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Environmental Impact Statement

Waste Management Activities for Groundwater Protection Savannah River Plant Aiken, South Carolina

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APPENDIX G

ASSESSMENT OF ALTERNATIVE STRATEGIES FOR NEW DISPOSAL/STORAGE FACILITIES

This environmental impact statement (EIS) furnishes an environmental basis for selecting a strategy to modify waste management activities at the Savannah River Plant (SRP). Appendix G provides the range of potential environmental impacts of the four strategies described in Chapter 2 (i.e., No Action, Dedication, Elimination, and Combination) relative to new disposal/storage facilities. Table G-1 lists the technologies the U.S. Department of Energy (DOE) could employ under each strategy. The implementation of each waste management strategy has been defined in terms of these technologies and facilities, which assume design and operation in compliance with all applicable regulations and requirements (see Appendix E). TE

This appendix discusses the range of potential environmental impacts associated with the implementation of each of the four alternative waste management strategies. The environmental evaluation is conservative; it analyzes impacts on groundwater, surface water, air, ecology, archaeological and historic resources, human health, socioeconomics, land dedication, institutions (DOE), and noise. Some analyses (i.e., groundwater modeling) were conducted relative to a specific site because of the need for site-related parameters. TE

Appendix E describes site selection. Site B was selected for hazardous waste and mixed waste RCRA facilities; Site L for mixed waste cement/fly ash matrix disposal; and Site G for low-level radioactive waste facilities (see Figure E-3). Some analyses (e.g., archaeological and historic resources) were conducted on the three or four highest ranked candidate sites. Other analyses (i.e., noise) were based on the nature of the potential impact relative to conditions present at any candidate site. Table G-2 shows the basis of impact evaluations in each environmental category. TE

The accuracy of numerical modeling results (i.e., groundwater concentrations and radiological doses) and qualitative results are affected by assumptions, potential ranges of significant parameters, and estimated site-specific details. The level of accuracy of these results is within an average factor of 5; therefore, they can be used only to determine the relative performance of a strategy. They are appropriately used in this EIS only for comparative evaluations and strategy selection. TE

G.1 NO-ACTION STRATEGY

G.1.1 SUMMARY AND OBJECTIVES

The No-Action strategy would continue the current management of hazardous, mixed, and low-level radioactive wastes with no new facilities. The existing interim storage buildings for hazardous and mixed waste would be used for storage until their capacity is reached in 1992. The existing low-level radioactive waste burial ground would be used for disposal of low-level waste

Table G-1. New Disposal/Storage Facility Technologies

Waste management strategy	Disposal/ storage objective	Disposal/storage technologies: Hazardous waste	Mixed waste	Low-level waste
No Action	No new facilities	Storage at existing facilities and at other available structures, pads, and areas	Storage at existing facilities and at other available structures, pads, and areas	Disposal at existing facilities and storage at other available structures, pads, and areas
Dedication	Disposal facilities	RCRA landfill or vaults[a]	RCRA landfill or shielded vaults[a], with or without CFM[e] vaults	ELLT[b], vaults[a], or AGO[c] for low-activity waste; and vaults or GCD[d] for intermediate activity waste
Elimination	Retrievable storage facilities	Storage buildings	Shielded storage buildings	Engineered storage buildings
Combination	Disposal/storage combination	Storage buildings and RCRA landfill or vaults[a]	Shielded storage buildings and RCRA landfill or shielded vaults[a], with or without CFM[e] vaults	Engineered storage buildings; and ELLT[b], vaults[a], or AGO[c] for low-activity wastes; and vaults[a] or GCD[d] for intermediate-activity waste

[a]Vaults may be aboveground or belowground.
[b]Engineered low-level trench disposal.
[c]Above grade operation disposal.
[d]Greater confinement disposal.
[e]Cement/flyash matrix.

Table G-2. Basis for New Waste Management Facility Impact Evaluations

Environmental Category	Basis of Impact Evaluation	
Groundwater	Environmental impacts analyzed using computer model or presumption of facility compliance with regulations; assumptions include (1) Candidate Site B (RCRA facilities for hazardous or mixed waste), Site L (DOE facilities for delisted mixed waste), or Site G (DOE facilities for low-level radioactive waste); (2) Waste stream consists of operations and interim storage wastes; and (3) Some pretreatment.	
Surface water	Same as Groundwater.	
Nonradiological air	Impacts based on the presumption that wastes are containerized at the treatment or generating facility prior to delivery for disposal or storage.	
Ecology	Impacts based on a conservative estimate of the land area required for technologies assuming maximum potential waste volumes and various ecological features as determined at the candidate sites.	TE
Radiological releases	Same as Groundwater.	
Archaeological and historic	Impacts based on results of an archaeological and historic field survey of candidate sites.	
Socioeconomics	Impacts assume a peak construction force for new waste management facilities not exceeding 200 persons.	
Noise	Impacts based on attenuation features at all possible siting locations.	
Site dedication	Impacts based on an estimate of the land area required for disposal assuming the most land intensive technologies and maximum potential waste volumes.	TE
Institutional	Impacts assessed relative to applicable regulations.	

until its capacity is reached in early 1989. Thereafter, containerized wastes would be stored indefinitely in other existing structures, on available concrete pads, or in other waste storage or disposal areas.

Under no action, noncompatible hazardous and mixed wastes would be segregated and stored to simplify periodic inspection. Inspections would be performed regularly, damaged or deteriorated containers would be replaced, and any spillage or leakage would receive immediate attention. Low-level radioactive and mixed wastes having radioactivity greater than 300 millirem per hour (i.e., intermediate-activity waste) would be placed in existing unused shielded structures such as the R-Reactor building.

The release of waste constituents and the associated health and environmental effects would be insignificant if no substantial leaks or spills occurred as a result of fire, explosion, container deterioration, or breach of containers by impact. Storage facilities of this type would not be designed and constructed to include the backup systems and safety equipment required of a regulated facility (e.g., liners and barriers, leachate collection, built-in fire protection, vapor detection, leakage recovery); thus, the risk of a serious accidental release of waste and the associated effects would be greater than any of the other strategies. A potential failure in performance of no action could result in releases ranging from zero (no releases under optimum circumstances) to the release and dispersion of all waste stored (under severe accidental or natural disaster circumstances). Because there would be no barriers, backup systems, and safety equipment, the risk of any waste constituent release, including a catastrophic release, would be higher than with other strategies. Although this higher risk cannot be quantified, it would be unacceptable under applicable regulations.

Details not considered in the environmental evaluation of no action include identification of specific unused structures, pads, or areas for storage; container design; specific handling and operational procedures; and specific characteristic of the waste generated. No action would not achieve regulatory compliance and poses higher environmental and health risks. The assessment of specific environmental categories assumes that the No-Action strategy would result in a high risk of sudden or long term accidental release of waste, adversely affecting the environment and potentially affecting human health.

G.1.2 GROUNDWATER AND SURFACE WATER EFFECTS

Waste management under no action could involve a greater risk of accidental release of waste constituents to surface and subsurface waters than other strategies. Potential impacts to the environment cannot be predicted accurately but over a 20-year period are assumed to exceed those of currently documented SRP existing waste sites.

G.1.3 NONRADIOACTIVE ATMOSPHERIC RELEASES

The preparation of existing structures, pads, and other areas for the storage of wastes under no action would result in the emission of small quantities of carbon monoxide and hydrocarbons from engine exhausts and truck traffic, and suspended particulates and dust from ground-surface disturbances. All applicable emission standards would be met during this activity.

The EIS assumes that all wastes would be packaged in high-integrity containers and that, except for accidents, natural disasters, or neglect, there would be no releases. Because of the lack of backup containment systems, leak sensors, and protection systems (e.g., fire, freezing), and because of its vulnerability to natural forces and human error, the No-Action strategy would have an unquantified risk of release and atmospheric dispersion of the stored material ranging between zero and 100 percent, which could cause environmental and health effects both on- and offsite.

G.1.4 ECOLOGICAL EFFECTS

Under the No-Action strategy, releases could range between zero and 100 percent of the waste stored. The ecological impact would depend on the amount and type of material released, the proximity to sensitive areas, and on the effectiveness of cleanup actions. Wetlands and aquatic resources would be especially sensitive to uncontrolled releases. The exact nature and extent of impacts cannot be determined, but the risk of such damage is higher than with other strategies.

G.1.5 RADIOLOGICAL RELEASES

Structures, pads, and areas that could be used to store mixed and radioactive wastes after the existing facilities reached capacity would not be equipped with protective and backup systems to contain releases. Although storage operations would strive to prevent releases of radiological contaminants to the environment, the risk of such an occurrence would be much higher for no action than for any other strategy. The on- and off-site effects of such releases cannot be accurately determined but could involve significant impact on human health and the environment. TE

G.1.6 ARCHAEOLOGICAL AND HISTORIC RESOURCES

No new construction would be required, because existing facilities would be used. Additional pads for storage of wastes would be located at an existing facility where, because of past soil disturbances, there are no significant archaeological resources.

G.1.7 SOCIOECONOMICS

Under the No-Action strategy, the potential socioeconomic impacts of a large-scale, catastrophic, accidental release could be substantial due to the combined effects of three factors. First, cleanup specialists would be brought in as expediently as possible. This sudden demand for housing and other requirements could have adverse effects on real estate markets and government services. Second, with such a release, it is possible that specific SRP units would have to shut down because of either contamination or interference with the cleanup. A shutdown could potentially result in SRP layoffs. Finally, public perception of the incident's effect on human health and welfare could have severe adverse effects on property demand and property values near the SRP. TC

G.1.8 DEDICATION OF SITE

The No-Action strategy would not involve permanent placement of wastes at existing facilities, but rather a temporary storage arrangement in which the ability to retrieve the waste was preserved. Assuming an uneventful period of storage, the long term dedication of these storage facilities would not be required. However, site dedication could be required as a result of previous waste management practices or a serious accidental release of wastes during storage.

G.1.9 INSTITUTIONAL IMPACTS

Because no action would involve the use of existing structures and waste disposal facilities for an indefinite period, DOE would have to maintain full title and control of the land as long as the wastes were stored.

G.1.10 NOISE

The preparation of storage areas under no action could require heavy equipment. Noise from this equipment would not be detectable at the SRP boundary because of attenuation provided by distance, topography, and natural vegetation.

G.2 DEDICATION STRATEGY

G.2.1 SUMMARY AND OBJECTIVES

With the Dedication strategy for waste management, DOE would establish new disposal facilities to accommodate hazardous, low-level radioactive, and mixed
TE wastes generated from ongoing SRP operations, those in interim storage, and those generated from the closure of existing waste sites. Waste disposal
TC sites would be dedicated for waste management in perpetuity. Up to 400 acres would be required. For the service life of the facilities plus an institutional control period following cessation of active service, DOE would monitor and maintain the sites to ensure long term environmental and public health protection.

Table G-1 lists the technologies included in the Dedication strategy; they are described in Appendix E.

Under the hazardous waste category, both RCRA landfill and vault technologies are considered to be equivalent in their groundwater protection capabilities; therefore, both were evaluated. The RCRA landfill and vault technologies under mixed waste are equivalent as well; however, when the cement/flyash matrix (CFM) vaults are included in the alternative, they represent the least
TC protective of the technological options. Therefore, RCRA landfill or vault, with CFM vault, was selected to describe mixed waste impacts.

Under low-level waste, the vault and greater confinement disposal technologies for intermediate-activity waste are considered equivalent in groundwater protection capabilities, and no distinction is made in the evaluation. Among the technologies for low-activity waste disposal, the engineered low-level trench (ELLT) technology was selected to evaluate the impacts since it represents the least protective of the optional technologies available for the disposal of this waste type. TC

The assessment of environmental impacts for the Dedication strategy presumes that facilities would be constructed and operated in accordance with applicable regulations and would achieve regulatory and environmental compliance.

Modeling has been used to define the influence of specific protective design features and the need for potential future mitigation. Assuming that post-closure maintenance and monitoring will cease at the end of the institutional control period, model results show that exceedances of environmental or health standards caused by presumed structural failure of a facility may occur to substantially varying degrees depending on the technology used (i.e., landfill or vault), the closure design (i.e., low permeability cap or no cap), and the inclusion of waste pretreatment technologies (i.e., treated waste or no pretreatment). DOE is <u>not</u> proposing waste management technologies under the Dedication strategy which will knowingly fail. For those alternatives which modeling indicates will fail at some time beyond the 100-year institutional control period, this EIS assumes that such failure would be averted by modifications to design, operations and, if necessary, post-closure care activities up to and including future waste retrieval and remedial action. TC

G.2.2 GROUNDWATER AND SURFACE WATER EFFECTS

The base floodplain of the SRP region is confined to riparian wetlands and low terraces along the Savannah River and its primary tributaries. Siting criteria for new disposal facilities avoid such flood-prone areas; thus, no impacts due to potential flooding of the facilities are expected.

G.2.2.1 Hazardous Waste

Facilities for hazardous waste management would be designed to meet or exceed RCRA minimum technology requirements (i.e., a goal of zero release) and prevent contact of waste constituents with groundwater. The facilities would include interior and exterior leachate collection systems to recover and retain any waste releases that could occur. Accordingly, releases of contaminants to the subsurface environment are not expected to occur, and groundwater quality should not be significantly affected during the period of institutional control.

Modeling of hazardous and mixed waste streams combined predicts that, beyond the institutional control period, both RCRA landfill and vault technology will eventually fail to varying degrees, given certain conditions and sufficient time. The RCRA landfill without a low-permeability cap and no predisposal treatment resulted in exceedances at the boundary well of the acceptable daily intake (ADI) of several hazardous substances soon after the end of the institutional control period. Exceedances of surface water criteria were determined in wetlands and Upper Three Runs Creek. No exceedances were identified for the Savannah River because of its dilution capacity.

Vault technology, a low-permeability cap, and predisposal treatment (i.e., incineration) all resulted in improvements which were somewhat additive. Modeling showed no exceedances of the ADI or surface water criteria for vault technology with a low-permeability cap and predisposal treatment. Table G-3 summarizes all exceedances of the ADI and surface water criteria identified by the modeling effort. For potential impacts that are projected to occur beyond the 100-year institutional control period, future planning would determine the most cost-effective, cost-beneficial technological option.

G.2.2.2 Mixed Waste

Mixed waste management with RCRA landfills or vaults would meet or exceed RCRA minimum technology requirements. Releases of contaminants to the subsurface environment are not expected to occur. Groundwater quality should not be significantly affected during the period of institutional control (see G.2.2.1).

Modeling indicates that no hazardous substances are released in concentrations which exceed applicable groundwater or surface water standards during a period up to 10,000 years following closure.

Of the radiological constituents, only uranium-238 was shown to exceed the derived standard [i.e., ICRP Publication 30 (ICRP, 1979) methodology was used to determine the radionuclide concentration that individually yields an annual effective whole-body dose or organ dose of 4 millirem per year, the dose limit required by EPA Primary Drinking Water Standards (40 CFR 141)]. Table G-4 shows that the estimated peak concentration at the boundary well was 8.3 times the standard concentration and was predicted to occur at 10,000 years. All remaining boundary well nuclides, as well as all surface water nuclides including uranium, did not exceed their respective derived standard concentrations.

Modeling was conservatively conducted with no solubility limit inputs for uranium. Uranium chemistry in the natural environment is complex and is a function of many factors including soil pH, groundwater reduction-oxidation (redox) potential (Eh), cation exchange capacity, and the presence of chelating or complexing species. In a field situation, low uranium solubility limits compared to the release rate will act as a limit to the migration of uranium from the facility. Uranium and other radionuclides are not expected to exceed derived groundwater or surface water standards due to the presence of solubility limits.

G.2.2.3 Low-Level Radioactive Waste

Low-level radioactive waste management activities, which were selected to evaluate impacts to groundwater and surface water, included ELLTs for disposal of low-activity waste (less than 300 millirem per hour) and vaults or GCD for disposal of intermediate-activity waste. These facilities would be constructed in accordance with DOE Orders and would achieve releases which are as low as reasonably achievable (ALARA). Groundwater and surface water modeling predict the peak concentrations of radionuclides and the times at which they occur. Table G-5 compares the modeling results to the derived groundwater standard for each nuclide.

Table G-3. Ratio of Modeled Peak Concentration to ADI[a]/Surface Water Criteria[b]

Substance	RCRA landfill		Vault	
	No cap	With cap	No cap	With cap
	BOUNDARY WELL (No Pretreatment)			
2,4-D	3.1 (100)[c]	2.2 (140)	< 1	< 1
Lead	140 (7700)	14 (74000)	77 (8100)	< 1
Methylethyl Ketone	550 (110)	52 (260)	3.3 (330)	3.3 (760)
Nitrate	4.6 (110)	3.6 (130)	< 1	< 1
Phenol	50 (110)	40 (130)	< 1	< 1
Toluene	8.8 (210)	< 1	< 1	< 1
TBP[d]	1200 (160)	130 (810)	8.2 (1000)	8.3 (9600)
Xylene	3300 (100)	1800 (170)	17 (330)	17 (1100)
	BOUNDARY WELL (Treated Waste)			
Lead	170 (7500)	19 (74000)	75 (8500)	< 1
Nitrate	1.1 (170)	1.1 (200)	< 1	< 1
	WETLAND (No Pretreatment)			
Benzene	2000	190	520	16
2,4-D	9400	8100	80	79
Lead	1.3	1.1	1.3	< 1
Lindane	37000	3600	800	300
Phenol	210	190	1.8	1.8
Toluene	590	54	35	4.6
TBP[d]	5.9	4.9	< 1	< 1
111-TCE[e]	5900	4900	49	49
	WETLAND (Treated Waste)			
Lead	1.3	1.1	1.2	< 1
	UPPER THREE RUNS CREEK (No Pretreatment)			
Benzene	2.0	< 1	< 1	< 1
2,4-D	9.4	8.1	< 1	< 1
Lindane	37	3.6	< 1	< 1
111-TCE[e]	5.9	4.9	< 1	< 1
	Upper Three Runs Creek (Treated Waste) No Exceedances			
	Savannah River (No Pretreatment or Treated Waste) No Exceedances			

TC

[a]Acceptable Daily Intake.
[b]Source: Cook, Grant, and Towler, 1987a.
[c]Numbers in parentheses represent the number of years after closure when peak will occur.
[d]Tributyl phosphate.
[e]1,1,1-Trichloroethane.

Table G-4. Estimated Peak Concentrations of Radionuclides (pCi/L) and Times of Occurrence for Dedication Strategy, Mixed Waste[a]

Radionuclide	Derived standard[b]	Estimated concentration[c]: Boundary well Estimate	Boundary well Ratio	Wetlands Estimate	Wetlands Ratio	Upper Three Runs Creek Estimate	Upper Three Runs Creek Ratio	Savannah River Estimate	Savannah River Ratio
Tritium	8.7×10^{4}	1.1×10^{0} (114)	1.3×10^{-5}	2.2×10^{-2} (140)	2.5×10^{-7}	2.2×10^{-5} (140)	2.5×10^{-10}	4.1×10^{-7} (140)	4.7×10^{-12}
Strontium-90	4.2×10^{1}	2.5×10^{-4} (361)	6.0×10^{-6}	1.9×10^{-14} (914)	4.5×10^{-16}	1.9×10^{-17} (914)	4.5×10^{-19}	3.6×10^{-19} (914)	8.6×10^{-21}
Yttrium-90	5.5×10^{2}	2.5×10^{-4} (361)	4.5×10^{-7}	1.9×10^{-14} (914)	3.5×10^{-17}	1.9×10^{-17} (914)	3.5×10^{-20}	3.6×10^{-19} (914)	6.5×10^{-22}
Uranium-235	2.2×10^{1}	1.6×10^{-1} (10,000)	7.3×10^{-3}	7.7×10^{-3} (10,000)	3.5×10^{-4}	7.7×10^{-6} (10,000)	3.5×10^{-7}	1.4×10^{-7} (10,000)	6.4×10^{-9}
Uranium-238	2.4×10^{1}	2.0×10^{2} (10,000)	8.3×10^{0}	9.5×10^{0} (10,000)	4.0×10^{-1}	9.5×10^{-3} (10,000)	4.0×10^{-4}	1.8×10^{-4} (10,000)	7.5×10^{-6}
Ratio Total			8.3×10^{0}		4.0×10^{-1}		4.0×10^{-4}		7.5×10^{-6}

[a]Source: Cook and Grant, 1987.
[b]ICRP Publication 30 (ICRP, 1979) methodology was used to determine radionuclide concentrations that individually yield an annual effective whole-body or organ dose of 4 millirem. Four millirem dose limit required for drinking water by 40 CFR 141.
[c]Figures in parentheses represent number of years after closure.

TC

Table G-5. Estimated Peak Concentrations of Radionuclides (pCi/L) and Times of Occurrence for Dedication Strategy, Low-Level Waste[a]

Radionuclide	Derived standard[b]	Estimated concentration[c]: Boundary well Estimate	Boundary well Ratio	Wetlands Estimate	Wetlands Ratio	Upper Three Runs Creek Estimate	Upper Three Runs Creek Ratio	Savannah River Estimate	Savannah River Ratio
LOW-ACTIVITY WASTE									
Carbon-14	2.6×10^{3}	1.25×10^{-1} (30.1)	4.81×10^{-5}	1.62×10^{-2} (53.1)	6.23×10^{-6}	1.62×10^{-5} (53.1)	6.23×10^{-9}	3.03×10^{-7} (53.1)	1.17×10^{-10}
Tritium	8.7×10^{4}	4.20×10^{0} (24.4)	4.83×10^{-5}	1.92×10^{-1} (40.1)	2.21×10^{-6}	1.92×10^{-4} (40.1)	2.21×10^{-9}	3.58×10^{-6} (40.1)	4.11×10^{-11}
Iodine-129	2.0×10^{1}	3.36×10^{-3} (132)	1.68×10^{-4}	4.44×10^{-4} (179)	2.22×10^{-5}	4.44×10^{-7} (179)	2.22×10^{-8}	8.29×10^{-9} (179)	4.15×10^{-10}
Rubidium-87	1.1×10^{3}	2.35×10^{-7} (2730)	2.14×10^{-10}	3.24×10^{-8} (3350)	2.95×10^{-11}	3.24×10^{-11} (3350)	2.95×10^{-14}	6.06×10^{-13} (3350)	5.51×10^{-16}
Selenium-79	6.6×10^{2}	7.42×10^{-3} (1380)	1.12×10^{-5}	1.02×10^{-3} (1700)	1.55×10^{-6}	1.02×10^{-6} (1700)	1.55×10^{-9}	1.90×10^{-8} (1700)	2.88×10^{-11}
Technetium-99	4.2×10^{3}	4.13×10^{0} (24.4)	9.83×10^{-4}	5.62×10^{-1} (47.7)	1.34×10^{-4}	5.62×10^{-4} (47.7)	1.34×10^{-7}	1.05×10^{-5} (47.7)	2.50×10^{-9}
Neptunium-237	1.4×10^{-1}	1.15×10^{-4} (5430)	8.21×10^{-4}	1.59×10^{-5} (6640)	1.14×10^{-4}	1.59×10^{-8} (6640)	1.14×10^{-7}	2.97×10^{-10} (6640)	2.12×10^{-9}
Subtotal			2.08×10^{-3}		2.80×10^{-4}		2.80×10^{-7}		5.22×10^{-9}
INTERMEDIATE-ACTIVITY WASTE									
Carbon-14	2.6×10^{3}	3.63×10^{-1} (57.1)	1.40×10^{-4}	1.41×10^{-2} (91.8)	5.42×10^{-6}	1.41×10^{-5} (91.8)	5.42×10^{-9}	2.64×10^{-7} (91.8)	1.02×10^{-10}
Tritium	8.7×10^{4}	6.13×10^{6} (37.7)	7.05×10^{1}	6.58×10^{4} (55.4)	7.56×10^{-1}	6.58×10^{1} (55.4)	7.56×10^{-4}	1.23×10^{0} (55.4)	1.41×10^{-5}
Iodine-129	2.0×10^{1}	2.00×10^{-2} (171)	1.00×10^{-3}	7.82×10^{-4} (295)	3.91×10^{-5}	7.82×10^{-7} (295)	3.91×10^{-8}	1.46×10^{-8} (295)	7.30×10^{-10}

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Table G-5. Estimated Peak Concentrations of Radionuclides (pCi/L) and Times of Occurrence for Oedication Strategy, Low-Level Waste[a] (continued)

Radionuclide	Derived standard[b]	Estimated concentration[c]: Boundary well Estimate	Boundary well Ratio	Wetlands Estimate	Wetlands Ratio	Upper Three Runs Creek Estimate	Upper Three Runs Creek Ratio	Savannah River Estimate	Savannah River Ratio
Rubidium-87	1.1×10^{3}	2.17×10^{-5} (3020)	1.97×10^{-8}	8.51×10^{-7} (3490)	7.74×10^{-10}	8.51×10^{-10} (3490)	7.74×10^{-13}	1.59×10^{-11} (3490)	1.45×10^{-14}
Selenium-79	6.6×10^{2}	3.40×10^{-1} (709)	5.15×10^{-4}	1.32×10^{-2} (1410)	2.00×10^{-5}	1.32×10^{-5} (1410)	2.00×10^{-8}	2.46×10^{-7} (1410)	3.73×10^{-10}
Technetium-99	4.2×10^{3}	1.20×10^{1} (646)	2.86×10^{-3}	4.69×10^{-1} (102)	1.12×10^{-4}	4.69×10^{-4} (102)	1.12×10^{-7}	8.77×10^{-6} (102)	2.09×10^{-9}
Strontium-90	4.2×10^{1}	1.16×10^{-7} (1060)	2.76×10^{-9}	(d)	-	(d)	-	(d)	-
Yttrium-90	5.5×10^{2}	1.16×10^{-7} (1060)	2.11×10^{-10}	(d)	-	(d)	-	(d)	-
Uranium-234	2.1×10^{1}	2.47×10^{1} (7480)	1.18×10^{0}	(d)	-	(d)	-	(d)	-
Uranium-235	2.2×10^{1}	2.80×10^{-1} (7480)	1.27×10^{-2}	(d)	-	(d)	-	(d)	-
Uranium-236	2.2×10^{1}	2.02×10^{0} (7480)	9.18×10^{-2}	(d)	-	(d)	-	(d)	-
Uranium-238	2.4×10^{1}	1.23×10^{0} (7480)	5.13×10^{-2}	(d)	-	(d)	-	(d)	-
Neptunium-237	1.4×10^{-1}	2.05×10^{-2} (3270)	1.46×10^{-1}	7.87×10^{-4} (4750)	5.62×10^{-3}	7.87×10^{-7} (4750)	5.62×10^{-6}	1.47×10^{-8} (4750)	1.05×10^{-7}
Subtotal			7.20×10^{1}		7.62×10^{-1}		7.62×10^{-4}		1.42×10^{-5}
Ratio Totals			7.20×10^{1}		7.62×10^{-1}		7.62×10^{-4}		1.42×10^{-5}

[a] Source: Cook, Grant, and Towler, 1987b.
[b] ICRP Publication 30 (ICRP, 1979) methodology was used to determine radionuclide concentrations that individually yield an annual effective whole-body or organ dose of 4 millirem. Four millirem dose limit required for drinking water by 40 CFR 141.
[c] Figures in parentheses represent number of years after closure.
[d] No significant radionuclide concentration at this receptor location within 10,000 years after closure.

TC

Table G-5 shows that peak concentrations of low-activity waste constituents occur at the boundary well as soon as 24 years following closure during the institutional control period and up to 5400 years in the future. The ratio of TE each peak concentration to its respective standard is less than one, indicating that no exceedances are projected to occur. Peak concentrations occur at widely varying times, and the sum of the ratios is less than one. This indicates that even if the peak concentrations occurred at the same time, the total annual radiological dose received by an individual using boundary well water or surface water for his sole drinking water supply would still be less TE than 0.2 percent of the drinking water standard.

The peak concentrations of intermediate-activity waste occur as soon as 38 years and up to 7500 years after closure. With the exception of tritium and uranium-234, all ratios of concentrations to standards are less than 1. TE Modeling yielded estimates that uranium-234 exceeds its derived standard, peaking at 7480 years. Since the model used contains no solubility limits for uranium which would inhibit leaching and transport, this value is considered high, and the uranium-234 concentration is not expected to exceed its derived groundwater standard (see Section G.2.2.2).

Tritium in surface waters is not expected to exceed its derived standard. However, a peak tritium concentration of approximately 70 times the derived standard occurs 38 years following closure at the boundary well. This TE exceedance is based on a conservative assumption that the facilities would contain no liners or leachate collection system. The tritium peak at 38 years occurs during the institutional control period. Therefore, an exceedance of the derived standard for tritium is not expected to occur because: (1) the vault technology or the optional GCD technology used for intermediate-activity waste disposal contain liners and leachate collection systems that would intercept and recover any tritium released from the waste throughout the 100-year institutional control period, (2) by the end of the 100-year TC institutional control period, radiological decay would reduce the original radioactivity by 99 percent, (3) if leachate continued to exceed standards at the conclusion of the 100-year institutional control period, an extended control period would be implemented by DOE until groundwater standards would be achieved without leachate collection, and (4) as a mitigation measure, tritium waste could be segregated from the intermediate-activity waste stream and stored for decay in place.

Low-level radioactive waste constituent concentrations are not expected to exceed derived standards at the boundary well, wetlands, Upper Three Runs Creek, or the Savannah River with any combination of the low-level waste technologies in Table G-1.

G.2.3 NONRADIOACTIVE ATMOSPHERIC RELEASES

The construction of waste disposal facilities would result in the emission of small quantities of carbon monoxide and hydrocarbons from engine exhausts and truck traffic, and suspended particulates and dust from ground surface disturbances. All applicable emission standards would be met during construction.

Because hazardous and mixed wastes would be delivered in sealed containers, releases would be unlikely. Thus, no significant impact on air quality is TE projected.

G.2.4 ECOLOGICAL EFFECTS

The candidate sites range as close as 300 meters to primary SRP streams (i.e., Upper Three Runs Creek, Tinker Creek) and even closer to associated wetlands and ephemeral feeder streams. The operation and dedication of facilities is not expected to involve releases which would exceed groundwater quality standards or surface water standards/criteria; therefore, no adverse impacts on aquatic or terrestrial ecology are expected.

Construction of waste disposal facilities may involve clearing as much as 400 acres for the waste facilities and roads. This clearing would destroy existing or potential wildlife habitat and foreclose any other future benefits that may be provided by a natural landscape at the candidate site (e.g., timber production). The available habitat on the SRP amounts to 184,200 acres; thus, the maximum loss of about 0.2 percent (i.e., 400 acres) would have an insignificant effect on the ecology of the Plant and the region.

Four endangered species (bald eagle, red-cockaded woodpecker, wood stork, and shortnose sturgeon) occur on or near the SRP; however, none are present on or in the immediate vicinity of any candidate sites. Therefore, construction of the disposal facilities under the Dedication strategy would not cause adverse impacts to any endangered species.

In addition to the habitat destruction, traffic, facility lighting, and human presence in the area would disturb wildlife in otherwise unaffected areas surrounding the facility and associated roadways. Traffic would also increase the risk of vehicle-wildlife collisions; however, because of slow vehicle speed such occurrences would be rare and would not have a significant impact on wildlife populations.

Construction of the facilities could result in soil erosion and subsequent sedimentation of nearby streams, distant wetlands, or creeks. Adequate erosion and sedimentation control measures should eliminate impacts on wetlands and water bodies.

With the belowground disposal options, the uptake of wastes by vegetation could occur if the roots of plants penetrated the clay cap and/or other barriers between the surface and the waste forms. Therefore, shallow-rooted species will be used to stabilize soils during closure and will be mowed during the postclosure institutional control period to prevent deeply-rooted plants (e.g., shrubs and trees) from becoming established.

G.2.5 RADIOLOGICAL RELEASES

G.2.5.1 Hazardous Waste

Since by definition hazardous wastes do not contain radioactive constituents, no radiological releases are expected from hazardous waste disposal facilities.

G.2.5.2 Mixed Waste

Mixed waste management with RCRA landfills or vaults would meet or exceed RCRA minimum technology requirements. Radiological releases from the facilities, as well as releases of other waste constituents, are not expected to occur during the institutional control period (see Section G.2.2.1). RCRA landfills and CFM vaults or RCRA vaults and CFM vaults and potential waste constituent releases are described in Section G.2.2.2. TE

Computer modeling was used to estimate the peak individual radiological doses from boundary well water, Savannah River water, and food grown onsite. Unlike ADIs for hazardous waste constituents, radiological doses expressed in millirem per year are additive and can be evaluated individually or collectively against a dose standard.

Table G-6 shows the peak radiological doses estimated by the model and the estimated times of occurrence for the three pathways. Conservative assumptions in the model were that the facility would not include a low-permeability cap, and that there were no solubility limits for uranium. As expected, only uranium-238 at the boundary is shown to be responsible for the exceedance of the 4 millirem per year drinking-water-dose standard. Doses from all other nuclides at the boundary well and all nuclides including uranium-238 from other pathways are below the standard. TE

The model assumption of no solubility limit for uranium is conservative and impossible in the environment of the SRP (see Section G.2.2.2). Consequently, the radiological dose from uranium-238 and all nuclides collectively, at the hypothetical boundary well and through other pathways, is expected to be significantly below the 4-millirem-per-year standard. TE

G.2.5.3 Low-Level Radioactive Waste

Computer modeling was used to predict peak individual radiological doses from ELLT disposal of low-activity waste and vault or GCD disposal for intermediate-activity waste. The two pathways analyzed were the boundary well and the Savannah River. Doses were calculated on the basis of an individual's diet of plant, meat, and dairy foods grown using well or river water, plus the direct annual ingestion of 370 liters of the same water.

Table G-7 shows the peak radiological doses estimated by the model and the estimated times of occurrence for the two pathways. Modeling has identified tritium from the intermediate-activity fraction as the dominant radionuclide relative to individual dose. However, when considering the inclusion of leachate collection and radiological decay during the period of institutional control, plus the ability to extend institutional control as necessary or segregate and store tritium for decay in-place, the total radiological doses from either pathway are within the applicable 4-millirem-per-year standard.

Doses from uranium-234, as well as the other uranium isotopes, would be substantially less than shown because of solubility limits in the environment not included in the modeling effort (see G.2.2.2). TE

G.2.6 ARCHAEOLOGICAL AND HISTORIC RESOURCES

Brooks, Hanson, and Brooks (1986) describe an intensive archaeological survey of the SRP candidate sites in compliance with Federal regulations. Within the five highest-rated candidate sites for waste disposal facilities under the Dedication strategy, five archaeological sites were located in Site G and two in Site L. Because of their limited extent, content, disturbed surface TC

Table G-6. Peak Radiological Dose and Times of Occurrence for Dedication Strategy, Mixed Waste[a]

Radionuclide	Boundary well		Savannah River		Food grown on site	
	Dose	Time	Dose	Time	Dose	Time
Tritium	6.1×10^{-5}	114	2.2×10^{-11}	140	(b)	-
Strontium-90	1.6×10^{-5}	361	3.3×10^{-20}	914	4.4×10^{-5}	100
Yttrium-90	(b)	-	2.5×10^{-21}	914	(b)	-
Uranium-235	1.9×10^{-2}	10,000	1.8×10^{-8}	10,000	(b)	-
Uranium-238	2.2×10^{1}	10,000	2.0×10^{-5}	10,000	2.6×10^{-4}	100
Cesium-137	(b)	-	(b)	-	2.8×10^{-5}	100
Total Dose	2.2×10^{1}		2.0×10^{-5}		3.3×10^{-4}	

[a]Source: Cook and Grant, 1987. Doses calculated using PATHRAE model incorporating a human diet of plant, meat, and dairy foods and 370 liters of contaminated water ingested per year. Doses expressed in millirem per year; time in number of years after closure. TC

[b]Dose contributed from this radionuclide is insignificant.

Table G-7. Peak Radiological Dose and Times of Occurrence for Dedication Strategy, Low-Level Waste[a]

Radionuclide	Boundary well Dose	Boundary well Time	Savannah River Dose	Savannah River Time
		LOW-ACTIVITY WASTE		
Carbon-14	1.58×10^{-4}	30.1	2.06×10^{-8}	53.1
Tritium	2.24×10^{-4}	24.4	1.93×10^{-10}	40.1
Iodine-129	6.67×10^{-4}	132	1.89×10^{-9}	179
Rubidium-87	8.93×10^{-10}	2730	4.24×10^{-14}	3350
Selenium-79	4.37×10^{-5}	1380	2.97×10^{-10}	1700
Technetium-99	3.93×10^{-3}	24.4	1.14×10^{-8}	47.7
Neptunium-237	2.09×10^{-5}	5430	6.19×10^{-11}	6640
Subtotal	5.04×10^{-3}		3.44×10^{-8}	
		INTERMEDIATE-ACTIVITY WASTE		
Carbon-14	4.59×10^{-4}	57.1	1.79×10^{-8}	91.8
Tritium	3.28×10^{2}	37.7	6.62×10^{-5}	55.4
Iodine-129	3.97×10^{-3}	171	3.32×10^{-9}	295
Rubidium-87	8.24×10^{-8}	3020	1.11×10^{-12}	3490
Selenium-79	2.00×10^{-3}	709	3.84×10^{-9}	1410
Technetium-99	1.14×10^{-2}	64.6	9.52×10^{-9}	102
Strontium-90	7.43×10^{-9}	1060	b	-
Yttrium-90	5.72×10^{-10}	1060	b	-
Uranium-234	3.06×10^{0}	7480	b	-

Footnotes on last page of table.

Table G-7. Peak Radiological Dose and Times of Occurrence for Dedication Strategy, Low-Level Waste[a] (continued)

Radionuclide	Boundary well Dose	Boundary well Time	Savannah River Dose	Savannah River Time
Uranium-235	3.34×10^{-2}	7480	b	-
Uranium-236	2.41×10^{-1}	7480	b	-
Uranium-238	1.35×10^{-1}	7480	b	-
Neptunium-237	3.72×10^{-3}	3270	3.06×10^{-9}	4750
Subtotal	3.31×10^{2}		6.62×10^{-5}	
Total Dose (all wastes)	3.31×10^{2}		6.62×10^{-5}	

TC [a]Source: Cook, Grant, and Towler, 1987b. Doses calculated using PATHRAE model scenarios incorporating a human diet of plant, meat, and dairy foods, and 370 liters of contaminated water ingested per year. Doses expressed in millirem per year; time in number of years after closure.

[b]No significant dose at this receptor location within 10,000 years after closure.

context, or the presence of similar preserved sites nearby, none of these sites is considered eligible for listing in the National Register of Historic Places. No further archaeological testing within these areas is warranted. Should a site for construction, other than those which have been evaluated, be considered for implementation during future planning, a similar field evaluation will be conducted to minimize potential impacts on archaeological resources.

TC

TE

G.2.7 SOCIOECONOMICS

The projected peak construction workforce is not expected to exceed 200 persons and would be from the existing SRP workforce. Workers are assigned to SRP projects based on availability. The construction workers required for this project reside in the SRP area and represent a maximum of only 2.6 percent of the Fiscal Year 1988 construction workforce projected by DOE. No impacts on the local communities and services because of immigrating workers are expected.

G.2.8 DEDICATION OF SITE

The original land acquisition efforts for the SRP were authorized by the Atomic Energy Act of 1946 (P.L. 77-585). This Act created the Atomic Energy Commission (AEC) and gave broad authority for land acquisition. These actions were not subject to discretionary Congressional review on such line items as specific parcel purchases.

The purchase of SRP properties was through fee-simple titles, which provide absolute ownership without limitations or conditions on their disposition. Land titles currently owned by DOE show no evidence of a remainder or reversion clause suggesting limited-ownership status (i.e., interest in an estate that passes on at a specified time or on the occurrence of a specific event). Moreover, a review of the AEC's official files and minutes yielded no evidence that a discussion of such actions took place during the land acquisition process at the SRP.

As a result of this ownership in perpetuity, DOE is responsible for ensuring long term dedication of the area to solid, hazardous, and nuclear waste disposal. Each disposal option identified in this EIS would require permanent dedication, defined as the retention of full title coupled with the implementation of security measures to prevent intentional or inadvertent human intrusion. Security measures include the enclosure of the actual site, the establishment of a land-use buffer zone around the waste facility within which only limited activities could occur (e.g., ecological research and forest management), the compliance with contingency plans and spill prevention and control measures, the erection of permanent markers to warn against future intrusion, and an extended period of institutional control as required.

New disposal facilities would require site dedication of up to an estimated 400 acres plus a buffer zone to ensure full compliance with the RCRA and South Carolina Hazardous Waste Management Regulations, and/or consistency with DOE Orders on environmental and public health protection.

G.2.9 INSTITUTIONAL IMPACTS

For DOE to ensure institutional control for the estimated 20-year service life of the waste disposal facilities and the monitoring period to follow, it must maintain full title to the land on which the disposal facilities are located. DOE must maintain organizational authority over the security and management of the site. Site dedication and security control require long-term control by a consistently cognizant organization.

In addition to the 30 years specified by RCRA for hazardous waste facilities, DOE intends to provide a minimum additional 70 years of institutional control, totaling 100 years. However, if necessary, these sites will be maintained in perpetuity to ensure long-term environmental and public health protection.

Institutional control requirements were imposed on DOE pursuant to RCRA and DOE Orders (see Table G-8).

Table G-8. Institutional Control Requirements

Requirement	Citation	Implementing agency	Summary
Financial requirements	R.61-79. 264, Subpart H[a]	South Carolina Department of Health and Environmental Control	Requires financial assurance of fiscal viability in the form of a trust fund, surety bond, or closure letter of credit. Although the Federal Government is exempt from this requirement, it recognizes the necessity for long term viability to ensure adequate closure and postclosure care.
Closure and postclosure performance standards	R.61-79. 264, Subpart G[a]	South Carolina Department of Health and Environmental Control	Requires that the need for maintenance be minimized and the potential for runoff and leaching be curtailed. Requires a postclosure monitoring period of 30 years.
Radioactive waste management	DOE 5820.2, Chapter III[b]	DOE	Requires security systems and permanent markers to prevent intrusion.

[a]South Carolina Hazardous Waste Management Regulations.
[b]DOE Administrative Order.

G.2.10 NOISE

Construction and operation of disposal facilities under the Dedication strategy would require heavy equipment. Noise from the equipment would not be detectable at the SRP boundary from any site and most other locations not less than 1 kilometer from the Plant boundary because of attenuation provided by distance, topography, and natural vegetation.

G.3 ELIMINATION STRATEGY

G.3.1 SUMMARY AND OBJECTIVES

Waste management under the Elimination strategy would use retrievable storage facilities to manage the hazardous, mixed, and low-level radioactive wastes generated for 20 years. A major objective of this strategy is to delay permanent deposition of wastes in anticipation of future, advanced methods of treatment, recycling, or disposal. Land is used on a temporary basis for waste management rather than being dedicated in perpetuity. When wastes are retrieved, the land may be used for other purposes or restored to a natural condition.

The technology included in the Elimination strategy is retrievable storage buildings as listed in Table G-1 and described in Appendix E.

The assessment of environmental impacts for the Elimination strategy presumes that retrievable storage facilities would be permitted, constructed, and operated for 20 years, in accordance with applicable regulations including periodic inspections and maintenance. Retrievable storage would achieve the goal of zero releases at hazardous and mixed waste facilities and ALARA releases, assumed to be zero, at low-level waste facilities. By the end of the operational period, advanced technologies for treatment, recycling, or disposal would be available presumably, such that the stored waste could be retrieved from the facilities.

The evaluation of the Elimination strategy is more limited than the Dedication strategy because it involves only the 20-year operational period (i.e., no post-operational impacts are considered) and it focuses only on the storage facilities (i.e., no consideration of impacts associated with construction or operation of the needed advanced treatment/disposal facilities during the 20-year operational period). TE

G.3.2 GROUNDWATER AND SURFACE WATER EFFECTS

The retrievable storage facilities of the Elimination strategy would achieve zero releases of waste constituents. Therefore, groundwater and surface water would not be contaminated with waste constituents.

The base floodplain of the region is confined primarily to wetlands and low terraces along the Savannah River and its primary tributaries. Siting criteria avoid such flood prone areas; thus, no impacts due to potential flooding of storage facilities are expected.

G.3.3 NONRADIOACTIVE ATMOSPHERIC RELEASES

The construction of the waste retrievable-storage facilities would result in the emission of small quantities of carbon monoxide and hydrocarbons from engine exhausts and truck traffic, and suspended particulates and dust from ground surface disturbances. All applicable emission standards would be met during construction.

Because hazardous, mixed, and low-level radioactive wastes would be delivered in high-integrity sealed containers, releases would be unlikely. No significant impact on air quality is projected.

G.3.4 ECOLOGICAL EFFECTS

No releases of waste constituents would result from operation of storage facilities. No contaminant-related impacts on aquatic or terrestrial resources are expected.

Construction of waste storage facilities may involve clearing up to 400 acres of land for facilities and roads. Clearing would destroy existing or potential wildlife habitat and foreclose other benefits (e.g., timber production) for the 20-year period of operations. Thereafter, the area could be restored to a natural condition or put to other nonrestricted uses.

The available habitat on the SRP amounts to 184,200 acres. The maximum loss of habitat, totaling about 0.2 percent (i.e., 400 acres), would have an insignificant effect on the ecology of the plant and the region.

TC Four endangered species (bald eagle, red-cockaded woodpecker, wood stork, and shortnose sturgeon) are on or near the SRP; however, none are present on or in the immediate vicinity of candidate sites. Therefore, construction of the retrievable storage facilities would not cause adverse impacts to endangered species.

In addition to destroying habitat; traffic, facility lighting, and human presence in the area would disturb wildlife in otherwise unaffected areas surrounding the facility and associated roadways. Traffic would increase the risk of vehicle-wildlife collisions; however, because of slow vehicle speed, such occurrences would be rare and would not have a significant impact on wildlife populations.

Construction of the facilities could result in soil erosion and subsequent sedimentation of the nearby streams, the more distant wetlands, or the creeks. Adequate erosion and sedimentation control measures should eliminate impacts on wetlands and water bodies.

G.3.5 RADIOLOGICAL RELEASES

The retrievable storage facilities would be designed to achieve a goal of zero releases of waste constituents. The release of radiological contaminants to the environment is not anticipated.

G.3.6 ARCHAEOLOGICAL AND HISTORIC RESOURCES

No effect on any significant archaeological resources through the development of selected candidate sites for waste storage facilities is anticipated. A request will be made to the South Carolina State Historic Preservation Officer for concurrence with this conclusion (see Section G.2.6.).

G.3.7 SOCIOECONOMICS

No socioeconomic impacts are expected from the construction of retrievable storage facilities (see Section G.2.7).

G.3.8 DEDICATION OF SITE

The Elimination strategy (i.e., retrievable-storage facilities) would require a site for a finite period of time. During this period, methods of waste recycling or disposal presumably would be developed and implemented at the SRP, such that at some future date the stored wastes could be retrieved. Facilities could then be decommissioned and removed, making these areas available for restoration or redevelopment. The Elimination strategy would not require the dedication of land for waste management purposes in perpetuity. TC

G.3.9 INSTITUTIONAL IMPACTS

Because the Elimination strategy would involve only temporary use (i.e., 20 years) of a site, after which use would not be restricted, DOE would not have to maintain full title and control of the land in perpetuity to ensure long-term protection of public health and the environment. However, since the basis of this strategy presumes that technologies for treatment, recycling, or disposal will be available before the end of the 20-year operational period, DOE would expect to undertake the research and development, planning, engineering, and construction to ensure that facilities are available. TC

G.3.10 NOISE

Noise associated with the construction and operation of storage facilities under the Elimination strategy would not be detectable at the SRP boundary from any candidate site because of attenuation provided by distance, topography, and natural vegetation.

G.4 COMBINATION STRATEGY

G.4.1 SUMMARY AND OBJECTIVES

The Dedication or Elimination strategies would provide adequate waste management of all SRP wastes as described in Appendix E (see Sections G.2 and G.3). However, the management of specific wastes could be more economical, more technologically feasible, or more environmentally reliable under one or the other strategy. TC A prime objective of the Combination strategy is to provide the optimum mix of disposal (i.e., Dedication) and storage (i.e., Elimination) technologies to accommodate specific hazardous, mixed, and low-level radioactive waste characteristics and volumes. TE

Technologies included in the Combination strategy for hazardous, mixed, and low-level radioactive waste are listed in Table G-1 and are described in Appendix E.

The technologies under each waste category are storage buildings and RCRA landfills or vaults for hazardous waste; storage buildings and RCRA landfills or vaults with CFM vaults for mixed waste; and for low-level radioactive waste, storage buildings, and ELLTs for the low-activity fraction, and vaults or GCD for intermediate-activity fraction (see Section G.2.1).

TC

The assessment of environmental impacts for the Combination strategy presumes that facilities would be permitted, constructed, and operated in accordance with applicable regulations. Storage facilities would operate (with a variance) for 20 years; nonradioactive wastes would be retrieved for application of waste management technologies while radioactive wastes would remain in storage for decay-in-place up to 120 years. Disposal facilities would be operated for 20 years, ending with closure of the final unit. Thereafter, postclosure monitoring and maintenance would be carried out for a minimum of 100 years.

TC

The storage actions of the strategy are assumed to result in no releases of waste constituents to the environment during their 20-year operational period or thereafter, for radioactive wastes. No post-operational impacts are considered. No consideration has been given to impacts associated with the construction or operation of future waste management facilities to treat or dispose of stored wastes.

G.4.2 GROUNDWATER AND SURFACE WATER EFFECTS

TE

The base floodplain of the SRP region is confined to riparian wetlands and low terraces along the Savannah River and its primary tributaries. Siting criteria for new waste management facilities avoid such flood-prone areas; therefore, no impacts involving potential flooding of the facilities are expected.

G.4.2.1 Hazardous Waste

There are no releases expected from storage facilities during the 20-year operational period, and releases of contaminants to the subsurface from disposal facilities are not expected to occur as long as monitoring and leachate collection continues (see Sections G.2.2.1 and G.3.2). Groundwater quality would not be significantly affected through the 100-year institutional control period. Potential impacts beyond the institutional control period are described in Section G.2.2.1.

G.4.2.2 Mixed Waste

TC

No releases of waste constituents will occur for storage facilities during the 20-year operational period or thereafter, and releases of contaminants from the RCRA disposal facilities are not expected to occur during the period of institutional control.

Modeling results indicate that hazardous constituents would not be released from the CFM vaults in concentrations which exceed applicable standards for up to 10,000 years. Likewise, radiological constituents including uranium are not expected to exceed their respective derived standards.

G.4.2.3 Low-Level Radioactive Waste

Low-level radioactive waste management facilities, selected to evaluate impacts on groundwater and surface water, were storage buildings, ELLTs for disposal of low-activity waste, and vaults or GCD for intermediate-activity waste. Retrievable storage assumably would be employed for the majority of intermediate-activity tritium wastes, carbon-14, and iodine-129. No releases of these stored wastes are expected, and no impact on groundwater or surface water is anticipated.

Modeling was used to predict the times of occurrence and the peak concentrations of radionuclides in ground and surface water. Table G-9 compares the modeling results to the derived groundwater standard for each nuclide. Peak concentrations of radionuclides are below their respective derived standard with the exception of uranium-234, which is just slightly above standard, 7500 years in the future. The uranium-234 concentration is not expected to exceed the derived groundwater standard as shown by the modeling (see Section G.2.2.2). Therefore, low-level radioactive waste constituent concentrations are not expected to exceed derived standards at the boundary well, wetlands, Upper Three Runs Creek, or the Savannah River with any mix of low-level waste technologies for the Combination strategy.

G.4.3 NONRADIOACTIVE ATMOSPHERIC RELEASES

The construction of waste disposal and retrievable storage facilities would result in the emission of small quantities of carbon monoxide and hydrocarbons from engine exhausts and truck traffic, and suspended particulates and dust from ground surface disturbances. All applicable emission standards would be met during construction.

Because hazardous wastes would be delivered in sealed containers, releases would be unlikely. No significant impact on air quality from the Combination strategy is projected.

G.4.4 ECOLOGICAL EFFECTS

The candidate sites are as close as 300 meters to primary SRP streams (i.e., Upper Three Runs Creek, Tinker Creek) and closer to wetlands and ephemeral feeder streams. Since the operation and dedication of facilities is not expected to involve releases which would exceed groundwater quality standards or surface water standards/criteria, no adverse impacts on aquatic or terrestrial ecology are expected.

Construction of waste disposal facilities may involve clearing up to 400 acres for the waste facilities, roads, and appurtenances. Clearing would destroy existing or potential wildlife habitat and foreclose any other future benefits that may be provided by a natural landscape in the SRP region (e.g., timber

Table G-9. Estimated Peak Concentrations of Radionuclides (pCi/L) and Times of Occurrence for Combination Strategy, Low-Level Waste[a]

		Estimated concentration[c]							
		Boundary well		Wetlands		Upper Three Runs Creek		Savannah River	
Radionuclide	Derived standard[b]	Estimate	Ratio	Estimate	Ratio	Estimate	Ratio	Estimate	Ratio
LOW-ACTIVITY WASTE									
Carbon-14	2.6×10^{3}	1.25×10^{-1} (30.1)	4.81×10^{-5}	1.62×10^{-2} (53.1)	6.23×10^{-6}	1.62×10^{-5} (53.1)	6.23×10^{-9}	3.03×10^{-7} (53.1)	1.17×10^{-10}
Tritium	8.7×10^{4}	4.20×10^{0} (24.4)	4.83×10^{-5}	1.92×10^{-1} (40.1)	2.21×10^{-6}	1.92×10^{-4} (40.1)	2.21×10^{-9}	3.58×10^{-6} (40.1)	4.11×10^{-11}
Iodine-129	2.0×10^{1}	3.36×10^{-3} (132)	1.68×10^{-4}	4.44×10^{-4} (179)	2.22×10^{-5}	4.44×10^{-7} (179)	2.22×10^{-8}	8.29×10^{-9} (179)	4.15×10^{-10}
Rubidium-87	1.1×10^{3}	2.35×10^{-7} (2730)	2.14×10^{-10}	3.24×10^{-8} (3350)	2.95×10^{-11}	3.24×10^{-11} (3350)	2.95×10^{-14}	6.06×10^{-13} (3350)	5.51×10^{-16}
Selenium-79	6.6×10^{2}	7.42×10^{-3} (1380)	1.12×10^{-5}	1.02×10^{-3} (1700)	1.55×10^{-6}	1.02×10^{-6} (1700)	1.55×10^{-9}	1.90×10^{-8} (1700)	2.88×10^{-11}
Technetium-99	4.2×10^{3}	4.13×10^{0} (24.4)	9.83×10^{-4}	5.62×10^{-1} (47.7)	1.34×10^{-4}	5.62×10^{-4} (47.7)	1.34×10^{-7}	1.05×10^{-5} (47.7)	2.50×10^{-9}
Neptunium-237	1.4×10^{-1}	1.15×10^{-4} (5430)	8.21×10^{-4}	1.59×10^{-5} (6640)	1.14×10^{-4}	1.59×10^{-8} (6640)	1.14×10^{-7}	2.97×10^{-10} (6640)	2.12×10^{-9}
Subtotal			2.08×10^{-3}		2.80×10^{-4}		2.80×10^{-7}		5.22×10^{-9}
INTERMEDIATE-ACTIVITY WASTE									
Carbon-14	2.6×10^{3}	7.56×10^{-2} (304)	2.91×10^{-5}	1.86×10^{-3} (333)	7.15×10^{-7}	1.86×10^{-6} (333)	7.15×10^{-10}	3.48×10^{-8} (333)	1.34×10^{-11}
Tritium	8.7×10^{4}	2.67×10^{-5} (223)	3.07×10^{-10}	1.99×10^{-7} (241)	2.29×10^{-12}	1.99×10^{-10} (241)	2.29×10^{-15}	3.71×10^{-12} (241)	4.26×10^{-17}
Iodine-129	2.0×10^{1}	4.30×10^{-3} (975)	2.15×10^{-4}	1.06×10^{-4} (1040)	5.30×10^{-6}	1.06×10^{-7} (1040)	5.30×10^{-9}	1.98×10^{-9} (1040)	9.90×10^{-11}

*Footnotes on last page of table.

Table G-9. Estimated Peak Concentrations of Radionuclides (pCi/L) and Times of Occurrence for Combination Strategy, Low-Level Waste[a] (continued)

Radionuclide	Derived standard[b]	Estimated concentration[c]							
		Boundary well		Wetlands		Upper Three Runs Creek		Savannah River	
		Estimate	Ratio	Estimate	Ratio	Estimate	Ratio	Estimate	Ratio
Rubidium-87	1.1×10^{3}	2.17×10^{-5} (3020)	1.97×10^{-8}	8.51×10^{-7} (3490)	7.74×10^{-10}	8.51×10^{-10} (3490)	7.74×10^{-13}	1.59×10^{-11} (3490)	1.45×10^{-14}
Selenium-79	6.6×10^{2}	3.40×10^{-1} (709)	5.15×10^{-4}	1.32×10^{-2} (1410)	2.00×10^{-5}	1.32×10^{-5} (1410)	2.00×10^{-8}	2.46×10^{-7} (1410)	3.73×10^{-10}
Technetium-99	4.2×10^{3}	1.20×10^{1} (646)	2.86×10^{-3}	4.69×10^{-1} (102)	1.12×10^{-4}	4.69×10^{-4} (102)	1.12×10^{-7}	8.77×10^{-6} (102)	2.09×10^{-9}
Strontium-90	4.2×10^{1}	1.16×10^{-7} (1060)	2.76×10^{-9}	(d)	-	(d)	-	(d)	-
Yttrium-90	5.5×10^{2}	1.16×10^{-7} (1060)	2.11×10^{-10}	(d)	-	(d)	-	(d)	-
Uranium-234	2.1×10^{1}	2.47×10^{1} (7480)	1.18×10^{0}	(d)	-	(d)	-	(d)	-
Uranium-235	2.2×10^{1}	2.80×10^{-1} (7480)	1.27×10^{-2}	(d)	-	(d)	-	(d)	-
Uranium-236	2.2×10^{1}	2.02×10^{0} (7480)	9.18×10^{-2}	(d)	-	(d)	-	(d)	-
Uranium-238	2.4×10^{1}	1.23×10^{0} (7480)	5.13×10^{-2}	(d)	-	(d)	-	(d)	-
Neptunium-237	1.4×10^{-1}	2.05×10^{-2} (3270)	1.46×10^{-1}	7.87×10^{-4} (4750)	5.62×10^{-3}	7.87×10^{-7} (4750)	5.62×10^{-6}	1.47×10^{-8} (4750)	1.05×10^{-7}
Subtotal			1.49×10^{0}		5.76×10^{-3}		5.76×10^{-6}		1.08×10^{-7}
Ratio Totals			1.49×10^{0}		6.04×10^{-3}		6.04×10^{-6}		1.13×10^{-7}

[a] Source: Cook, Grant, and Towler, 1987b.
[b] ICRP Publication 30 (ICRP, 1979) methodology was used to determine radionuclide concentrations that individually yield an annual effective whole-body or organ dose of 4 millirem. Four millirem dose limit required for drinking water by 40 CFR 141. TC
[c] Figures in parentheses represent number of years after closure.
[d] No significant radionuclide concentration at this receptor location within 10,000 years after closure.

production). The available habitat on the SRP amounts to 184,200 acres; thus, the maximum loss of about 0.2 percent (i.e., 400 acres) would have an insignificant effect on the ecology of the Plant and the region.

TC Four endangered species (i.e., bald eagle, red-cockaded woodpecker, wood stork, and shortnose sturgeon) occur on or near the SRP; however, none are present on or in the immediate vicinity of any candidate sites. Therefore, construction of the disposal facilities under the Combination strategy would not cause adverse impacts to any endangered species.

In addition to the habitat destruction, traffic, facility lighting, and human presence in the area would disturb wildlife in otherwise unaffected areas surrounding the facility and associated roadways. Traffic would also increase the risk of vehicle-wildlife collisions; however, because of the slow vehicle speed, such occurrences would be rare and would not have a significant impact on wildlife populations.

Construction of the facilities could result in soil erosion and subsequent sedimentation of nearby steams, the more distant wetlands, or the creeks. Adequate erosion and sedimentation control measures should eliminate impacts on wetlands and water bodies from this source.

With the belowground disposal options, the uptake of wastes by vegetation could occur if the roots of plants penetrated the clay cap and/or other barriers between the surface and the waste forms. Therefore, shallow rooted species would be used to stabilize soils during closure and would be maintained by mowing during the postclosure institutional control period to prevent more
TE deeply rooted plants (e.g., shrubs and trees) from becoming established.

G.4.5 RADIOLOGICAL RELEASES

G.4.5.1 Hazardous Waste

Because hazardous wastes do not contain radioactive constituents by definition, no radiological releases are expected from hazardous waste disposal/storage facilities.

G.4.5.2 Mixed Waste

The major radiological releases of the Combination strategy are associated with the CFM vault technology (see Section G.2.5.2). It is concluded that individual doses during the peak year, for all radionuclides including uranium-234, would not exceed the 4-millirem-per-year drinking water standard through all modeled pathways.

G.4.5.3 Low-Level Radioactive Waste

Under the Combination strategy, retrievable storage would be expressly designated for the intermediate-activity carbon-14, tritium, and iodine-129. Currently, storage of other wastes remains optional. Table G-10 shows the peak radiological doses estimated by the model and their estimated times of occurrence for the boundary well and Savannah River pathways. The sum of doses from all radionuclides is below the 4-millirem-per-year drinking-water standard for both the boundary well and Savannah River pathways. The modeling

Table G-10. Peak Radiological Dose and Times of Occurrence for Combination Strategy, Low-Level Waste[a, b]

Radionuclide	Boundary well Dose	Boundary well Time	Savannah River Dose	Savannah River Time
LOW-ACTIVITY WASTE				
Carbon-14	1.58×10^{-4}	30.1	2.06×10^{-8}	53.1
Tritium	2.24×10^{-4}	24.4	1.93×10^{-10}	40.1
Iodine-129	6.67×10^{-4}	132	1.89×10^{-9}	179
Rubidium-87	8.93×10^{-10}	2730	4.24×10^{-14}	3350
Selenium-79	4.37×10^{-5}	1380	2.97×10^{-10}	1700
Technetium-99	3.93×10^{-3}	24.4	1.14×10^{-8}	47.7
Neptunium-237	2.09×10^{-5}	5430	6.19×10^{-11}	6640
Subtotal	5.04×10^{-3}		3.44×10^{-8}	
INTERMEDIATE-ACTIVITY WASTE				
Carbon-14	9.57×10^{-5}	304	2.36×10^{-9}	333
Tritium	1.43×10^{-9}	223	2.00×10^{-16}	241
Iodine-129	8.54×10^{-4}	975	4.51×10^{-10}	1040
Rubidium-87	8.24×10^{-8}	3020	1.11×10^{-12}	3490
Selenium-79	2.00×10^{-3}	709	3.84×10^{-9}	1410
Technetium-99	1.14×10^{-2}	64.6	9.52×10^{-9}	102
Strontium-90	7.43×10^{-9}	1060	b	-
Yttrium-90	5.72×10^{-10}	1060	b	-
Uranium-234	3.06×10^{0}	7480	b	-
Uranium-235	3.34×10^{-2}	7480	b	-

Footnote on last page of table.

Table G-10. Peak Radiological Dose and Times of Occurrence for Combination Strategy, Low-Level Waste[a,b] (continued)

	Boundary well		Savannah River	
Radionuclide	Dose	Time	Dose	Time
Uranium-236	2.41×10^{-1}	7480	b	-
Uranium-238	1.35×10^{-1}	7480	b	-
Neptunium-237	3.72×10^{-3}	3270	3.06×10^{-9}	4750
Subtotal	3.49×10^{0}		1.92×10^{-8}	
Total Dose	3.50×10^{0}		5.36×10^{-8}	

[a]Source: Cook, Grant, and Towler, 1987b.
TC [b]Doses calculated using PATHRAE model incorporating a human diet of plant, meat, and dairy foods, and 370 liters of contaminated water ingested per year. Doses expressed in millirem per year; time in number of years after closure.

result of a 3.5-millirem-per-year peak is a conservative sum. It assumes that all nuclide doses peak at the same time, that no solubility limits exist for uranium, and that there is no leachate collection during the 100-year institutional control period. The nuclide doses would peak at various times from 24 to 7500 years beyond closure; environmental factors [e.g., soil pH, groundwater reduction-oxidation (redox) potential (Eh), cation exchange capacity, and the presence of chelating or complexing species in the soil] would limit the solubility of uranium; and leachate collection would occur as required during the institutional control period. Consequently, radiological doses from low-level radioactive waste facilities would be below the 4-millirem-per-year standard (see Section G.2.5.3).

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G.4.6 ARCHAEOLOGICAL AND HISTORIC RESOURCES

No effect on any significant archaeological resources through the development of selected candidate sites for waste storage and disposal facilities is anticipated. A request will be made to the South Carolina State Historic Preservation Officer for concurrence with this conclusion (see Section G.2.6.).

G.4.7 SOCIOECONOMICS

No socioeconomic impacts are expected from the construction of storage and disposal facilities under the Combination strategy (see Section G.2.7).

G.4.8 DEDICATION OF SITE

The disposal portion of the Combination strategy, involving up to 400 acres plus a buffer zone, would require site dedication in perpetuity to ensure full compliance with RCRA and South Carolina Hazardous Waste Management Regulations and consistency with DOE Orders regarding environmental and public health protection.

The storage portion of the strategy, however, would require the use of a site for a finite period of time. Then the facilities could be removed and the site restored to a natural condition or redeveloped for other land uses with no restrictions (see Sections G.2.8 and G.3.8).

G.4.9 INSTITUTIONAL IMPACTS

Institutional impacts associated with the disposal portion of the Combination strategy would be the same as those in Section G.2.9.

Because the retrievable-storage portion of the Combination strategy would involve temporary use of a site (i.e., 20 or 120 years), DOE would not have to maintain full title and control of that portion of the site in perpetuity to ensure long-term protection of public health and the environment. Thus, institutional impacts associated with the storage facilities would be insignificant. TC

G.4.10 NOISE

Noise associated with the construction and operation of storage and disposal facilities under the Combination strategy would not be detectable at the SRP boundary from any candidate site because of attenuation provided by distance, topography, and natural vegetation.

G.5 SUMMARY

Table G-11 provides a summary of the four alternative waste management strategies.

Table G-11. Summary of New Waste Management Facility Impacts for Each Waste Management Strategy

Environmental category	No action	Oedication	Elimination	Combination
Groundwater/surface water	Potentially more damaging than all current existing waste sites	No significant impact through period of institutional control. Potential hazardous and radioactive releases, thereafter	No significant impact through 20-year period of operation	No significant impact through period of institutional control. Potential hazardous and radioactive releases, thereafter
Nonradioactive atmospheric	Potential dispersion of large quantities of waste due to disaster (e.g., fire)	No significant impact	No significant impact	No significant impact
Ecology	Potential substantial impacts both onsite and offsite and downstream	No significant waste-related impacts. No significant loss of habitat. No impact to rare/endangered species	Same as Dedication	Same as Dedication
Radiological releases	Potentially very damaging to the environment and public health	No significant impact through the period of institutional control. Potential impacts thereafter from tritium unless mitigated	No significant impact through 20-year period of operation	No significant impact through the period of institutional control. No significant impact from tritium thereafter
Archaeological/ historic	No impact	No impact	No impact	No impact
Socioeconomics	Potential substantial impacts due to temporary cleanup workforce, SRP unit shut-downs and layoffs, and public perception of offsite property values	No impact	No impact	No impact
Noise	No impact	No impact	No impact	No impact
Site dedication	Potential site dedication of land contaminated by accidental releases	Dedication of up to 400 acres of land for waste management in-perpetuity	No dedication of land in-perpetuity	Dedication of up to 400 acres of land for waste management in-perpetuity
Institutional	Would result in DOE's non-compliance with environmental laws and regulations	Possible site maintenance and monitoring indefinitely beyond institutional control period	Commitment to carry out research and development, planning, engineering, and construction of advanced waste management technologies.	Possible site maintenance and monitoring indefinitely beyond institutional control period. Commitment to carry out research and development, planning, engineering, and construction of advanced waste management technologies

TE

TC

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APPENDIX H

TRANSPORT AND DOSE MODELS

This appendix describes the analytical models used to determine the transport of waste constituents through the environment. It also discusses potential exposure of individuals to such constituents resulting from the alternative actions evaluated in this environmental impact statement (EIS). The primary transport is via the groundwater pathway; Section H.1 describes the hydrogeologic models used to evaluate that pathway. Atmospheric pathways provide more routes for exposure via deposition and uptake in foods and by inhalation; Section H.2 describes models used for these evaluations.

H.1 HYDROGEOLOGIC MODELS

This section describes the hydrogeologic models used to support this EIS. The assessments in the EIS are based on data and study results presented in Environmental Information Documents (EIDs). The computer models are identified in several documents (Colven et al., 1985; Stephenson et al., 1987; Merrell, Rogers, and Bollenbacher, 1986; Rogers, Merrell, and Bollenbacher, 1986; Merrell and Rogers, 1986). The hydrogeologic models discussed in this appendix are PATHRAE, MOD3D, and SWIFT II. TC

H.1.1 PATHRAE

PATHRAE is an analytical model used to provide a basis for quantitative estimates of the human health risks associated with land disposal of wastes. This code was developed originally for the U.S. Environmental Protection Agency (EPA) for low-level radioactive waste disposal. It was modified to estimate health risks and environmental effects of removal and closure options for low-level radioactive, mixed, and hazardous waste disposal sites on the Savannah River Plant. PATHRAE has also been used in performance assessments of new disposal facilities for hazardous wastes, mixed wastes, and low-level radioactive wastes. The value of the PATHRAE model is its simplicity of operation and its presentation of analysis results for a set of waste constituents and pathways.

PATHRAE was the primary model used to provide a basis for the relative environmental consequences of the various approaches considered for existing waste sites and new disposal facilities. The following paragraphs evaluate the ability of PATHRAE to perform this task as a basis for comparative evaluation of alternative strategies, as opposed to site-specific decisions that would be based on more precise determinations of environmental consequences. Such determinations require site-specific groundwater flow data such as input, in more complex cases, to three-dimensional models (as well as site-specific information on waste inventories and soil-waste interactions), and would be prepared as part of the regulatory agency interactions required for specific project proposals. TC

The PATHRAE evaluation was performed by the following methods:

- Comparison with other analytical models

- Comparison with measured concentrations
- Comparison with three-dimensional numerical solutions
- Evaluation of the selection of model input values and their effect (i.e., sensitivity on model results)

TE A comparison with other analytical results indicates good agreement between PATHRAE and a slightly more complex analytical model (Looney, King, and Stephenson, 1987). This indicates that two simplifying assumptions in PATHRAE (i.e., plug flow in the unsaturated zone and uncoupled longitudinal and transverse dispersion in the saturated zone) do not have a significant effect on transport predictions. PATHRAE predicts higher concentrations than a three-dimensional dispersion model. This indicates that neglecting the vertical dispersion causes PATHRAE to be more conservative than the more sophisticated three-dimensional model. PATHRAE also predicts concentrations that are higher than those predicted by the EPA VHS model, which was developed specifically to develop conservative models of land disposal scenarios. In the concentrations presented in Chapter 4 and Appendix F for the 1- and 100-meter wells, this conservatism was increased by neglecting the transverse dispersion component of the PATHRAE model.

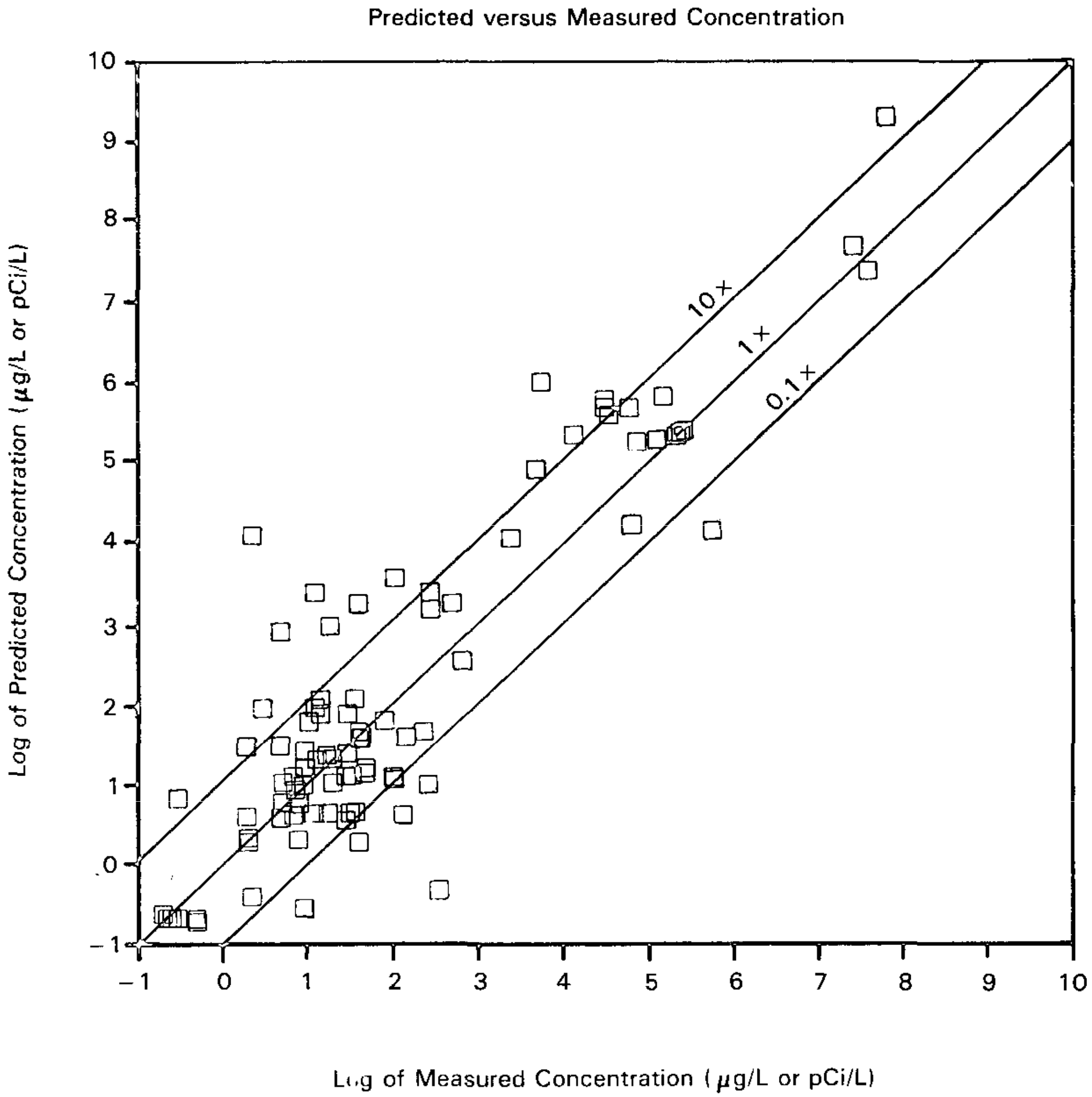
Figure H-1 presents the results of a comparison of PATHRAE 1-meter well predictions for SRP waste site assessments to average 1985 downgradient concentrations, which suggests that the methods used for prediction produced generally reasonable results. Based on the data, approximately 73 percent of the predictions are within a factor of 10 of the measured values, with considerable scatter both above and below the "1x" line, particularly at low concentrations (i.e., less than 100 micrograms per liter or picocuries per liter). However, at concentrations above several hundred micrograms per liter or picocuries per liter, the PATHRAE predictions improve considerably with only a few underpredictions of measured values.

TC

Thus, in a comparison of PATHRAE success in predictions of exceedances of groundwater protection guidance, PATHRAE predicted 36 exceedances while 33 exceedances were measured (of which PATHRAE predicted 28). With respect to waste sites, PATHRAE predicted at least one exceedance at each of 14 sites, compared to 13 sites with at least one measured exceedance; all 13 sites were identified by the PATHRAE predictions.

Researchers also compared PATHRAE results to those generated by "more sophisticated" three-dimensional flow and transport models (Looney, King, and Stephenson, 1987). The three-dimensional models were used in the A- and M-Areas and the F- and H-Areas, where detailed geohydrologic data were available. Generally, the peak concentrations predicted by PATHRAE are higher by factors of 10 or greater than those predicted by the three-dimensional models. The model comparisons suggest that PATHRAE is conservative but sufficiently accurate to compare relative differences in various waste management approaches.

Researchers applied sensitivity analyses to bound the range of predicted concentrations that would result from the uncertainty in estimating the input parameters. The input parameters that have the most significant effects on results are assumed inventory, groundwater flow rate, and leach rate. These studies indicate that the variations due to uncertainties in input parameters



Source: Looney, King, and Stephenson, 1987.

Figure H-1. Verification of PATHRAE Model Results

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are less than the inherent uncertainties of the model. The worst-case deviation for a single parameter was less than a factor of 10 (Looney, King, and Stephenson, 1987).

In summary, these four studies indicate that the PATHRAE model is sufficiently accurate to make relative comparisons between generic waste management approaches for the purposes of this EIS. However, specific conceptual design-level and/or permitting decisions would require more detailed site-specific modeling.

The PATHRAE model has some limitations:

- It is one-dimensional.
- It was not used to incorporate results of groundwater remedial actions in the overall analysis.
- It was not used to predict spatial distribution of plumes.
- It was not used to determine concentration distribution.
- It is not suitable for determining effects of remedial actions (e.g., groundwater pumping in M-Area).

Researchers can investigate site performance for radioactive/hazardous waste disposal with relatively few parameters to define the site condition. This characteristic makes the model useful for the evaluation of a wide range of radioactive and hazardous waste disposal problems. The modified version of PATHRAE can evaluate the environmental and health risk due to nonradioactive contaminants by the input of equivalent model parameters.

General inputs to the model include the following:

- Dimension and size of the source
- Flow rate of the receiving surface stream
- Distance to the receiving surface stream
- Depth to the aquifer
- Aquifer distance to accessible location
- Bulk density of aquifer materials
- Groundwater flow velocities
- Longitudinal and lateral dispersivities
- Total waste volume
- Density of waste

- Parameters associated with vegetation and air deposition
- Atmospheric parameters such as atmospheric stability, wind speed, diffusion coefficient, precipitation, etc.
- Soil retardation characteristics
- Porosity of aquifer
- Cover thickness and impermeability
- Mixing thickness of aquifer
- Surface erosion rate

The contaminant transport through the aquifer is determined by the solution of either the one-dimensional advection equation or the one-dimensional advection-dispersion equation with decoupled longitudinal and transverse dispersion. In association with this methodology, the model includes the following assumptions:

1. The aquifer is one-dimensional, consisting of an infinitely long homogeneous, isotropic porous medium.
2. The releases of contaminants from the source are constant or are an exponentially decaying function of time.
3. Only adsorption-desorption equilibrium of contaminant between water and aquifer materials is considered in calculating the effect of retardation. Effects of pH, redox potential, and thermodynamically competing species are neglected.
4. The movement of contaminants in the unsaturated zone is described in terms of plug flows.

The code contains algorithms for analyzing 10 different pathways. The pathways that were modeled include groundwater movement to hypothetical water wells nearby, groundwater movement to the Savannah River, waste erosion and movement to the Savannah River, food consumption on reclaimed farm, and consumption of crops grown through natural biointrusion.

For groundwater movement to nearby water wells, the pathway consists of downward migration of the modeled waste components through advection and diffusion or as a result of dissolution in percolating precipitation. The waste components move downward through the unsaturated zone to the aquifer and move horizontally to nearby wells downstream (in the sense of aquifer flow). Two hypothetical well scenarios were analyzed: one immediately adjacent to the waste disposal facility (i.e., the 1-meter well) and one 100 meters downstream from the edge of the facility. The models for both vertical and horizontal movement of waste materials account for chemical retardation by the soils. Once withdrawn from the well, the water is assumed to be consumed directly by individuals and used to irrigate crops that are then consumed by these same individuals.

For groundwater movement to surface streams, the pathway is similar to that described above, but the modeled waste components are assumed to continue to move through the aquifer until released to surface waters. For the purpose of analyzing the potential impacts of releases through this pathway, the release was assumed to be into the Savannah River, with its downstream consumer populations. The waste components are assumed to be mixed completely with water in the Savannah River.

The following subsections present equations describing the transport and dose via groundwater to surface waters and to wells.

H.1.1.1 Groundwater Pathway to a Surface Stream

The dose from groundwater migration to a river is calculated from:

$$D = \frac{Q\lambda_L f_0 U_I}{q_w} (DF) \tag{H-1}$$

where:

- Q = inventory of the radionuclides (picocuries) or toxic chemicals (kilograms)
- q_w = flow rate of the river (cubic meters per year)
- f_o = fraction of the inventory arriving at the river from transport through the aquifer
- λ_L = fraction of each nuclide/chemical leached from the inventory in a year
- U_I = annual equivalent surface-water uptake by an individual (cubic meters per year)
- DF = dose conversion factor for radionuclides (millirem per picocurie) = 1 for chemicals
- D = (units) dose in millirem for 1 year or kilograms per year for chemicals

In Equation H-1, the product of Q and λ_L represents the release rate of radionuclide/chemical from the source. Parameter f_o determines the fraction of radionuclide/chemical released from the source that can reach the river. U_I is the amount of river water consumed by an individual. DF defines the dose to an individual for each unit of radionuclide or chemical uptake.

Transport of contaminants through the aquifer can be described by the advection-dispersion equation:

$$\frac{\partial C}{\partial t} = -\frac{V}{R} \bullet \frac{\partial C}{\partial X} + \frac{D_L}{R}\frac{\partial^2 C}{\partial X^2} - \lambda C \tag{H-2}$$

where:

C	= concentration of contaminant (picocuries per liter or milligrams per liter)
V	= seepage velocity of the groundwater flow (meters per year)
X	= distance along the mean groundwater flow direction (meters)
D_L	= longitudinal dispersion coefficient along the direction of flow (square meters per year)
R	= retardation factor $= 1 + \frac{\rho \text{ rho}}{p} k_d$ (Freeze and Cherry, 1979)
λ	= first-order decay constant
ρ	= aquifer density
p	= aquifer porosity
k_d	= sorption coefficient in the aquifer (cubic meters per kilogram)

If the dispersion term is neglected, Equation H-2 reduces to the one-dimensional advection equation with radioactive decay

$$\frac{\partial C}{\partial t} = -\frac{V}{R} \bullet \frac{\partial C}{\partial X} - \lambda C \qquad \text{(H-3)}$$

Parameter f_o of Equation H-1 can be calculated for either dispersive or nondispersive groundwater transport. For the nondispersive case, the line source is assumed to decrease in inventory with time at a constant fraction due to both the release of contaminant and radioactive decay. The solution of the one-dimensional advection equation (Equation H-3) for this boundary condition, parameter f_o, is as follows:

$$f_0 = 0 \text{ for } t \leqslant t_1 - t_0$$

$$f_0 = \frac{V_a}{LR\lambda_L} \bullet [1 - \exp[-\lambda_L (t - (t_1 + t_0))]] \quad \text{for} \quad t_1 - t_0 < t < t_1 \qquad \text{(H-4)}$$

$$f_0 = \frac{V_a}{LR\lambda_L} \bullet \exp[-\lambda_L(t - t_1)] \quad [1 - \exp(-\lambda_L t_0)] \quad \text{for} \quad t_1 \leqslant t$$

where:

t	= time (years)
t_0	= RL/V_a
t_1	= $R(L+X_w)/V_a$
R	= retardation factor $= 1 + \frac{\rho}{p} k_d$
k_d	= sorption coefficient in the aquifer (cubic meters per kilogram)
ρ	= aquifer density (kilograms per cubic meter)
L	= length of waste site in direction parallel to aquifer flow (meters)
V_a	= interstitial horizontal aquifer velocity (meters per year)
X_w	= distance of groundwater flow from nearest edge of burial pits to the river (meters)
p	= aquifer porosity

For dispersive groundwater transport, the source is considered to be a line of point sources that release contaminants, with the exception of radioactive decay, at a constant rate. The solution of the one-dimensional advection-dispersion equation (Equation H-2) for this boundary condition, the parameter f_o, can be expressed as:

$$f_0 = \frac{1}{N} \sum_{j=1}^{N} [Fj(t) - Fj(t-1/\lambda_L)] \qquad \text{(H-5)}$$

where:

$Fj(t)$ = 0.5 U (t) [erfc (z-) + exp(d_j) erfc (z+)]
$U(t)$ = unit step function
$z\pm$ = $\dfrac{d_j^{1/2}[1 \pm t/Rt_{wj}]}{2[t/Rt_{wj}]^{1/2}}$
d_j = distance from sector center to access location divided by the longitudinal dispersivity
t_{wj} = water travel time for distance d_j (years)
N = number of mesh points in numerical integration

The disposal area of length L is divided into N sectors of equal length. A point source of the appropriate magnitude is placed at the center of each sector. The distance d_j is measured from the center of sector j to the access location. The summation shown in Equation H-5 represents the integration of the point source analytical solutions to approximate an area source.

H.1.1.2 Groundwater Pathway to a Well

The dose from groundwater migration with discharge to a well is calculated from:

$$D = \frac{Q\lambda_L f_0 U_2 (DF)}{q_w} \qquad \text{(H-6)}$$

The aquifer flow rate q_w is given, in this case, by:

$$q_w = \begin{cases} WLP & \text{for } H_w > L_p \\ WL_pV_ap & \text{for } H_w < L_p \end{cases}$$

where

W	= width of waste pit perpendicular to aquifer flow (meters)
P	= water percolation rate (meters per year)
L_p	= length of well casing in aquifer (meters)
H_w	= vertical dimension of contaminated zone in aquifer (meters)
v_a	= horizontal velocity of aquifer (meters per year)
U_2	= *annual equivalent total uptake of well water by an* individual (cubic meters per year)

Continuity of mass for the contaminated water in the unsaturated and saturated zone requires that

$$H_w = \frac{P \bullet L}{p \bullet v_a} \tag{H-7}$$

In addition to modeling the effects of longitudinal dispersion in the aquifer, the well pathway can account for any transverse dispersion that might occur. This reduces the conservatism when calculating contaminant doses for the well pathway. In modeling of transverse dispersion, the term f_o in Equations H-5 and H-6 is modified by an additional multiplicative term, f_t, given by:

$$f_t = \frac{1}{2} \text{erf} \left[\frac{(y_w + W/2)R}{2(D_y t)^{1/2}}\right] - \frac{1}{2} \text{erf} \left[\frac{(y_w - W/2)R}{2(D_y t)^{1/2}}\right] \tag{H-8}$$

where:

y_w	= distance to well from center of waste area in the direction perpendicular to the aquifer flow (meters)
D_y	= transverse dispersion coefficient (square meters per year)

For the limiting case in which D_y goes to zero, f_t becomes equal to 1. Therefore, the effects of transverse dispersion can be ignored by choosing D_y equal to zero.

Although a portion of the model's algorithms associated with subsurface transport have been verified analytically by comparison with the simplified analytical solutions and other independent calculations using different programs, the overall model has not been verified with field measurements. A report prepared by Clemson University discusses PATHRAE code sensitivity and verification (Fjeld et al., 1986).

H.1.2 MOD3D

The MOD3D model, which was developed by the U.S. Geological Survey, simulates three-dimensional groundwater flow in a porous, heterogeneous, and anisotropic medium with irregular boundaries. The uppermost hydrologic unit can have a free water-table surface. Stress can be applied to the system in the form of well discharge/recharge, and as recharge from precipitation. A modified version of this model extends its application to simulations involving head-dependent sources and sinks such as river, springs, or drains, and evapotranspiration. These modifications also enhance the effectiveness of the iterative solution process used by the original version.

This model can simulate groundwater flow in both a fully three-dimensional and a quasi-three-dimensional manner, depending on the availability of data and the requirements of computer memory. It can simulate each hydrologic unit with one or more layers and permits the use of variable grid spacing. If the analysis can neglect the storage in a confining bed and the associated horizontal component of flow, the model can incorporate the effects of vertical leakage through a confining bed into the vertical component of the anisotropic hydraulic conductivity of adjacent aquifers.

The iterative numerical technique used to solve the set of simultaneous block-centered, finite-difference, approximated, algebraic equations is the strongly implicit procedure. This method converges faster and has fewer rounds of errors than the iterative alternating direction implicit method.

Groundwater flow in a three-dimensional, heterogeneous, and anisotropic porous medium can be expressed as

$$\nabla \bullet \left(K_{ij}\frac{\partial h}{\partial x_j}\right) = S_s\frac{\partial h}{\partial t} + W(x,y,z,t) \qquad \text{(H-9)}$$

where:

∇	=	vector differential operator
h	=	hydraulic head (L)
S_s	=	specific storage (L^{-1})
K_{ij}	=	tensor of hydraulic conductivity (LT^{-1})
X_j	=	distance in the space direction j (L)
$W(x,y,z,t)$	=	volumetric flux per unit volume of aquifer (T^{-1}) representing source/sink of the porous medium

Assuming that the coordinate axes x, y, and z are aligned with the principal directions of the hydraulic conductivity tensor, the crossproduct terms drop from Equation H-9. It reduces into the following form:

$$\frac{\partial}{\partial x}\left(K_{xx}\frac{\partial h}{\partial x}\right) + \frac{\partial}{\partial y}\left(K_{yy}\frac{\partial h}{\partial y}\right) + \frac{\partial}{\partial z}\left(K_{zz}\frac{\partial h}{\partial y}\right) = S_s\frac{\partial h}{\partial t} + W(x,y,z,t) \qquad \text{(H-10)}$$

in which K_{xx}, K_{yy}, and K_{zz} are the components of the hydraulic conductivity in the three principal directions x, y, and z. In the finite-difference approach, it is often convenient to represent a hydrologic unit by one layer of nodes. Thus, if Equation H-9 is multiplied by the thickness (b) of the hydraulic unit, Equation H-10 can be written as:

$$\frac{\partial}{\partial x}(T_{xx}\frac{\partial h}{\partial x}) + \frac{\partial}{\partial y}(T_{yy}\frac{\partial h}{\partial y}) + \frac{\partial}{\partial z}(b\,K_{zz}\frac{\partial h}{\partial z}) = S^{1}\frac{\partial h}{\partial t} + bW(x,y,z,t) \qquad \text{(H-11)}$$

in which T_{xx} and T_{yy} are the principal components of the transmissivity tensor, and S^{1} is the storage coefficient. Although the model is designed to solve Equation H-10, it will solve Equation H-9 by substituting hydraulic conductivity, specific storage, and W(x,y,z,t) for transmissivity, storage coefficient, and bW(x,y,z,t), respectively. If the upper hydrologic unit is under water-table conditions, the specific yield is used to replace the storage coefficient in Equation H-10. The transmissivity in Equation H-10 is defined as a function of the head obtained from the previous iteration. That is,

$$T^{\,n}_{xx\ (i,j,k)} = K_{xx\ (i,j,k)} \bullet b^{\,n-1}_{i,j,k} \qquad \text{(H-12)}$$

where:

$b^{\,n-1}_{i,j,k}$ = the saturated thickness of the upper hydrologic unit at iteration n-1

n = iteration index

The required input data to simulate an aquifer under a stress of pumping are the transmissivity or hydraulic conductivity, storage coefficient or specific storage, initial head distribution, geometry of the hydrologic unit, dimension and layout of the finite-difference grid, length of pumping periods, number of pumping wells, pumping rates, and other simulation control parameters.

This model incorporates the following assumptions and limitations:

1. Aquifer properties can be heterogeneous and anisotropic.

2. Aquifer properties and hydrologic characters are uniform within each block of the model grid.

3. The perimeter of the aquifer should be described by a no-flow boundary.

4. Grid axes are parallel to the principal directions of the transmissivity tensor if the aquifer is anisotropic.

5. Head-dependent sources/sinks can also be simulated.

6. Darcy's Law can be applied in the porous media of the aquifers.

7. A simulated aquifer can be represented by such boundary conditions as constant head, constant flux, and head-dependent flux.

8. Only one horizontal anisotropy factor is allowed for each layer.

9. Overpumping can create an irreversible dry cell.

10. If the same aquifer is simulated by several layers and the water table is expected to traverse more than one layer, the cells can be converted incorrectly to no-flow cells.

11. Because the conversion to no-flow is irreversible, only declines in the water table can be simulated.

12. A confining layer with a given vertical hydraulic conductance is assumed to be below the water-table layer because vertical hydraulic conductance is left as a non-zero constant until the cell is converted to a no-flow cell.

McDonald and Harbaugh (1984) developed this modular, three-dimensional, finite-difference model to simulate groundwater flow in the porous medium. Their main objectives were to produce a program that can be modified readily, is simple to use and maintain, can be executed on a variety of computers with minimum changes, and is relatively efficient with respect to computer memory and execution time.

This model has been applied to a number of studies, including various aquifer and flow conditions in the A/M-Area and the Separations (F and H) Areas. In addition to the field application, this model also has been compared successfully with simplified analytical solutions. This model has better convergence than the quasi-three-dimensional model. In general, it has been appropriately validated, modified, and documented. Reliable results can be obtained, especially for aquifers in which the properties are ideally stratified and the groundwater flow in the porous medium can be modeled for the condition of confining beds.

MOD3D has been used in conjunction with SWIFT II for a number of groundwater flow and transport investigations. MOD3D provided the flow results; SWIFT II provided the contaminant transport results. The waste sites or locations studied were the A/M-Area, the F- and H-Area seepage basins, and the low-level radioactive waste burial ground. Published results of these field problems are not available at present. In addition, the published results of code verification of MOD3D are not available, even though the code has gone through the USGS review process. However, the model includes detailed mass balance algorithms to provide confidence in convergence and apportioning of sources and sinks.

H.1.3 SWIFT II

SWIFT II (Sandia Waste Isolation Flow and Transport for Fractured Media) (Reeves and Cranwell, 1981; NRC, 1986) is a general nuclide transport code to describe migration from the repository through the groundwater system. It is based on the finite-difference method, and solves not only for flow and solute transport but also for heat and brine transport. TE

The code simulates the flow and transport of energy, solute, and radionuclides in a geologic medium. SWIFT II is a three dimensional finite-difference groundwater flow and nuclide transport code. The model takes into account saturated flow in an isothermal or heated porous medium as well as sorption and desportion mechanisms. In addition, the code takes into explicit account nuclide decay and the creation of daughter products. For the nuclide decays, the code considers conservation of dissolved contaminants, energy, and total liquid mass. The fluid density can be a function of pressure, temperature, and concentration. Viscosity can also be a function of temperature and concentration. Aquifer properties can vary spatially. Hydrodynamic dispersion is described as a function of velocity. Boundary conditions allow natural water movement in the aquifer, heat losses to the adjacent formation, and location of injection, production, and observation points anywhere in the system.

SWIFT II solves four differential equations, together with a number of submodels describing the nonlinearities, in a sequential manner. Options include:

- Steady-state or transient flow
- Steady-state or transient density-dependent brine transport
- Solute transport
- Heat transport
- Dual porosity or discrete fracture-matrix
- Salt dissolutioning
- Well bore
- Radioactive waste-leach source
- Heterogeneous and/or anisotropic media
- Confined and/or water table conditions and recharge
- Recharge and/or wells

The code is fairly general and can be used to examine most farfield problems. It contains many options in terms of geometry, processes, and boundary conditions. Because it contains heat flow, it can also be used to examine some near-field problems.

SWIFT II is a general-purpose code and is applicable to most geologic media, including fractured rock. The main limitation would be due to the availability of data. It can be valid in many cases to perform a horizontal or vertical averaging. SWIFT II can still be used to perform a one- or two-dimensional simulation for this purpose.

Sensitivity analysis has been performed on both physical and numerical parameters.

Verification of numerical decay processes appear in the SWIFT II documentation. Verification of flow, heat, and solute transport also appear in which eight problems are documented.

Three field comparison problems for flow, heat, and solute transport have been performed (Colven et al., 1985).

H.2 ATMOSPHERIC TRANSPORT PATHWAY

Modeling calculations to determine potential risk to human populations due to atmospheric transport of waste materials have been made using a variety of computer codes. The pathway scenarios were inhalation of polluted air and ingestion of contaminated food by individuals and the offsite population. The occupational risk to personnel from airborne contaminants generated during actual waste site closure operations was included.

H.2.1 SOURCE TERMS

Atmospheric source terms for the site were estimated from soil inventories. Contaminants selected for atmospheric transport modeling were the same as TC those analyzed for the subsurface transport exposure scenario (Looney et al., 1987). Atmospheric source terms account for volatilization of select contaminants (i.e., organics), dust generated by suspension of contaminated soil due to wind erosion, and dust generated as a consequence of excavation of contaminated soil from the site. The time-dependent nature of atmospheric source TC terms was estimated to account for the time period of interest in this analysis. SESOIL (Bonazountas and Wagner, 1984), an EPA soil layer model, was used to estimate the soil contaminant concentration profiles as a function of time. SESOIL accounts for potential upward transport (volatilization) and downward movement (infiltration) of each contaminant for each remedial action. Airborne contaminant loadings are estimated using SESOIL and MARIAH (a National Oceanographic and Atmospheric Administration box model) (Holton et al., 1986). SESOIL estimates the amount of contamination entering the atmosphere over time from the site via volatilization. MARIAH estimates suspended dust loading to the atmosphere and excavation-generated dust loading due to digging, vehicular movement, and dumping. The source term for potential atmospheric transport away from the site - the contaminant loading due to dust - is the product of the dust loading and the contaminant concentration in the top soil layer.

H.2.2 TRANSPORT AND DOSE MODELS

The transport of waste constituents from a waste disposal facility to potential receptor sites through atmospheric dispersion was modeled using the XOQDOQ computer code (Sagendorf, Goll, and Sandusky, 1982). The XOQDOQ code is an NRC model that is used for routine release of atmospheric dispersion calculations to the SRP. The code was modified to handle area source terms. The XOQDOQ transport code uses a modified Gaussian plume model to estimate constituent concentration as a function of distance and direction from a waste site. Time-dependent source strength and meteorological conditions were input parameters.

The calculation of the transport of materials from the SRP by the atmosphere is based on meteorological conditions that are measured continuously at seven onsite meteorological towers and at a 365-meter television transmitting tower 30 kilometers northwest of the geometric center of the Plant. These meteorological measurements were to calculate the dispersive characteristics of the atmosphere by methods used in the nuclear industry (NRC, 1977a).

H.2.2.1 Nonradiological Exposures

After waste contaminant concentrations at potential receptor locations were determined, the results were translated into individual and population exposures. The maximally exposed individual at the site boundary and general population exposures to airborne substances via inhalation and ingestion pathways were determined. The CONEX computer code (Holton et al., 1986) uses XOQDOQ transport results and local population demographics to estimate time-dependent population exposures to nonradioactive airborne substances. The TERREX computer code (Holton et al., 1986) also uses XOQDOQ transport results along with local crop production data and local population demographics to estimate population data and local foodstuff uptake. The population demographics used in the CONEX and TERREX codes are estimated using a population growth model. Using census data from 1980 as the initial basis, the population growth model estimates the surrounding population from 1980 to 2050. After 2050, the population is assumed to be constant. After the end of the assumed 100-year period of institutional control (2085), the SRP site is assumed to be inhabited by the public. Hence, the air receptor is closer to the waste site at the end of the institutional control period.

Risk posed to the public population was calculated using a computer code called MILENIUM (Holton et al., 1986). For each potential airborne contaminant, the MILENIUM code translates time-dependent exposure results into a population dose and into a maximally exposed individual dose. The code uses the dose results and appropriate unit cancer risk (UCR) values and acceptable daily intake (ADI) factors (explained in Appendix I) to estimate excess risks for the population and a maximally exposed individual at the SRP boundary.

Risk posed to the worker involved in waste excavation activities was estimated using the MARIAH and MILENIUM computer codes. MILENIUM uses the source term results generated by MARIAH and appropriate UCRs and ADIs to estimate excess worker risk. A conservative assumption built into these models is that the occupational workforce would not use special protective clothing during waste excavation operations.

H.2.2.2 Radiological Exposures

To calculate the doses and corresponding human health risks associated with the atmospheric transport of radioactive waste materials, DOE used transport and dosimetry models developed for the nuclear industry. These models were developed by the U.S. Nuclear Regulatory Commission (NRC) and others for assessing the effects of operations of licensed commercial nuclear facilities (NRC, 1977b; ICRP, 1978). The radioactive transport and dose models have been implemented in the following computer programs:

- MAXIGASP: Calculates maximum and average doses to offsite individuals from atmospheric releases

- POPGASP: Calculates population doses from atmospheric releases

MAXIGASP and POPGASP are Savannah River Laboratory (SRL) modified versions of the NRC program GASPAR (Eckerman et al., 1980). The modifications enable the input of specific SRP physical and biological data. SRL did not modify the basic calculational methods used in the GASPAR program (Marter, 1984).

The pathway scenarios considered for the calculation of doses received by individuals and the offsite population are inhalation, ingestion, and exposure to direct radiation from material deposited on the ground.

DOE used the annual average concentration and deposition factors calculated with the XOQDOQ program in the MAXIGASP and POPGASP programs, along with data on population distribution, vegetable crop production, milk production, and meat production, to calculate offsite radiation exposure.

The direct gamma exposure pathway calculates the external radiation dose to an individual standing directly over a waste site. This scenario allows the cover material over the waste to erode at a specified rate so the degree of shielding provided by the cover can decrease in time. This pathway also assumes that no loss of contaminants occurs by leaching to the groundwater pathways. The time dependence of the source term is defined solely by radioactive decay.

H.2.2.3 Cumulative Radiological Effects

In evaluating the radiological impacts for the no-action alternative and during the first year after the implementation of the other three options, the cumulative effects of the operation of all nuclear facilities in the affected region also were considered. This region includes the Savannah River Plant and the area within 80 kilometers of the Plant.

The impacts from the following nuclear facilities, which represent existing and planned operations, were considered in calculating cumulative effects:

- The SRP, which includes four production reactors (L, P, K, and C) with associated support facilities, in addition to the low-level radioactive waste and mixed waste sites

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- The F- and H-Area Effluent Treatment Facility (ETF), to be constructed at H-Area on the Plant
- The Defense Waste Processing Facility (DWPF), under construction at S-Area on the Plant
- The Fuel Materials Facility (FMF), under construction at F-Area on the Plant
- The Fuel Production Facility (FPF), to be constructed at H-Area on the Plant

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- The Vogtle Electric Generating Station (Unit 1 is operating), Unit 2 is under construction across the Savannah River from the southwestern boundary of the Plant
- The Barnwell Nuclear Fuel Plant (BNFP; not operating) adjacent to and east of the Plant
- The Chem-Nuclear Services, Inc., low-level radioactive disposal site adjacent to BNFP (no releases expected)

Table H-1 lists the maximum individual and population doses associated with each of these facilities as base-case doses derived from documentation that summarizes doses for releases from each facility (DOE, 1986).

To estimate the cumulative impact of the operation of all nuclear facilities in the region, including each of the four waste management strategies, DOE combined the base-case doses in turn with the doses from the Dedication strategy, the Elimination strategy, and the Combination strategy. Because the dose from the No-Action strategy is included in the total base-case dose, the cumulative impact associated with that strategy would be the same as for the base case. TE

H.3 ENVIRONMENTAL DOSE COMMITMENT

Man can receive doses externally from radioactive materials outside the body or internally from the intake of radioactive material by inhalation or ingestion. Radionuclides that enter the body are distributed to various organs and are removed by normal biological processes and radioactive decay. The rate at which each radionuclide is removed from the body depends on its chemical, physical, and radiological properties. Historically, dose calculations have included an accounting of doses resulting from the fraction of radionuclides retained in the body for 50 years following the year of intake. The dose commitment factors used in these dose calculations include this 50-year integrating period.

Similarly, radioactive materials released in a given year remain in the environment for varying lengths of time, depending on many environmental factors and on the decay rate of each radionuclide. The environmental dose commitment (EDC) concept has been used to account for this activity.

EPA developed the EDC concept, defining the environmental dose commitment as "...the sum of all doses to individuals over the entire time period the material persists in the environment in a state available for interaction with humans." The EPA report presenting this concept (EPA, 1974) describes its implementation and presents some sample calculations. These calculations integrate doses for 100 years following radionuclide release rather than "the entire time period." This 100-year integrating period is distinct from the 50-year integrating period discussed above because it deals with the accumulation of doses from residual radioactivity in the environment rather than in the body.

This analysis uses the 100-year integrating period; in other words, all collective (population) dose calculations include an accounting of collective doses caused by environmental radioactivity levels for 100 years following each year's release. The 100-year period provides meaningful results by accounting for impacts over a period of time that is about equal to the maximum lifetime of an individual; thus, it provides a measure of risk to an individual. Longer integrating periods or an infinite time integral would require extremely speculative predictions about the human environment for thousands of years into the future.

Table H-1. Annual Cumulative Maximum Individual and Collective Doses from Atmospheric and Liquid Releases from Indicated Facilities

		Facilities						
Dose	Release	SRP[a]	ETF[a]	DWPF	FMF	FPF[b]	Vogtle[c]	Total
Annual maximum individual (millirem per year)	Atmospheric	1.5×10^{1}	-8.0×10^{-3}	7.0×10^{-4}	5.6×10^{-3}	4.0×10^{-5}	5.4×10^{-1}	1.6×10^{1}
	Liquid	1.1	7.2×10^{-2}	3.7×10^{-3}	6.5×10^{-4}	–	9.9×10^{-1}	2.2
	Combined	1.6×10^{1}	6.4×10^{-2}	4.4×10^{-3}	6.3×10^{-3}	4.0×10^{-5}	1.5	1.8×10^{1}
Annual collective (person-rem per year)	Atmospheric	1.1×10^{2}	-9.3×10^{-1}	9.4×10^{-2}	7.4×10^{-1}	4.1×10^{-3}	4.8×10^{-1}	1.1×10^{2}
	Liquid	3.2×10^{1}	1.1×10^{1}	5.4×10^{-1}	9.2×10^{-2}	–	–	4.4×10^{1}
	Combined	1.4×10^{2}	1.0×10^{1}	6.3×10^{-1}	8.3×10^{-1}	4.1×10^{-3}	4.8×10^{-1}	1.5×10^{2}

[a]The values in the SRP column include continued use of the F- and H- Area seepage basins. The values in the ETF column represent <u>changes</u> in doses resulting from operating the ETF rather than using the seepage basins. The sums of the dose values in the two columns represent SRP doses with the ETF in operation.
[b]There will be no radioactive liquid releases during normal FPF operations.
[c]Georgia Power Company, 1985.

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For the EDC calculations, changes in environmental characteristics were not predicted. Population size and distribution were based on the latest estimates. The analysis assumed that the historic meteorology would continue into the future and that food production and consumption patterns would be static.

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APPENDIX I

HEALTH EFFECTS

This appendix describes the models used to estimate health risks to the public from exposures to chemical and radioactive waste materials following the implementation of each remedial alternative. The appendix divides the modeling methodology into its component parts and describes each to provide sufficient information for an understanding of the application of risk assessment to the remedial alternative selection process.

Risk assessment has three major components: (1) hazard assessment, consisting of hazard identification and dose-response assessment; (2) exposure assessment; and (3) risk characterization (King et al., 1987). These components are common to all assessments of the risk of exposure to hazardous substances, regardless of the substance under investigation, the species, the population or environmental systems at risk, the medium in which exposure occurs, the route of exposure, or the adverse effects under consideration. TE

Hazard assessment involves the identification of substances of concern (i.e., as subjects of the risk assessment) and an initial determination of the intrinsic toxicity of these materials (dose-response assessment). Exposure assessment is the process of measuring or estimating the intensity, duration, and frequency of exposure to these pollutants, including the identification of routes of exposure and the determination of human receptors at risk; Appendix H describes this element of risk assessment. Risk characterization is the process of estimating the incidence of an adverse effect under the various conditions of exposure described in the exposure assessment; it involves combining the results of the exposure and hazard (dose-response) assessments.

I.1 HAZARD ASSESSMENT

I.1.1 HAZARD IDENTIFICATION

Hazard identification is the process of determining whether exposure to an agent can cause an increase in the incidence of a health condition (cancer, birth defects, etc.). According to the National Research Council, hazard identification involves characterizing the nature and strength of the evidence of causation (National Research Council, 1983). The Savannah River Plant (SRP) health risk analysis identified certain chemical and radioactive waste materials as hazardous on a site-by-site basis. An indepth evaluation of these materials, using transport modeling and risk calculations, forms the basis of the risk assessment.

The hazard evaluation process was divided into two parts. First, the available data - including soil characterization studies, groundwater analyses, influent records, and process chemical usage - were analyzed to determine what chemicals might have been disposed of at each site. Second, the concentration of each chemical was compared to a "selection criterion" listing. If the groundwater or soil concentration exceeded the selection criterion, the material was selected as a part of the transport modeling and risk calculation studies. In addition, if large amounts of specific chemicals were believed to have been released to the site (based on inventory or process usage), those TE materials were included for assessment, even if the soil or groundwater characterization data did not indicate their presence (Looney et al., 1987).

Soil and groundwater concentration criteria for selection of radioactive and chemical wastes and sites for evaluation were based on toxicological and modeling information published by the U.S. Environmental Protection Agency (EPA). TE Additionally, the South Carolina Department of Health and Environmental Control (SCDHEC) regulations governing groundwaters of the State were considered in setting selection criteria (Looney et al., 1987).

The selection of a radionuclide from an SRP site for environmental assessment and dose-risk calculations was based on detection of that radionuclide in soils or groundwater at levels that exceed the guideline activity concentrations listed in Table I-1 (Looney et al., 1987). These concentrations correspond to those that would be "below regulatory concern" (Guimond and Galpin, 1984) or "de minimis" (NRC, 1984); that is, they would produce a negligible increase in societal risk of adverse health effects (10^{-5} to 10^{-7} lifetime risk increment). The groundwater concentrations correspond to TC 0.5 times the EPA Interim Primary Drinking Water Standard of 4 millirem per year for beta-gamma emitters or 0.5 x 15 picocuries per liter for alpha-emitting radionuclides (EPA, 1976). The soil concentrations are derived by considering all soil-derived dose pathways, both external and internal, that would result in a dose to the maximally exposed individual that does not exceed 30 millirem per year. This value provides a margin of safety below the DOE standard of 100 millirem per year when combined with the annual exposures from the drinking-water and airborne pathways of 4 and 25 millirem, respectively.

Groundwater and soil criteria for selection of chemical waste constituents and sites for evaluation were also established. In determining whether a given nonradioactive compound present in groundwater at SRP waste sites was the subject of a risk or environmental assessment, measured levels in groundwater were compared with maximum contaminant limits (MCLs) or other health-based standards. If the observed levels exceeded 0.5 times the MCL (or, in the absence of the MCL, 1 times other relevant health criteria or guidelines), the compound was included in the assessment. This approach resulted in the assessment of a larger number of chemicals present in groundwater, and, therefore, was more conservative than a comparison made solely on the basis of EPA delisting guidelines (Looney et al., 1987).

The approach for the selection of compounds for risk assessment based on soil contaminant concentrations was similar to that developed by EPA in the final rule on identification and listing of hazardous waste (EPA, 1985a). Using a 20-fold dilution factor based on EP toxicity testing procedures (EPA, 1984) and assuming a dilution factor of 10 to account for hydrodynamic dispersion in TE a saturated groundwater system (EPA, 1985a), Looney et al. (1987) developed the following soil constituent concentration criterion:

$$\text{Soil criterion } (\mu g/g) = \text{MCL } (\mu g/L) \times 10 \times 20 \frac{1}{1000 g/L}$$

Table I-1. Selection Criteria for Radioactive Constituents[a]

Constituent	Groundwater concentration guideline (pCi/L)	Soil concentration guideline (pCi/g)
Americium-241	8	2.6×10^{1}
Americium-243	8	7.9
Antimony-125	150	NA
Carbon-14	NA	4.9
Cesium-134	10,000	4.2
Cesium-135	NA	4.7×10^{1}
Cesium-137	450	1.1×10^{1}
Cobalt-60	50	2.9
Curium-243	8	1.9×10^{1}
Curium-244	8	6.0×10^{1}
Curium-246	8	7.6
Hydrogen (tritium)	10,000	2.7×10^{4}
Iodine-129	0.5	2.9
Iron-55	NA	4.1×10^{2}
Neptunium-237	NA	4.3×10^{-1}
Nickel-59	NA	2.6×10^{2}
Nickel-63	NA	1.1×10^{4}
Niobium-94	NA	2.7
Plutonium-238	8	3.3×10^{1}
Plutonium-239	8	3.3×10^{1}
Plutonium-240	8	3.3×10^{1}
Plutonium-241	NA	1.9×10^{3}
Plutonium-242	8	3.2×10^{1}
Sodium-22	200	NA
Strontium-90	4	3.4×10^{1}
Technetium-99	450	2.0×10^{2}
Uranium-233	NA	6.5×10^{1}
Uranium-235	NA	1.5×10^{1}
Uranium-238	NA	2.2×10^{1}

[a]Source: Looney et al., 1987. | TE

where:

MCL = the maximum contaminant level (or other health-based criteria of relevance in the absence of the MCL)

10 = dilution factor due to mixing in groundwater

20 = dilution factor due to leaching in the unsaturated zone

This criterion represents the level of a given constituent in soil that would result in a concentration equivalent to the MCL in water at a receptor well 152 meters downgradient, based on the VHS model used by EPA for screening purposes.

Table I-2 lists the groundwater and soil criteria developed for each nonradioactive waste constituent identified by sampling and analysis at the various sites. The hazard assessment component of the health risk assessment model was accomplished by the selection of nonradioactive constituents based on (1) exceeding concentration criteria, (2) exceeding the soil criteria, or (3) indicating that a particularly hazardous constituent was present in the site waste. In some cases, background concentration information and analytical protocol information were factored into the selection process.

I.1.2 DOSE-RESPONSE ASSESSMENT

TE Health impacts associated with exposure to radionuclides usually are treated separately from impacts associated with nonradioactive materials (King et al., 1987). Similarly, risk characterization for carcinogens and noncarcinogens usually is considered separately. This is due to a fundamental difference in the way organisms typically respond to these classes of compounds. For noncarcinogens, toxicologists recognize the existence of a threshold of exposure below which there is only a small likelihood of adverse health effects in an exposed population. Exposure to carcinogenic compounds, however, is not characterized by the existence of a threshold. Rather, all levels of exposure are considered to carry a risk of adverse effect (risk per unit dose). Carcinogenic risks are associated with radionuclides and some nonradioactive materials.

I.1.2.1 Radiological Risks

Health impacts from radiation exposure, whether from sources external or internal to the body, generally are identified as "somatic" (affecting the individual exposed) or "genetic" (affecting descendants of the exposed individual). At low doses, the somatic risks of most importance are the induction of cancers; these risks are greater than genetic risks.

For a uniform irradiation of the body, the incidence of cancer varies among organs and tissues; the thyroid and skin demonstrate a greater sensitivity than other organs. However, such cancers also produce relatively low mortality rates, because they are relatively amenable to medical treatment. A TC consideration of somatic risks must distinguish between cancer incidence and cancer mortality rates; the evaluation described in this section uses projections for the latter.

Increased cancer incidence has been observed in humans only after exposures to radiation at doses and dose rates that are at least several orders of magnitude greater than those of interest in this assessment. Thus, risks are estimated for effects at low doses and dose rates by extrapolation downward from risks observed to occur at high doses and dose rates. The factors involved in such extrapolations can produce risk estimates that vary by factors as great as about 4.

Table I-2. Selection Criteria for Nonradioactive Constituents[a]

Constituent	Groundwater concentration guideline (μg/L)[b]	Soil concentration guideline (μg/g)[c]
Aluminum	NS[d]	NS
Arsenic	25	10
Barium	500	200
Beryllium	NS	NS
Cadmium	5	2
Chloride	NS	NS
Chromium	25	25
Copper	1,000	200
Cyanide	100	40
Fluoride	2,000	800
Iron	NS	NS
Lead	25	10
Mercury	1	0.4
Manganese	NS	NS
Nickel	175	70
Nitrate (as N)	5,000	2,000
Phosphate (as P)	10	150
Selenium	5	2
Silver	25	10
Sodium	10,000	4,000
Sulfate	400,000	80,000
Zinc	5,000	1,000
Endrin	0.1	0.04
Lindane	2	0.8
Methoxychlor	50	20
Silvex	5	2
Toxaphene	2.5	1
2-4,D	50	20
Trichloroethylene	2.5	1
Carbon tetrachloride	2.5	1
Vinyl chloride	0.5	0.2
1,2-dichloroethane	2.5	1
Benzene	2.5	1
1,1-dichloroethylene	3.5	1.4
1,1,1-trichloroethane	100	40
p-dichlorobenzene	375	150
Formaldehyde	15	3
Dichloromethane	60	12
Chlorobenzene	1,000	200
Chloroform	0.5	0.1
Ethyl benzene	3,500	700

TE

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Table I-2. Selection Criteria for Nonradioactive Constituents[a] (continued)

C-14

Constituent	Groundwater concentration guideline (μg/L)[b]	Soil concentration guideline (μg/g)[c]
Tetrachloroethylene	0.7	0.14
Toluene	10,000	2,000
1,1,2-trichloroethane	0.6	0.12
Di-n-butyl-phthalate	44,000	8,800
Bis(2-ethylhexyl)phthalate	20,000	4,000
Diethyl-phthalate	500,000	100,000
Methyl ethyl ketone	2,000	400
Trichlorofluoromethane	10,000	2,000
1,2-dichloroethylene	350	70
Phenol	3,500	700
Dichlorobenzenes	3,000	600
Trifluorotrichloroethane	955	191
Fluoroanthene	5	1
Naphthalene	5	1
Xylene	NS[d]	7
Tetrachlorobiphenyl	NS	1
Pentachlorobiphenyl	NS	1
Hexachlorobiphenyl	NS	1
TOH (total organic halogen)	10	NS

TC

[a]Source: Looney et al., 1987.

[b]Groundwater concentration guidelines are 0.5 x EPA Primary Drinking Water Standards. National Secondary Drinking Water Regulations are generally not listed because they are based on aesthetic characteristics rather than a quantitative effect on human health. However, 1 x secondary standards are used for sulfate, zinc, and sodium based on sensitive subpopulations. Copper and phosphate groundwater concentrations are included based on ecological considerations.

[c]Soil concentration criteria are based on EPA guidance (EPA, 1985a). Values are based on the following assumptions: (1) all of the constituents present in the soil will leach into water, (2) the ratio of soil to water is 1:20, as specified in the EPA EP Toxicity Leach Test, and (3) calculation using the EPA VHS model can be used to determine the concentration at a receptor 152 meters from the site. A dilution factor of 10 at the receptor well was chosen (actual VHS model runs resulted in a dilution range of 8 to 30). Thus, soil concentration guidelines were conservatively chosen using the formula Soil concentration (ppm) = DWS (ppb) x 10 x [20/1000].

[d]NS = No standard.

TC

One such factor involves the nature of the cancer induction risk; that is, whether the excess cancers observed to occur in a defined exposed population are best represented by either a defined fractional increase in the natural cancer incidence or mortality rates per unit dose (a "relative risk" estimate), or by a defined number of excess cancers per unit dose (an "absolute risk" estimate).

Another factor involves the nature of the relationship between (or the shape of the curve relating) dose and effect in the dose region below that for which data exist. The National Academy of Sciences Committee on the Biological Effects of Ionizing Radiation (BEIR, 1980) examined three dose-effect relationships:

- Linear - effects proportional to dose at all dose values greater than zero

- Linear-Quadratic - effects essentially proportional to dose at very low doses and to the square of the dose at higher doses

- Quadratic - effects increase as the square of the dose at all dose levels

A majority of the BEIR Committee felt that the linear-quadratic relationship provides the most probable representation of the true dose-effect relationship, because it is similar in form to observed biological system responses in studies of other effects. The committee accepted the linear (nonthreshold) dose-effect relationship as an upper-limit, conservative basis for extrapolation of observed effects to low doses. TC

The BEIR study provided estimates of excess cancer deaths per million person-rem of low LET (beta-gamma) radiation from 67 to 226, depending on the dose response and risk function assumed. The linear-response, absolute risk-model estimate is 158 cancer deaths per million person-rem. The International Commission on Radiological Protection (ICRP, 1977) postulated about 125 fatal individual organ risks per million person-rem; however, ICRP rounded the overall fatal cancer risk factor to 100 per million person-rem. The United Nations Scientific Committee on Effects of Atomic Radiation (UNSCEAR, 1977) also presented a value of 100 fatal malignancies per million person-rem.

In contrast to the somatic risk that occurs in an exposed individual, genetic risks are expressed for the descendants of the exposed individual, potentially for several generations. These risks, which might or might not result in death, have been estimated primarily from the results of animal studies. The BEIR Committee estimated a risk of 5 to 65 disorders per million liveborn offspring per rem of preconceptual parental exposure (i.e., over a 30-year "generation") in addition to the present incidence rate of about 107,000 cases of such disorders per million live births (BEIR, 1980). If the parental exposure were to continue in each generation, the ultimate increase in such disorders would be in the range of 60 to 1100 per million liveborn offspring.

In its 1982 report, UNSCEAR reduced its genetic risk estimates to 20 first-generation and 150 total serious hereditary disorders per million liveborn children per rem of parental exposure (over 30 years) (UNSCEAR, 1982). The corresponding total genetic risk proposed by ICRP (1977) is about three times that expressed in the first two generations (4×10^{-5} per rem), or about 1.2×10^{-4} per rem.

TC

This evaluation assumes that a linear (nonthreshold) absolute risk model applies to the radiological risks. Further, to permit a simplified presentation of radiological risk estimates in this EIS, the evaluation considers such risks to include both those from cancer in the exposed individual and those from serious genetic disorders in that individual's descendants, as described above. These risks range from 1.65×10^{-4} to 2.8×10^{-4} fatal effects per person-rem of collective dose. This analysis uses the upper limit of this range to estimate radiological risks; the upper limit includes all fatal stochastic (probabilistic) somatic and genetic effects.

I.1.2.2 Nonradioactive Carcinogenic Risks

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The procedure for calculating risk of exposure to carcinogenic compounds used in the SRP risk assessment is well documented (National Research Council, 1983; EPA, 1983; Roderick, 1984; King et al., 1987). A nonthreshold dose-response model was used to calculate a unit risk value (risk per unit dose) for each chemical; Table I-3 lists unit cancer risks (UCRs) for a select list of SRP waste constituents. The risk per unit dose (UCR) was multiplied by the estimated average daily lifetime dose experienced by the exposed population, to derive an estimate of risk as follows:

$$R = D \times UCR$$

where:

D = average daily lifetime dose (milligrams per kilogram of body weight per day)

UCR = unit cancer risk estimate [(milligrams per kilogram of body weight per day)$^{-1}$]

R is an explicit estimate of risk and will have a value between 0 and 1. In evaluating the risk of exposure to more than one carcinogen, the risk values (R) for each compound were summed to give an overall estimate of total carcinogenic risk (EPA, 1983; Roderick, 1984). This was done for each source of environmental release, for each associated pathway, and for each receptor group at risk of exposure.

I.1.2.3 Nonradioactive Noncarcinogenic Risks

The traditionally accepted practice of evaluating exposure to noncarcinogenic compounds has been to determine experimentally a no-observable-effect level (NOEL) and to divide this by a "safety factor" to establish an acceptable human dose [e.g., acceptable daily intake or ADI (National Research Council, 1983)]. Table I-4 lists values of ADIs used in this analysis. The ADI was

Table I-3. Toxicity Data for Potential Carcinogenic Effects[a]

Chemical	Ingestion $(mg/kg/day)^{-1}$	Inhalation $(mg/kg/day)^{-1}$
Arsenic and compounds	1.50×10^{1}	5.00×10^{1}
Beryllium and compounds	–	2.60
Cadmium and compounds	–	7.8
Chromium VI and compounds	–	4.1×10^{1}
Nickel and compounds	–	1.20
Aldrin	1.10×10^{1}	
Benzene	4.45×10^{-2}	2.60×10^{-2}
Carbon tetrachloride	1.3×10^{-1}	
Chloroform	7.00×10^{-2}	
1,2-dichloroethane	6.90×10^{-2}	
1,1-dichloroethylene		1.50×10^{-1}
Dichloromethane (methylene chloride)		6.30×10^{-4}
Lindane	1.33	
Polychlorinated biphenyls	4.34	
Polynuclear aromatic hydrocarbons	1.15×10^{1}	6.10
2,3,7,8 TCDD (dioxin)	1.56×10^{5}	
1,1,2,2-tetrachloro-ethane	2.00×10^{-1}	
Tetrachloroethylene	5.10×10^{-2}	1.70×10^{-3}
Toxaphene	1.10	

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Table I-3. Toxicity Data for Potential Carcinogenic Effects[a] (continued)

Chemical	Ingestion $(mg/kg/day)^{-1}$	Inhalation $(mg/kg/day)^{-1}$
1,1,1-trichloroethane	1.6×10^{-3}	
1,1,2-trichloroethane	5.73×10^{-2}	
Trichloroethylene	1.10×10^{-2}	4.60×10^{-3}
Vinyl chloride	2.30	2.50×10^{-2}

TE [a]Source: King et al., 1987.

compared to the average daily dose experienced by the exposed population to obtain a measure of risks as follows:

$$R = D/ADI$$

where:

D = average daily lifetime dose (milligrams per kilogram of body weight per day)

ADI = acceptable daily intake for chronic exposure (milligrams per kilogram of body weight per day)

The method of developing acceptable limits of exposure implies that the application of safety factors of various magnitudes to an experimentally derived NOEL will ensure minimal risk. The acceptable exposure levels (e.g., ADIs) typically are derived by making assumptions about the nature of dose-response relationships at low doses and by drawing inferences based on the available data (National Research Council, 1983).

The risk values derived for noncarcinogens will vary from less than 1 to more than 1. The smaller the value of R, the larger the margin of safety (MOS). The smaller the MOS, the larger the risk.

TE The data base (King et al., 1987) for UCRs and ADIs for inhalation and ingestion pathways was derived from the EPA Superfund Public Health Evaluation Manual (EPA, 1983), which was designed to conform to EPA's proposed risk assessment guidelines (49 FR 46294-46331; 50 FR 1170-1176) and to serve as a framework for analyzing public health risks and for developing design goals for remedial alternatives.

I.1.2.4 Occupational Risks

Occupational risks due to workers' exposures to radioactive constituents were estimated with the use of the methodology outlined in Section I.1.2.1 for assessing public risk. The occupational risks are based on the assumption that the average worker is exposed for 40 hours per week for the period of

Table I-4. Toxicity Data for Noncarcinogenic Effects[a]

Chemical	Ingestion (mg/kg/day)	Inhalation (mg/kg/day)
	INORGANIC	
Arsenic and compounds	0.00	2.80×10^{-3}
Barium and compounds	5.10×10^{-2}	1.40×10^{-4}
Cadmium and compounds	2.90×10^{-4}	
Chromium III and compounds	1.50	5.10×10^{-3}
Chromium VI and compounds	5.00×10^{-3}	
Copper and compounds	3.70×10^{-2}	1.00×10^{-2}
Iron and compounds		8.60×10^{-3}
Lead and compounds	1.40×10^{-3}	4.30×10^{-4}
Manganese and compounds	2.20×10^{-1}	3.00×10^{-4}
Mercury and compounds (alkyl)	2.80×10^{-4}	1.00×10^{-4}
Mercury and compounds (inorganic)	2.00×10^{-3}	5.10×10^{-5}
Nickel and compounds	1.00×10^{-1}	1.20
Phosphoric acid (H_3PO_4)	5.10×10^{-3}	5.10×10^{-3}
Selenium and compounds	3.00×10^{-3}	1.00×10^{-3}
Silver	3.00×10^{-3}	
Sodium	5.70×10^{-1}	
Sulfuric acid (H_2SO_4)	5.10×10^{-3}	5.10×10^{-3}
Zinc and compounds	2.10×10^{-1}	1.00×10^{-2}
Chloride	3.00×10^{-1}	

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Table I-4. Toxicity Data for Noncarcinogenic Effects[a] (continued)

Chemical	Ingestion (mg/kg/day)	Inhalation (mg/kg/day)
	INORGANIC (continued)	
Cyanides	2.00×10^{-2}	
Fluorides	5.00×10^{-2}	
Nitrate	2.86×10^{-1}	
Phosphate	3.0×10^{-1}	
Sulfate	3.5×10^{-1}	
	ORGANIC	
Bis-2ethylhexyl phthalate	6.00×10^{-1}	
Carbon tetrachloride	7.00×10^{-4}	
Chlorobenzene	2.70×10^{-2}	5.70×10^{-3}
Dibutyl phosphate	2.55×10^{-2}	2.55×10^{-2}
1,2-dichlorobenzene	9.00×10^{-2}	
1,1-dichloroethane	1.20×10^{-1}	1.40×10^{-1}
trans-1,2-dichloroethylene	4.03	4.03
Dichloromethane (methylene chloride)	5.00×10^{-2}	
2,4-dichlorophenoxy-acetic acid (2,4D)	1.26×10^{-1}	
n-Dodecane	7.40	7.40
Endrin	1.00×10^{-3}	
Ethylbenzene	9.70×10^{-2}	
Freon	2.86×10^{1}	2.86×10^{1}

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Table I-4. Toxicity Data for Noncarcinogenic Effects[a] (continued)

Chemical	Ingestion (mg/kg/day)	Inhalation (mg/kg/day)
	ORGANIC (continued)	
Lindane	3.00×10^{-4}	
Methoxychlor	5.00×10^{-2}	
Methyl ethyl ketone	4.60×10^{-2}	
Naphthalene	2.60×10^{-1}	
Phenol	1.00×10^{-1}	2.00×10^{-2}
Silvex	9.00×10^{-3}	
Sym-trimethylbenzene	6.38×10^{-1}	6.38×10^{-1}
Tetrachloroethylene	2.00×10^{-2}	
Toluene	2.90×10^{-1}	
Tributyl phosphate	1.28×10^{-2}	1.28×10^{-2}
1,1,1-trichloroethane	5.40×10^{-1}	6.30
Xylene (mixed)	1.00×10^{-2}	4.00×10^{-1}

[a]Source: King et al., 1987. TE

cleanup. If a worker were exposed to the DOE annual occupational dose limit of 5 rem to the whole body, the increased risk to that worker would be 1.4×10^{-3} health effect. Occupational risks due to worker exposures to nonradioactive carcinogenic and noncarcinogenic constituents were estimated with the use of the methodologies outlined in Sections I.1.2.2 and I.1.2.3, respectively, for assessing public risk, with the following exceptions. The occupational risks are based only on worker exposure via the inhalation pathway and, assuming the average individual works at the site for 8 hours each day, for the period of cleanup.

I.2. RISK CHARACTERIZATION

I.2.1 GENERAL APPROACH

Risk characterization is the process of estimating the incidence of a health effect under the various conditions of human exposure described in the exposure assessment (National Research Council, 1983). It essentially combines the exposure and dose-response assessments.

Risks associated with exposure to radionuclides and nonradioactive carcinogenic waste materials are characterized as the probability of a health effect occurring in an exposed individual or the number of health effects in a population group.

The individual risks take on values ranging from 0 to 1. For example, a 10^{-6} cancer risk indicates that an individual incurs a one-in-a-million additional chance (i.e., above the normal likelihood) of cancer due to exposure to the waste material. In this analysis, cancer risk estimates have been added when concurrent exposure to more than one carcinogen occurs. For example, concurrent exposure to two waste constituents, each posing a 10^{-6} cancer risk, is assumed to yield an overall 2×10^{-6} additional cancer risk (i.e., two chances in a million, or one in 500,000) beyond the normal likelihood of cancer.

Risk characterization for exposure to noncarcinogens is estimated from the fraction of the ADI represented by the estimated dose. A fractional ADI less than 1.0 indicates that the estimated exposure dose is less than that recognized as constituting a health hazard. Consequently, some MOS exists at the estimated dosage if the fraction of ADI is less than 1. Under this system, the smaller the MOS, the larger the risk. For example, if the fraction of ADI is 0.1 for one contaminant, and 0.01 for another, the latter (0.01) has a larger associated MOS than the former (0.1) and, hence, a lower attendant risk of the associated health effect.

ADI fractions can be added when concurrent exposure to more than one noncarcinogen occurs to provide a means of evaluating the MOS resulting from exposure to a mixture of contaminants. In such cases, the Hazard Index (HI) (EPA, 1985b) of the mixture based on the assumption of dose additivity is defined as

$$HI = E_1/AL_1 + E_2/AL_2 + \ldots + E_i AL_i$$

where:

E_i = exposure level to the i^{th} toxicant

AL_i = maximum acceptable level for the i^{th} toxicant

Because the inverse of the acceptable level can be used as an estimate of toxic potency, the equation can be interpreted as a normalized weighted-average dose, with each component dose scaled by its potency. As this index approaches unity, concern for the potential hazard of the mixture increases. If HI is greater than 1, the concern for the potential hazard is the same as if an acceptable level were exceeded for an individual compound (i.e., if E_i/AL_i exceeded 1). If the variabilities of the acceptable levels are known, or if the acceptable levels are given as ranges (e.g., associated with different margins of safety), then HI should be presented with estimates of variation or as a range (EPA, 1985b).

The Hazard Index is not a mathematical prediction of incidence of effects or severity. Statistical properties of this index and its dependence on the shape of the dose-response curves for the components are not known. Much additional research is required to determine the accuracy of the Hazard Index as a numerical prediction of toxic severity. The Hazard Index is only a numerical indicator of the transition between acceptable and unacceptable exposure levels and should not be overinterpreted (EPA, 1985b).

I.2.2 WASTE SITE RISK CHARACTERIZATION

To characterize the risks associated with potential exposure to hazardous materials at any SRP waste site, the dosages, as determined in the exposure assessment step, were evaluated in terms of their attendant carcinogenic and noncarcinogenic risks. Radioactive and nonradioactive carcinogenic risks were evaluated separately for the mixed waste sites.

Carcinogenic and noncarcinogenic risks were calculated for all exposure scenarios (subsurface and atmospheric) over the 1000-year time period for each remediation option. Risks were displayed in tabular or graphic format over appropriate time intervals, usually 100 years. Maximum risks and time of occurrence were also calculated and displayed. Additionally, summary estimates of risks for all exposure routes were computed by summing the carcinogenic risk estimates and ADI fractions. These risks are presented in Chapter 4 of this statement for each of the sites and remediation alternatives evaluated.

The methods for evaluating and characterizing carcinogenic and noncarcinogenic risks have been used only to assess the relative risk of adverse effects from alternative remediation options at a given site or from one site to the next on the SRP. These methods are not to be assumed to be a quantitative evaluation and prediction of the incidence of adverse effects in exposed populations, but are rather a tool for the assessment of relative risk (i.e., comparison across sites or across the different remediation options).

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APPENDIX J

WASTE MANAGEMENT DEMONSTRATION PROGRAMS

This appendix describes hazardous, low-level radioactive, and mixed waste demonstration programs that have been implemented on the Savannah River Plant (SRP). These programs were established to demonstrate the feasibility of treatment or disposal technologies for these categories of waste. One demonstration program has led to the establishment of a full-scale operating system for groundwater recovery and remedial action.

J.1 HAZARDOUS WASTE DEMONSTRATION PROGRAMS

Research is under way on cement/fly-ash solidification of the Defense Waste Processing Facility (DWPF) supernate to form saltstone monoliths suitable for disposal. This process is also being considered for stabilizing the following wastes: (1) incinerator ash and scrubber blowdown, (2) effluent treatment facility (ETF) sludges, and (3) still-bottom sludge from the Naval Reactor Fuel Materials Facility (FMF) process-water treatment.

J.2 MIXED WASTE DEMONSTRATION PROGRAMS

Presently, the Savannah River Plant has no demonstration programs for mixed wastes. However, research on a method for the stabilization of some wastes of this type is under way (see Section J.3.2).

J.3 LOW-LEVEL RADIOACTIVE WASTE DEMONSTRATION PROGRAMS

J.3.1 INCINERATION

The U.S. Department of Energy (DOE) is developing a full-scale incineration process for nonhazardous, slightly radioactive solvent and beta-gamma contaminated solid wastes and is demonstrating this process on the SRP. The incinerator is a two-stage, controlled-air unit capable of incinerating 181 kilograms of solids per hour or 1500 liters of liquid wastes per hour. Waste in the first chamber is pyrolyzed at 900°C. Final combustion is achieved with excess air in the second stage at 1000°C (Lewandowski, Long, and Mersman, 1984).

From October 1981 through September 1982, the Savannah River Laboratory (SRL) demonstrated the incineration equipment by burning nonradioactive solid and solvent wastes. The equipment was moved from the laboratory for further demonstration and low-level waste incineration. In January 1984, DOE began an SRP demonstration program to develop further the process for incinerating nonhazardous solvents, to demonstrate solids burning capabilities, to incinerate the existing inventory of radioactive solvents, and to burn a fraction of the newly generated, suspect-low-level, radioactive solid wastes. This incinerator has received all applicable permits.

This program demonstrated the following key elements of equipment operation, optimization, and maintenance (Lewandowski, Long, and Mersman, 1984):

- Successful relocation and operational testing of the process equipment.

- Selection and testing of a suitable spray nozzle for burning solvent slurry; optimization of the feed rates for the solvent and atomizing medium.

- Testing of several spray nozzle locations and orientations.

- Conformation of parameters for operating the dry off-gas system.

- Chemical fixing of the phosphorus released by burning tributyl phosphate using tetrabutyl titanate as a fixative; this minimizes the formation of phosphoric acids and reduces long-term corrosion rates and filter blinding.

TE

- Removal of ash from the incinerator on a semicontinuous basis, using two automatically sequenced and electrically interlocked ash rams; the ash remains in a removal duct until it has cooled.

- Replacement of the castable refractory in both chambers of the incinerator with 80-percent brick and 20-percent castable refractories.

- Enhancement of combustion safeguards by placing strongbacks on the incinerator cleanout doors.

- Improvements in the application of the hydraulic cylinders.

- Development of a method for incinerating small amounts of water in the solvent slurry.

- Burning suspect waste oil as a supplementary fuel.

In addition, a pilot incinerator for transuranic (TRU) wastes is operating on the Plant. This is an infrared movable-grate incinerator with a capacity of about 11 kilograms of solids per hour. Results of research conducted with this incinerator could be applied to low-level radioactive mixed wastes on the Plant.

J.3.2 SOLIDIFICATION/STABILIZATION

SRP has an active waste-stabilization program. Greater confinement disposal (GCD) techniques are being demonstrated at the Burial Ground (643-7G). The goal of GCD is to dispose of the higher activity fraction of low-level radioactive wastes in a near-zero-release facility that would meet U.S. Nuclear Regulatory Commission (NRC) guidelines (10 CFR 61). Self-leveling cement grout is used to solidify the wastes before they are placed in a GCD demonstration borehole or trench (Cook et al., 1984).

While GCD boreholes on the Plant have been in operation for some time, it is too early to assess long-term performance. The boreholes have been free of liquids, indicating that no water is infiltrating to the waste. The grout liner is expected to last for hundreds of years. While the lifetime of the inner fiberglass liner is not known, the fiberglass is made with a resin that is specifically unaffected by most chemicals; it is expected to be stable in the grout matrix for more than 100 years (Du Pont, 1986).

The Greater Confinement Disposal Engineered Trench (GCD-ET) began receiving waste in April 1987. The four-celled, 30.5 by 15.2 meter trench has reinforced concrete walls and steel covers that are placed over each cell when it is not in use. TC

Research also is under way on cement/fly-ash solidification of various low-level radioactive wastes (see Section J.1).

J.3.3 COMPACTION

Compactor demonstration programs on the Plant are evaluating volume reduction technologies for low-level radioactive waste. The Du Pont Reactor Department and the Savannah River Laboratory each use a small (0.15-cubic-meter) box compactor. Annually, these units will reduce approximately 425 cubic meters of job-control wastes to approximately 140 cubic meters. Data from these demonstrations will determine the number of additional compactors to be installed.

A large box compactor in H-Area compacts wastes so they can be placed in 2.5-cubic-meter, carbon steel boxes. As waste items are received in cardboard boxes, radiation levels are verified, and the waste is fed manually to the compactor. Approximately 2265 cubic meters of waste can be compacted to a volume of about 565 cubic meters. This demonstration will permit the determination of achievable volume reduction for low-level radioactive waste and a classification of compactible material, loading techniques, and ventilation-control requirements.

Another large box compactor has been installed in M-Area. This unit will compact about 700 cubic meters to a volume of about 170 cubic meters or less.

These compactor programs are expected to achieve a 9-percent reduction (approximately 2400 cubic meters annually; Mentrup, 1985) in the amount of low-level waste disposed of at the Burial Grounds.

J.3.4 SHREDDING

SRP generates as much as 1415 cubic meters of TRU combustible and noncombustible wastes each year. Since 1965, such waste has been stored at the Burial Ground (643-G and 643-7G) for retrieval. Shredders will be used in the TRU processes developed to prepare these wastes for final disposal; these processes will handle both newly generated wastes and waste now being stored for retrieval.

Demonstration programs are in progress at both SRP and SRL. Two small (45- and 15-horsepower) shredders will prepare combustible TRU-contaminated waste for incineration. These units, which have been installed in a pilot-plant facility for thorough nonradioactive testing, will demonstrate a remote operation and maintenance capability.

A large (160-horsepower) shredder will size-reduce decontaminated noncombustible items, such as decommissioned glove boxes and process equipment. This unit is being installed in an integrated test facility for demonstration of remote operation and maintenance technique. Simulated glove boxes made of both 0.3- and 0.6-centimeter steel and stainless steel have been size-reduced successfully (Charlesworth, 1985).

J.4 REMEDIAL AND CLOSURE ACTION DEMONSTRATION PROGRAMS

At present, DOE has no major demonstration projects on the SRP to define specific remedial and closure actions for existing waste sites. An earlier major demonstration project has led to a specific remedial action project; that is, the pilot air stripper in the M-Area was used to demonstrate the removal of volatile organics from the groundwater. The air stripper and a groundwater recovery well system are in full-scale operation.

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APPENDIX K

SCOPING COMMENTS AND RESPONSES

The U.S. Department of Energy (DOE) announced its intent to prepare an environmental impact statement (EIS) on waste management activities for groundwater protection at the Savannah River Plant in the Federal Register on April 26, 1985. Interested parties were invited to submit written comments or suggestions for consideration in preparing the EIS during a 30-day public comment period that ended on May 28, 1985, or at two public scoping meetings.

During the public comment period, 16 individuals, agencies, and organizations presented written or oral comments; one individual provided written comments at one of the public scoping meetings and more detailed written comments after the meetings. Table K-1 lists the individuals, agencies, and organizations who provided comments.

Table K-2 presents the comments received at the scoping meetings or in writing during the public comment period. This table also provides DOE's responses to these comments.

Table K-3 summarizes the topics contained in the comments and references the appropriate chapters and sections of this EIS.

At the public scoping meetings, DOE presentations inadvertently referred to the alternative of aboveground disposal as "greater confinement disposal facilities." Greater confinement disposal is an in-ground disposal concept, and the summary of this EIS contains a brief correction of this inadvertent statement.

Table K-1. Agencies, Organizations, and Individuals Submitting Scoping Comments

Designation	Agency, organization, or individual	Page
A	Frances Hart, on behalf of the Energy Research Foundation and the Natural Resources Defense Council	K-4
B	W. F. Lawless	K-19
C	Sheppard N. Moore, on behalf of Jack E. Ravan, Regional Administrator for Region IV, U.S. Environmental Protection Agency	K-29
D	Arthur H. Dexter	K-30
E	Beatrice Jones	K-32
F	Ira Davis, Richmond County Property Owners Association	K-35
G	Gene Weeks, on behalf of Judith E. Gordon, South Carolina Chapter, Sierra Club	K-39
H	Ms. Dorcas J. Elledge	K-54
I	Mr. T. M. King	K-55
J	Mary Lou Seymour, representing the CSRA Health Project	K-57
K	Hans Neuhauser, Coastal Director, Georgia Conservancy	K-58
L	Dr. Zoe Tsagos, representing the League of Women Voters of Northern Beaufort County	K-61
M	Honorable Harriet H. Keyserling, State Representative of the State of South Carolina	K-66
N	R. Lewis Shaw, Deputy Commissioner, South Carolina Department of Health and Environmental Control	K-67
O	Mary T. Kelly, President, League of Women Voters of South Carolina	K-70
P	Honorable Richard W. Riley, Governor, State of South Carolina	K-72
Q	W. F. Lawless	K-74

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response

STATEMENT OF FRANCES HART
Energy Research Foundation
2530 Devine St.
Columbia, SC 29205

Waste Management Activities for Groundwater Protection
at the Savannah River Plant, Aiken, South Carolina

Scoping Comments on the Preparation of
an Environmental Impact Statement

Aiken, South Carolina
May 14, 1985

Energy Research Foundation
2530 Devine Street
Columbia, South Carolina 29205

Natural Resources Defense Council
1350 New York Avenue, NW
Washington, D.C. 20005

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
	I am Frances Hart and I represent the Energy Research Foundation. We appreciate the opportunity to present suggestions for the scope of an Environmental Impact Statement on hazardous waste management at the Savannah River Plant and we commend the Department of Energy for voluntarily undertaking this assessment.	
A-1	Before making specific comments, however, we would like to stress the need to view this process within the context of national and state laws regulating hazardous wastes. DOE must make it clear that any selection of alternatives is limited by existing regulatory requirements under the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation and Liability Act (Superfund), and other federal laws; by South Carolina's Hazardous Waste Management regulations and the South Carolina Pollution Control Act; and by SRP's own commitments.	All alternatives considered in the EIS are assessed in relation to applicable regulations and standards. Chapter 6 discusses the applicable regulatory requirements associated with the alternatives, including DOE Orders and the Resource Conservation and Recovery Act, as amended.
A-2	The NEPA process cannot and must not be used to circumvent these requirements, nor may required actions be delayed pending completion of the EIS.	If NEPA requirements conflict with other applicable statutes, Chapters 1 and 6 of the EIS will discuss the conflicts.
A-3	Thus, there are no alternatives for closure and remedial action at RCRA sites other than those specified in the statute and applicable regulations. CERCLA sites will be subject to the same cleanup standards as commercial sites. For other sites, such as low-level radioactive waste sites with no hazardous waste contamination, SRP would be guided by the ALARA principle and its own requirements and commitments towards alternatives to shallow land burial, such as engineered above-ground storage and other state-of-the-art technology. Many of our specific comments are, therefore, stated in terms of compliance with these pertinent regulations.	See the response to comment A-1.
	We would expect that any Environmental Impact Statement would include, first of all, a background description consisting of at least the following elements:	
A-4	1. A section describing all applicable laws, regulations and orders, and potential future requirements; including RCRA, as amended, Superfund Reauthorization bills, Clean Air and Water Acts, Safe Drinking Water Act, OSHA, Atomic Energy Act, EPA radiation standards, and DOE Order 5820.	See the response to comment A-1. The EIS discusses the status, intent, and potential applicability of regulations that are required under the 1984 RCRA amendments, even though they might not be finalized or issued.

Table K-2. Scoping Comments and DOE Responses

Comment number		Comment	Response
A-5	2.	A characterization of the existing environment including a detailed discussion of SRP geology, hydrology, seismicity, local climate and meteorology, and so on. This description should include a detailed discussion of SRP groundwater characteristics, including interconnection of aquifers and connection of contaminated aquifers with surface streams flowing offsite. All environmental studies by outside contractors, universities, and researchers should be referenced.	Chapter 3 and Appendixes A and B of the EIS discuss and characterize the existing environment. Chapter 5 discusses environmental studies and monitoring programs within the scope of the EIS. Appendix A describes the geology and subsurface hydrology of the SRP, including the relationship of groundwater to surface water. Documents used to prepare Appendixes A and B are referenced.
	3.	A characterization of existing waste generation and treatment should include:	
A-6	a)	a brief history including types and amounts of hazardous, low-level, and mixed wastes previously generated;	Appendix B of the EIS discusses previously generated wastes contained in existing hazardous, low-level radioactive, and mixed waste sites.
A-7	b)	a detailed description of types and amounts of hazardous, low-level, and mixed wastes currently generated at SRP, including wastes discharged to air, surface waters, land, groundwater, TSD facilities, and shipped offsite;	Chapters 2 and 4 of the EIS discuss the quantities and characteristics of hazardous, low-level radioactive, and mixed wastes from ongoing and planned SRP operations, wastes in storage, and wastes from remedial and closure actions requiring disposal. A description of all releases and effluents that are currently generated and not related to the protection of groundwater resources is outside the scope of this EIS; however, these releases are discussed in U.S. Department of Energy Savannah River Plant Environmental Report for 1984 (DPSPU 85-30-1).
A-8	c)	anticipated changes in types or amounts of hazardous, low-level, and mixed wastes to be generated in the future;	Chapters 2 and 4 discuss major assumptions on changes in the types or amounts of waste requiring disposal.
A-9	d)	programs underway to reduce or eliminate the generation of wastes as expeditiously as possible, as required by RCRA;	Chapters 2 and 4 and Appendix D discuss predisposal technologies to reduce volume, solidify/stabilize, treat, and control hazardous, low-level radioactive, and mixed wastes. Waste minimization permitting requirements of RCRA are discussed in Chapter 6; however, as required by RCRA, waste minimization programs are continuing efforts at the SRP and are not specific alternatives for remedial actions or for other actions that are within the scope of this EIS.

Table K-2. Scoping Comments and DOE Responses

Comment number			Comment	Response
A-10		e)	steps taken by SRP to encourage process substitution, materials recovery, properly conducted recycling, reuse and treatment, as required by RCRA;	See the response to comment A-9.
A-11		f)	results of previous studies and steps taken to reduce the volume of wastes generated at SRP, including incineration and compaction;	See the response to comment A-9.
A-12		g)	results of any studies undertaken or programs underway to separate mixed wastes into hazardous and radioactive components;	There are no current programs or studies for separating mixed wastes into separate hazardous and low-level radioactive components.
A-13		h)	compliance with RCRA hazardous waste generator requirements and applicable DOE regulations;	Chapter 6 summarizes applicable RCRA requirements for waste generators and associated DOE Orders and regulations.
A-14		i)	provide to the greatest extent possible the information required by the Hazardous Substances Inventory section of the Superfund Improvement Act of 1985.	Appendix B characterizes existing hazardous, low-level radioactive, and mixed waste sites. Appendix B also discusses the history of waste disposal, evidence of past and existing contamination, and waste characteristics. Also see the response to comment A-1.
A-15	4.		Describe the types, amounts, and source or destination of hazardous, low-level, or mixed wastes, if any, that are transported onsite and offsite. Discuss compliance with RCRA and DOE transportation requirements. Discuss any past accidental releases during transportation.	The final EIS for waste management operations at the SRP (ERDA-1537) discusses the transport of waste materials. Chapter 6 of this EIS discusses applicable regulatory requirements for the transport of waste material that might be associated with proposed actions and alternatives. Also see Chapter 4.
	5.		A characterization of current waste storage should include:	
A-16		a)	a description of the location and contents of all SRP storage facilities for hazardous, low-level, or mixed wastes, including idle production facilities and underground storage tanks;	The EIS describes the characteristics and amounts of wastes in storage requiring disposal in Chapters 2 and 4. Existing storage facilities and idle production facilities are outside the scope of this EIS.
A-17		b)	anticipated changes in types and amounts of hazardous, low-level, and mixed wastes to be stored at SRP, or in the number or location of storage facilities, in the future;	Anticipated changes in the amounts of hazardous, low-level radioactive, and mixed wastes requiring disposal are considered in Chapters 2 and 4. These sections also describe new retrievable-storage facilities for disposal of hazardous, low-level radioactive, and mixed wastes that have not been approved and permitted.

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
A-18	c) discuss DOE's alternative storage plans if storage of these wastes is prohibited under section 201(j) of the 1984 RCRA amendments;	The EIS considers only those new retrievable-storage facilities that comply with applicable Federal and State requirements, as currently defined. See Chapter 6.
A-19	d) discuss implications and plans for compliance with *1984 RCRA amendments concerning underground storage* tanks.	Compliance of new retrievable-storage facilities with applicable Federal and State regulatory requirements is discussed in Chapters 4 and 6.
	6. A characterization of current waste disposal at SRP should include:	
A-20	a) a complete description of all SRP past and present disposal facilities for hazardous, low-level, and mixed wastes, including size, location, and type of facility, type and amount of waste disposed of, source of each type of waste disposed, date on which each type of waste was placed in facility, and date - if any - on which waste disposal ceased;	Appendix B and its referenced documents present the pertinent characteristics of existing hazardous, low-level radioactive, and mixed waste sites, including location, history of waste disposal, past and existing contamination, and characterization of disposed wastes.
A-21	b) discuss whether and to what extent SRP facilities have been used to dispose of waste generated offsite.	Chapters 2 and 4 discuss waste material for disposal on the SRP that is generated offsite.
	The Environmental Impact Statement should include detailed descriptions of environmental effects of past and current waste management activities at SRP including the following:	
A-22	1. Complete information and monitoring data regarding past waste releases from all waste generating, transporting, treatment, storage, and disposal facilities, including dates of releases, amount and toxicity of waste released, extent and nature of environmental contamination, extent to which release is continuing, and all other information required by Section 244 of the 1984 RCRA amendments.	See the responses to comments A-7 and A-20. The EIS considers existing hazardous, low-level radioactive, and mixed waste sites, regardless of whether they are defined as "continuing release" sites.

Table K-2. Scoping Comments and DOE Responses

Comment number		Comment	Response
A-23	2.	Detailed discussion of effects of each release on groundwater, surface streams, air, vegetation, wildlife, health and safety of workers, and public health and safety. Include the extent to which release has traveled or has the potential to travel offsite. Several of the streams at SRP dissect aquifers known to be contaminated; these aquifers are discharging to streams and the material is being carried offsite.	Chapters 2 and 4 and Appendixes F through I discuss the environmental consequences and the methods for assessing the environmental consequences of the proposed action and alternatives. Also see the responses to comments A-7 and A-20.
A-24	3.	Detailed discussion of maximum cumulative environmental effects which could be caused by such releases; assessment must include the following: a) a detailed description of background (i.e., not affected by any SRP operations) concentrations in all media for all actual and suspected pollutants, and current distributions from chronic releases from point sources and nonpoint sources in all media for all pollutants. b) impacts to vegetation including but not limited to pollutant concentrations in specific tissues from root uptake and absorption from the atmosphere; changes in vegetation distribution resulting from pollutants; changes in physiologic processes (e.g., growth, carbon fixation, reproductive effort and success) resulting from pollutants; physical effects (e.g., chlorosis, growth reduction) resulting from pollutants; c) impacts to animals including but not limited to pollutant concentrations in specific tissues from bio-accumulation and inhalation; changes in physiologic processes (e.g., growth, reproductive effort and success) resulting from pollutants; physical effects (e.g., hair loss, teratogenic effects) from pollutants;	Cumulative environmental effects of the proposed action and alternatives are discussed in Section 4.7. Chapter 3 and Appendixes A and B describe the existing SRP environment, including current impacts from prior hazardous, low-level radioactive, and mixed waste management practices.

Table K-2. Scoping Comments and DOE Responses

Comment number		Comment	Response
		d) impacts to ecosystems including but not limited to changes in habitat structure that limit or change floral/faunal distributions; changes in energy flow that might effect floral/faunal distributions, both immediate and delayed; changes that might affect the species composition of communities;	
		e) maximum health effects that could be caused by such releases, including the uncertainties involved in each calculation;	
		f) compare the releases, doses and levels of contamination discussed above with standards found in DOE orders, the Clean Water Act, the Clean Air Act, the Safe Drinking Water Act, EPA standards, and other applicable standards.	
A-25	4.	Detailed discussion of any studies or programs underway or planned to obtain more data on past releases, including groundwater monitoring programs, placement of new wells, and so on.	Chapter 5 discusses ongoing and planned monitoring programs and studies related to the proposed action and alternatives.
A-26	5.	Provide for all pollutants literature, data, or experimental toxicological data to support predicted impacts to terrestrial and aquatic flora and fauna, including estimates of accuracy and precision for predicted impacts.	Chapter 4 and its referenced documents describes the methods and assumptions related to the assessment of health effects from radiological and nonradiological releases.
A-27	6.	Any facility which must obtain any types of hazardous waste permit must include in the permit application provisions for corrective action for all prior releases of hazardous waste from any waste management facilities, as required by Sections 206 and 207 of the 1984 RCRA amendments. This means that SRP must provide plans for corrective action for all of the CERCLA sites, requiring the installation of groundwater monitoring systems, development of cleanup plans, and so on. At SRP, with a total of 153 identified waste sites, this will be a major undertaking. Discuss SRP's plans for compliance.	Chapters 2 and 4 of the EIS assess alternative remedial and closure actions at existing hazardous, low-level radioactive, and mixed waste sites. Based on the Record of Decision to be prepared on this EIS, the alternatives selected for implementation will be defined in detail when the required permit applications are made, before implementation of the proposed action. Not all of the 153 waste sites identified on the SRP contain hazardous, low-level radioactive, and mixed wastes.

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
A-28	7. The atmospheric distribution (micro and macroscale) of volatile organic compounds such as solvents must be addressed. EPA is currently undertaking the development of air standards for VOC including the compounds historically and currently used at SRP. Regulations will cover emissions from point as well as nonpoint sources (e.g., lagoons, rivers, and sewage and waste treatment facilities, and irrigation systems). Portable gas chromotographs employed with a sound sampling plan can adequately describe existing atmospheric distributions of VOC's. Meteorological models validated internally and calibrated to the SRP region, must be employed for macroscale distributions.	Ambient air quality and meteorological parameters are discussed in Chapter 3. Atmospheric releases of nonradioactive substance due to alternative remedial and closure actions for waste sites considered in the EIS are discussed throughout Chapter 4.
A-29	8. Discuss any response, corrective, or closure activities undertaken at any of these facilities.	Chapter 1 discusses programs and projects for corrective action and closure that have been approved or permitted on the SRP.
	The Environmental Impact Statement discussion of current waste management and disposal activities at SRP should include the following as well:	
A-30	1. Discuss compliance with RCRA at all SRP hazardous and mixed waste facilities, including: a) M-, F-, and H-Areas seepage basins; b) CMP pits; c) the old TNX basin, which must be closed as a RCRA 265 unit; d) the new TNX basin, whose contents appear to include mercury, methylene chloride and other listed solvents and so must be included in SRP's Part B application and RCRA groundwater monitoring requirements; e) the Savannah River Lab seepage basins, which received waste after July 26, 1982, and so must be included in the Part B application and RCRA groundwater monitoring requirements;	Chapter 6 discusses the applicable Federal and State requirements, including permits for the proposed action and alternatives considered in the EIS.

Table K-2. Scoping Comments and DOE Responses

Comment number		Comment	Response
		f) the L-Area Oil and Chemical Basin which has been inactive but not closed, and so must be included in the Part B application and RCRA groundater monitoring requirements;	
		g) the Metallurgical Lab basin and overflow seepage depressions;	
		h) the underground storage tanks, waste oil trenches and other hazardous waste landfill trenches at the low-level waste burial ground;	
		i) the Ford Building seepage basin and waste site;	
		j) the 716-A Motor Shop seepage basin;	
		k) the Experimental Sewage Sludge application sites;	
		l) acid/caustic basins;	
		m) burning and rubble pits;	
		n) coal pile runoff containment basins.	
A-31	2.	Discuss compliance with groundwater assessment requirements of RCRA at all applicable facilities, including M, F, and H Areas. The discussion of compliance must demonstrate in detail that SRP's groundwater monitoring system meets the following RCRA requirements:	Chapter 5 discusses the SRP groundwater quality assessment plan.
		a) minimum of one upgradient and three downgradient monitoring wells;	
		b) wells must monitor the uppermost aquifer;	

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
	c) downgradient wells must be placed in a position to immediately detect migration of statistically signficant amounts of hazardous waste or hazardous waste constituents to the uppermost aquifer; wells placed more than a few feet from the impoundment cannot meet this requirement of immediate detection;	
	d) wells must be analyzed for parameters specified in 265.92(6) and according to a specified schedule;	
	e) If groundwater contamination is detected, a formal and detailed groundwater quality assessment plan to identify the rate and extent of contamination must be implemented. Regulations require that within 15 days of the detection of a statistically significant difference, a specific plan be submitted which includes: 1) number, location, and depth of any new wells; 2) sampling and analytical methods to be used; 3) criteria to be used in evaluating the data; 4) schedule for implementation 5) certification by a qualified geologist or geotechnical engineer.	
	The discussion of compliance should also take into account the following:	
A-32	a) There are many monitoring wells at SRP, but there is little available information about construction techniques and materials. Details regarding construction and also precise sampling locations, methods of selecting locations, sampling procedures and preservation techniques need to be specified to	See the response to comment A-31.

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Comment number		Comment	Response
		demonstrate conformity with RCRA. Site geology is complex but it appears that almost all basins are underlain by several interconnected aquifers, making the use of cluster wells necessary.	
A-33	b)	SRP must do Appendix VIII analyses yearly at all areas which display groundwater contamination. There is some indication at several of the basins, according to the Technical Summary of Groundwater Protection Plan, that contamination from substances which were supposedly never placed in the basins is occurring. This, and the fact that there seems to have been a lack of control and recordkeeping regarding disposal practices in the past, make Appendix VIII analyses at all regulated areas crucial. SRP Types A, B, C, D, and E analyses collectively do not contain all the Appendix VIII compounds.	See the responses to comments A-30 and A-31.
A-34	c)	Seepage basins at F and H Areas receive or have received wastewater hazardous because of low pH and contamination by mercury or chrome. Two of the basins are inactive and should be listed as CERCLA sites. The active basins must receive a hazardous waste storage permit. Because groundwater contamination from the active pits has been detected, the issuance of a storage permit to these surface impoundments does not seem justified, and a groundwater assessment program as specified under RCRA should already have been implemented.	Chapters 2 and 4 discuss alternative remedial and closure actions for existing waste sites, including the F- and H-Area seepage basins. Also see the response to comment A-30.
A-35	d)	At a RCRA facility the closure performance standard and the spill cleanup and groundwater cleanup standards require the removal of all waste. Thus any inorganic or organic constituent in total concentration above background should be removed. The level of existing contamination at SRP is not relevant to this demand, nor is there any kind of special status or exemption afforded any facility in meeting this demand.	Both Federal and State hazardous waste regulations call for either the removal of waste or closure without removal. Each of these alternatives will be assessed for existing hazardous, low-level radioactive, and mixed waste sites.

Table K-2. Scoping Comments and OOE Responses

Comment number	Comment	Response
A-36	e) A discussion of M-Area compliance with closure standards must include the following: 1) There are essentially seven hazardous waste units to consider: – the M-Area settling basin – the pipeline from process buildings to the basin – the natural seepage area – the overflow from M-basin to the seepage area – Lost Lake – the overflow from the seepage area-to Lost Lake – the sewer lines from the process buildings to Tim's Branch 2) The solvent storage tanks behind Buildings 313M and 321M have leaked organic solvents into the ground and should be considered a RCRA facility. 3) The M-basin has received effluents which are hazardous because of low pH and contamination by mercury, cadmium, chrome, and lead. The effluent also contains large quantities of listed solvents. Thus the waste would require more than control of pH alone to be classified as non-hazardous. 4) The treatment of contaminated groundwater by an airstripping unit should only be done in accordance with a hazardous waste treatment permit, and upon proper certification that this alternative is the preferred one. Remedial actions such as air-stripping of organic compounds from contaminated groundwater must address micro and macro-scale	Chapter 1 discusses those approved or permitted actions being taken at M-Area for which separate NEPA documentation has been prepared. Also see the response to comment A-30.

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
	atmospheric distributions as well as runoff to nearby streams and recontamination of soils by VOCs returned to earth in precipitation and settling.	
	5) The basin must receive a permit and cannot be closed until a permit is issued.	
	6) Placing waste generated from cleanup of Lost Lake, seepage areas, etc., into the basin is totally unacceptable. If any other material has to be excavated, it should be placed in a secure RCRA facility. If the other waste is left in place, these areas should also be considered regulated units requiring post-closure care.	
A-37	f) There is a specific ban on construction of new hazardous waste facilities without prior issuance of a permit. Since the average time to issue a hazardous waste permit is two years, and no construction activity can begin until a permit is issued, discuss how this requirement will affect SRP's plans and implementation schedules for additional facilities.	See the response to comment A-30.
A-38	g) Discuss SRP compliance with relevant commitments made during the L-Reactor NEPA process.	Chapter 1 discusses the commitments made in the L-Reactor EIS.
A-39	h) Discuss SRP compliance with EPA requests made in connection with its review of the L-Reactor EIS, including its request that DOE expedite the decommissioning of the low-level waste burial ground; that it halt the discharge of disassembly basin purge water to seepage basins; and that state-of-the-art disposal techniques be substituted in both instances.	EPA comments submitted on the draft EIS for the restart of L-Reactor were addressed in Volume 3 of the final EIS (DOE/EIS-0108).
A-40	i) Discuss plans for alternative storage and disposal techniques if certain types of waste are banned from land disposal under Section 201 of the 1984 RCRA amendments.	See the response to comment A-18.

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Comment number	Comment	Response
A-41	j) Discuss plans to retrofit existing surface impoundments within the next four years to meet the minimum technological requirements of the 1984 RCRA amendments, including double liners and leachate collection systems.	DOE will comply with applicable portions of the Resource Conservation and Recovery Act, as amended, including the minimum technological requirements for and closure of land disposal facilities. Also see the response to comment A-1.
A-42	k) Discuss plans to comply with the requirement, effective September 1, that all facility owners or operators must certify that a program is in place to reduce volume and/or toxicity of waste to the degree economically feasible; for example, how SRP will conform to the same standards in this regard as other aluminum extrusion facilities do.	See the response to comment A-9.
A-43	l) Discuss plans to comply with the requirement, also effective September 1, that a generator must certify that the treatment or disposal method used is the best and most practical currently available method which will minimize current and future threats to human health and the environment.	See the response to comment A-9.
A-44	m) Discuss plans to comply with the requirement that the Part B application contain a certification that the facility is in compliance with all applicable groundwater monitoring and financial responsibility requirements.	See the response to comment A-30. DOE will meet specific and applicable requirements of Part B applications as part of the permitting process for facilities. Federal facilities are exempt from the financial responsibility requirements of RCRA.
A-45	Possible environmental impacts and cumulative impacts of all proposed actions must be described in detail, including estimated changes in concentrations and distributions of pollutants in all media for all proposed actions.	Chapter 4 discusses the environmental consequences of the proposed action and alternatives and cumulative environmental effects.
A-46	The Environmental Impact Statement should describe all energy and resource commitments as follows: 1. present for all alternatives in comparable units budgets of energy and resources committed to construction, operation and maintenance; 2. provide detailed documentation to support unit value assignments and conversion factors to comparable units;	Section 4.9 discusses environmental impacts that cannot be avoided or that are irreversible for each of the categories of alternatives considered in the EIS, including energy and resource commitments.

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
	3. provide estimates of accuracy and precision by which total commitments for each alternative can be evaluated and compared.	
A-47	I will close with two final comments. First, although "source, special nuclear, and byproduct materials" which are regulated by the Atomic Energy Act are exempt from RCRA, the AEA definition of these materials is very narrow, and does not include the hazardous wastes with which these AEA materials may be associated. The AEA contains no provisions for managing hazardous wastes, nor does it authorize DOE to regulate these mixed wastes. Mixed wastes should be regulated according to the requirements of both RCRA and the AEA. Where RCRA regulations overlap with the AEA, the more stringent standard should prevail. In the rare case where compliance with both sets of requirements is physically impossible, the burden should be on DOE to demonstrate the inapplicability of RCRA.	See the response to comment A-30. Chapter 6 discusses the status and applicability of mixed waste rulemaking.
A-48	Finally, the Federal Water Pollution Control Act explicitly requires DOE to comply with all state laws "respecting the control and abatement of water pollution in the same manner and to the same extent as any non-governmental entity." This requires compliance with all state water pollution requirements, including groundwater pollution. Formal authority over monitoring and control of all sources is necessary if South Carolina's responsible agency, the Department of Health and Environmental Control, is to address the SRP waste management and groundwater contamination problem in the comprehensive manner demanded by the South Carolina Pollution Control Act. Thank you.	On April 8, 1985, DOE and the South Carolina Department of Health and Environmental Control entered into a Memorandum of Agreement to cooperate mutually in ensuring the environmental quality on the SRP. As stated in this memorandum, DOE will comply with specific environmental acts of the State of South Carolina. Also see the response to comment A-30.

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
	STATEMENT OF W. F. LAWLESS Assistant Professor of Mathematics Paine College SCOPING COMMENTS CONCERNING SAVANNAH RIVER PLANT WASTE MANAGEMENT ACTIVITIES ENVIRONMENTAL IMPACT STATEMENT by W. F. Lawless Assistant Professor of Mathematics Paine College May 28, 1985	

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
	INTRODUCTION The Department of Energy (DOE) has initiated comments and suggestions to assist in identifying environmental issues and the scope of an environmental impact statement (EIS) on waste management activities for groundwater protection at the Savannah River Plant (SRP). Public comments are to be considered in the preparation of an EIS. An April 29, 1985 DOE news release identified the DOE intent to prepare such an EIS and included background information on the SRP; the DOE news release also included alternatives for treating waste sites, for building new waste disposal facilities, and for discharging reactor basin purge water, plus the non-inclusive listing of SRP environmental issues (1). The comments herein were delivered in draft at the first DOE scoping meeting, held at the H. Odell Weeks Activity Center in Aiken, SC, May 14, 1985. General Comments	
B-1	1. Savannah River Plant Seepage Basins In August 1983, a hotline complaint was filed with the DOE Inspector General charging the DOE with willfully avoiding its public responsibility to prepare an EIS for the new DOE Order 5820.2, Radioactive Waste Management (2,3). Such an EIS has not been written, but one is now planned for SRP groundwater protection waste management activities (1). The Department of Energy is to be congratulated on this very important and forthright action. It is hoped that similar actions will take place at all DOE sites throughout the nation. The new EIS planned for the Savannah River Plant will speak volumes on the inadequacies of DOE Order 5820.2, a regulation that is a mockery of American technology and epitomizes the mishandling of radioactive and hazardous wastes by the DOE bureaucracy. The new EIS will begin to correct the groundwater damage done by the DOE's use of seepage basins at SRP, basins still allowed by DOE Order 5820.2.	Chapter 6 discusses the applicable Federal and State regulatory requirements for the proposed modification of waste management activities at the SRP, including the requirements of the Resource Conservation and Recovery Act, as amended, and DOE Orders. A NEPA assessment of DOE Order 5820.2 is outside the scope of this EIS.

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
B-2	The SRP is cleaning up one of its 68 liquid waste seepage basins, the M-Area seepage basin (4). The General Accounting Office (GAO) has estimated that the M-Area seepage basin clean-up will cost up to $64 million or more (4), yet the Savannah River Plant will be using a seepage basin when the L-Reactor comes on line in 1985 (5). The new EIS should carefully detail what seepage basins will continue to be used at the Savannah River Plant and for how long, the contaminants to be disposed of and where, the estimated contaminant build-up at each basin, the basins that are clogged to further seepage and are overflowing, the current estimated clean-up cost for each basin, and the rationale for each basin's continued use.	Chapters 2 and 4 and Appendix F discuss remedial and closure actions at hazardous, low-level radioactive, and mixed waste sites. Appendix B characterizes each of the waste sites considered. Chapters 2 and 4 and Appendix G discuss new disposal facility alternatives for hazardous, low-level radioactive, and mixed waste, including waste material from remedial and closure actions at existing waste sites. Chapters 2 and 4 discuss alternatives to the continued use of seepage basins for the discharge of disassembly-basin purge water from C-, K-, and P-Reactors.
B-3	Seepage basins are one of the sources of hazardous and radioactive waste contamination of migratory fowl and animals at the SRP (6). Contaminated animals have been known to leave the Savannah River Plant site (6). The new EIS should quantify this phenomenon by detailing how each basin has possibly contributed to this means of spreading contamination, and to where with what extent. The new EIS should review the steps SRP has taken to prevent the spread of hazardous and radioactive contamination via water fowl and animals from each one of the 68 known seepage basins.	The Operating Contractor has developed a Program for Management of Contaminated Wildlife at the Savannah River Plant, which identifies and monitors potential human exposure pathways to wildlife contaminated by hazardous and radioactive substances. The locations, contaminants, and descriptions of those areas of potential contamination are contained in various reports (DPSP-83-1008, DPSP-84-1054, DSPS-84-1051, and DPSPU-84-302). Procedures followed in the wildlife monitoring program are contained in DPSOP 271.1. Chapter 4 of the EIS assesses the environmental consequences of the proposed modifications to waste management activities at the SRP, including impacts to aquatic and terrestrial biota and potential health effects from radiological releases that take into account known major pathways of exposure.

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
	2. Waste Management Practices. The DOE Intent to Prepare an Environmental Impact Statement (1) states that a 1977 EIS on the SRP "...resulted in the implementation of a waste management practices improvement program in accordance with	
B-4	DOE policies and standards." This 1977 EIS (ERDA 1537) included many important predictions that have not been publicly assessed by the DOE and should be assessed in the new EIS (8). Many of these predictions have proven wrong, e.g., on the levels of contamination entering the groundwaters underlying the SRP radioactive waste burial grounds and the radioactive and hazardous waste seepage basins, and on how well protected the Tuscaloosa aquifer was from contaminated groundwaters above the Tuscaloosa aquifer (5, 6, 7, 8).	Chapter 3, Appendix A, Appendixes F through I, and references in the EIS document all major assumptions and predictions related to the assessment of environmental consequences of the proposed modifications to waste management activities.
B-5	The SRP publishes annual monitoring reports on radioactive and hazardous contamination at and off the SRP (e.g., reference 6). The new EIS should not only assess the correctness of ERDA 1537, but should as well analyze the monitoring reports from 1977 to the present. Special attention should be directed to DOE excess releases on and off the SRP. For instance,	The EIS uses the results of SRP monitoring programs in characterizing and assessing the environmental consequences of the proposed modifications of waste management activities. Also see the response to comment B-4.
B-6	a) strontium-90 released from the F-Area seepage basins has been found to be at a groundwater concentration over eight (8) times the DOE Concentration Guides, or over 40,000 times the EPA drinking water standard, yet no reprimand has been given to Du Pont, the prime SRP contractor, because of this excess. The new EIS should detail every instance where the DOE Concentration Guides have been exceeded, what corrective actions have been taken and with what long-term effects.	Chapters 2 and 4 and Appendix F discuss remedial and closure actions at existing waste sites, including the F-Area seepage basins.
B-7	b) The annual off plant SRP monitoring reports indicate that strontium-90 in milk samples collected from around the SRP are within ranges found by the Environmental Protection Agency (EPA) (9). In a 1984 report, the EPA collected its own milk sample near the SRP and confirmed by their analysis that strontium-90 in milk samples drawn from near the SRP are not significantly different from other milk	Chapter 4 presents the radiological impacts from proposed remedial and closure actions at existing waste sites, including the potential radiological doses due to atmospheric releases.

Table K-2. Scoping Comments and DOE Responses

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		samples from the southeastern U.S (10). However, the EPA apparently did not review the SRP annual monitoring data on strontium-90 in milk. That data, collected by the Savannah River Plant, indicates that the mean strontium-90 milk concentrations, along certain wind paths, are significantly greater than the mean concentrations in southeastern U.S. milk data as published by the EPA (11). One source of the strontium-90 in milk from around the SRP may be the airborne resuspension from seepage basin releases.	
B-8	3.	Waste Management Assessments The SRP waste management practices improvement program that started with the 1977 EIS (ERDA 1537), as announced in the DOE intent to prepare the new EIS, was stated to also include regular assessments and improvements to SRP waste management programs (1). A listing of all waste management assessments, including appraisals with findings and recommendations, since 1977 should be a part of the new EIS. For instance, the 1982 Savannah River Plant radioactive low level waste burial ground management appraisal report, not published by DOE, should be included (13). This appraisal report was highly critical of DuPont's management of the SRP radioactive waste burial grounds, but not having been finalized nor transmitted to DuPont, the appraisal report became the subject of a separate hot line complaint to the DOE Inspector General (12, 13). The result of that hot line complaint and a subsequent re-appraisal as directed by the DOE Inspector General, has been to dramatically transform operations at the SRP burial grounds (22).	Chapters 2 and 4 and Appendix G identify remedial and closure actions for the low-level radioactive burial ground. Appendix B also characterizes the burial ground.
B-9		The burial ground management appraisal report did not assess SRP seepage basins, but a 1982 radioactive high-level waste tank farm appraisal report attempted to do so and attempted to assess the long-term impacts seepage basins would have on the SRP groundwater environment (14, 15). However, that part of the high-level waste tank farm appraisal report was stopped by DOE management (12), but in effect, part of that long-term appraisal will be assessed in the new Waste Management Activities EIS. The scope of the original long-term appraisal of the high-level waste tank farms appears to have been more far reaching than the	The purpose of this EIS is to assess the proposed modifications of waste management activities at the SRP for hazardous, low-level radioactive, and mixed wastes. A discussion of high-level waste management activities is outside the scope of the EIS. The impacts of high-level waste management activities at the SRP were discussed in DOE/EIS-0062.

Table K-2. Scoping Comments and DOE Responses

Comment number		Comment	Response
		scope of the new EIS (15); the latter's scope should be expanded to cover all sources of SRP groundwater contamination, including the SRP high level radioactive waste tank farm and the Defense Waste Production facility (DWPF).	
B-10	4.	<u>DOE Concentration Guides</u> As stated in the recent DOE news release (1), the DOE wants "...to ensure continued protection of groundwater, human health and the environment." However, numerous instances have occurred at SRP where concentrations of radionuclides have exceeded the DOE Concentration Guides (16, p. 25, Table D; 17). Yet, the DOE apparently does not take steps to bring releases into the environment below levels established by these DOE Concentration Guides, nor has the DOE cited the SRP contractor when the Concentration Guides have been exceeded (18). This appears to be incongruent with DOE policy. For example, the *1984* L-Reactor EIS reported that strontium-90 groundwater concentrations from F-Area seepage basins reached 340,000 pCi/L (5). This level of strontium-90 is 42,500 times greater than the EPA drinking water standard and over 8 times higher than the DOE Concentration Guides (16, 17). When this was discussed with DOE, the DOE responded that the contractor was under no obligation to meet the DOE Concentration Guide for strontium-90 in groundwater (19). Putting aside, for the moment, the question of whether the DOE Concentration Guides themselves provide satisfactory protection to human health and the environment, exceeding those DOE Concentra*tion Guides assuredly cannot protect anything. Since the* DOE still self-regulates nuclear wastes, it would appear that these DOE Concentration Guides afford both the DOE and the prime contractor a cozy relationship. The new EIS should question the efficacy of these DOE Concentration Guides and whether, in the best interests of the public, these guidelines should be replaced with regulations that bite.	See the response to comment B-6. Chapter 6 discusses the applicable Federal and State regulatory requirements for the proposed modifications of waste management activities, including DOE Orders.

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	In 1984, the federal court removed the DOE's right to self regulate hazardous chemical wastes (4) after the largest industrial spill of mercury occurred at the DOE Oak Ridge facility (20, 21). The new EIS is a good, first step forward for the DOE to recoup lost credibility, but it must be strongly reinforced with a cost-efficient, professional operation that cleans up the SRP environment and keeps it clean. The DOE can ill afford another cover-up.	
B-11	5. Remedial Action Programs The M-Area remedial action program to manage and control existing groundwater contamination was included in the L-Reactor EIS (5), but it has not been central to the subject of an EIS until now, yet corrective action alternatives to the M-Area basin clean up apparently do not exist because remediation has already begun (4, 5). The new EIS is a fine idea, but it comes after the fact for deciding the appropriate course of action for the M-Area seepage basin clean-up, and for allowing public input into that decision, unless, with the new EIS, the DOE is now offering the public this opportunity. The M-Area seepage basin clean-up will jettison an estimated 30 tons per year of chlorinated hydrocarbons into the atmosphere at one of the most populated work areas on the SRP plant site (4, 5). It is appropriate that the public have the right to question the Savannah River Plant scientists and engineers on the decision to allow airborne releases of these potentially hazardous chemicals within the SRP manufacturing and administration areas.	As stated at the public scoping meetings, approved and permitted remedial actions are currently underway in M-Area (i.e., operation of an air stripper and the construction and operation of an effluent treatment facility to discontinue use of the M-Area seepage basin). These actions, taken pursuant to Public Law 98-181, are discussed in Chapter 1 of the EIS. Because these actions have been approved previously and a separate NEPA review has been performed, these actions are not considered in detail in the EIS. The EIS considers the disposal of the sludge from the M-Area effluent treatment facility. Operation of the air stripper meets all applicable air-quality standards, and its operation has been permitted by the South Carolina Department of Health and Environmental Control.
B-12	The SRP Groundwater Quality Protection Program discussed the removal of highly contaminated soil and chemical and pesticide hazardous waste from the CMP seepage basins for transport, storage and disposal elsewhere (7). This remedial action should similarly be a apart of the new EIS, especially if highly contaminated wastes will be transported and disposed offsite the SRP plant site.	Chapter 1 discusses the removal of waste material from the CMP pits. Disposal of the waste material, currently in a permitted hazardous waste storage building, is considered as part of the material requiring disposal at new onsite disposal facilities, to be assessed in Chapter 4 of the EIS.

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
	Specific Comments	
B-13	1. The 1983 technical summary document, The Technical Summary of Groundwater Quality Protection Program at Savannah River Plant, Volumes I and II, should be up-dated and corrected where necessary. For instance, the M-Area seepage basin is listed as non-radioactive instead of as a mixed waste basin.	The EIS will use the most current data available.

References

1. U.S. DOE news release, Department of Energy Announces Scoping Meetings Concerning Waste Management Activities EIS, April 29, 1985. The news release included as an attachment, the Department of Energy Waste Management Activities for Groundwater Protection at the Savannah River Plant, Aiken, SC: Intent to Prepare an Environmental Impact Statement.

2. Letter to C. Benge, Inspector, DOE Inspector General's Office, from W. F. Lawless, "DOE Order 5820.1 (Management of Transuranic Contaminated Material) and draft DOE Order 5820, Radioactive Waste Management," August 27, 1983.

3. U.S. Department of Energy Order 5820.2, Radioactive Waste Management (1984).

4. Department of Energy Acting to Control Hazardous Waste at its Savannah River Nuclear Facilities, U.S. General Accounting Office report to the Honorable Ernest F. Hollings, United States Senate, Rep. GAO/RCED-85-23 (1984).

5. Final Environmental Impact Statement, L-Reactor Operation, Savannah River Plant, Aiken, SC, U.S. Department of Energy 3-Volume Rep. DOE/EIS-0108 (1984).

6. Environment Monitoring at the Savannah River Plant, Annual Report for 1982, Savannah River Plant Rep. DPSPU 83-302 (1984).

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Comment number	Comment	Response
	7. Technical Summary of Groundwater Quality Protection Program at Savannah River Plant, Volume I, Site Geohydrology and Solid Hazardous Wastes, a Savannah River Plant Rep. DPST-83-928 (1983).	
	8. Final Environmental Impact Statement, Waste Management Operations, Savannah River Plant, Aiken, SC, U.S. Energy Research and Development Administration Rep. ERDA-1537 (1977).	
	9. Environmental Monitoring in the Vicinity of the Savannah River Plant, Annual Report for 1982, Savannah River Plant Rep. DPSPU 83-30-1 (ca. 1983).	
	10. An Airborne Radioactive Effluent Study at the Savannah River Plant, a U.S. Environmental Protection Agency Rep. 520/5-84-012 (1984).	
	11. W. F. Lawless, "General and Specific Comments," p. 91-95, Final Environmental Statement Related to the Operation of Vogtle Electric Generating Plant, Units 1 and 2, a U.S. Nuclear Regulatory Commission Rep. NUREG-1087 (1985).	
	12. Letter to C. Benge, Inspector, Department of Energy, Inspector General's Office, from W. F. Lawless, SRP Burial Ground Appraisal Report (BGAR)	
	13. W. F. Lawless, Savannah River Plant (SRP) Burial Ground, Building 643-G, Management Appraisal Report, Appraised June 2-13, 1980, a U.S. Department of Energy Savannah River Operations Office draft report (1982).	
	14. W. F. Lawless, K. G. Brown, Management Appraisal Report, Savannah River Plant (SRP) Tank Farm., a U.S. Department of Energy Savannah River Operations Office report (1981).	
	15. W. F. Lawless, K. G. Brown, B. M. Dodge, Performance Audit Questions, Savannah River Plant (SRP) Tank Farm, a U.S. Department of Energy Savannah River Operations Office draft report (1982).	

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	16. W. F. Lawless, <u>The Savannah River Plant: Hazardous and Radioactive</u>, Comments on a Panel's Review and Findings of Ongoing Health Effects and Epidemiological Studies of Operations at the Savannah River Plant (1985).	
	17. <u>Environmental Monitoring at the Savannah River Plant, Annual Report for 1982</u>, SRP Rep. OPSPU 82-302 (1984).	
	18. Letter to R. L. Morgan, Manager, DOE-Savannah River Operations Office, from W. F. Lawless, transmitting reference 16, February 8, 1985.	
	19. C. Nandrasy, *DOE-Savannah River Public Relations Office*, personal communication, February 8, 1985.	
	20. "The Lost Mercury at Oak Ridge," News and Comment, <u>Science</u>, 221, 130-132 (1983).	
	21. B. A. Fenimore, "Atomic Bombs, Chemical Wastes," <u>Environment</u>, 26, 2-3 (1984).	
	22. The 1984 Department of Energy response to Congressman Dingell.	

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Comment number	Comment	Response
	STATEMENT OF SHEPPARD N. MOORE Chief, NEPA Review Staff Environmental Protection Agency Region IV Atlanta, Georgia	
	My name is Sheppard N. Moore and I'm Chief of the NEPA Review Staff for Region IV, U.S. Environmental Protection Agency, Atlanta, Georgia. I'm presenting this statement on behalf of Jack E. Ravan, Regional Administrator. I also would like to state that Larry Neville of our General Counsel's Office is with me today. We're pleased at EPA to see the Department of Energy preparing an Environmental Impact Statement as part of the decision-making process concerning waste management activities at the Savannah River Plant. The Environmental Protection Agency has a long history of involvement with working with DOE in the State of South Carolina and we look forward to working with them during the preparation of this EIS. As many of you will recall, the issue of hazardous waste and groundwater management was raised on numerous occasions during the EIS process on the L-Reactor Restart, but was resolved through mitigation efforts with EPA, you, and the State. The EIS will provide a mechanism for thorough analysis of reasonable alternatives to manage the hazardous waste at SRP. The RCRA permitting procedures do apply to DOE and will be used to establish a Remedial Action Plan for waste management. I appreciate the opportunity to be here and my primary purpose in being here is to hear what the public has to say. Thank you.	Comments noted. No response on scoping required.

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Comment number	Comment	Response
	STATEMENT OF ARTHUR H. DEXTER 3033 Powderhouse Rd. Aiken, SC 29801 May 14, 1985 Comments at DOE Hearing - Aiken, SC The handouts that you recently sent me indicate a desire on the part of DOE to protect groundwater resources, human health, and the environment from any adverse effects of waste management activities. I too share these concerns and after reading the proposed scope of he EIS, I wondered if it shouldn't be expanded to include other concerns that - so far as I am aware - have not yet been addressed in an EIS. I would like to cite three such concerns for your consideration:	
D-1	1) Within the tank farm where 32-million gallons of high-level radioactive waste is stored, there are wells which draw water from the Tuscaloosa aquifer to cool these waste tanks. Several years ago, a new waste storage tank was inadvertently scheduled to be installed directly on top of an existing well. When the error was discovered, the tank was relocated 40 ft. from the well and the well was plugged with concrete. Knowledgeable people contend that this course of action was inappropriate, in that the shrinkage of the concrete plug during solidification will produce annualar voids, in spite of the best of precautions. Should the adjacent waste tank leak or overflow there is a real possibility for the flow of radioactive liquid directly into the Tuscaloosa aquifer. I would like to see this matter addressed in the EIS.	The purpose of the EIS, as announced in the Federal Register, is to assess the potential environmental effects of the modification of waste management activities for hazardous, low-level radioactive, and mixed wastes for the protection of groundwater, human health, and environment. High-level radioactive waste management activities have been described extensively in four previous environmental impact statements (ERDA-1537, DOE/EIS-0023, DOE/EIS-0062, and DOE/EIS-082), and are outside the scope of this EIS.
D-2	2) Within the waste-management facilities, there is an important waste-transfer line for high-level radioactive waste that is enclosed within another pipe, or shroud, so that, in the event of the rupture of the transfer line, the liquid would be contained within the shroud. It appeared that the shroud was breached several years ago when	See the response to comment D-1.

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	monitors revealed the in-leakage of water into the shroud subsequent to heavy rains. I should like to ask if this shroud has since been repaired or replaced and I should like to request that the EIS establish standards for the shut down of process equipment when the integrity of important protective devices is lost.	
D-3	3) It is said that radioactive materials have escaped through the expansion joints of the concrete floors of the canyon buildings. It is further said that this material is moving through the soil beneath the buildings. Does this problem come under waste management and should it be addressed in the EIS?	See the response to comment D-1.
	Thank you for the opportunity to voice these concerns. Arthur H. Dexter 3033 Powderhouse Rd. Aiken, SC 29801	

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Comment number	Comment	Response
	STATEMENT OF BEATRICE JONES SCOPING MEETING SAVANNAH RIVER PLANT May 14, 1985	
E-1	Although I welcome the opportunity for comments at this scoping meeting in preparation of the DOE's EIS on waste management activities at the Savannah River Plant, I nevertheless find it regrettable that the NUS Corporation will be preparing the Environmental Impact Statement. Previous public criticism of their preparation of the DOE's EIS indicated their inefficiency with their lack of objectivity. It often appears that the NUS Corporation discovers what the Agency wants and then chooses what supports it. The signing by the NUS Corporation of a three year, $10.7 million contract with the Department of Energy indicates there has been no attempt to dispel public criticism.	A response to previous comments on the role of NUS Corporation in assisting DOE in the preparation of environmental impact statements was contained in Volume 3 of the <u>Final Environmental Impact Statement, L-Reactor Operation, Savannah River Plant, Aiken, S.C.</u> (DOE/EIS-0108) on pages M-35 and M-37. DOE is solely responsible for the preparation and contents of its environmental impact statements.
E-2	The opening remarks of the SRP Groundwater Protection Implementation Plan stated that SRP's monitoring and other activities "are the foundation of a broadly based environmental program which has consistently demonstrated the negligible environmental impact of the site's operations on the general public." Statements like this appear to be in conflict with the National Environmental Policy Act, which, according to the Calvert Cliff's Decision, has as one of its purposes, "...to advise other interested agencies and the public of the environmental consequences of planned federal action."	The statement in the <u>SRP Groundwater Protection Implementation Plan</u> was based on the monitoring and analysis of samples during operation of the SRP. The statement was not intended to be a conclusion on actions or activities to be considered in the EIS.
E-3	Anything that affects the environment affects the general public. There is little that is negligible at the Savannah River Plant. Over the years, the Savannah River Plant has built up tremendous amounts of contamination, some of which is being addressed. Nevertheless, the re-start of the L-Reactor, and new facilities yet to come on line, will add to the existing problems. The D.O.E. has stated that there is no immediate threat of any kind to the on- or off-site population. They have also stated in their April 1984 report that 82 monitoring wells have been drilled in the A/M area for management of the groundwater contaminated with volatile chlorocarbons. However,	Monitoring programs and studies related to the actions considered in the EIS are discussed in Chapter 5.

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	according to S.C.D.H.E.C., there are presently at least 160 monitoring wells in the area indicating the difficulty in following the plume of migration, and an increase of 78 or more wells in a year.	
E-4	In a report of June 22, 1970 by the U.S. Department of the Interior Geological Survey, it was stated, "Although monitoring wells are of value at the site of nuclear facilities, it must be remembered that the data obtained from the monitoring will not necessarily prove that radionuclides are not migrating from the site. (This, of course, would apply to volatile chlorocarbons or other contaminants, as well.) In other words, the absence of radionuclides (in this case, chlorocarbons) obtained from a monitoring system does not prove containment of radionuclides (or chlorocarbons) on-site. Because of the complexity in the flow patterns of groundwater, radionuclides (or other contaminants) contained in it could by-pass the monitoring wells, and not be detected until they have moved some distance from the site."	The bases for the prediction of groundwater transport of contaminants will be discussed in Appendixes A and H of the EIS.
E-5	It is for these reasons that the highly prioritized, highly contaminated A/M area is of particular concern to me, although I have not forgotten other areas. According to the Revised: April 4, 1984 SRP Groundwater Protection Implementation Plan, process water was discharged to Tims Branch and the M area settling basin from 1953-1982, a period of twenty-nine years. Tims Branch contained volatile chlorocarbons from seepage of the settling basin, spills and leaking underground process effluent piping which resulted in groundwater contamination. The chlorocarbons traveled down Tims Branch to Steeds Pond and may have migrated into the ground along the effluent route.	Programs underway for the remediation of chlorocarbon contamination of groundwater in the A/M-Area are discussed in Chapter 1, and the relationship of groundwater to surface hydrology will be discussed in Chapter 3 and Appendix A. Actions and activities in the A/M-Area that are not underway and that might be implemented are assessed in Chapter 4.
E-6	A possible explanation contrary to the DOE's "plant security" reason for their occupancy and control of the Forest Service Lands, comprising tracts 1 and 2--the Talatha Units which adjoin the SRP near the Administration Area--is that migration of the contaminated groundwater from the A/M area may be more extensive than previously known, and either off-site, or closer to the plant boundary than the DOE would care to admit. Dr. Joseph	As contained in the environmental assessment on the transfer of control of occupancy and use of lands adjacent to the SRP, the tracts of land were originally part of the Savannah River Plant and the sole consideration in transferring the control of the land was to improve the security posture of the SRP. Chapter 4 and Appendix F discuss the potential migration of groundwater contamination both on and off of the

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	Spencer who was the plant's technical supervisor in 1983, stated in April of that year that the Tuscaloosa aquifer flows toward Jackson, as well as New Ellenton and Talatha. Occupancy of the Talatha Units of USFS land may make it possible for the DOE to truthfully say that there has been no off-site migration of contamination. I believe there is considerable evidence that is supportive of my view. There may be a similar explanation for Tract 3, the Swamp Unit, which adjoins the western boundary of the SRP near the "D" area, heavy water area, and Equipment Test Facility.	SRP, including those tracts formerly controlled by the U.S. Forest Service.
E-7	With regard to the DOE's Environmental Impact Statement, most of all I would like to see in the EIS decision-making process how you have figured the cost of SRP waste management in terms of health effects, and/or the shortening of people's lives. I would like to know what monetary figure you have selected to represent the value of a person's life.	The potential health effects of alternatives and the methods used to evaluate health effects are presented in Sections 4.2, 4.3, 4.4, 4.7, and Appendix I. The methodology of assessing health effects does not assign a "cost" to health effects or shortening of people's lives; rather, it assesses the potential risk of increased incidences of cancer.
E-8	The public has the right to expect that this time you comply completely with RCRA, since it took a legal battle on the part of citizens' organizations to force the DOE to do what they should have been doing all along. Beatrice D. Jones	Chapter 6 discusses the applicable Federal and State regulatory requirements for the proposed modification of waste management activities at the SRP, including the requirements of the Resource Conservation and Recovery Act, as amended.

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	STATEMENT OF IRA DAVIS Richmond County Property Owners Association	
	Ladies and gentlemen, we are here today for two reasons. The first is to give these gentlemen the benefit of our thinking in connection with the up-coming EIS. The second is to hear and explanation from them of the measures which are planned and which will be put in motion when and if the EIS is approved by DOE Headquarters in Washington, D.C. I think sometimes we are too slow to realize and appreciate the fact that ours is a government of, for and by the people of the country. In some other countries the thing would be done and we would be told about it after it was all over. In some other countries it would be done and, regardless of the risk we would not be told at all. Here, and only here, we are told up front what is contemplated and asked to contribute our thinking to the united effort to determine the danger to the environment and determine how to keep the risks to a minimum. Almighty God, in his infinite wisdom placed all species on this earth to remain for a time and then, in the eternal plan and scheme of things to pass away and give room for other species to take their place. Man may be a part of this scheme - we do not know. We do know that we and we alone have the power to destroy the greater part of what we call our world. The question is if we have the wits to preserve it. The best professionals in our country's service have contributed their special talents to determining the present and future dangers to the environment today, tomorrow, and as far in the future as man can see with any pretense of accuracy. The purpose of the EIS, as I understand it, is to balance the risk against the gain, to determine what if any, other precautions need to be taken and, if so, how it should best be done. Fine! But when the first atomic bomb laid waste Hiroshima man was made a junior partner by God and given knowledge to enable him, if he is foolish, to destroy himself.	Comments noted. No response on scoping required.

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	No man, whether sitting in the Pentagon or here in this room, can say with certainty what the environmental results will be. But some of us know this, others can hazard a guess. Our way of life is threatened as never before by the forces of a Godless world that would utterly destroy us to ensure its own supremacy. The Russians looking down through the bomb sights on their Bears and Backfires care not what damage they do to the environment where their bombs fall. Their only care is can they destroy the war making potential of SRP quick enough and completely enough to prevent it furnishing our own Armed Forces with the means to take dreadful revenge for their fast strike. If they can, they will win and win the world with it. If they cannot, the cost will be 100,000,000 plus Russian casualties, most of them inside European Russia. Such losses would undoubtedly mean the end of the Communist system, regardless of the final outcome of the war. For make no mistake, ladies and gentlemen, the old saying is true - nobody ever started a fight he didn't think he could win. But, our starry eyed liberals say - and what makes them so awfully dangerous is the fact that most of them sincerely believe what they say - we already have enough warheads to blow up the world x number of times over. True, maybe. But some of those same warheads were made during the '50s and are beginning to lose their efficiency with age. They must be modified, rejuvenated or even replaced if we are to continue to be able to say to Moscow "Yes, you can kill us but the price of doing it is your own life." That is what is keeping an uneasy truce and has since 1950 - the certainty that our destruction would mean theirs as well. So let me close by saying this - nothing from George Washington risking the little band of ragged patriots in the middle of the Deleware of Christmas Eve to the outcome of the tests at Los Alamos which ended the bloodiest conflict in world history - nothing worth doing was ever done without RISK.	

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	Our task is to determine the degree of that risk, how to minimize it or avoid it and to go back to our own communities and squelch rumors that our great grandchildren will be born with horns in the middle of their foreheads from drinking radio active water caused by the discharge from SRP into our own Savannah River. The men who work daily with this dreadful power have as much to lose as we do - in some cases maybe more. None of them back away. We must know if we will have clean water and fresh clean air. We cannot survive without them. But if some sub-species has reached the end of its allotted time in God's great scheme of things it dies so that free men can live in progress, sleep at night in their beds in peace and pass a better world on to their children - then men themselves have died, gladly, for the same reasons. Nuclear power for peace could be the greatest boon to mankind since the invention of fire. Nuclear power for war could destroy us. If we are to join other bygone nations on the scrapheap of history let no man be able to say, truthfully, that they met their fate because of an unwillingness to fight and die for what they believed in. Nor let them be able to say that our fate overtook us because, like ostriches we stuck our heads in the sand and waited for the danger to pass. I quote the Father of our Country, who saw us through our birth and childhood. George Washington said "The best way to insure peace is to remain ever prepared to defend it. Let us prove, to ourselves, to our grand children who, terrified by false rumors and blinded by meaningless platitudes, wail "better Red than Dead," that we mean to be neither. If there are risks let us use our science to minimize them - then take them. And ending to the time of testing, quibbling and indecision is upon us. The time for action is upon us. Let us build and strengthen ourselves so that we can say - and make it stick - "come the three other corners of the world in arms against us we shall shock them. AND NAUGHT SHALL MAKE US RUE, IF THIS LAND TO ITSELF DOES REMAIN BUT TRUE."	

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	Thank you. Ira Davis Jr. Pres. R.C.P.O.A P. O. Box 5631 Augusta, GA 30906	

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	STATEMENT OF GENE WEEKS Speaking for Judith E. Gordon, Ph.D. Nuclear Issues Coordinator South Carolina Chapter Sierra Club	
	SIERRA CLUB SOUTH CAROLINA CHAPTER	
	TO: DOE Officials, Scoping Meeting for EIS on Waste Management at SRP.	
	FROM: Judith E. Gordon, PhD, Nuclear Issues Coordinator, South Carolina Chapter, Sierra Club	
	Re: Comments on proposed EIS.	
	The South Carolina Chapter wishes to express its appreciation for the opportunity to present comments on waste management activities and procedures at the Savannah River Plant (SRP). I'm sure we can agree that the Department of Energy's willingness to write an environmental impact statement (EIS), without "outside" coercion, is going to save all of us time and energy, so to speak.	
G-1	Attached to this statement is a more detailed fact sheet that outlines the Sierra Club's position on the treatment of low-level nuclear waste. In the interest of brevity, this will not be read now but instead entered as part of the record of this hearing. Our main concerns are outlined as follows.	Comments in fact sheet noted. The EIS discusses alternatives for the disposal of hazardous, low-level radioactive, and mixed waste, including above-ground disposal facilities in Chapters 2 and 4.
	The Environmental Protection Agency (EPA) has stated that groundwater contamination is a growing problem in the U.S. It has led to the closing of private and public wells in at least 25 states. One of the major sources of contamination is surface impoundments. While EPA is, of course, speaking of commercial facilities, we have seen similar contamination occur at SRP with the movement of trichloro- and perchloroethylenes into the Tuscaloosa Aquifer from seepage basins at the SRP. Had DOE officials been asked about the possibility of such leakage ten years ago, they would have assured the public that it was such	

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	a remote possibility that it wasn't worth a second thought.	
G-2	Today there are plenty of second thoughts - how well do we really understand the hydrology of this region? Are seepage basins AND shallow-trench burial, for that matter, really the best way to handle either hazardous or low-level radioactive waste? It is becoming obvious that the answers and possible solutions are far more complex than technocrats ever envisioned. Worldwatch Institute's paper on water management (Water: Rethinking Management in an Age of Scarcity, #61, Dec. 84) emphasizes the seriousness of the contamination problem, be it commercial or defense in origin. "As much as a fourth of the world's water supply could be rendered unsafe for use by the year 2000." We in the Sierra Club feel that government operations have a unique opportunity, if not a responsibility, to demonstrate to all concerned that the proper handling of waste can prevent future catastrophes. Indeed SRP now has such an opportunity to correct many of its past errors. Along these lines, we assume that DOE officials will want to	Chapter 3 and Appendixes A and H discuss the geology and subsurface hydrology at the SRP, as well as geohydrological modeling used to assess the alternatives in the EIS. Also see the response to comment G-1.
G-3	1. Conform to all state and national regulations that currently apply to disposal of commercial hazardous and low-level radioactive wastes. This includes compliance with the Resource Conservation and Recovery Act (RCRA) as directed by the court decision (LEAF v. Hodel, No. 3-83-562, E.D. Tenn. 1984) stating that federal defense facility "mixed" wastes are also subject to RCRA regulations.	Chapter 6 discusses the applicable Federal and State regulatory requirements for the proposed modification of waste management activities at the SRP, including the requirements of the Resource Conservation and Recovery Act, as amended, and the status and applicability of "mixed waste" regulations.
G-4	2. Consider greatly increase use of above-ground storage of hazardous and low-level radioactive waste, especially in view of the dismal record of such sites as Maxey Flats, KY, and Sheffield, IL where so-called safe trenches leaked prematurely and had to be permanently closed. The climate and hydrology of the Eastern U.S. do not lend themselves well to trench disposal of waste. EPA has stated that half of all commercial sites are located over thin or permeable unsaturated zones; that over 70% lack proper lining; that nearly one third of all sites are within a mile of a water well that could be affected by contamination. How much of this applies to defense waste disposal sites at SRP?	See the response to comment G-1.

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G-5	3. Support new regulations that redefine low-level waste so that, for example, radionuclides that require more than 100 years of monitoring are treated as high-level waste and handled separately.	The development and support of new regulations are not within the scope of this EIS.
G-6	4. Consider all state-of-the-art disposal methods and make choices on criteria that first emphasize sufficient isolation and safety and then consider costs. We have seen what short-term savings have produced - ineffective trench burial and leaking seepage basins!	See the response to comment G-1.
G-7	5. Permit effective outside monitoring so that the public can have some faith that things are really working as they should.	Chapter 5 discusses groundwater monitoring activities at the SRP, including the relationship of monitoring activities to State and EPA requirements.
G-8	6. Admit that in view of past problems, the SRP site is not well suited to waste burial, and perhaps another production reactor is not in the best interests of anyone save those whose jobs are tied to SRP. This is by no means a statement that jobs are not an important consideration, but that the health and welfare of the people of this area are more important. DOE should seriously consider job retraining and location for those who may need it if and when the SRP facilities are no longer needed.	See the responses to comments G-1, G-2, and G-3. The subject of a new production reactor is outside the scope of this EIS.
	We are sure you will want to meet these challenges in creative ways and in the best interests of all concerned. Thank you.	

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	ATTACHMENT	

SIERRA CLUB

Radioactive Waste Campaign
Fact Sheet

"Low-Level" Nuclear Waste: Options for Storage

Legislators, policy makers and citizens are rushing to meet a deadline of January 1986 set by the U.S. Congress (Low-Level Radioactive Waste Policy Act) when regional solutions to the "low-level" nuclear waste problem must be in place. The imminence of this unrealistic deadline has forced decision makers to opt for the quick fix, disposing of all "low-level" waste in burial grounds.

Burial grounds differ little from garbage-type landfills. Waste generators believe landfills can somehow be made to work. But they are not a viable option. In moist areas, water runoff and underground migration inevitably bring water into a landfill and carry out poisonous chemical and radioactive substances.

Waste generators and the Nuclear Regulatory Commission (NRC) consider all "low-level" waste the same. But it is not. Some is extremely radioactive and long-lived, requiring monitoring and maintenance for thousand of years; other waste is slightly contaminated and short-lived. These "low-level" waste streams should not be "disposed of" in the same place, using the same basic technology - shallow landfills.

A sound "low-level" waste management policy calls for segregating radioactive waste at the point of generation and storing it above-ground. While the waste is stored above-ground, we can be assured of no leakage into our ground water. The waste can be easily monitored and protected. Short-lived waste will decay to non-toxic levels.

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THE WASTE STREAM MUST BE SEGREGATED AT THE POINT OF GENERATION

Each of the different types of "low-level" waste have specific characteristics and require specific storage techniques.

REACTOR WASTE, which accounts for 24% of the radioactivity of "low-level" waste sent to burial grounds[1], falls into two radically different categories. Wet waste which consists of ion exchange resins and sludges, and dry waste which consists of clothing, rags and tools. By volume, power reactors account for about 54% of the waste stream.

WET WASTE Resins and irradiated components, such as control rods, make up over 95% of the radioactivity in reactor "low-level" waste.[1] The nuclear industry tends to talk only in terms of volume when discussing "low-level" waste. This is misleading. The radioactivity, longevity and chemical composition of the material must be an integral part of a sound waste management policy.

Resins are a media with the consistency of caviar. They are used to purify the water that circulates around the fuel in the reactor. Of particular concern is cesium-137, which is water soluble, and therefore, readily migrates out of the nuclear fuel into the surrounding cooling water. Because of this solubility, the substance will also readily migrate out of a burial ground. An average reactor produces 500 curies* of cesium-137 per year.[12] with 80 operating nuclear power plants in the U.S., about 40,000 curies of cesium-137 are shipped to burial grounds each year.

Besides cesium-137, another dominant component of reactor wet waste is cobalt-60. These two isotopes have half-lives,* respectively, of 30 and 5 years and must be sequestered from the environment for at least 300 and 50 years, respectively. These wet wastes, because of their toxicity, longevity and mobility in the case of the cesium-137, should not be dumped in landfills. They should be temporarily stored in bunkers, preferably above-ground, carefully monitored and subsequently, isolated in a high-level waste repository, when one is available.

*see glossary.

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	DRY WASTES These are generally only slightly contaminated materials that can be compacted: Some of these materials conceivably could be incinerated because the radioactivity could be trapped on filters as in done in Canada (see page 4). The difficulty with incinerating the dry wastes of the nuclear reactor "low-level" waste stream is that, if an incinerator were operating, nuclear utilities would press to also have the resins and sludges incinerated. This would pose an unacceptable health hazard to surrounding communities because of the large amounts of cesium and other isotopes going up the stack, material which could not be entirely trapped on stack filters. If not incinerated, the dry wastes of a reactor should be compacted and stored in bunkers. IS IT FEASIBLE? Can the wet waste stream be separated from the dry waste steam at the reactor? Yes, it is already being divided prior to transport. Because of high radiation levels of resins, these materials are currently transported in shipping containers separate from the steel drums and wooden crates used for dry wastes. Current practice is that, in these separate shipping containers the wet and dry wastes are sent to the same burial grounds, and buried together. This segregation, initiated at the reactor for transport purposes should be used for storage purposes as well, as is done in Canada[3] (see page 4). INDUSTRIAL WASTE These account for 73% of the radioactivity of the "low-level" waste going to burial sites.[1] In this category fall two large producers of isotopes for medical and research purposes: New England Nuclear (MA) and Union Carbide (NY) which, respectively, account for 24% and 15% of the total radioactivity of the nation's "low-level" waste. New England Nuclear's waste is primarily tritium, producing 120,000 curies per year. Since tritium behaves exactly like water, it cannot be isolated in a landfill. This waste should be stored in above-ground bunkers for at least 100 years. Union Carbide's waste consists of all the radionuclides represented in irradiated fuel. By no stretch of the imagination can this waste, which is dominated by the long-lived	

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	isotopes such as strontium-90 and cesium-137, be classified as "low-level." This is waste, which along with the resins and sludges from reactors, should be isolated in above-ground storage bunkers, temporarily (20-50 years) and then moved to a high-level waste repository. By volume, industrial waste accounts for about 11% of the total stream. INSTITUTIONAL WASTE, which accounts for about one-third of the volume of waste presently going to commercial burial grounds, consists of materials both from hospitals and research institutions. These two waste streams are significantly different from one another with medical waste dominated by short-lived materials such as technetium-99m with a half-life of six hours and the research waste stream consisting of long-lived materials such as carbon-14 and tritium with half-lives, respectively, of 5,000 and 12 years. Other shorter-lived materials are also included in institutional waste. The medical waste, with less than one percent of the radioactivity in "low-level" waste, lends itself to being stored in above-ground facilities for about three years until it has decayed to levels low enough to be disposed of as regular trash. Dartmouth College has a program (described in detail on page 4) which offers considerable promise for similar institutions. Hospitals in cities should follow Dartmouth's example by using a centralized storage location for isotopes for the necessary decay period. LANDFILLS LEAK An erroneous assumption dominating current "low-level" waste planning is that landfills can be prevented from leaking. The history of both radioactive and chemical landfills in humid climates does not substantiate this claim. The unlined dump, and even the double liner approach, using a leachate* collection system, have failed in areas of average rainfall (30-40 inches per year). Experts, such as Dr. Peter Montague at Princeton University, Center for Energy and Environmental Studies have stated.	

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	"We found that four state-of-the-art landfills in New Jersey developed leaks within one year. I think the whole idea of secure landfills is really a figment of optimistic imaginations." The track record of radioactive landfills in humid areas, has similarly been poor (see box 1). Of six commercial sites which have operated in the United States, three are now closed because of problems: Maxey Flats, Kentucky; West Valley, New York; and Sheffield, Illinois. All three have had water infiltration into trenches, slumpage of trench covers and erosion. At each site, radioactivity has migrated and expensive remedial actions are continuing. The major operating radioactive landfill for the country, Barnwell, South Carolina, is located in a high rainfall area. It has not had buildup of radioactive leachate because of the porous, sandy trench bottom which allows radioactive water to drain out into the environment. Tritium has been detected 45 feet from the burial trenches at Barnwell. The other operating sites, in Beatty, Nevada and Richland, Washington, both located in semi-arid regions, have apparently not had the same problems as at other sites. Leaking radioactive landfills are not acceptable to the general public. The definition of a "safe" level of radiation has changed drastically over time as we have learned more about radiation and human health. Most physicians agree now that it is the accumulation of low-level radiation doses which is hazardous. We still do not know the exact dose which causes cancer, though we do know that there is a direct correlation between the amount of radiation received by humans and the incidence of cancer.[4] ABOVE-GROUND STORAGE IS PREFERABLE Above-ground storage avoids the health hazard of leaky burial grounds and avoids the high cost associated with remedial action that, inevitably, will be required at failed burial grounds. Above-ground structures permit storage in a facility that can be easily repaired. While, over time, concrete may deteriorate, cracks may develop, or operational error may cause leakage, problems can be quickly detected and remedied. Above-ground	

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Comment number	Comment	Response
	structures can be designed in such a way as to provide a double barrier which can be used to isolate leakage and prevent it from moving into ground water. The nuclear industry and its boosters have fabricated a number of disadvantages to above-ground storage: cost, nonpermanence, reliance on institutional controls, sabotage, even plan crashes. Many of these arguments, discussed in box 2, are simply red herrings. The industry, in advocating radioactive landfills, is promoting an "out-of-sight, out-of-mind" solution. But as the operating record at three closed sites has made one point abundantly clear: RESIDENTS AND TAXPAYERS ALWAYS PAY IN THE END FOR LEAKY LANDFILLS. ABOVE-GROUND STORAGE IS PRACTICAL AND FEASIBLE Above-ground structures are being used by utilities operating power reactors in the United States and Canada,[3] and by medical and research institutions. The Tennessee Valley Authority (TVA) has built above-ground storage modules at the Sequoyah Nuclear Plant near Chattanooga, Tennessee.[2] Several utilities in the Northeast are designing and building on-site, above-ground storage facilities. Vermont Yankee in Vermont, Pilgrim I in Massachusetts and Susquehanna in Pennsylvania are all moving in this direction. TVA ABOVE-GROUND STORAGE Presently, the TVA ships "low-level" radioactive waste to the Barnwell, South Carolina landfill. Because of the near-term uncertainty of space at Barnwell, the NRC approved and TVA has partially constructed an above-ground storage facility at the two Sequoyah nuclear reactors located on the Tennessee River, 18 miles northeast of Chattanooga. The TVA above-ground storage facilities are not much more complicated than a large concrete box, called a module, with special features to collect radioactive leakage and to shield workers.	

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Comment number	Comment	Response
	The storage modules are constructed, as needed, of reinforced concrete with an inner decontaminable coating. The modules are large, rectangular boxes, 34' wide, 195' long and 19-1/2' high. The thickness of the concrete floor slab is 39-1/2", while that of the caps and walls is 24". Modules for the storage of resins are almost twice as thick - 42". According to TVA plans, eight resin storage modules and five trash modules will be located on a 20-acre area. There are four compartments in each module. Each compartment contains a liquid drainage system and sampling valves. Any radioactive liquids can be collected and repackaged, or taken to the nuclear plant for processing. Filters and booties that are less radioactive are stored in 18-gauge, steel drums or boxes. The more radioactive exchange resins are stored in more rugged carbon steel cylinders coated with epoxy. A giant mobile crane straddles the entire concrete module, running along curbed concrete sidewalks on each side of the module. Module loading/unloading steps, through use of the rubber-tired, diesel-powered gantry crane, are shown in box 2. The highest radiation doses are received by crane operators, though the concrete shielding reduces the levels. Since the storage facility is located about 200' from the site boundary, the doses to the public were expected to exceed the NRC hourly radiation limits while the cover is off the storage module. Above-ground storage units can be located so that public exposure is not necessary. The above-ground storage facility is of substantial construction and is expected to remain functional for several decades. The NRC will, however, only license above-ground storage facilities for a five-year period. This limit will need to be extended for the above-ground storage to be implemented. The NRC has no technical justifications for this limit. ONTARIO HYDRO EXPERIENCE Ontario Hydro operates eight nuclear reactors with a total capacity of 5,100 MW(e), with an additional eight reactors under construction.[3] The Canadian reactors, called CANDU reactors,	

Table K-2. Scoping Comments and DOE Responses

Comment number	Comment	Response
	are different than U.S. reactors which must be shut down for refueling every 12 to 18 months. The CANDU reactors are fueled while the reactor is operating. Defective fuel leaks radioactivity into the cooling water. In the CANDU reactors, this fuel can be promptly replaced. This means the CANDU generates about one-half of the "low-level" waste that U.S. reactors produce for the same electrical output. In the Ontario Hydro system, there are four reactors at each site. A central storage area, the Waste Operations Site, located at the Bruce pant near Tiverton, Ontario, will service all 16 Ontario Hydro reactors. At each reactor site, the resins are slurried into large (three cubic feet) carbon steel cylinders. These sit upright in shipping containers and are sent to Bruce for storage. These resins, along with water purification filters, are stored either in tile holes or Quadricells. The tile holes are located underground; they are cylindrical, concrete storage containers, each of which holds two ion exchange resins. After loading, the containers are backfilled with concrete. A leachate collection system and monitoring system are utilized at the bottom of the tile holes. As part of Ontario Hydro's waste management plan, when the resins and filters have cooled to the point where radiation levels are less than one rem per hour, the cylindrical container and concrete backfill will be lifted in one piece and transported to an above-ground storage building (see photo page 5). Resins are also stored in Quadricells, heavy concrete vessels which are placed in an above-ground concrete room 8' by 8' at its base, and 18' high , similar to a cemetery mausoleum. The roof is sloped to aid water runoff. The walls and floors are 2' thick, and, with the inner concrete cylinders, sufficient to shield workers and to withstand impacts from airplane crash, or tornado-borne utility poles. Fifteen Quadricells are placed in an area about 20' wide by 272' in length. The minimum design life is 50 years.	

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Comment number	Comment	Response
	The Ontario Hydro system for storing resins is clearly far superior to the U.S. system in which these radioactive, water soluble materials are dumped in leaky landfills. Also in use by Ontario Hydro are inground concrete trenches. These are for dry waste which is compacted and non-combustible and for radioactive ash that is generated by incineration of slightly contaminated materials such as clothing and papers. These concrete trenches are 10' wide, 10' deep and 125' long. The concrete lid is one foot thick; the trench walls are somewhat thicker. The trench slopes to a sump and standpipe which allows for water detection and removal. The above-ground storage building in the Ontario Hydro system is for wastes with radiation levels of less than one rem per hour. Both resins and lower-level wastes in the concrete trenches will eventually be stored here. This building is a prefabricated concrete warehouse with walls 1-1/4' thick and a concrete roof 1/2' thick. The building dimensions are 164' long by 98' wide by 26' high. The building has smoke detection equipment, carbon dioxide fire extinguishers and an internal drainage system. DARTMOUTH COLLEGE Dartmouth College in Hanover, New Hampshire produces "low-level" radioactive waste in medical and scientific research and at the College hospital.[5] In the past, this waste was shipped to commercial radioactive landfills in Richland, Wash. and Barnwell, S.C. While the volume produced between 1977 and 1982 remained stable (120 to 150 55-gallon drums per year), the cost of disposal increased by a factor of seven in this five year period. Like most medical and research institutions, the radioactive waste can be placed into five categories: liquid, solid, liquid scintillations vials (LSV), animal carcasses and other. For liquids containing less than 100 microcuries per liter of radioactivity, this waste, containing tritium and iodine-125, is disposed of into the sewer. Liquids containing more than 100 microcuries per liter are stored in one-gallon containers within a lined 30-gallon drum. This waste is primarily iodine-125	

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Comment number	Comment	Response
	(half-life: 60 days) and phosphorus-32 (half-life: 14.3 days), and is stored for ten half-lives. Solid waste, consisting of disposable plastic and glass items, and contaminated paper, is placed in a lined 55-gallon steel drum and compacted to reduce the volume. A drum typically contains a few millicuries of tritium, sulfur-35, chromium-51 and iodine-125, and is stored for at least ten half-lives, or approximately 2.4 years. After this storage period, 55-gallon drums containing less than a millicurie of tritium, will be disposed of as regular trash. Glass and plastic liquid scintillation vials are put into a lined 55-gallon drum for temporary storage. A shredder-crusher is used to separate the liquid, containing tritium, carbon-14, phosphorus-32, sulfur-35 and iodine-125, from the plastic and glass. Vials containing shorter-lived radionuclides are separated from those with tritium and carbon-14, and are stored for ten half-lives. The vials containing tritium and carbon-14 below minimum NRC levels and are disposed of as regular trash. Carcasses, mainly rats, are first stored in a cooler. If the carcasses contain iodine-125, they are placed in a freezer for sufficient decay (5 to 10 half-lives). Carcasses containing minute amounts of tritium and carbon-14 are incinerated. Other waste from special experiments may contain up to one to three curies of tritium. This waste, managed on a case-by-case basis, is packed separately and shipped to a commercial burial site. Based on the production rate of radioactive waste and the management methods mentioned above, Dartmouth College built a storage building capable of holding 240 drums, with expansion space for future needs. The storage building is a reinforced concrete structure 24' wide, 98' long and about 11' high. the walls are one-foot thick, insulated and faced with a brick veneer. To collect leakage, the floor slopes toward the center where a collection pit is located. With the doors set four inches above floor level, the room will hold about 800 gallons	

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	of fire water. A telephone and fire alarm pull station provide added safety and the building is equipped with heat detectors. The cost of the whole building, 2/5 of which is used for waste storage, was $125,000. Dartmouth estimates that the yearly cost of the storage facility, including operating and equipment costs, are less than the disposal costs at a radioactive landfill. As a result of this waste storage program and the short-lived nature of medical and research wastes, almost no radioactive waste is shipped to a radioactive landfill. CONCLUSIONS These examples of above-ground storage show that the technology is available. Above-ground storage will be resisted by utilities because of higher initial costs and because it will require the utility to maintain long-term responsibility for the wastes, rather than thrusting the long-term responsibility off on an unsuspecting state and its taxpayers. Some of the questions that need to be resolved are how many above-ground storage sites should be developed? Should these be at the reactor sites? What should be the design life of these facilities? Should above-ground storage operate in tandem with an incineration facility strictly limited to reactor dry wastes? It is clear that further research needs to be done on these questions. It is also clear that utilities and state governments must break off their love affair with out-of-sight, out-of-mind shallow landfill "solutions." It is time to re-think the "low-level" waste problem.	

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FOOTNOTES

[1]Department of Energy, Spent Fuel and Radioactive Waste Inventories, Projections and Characteristics, DOE/NE-0017/2, Washington, D.C., September, 1983.

[2]Nuclear Regulatory Commission, Environmental Impact Appraisal and Safety Evaluation Report of Low-Level Radioactive Waste Storage at Tennessee Valley Authority, Sequoyah Nuclear Plant, Docket No. 30-19101, Washington, D.C., September, 1982.

[3]Carter, T.J., "Radioactive Waste Management Practices at a Large Canadian Electric Utility," In Seminar in Management of Radioactive Waste from Nuclear Power Plants, Karsruhe, West Germany, 5-9 October, 1981, International Atomic Energy Agency, Vienna, Austria 1982.

[4]National Academy of Sciences, BEIR Report, Washington, D.C.

[5]Schori, E., "Disposal of Low-Level Radioactive Waste," Presented at League of Women Voters Conference on Low-Level Radioactive Waste, Boston, Mass., November 1983.

GLOSSARY

Leachate - The soluble components from waste which leak from a landfill when rain percolates through the trenches. This polluted liquid is called leachate.

Curies - A unit which measures radioactivity equivalent to 37 billion disintegrations per second.

Half-life - A period of time required for the disintegration of half of the atoms in a radioactive material.

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Comment number	Comments	Responses
	STATEMENT OF MS. DORCAS J. ELLEDGE	
	I live in Columbia, South Carolina. I am a native South Carolinian and have been concerned for some time about the environmental quality that we are presently living in and what we are leaving...living...leaving future generations. I'm real glad that the Federal Government finally decided that the SRP was not the fifty-first state, but is a part of the State of South Carolina, which is a part of the United States of America. I wondered for sometime when they would come to that decision. I attended the hearings on the L-Reactor, and I was disappointed the DOE decided not to come up with the best solution to the problem concerning Steel Creek and the cooling towers. They had a choice, but due to time, so they said, and money, not the best solution did they do. This was a disappointment. I hope and pray that DOE, with the encouragement and insistence of EPA, will get the best solution to the problems of groundwater... possible groundwater contamination, and that already contaminated, for the Savannah River Plant. I think it's time that the health and safety of South Carolinians and, in this case, Georgians, too, take priority over time and costs. There comes a time of reckoning. Potable water is essential to life. You can't live without it. No living thing can. So, I hope this will be a consideration, and the first consideration of DOE and EPA, who will be working with them. We are South Carolinians who have been, really, put upon, maybe by our own will, ignorance, whatever you want to call it, but I would find it reprehensible if DOE compromised the health and safety of the people of South Carolina on this issue of groundwater contamination. I am not a scientist. I have, for thirty years, been a nurse, and dealt with health and sickness and death. Please do what is best in the interest of health and safety for the citizens of South Carolina, and I appreciate this opportunity to speak with you.	Comments noted. No response on scoping required.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	STATEMENT OF MR. T. M. KING	
	My name's T. M. King. I live in Bath, South Carolina. Concerned citizens, gentlemen; I won't go into the warmongering thing here, and I personally do not believe that these weapons are necessary, but we'll skip all that, you've heard it before.	
I-1	An honest EIS is needed for the SRP because of the leaking, hazardous waste, and non-hazardous, or so-called non-hazardous waste, from both above-ground storage tanks and seepage basins entering into the CSRA water supply and aquifer, and numerous radioactive gas releases, which most of them have not been reported to the public and Aiken.	The EIS will present a characterization of existing hazardous, low-level radioactive, and mixed waste sites at the SRP (Appendix B), including an assessment of groundwater contamination and health effects of alternatives for remedial and closure actions at these waste sites (Chapter 4). The storage and immobilization of high-level radioactive waste in waste tanks is not within the scope of this EIS. These subjects have been discussed extensively in the following documents: • _Final Environmental Impact Statement, Waste Management Operations, Savannah River Plant, Aiken, South Carolina_, ERDA-1537, September 1977. • _Final Environmental Impact Statement, Long-Term Management of Defense High-Level Radioactive Wastes, Savannah River Plant, Aiken, South Carolina_, DOE/EIS-0023, November 1979. • _Final Environmental Impact Statement (Supplement to ERDA-1537, September 1977), Waste Management Operations, Savannah River Plant, Aiken, South Carolina_, DOE/EIS-0062, April 1980. • _Final Environmental Impact Statement, Defense Waste Processing Facility, Savannah River Plant, Aiken, South Carolina_, DOE/EIS-082, February 1982.

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Comment number	Comments	Responses
		Releases of radioactive material and their impacts on the population within a 50-mile radius from the Savannah River Plant and downstream consumers of Savannah River water are published in an annual series of reports available to the public, entitled Environmental Monitoring in the Vicinity of the Savannah River Plant. The most recent of these reports is for 1984.
I-2	This environmental impact should be taken a step further by including a study on the health effects of citizens living in the areas around the SRP.	The EIS will discuss the potential health effects of alternatives for existing waste sites in Section 4.2, alternatives for new disposal facilities in Section 4.3, and alternatives for disassembly-basin purge water in Section 4.4.
	In a '76 study, conducted by DuPont, revealed a sixty percent excess incidence of lung cancer, and I repeat that; a sixty percent excess incidence of lung cancer. And a hundred and fourteen percent higher than average leukemia rate at the SRP site.	
I-3	I strongly recommend this area health study be taken independently, hopefully with funds provided by the Government, if possible,	A review of the feasibility and usefulness of conducting further epidemiologic studies of delayed health effects around the SRP was undertaken by a panel organized by the Centers for Disease Control of the U.S. Department of Health and Human Services. The review and recommendations of the panel are documented in a report entitled, Epidemiologic Projects Considered Possible to Undertake in Populations Around the Savannah River Plant. Public comments and responses and DOE's final position regarding the panel's recommendations are documented in Public Comment and Meeting Report, A Centers for Disease Control Review Panel's Recommendations on Health Effects and Epidemiological Studies of Operations at the Savannah River Plant, Aiken, South Carolina, DOE/ER-0225, May 1985.
I-4	and, also, that something be done about the transportation of this nuclear waste traveling the city streets of Aiken, South Carolina, congested small streets, not to mention the highways, and even parking across the street at the Burger King. I think it's gone a little too far. This is spaceship Earth. Let's don't foul our own nests. Thank you.	See the response to comment A-15.

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Comment number	Comments	Responses
	STATEMENT OF MARY LOU SEYMOUR	
	My name is Mary Lou Seymour. I'm a resident of Aiken County, I live in Bath. I am today representing the CSRA Health Project, which is a group of citizens from the CSRA, and our main interest is getting an independent health study done.	
J-1	We have come and testified several times at epidemiological meetings, and all this kind of stuff, and we haven't seen anybody want to do a health study of the residents of the area.	See the response to comment I-3.
	Many of our members have been affected by working at the plant, physically, and many have died, and we talk to people every day that have cancers and leukemia, and we think this should be *documented. Now, I don't know* if this is in the scope of an environmental impact study, but I think that people's health, that's part of the environment, too. It's the environment that's causing that.	
	And we would like, once again, to urge that a study be done of the residents of the area, and maybe y'all won't find anything. Well, that would be wonderful. We could all sleep quietly at night. But I don't...I don't know, from the way they never want to do it, it makes us think that there is something wrong, and we would sincerely like to urge you to put all possible efforts to doing a health study of this area.	
	Thank you.	

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Comment number	Comments	Responses
	STATEMENT OF HANS NEUHAUSER Coastal Director Georgia Conservancy	
	Thank you. I am Hans Neuhauser. I am Coastal Director of the Georgia Conservancy with offices in Savannah.	
	The Georgia Conservancy is a statewide membership organization that is concerned about the quality of the environment in the State of Georgia and in adjacent areas.	
	Our concern relates in large measure to our membership which includes individuals who live along the Savannah River, both in the Augusta area and in the Savannah area.	
	First of all, I would like to thank the Department of Energy for complying with the National Environmental Policy Act and holding this and other scoping meetings on this proposal.	
	I believe that the Department of Energy has learned its lesson from the L-Reactor and from the litigation and the Congressional action that went along with that issue.	
	And I think the opportunity for citizens to participate in providing suggestions on this proposal will in the long run be beneficial for the Department of Energy and the operation of the Savannah River Plant.	
	The concerns that our organization have, I believe, mirror the concerns that have been expressed by others relating to groundwater and surface water contamination.	
K-1	In Georgia, we are dependent on a number of aquifers and on the Savannah River for drinking water and industrial process water, and we need to make sure that these water supplies remain clean and useful for the people of Georgia, not only now but in the future, and so we urge the Department of Energy to take all necessary steps to prevent groundwater and surface water contamination, and in those areas where there has already been contamination to take all necessary actions to remove that contamination.	The EIS discusses the impacts to surface-water and groundwater quality from remedial and closure actions at existing waste sites in Section 4.2, from new disposal facilities in Section 4.3, and the discharge of disassembly-basin purge water in Section 4.4. Cumulative surface-water and groundwater quality impacts are presented in Section 4.7.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
K-2	We are also concerned about such things as endangered species, like the woodstork. Many of these have been identified in other scoping process documents.	Potential impacts to endangered species are discussed in Sections 4.2, 4.3, 4.4, and 4.7. Chapter 6 discusses the status of any required consultations in accordance with the Endangered Species Act.
K-3	We would like to urge the Department of Energy to comply with the Resource Conservation and Recovery Act in developing this environmental impact statement. It has been indicated by others that on occasion the Department of Energy has attempted to circumvent compliance with the Resource Conservation and Recovery Act by hiding under the provisions of the Atomic Energy Act, and we feel that both the States of South Carolina and Georgia would benefit from the Department of Energy's voluntary compliance with all the requirements of that act.	Chapter 6 discusses the applicable Federal and State regulatory requirements for the proposed modifications of waste management activities at the SRP, including the requirements of the Resource Conservation and Recovery Act, as amended.
K-4	Finally, we would like to see incorporated into the Environmental Impact Statement analysis an evaluation of the opportunities for independent oversight of this activity. In our view, many of the organizations at the Savannah River Plant have been carried out in the past without adequate independent oversight, particularly by agencies that have the technical expertise to determine exactly what is being done. So we would like to see an analysis of an independent oversight role for such agencies as the Environmental Protection Agency, the South Carolina Department of Health and Environmental Control, the Georgia Environmental Protection Division and citizens' interests. This concern for citizen and independent agency oversight is not a minor issue with us, and it does not confine itself simply to the waste management issue. It is something that we believe is necessary for not only the Savannah River Plant operation but the entire nuclear developments in the Savannah River basin, and this position is endorsed by a broad range of citizens, including groups like the	Chapter 5 discusses groundwater monitoring activities at the SRP, including the relationship of these activities to State and EPA requirements. Also see the response to comment K-3.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	Savannah Area Chamber of Commerce, so it is no small concern to us and the residents of this area. In conclusion, again I would like to thank you for holding these meetings. I apologize that there are so few people who have come to express interest or concern about this, but again I think it is a tribute to the opening of the process that some of this lack of interest is due to. Thank you.	

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Comment number	Comments	Responses
	STATEMENT OF DR. ZOE TSAGOS League of Women Voters Northern Beaufort County PRESENTED BY THE LEAGUE OF WOMEN VOTERS OF NORTHERN BEAUFORT COUNTY AT A PUBLIC SCOPING HEARING FOR AN EIS ON WASTE MANAGEMENT AT SRP May 16, 1985 I have appeared before you several times. However, for the record, I identify myself as Dr. Zoe Tsagos and I represent the League of Women Voters of Northern Beaufort County. The problem of ground water contamination and waste management practices at the SRP has come up at every public meeting which has been held by DOE which I have attended, originally on the start-up of the L-Reactor and then at the scoping meeting for the EIS. Today we are considering with you on what should be included in an EIS on Waste Management which is required by several recent legislative acts.	
L-1	According to a statement by DOE in May 1984, and according to the contents of the EIS on the L-Reactor the following, in brief, were proposals applied to ground water protection: to "construct a $30 million waste water facility" by April 1985 in order to terminate the use of seepage basins; to pump out the already seeped chemical solvents from the Tuscaloosa Aquifer; to study and act to correct ground water problems on site; and to approach the problem of hazardous wastes in ground water. Now with an EIS in preparation, specifically on Waste Management, a greater analysis will be made on how DOE can bring about the above aims.	The referenced effluent treatment facility and groundwater withdrawal program are actions being taken at the SRP Fuel and Fabrication Area (M-Area) in accordance with the Supplemental Appropriations Act of 1984, Public Law 98-181. These actions, which have been approved and permitted, are discussed in Chapter 1.
L-2	Problems have arisen this past year in relation to waste management and ground water pollution. Perhaps the most significant has been the question as to whether mixed wastes, radioactive and non-radioactive, would be covered by law, specifically by the Resource Conservation and Recovery Act (RCRA) for on site storage and disposal in all nuclear weapons facilities.	Chapter 6 discusses applicable Federal and State regulatory requirements for the proposed modifications of waste management activities at the SRP, including the requirements of the Resource Conservation and Recovery Act, as amended, and the status and applicability of "mixed waste" regulations.

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Comment number	Comments	Responses

The case brought by the Natural Resources Defense Council (NRDC) and the Legal Environmental Assistance Foundation (LEAF) in the suit LEAF vs. Hodel on the Oak Ridge, Tennessee Plant challenging the position that mixed wastes must be exempted from RCRA supervision on the grounds of national security. On April 13, 1984, this position was held invalid by a ruling in a U.S. District Court in Tennessee.

In a letter of June 14, 1984 by NRDC to William Ruckelshaus, the then Director of the Environmental Protection Agency (EPA), he was urged to accept the Tennessee court decision as precedent setting and that it be applied to all nuclear weapons facilities. On August 1, 1984, DOE conceded that RCRA requirements for treatment and storage of wastes apply to mixed wastes and that this interpretation has over-all application.

We are in favor of this decision since it is a logical acceptance of the fact that mixed wastes cannot and should not be divided into their component parts for each of the regulatory agencies' jurisdiction. A quotation from the NRDC letter to Ruckelshaus puts it clearly:

> There is no provision in RCRA permitting deregulating of hazardous wastes by mixing them with exempted materials, such as AEA (Atomic Energy Act) materials. Nor should there be, since such wastes become no less "hazardous" by virtue of their radioactive components.

A further recommendation has been made by NRDC to EPA, namely that the contracting company, if any, be held responsible for complying with RCRA since they, the contractors/managers "are the ones actually generating, treating, storing and disposing of the wastes."

We find this position logical and likely to expedite corrective measures on ground water waste management, as well as for other waste disposal such as solid, liquid etc. at SRP.

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Comment number	Comments	Responses
	A significant statement on agency jurisdiction is the following from the NRDC letter: "In the rare case where compliance with both sets of requirements is physically impossible, the burden is on DOE to demonstrate the inapplicability of RCRA." The LWVUS in Convention in 1984 formed a Water Resources Task Force which will concern itself with the improvement of water quality in general in the nation and with lobbying for and supporting legislation which will best bring this improvement about. Special stress will be placed on the quality of ground water management. We come now to the DOE notice for today's scoping meeting for the citizen input to an EIS on an SRP Waste Management Program "for the protection of ground water, human health and the environment." In the DOE material sent to us on the Intent to Prepare an EIS, the background on Waste Management activities is touched upon, indicating how it started in 1952 and about the 1977 EIS on improved waste management operations. Now new regulatory requirements, one should add with many new regulating agencies and legislative acts, make certain changes necessary in the SRP Ground Water Management Program, especially because of the provisions of the RCRA and of the CERCLA (Comprehensive Environmental Response Compensation and Liability Act). In an article in the Beaufort Gazette of May 14, 1985 under Fran Smith's by-line, she reports the present scoping meetings and she notes the following: The Department of energy has identified 153 basins, pits, or piles of hazardous wastes on the 300-square mile tract that either do affect groundwater or could affect it. Some of them have been disposal sites for 30 years. The variety of materials includes mercury, volatile organic chemicals and acids.	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
L-3	The source of this data is not given. However, since the statement following, as well as the description of ground water pollution sites at SRP are ascribed to Jim Ferguson, director of S.C. DHEC, Bureau of Water Controls Compliance and Enforcement Division, he seems to be the source of the statement quoted above. We feel that although the time is fairly short when the 1977 Waste Management Program was established to the present, the 153 areas of real or potential ground water pollution is excessive if an ongoing inspection and correction program had been really in operation.	The identification of 153 waste sites at the SRP is contained in a document prepared by E. I. du Pont de Nemours and Company entitled, <u>Technical Summary of Groundwater Quality Protection Program at Savannah River Plant</u>, DPST-83-829, December 1983. Of the 153 sites, approximately 80 active and inactive sites contain hazardous, low-level radioactive, or mixed wastes. The EIS describes the required remedial and closure actions to be taken at these waste sites - at several sites remedial and closure actions will not be required - and assesses the environmental consequences of alternative actions at these sites in Chapter 4. Chapter 5 discusses the ongoing groundwater monitoring program at the SRP for the detection of contaminants.
L-4	Again quoting from the article by Fran Smith cited above, "The S.C. Water Resources Commission especially would like to have some cluster wells drilled outside the 300-square mile plant site to be used for groundwater testing, according to a spokesman." We recommend that this testing be carried out in view of the degreasing chemicals and possibly other pollutants which have reached into the Tuscaloosa Aquifer and for the protection of the health of the residents of the town of Jackson, in particular, which is only two and a half miles away from SRP.	Extensive groundwater sampling and modeling efforts are underway at the SRP. These programs, including groundwater monitoring outside the SRP, are discussed in Chapter 5.
L-5	In the DOE statement of April 19, 1985 on the Intent to Prepare an EIS for Waste Management at SRP, there is the following statement: "Projects are currently underway at SRP to comply with recently enacted RCRA and CERCLA (Comprehensive Environmental Response Compensation and Liability Act) regulatory requirements for groundwater protection and to protect public health and the environment." SCDHEC and EPA permits are also needed to work on this ground water program. We feel that with the acquiring of the required permits and authorizations, DOE, supported by the regulatory agencies both state and federal which are concerned in ground water usage, should be able to reach a more effective control of this very serious problem of ground water pollution which seems to have become dangerously widespread.	See the response to comment L-2.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
L-6	Two announcements in the press, both of them familiar to DOE, should be mentioned here. They were both Associated Press releases from Washington picked up by the <u>Beaufort Gazette</u>. The first, June 5, 1984, said that the SRP was chosen as "a preferred option" for the burial of radioactive nuclear engine rooms from retired navy submarines over a period of years as obsolescence set in. The second press release of February 21, 1985, is concerned with the plan to build a new reactor which would have state-of-the-art technology and the possible closing down of one of the older operating reactors at SRP when the new one is on stream. With programs such as these two possible in the not distant future, setting aside any consideration, at the present time of possible opposition to either or both of these two projected events on the part of individuals and organizations, ground water pollution becomes more menacing.	The referenced programs either have been (decommissioned naval submarine reactor compartments) or will be (new production reactor) the subject of a separate NEPA review and are outside the scope of this EIS.
L-7	Finally, we do not think that indicating our preference in "Alternatives" to be followed under different conditions for the solution of the ground water pollution problem would be of great value here, since we assume that the safest and most corrective methods will be chosen by DOE, DuPont, and the various agencies, state and federal, that have oversight at SRP. In this scoping material sent to us by DOE, obviously, the last alternative, in each case, of doing nothing is not acceptable.	The No-Action strategy, which is required pursuant to the regulations of the Council on Environmental Quality [40 CFR 1502.14(d)], is discussed in the EIS for each set of alternatives considered (i.e., existing waste sites in Sections 2.2 and 4.2, new disposal facilities in Sections 2.3 and 4.3, and disassembly-basin purge water discharge in Sections 2.4 and 4.4). DOE identifies its preferred alternative for each set of alternatives in Sections 2.1 in accordance with 40 CFR 1502.14(e).

Thank you, Mr. Chairman.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	STATEMENT OF THE HONORABLE HARRIET H. KEYSERLING State Representative District, South Carolina	
	The last time I appeared at a Department of Energy hearing, I supported an environmental impact statement before the restart of the L-Reactor.	
	My reasoning was that nuclear hazards are nuclear hazards, whether it be government produced or commercial, and if there is any danger in one kind of waste, there is the same in the other.	
	Therefore, the same rules and regulation should hold for both. When I first became involved in the problems of nuclear waste, I was told by those who produced it I should be less concerned about nuclear wastes than chemical wastes, because there was more potential hazard and therefore more control over nuclear waste.	
	I don't know about the first statement, that I need not be concerned about nuclear waste, but they were right about the problems which would and have surfaced about other chemical wastes and other hazardous wastes, so I come here today with the some statement as I made concerning the L-Reactor, to say that hazardous wastes are hazardous wastes, whether they be from government or commercial facilities.	
M-1	So the same rules and regulations which the federal government finds necessary for commercial waste should also apply to government as well radioactive and mixed wastes.	The EIS assesses the potential environmental effects of modifying waste management activities at the SRP for low-level radioactive, hazardous, and mixed wastes in compliance with applicable regulatory requirements, including the Resource Conservation and Recovery Act, as amended. Chapter 6 discusses the applicable Federal and State regulatory requirements for the proposed modification.
	I urge all the alternatives that you will consider be within existing regulatory requirements under the Resource Conservation and Recovery Act, the compensation and liability act, other federal laws, as well as South Carolina's laws and regulations.	
	I also want to express my thanks for going through this EIS process and for giving the public an opportunity to give their views at this and other meetings. Thank you.	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	STATEMENT OF R. LEWIS SHAW SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL 2600 Bull Street Columbia, SC 29201 Board Moses H. Clarkson, Jr., Chairman Gerald A. Kaynard, Vice-Chairman Oren L. Brady, Jr., Secretary Barbara P. Nuessle James A. Spruill, Jr. William H. Hester, M.D. Euta M. Colvin, M.D. Commissioner Robert S. Jackson, M.D. May 28, 1985 Mr. Charles G. Halstead Assistant Manager for Health, Safety and Environment US Department of Energy Savannah River Operations Office P.O. Box A Aiken, S.C. 29802 Re: Comments on Scope of the Environmental Impact Statement on the Waste Management Activities for Groundwater Protection at the Savannah River Plant Dear Mr. Halstead: The Department appreciates the opportunity to provide comments on the above referenced subject. For your preparation of the EIS the Department presents the following items for consideration:	
N-1	1. Preparation of the EIS should not interfere with permitting and compliance activities, ongoing or future, required by the Department.	The purpose of the EIS is to assess the environmental consequences of modifying waste management activities at the SRP for hazardous, low-level radioactive, and mixed wastes in accordance with Section 102(2)(c) of the National Environmental Policy Act of 1969, as amended. If NEPA requirements conflict with the requirements of other applicable statutes, Sections 1.1 and 1.2 and Chapter 6 will discuss these conflicts.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
N-2	2. The EIS should encompass all wastes sites which are required by the 1984 RCRA amendments to be investigated as "continuing release" sites.	The EIS considers existing hazardous, low-level radioactive, and mixed waste sites, regardless of their definition as "continuing release" sites.
N-3	3. The EIS should provide a description of all applicable laws, regulations and agreements for each existing and proposed hazardous, low-level radioactive, and mixed waste site.	Chapter 6 discusses the applicable Federal and State regulatory requirements for the proposed modifications of waste management activities at the SRP.
N-4	4. The EIS should discuss existing and future laws and regulations which govern remedial and closure actions and their relationship to the NEPA and Federal budget processes.	See the response to comment N-3. A discussion of future laws is outside the scope of the EIS.
N-5	5. The Department recommends that recycling, reuse, incineration or further treatment (to render waste less hazardous) receive a higher ranking than land based treatment, storage or disposal facilities as preferred alternatives for future management of hazardous waste.	Appendix D discusses predisposal techniques such as source control, incineration, compaction, and biological/chemical treatment.
N-6	6. The Department recommends that the EIS evaluate the feasibility of using off-site treatment, storage, or disposal facilities which may be better suited than new sites on the SRP.	The subject and alternatives of using offsite facilities for waste - particularly radioactive waste - was discussed in the <u>Final Environmental Impact Statement, Waste Management Operations, Savannah River Plant, Aiken, South Carolina</u> (ERDA-1537), and was dismissed due to cost and potential exposures due to transport.
N-7	In conclusion, the Department wishes to clarify that the preparation, or the EIS itself should not be construed to satisfy any existing State regulation or requirement.	Although this EIS is not a permit application, the DOE Record of Decision on the EIS will identify those actions to protect groundwater, human health, and the environment for which DOE will request the necessary approvals and permits for implementation.
	Sincerely, R. Lewis Shaw, P.E. Deputy Commissioner Environmental Quality Control	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	RLS/lnj cc: Kim Hill Jim Joy Jim Ferguson Hartsill Truesdale Virgil Autrey Bill Culler	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	STATEMENT OF MARY T. KELLY, PRESIDENT	
	LEAGUE OF WOMEN VOTERS of South Carolina	
	2838 Devine Street Columbia, S.C. 29205 Telephone: 771-0063 May 24, 1985	
	Mr. Charles G. Halstead Assistant Manager for Health, Safety and Environment U.S. Department of Energy SRP Operations Office P.O. Box A Aiken, SC 29802	
	Dear Mr. Halstead:	
	The League of Women Voters of South Carolina appreciates this opportunity to help identify some of the issues which we think should be addressed in the proposed Environmental Impact Statement for waste management activities at the Savannah River Plant.	
0-1	Our organization believes that the operation at Savannah River in all aspects should have to comply with state and federal environmental laws and regulations for water quality, air quality, groundwater quality and protection, and hazardous waste management; and that representatives of state and federal regulatory agencies must be accorded full access for inspection and monitoring as well as complete cooperation. The implications for the health and safety of the citizens of this and neighboring states are too serious if such access and compliance are not guaranteed.	Chapter 6 discusses the applicable Federal and State regulatory requirements for the proposed modifications of waste management activities at the SRP. Chapter 5 discusses groundwater monitoring activities at the SRP, including the relationship of these activities to State and EPA requirements.
0-2	We realize that changing practices of the chemical industry are now mandating practices which are more health and environmentally protective than those followed in the 50's, 60's, and 70's. But we also realize that in the past certain practices which were widely followed were even then suspect. However, in the interests	Chapter 1 describes the approved actions being taken to eliminate the use of seepage basins, and Section 4.2 evaluates the environmental consequences of remedial and closure actions at existing hazardous, low-level radioactive, and mixed waste sites, including seepage basins.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	of getting the job done, they were followed. The use of unlined seepage basins is a case in point, as well as the manner in which degreasing solvents and metallic pollutants were handled and allowed to enter the atmosphere, the sediment, and the groundwater.	
0-3	Consequently, we ask that any cost-benefit analysis that will lead to less than the best and most protective technology, be disallowed. The continued use of a seepage basin for the L-Reactor is a case in point.	The EIS identifies DOE's preferred alternatives in Chapter 2. The L-Reactor seepage basin was evaluated in the Final Environmental Impact Statement, L-Reactor Operations, Savannah River Plant, Aiken, South Carolina (DOE/EIS-0108), and SCDHEC subsequently concurred in its use. This seepage basin is outside the scope of this EIS.
0-4	Careful, professionally prepared specific comments have been submitted by Energy Research Foundation and the Natural Resources Defense Council. We ask that their suggestions receive the utmost consideration, as well as the contributions of others who have commented or testified. We request that this communication be included in the scoping record. Sincerely yours, Mary T. Kelly, President MTK:fb	See the responses to the comments A-1 through A-48 "A."

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	STATEMENT OF GOVERNOR RILEY STATE OF SOUTH CAROLINA Office of the Governor Richard W. Riley Governor Post Office Box 11450 Columbia 29211 May 20, 1985 Mr. C. G. Halstead, Jr. Assistant Manager for Health, Safety and Environment United States Department of Energy Savannah River Operations Office Post Office Box A Aiken, South Carolina 29802 Dear Mr. Halstead: I am writing in response to your announcement of "scoping" activities in support of the preparation of an Environmental Impact Statement (EIS) on waste management at the Savannah River Plant. The Memorandum of Agreement recently signed by the South Carolina Department of Health and Environmental Control and the United States Department of Energy seems to have improved communication between the two agencies, and you are to be commended for your current efforts to address waste management issues in a comprehensive manner.	
P-1	South Carolinians are understandably sensitive about waste storage and disposal within the state, particularly when waste has not been generated by in-state firms. Therefore, it is very important for the EIS to specify that the waste management activities undertaken at the Savannah River Plant will be solely for wastes generated at the site.	Sections 2.3 and 4.2.1 discuss waste material requiring disposal, including waste presently in storage, waste resulting from remedial and closure actions (at the SRP), and waste from ongoing operations.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
P-2	South Carolinians are also concerned about what many perceive as a lack of quality control in waste management activities. I would like the EIS to include a full discussion of the quality assurance program designed to ensure the safety of the new waste management facilities. Such a program should not only include protection for "whistle blowers" but, more importantly, should incorporate positive incentives to encourage employees to call potential safety issues to the attention of top management personnel. Knowledge that potential hazards to human health or the environment will be promptly identified and eliminated is necessary to reassure those of us who have been alarmed by recent reports of improper waste management. I look forward to your keeping me informed as the EIS is developed. Yours sincerely, Richard W. Riley RWR:bd	Chapter 6 discusses those DOE Orders applicable to the identification and resolution of potential hazards to human health or the environment.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses

STATEMENT OF W. F. LAWLESS
Assistant Professor of Mathematics
Paine College

PAINE COLLEGE
1235 Fifteenth Street (10)
Augusta, Georgia 30910
404-722-4471

May 31, 1985

C. G. Halstead, Jr., Assistant Manager
for Health, Safety, and Environment
U.S. DOE - Savannah River Plant
P.O. Box A
Aiken, SC 29801

Dear Mr. Halstead:

As stated in my handwritten letter to you May 28th, hand delivered to your office the same day with my final scoping comments, per requirements stated in the Federal Register notice (50(81), April 26, 1985, p. 16534), this letter transmits a cleanly typed version of my final scoping comments on the proposed SRP Waste Management Activities EIS. Minor editorial changes differ from the copy provided May 28th, and a new conclusion statement, the 8th, has been added, however, no new information nor references have been added per our agreement.

It has been a pleasure providing the enclosed comments, and it is hoped they will be of some value to the DOE. Thank you for the opportunity to comment, and for your assistance.

Sincerely,

W. F. Lawless, Assistant
Professor of Mathematics

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses

SCOPING COMMENTS CONCERNING SAVANNAH RIVER PLANT
WASTE MANAGEMENT ACTIVITIES
ENVIRONMENTAL IMPACT STATEMENT

by

W. F. Lawless

Assistant Professor of Mathematics

Paine College

May 28, 1985

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	INTRODUCTION	
	The Department of Energy (DOE) has initiated comments and suggestions to assist in identifying environmental issues and the scope of an environmental impact statement (EIS) on waste management activities for groundwater protection at the Savannah River Plant (SRP). Public comments are to be considered in the preparation of an EIS. An April 26, 1985 <u>Federal Register</u> identified the DOE intent to prepare such an EIS and included background information on the SRP; the notice also included alternatives for treating waste sites, for building new waste disposal facilities, and for discharging reactor basin purge water, plus the non-inclusive listing of SRP environmental issues (1).	
	The comments herein were delivered in draft at the first DOE scoping meeting, held at the H. Odell Weeks Activity Center in Aiken, SC, May 14, 1985.	
	CONCLUSIONS	
Q-1	1. The proposed EIS should justify why an EIS is not being written for the national DOE Order 5820.2, Radioactive Waste Management, an Order that has and will have a much greater environmental impact on the nation and at SRP than the proposed action.	The subject of preparing an EIS for DOE Order 5820.2 is beyond the scope of this EIS.
Q-2	2. The new EIS should justify the continued use of seepage basins at SRP, natural soil columns that are extraordinarily expensive to clean up. Their continued use does not appear to be in the best interest of the public, nor does their use make good business and engineering sense.	The EIS assesses remedial and closure actions at hazardous, low-level radioactive, and mixed waste sites, including seepage basins, in Sections 2.2 and 4.2. The continued use of the C-, K-, and P-Reactor area seepage basins for disassembly-basin purge water is assessed in Sections 2.4 and 4.4. Also see the response to comment 0-3.
Q-3	3. Environmental Impact Statements (EIS) rely on complex predictions that are difficult to disprove. Independent peer review panels and the assessment of past predictions should in part correct this problem. EIS statements should no longer be treated as passive documents to be filed and never officially assessed.	As required by the regulations of the Council on Environmental Quality (40 CFR 1502.19), copies of the draft EIS will be provided to Federal and State agencies having special expertise on any environmental impact that might be involved.

Table K-2. Scoping comments and DOE responses

Comment number		Comments	Responses
Q-4	4.	Release of contaminants on and off the SRP exceed DOE Concentration Guides, however no citations against excessive releases have been filed against the SRP prime contractor, DuPont. The groundwater clean up at SRP may well exceed $250 million, paid for by the taxpayers. Yet, it appears that the prime contractor has been relieved of any financial obligations and penalities in the clean up. In fact, the prime contractor's contract was renewed in 1984.	Sections 2.2 and 4.3 and Appendix F discuss remedial and closure actions at hazardous, low-level radioactive, and mixed waste sites in relation to applicable Federal and State regulations, including DOE Orders.
Q-5	5.	Public reviews of EIS statements are inadequate. The public is unqualified to review these complex, recondite documents, but a combination of independent peer review panels followed and coupled with public reviews may correct this problem, and may enhance the rigor and the quality of the final document.	See the response to comment Q-3.
Q-6	6.	The DOE philosophy appears to be that cost is no object to cleaning up publicly identified environmental problems. This is inappropriate, bureaucratic in approach, and unprofessional at best. Although it is appropriate to correct an original lack of engineering and scientific insight it is time that the DOE bureaucracy become responsible in spending the millions of taxpayer dollars to manage radioactive and hazardous wastes. The contamination build-up problems in the M-Area seepage basin and other SRP seepage basins have been known for many years, yet other seepages are planned. This disregard by the DOE may be typical of a bureaucracy, but is no longer tolerable in this or any other society.	See the response to comment Q-2.
Q-7	7.	The DOE should not be allowed to both self-regulate and manage radioactive wastes. The DOE lost the right to self-regulate hazardous chemical wastes in 1984 in a federal court suit filed in response to one of the largest industrial spills of mercury in the U.S. The $64 million clean-up of the single M-Area radioactive and hazardous waste seepage basin at SRP implies that the DOE is not capable of safely managing and regulating either hazardous radioactive wastes.	Chapter 6 discusses the applicable Federal and State regulatory requirements for the proposed modifications of waste management activities at the SRP, including the requirements of the Resource Conservation and Recovery Act, as amended, and DOE Orders. Also see the response to comment Q-4.

Table K-2. Scoping comments and DOE responses

Comment number		Comments	Responses
Q-8	8.	The DOE tendency to publish vast amounts of apparently meaningless statistical information should be rigorously upgraded. Selected data from selected monitoring wells often do not adequately describe the data set, nor correlate to standards, nor fit with other selected data.	The preparation of the EIS complies with the provisions of the Council on Environmental Quality as contained in 40 CFR 1502.2, which require an EIS to focus on significant environmental issues and alternatives, while reducing the accumulation of extraneous background data and not being encyclopedic.
		GENERAL COMMENTS	
	1.	<u>Savannah River Plant Seepage Basins</u> In August 1983, a hotline complaint was filed with the DOE Inspector General charging the DOE with willfully avoiding its public responsibility to prepare an EIS for the new DOE Order 5820.2, Radioactive Waste Management (2,3). Although the environmental impact of DOE Order 5820.2 is national in scope and is much greater than the proposed groundwater protection action for SRP waste management activities, the latter a local action versus a national action for the former, such an EIS has not been written (1). Nonetheless, the Department of Energy is to be congratulated on this very important and forthright action to prepare an EIS for Savannah River Plant waste management activities. It is hoped that similar actions will take place at all DOE sites throughout the nation, and that one day, an EIS will be written to cover DOE Order 5820.2. The new EIS planned for the Savannah River Plant will document many of the inadequacies of DOE Order 5820.2, a regulation that mocks American technology and one that epitomizes the mishandling of radioactive and hazardous wastes by the DOE bureaucracy. The new EIS will continue to focus on the corrective actions necessary to remediate the groundwater damage done by the DOE's use of seepage basins at SRP, basins still allowed by DOE Order 5820.2.	
Q-9		The new EIS should justify why it is being written and why no EIS has been written for DOE Order 5820.2, a regulation that has and will have a quantifiably greater impact on the national environment than the proposed action.	The purpose of the EIS is stated in Section 1.2. Also see the response to comment Q-1.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
Q-10	The SRP is cleaning up one of its 68 liquid waste seepage basins, the M-Area seepage basin (4). The General Accounting Office (GAO) has estimated that the M-Area seepage basin clean-up will cost up to $64 million or more (4), yet the Savannah River Plant will be using a seepage basin when the L-Reactor comes on line in 1985 (5). The new EIS should carefully detail what seepage basins will continue to be used at the Savannah River Plant and for how long, the contaminants to be disposed of and where, the estimated contaminant build-up at each basin, the releases to each basin since start-up, the basins that are clogged to further liquid waste seepage and are overflowing, the current estimated clean-up cost for each basin, and the rationale for each basin's continued use.	See the responses to comments B-2 and Q-2.
Q-11	Seepage basins are one of the sources of hazardous and radioactive waste contamination of migratory fowl and animals at the SRP (6). Contaminated turtles have been known to leave and have been collected from off the Savannah River Plant site (6). The new EIS should quantify this phenomenon by detailing how each basin has possibly contributed to this means of spreading radioactive and hazardous contamination, and to where with what extent by what means (turtles, fish, fowl, plants, resuspension, etc.). The new EIS should review the steps SRP has taken to prevent the spread on and off plant of hazardous and radioactive contamination through all of the various possible pathways from each one of the 68 known seepage basins (7).	See the response to comment B-3.
Q-12	2. <u>Waste Management Practices</u>. The DOE "Intent to Prepare an Environmental Impact Statement" (1) states that a 1977 EIS on the SRP "...resulted in the implementation of a waste management practices improvement program in accordance with DOE policies and standards." This 1977 EIS (ERDA 1537) included many important predictions that have not been publicly assessed by the DOE and should be assessed in the new EIS (8). Many of these predictions have proven wrong, e.g., on the levels of contamination entering the groundwaters underlying the SRP radioactive waste burial grounds and the radioactive and hazardous waste seepage basins, and on how well protected the Tuscaloosa aquifer was from contaminated groundwaters above the Tuscaloosa aquifer (5, 6, 7, 8).	See the response to comment B-4.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
Q-13	The recondite interactions between DOE operations and the environment creates the need for an EIS to include many predictions of the impacts of these interactions, predictions based on both assumptions and complex equations not easily verified, especially during the short public review period of an EIS. Nor is the public qualified to review an EIS. These documents are replete with abstruse, technical processes and environmental systems that usually confound experts. The establishment of a competent, independent peer review for all environmental impact statements (EIS) with adequate review time and appropriate peer-review authority should become a part of the EIS process. First, an EIS should verify or not, to the extent knowledge has been gained, each prediction made in previous EIS statements (in this case, ERDA 1537, DOE/EIS-0062, DOE/EIS-082, DOE/EIS-0108); second, an independent peer review panel should study the draft(s) and final EIS documents (other cognizant organizations and authorities should be included on the panel); third, a public review of the EIS documents and peer review comments should be conducted after the draft and final documents have been reviewed.	See the responses to comments B-5, Q-3, and Q-8.
Q-14	The SRP publishes annual monitoring reports on radioactive and hazardous contamination at and off the SRP (e.g., reference 6). The new EIS should not only assess the correctness of ERDA 1537, but should as well analyze the monitoring reports from 1977 to the present. Special attention should be directed to DOE releases that exceed DOE Concentration Guides and EPA drinking water standards on and off the SRP. For instance,	See the response to comment B-5.
Q-15	a) strontium-90 released from the F-Area seepage basins has been found to be at a groundwater concentration over eight (5) times the DOE Concentration Guides, or over 40,000 times the EPA drinking water standard, yet no reprimand has been given to Du Pont, the prime SRP contractor, because of this excess. The new EIS should detail every instance where the DOE Concentration Guides have been exceeded since plant start-up, what corrective actions have been taken and with what long-term consequences.	See the response to comment B-6.

Table K-2. Scoping comments and DOE responses

Comment number		Comments	Responses
Q-16		Environmental Protection Agency (EPA) drinking water standards are important performance measures, regardless of whether groundwater is available or accessible as public drinking water sources, for the following reasons. The SRP has apparently not been designated a reservation to be kept from public hands for perpetuity, but is planned to be eventually returned to the public domain, yet the SRP is contaminated and cannot be released until levels of contamination do not jeopardize public safety. Thus, EPA drinking water standards provide a measure of DOE environmental performance and concomitantly the degree of remediation before the return of DOE property to the public. The new EIS should recognize the importance of EPA drinking water standards and should compare all data to applicable DOE Concentration Guides and EPA drinking water standards.	The need to dedicate existing hazardous, low-level radioactive, and mixed waste sites to ensure the protection of public health and safety is addressed in Section 2.1 of the EIS. Also, see the response to comment Q-4.
Q-17	b)	The annual off plant SRP monitoring reports indicate that radioactive strontium-90 contamination in milk samples collected from around the SRP are within ranges found by the Environmental Protection Agency (EPA) (9). The SRP annual monitoring reports attribute the strontium-90 in milk from around the plant to world-wide nuclear test fall-out (9), but statistical tests comparing SRP data with regional data discredit this hypothesis. Support for this hypothesis is found in a 1984 report of a one-week study of the SRP conducted by the EPA in 1982. The EPA collected one milk sample from a dairy about 32 km northwest of SRP plant center and purportedly confirmed by their analysis that the concentration of radioactive strontium-90 in milk samples drawn from near the SRP are not significantly different from other milk samples from the southeastern U.S. (10). However, the EPA apparently did not review or overlooked the SRP annual monitoring data (9) for radioactive strontium-90 concentrations in milk (see Table 1 below). That data, collected by the Savannah River Plant in 1982, indicates that the mean strontium-90 milk concentrations, along certain wind paths, are significantly greater than the mean concentrations in southeastern U.S. milk data as published by the EPA in 1982 (11, p. 91-95). One source of the strontium-90 in milk from around the SRP may possibly be the airborne re-suspension from SRP seepage basin releases.	See the response to comment B-7.

Table K-2. Scoping comments and DOE responses

Comment number		Comments	Responses

Table 1

1982 Radioactive Strontium-90 Contamination in Milk (9)

	Mean Strontium-90 Milk Concentration, pCi/L
1.. EPA Southeastern U.S. Data	1.8
2. EPA Single Milk Sample around SRP (Langley, SC)*	1.8
3. SRP Milk Data	4.1
4. SRP Milk Data Northeast/ Southwest of SRP	6.0
5. SRP Milk Data Maximum Average (Waynesboro, GA)	7.5
6. SRP Milk Data Maximum Reading (Waynesboro, GA)	14
7. EPA Drinking Water Standard	8

*NOTE: The SRP milk data for 1982 for milk from Langley, SC, had an average Strontium-90 concentration of 1.6 pCi/L.

Q-18	3.	Waste Management Assessments The SRP waste management practices improvement program that started with the 1977 EIS (ERDA 1537), as announced in the DOE intent to prepare the new EIS, was stated to also include regular assessments and improvements to SRP waste management programs (1). A listing of all waste management assessments, including appraisals with findings and recommendations, since 1977 should be a part of the new EIS. For instance, the 1982 Savannah River Plant radioactive low level waste burial ground management	See the response to comment B-8.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	appraisal report, not published by DOE, should be included (12). This appraisal report was highly critical of DuPont's management of the SRP radioactive waste burial grounds, but not having been finalized nor transmitted to DuPont, the appraisal report became the subject of a separate hot line complaint to the DOE Inspector General (12, 13). The result of that hot line complaint and a subsequent re-appraisal as directed by the DOE Inspector General, has been to dramatically transform operations at the SRP burial grounds (14). At the same time, because there were so few Savannah River Laboratory (SRL) research recommendations for improvements to operations of the SRP burial grounds before the 1980 appraisal of the SRP radioactive waste burial grounds, also because there have been significant changes since the 1980 appraisal, including the implementation of almost all the recommendations made in the 1982 appraisal draft report (14), the SRL Laboratory's significance to radioactive waste management is questioned. The new EIS should discuss the importance of the SRL Laboratory to SRP operations, and what changes since the 1980 appraisal have occurred to make the SRL Laboratory more relevant to SRP operations.	
Q-19	The burial ground management appraisal report did not assess SRP seepage basins, but a 1982 radioactive high-level waste tank farm appraisal report attempted to do so and attempted to assess the long-term impacts seepage basins would have on the SRP groundwater environment (15, 16). However, that part of the high-level waste tank farm appraisal, i.e., the long term performance appraisal of the high-level waste tank farm, was stopped by DOE management (13), but in effect, part of that long-term appraisal will be assessed in the new Waste Management Activities EIS. The scope of the original long-term appraisal of the high-level waste tank farms appears to have been in some aspects more far reaching than the scope of the new EIS (16; copy attached)); the latter's scope should be expanded to cover all sources of SRP groundwater and soil contamination, including the SRP high level radioactive waste tank farm, Defense Waste Production Facility (DWPF) and DWPF waste and by-products disposal, such as saltcrete disposal.	See the response to comment B-9.

Table K-2. Scoping comments and DOE responses

Comment number		Comments	Responses
Q-20	4.	<u>DOE Concentration Guides</u> As stated in the recent DOE news release and Federal Register (1), the DOE wants "...to ensure continued protection of groundwater, human health and the environment." However, numerous instances have occurred at SRP where concentrations of radionuclides have exceeded the DOE Concentration Guides (17, p. 25, Table D; 18). Yet, the DOE apparently does not take steps to bring releases into the environment below levels established by these DOE Concentration Guides, nor has the DOE cited nor fined the SRP contractor when the Concentration Guides have been exceeded (19). A case in point is the $64 million clean up cost of the M-Area basin, a cost to be paid for with tax dollars, not DuPont corporate funds. This appears to be incongruent with DOE policy. For example, the 1984 L-Reactor EIS reported that strontium-90 groundwater concentrations from F-Area seepage basins reached 340,000 pCi/L (5). This level of strontium-is 42,500 times greater than the EPA drinking water standard and over 8 times higher than the DOE Concentration Guides (17, 18). When this was discussed with DOE, the responded that the contractor was under no obligation to meet the DOE Concentration Guide for strontium-90 in groundwater (20). Putting aside, for the moment, the question of whether the DOE Concentration Guides themselves provide satisfactory protection to human health and the environment, exceeding those DOE Concentration Guides assuredly cannot protect anything. Since DOE still self-regulates nuclear wastes, it would appear that these DOE Concentration Guides apparently afford both the DOE and the prime contractor a cozy relationship. The new EIS should question the efficacy of these DOE Concentration Guides and whether, in the best interests of the public, *these guidelines should be replaced with regulations that bite.* In 1984, the federal court removed the DOE's right to self regulate hazardous chemical wastes (4) after the largest industrial spill of mercury occurred at the DOE Oak Ridge facility (20, 21). The new EIS is a good, first step	See the response to comment B-10.

Table K-2. Scoping comments and DOE responses

Comment number		Comments	Responses
		forward for the DOE to recoup lost credibility, but it must be strongly reinforced with a cost-efficient, professional operation that cleans up the SRP environment and keeps it clean. To do so is in the best interests of the public, and it makes good business and engineering sense as well. The DOE can ill afford another cover-up.	
Q-21	5.	Remedial Action Programs The M-Area remedial action program to manage and control existing groundwater contamination was included in the L-Reactor EIS (5), but it has not been central to the subject of an EIS until now, yet corrective action alternatives to the M-Area basin clean up apparently do not exist because remediation has already begun (4, 5). The new EIS is a fine idea, but it comes after the fact for deciding the appropriate course of action for the M-Area seepage basin clean-up, and for allowing public input into that decision, unless, with the new EIS, the DOE is now offering the public this opportunity. The M-Area seepage basin clean-up will jettison an estimated 30 tons per year of chlorinated hydrocarbons into the atmosphere at one of the most populated work areas on the SRP plant site (4, 5). It is appropriate that the public have the right to question the Savannah River Plant scientists and engineers on the decision to allow airborne releases of these potentially hazardous chemicals within the SRP manufacturing and administration areas.	See the response to comment B-11.
Q-22		The SRP Groundwater Quality Protection Program discussed the removal of highly contaminated soil and chemical and pesticide hazardous waste from the CMP seepage basins for transport, storage and disposal elsewhere (7). This remedial action should similarly be a apart of the new EIS, especially if highly contaminated wastes will be or have been transported and disposed offsite the SRP plant site.	See the response to comment B-12.
		SPECIFIC COMMENTS	
Q-23	1.	As part of the new EIS, the 1983 technical summary document, The Technical Summary of Groundwater Quality Protection Program at Savannah River Plant, Volumes I and II, should be up-dated and corrected where necessary (7). For instance,	See the response to comment B-13.

Table K-2. Scoping comments and DOE responses

Comment number		Comments	Responses
		the M-Area seepage basin is listed as non-radioactive instead of as a mixed waste basin, and basin 904-49G has been omitted from Figure 5-4, p. 5-11. It would be helpful to include the numbers of each type of basin or pit on page 5-7.	
Q-24	2.	As part of the new EIS each new project, each remedial action program, and each current SRP program that impacts the human health and the SRP environment should be assessed for total costs, including the decontamination and decommissioning (D&D) costs for the SRP.	Impacts to human health and the environment for remedial and closure actions, new disposal facilities, and the discharge of disassembly-basin purge water are identified in Chapter 4. To the extent practicable, estimated costs associated with the alternatives are presented. A detailed discussion of decontamination and decommissioning of SRP facilities is outside the scope of this EIS.
Q-25	3.	The past estimate made in 1982 for the D&D of the SRP was set between $2-20 billion. This estimate should be up-dated and explained in detail in the new EIS.	A detailed discussion of decontamination and decommissioning of SRP facilities is outside the scope of this EIS.
Q-26	4.	The estimated date that the SRP will be returned to the public domain should be provided with detailed explanations in the new EIS.	The estimated date for return of the SRP to public use is outside the scope of this EIS. Also see the response to comment Q-16.
Q-27	5.	The Nuclear Regulatory Commission has inferred in its Plant Vogtle Environmental Statement that Vogtle environmental impacts can be assessed independently of SRP releases (11, p. 9-27), and the consequences of combined environmental effects are in essence not a part of their review process. To the credit of DOE, the L-Reactor EIS made such an assessment (5). However, who ultimately is responsible to study the combined effects of all releases into the environment from all sources?	Section 4.7 discusses the cumulative effects of the alternatives considered in combination with the effects of other existing and planned facilities on and near the SRP.
Q-28	6.	A 6000 curie cesium-137 source and cobalt-60 sources were left unattended in the SRP environment for a number of years before being disposed in the SRP burial ground. This should be discussed including environmental impacts.	Remedial and closure actions for the burial ground are discussed and assessed in Sections 2.2 and 4.2 and Appendixes B and F.
Q-29	7.	Allied General Nuclear Services (AGNS) has had transuranic waste sent to SRP for disposal. The significance of this action should be discussed.	The purpose of the EIS, as announced in the Federal Register, is to assess the potential environmental effects of the modifications of waste management activities for hazardous, low-radioactive, and mixed wastes. A discussion of high-level and transuranic wastes is outside the scope of this EIS.

Table K-2. Scoping comments and DOE responses

Comment number		Comments	Responses
Q-30	8.	Reported SRP airborne data for the release of tritium appears to be confounded by the lack of timely and relevant meteorological data, e.g., concomitant humidity readings (17 p. 10-12). This should be discussed.	Data in SRP monitoring reports have been used in the preparation of the EIS. Revisions to the monitoring reports to provide absolute humidity during periods of data collection - which can be derived by a division of data provided - is not within the scope of this EIS.
Q-31	9.	The SRP data published in annual monitoring reports (also, cf. 5, 7) is not unified nor understandable nor conclusive but selective; nor does the data display ranges nor significant statistics of the data base. Data published in the future by SRP, especially in this EIS, should provide a means of the data base available for a particular observation (for instance, strontium-90 groundwater concentrations under F-Area seepage basins), a range of the data, number of data sources in the data base, and pertinent data statistics (e.g., standard deviations), and comparisons of the data to EPA drinking water standards, DOE Concentrations Guides, and other applicable standards. This problem is endemic in all SRP reports, but two examples will be given in addition to Specific Comment No. 8: First, the maximum level of gross beta contamination in wells sampling ground water underlying the F-Area seepage basin was reported to be 8,000 pCi/L in the May 1984 L-Reactor EIS (5, pp.F-88 and M-112) but in the 1981 Annual At-The SRP Monitoring Report (18) published in April 1984, the maximum level was reported to be 330,000 pCi/L, a level over forty times greater than the first level; this is significant because SRP took particular exception to an earlier comment about water contaminated at the 8,000 pCi/L level being used for drinking water (5, p. M-112), all the while having knowledge that the actual level of contamination was much higher, knowledge the commentor did not have; but this is significant for the more compelling reason that SRP has not published a range so that even the 330,000 pCi/L level may not be the maximum (viz., strontium-90 has been reported in this same area, 1-3 miles downstream, to reach a level of 340,000 pCi/L at outcrop (5, p. F-84; 19)).	See the responses to comments B-4, Q-8, and Q-30. The format and content of the annual monitoring report has been changed for 1984.

Table K-2. Scoping comments and DOE responses

Comment number		Comments	Responses
		Second, data is often published in a meaningless, but authoritative fashion, such as the inventory in pounds of lead or mercury in a core sample but without supporting data to determine concentrations and/or significance (7, p. 6-30); or such as collected rainwater concentrations of radioactive contamination per square area, but without supporting data that would allow the calculation of volume concentrations effectively preventing the determination of whether or not standards have been violated (18, p. 93-94). On the one hand, this gives the appearance of DOE's honesty in publishing so much information, but on the other hand, information presented in gibberish is of little value.	
Q-32	10.	SRP data do not include the releases of all hazardous chemical and radioactive nuclides at the SRP. Nor is the data displayed in an understandable and accessible form. This should be corrected.	See the responses to comments B-4, Q-8, Q-30, and Q-31.
Q-33	11.	Data averages should not be reported without providing the significance to those averages, i.e., ranges, standard deviations, etc.	See the responses to comments B-4, Q-8, Q-30, and Q-31.
Q-34	12.	The high-level waste (HLW) tank corrosion pitting problem at SRP has not been adequately addressed in an EIS and should be in this EIS in light of the continuing problem observed in the Type IV tanks; and second, because HLW tanks 25-28 are new type III tanks that went into operation after the corrosion pitting was found in the remaining Type III tanks, tanks 25-28 should be assessed for potential corrosion pitting problems in this EIS. Tanks 25-28 were not cleaned nor treated for the corrosion pitting as the other new Type III HLW tanks were. The performance of the SRP HLW tanks since the corrosion pitting incidences should be reviewed as well (5).	See the response to comment Q-29.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
Q-35	13. In December, 1982 in private discussions within DOE management, doubt was expressed by DOE management for the need of the DWPF facility. However, apparently to induce Congress to fund the DWPF, the estimated cost was reduced from around $3 billion to $1 billion, and the proposed cost for new HLW tanks (FY-1984 request) were more than doubled from past HLW tank costs (23), both as extraordinary but apparently effective inducements. Will the cost for the DWPF remain at $1 billion? Could the DWPF have been built within the existing HLW tank farm system without the expenditure of $1 billion?	See the response to comment Q-29.
Q-36	14. The National Academy of Sciences (NAS) was highly critical of the DWPF in their analysis of the DWPF, although based on data provided to the Academy by SRP (24). This new EIS should formally address the NAS criticism and justify the tax expenditures for solidifying the SRP high level waste before a geologic repository will be available, especially comparing the cost of storing the solidified HLW until such a repository is available against having waited until the repository would have been concurrently available before constructing the DWPF. This analysis should use actual HLW tank costs and not the inflated costs in the proposed congressional line item No. 84-SR-037 (23).	See the response to comment Q-29.
Q-37	15. The L-Reactor EIS (5; and other documents: e.g., cf., 6, 7) reviewed the groundwater concentrations of chlorinated hydrocarbons in the M-Area, but made only passing reference to unspecified hydrocarbons in other areas of the plant (cf. 5, p. M-270). This should be detailed by specific type wherever they exist. As well, all hazardous chemicals and potentially hazardous chemicals should be assessed and listed in the published data tables in the new EIS. The data tables for a particular monitoring well should include all chemicals and radionuclides in one table per well, in an easily accessed manner. (Compare the difficulty of determining the significance of the data listed in the L-Reactor EIS, Tables F-14 and F-15 with pages F-85 ad F-99, reference 5.)	This EIS characterizes the radiological and chemical composition of waste sites in Appendix B, including those sites having significant concentrations of chlorinated hydrocarbons. Also see the responses to comments B-4 and Q-8.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
Q-38	16. In a 1981 internal DOE memorandum (25), DOE stated "...present SRP burial ground operations do not comply nor are they compatible with RCRA hazardous waste regulations if applied to mixed hazardous wastes." Part of the reason for noncompliance is that SRP used underground tanks to store hazardous chemical wastes (5, 7, 8). What is being done to correct this problem?	See the responses to comments A-16 through A-19 and comment Q-29.
Q-39	17. The low level waste (beta-gamma) incinerator has not been publicly reviewed in an EIS and should be assessed in this EIS. Costs (construction and operational), airborne and solid releases, and a comparison to applicable standards should be provided. The types of materials incinerated along with appropriate experimental statistics of the incineration process should be provided and discussed.	Chapter 1 discusses the low-level (beta-gamma) waste incinerator and other approved projects that are being implemented. Appendix D also discusses the use of incinerators as a predisposal technique. Section 4.3 assesses alternative new disposal facilities for wastes, including ash from incinerators.
Q-40	18. In the past, despite legal requirements to do so, the DOE has apparently tended not to publish fully, e.g., discrepancies between public SRP monitoring reports versus internal SRP monitoring reports (13, 14); SRP slider-turtle radioactive strontium-90 contamination (6, 13); and, SRP plutonium-238 contaminated combustible waste generation of dangerous levels of hydrogen gas (14). The new EIS should review what safeguards DOE has implemented to assure the public that the public's interests and right-to-know will be protected.	See the responses to comments Q-3 and Q-7.
Q-41	19. The environmental impact at SRP of DOE 5820.2 as a change from AEC 0511, Radioactive Waste Management (26), should be assessed within the new EIS.	See the response to comment Q-1.
Q-42	20. The new EIS should assess the cost and impact of having the SRP regulated by the NRC and the EPA for SRP radioactive waste management. Differences between commercial regulations and DOE regulations should be highlighted. The DOE should justify its right to self-regulate radioactive wastes.	The cost and impact of having the SRP regulated by the NRC is outside the scope of this EIS. Compliance of new low-level radioactive disposal facilities with applicable regulations is discussed in Section 4.3.

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
Q-43	21. The new EIS should explain what is happening to congressional underrun funds from SRP construction projects, whether or not underrun funds are turned back to the U.S. Treasury, and if so how much, whether or not underrun funds discourage cost efficiencies, whether or not construction cost indexes on waste management construction projects should be published, and whether or not funding abuses have occurred in the past at SRP (23).	These comments are not within the scope of this EIS.
Q-44	22. The effectiveness of the various environmental release and dose consequence models used by SRP should be discussed in the new EIS, especially calibration and validation of the models (e.g., NOAA models, DOSETOMAN, etc.).	The 1984 annual monitoring report discusses the use of environmental release and dose consequence models, in addition to quality assurance and validation. The EIS discusses assumptions and methods used to calculate radiological doses presented in Appendix H.
Q-45	23. The SRP decided (27) in 1977 to continue the use of seepage basins at SRP, despite the 1973 AEC regulation requiring seepage basins and other natural soil columns, not allowed in the commercial sector, to be phased out (26). Considering the $64 million clean up costs of the single M-Area seepage basin (4), that the DOE no longer prohibits the use of seepage basins and natural soil columns (3), and that the L-Reactor will enter into service another seepage basin this year (5), discuss in the new EIS why the DOE feels it is acting in the best interest of the public in the protection of the SRP environment, especially the groundwater underlying SRP (cf. the DOE policy, reference 5, p. F-111).	See the response to comment Q-2.
Q-46	24. The planned EIS should justify the disposal of saltcrete in the SRP environment and should discuss predicted groundwater levels of contamination directly under the saltcrete.	The disposal of saltcrete from the DWPF was assessed in the final EIS for the Defense Waste Processing Facility (DOE/EIS-0082) and is not within the scope of this EIS. Immobilization of other low-level radioactive waste in saltstone or concrete monoliths is discussed in Appendix D.
Q-47	25. The SRP proposed FY 1985 budget proposed reducing the number of groundwater monitoring wells observing the migration of radionuclides migrating from the SRP low level radioactive waste burial grounds (13). Discuss whether or not this cut back was effected and justify the cut back in light of the indicated increasing levels of radionuclide migration in the SRP burial grounds between 1977 and 1981 (8, 13, 18).	Chapter 5 discusses ongoing and planned monitoring programs.

Table K-2. Scoping comments and DOE responses

Comment number		Comments	Responses
Q-48	26.	Discuss the status of the transuranic (TRU) combustible waste generation of hydrogen gas problem and the concerns of the transportation over public highways of this TRU combustible waste to the WIPP facility in New Mexico.	See the response to comment Q-29.
Q-49	27.	Discuss the operational usage of all 51 HLW tanks at SRP. Discuss the concerns of using cooling well water in the HLW tank farm with water drawn from the important Tuscaloosa aquifer, especially discussing the potential pathway for contaminants into the aquifer via these cooling water wells.	See the response to comment Q-29.
Q-50	28.	What is the disposition of the SRP inventory of 32,536,000 pounds of depleted $^{UO}3$? What are the environmental consequences at SRP of having retained this material at SRP?	Inventories of SRP material that are not wastes are not within the scope of this EIS.

REFERENCES

1. Department of Energy,, Waste Management Activities for Groundwater Protection at the Savannah River Plant, Aiken, SC; Intent to Prepare an Environmental Impact Statement, Federal Register, 50 (81), 16534-16535 (1985).

2. Letter to C. Benge, Inspector, DOE Inspector General's Office, from W. F. Lawless, "DOE Order 5820.1 (Management of Transuranic Contaminated Material) and draft DOE Order 5820, Radioactive Waste Management," August 27, 1983.

3. U.S. Department of Energy Order 5820.2, Radioactive Waste Management (1984).

4. Department of Energy Acting to Control Hazardous Waste at its Savannah River Nuclear Facilities, U.S. General Accounting Office report to the Honorable Ernest F. Hollings, United States Senate, Rep. GAO/RCED-85-23 (1984).

5. Final Environmental Impact Statement, L-Reactor Operation, Savannah Rier Plant, Aiken, SC, U.S. Department of Energy 3-Volume Rep. DOE/EIS-0108 (1984).

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	6. Environment Monitoring at the Savannah River Plant, Annual Report for 1982, Savannah River Plant Rep. DPSPU 83-302 (1984).	
	7. Technical Summary of Groundwater Quality Protection Program at Savannah River Plant, Volume I, Site Geohydrology and Solid Hazardous Wastes, a Savannah River Plant Rep. DPST-83-928 (1983).	
	8. Final Environmental Impact Statement, Waste Management Operations, Savannah River Plant, Aiken, SC, U.S. Energy Research and Development Administration Rep. ERDA-1537 (1977).	
	9. Environmental Monitoring in the Vicinity of the Savannah River Plant, Annual Report for 1982, Savannah River Plant Rep. DPSPU 83-30-1 (ca. 1983).	
	10. An Airborne Radioactive Effluent Study at the Savannah River Plant, a U.S. Environmental Protection Agency Rep. 520/5-84-012 (1984).	
	11. Final Environmental Statement Related to the Operation of Vogtle Electric Generating Plant, Units 1 and 2, a U.S. Nuclear Regulatory Commission Rep. NUREG-1087 (1985).	
	12. W.F. Lawless, Savannah River Plant (SRP) Burial Ground, Building 643-G, Management Appraisal Report, Appraised June 2-13, 1980, a U.S. Department of Energy Savannah River Operations Office draft report (1982).	
	13. Letter to C. Benge, Inspector, Department of Energy, Inspector General's Office, from W. F. Lawless, SRP Burial Ground Appraisal Report (BGAR), August 4, 1983.	
	14. The Department of Energy, Savannah River Operations Office response to the August 13, 1984 letter from Congressman John Dingell to Secretary Donald R. Hodel. The update of the 1980 Burial Ground Appraisal report is Attachment 4.B.	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	15. W. F. Lawless, K. G. Brown, Management Appraisal Report, Savannah River Plant (SRP) Tank Farm., a U.S. Department of Energy Savannah River Operations Office report (1981).	
	16. W. F. Lawless, K. G. Brown, B. M. Dodge, Performance Audit Questions, Savannah River Plant (SRP) Tank Farm, a U.S. Department of Energy Savannah River Operations Office draft report (1982).	
	17. W. F. Lawless, The Savannah River Plant: Hazardous and Radioactive, Comments on a Panel's Review and Findings of Ongoing Health Effects and Epidemiological Studies of Operations at the Savannah River Plant (1985).	
	18. Environmental Monitoring at the Savannah River Plant, Annual Report for 1981, SRP Rep. DPSPU 82-302 (1984).	
	19. Letter to R. L. Morgan, Manager, DOE-Savannah River Operations Office, from W. F. Lawless, transmitting reference 16, February 8, 1985.	
	20. C. Nandrasy, DOE-Savannah River Public Relations Office, personal communication, February 8, 1985.	
	21. "The Lost Mercury at Oak Ridge," News and Comment, Science, 221, 130-132 (1983).	
	22. B. A. Fenimore, "Atomic Bombs, Chemical Wastes," Environment, 26, 2-3 (1984).	
	23. Letter to A. Walters, Inspector, Department of Energy Inspector General's Office, from W.F. Lawless, Change Room Facility, Building 241-58H, S-3932, July 26, 1983. Attachment 6, FY84 Budget Validation, SRP Project No. 84-SR-037, Congressional line item for 4 high level waste tanks.	
	24. Radioactive Waste Management at the Savannah River Plant: A Technical Review, National Academy of Sciences Press (1981).	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	25. Internal DOE-Savannah River Memo Route Slip with Attachment I, comments on th possible implementation of RCRA at SRP, from T. B. Hindman, Jr., Director Waste Management Project Office, DOE-Savannah River, to W.A. Reese, Director Safety and Health Division, May 19, 1981.	
	26. U.S. Atomic Energy Commission Manual Chapter 0511, Radioactive Waste Management (1973).	
	27. W.L. Marter, New Criteria for Seepage Basin Use, a Savannah River Plant Rep. DPST-77-444 (1977).	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	ATTACHMENT	

Performance Audit Questions

Savannah River Plant (SRP) Tank Farm

Report Date

8-12-82

W. F. Lawless
K. G. Brown
B. M. Dodge

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
	<u>Personnel</u>	
1.	What is the exposure history for personnel in the tank farm and burial ground?	
2.	Incidents 241-FH-81-6, WMI-82-5-8, and WMI-81-10-21 discuss skin contamination of waste management supervisors. What training on procedures and radiation protection is required for supervisors? How can management track the level of training and correlate the number of incidents that occur to deficiencies in training? What procedures can be incorporated to reduce the "personnel error" reason offer for incidents?	
3.	Please provide us with organizational charts and responsibilities for waste operations and waste technology, as well as personnel time in the job.	
	<u>Tank Farm</u>	
1.	What are the estimated curies, hazardous or potentially hazardous, and mixed substances released (initial or contained loss of control; e.g., spill) to the environment (by species, curies, volume and weight) from the tank farm, excluding the seepage basins?	
2.	DPSPU-79-302 gives the amount of radioactivity per tank farm monitoring well. What impact on groundwaters have these nuclides had? What tank farm monitoring wells are not covered in DPSPU-79-302 and what data has been obtained from these wells?	
3.	What are the yearly release guides and actual annual and cumulative releases for each operational unit in the tank farm (i.e., tanks, diversion boxes, etc. excluding seepage basins) since they were placed into radioactive service? Have the releases from the tank farm migrated and, if so, describe the limit of migration? Update pages 348-349 of ERDA 1537.	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
4.	DPSTSY-200-8, pages 5-6 state that "No incidents since 1959 that resulted in or would result in ground water or surface contamination are noted in the data base." Is this saying that no incidents have happened to this effect since 1959? Please update this statement.	
5.	What is the current status (movement rate and distance) of the migrating nuclides and their long-term impact (by migrating species) around Tanks 8 and 16?	
6.	DPSPU-79-302 gives nuclide migration for the area around Tank 8. What other nuclide migration is there in and around the tank farm? Please provide any trend analyses that have been made on these areas.	
7.	What are the yearly release guides and actual releases for each evaporator? Characterize the releases (i.e., liquid and airborne amounts by radioactive species and curies). Describe the monitoring methods for evaporators. Are evaporators inspected routinely for leaks, cracks, etc.?	
8.	What is the status of the waste tank farm transfer system? What is the condition of the operational units and their expected remaining life time, i.e., diversion boxes, evaporators, etc.? Are all systems presently operational? What are the retirement and D&D plans? (Include the interarea transfer line.)	
9.	Please provide us with the latest list of waste management DPSOPs and DPSOLs.	
10.	Is chloride induced tape employed anywhere in the tank farm? Is it used on stainless steel? If so, where?	
11.	Are air flow monitors installed in transfer lines to assure proper connections are made? If not, how are proper connections determined?	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
12.	For each of the Liquid Waste Surveillance Methods listed in Figure 10, p. 22, of the SRP Presentation to NAS panel on SRP wastes (10-17-78), what is the respective probabilistic statistical effectiveness (i.e., % known and probability assurances)? What is the probability of waste (by volumes and curies) lost into the environment or unaccounted for as a result of the balance checks? (c.f. p.6, Chromate Water Piping Leak, DPSP-81-21-6). How is the loss to the environment determined?	
13.	Please provide us with a copy of tank farm incident experience since the beginning of operations. Tabelize and classify the incidents similar to those in DPSTSY-200-6, p.6-3.	
14.	What is the calculated criticality in the different tank types? How does the actual content of fissile materials in the tanks compare to this? When was the last criticality audit performed in the tank farm? What were the results of the audit?	
15.	What are your requirements and procedures for reporting spills or leaks as they relate to the Superfund Act of 1980?	
16.	What are your procedures for reporting tank farm operating incidents? When do you notify DOE? What is your follow up procedure once the problem has been resolved?	
17.	What is your preventive maintenance program for each tank farm facility and piece of equipment (specifically pumps, generators, cranes, etc)? Are failure histories maintained for performance of trend analyses? How are results of trend analyses factored back into the preventative maintenance program?	
18.	When a leak occurs in a transfer line (CTS, interarea, etc.), how is it detected then pinpointed? How long does this process take (average time, historical maximum time)? What impact does it have on operations, programs, and the environment? Can cost effective improvements be made in this area?	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
19.	If a monitor alarm sounds during a transfer (from the canyon to a pump pit, pump pit to tank, tank to evaporator, etc), is the transfer stopped? Discuss how much waste (or liquid) will continue down the line, and how long it will take to reach a final destination. Is the transfer stopped as soon as the alarm sounds?	
20.	In August and September 1981, a series of alarms occurred in H-Area Leak Detection Box-2 (LDB-2). Initially, no radiation was found in the box and the alarms were attributed to moisture. However, when the drain downstream from the box was purged with dry air, activity from 350 to 2000 mrad was subsequently found in the box. What are your procedures for investigating a monitor alarm? Explain why the procedure failed to detect the leak in LBD-2. (DP-81-125-3).	
21.	What are the currently projected waste transfer costs and time schedule for sludge removal, salt removal, sludge processing, salt processing, and chemical cleaning? Show capital and operating costs (or design, construction), start up and completion dates by task, year, and tank.	
22.	What is the technical basis for the tank chemistry control sampling schedule? Please provide us with a copy of the schedule.	
23.	What risks are assumed by the following modifications to the operating criteria of the tank farm: a. Use of evaporator feed tanks as low heat waste receivers; b. Use of the additional 300,000 gallons of tank space in salt tanks; c. Continued use of a Type I tanks in F-area as an emergency spare; and	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses

d. Use of one Type III tank as an emergency spare to cover both F and H areas?

Will an additional Type III tank be used when one is eventually emptied?

24. Why is the interarea line inadequate for transferring processed sludge from F to H area, but is adequate when using only one Type III tank as an emergency spare for both areas?

25. What is the impact of the out-of-specifications thicknesses on the longevity of Tanks 35 and 36? What is the impact of the out-of-specifications flatnesses on the longevity of Tanks 43 and 50?

26. Are Type III encasements (cement-asbestos jackets) used for transfer line designs today? Are there any Type III encasement lines in use today? If so, are the rubber seals checked routinely for degrading? (DPSTSA-200-3, p.3.171).

27. In the April 1982 Waste Management Programs Report (OPSP 82-21-4), Tables 4 and 14 give the following data:

	Table 4 (gal)		Table 14 (gal)	
	F-Area	H-Area	F-Area	H-Area
Evaporator Feed	541,585	389,378	525,000	338,000
Concentrate	360,301	297,782	403,000	245,000
RBOF fed to CRC	215,970	0	224,000	114,000
Seepage Basin	238,670	141,650	230,000	114,000

Why are the figures in these tables different? What are the correct figures? What method is used in previewing draft copies of the monthly report to preclude these types of discrepancies?

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
28.	In construction, what are your criteria and procedures for accepting design variances to construction specifications? *Are design variances separated into critical and* non-critical acceptance procedures? If so, how is this categorization determined and put into practice? Specifically discuss the criteria and procedures for accepting variances in Tanks 43 and 50. Be sure to include a discussion as to why a variance was chosen rather than complying with specifications.	
29.	What are your management controls that assure DOE that a subcontractor is meeting requirements? *Explain how these* controls were exercised in the following cases: a. Failure to meet flatness specifications in Tanks 43 & 50? b. Discovery of a rolling defect in Tank 45; c. Insufficient gritblasting in most tanks, an overblasting in Tanks 38 and 41; and, d. Stress relieving Tank 50 twice. Answer specifically: 1. Why did these problems occur? 2. Who corrected these problems (if corrected)? 3. Was the subcontractor held responsible financially? 4. Were the best interests of the government taken care of in this cost conscious period?	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
30.	The QA audit of Tank 45, DPSP 80-72-2 (3-5-80), checklist 2, states that "Plates shall be inspected for cold laps, surface imperfections, stringer separation at edges." It further states that the primary plates were inspected, defects identified and repaired. However, on 5-1-81, a defect was found on the tank bottom after gritblasting for pit inspection. Subsequent repair and inspection concluded that the defect was "a rolling defect in the original plate." (Metallurgical Report, 12-15-81, "Linear Defect Repair - Waste Tank 45). According to the audit, this defect should have been catalogued and repaired. Who performs your quality assurance inspections? Are they chosen by qualifications, i.e., an electrical engineer inspects electrical systems, a metallurgist inspects for material defects, etc.?	
31.	In Tank 38, a source of communication between the primary and annulus tanks resulted when a design change made in the field was not coordinated with construction procedure changes. What are your procedures for coordinating design changes with the other organizations involved in the project?	
32.	Every new tank built at SR is redesigned. Is this cost effective and efficient? The planned FY 1984 waste tank design costs are estimated at $9,400,000 compared to a design costs of $3,715,000 (based on 8.84% on $42M) for Tanks 41 and 51. Since the FY 84 tanks are duplicates of the last tanks built, why isn't there a decrease in cost due to economies of scale? Why are the tank costs escalated at the last tanks' authorized cost instead of the actual costs? In addition, since inflation is abating and is expected to be lower than a double digit rate, why have the FY 1984 tanks' projected costs been escalated at _____ %? (figures are based on conceptual design reports)	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
33.	Since January 1982, water or water marks have been observed in the annuli of 21 of the 43 double wall waste tanks (8 tanks are single wall). What is the cause of this inleakage? How is the cause determined? How is the problem corrected? How can you assure secondary containment if inleakage has occurred? Why weren't these errors (in Tanks 38-51) detected and corrected during tank fabrication and prior to tank service?	
34.	During construction of Tanks 38-51, chemically treated plywood place on tank floors for protection resulted in ferrous orthophosphate pitting of the floors. Also, modifications to mechanical agitation pump motor stands resulted in broken shafts. Additionally, decontamination efforts of a failed feed pump in 299-H severely damaged the motor (draft WM operations and surveillance monthly report, July 1982, p.10). What are your procedures for evaluating safety methods for potential detrimental effects?	
	<u>Seepage Basins</u>	
1.	How long does it take tritium and groundwater to move from the seepage basins to Four Mile Creek? Specifically, show how these migration rates are determined.	
2.	What are the yearly release guides and releases, annual and cumulative, to the seepage basins (F, H, and combined)? What are the yearly release guides (migrated) and releases, annual and cumulative, from the seepage basins to Four Mile Creek (F, H, and combined)? How many times have the absolute limits been exceeded in the history of the seepage basins? What measures are taken if the releases exceed the release guides in any year? What is the justification for the action?	
3.	One of the basins in H-area has been "abandoned in place". What provisions have been made to stop airborne contamination? Similarly, what is done to stop airborne releases from the exposed, dried out portions of the basins?	

Table K-2. Scoping comments and DOE responses

Comment number	Comments	Responses
4.	What are your closure plans for the seepage basins (as requested by SCDHEC)? When will these plans be completed?	
5.	What is the status of the migration of nuclides and hazardous elements in retention and seepage basins? The following elements are known to be in the basins: Ru-103, 106; Cs-137; H_3; Ce-144, 141; Sr-89, 90; Zr-95; Nb-95; I-131; Pu-238, 239; and U-238. What other elements and compounds are in the basin and in the environment (classify as to radioactive, hazardous, mixed, and unknown impact with estimated volumes, weights, and curies)? Also, what has migrated to Four Mile Creek by monitoring results?	
6.	How are overflow constraints for seepage basins enforced to maintain the level within 8 inches of the top? Is there a correlation with discharge amount? What are the backup systems for overflow and basin leakage? Please provide a list of overflow incidents and their impact on the environment (include migration, settlement of elements, resuspension, curies and biological parameters).	
7.	Are non-radioactive or mixed materials sent to the seepage basins monitored routinely? What are the results of chemical analyses on fluid sent to seepage basins? Are all chemicals identified? What are the release guides for these chemicals sent to the seepage basins? What non-radioactive or mixed contaminants have been found in the SRP monitoring program? (DPST-77-444, p.12).	
8.	The chemicals that would be released if fluid was sent directly to Four Mile Creek instead of seepage basins would exceed NPDES requirements. When fluid is sent directly to Four Mile Creek, what analyses is made to verify that the non-radioactive chemicals are in compliance with NPDES requirements? What type of fluid is sent directly to Four Mile Creek? What are the Four Mile Creek monitoring results? (Meyer to Stetson, 9-26-77).	

Table K-3. Scoping Topics and Appropriate EIS Sections

Comment number	Scoping topic	EIS section
A-1	Regulatory requirements	Ch. 6
A-2	Regulatory requirements	Ch. 1, 6
A-3	Regulatory requirements	Ch. 6
A-4	Regulatory requirements Future laws/regulations	Ch. 6 Outside the scope of this EIS
A-5	Affected environment Environmental studies	Ch. 3, Appendixes A and B Ch. 5
A-6	Waste site characterization	Appendix B
A-7	Waste site characteristics	Ch. 2, 4
A-8	Changes in waste generation	2.3.2, 4.3.1
A-9	Predisposal technologies	2.3.2, 4.3.1, Appendix D
A-10	Predisposal technologies	2.3.2, 4.3.1, Appendix D
A-11	Predisposal technologies	2.3.2, 4.3.1, Appendix D
A-12	Research studies	Outside the scope of this EIS
A-13	Regulatory requirements	Ch. 6
A-14	Affected environment Regulatory requirements	Appendix B, Chapter 3 Ch. 6
A-15	Transportation of waste Regulatory requirement	4.5 Ch. 6
A-16	Waste storage	2.3, 4.3
A-17	Changes in waste storage	2.3, 4.3
A-18	Regulatory requirements	Ch. 6
A-19	Regulatory requirements	Ch. 6
A-20	Waste site characterization	Appendix B
A-21	SRP disposal of waste generated offsite	2.3, 4.3

Table K-3. Scoping Topics and Appropriate EIS Sections (continued)

Comment number	Scoping topic	EIS section
A-22	Affected environment	Ch. 3, Appendix A, B
	Environmental monitoring	Ch. 5
	Waste site characterization	Appendix B
	Assessment of impacts	Ch. 4, Appendixes F and G
A-23	Environmental impacts	Ch. 2, 4, Appendixes F through I
	Health effects	4.7, Appendix I
	Accident analysis	4.5
A-24	Environmental impacts	4.7
	Health effects	4.7, Appendix I
	Affected environment	Ch. 3, Appendixes A and B
A-25	Environmental monitoring	Ch. 5
A-26	Ecological impacts	Ch. 4
A-27	Regulatory compliance	2.1, Ch. 6
A-28	Atmospheric effects	Ch. 3, 4.2, 4.3
A-29	Current compliance status	Ch. 1
A-30	Regulatory requirements	Ch. 6
A-31	Regulatory requirements	Ch. 6
A-32	Environmental monitoring	Ch. 5
A-33	Regulatory requirements	Ch. 6
	Environmental monitoring	Ch. 5
A-34	Regulatory requirements	Ch. 6
	Remedial and closure alternatives	2.1, 4.2, Appendixes B and F
A-35	Regulatory requirements	Ch. 6
	Remedial and closure alternatives	2.1, 4.2, Appendixes B and F
A-36	Permitted facilities	Ch. 1
	Regulatory requirements	Ch. 6
A-37	Regulatory requirements	Ch. 6
	Implementation schedules	

Table K-3. Scoping Topics and Appropriate EIS Sections (continued)

Comment number	Scoping topic	EIS section
A-38	L-Reactor EIS	Ch. 1
A-39	L-Reactor EIS	Vol. 3 of the L-Reactor EIS
A-40	Regulatory requirements	Ch. 6
A-41	Regulatory requirements	Ch. 6
A-42	Predisposal technologies	2.3.2, 4.3.1, Appendix D
A-43	Predisposal technologies	2.3.2, 4.3.1, Appendix D
A-44	Regulatory requirements	Ch. 6
A-45	Environmental impacts	Ch. 4
A-46	Unavoidable and irreversible impacts	4.9
A-47	Regulatory requirements	Ch. 6
A-48	State authority for regulating waste	Ch. 6, Memorandum of Understanding
B-1	Regulatory requirements	Ch. 6
B-2	Remedial and closure alternatives New disposal facility alternatives Disassembly-basin purge water alternatives	2.1, 2.2, 4.2, Appendixes B and F Appendix G 2.4, 4.4
B-3	Health effects	Ch. 4, Appendix I
B-4	Affected environment	Ch. 3, Appendix A, Appendixes F through H
B-5	Environmental monitoring	Ch. 5
B-6	Remedial and closure alternatives	2.1, 2.2, 4.2, Appendix F
B-7	Atmospheric effects	4.2, 4.3, 4.7
B-8	Remedial and closure alternatives	2.1, 2.2, 4.2, Appendixes B and C
B-9	High-level radioactive waste	Outside the scope of this EIS

Table K-3. Scoping Topics and Appropriate EIS Sections (continued)

Comment number	Scoping topic	EIS section
B-10	Emission limitations	Ch. 6
B-11	Ongoing remedial actions	Ch. 1
B-12	Ongoing remedial actions	Ch. 1
B-13	Use of current data	EIS will use most current data available
D-1	High-level radioactive waste	Outside the scope of this EIS
D-2	High-level radioactive waste	Outside the scope of this EIS
D-3	High-level radioactive waste	Outside the scope of this EIS
E-1	Role of contractor in preparing EIS	Vol. 3 of the L-Reactor EIS
E-2	Environmental monitoring	Ch. 5
E-3	Environmental monitoring	Ch. 5
E-4	Groundwater contamination	Appendixes A and H
E-5	Ongoing remedial actions	Ch. 1
	Groundwater/surface-water relationships	3.4, 3.5, Appendix A
	Remedial and closure actions	2.1, 2.2, 4.2
E-6	Groundwater contamination	4.2, Appendix F, H
E-7	Health effects	Ch. 4, Appendix I
E-8	Regulatory requirements	Ch. 6
G-1	New disposal facility alternatives	2.3, 4.3
G-2	Affected environment	Ch. 3, Appendixes A and B
	New disposal facility alternatives	2.3, 4.3
G-3	Regulatory requirements	Ch. 6
G-4	New disposal facility alternatives	2.3, 4.3
G-5	Future laws/regulations	Outside the scope of this EIS
G-6	New disposal facility alternatives	2.3, 4.3

Table K-3. Scoping Topics and Appropriate EIS Sections (continued)

Comment number	Scoping topic	EIS section
G-7	Environmental monitoring	Ch. 5
G-8	New production reactor	Outside the scope of this EIS
	New disposal facility alternatives	2.3, 4.3
	Affected environment	Ch. 3, Appendixes A, F through H
I-1	Waste site characterization	Appendix B
	High-level radioactive waste	Outside the scope of this EIS
	Health effects	4.1, 4.2, 4.3, annual monitoring
I-2	Health effects	4.2, 4.3 4.4, Appendix I
I-3	Independent health effects study	Study needs evaluated by Centers for Disease Control, U.S. Department of Health and Human Services
I-4	Transportation of waste	4.5
J-1	Independent health effects study	Study needs evaluated by Centers for Disease Control, U.S. Department of Health and Human Services
K-1	Surface/groundwater impacts	4.2, 4.3, 4.4
	Cumulative hydrologic impacts	4.7
K-2	Endangered species	4.2, 4.3, 4.7
	Endangered species	Ch. 6
K-3	Regulatory requirements	Ch. 6
K-4	Environmental monitoring requirements	Ch. 5
	Regulatory requirements	Ch. 6
L-1	Current waste management projects	Ch. 1
	Regulatory requirements	Ch. 6
L-2	Regulatory requirements	Ch. 6
L-3	Remedial and closure alternatives	2.1, 2.2
	Environmental impacts	4.2
	Environmental monitoring	Ch. 5
L-4	Groundwater monitoring	Ch. 5

Table K-3. Scoping Topics and Appropriate EIS Sections (continued)

Comment number	Scoping topic	EIS section
L-5	Regulatory requirements	Ch. 6
L-6	Burial of decommissioned naval reactors	Outside the scope of this EIS
	New production reactor	Outside the scope of this EIS
L-7	Alternatives	Ch. 2, 4
M-1	Regulatory requirements	Ch. 6
N-1	Regulatory conflicts	1.1, 1.2, Ch. 6
N-2	Regulatory requirements	Ch. 6
N-3	Regulatory requirements	Ch. 6
N-4	Future laws/regulations	Outside the scope of this EIS
N-5	Predisposal technologies	Appendix D
N-6	Offsite treatment, storage, and disposal facilities	Evaluated in another EIS
N-7	Regulatory conflicts	1.1, 1.2, Ch. 6
O-1	Regulatory requirements	Ch. 6
	Environmental monitoring	Ch. 5
O-2	Current waste management projects	Ch. 1
	Regulatory requirements	Ch. 6
	Environmental impacts	4.2
O-3	Analysis of alternatives	Ch. 2
	L-Reactor seepage basin	Evaluated in another EIS
O-4	Response to comments	Appendix K
P-1	Waste material generated, stored, and disposed of onsite	2.3.2, 4.3.1
P-2	Regulatory requirements	Ch. 6

Table K-3. Scoping Topics and Appropriate EIS Sections (continued)

Comment number	Scoping topic	EIS section
Q-1	EIS for DOE Order 5820.2	Outside the scope of this EIS
Q-2	Remedial and closure alternatives Disassembly-basin purge water alternatives Analysis of alternatives	2.1, 2.2, 4.2 2.4, 4.4 Ch. 2, 4.2, 4.3, 4.4
Q-3	Professional review of EIS	Copies of draft EIS provided to Federal and State agencies having special areas of expertise
Q-4	Regulatory requirements Remedial and closure alternatives	Ch. 6 2.1, 2.2, 4.2, and Appendix F
Q-5	Professional review of EIS	See Q-3
Q-6	Environmental impacts	2.2, 2.3, 2.4, 4.2, 4.3, 4.4, 4.7
Q-7	Regulatory requirements	Ch. 6
Q-8	Content and quality of data in EIS	EIS will comply with requirements and intent of 40 CFR 1502.2
Q-9	EIS for DOE Order 5820.2	Outside the scope of this EIS
Q-10	Analysis of alternatives	Ch. 2, 4.2, 4.3, 4.4 Appendixes F, G
Q-11	Health effects	Ch. 4
Q-12	Groundwater contamination	Ch. 3, Appendixes A, F through I
Q-13	Modification of the NEPA process	Outside the scope of this EIS
Q-14	Environmental monitoring	Ch. 5
Q-15	Remedial and closure alternatives	2.1, 2.2, 4.2, Appendix F
Q-16	Regulatory requirements Remedial and closure alternatives Site dedication	Ch. 6 2.1, 2.2, 4.2, Appendix F 2.1, 4.2
Q-17	Atmospheric effects	4.2, 4.3

Table K-3. Scoping Topics and Appropriate EIS Sections (continued)

Comment number	Scoping topic	EIS section
Q-18	Remedial and closure alternatives	2.1, 2.2, 4.2, Appendix F
Q-19	High-level radioactive waste	Outside the scope of this EIS
Q-20	Emission limitations	Ch. 6
Q-21	Ongoing remedial actions	Ch. 1
Q-22	Ongoing remedial actions	Ch. 1
Q-23	Use of current data	EIS uses the most current data available
Q-24	Health effects	Ch. 4, Appendix I
	Decontamination and decommissioning costs	Outside the scope of this EIS
Q-25	Decontamination and decommissioning costs	Outside the scope of this EIS
Q-26	Site dedication	2.1, 4.2
Q-27	Cumulative impacts	4.7
Q-28	Burial ground	2.2, 4.2, Appendixes B and F
Q-29	Transuranic wastes	Outside the scope of this EIS
Q-30	Detailed reporting of meteorological monitoring data	Outside the scope of this EIS
Q-31	Groundwater contamination	Ch. 3, Appendixes A, F through I
	Content and quality of data in EIS	Complies with requirements and intent of 40 CFR 1502.2
	Detailed reporting of environmental monitoring data	Outside the scope of this EIS
Q-32	Monitoring data content and format	Outside the scope of this EIS
Q-33	Monitoring data format	Outside the scope of this EIS
Q-34	High-level radioactive waste	Outside the scope of this EIS

Table K-3. Scoping Topics and Appropriate EIS Sections (continued)

Comment number	Scoping topic	EIS section
Q-35	Defense Waste Processing Facility	Outside the scope of this EIS
Q-36	Defense Waste Processing Facility	Outside the scope of this EIS
Q-37	Waste site characterization	Ch. 3, Appendixes A, B, F through I
Q-38	Affected environment-waste storage	2.3, 4.3
	Environmental impacts of retrievable waste storage	2.3, 4.3
	Regulatory requirements	Ch. 6
Q-39	Compliance status of incinerators	Ch. 1
	Incinerators as predisposal technique for reducing waste volume	Appendix D
	New disposal facility alternatives	4.3
Q-40	NEPA requirements	Complies with requirements and intent of 40 CFR 1502.2
	Health effects	Ch. 4, Appendix I
	Atmospheric effects	4.2, 4.3
Q-41	EIS for DOE Order 5820.2	Outside the scope of this EIS
Q-42	Regulation of the SRP by the NRC	Outside the scope of this EIS
Q-43	Status of construction project funds	Outside the scope of this EIS
Q-44	Radiological dose assessment - models and assumptions	Appendix H
Q-45	Remedial and closure alternatives	2.1, 2.2, 4.2
	Disassembly-basin purge water alternatives	2.4, 4.4
	Analysis of alternatives	Ch. 2, 4.2, 4.3
Q-46	Defense Waste Processing Facility	Outside the scope of this EIS
Q-47	Environmental monitoring	Ch. 5
Q-48	Transuranic waste	Outside the scope of this EIS
Q-49	High-level radioactive waste	Outside the scope of this EIS
Q-50	Disposition of nonwaste products	Outside the scope of this EIS

APPENDIX L

COMMENTS AND DOE RESPONSES ON DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR WASTE MANAGEMENT ACTIVITIES FOR GROUNDWATER PROTECTION

During the 53-day public comment period from May 8 through June 30, 1987, the U.S. Department of Energy (DOE) received 23 comment letters and statements on the Draft version of this Environmental Impact Statement (DEIS). One of these letters was received after June 30, 1987. Of the total of 23 letters and statements, 4 were from Federal agencies and 4 were from agencies and offices of the States of Georgia and South Carolina. Eleven statements were presented at public meetings conducted by DOE at Savannah, Georgia, and Aiken, South Carolina, during the week of June 1, 1987. Approximately 500 comments have been addressed by DOE in this EIS.

This appendix presents each comment letter and statement and DOE's responses. If a comment or statement has led to a revision to the text of this EIS, the revision is identified by a vertical line in the margin in the appropriate section with a comment letter-number designation. Table L-1 lists the sources of comments received, and Table L-2 lists the individual comments and DOE responses.

The comments and statements reflected a number of specific and general issues. The following sections summarize the major issues and DOE's responses.

COMMERCIAL REACTOR/NUCLEAR REGULATORY COMMISSION (NRC) REGULATIONS

Comments generally reflected the need or desirability of employing NRC regulations at DOE production facilities. This comment was also associated with the need for independent peer review or oversight. See below.

DOE's responses generally indicated that their operations were governed by the Atomic Energy Act and specifically that commercial (NRC) reactor operations rules and regulations (NUREGS) do not apply.

COMPLIANCE WITH RCRA/HSWA AND CERCLA/SARA

Comments in these areas frequently dealt with DOE's perceived lack of adherence to and compliance with the hazardous waste/substance acts and their amendments. Issues included citations of the LEAF vs. Hodel case; solid waste management unit (SWMU) requirements; definition of solid/hazardous waste terms as used in the EIS; groundwater corrective/remedial actions; maximum contaminant levels/alternate concentration levels (MCLs/ACLs) or background levels and lack of site-specific information; emerging regulations, technologies and standards; permitting of facilities; and continuing releases [S 3004(u)] of RCRA.

DOE's responses generally indicate their active compliance with RCRA and HSWA at the SRP. Numerous examples of compliance are given (i.e., Sitewide Part A and site-specific Part B permit applications; closure of M-Area Settling Basin and F- and H-Area Seepage Basins; and groundwater (recovery) remedial action at M-Area wells). Chapter 6 of the EIS summarizes DOE compliance with RCRA and other groundwater assessment activities. The responses to definitions of terminology in the EIS note that the terms are used to indicate the potential contents of existing waste sites, largely for convenience in the EIS. DOE responses to comments on background levels vs. MCL and ACL note that these levels are largely health-based standards that provide a uniform numerical basis for groundwater transport modeling and estimation of human health and environmental risks. The response to comments on MCLs for certain organic compounds notes that they were proposed in November 1985 and finalized in July 1987. Only 2 or 3 of these compounds were appreciably changed in proposed vs. final MCL concentrations.

DOE's general response to comments on emerging technologies, regulations, and standards is that they will be considered by DOE as appropriate when they become available to the public. Comments on permitting of facilities bring DOE to reply that such activities are part of ongoing and future interactions with regulatory agencies following the Record of Decision (ROD) on this EIS.

The subject of continuing release sites has been adequately considered by DOE. Letters to EPA Region IV and site inspections (i.e., RCRA Facility Assessments) have covered this area thoroughly, and any apparent discrepancies in EIS lists vs. DOE letters will be resolved in the future. Tables noting the current status of all sites within the scope of the EIS (i.e., "criteria waste sites") are included in this final EIS.

OVERSIGHT/PEER REVIEW

These comments call for independent outside peer review and oversight of a variety of activities beyond waste management at the SRP.

Noting that the scope of this EIS is to assess the environmental impacts of waste management modification, comments on oversight or peer review of other activities are considered by DOE to be out of scope. DOE also replied that adequate peer review of the EIS and its supporting documents is made available and possible through the mandated NEPA process (i.e., public hearings, cognizant Federal agency involvement, news media advertisement, public reading rooms, extensive scientific data, and other forums).

GROUNDWATER MONITORING

Comments on this topic ranged widely, from adequacy and locations of wells, length of monitoring programs, and sample treatment, to the lack of level of data detail presented in the EIS, and standards.

DOE has responded generally to these comments by noting that it is negotiating with SCDHEC and EPA to identify groundwater monitoring requirements for solid waste management units. The comments on standards were answered above. DOE notes that detailed and updated groundwater monitoring data are presented in the Environmental Information Documents (EIDs) prepared for this EIS and in SRP annual environmental reports. DOE has also responded that extensive groundwater monitoring programs have been implemented since 1981 or earlier at some sites. Data reliability, methodologies, QA/QC, and related topics are also covered in the site EIDs and related documents.

CONTAMINATION OF DEEP AQUIFERS/HEAD REVERSAL AND OTHER RELATED HYDROGEOLOGIC TOPICS

Comments in these areas were wide-ranging, dealing with groundwater flow velocities and directions; movement of groundwater offsite; vertical hydraulic gradients; contamination of the "Tuscaloosa" aquifer; continuity of clay aquitards; and construction of new disposal facilities in groundwater recharge zones.

DOE's responses to these comments reflect inclusion of current, updated information. New tables and figures showing new head reversal information have been incorporated in the EIS. Information related to groundwater flow and directions has been revised as appropriate. Information on the possible transient contamination of the "Tuscaloosa" aquifer with organic compounds is presented. DOE has emphasized that there is no likelihood of offsite groundwater contamination as a result of SRP operations. Recovery wells operating in the M-Area have removed significant amounts of volatile compounds from groundwater since beginning pilot and full-scale operations and have successfully contained the contaminant plume. New disposal facilities, as currently conceived, will be established in areas meeting siting requirements and criteria of EPA and SCDHEC.

VALIDITY AND ACCURACY OF GROUNDWATER CONTAMINANT TRANSPORT MODELS

Many comments dealt with groundwater contaminant transport model issues and questioned the relationship of the PATHRAE model (originally a radionuclide transport model) as suitable for chemical constituents, criteria for selection of modeled constituents, background vs. MCL levels (see above) used in modeling, and results of modeling and their applicability to site-specific actions.

DOE has responded generally and specifically to comments on PATHRAE, noting that the model was used both for radionuclide and chemical transport (after modification) in a comparative manner to assess the alternative waste management strategies developed in the EIS. DOE has emphasized that site-specific decisions will not be based on modeling results, as they are preliminary and only future regulatory interaction will affirm the site cleanup decisions that are made. Specific issues of the comments usually are resolved by details in the supporting EIDs referenced in Appendix H of the EIS. External independent peer review of PATHRAE has been documented; its validity and accuracy are stated in revisions to the Summary and Appendix H of this final EIS.

NEW DISPOSAL/STORAGE FACILITY SITING CRITERIA

Comments on siting new disposal/storage facilities were directed toward the methodology used by DOE in the final choice of candidate sites and concerns over geohydrologic characteristics (i.e., "vulnerable hydrogeology," such as recharge zones and hydraulic barriers). Comments noted emerging EPA criteria based on these concerns.

DOE has responded by noting that interactions will be effected with regulatory agencies prior to final disposal site selection and by noting the need for additional site-specific hydrogeologic studies. DOE has also noted that the Sitewide Baseline Hydrogeologic Investigation was completed in 1987. DOE has cited SCDHEC and NRC siting and waste management regulations as protective of groundwater and noted that new facilities will include engineered technologies to assure essentially zero releases.

Responses on methodology of site selection have been made as well as revisions to Appendix E of the Draft EIS. Tables and figures have been incorporated to provide further information concerning site selection.

ALTERNATIVE STRATEGIES AND TECHNOLOGIES

Comments on these topics dealt with several aspects of the programmatic/project-specific actions assessed in the EIS. Public preference for the Elimination strategy was evident. Disproportionate distribution of costs and occupational risks of the Elimination strategy in the radioactive burial grounds obscured similar effects of remaining existing waste-site cleanup for some reviewers. The linkage of the three waste management actions (i.e., removal of waste with closure and remedial actions, establishment of new disposal/storage facilities, and discharge of disassembly basin purge water) was cited as a concern. The number of sites selected to receive waste removal actions also caused frequent comment.

DOE responses noted particularly that no waste management strategy will be selected until after the ROD and subsequent regulatory interactions are completed. Costs of waste management actions have been revised in Appendix E and Chapter 2. Radioactive burial ground costs have been revised to show breakouts of segments of the facility and are shown separately in several tables. DOE enlarged its discussions on the association of the waste management strategies and responded that the exact number of sites selected for removal actions under the Combination strategy will be decided after the ROD, further site characterizations, and regulatory agency interactions.

WEAPONS PRODUCTION AND DEPLOYMENT

These topics were commented on by several reviewers. DOE's response is that for this EIS, such comments are considered out of scope.

CURRENCY OF ENVIRONMENTAL DATA

Several reviewers noted that data in some tables appeared to be out of date. DOE has made extensive revisions of data tables based on the final EIDs and the most current SRP Environmental Report.

DISCHARGE OF DISASSEMBLY BASIN PURGE WATER

Reviewers commented on the DOE preferred alternative to continue to discharge the tritium-containing stream to active reactor seepage basins as being less than desirable or unacceptable. DOE responded that alternatives for management of disassembly basin purge water have an extremely high cost-benefit when compared to current guidelines. Implementation of detritiation would result in a cost of over $3 million per person-rem averted; evaporation to the atmosphere would cost about $0.5 million per person-rem. Guidelines cited by DOE indicated that $1000 per person-rem is an acceptable cost-benefit level. The radioactive decay advantages of seepage basin discharge were noted, as were the very low off-site population doses resulting from drinking water. These off-site doses are below DOE guidelines and primary drinking water standards.

COST OF CLEANUP AND NEW DISPOSAL FACILITIES

Costs were noted to be high by some reviewers. DOE has responded that costs have been revised (Moyer, 1987*), that they are preliminary study estimates, and that they would be revised in conceptual design stages of projects following selection of site-specific remedies and new facility designs.

AVAILABILITY OF REFERENCES AND SUPPORTING DOCUMENTS

DOE responded that all references (over 250) cited in this EIS are available in the public reading rooms set up for the purpose of public review. References to these documents are made in the EIS as appropriate.

*Moyer, R. A., 1987. Venture Guidance Appraisal Cost Estimates For Groundwater Protection Environmental Impact Statement, DPSP-87-1008, E.I. du Pont de Nemours and Company, Savannah River Laboratory, Aiken, South Carolina.

Table L-1. Comments and Statements Received on the Sitewide Waste Management Draft Environmental Impact Statement

Designation	Individual or Organization	Presented Oral Statement at Public Hearing
A.	U.S. Representative Lindsay Thomas	Mr. Derby Waters
B.	G. D. Crome, Contamination Control Services	Ms. Teresa Miller
C.	Energy Research Foundation (ERF) and Natural Resources Defense Council (NRDC)	Mr. James Chandler
D.	Greenpeace	Mr. James E. Beard
E.	W. F. Lawless (self)	Mr. W. F. Lawless
F.	Mr. R. Lewis Shaw (SCDHEC)	Mr. James Ferguson
G.	USGS Columbia Mr. Gary Speiran	--
H.	Ms. Barbara Gerth	--
I.	Synergistics Dynamics, Inc.	Mr. James Snedeker
J.	USEPA Region IV Mr. Joseph R. Franzmathes	--
K.	U.S. Dept. of Health and Human Services Mr. John C. Villforth	--
L.	Ms. Beatrice Jones	--
M.	League of Women Voters of South Carolina Mary T. Keller, Ph.D.	--
N.	League of Women Voters of North Beaufort County Dr. Zoe G. Tsagos	--
O.	Environmentalists, Inc. Ms. Ruth S. Thomas	--
P.	William A. Lochstet, Ph.D. (University of Pittsburgh, Johnstown)*	--

Table L-1. Comments and Statements Received on the Sitewide Waste Management Draft Environmental Impact Statement (continued)

Designation	Individual or Organization	Presented Oral Statement at Public Hearing
Q.	State of South Carolina Office of the Governor	--
R.	Georgia Department of Natural Resources	--
S.	Georgia Department of Natural Resources (July 28, 1987 - Transmitted to R. Lewis Shaw, retransmitted to S. R. Wright)	--
T.	--	Mr. Hans Neuhauser Georgia Conservancy
U.	--	Mr. Neil Dulohery Students for Environmental Awareness, University of Georgia
V.	--	Mr. Ken Matthews Savannah Area Chamber of Commerce
W.	--	Ms. Amy Estelle (self)

*For affiliation information only; Dr. Lochstet does not officially represent the University of Pittsburgh.

Comment number	Comments	Responses

TESTIMONY ON THE DRAFT EIS
OF THE DEPARTMENT OF ENERGY'S GROUNDWATER
PROTECTION PLAN FOR THE SAVANNAH RIVER PLANT

U.S. REP. LINDSAY THOMAS

June 2, 1987

I regret that the Congress is in session today, and I must therefore be in Washington in order to maintain my 100 percent voting attendance record. However, I appreciate this opportunity to present my views at this public hearing on the Department of Energy's draft environmental impact statement on the groundwater protection plan for the Savannah River Plant.

The Savannah River Plant in Aiken, South Carolina, is not, of course, in my Congressional District. However, my district does lie adjacent and downriver from the plant, and I maintain a strong involvement in developments concerning the SRP because of the potential health and environmental hazards which could impact on my District. I have made two lengthy personal visits to the SRP, and on one occasion was accompanied at my request by officials of the Georgia Department of Natural Resources in order to have the benefit of their expertise.

Table L-2. DOE Responses to Comments on Draft EIS
(Page 2 of 210)

Comment number	Comments	Responses
A-1	We are forced today to live with contaminated water resources at the SRP that are the legacy of the neglect and ignorance of the past! The weakness of the technology and level of environmental concern of the 1950's has given us a groundwater problem that is both dangerous and costly to resolve. We know that the old disposal techniques for hazardous and low-level radioactive and mixed wastes have contaminated two aquifers beneath the plant. It is possible that more problems will develop in the future which we do not anticipate today. What we have learned is that the environmental wonder of the natural recharging of our freshwater aquifers is a complex process about which our scientific knowledge is limited. Scientists though 30 years ago that natural processes would cleanse the waste of the SRP before it reached the aquifers. They were wrong.	The Summary, page S-1, has been revised to state that some aquifers have been contaminated as a result of previously acceptable waste management practices, which predated the environmental regulations derived from RCRA, CERCLA and SDWA.
A-2	What we do know with great certainty is that in this part of the country, we depend on the aquifers for life itself. They provide our drinking water, our industrial water, and water for agriculture. We also know that it takes much time and abuse to contaminate an aquifer. What we do not know is precisely how or if we can cleanse an aquifer once it has been contaminated.	Chapter 3, Section 3.4, of the EIS discusses offsite groundwater quality and uses by industry, the public, and agriculture. Over 50 percent of public drinking water supplies in the Southeast come from groundwater sources. Over 70 percent of the population drink groundwater.

Comment number	Comments	Responses
A-3	What we now need is a blueprint on how to proceed with the closure and cleanup of the waste management facilities at the SRP that are unsafe to our health and environment. We also must determine how we will take care of these wastes in the future.	Chapter 1 of the EIS presents the purpose and need of the proposed actions to modify waste management activities for the protection of groundwater, human health, and the environment at the SRP. The alternative waste management strategies being considered are discussed fully in Chapter 2.
	I am very pleased that Du Pont and the Department of Energy have recognized their obligation to the communities surrounding the SRP by developing the draft EIS. This statement lays out the possible alternatives to attempt to contain and eliminate the present groundwater contamination and to take actions to prevent further aggravation of this situation.	
	I am not a scientist, and so I cannot say which plan in the EIS may be the best technical plan to correct the current problems. I do know, however, that Du Pont and the Federal government cannot spare any expense in providing the most effective plan. We cannot compromise with public health and safety.	
A-4	Every effort must be made to contain the present contamination on site, and to clean the presently contaminated aquifers until the water is determined safe and drinkable under all Federal and state regulations.	Section 2.2 discusses the alternative waste management strategies being considered to remove contamination, close existing waste sites, and take groundwater remedial actions as required.

Table L-2. DOE Responses to Comments on Draft EIS
(Page 4 of 210)

Comment number	Comments	Responses
	In the past, there has been a tendency to spare no expense to build the nuclear weapons which we need for our national defense. But there has been a tendency to cut corners and take chances in the area of environmental protection.	
A-5	In hindsight, we may be able to forgive those shortcuts of the past because we were ignorant of the dangers of our actions. But today there is no excuse. We must ensure that there is no further contamination of either the upper or lower aquifers.	DOE plans to establish new disposal/storage facilities that will be designed for essentially zero releases of hazardous constituents to the environment, or as low as reasonably achievable (ALARA) for radioactivity.
	I think Department of Energy and the members of this panel for their work in conducting this hearing and working to resolve this problem. I assure the Department and my constituents that I will monitor this process, and I will accept no compromise of public safety and the final regulations.	
	Thank you again for this opportunity. My staff representative will remain at the hearing to report to me the comments of the other participants.	

Comment number	Comments	Responses
	PRESENTATION BY TERESA MILLER FOR MR. G. D. CROWE OF CONTAMINATION CONTROL SERVICES, INC. My name is G. D. Crowe, President and Owner of Contamination Control Services, Inc. As we all know, the toxic waste industry is currently in somewhat of a quandry. While millions of pounds of toxic and radioactive wastes have been buried in temporary burial sites around the country, millions of pounds more remain above ground, awaiting governmental decisions regarding permanent disposal techniques. DOE, DHEC, and DEPA are searching for solutions for permanent disposals, but such solutions are viewed as political suicide to those personally involved in the selection process. The culprit of the bureaucratic quagmire is the ability of existing disposal procedures to prevent contamination of groundwater supplies for a long enough period of time to allow complete decay of toxic wastes; that is, current contaminant equipment does not offer long-term groundwater control.	

Comment number	Comments	Responses
	All of us here are here because we are well aware and concerned about the problems I have just described as being most critical at the Savannah River Plant. My main objective is to make DOE, DHEC, EPA, and the public aware of the fact that I have developed a product from which a leach proof container with a combination of retrievable storage and above ground or below ground disposal units can be built and sealed. Savannah River Laboratory, along with Clemson University Ceramic Engineering Department in Clemson, South Carolina, has tested and approved this material as providing groundwater control for permanent radioactive waste burial which can offer the rad waste and toxic waste industry permanent groundwater control. Being able to provide groundwater control for toxic waste burial will allow governmental agencies the world over to eliminate temporary burial sites and assign permanent toxic waste burial sites as is now being called for. As permanent burial sites are made available, more toxic waste will be able to be handled. I feel sure most of you here read the article which was published on Friday, May 1, 1987, with the headlines, Cleanup May Cost $3.1 Billions. Of course, the article was referring to the Savannah River Plant.	

Comment number	Comments	Responses
	With sufficient funding, I will be able to build a state of the art manufacturing facility that will solve the problems here at the Savannah River Plant as well as any other locations with the same toxic or radioactive waste disposal problems, and I can assure you as well that the cost involved will be significantly less than the #3.1 billion as quoted earlier in May of this year.	
B-1	According to DHEC, all liquid toxic and rad waste chemicals in the state, other than federal sites, must be solidified before burial. With the use of the leach-proof container, it would not be considered as a safety hazard for the liquid toxic chemicals and rad waste to be buried in a liquid format, which would result in a significant savings in money and time. Also, the cost of approximately $700 million dollars for the excavating of monitoring wells and purchase of monitoring equipment would be eliminated except for periodic safety checks. In addition, this would be a permanent burial instead of only a temporary burial. Other savings to be realized: 1. $50 million for pumping contaminants out of the ground 2. Deleting the cost of $500 million to $2 billion for future cleanups which does not even include life-time monitoring.	Groundwater monitoring is required by waste management regulations at all waste dispsoal sites for a period of 30 years after closure.

Comment number	Comments	Responses
	3. Delete $100 million to $800 million to cleanup and close current waste sites in the future. 4. Delete the cost that the Savannah River Plant is currently spending at a rate of about $50 million annually to clean up chemical waste. I obviously need the financial support of DHEC and DOE as well as their encouragement and backing. My background includes the fact that I am 59 years old and have spent 25 years in the construction field. I was also the owner of an industrial electrical distributorship. From 1952 - 1953, I was employed at the Savannah River Plant (DOE facility for the manufacture of weapons grade nuclear fuel), Aiken, South Carolina. From 1954 - 1956, I was employed at the government's nuclear installation at Oak Ridge, Tennessee. Is served 7 years as President of Resources, Inc. The primary purpose of Resources, Inc. was that of mining and marketing of naturally occurring radioactive materials. During all of the previous years, I have always been interested and kept myself up-to-date on radioactive materials and geology. I have brought a sample model along with me today so that you can see the material after it is processed. Obviously, additional engineering and design studies will be necessary.	

Table L-2. DOE Responses to Comments on Draft EIS
(Page 9 of 210)

Comment number	Comments	Responses
	I appreciate your time and attention; and, hopefully, what I have discussed with you today will prove to be beneficial to us all. Thank you! GD:dh	

Comment number	Comments	Responses
	STATEMENT OF MR. JAMES CHANDLER DRAFT ENVIRONMENTAL IMPACT STATEMENT WASTE MANAGEMENT ACTIVITIES FOR GROUNDWATER PROTECTION SAVANNAH RIVER PLANT, AIKEN, SOUTH CAROLINA Comments June 4, 1987 Energy Research Foundation 1916 Barnwell Street Columbia, South Carolina 29201 Natural Resources Defense Council 1350 New York Avenue, NW Washington, D.C. 20005 This statement is presented on behalf of the Energy Research Foundation of Columbia, S.C., and the Natural Resources Defense Council of Washington, D.C. We appreciate this opportunity to comment on the draft Environmental Impact Statement for Waste Management Activities for Groundwater Protection at the Savannah River Plant. The documents comprising the draft EIS represent a tremendous amount of information. We commend the Department of Energy for preparing it and for the commitment to public participation and long-range, comprehensive planning implied.	

Comment number	Comments	Responses
	The draft EIS, which took two years to prepare, was released only about a month ago, and we have not had time to go over it as thoroughly as we would like. The following testimony is of a general nature. We will submit more detailed comments closer to the end of the comment period.	
	In today's statement we express misgivings about four aspects of the draft EIS. First, we are concerned that it does not take federal hazardous waste laws into account in a meaningful way. Second, we are concerned about some of the data used. Third, we feel that the assessment of the Elimination Strategy is skewed to make waste removal appear undesirable. These weaknesses in the analysis may undermine the rationale for DOE's preferred alternative, the Combination Strategy. Finally, we feel that the document itself is presented in a very confusing way.	
C-1	The single largest problem with the draft EIS is the lack of integration of the various proposed options with the regulatory requirements of the Resource Conservation and Recovery Act (RCRA). Of the 160 scoping comments identified by DOE, 39 expressed concern over assuring that the regulatory process be accounted for in the EIS. Throughout this document, statements are made that all activities will be carried out as per the pertinent regulations. But this is not equivalent to actually evaluating the impacts of the regulations. As written, the draft almost totally ignores the RCRA permitting process and the consequences of that process.	DOE has frequently stated its commitment to comply with applicable regulations, and this commitment is repeated in several places in the EIS. It is not the intent of the EIS to evaluate the impacts associated with regulatory compliance actions, but rather to assess the environmental impacts of implementation of the four alternative waste management strategies and project-specific actions.

Comment number	Comments	Responses
C-2	Chapter Six purports to discuss the impact of the regulations on possible strategies. We believe this chapter to be simplistic. It contains errors, and ignores, except for a single comment, perhaps the most important provision of the Hazardous and Solid Waste Amendments of 1984 (HSWA) which requires corrective action at all solid waste management units (SWMUs) identified to be releasing hazardous waste constituents to the environment.	Chapter 6 summarizes the applicable regulatory requirements and describes them generally and specifically. Potential corrective actions (groundwater remedial actions) are included in all three "action" waste management strategies.
C-3	The purpose of the EIS is to compare the impacts and costs associated with various waste management options at SRP. This cannot be accomplished unless the regulatory status of each unit is clearly identified, and the regulatory consequences of each option discussed. All solid waste management units at SRP are subject to regulation under RCRA as amended by HSWA. This is a simple fact of law. The actions to be undertaken at specific waste sites will only be determined following the development of a RCRA Facility Assessment - which we understand is being prepared now - and the implementation of a RCRA Facility Investigation.	The status of existing waste sites at the SRP has been or is being negotiated. Potential categories of waste type and current regulatory action or status are described in Tables 2-2, 2-3, and 6-2.
C-4	The permit eventually issued to SRP must and will contain specific requirements for monitoring and corrective action at every solid waste management unit determined to be releasing hazardous constituents to the environment. Items such as groundwater corrective action can add orders of	The specification of a monitoring program to be implemented at each site, based on regulatory requirements, is by definition beyond the scope of this EIS since it is a NEPA document (since alternatives are involved). These details are being

Comment number	Comments	Responses
	magnitude to costs. DOE cannot make meaningful cost comparisons without taking specific regulatory demands into account.	determined through the permitting process. Solid waste management units (SWMU) are discussed. Groundwater monitoring regulations for SWMUs have not yet been developed under either Federal or State statutes. As part of the permitting process, the SRP is currently negotiating with SCDHEC and EPA to identify groundwater monitoring requirements for SWMU. The cost comparisons presented in this EIS are identified as preliminary and are subject to revision. Future regulatory actions may require added expenditures.
C-5	Another example of this deficiency is the use of non-regulatory-based standards for groundwater assessment. The draft EIS consistently uses Minimum Concentration Limits (MCLs), Alternative Concentration Limits (ACLs), and other criteria for making major decisions regarding groundwater impacts. These so-called standards for most of the organic compounds have no legal or regulatory basis and should not have been used. MCLs are established in the regulations promulgated by the Safe Drinking Water Act, but these MCLs do not include the vast majority of chemicals present as contaminants at SRP.	Maximum Contaminant Levels (MCLs) and Alternate Concentration Levels are presented in RCRA groundwater regulations at 40 CFR 264.94 as alternates acceptable to, and that may be specified by the Regional Administrator in a facility permit. (See page 4-2 of the FEIS.) Moreover, MCLs, as enforceable health-based standards, provide a numerical basis for estimating, through multipathway transport modeling, the human health and environmental risks that were done for the EIS. MCLs are generally identical to the Primary Drinking Water Standards cited in 40 CFR 265, Appendix III. MCLs for some organic compounds were proposed by EPA and were finalized in July 1987 (52 FR 25690).

Comment number	Comments	Responses
C-6	At RCRA sites the appropriate reference criteria for constituents without primary drinking water standards are background levels. At Solid Waste Management Units for which corrective action will be required the standard, until another is set by regulation, is also background. Although the Environmental Protection Agency is considering adopting other standards, these levels have not been codified. As the draft EIS clearly points out in response to scoping comments, consideration of future regulations is outside the scope of the EIS.	All groundwater monitoring systems installed at SRP have background (upgradient) wells. See the response to comment C-5.
C-7	Therefore, all models and decisions based upon comparing contamination levels to MCLs or other non-regulatory standards must reevaluated to compare to site-specific background levels. Once again, because the draft ignores the applicable regulations, many projections and decisions are useless.	See the response to comment C-5. MCLs were used partially because they provide a uniform standard basis for comparison of alternatives, while background concentrations vary from site to site. The EPA has indicated that background levels may be technically or economically impossible to achieve.
C-8	The draft indicates that current SRP storage and disposal capacity for mixed and hazardous waste will be reached in a short time. New facilities will have to be available. No new facility may be built or operated without first receiving a permit, but it is likely to take years for such permits to be issued. The draft does not consider the exigencies of storage and disposal capacity, so we are left to suppose that once again regulatory issues have been ignored.	The draft EIS considers the need to construct and establish new disposal/storage facilities for low-level radioactive, mixed, and hazardous wastes. The length of time required for permitting is not estimated in this EIS; however, all storage facilities will be operated in compliance with regulatory requirements. See Section 2.3.

Table L-2. DOE Responses to Comments on Draft EIS

Comment number	Comments	Responses
C-9	Because the controversy over the byproduct rule concerning mixed wastes was only recently resolved administratively, it is understandable that the present draft does not include a discussion of the implications for SRP. It will certainly now have to be taken into account, however.	Chapter 6 (page 6-3) includes a revised statement on the byproduct decision and acknowledges EPA/SCDHEC jurisdiction over mixed wastes.
C-10	A second major problem relates to the data used throughout the draft. It appears that few data collection activities were performed for the EIS; existing SRP data were used. A review of the reference section for each chapter indicates that the majority of references are taken from in-house DOE or Du Pont reports which have not been subjected to peer review. This leads to concern, given numerous documented problems with SRP data collection and analysis methods. Wherever SRP data is used in the EIS, or in the Environmental Information Document on which the draft is based, a thorough discussion of exactly which data were used; what Quality Assurance/Quality Control procedures were followed; and what, if any, data were excluded and why, must be provided.	Extensive periodic groundwater monitoring and soil/sediment analysis programs have been conducted at the SRP since 1981 or earlier. Separate documents dealing with methodology, QA/QC procedures, data reliability, and related matters are referenced in this EIS and discussed in detail in its support documentation prepared for this EIS. The support documents tabulate these data-related programs, the PATHRAE modeling results, and assess the alternative waste management actions.
C-11	Beyond questions about the accuracy of SRP's data, it appears that existing data is not utilized. The draft EIS contains the puzzling statement that, although two monitoring wells were installed at the 716-A Motor Shop Seepage Basin and well sampling began in February 1984, "no evaluation of the sampling data has been made available."	Existing data were used in this EIS. The statement relative to 716-A Motor Shop has been revised in this FEIS, Appendix B, page B-5.
C-12	Application of a generalized model for decision-making where site specific data are available is unacceptable. The model presented in Volume Two, Appendix H of the draft is demonstrated to be accurate to within a factor of ten, 73 percent of the time; thus the model is in error by more than 1000 percent, more than one-fourth of the	Site-specific data such as groundwater monitoring results, soil/sediment analyses, waste inventories, or estimated waste disposal volumes were used as input to the PATHRAE model. The accuracy of the model is described in revisions to Appendix H and in its references. See paragraph 1, page S-13.

Comment number	Comments	Responses
	time. Where site-specific data is available, use it rather than a seriously flawed model. Where no site-specific data is available, another more applicable model should be used. Because SRP is located in an area of very complex hydrogeology, a three-dimensional model should be considered.	The modeling results are used in a comparative, not absolute sense. Some three-dimensional flow modeling has been performed.
C-13	The Council on Environmental Quality regulations state that the EIS "shall be supported by evidence that the agency has made the necessary environmental analyses." We are not convinced of this from the draft.	Thirty-four supporting documents (EIDs) were specially prepared for this EIS as required by NEPA. Approximately 220 other documents were also referenced. The reference documents have been placed in public reading rooms.
C-14	In fact, the draft may not even include all sites at SRP which have received hazardous waste or hazardous constituents. DOE's letter of February 11, 1987, from R. L. Morgan to J. E. Ravan (EPA Region IV Administrator) which accompanies the latest information on continuing releases of hazardous waste or constituents includes sites not listed in the draft EIS. There are other discrepancies concerning sites found both in the draft EIS and in the continuing releases document. The EIS must include all waste sites, and discrepancies between it and other documents must be resolved.	DOE has undertaken an extensive verification effort for the sites for the EIS. It has been stated in the DOE/EPA interactions that there may be discrepancies. Ongoing and future regulatory processes are expected to resolve these differences. Much of the documentation of continuing release sites was not available at the time of earlier waste site assessments. The rationale for selection of waste sites in the EIS is presented in Appendix B in Tables B-1 and B-2.
C-15	Our third major concern relates to the assessment of the Elimination Strategy. We believe that DOE's presentation of this strategy is manipulated so that the option of removing the waste looks either too costly or environmentally unacceptable. DOE skews the waste removal and closure costs by including the Radioactive and Mixed Waste Burial Ground, which accounts for over 90 percent of the total cost for this option. DOE is thus able to dismiss it as too expensive.	Cost and high occupational risks for removal of wastes from the Burial Ground are discussed in the Elimination strategy. DOE has not dismissed the strategy; the final decision on strategies will be made in the Record of Decision. In the FEIS, Appendix E and Chapters 2 and 4 give revised costs for all waste management strategies and, in particular, break out the costs for a Low Level Waste Disposal Facility and its major components.

Comment number	Comments	Responses
C-16	DOE then makes the Elimination Strategy look environmentally unacceptable by calling for direct discharge of undecayed disassembly basin purge water to surface streams. Under the Combination Strategy, DOE will investigate the uses of a moderator-detritiation plant (MOP) which will reduce tritium discharges at the source. This appears a more appropriate "elimination" strategy.	Direct discharge of disassembly basin purge water increases tritium doses to onsite streams; however, offsite doses would continue to be below guidelines and standards. Seepage basins would continue to be used except under the Elimination strategy. Under direct discharge or evaporation, reactor seepage basins could be eliminated, hence these actions are appropriate for the Elimination strategy.
C-17	While DOE does include detritiation and other possible mitigation in the Combination Strategy, it plans to continue discharges to reactor seepage basins while studying these options. There is no commitment to phase out the basins. There is also no commitment in the draft to complete closure of the F- and H-area seepage basins by November, 1988, as required by law.	Other tritium mitigation measures are discussed in Section 4.8. The DEIS considers continued discharge to reactor seepage basins as part of the "preferred" alternative waste management strategy. Closure plans for the F- and H-Area seepage basins have been prepared and submitted to SCDHEC.
C-18	Neither the Combination nor Elimination Strategies, as presented, are the best from an environmental or economic standpoint. DOE should consider removal/closure at a far greater number of sites than is planned in the Combination Strategy. This could be accomplished at less than 10 percent of the presently-projected Elimination Strategy costs if the burial ground wastes are left in place. While we do not necessarily advocate that option, it certainly would be worth study. DOE should also consider immediate phase-out of the purge basins, use of an MDP, and if necessary, evaporation to remove the remaining tritium.	The seven sites included in the Combination strategy were selected based on multipathway transport modeling and are considered preliminary choices for purposes of comparison and strategy selection in this EIS. The final number of sites at which waste will be removed will be made following DOE's Record of Decision, subsequent regulatory agency interactions, ongoing and future monitoring, modeling, and site-specific characterizations.
C-19	Finally, the draft EIS, especially Chapter Two where the different strategies and their costs are explained, is extremely confusing. The Council on Environmental Quality regulations, which DOE has adopted, state: "Statements shall be concise, clear, and to the point....NEPA (National Environmental Policy Act) documents must	Chapter 2 is a discussion of the proposed actions, i.e., modificaton of waste management activities at the SRP, and the development of alternative waste management strategies. It deals with programmatic and project-specific actions for three kinds of waste at 77 existing sites, three new

Comment number	Comments	Responses
	concentrate on the issues that are truly significant to the action in question rather than amassing needless detail. Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork - even excellent paperwork - but to foster excellent action. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment." Thank you. June 30, 1987 Mr. S. R. Wright Director, Environmental Division U.S. Department of Energy Savannah River Operations Office P. O. Box A Aiken, SC 29802 RE: Waste Management EIS Dear Mr. Wright: At the public hearing on June 4, 1987, Energy Research Foundation and Natural Resources Defense Council, Inc. submitted general comments on the draft Environmental Impact Statement, "Waste Management Activities for Groundwater Protection at the Savannah River Plant, Aiken, South Carolina." We noted at the time that our comments would be supplemented with more detail prior to the end of the comment period.	disposal/storage facilities for three kinds of waste, and six active reactor seepage basins and one containment basin for the management of disassembly basin purge water. Revisions to the DEIS have been made.

Comment number	Comments	Responses

Enclosed please find an additional copy of our public hearing comments, along with the more detailed comments on the draft EIS. Please let me know if you have any questions.

Yours very truly,

James S. Chandler, Jr.

JSC/dhe
Enclosure

cc: Frances Close Hart
Dan W. Reicher, Esquire
John Croom

ADDITIONAL COMMENTS BY MR. JAMES CHANDLER

Specific Comments
on the
DRAFT ENVIRONMENTAL IMPACT STATEMENT

WASTE MANAGEMENT ACTIVITIES FOR
GROUNDWATER PROTECTION
SAVANNAH RIVER PLANT
AIKEN, SOUTH CAROLINA

June 30, 1987

Energy Research Foundation
1916 Barnwell Street
Columbia, South Carolina 29201

Natural Resources Defense Council
1350 New York Avenue, N.W.
Washington, D.C. 20005

Comment number	Comments	Responses
C-20	The EIS purports to assess "broadly defined strategies" that DOE could select to implement at specific sites in the future. The document then proceeds to make recommendations etc. regarding specific sites. Such decisions are beyond the scope of the EIS. (Page V, Par. 3)	The EIS is both a programmatic and project-specific document. See page v, paragraph 2. The recommendations are made to allow comparative analyses of the environmental effects of alternative waste management strategies. DOE's Record of Decision will specify actions proposed to be implemented based on discussions and analyses in the EIS. Future regulatory decisions will determine actions undertaken at specific sites.
C-21	Using terms such as "hazardous" etc. which have a very precise regulatory definition in a non-regulatory manner is confusing and unacceptable. To be consistent all terms should be used in the manner defined by regulations. The EIS purports to consider the regulatory aspect of each item, yet by refusing to accept the established regulatory meaning of these terms it appears doubtful that a commitment to the regulations exists. All places where terms such as "hazardous," "mixed waste" etc. are used should be revised to indicate their regulatory status or different terms should be used. (Page VI, Par. 1)	Tables 2-3 and 2-4 list the potential categories of waste at particular sites. The terms are used primarily to identify and categorize the wastes without regard to a regulatory definition.
C-22	Use of seepage basins etc. may have been legal but was never wise environmental practice. Please eliminate this statement. (Page S-1, Par. 2)	In the context of NEPA documentation and of the proposed action and alternatives presented in this EIS, DOE considers the statement on seepage basins to be reasonable because of the insignificant environmental and human health effects associated with their continued use. See the response to comment A-1.
C-23	See comment VI-1 above. (Page S-1, Par. 4)	See the response to comment C-21.
C-24	Storage of hazardous waste is contemplated as a short-term activity and is usually measured in months, not years. The concept of storing waste almost indefinitely is not acceptable and should be eliminated from the EIS. Page S-3, Par. 2)	The storage of hazardous and low-level radioactive or mixed wastes assumes that emerging technologies will be developed which will result in the detoxification and/or permanent disposal of these wastes.

Comment number	Comments	Responses
C-25	The notion of a return of SRP to the public after an institutional control period is simply posturing. Current plans for SRP extend well into the future. All reference to returning areas to public use should be eliminated. (Page S-7, Par. 3)	The 100-year institutional control period is based on plans by DOE for the SRP and is therefore considered appropriate in terms of the EIS scope. See the general statement by EPA Region IV (comments J of this appendix).
C-26	Include as a condition under the combination strategy complying with all applicable state and federal regulations. Eliminate the reference to eight sites. Choosing specific actions at specific waste sites is beyond the scope of the EIS (Reference comment V.3 above). (Page S-8, Par. 5)	The text has been revised accordingly. Seven sites were selected on the basis of modeling results and to provide comparisons among the alternative waste management strategies. See the response to comments C-18 and F-10.
C-27	There is no basis for stating that the no-action strategy will protect the off-site environment. Releases to streams leaving the site are occurring and there is no scientific basis for stating that such releases will never have an effect. (Page S-13, Par. 1)	Waste management actions at the SRP that are currently underway (i.e., M-Area cleanup, construction of effluent treatment facilities, and demonstration programs) will assure offsite environmental protection.
C-28	See comment S-13-1 above. For many of the constituents released by SRP there are no safe levels established after notice- and -comment rule making. In the absence of established levels any release must be considered unacceptable. The use of non-regulatory "safe levels" should be eliminated from the EIS and all analyses based on these criteria redone. (Page 1-1, Par. 3)	Environmental releases do not cause offsite health effects, do not have significant environmental impacts, and are within generally recognized environmental and health protection standards and criteria. See Zeigler et al., 1987, DPSPU-87-30-1. Established levels such as ADIs and UCRs are routinely used by EPA.
C-29	Compliance with groundwater protection standards is only one area of concern. Indicate that compliance with all applicable environmental laws and regulations is both desired and mandated. (Page 1-2, Par. 2)	Text has been revised.

Comment number	Comments	Responses
C-30	The discussion of the continuing release provisions of RCRA is incorrect and must be revised. A site with continuing releases is required to correct both off-site and on-site conditions under RCRA 3004 (U) and 3004 (V). The discussion indicates that removal of on-site wastes eliminates the need for off-site corrective action. This is incorrect. (Page 2-2, Par. 2)	The intent of the discussion in Section 2.1 is to indicate needs for long-term oversight or monitoring and site dedication, not corrective action. If all residues at surface units and waste sites and everything contaminated with waste and leachate can be removed or decontaminated, post-closure monitoring is not required.
C-31	There is no basis for equating the no-action strategy with continued protection of the off-site environment. This and all similar statements should be removed. (Page 2-7, Par. 2)	See the response to comment C-27.
C-32	The concept that land used for waste management practices must undergo long periods of institutional control prior to being used for other purposes is incorrect and should be eliminated here and throughout the EIS. Immediately upon closure a RCRA site can be utilized provided the use does not interfere with the established cap and corrective action plan. Many RCRA sites have parking lots on them which reduces rainwater percolation. Any analysis that assumes an area can not be utilized at all for many years or ever is incorrect and should be redone. The regulations at 40 CFR 264.117 (c) clearly indicate that post-closure use of property is possible. (Page 2-8, Par. 5)	The response to comment C-25 explains the basis for the 100-year control period. The presumption of governmental institutional control is not meant to be preemptive of RCRA requirements; however, institutional control of the SRP for security reasons will likely mean that other land uses which might be available at publicly accessible RCRA facilities will not be available at the SRP.
C-33	Entire paragraph is based on false premise that sites have to undergo long periods of control or be dedicated in perpetuity with no other use possible. Revise this paragraph and all others which suggest this. (Page 2-9, Par. 3)	See the response to comments C-25 and C-32.

Table L-2. DOE Responses to Comments on Draft EIS

Comment number	Comments	Responses
C-34	Identify what other sites are not appropriate for consideration and the reasons for this. (Page 2-11, Par. 2)	Tables 2-3, 2-4, B-1, and B-2 identify sites considered and not considered in this EIS and the rationale for their characterization.
C-35	As stated earlier the concept of waste areas never being useful is incorrect and such statements should be eliminated from the EIS. (Page 2-17, Par. 3)	See the response to comment C-32.
C-36	No basis exists for stating that the elimination strategy would require fewer groundwater remedial actions. All sites with contaminated groundwater are subject to remediation whether waste is removed from the site or left in place. Either eliminate this sentence or fully explain the rationale which supports it. (Page 2-23, Par. 3)	The rationale for the statement is presented in Chapter 4, considering transport modeling results of waste removal and closure vs. no waste removal and closure.
C-37	The concept of storage for as long as twenty years does not seem consistent with RCRA. Please provide specific references to indicate that this is an acceptable option under RCRA. (Page 2-32, Par. 1)	RCRA regulations define "storage" as "the holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere" (40 CFR 260.10). The term "temporary" is not defined by a specific time period, rather it is taken to mean "not permanent" and implies an intention to retrieve the waste for future treatment and/or disposal. Provided the storage facilities proposed under either the Elimination Strategy or the Combination Strategy are permitted and operated in compliance with RCRA regulations (i.e., 40 CFR 270 and 40 CFR 264, respectively), the period of such operation is not an issue. The RCRA Part B permit for permitted storage facilities was prepared in accordance with 40 CFR 264, 265, and 270. This permit, including the operational life of the storage facilities, is being reviewed.

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Comment number	Comments	Responses
C-38	There is no such unit as a RCRA-vault. A unit used for waste disposal would, as described, constitutes a landfill, and as designed would not meet the minimum technology requirements of a landfill and thus could not be permitted. Throughout the EIS all references to units not consistent with the regulatory requirements of RCRA should be eliminated. (Page 2-34, Par. 3)	The concept includes double liners, leachate detection, and dual collection systems. DOE considers these RCRA-type units to be consistent with RCRA requirements.
C-39	The proposed CFM vault would also constitute a RCRA landfill unless all waste disposed there was first delisted. Currently cement flyash solidification does not appear to bind organics effectively. Revise the EIS to consider this unit a RCRA landfill or to consider the real possibility of delisting the proposed wastes. (Page 2-34, Par. 5)	The cement/fly ash matrix vault concept is discussed in the EIS as a facility type which conceptually would comply with the intent of RCRA as well as being a facility which could be built at the SRP. The final design of such a mixed waste facility, including the appropriateness of the vault matrix and the need for liners and a leachate collection system, will be determined through regulatory compliance activities.
C-40	It is inappropriate to predicate compliance with RCRA on receipt of regulatory waivers. It is inconsistent with the premise that all regulations be complied with, to predicate a considered option on receiving waivers. Eliminate this aspect of the strategy and reevaluate it assuming compliance with the regulations. (Page 2-44, Par. 5)	The waivers would apply only to long-term retrievable storage. DOE considers such actions to be within the range of negotiations with SCDHEC. See the response to comment C-37.
C-41	How was it determined what constitutes the "best mix of the disposal and storage technologies." Provide a basis for this major decision. (Page 2-44, Par. 7)	The flexibility of the Combination strategy for new disposal facilities has the advantages of disposal and storage of wastes, optimizing performance, recovering and retrieving waste, minimizing costs, and complying with applicable environmental regulations and standards.

Comment number	Comments	Responses
C-42	The lower estimate of cost of the no-action alternative cost was $160 million. The lower estimate of the cost of combination strategy cost was $143 million. Please explain fully how a no-action alternative is more expensive than the preferred alternative. (Page 2-45, Par. 1)	The cost shown in the text as $143 million is incorrect; it should have been $170 million. Revisions have been made in the FEIS text and Tables 2-11 and 2-12 to reflect estimated costs, resulting from recalculations performed in May 1987.
C-43	As stated earlier no land must be dedicated in perpetuity. Remove this statement and reevalaute the alternatives. (Page 2-45, Par. 2)	DOE's basis for dedicaton of waste sites is appropriate in terms of the impacts discussed in Chapter 4. The responses to comments C-25 and C-32 explain the basis for the control period.
C-44	Site specific actions are indicated throughout the EIS yet the most expensive and extensive action at the sites, groundwater remediation is ignored. We believe that this invalidates the entire cost analysis. Please provide detailed rationale as to how this activity can be ignored and a valid cost estimate still be generated. We still feel that site-specific recommendations are simply beyond the scope of the EIS and that only the broad scope of proposed activities should be evaluated. (Page 2-63, Par. 3)	DOE considers that groundwater remedial action costs are site-specific and as required would entail additional costs. These will be determined after the EIS Record of Decision has been issued and regulatory interactions completed.
C-45	Removing waste "to the extent practicable" may or may not result in site dedication. Much depends on the regulatory status. Eliminate this premature decision from consideration. (Page 2-64, Par. 4)	The extent practicable will be determined by regulatory actions and site dedication or post-closure care. See the response to comment F-29.
C-46	Paragraph should be modified to reflect that although the green clay exists it does not provide a mechanism for totally separating the formations. They may still be hydraulically interconnected. (Page 3-17, Par.1)	The discontinuity of the green clay is stated.

Comment number	Comments	Responses
C-47	As most of the information presented here is highly speculative please present appropriate references for each conclusion. (Page 3-17, Par. 2-6)	A reference is given in Figure 3-4 and the end of Chapter 3. See also Appendix A.
C-48	Provide a reference for the statement that "any contaminants that would be drawn into the Black Creek by this pumpage would flow to the pumping well and, therefore, would not impact offsite areas." (Page 3-20, Par. 3)	Duffield et al., 1987.
C-49	Please include information on the procedures, decision criteria etc. used to determine the validity and usefulness of all groundwater data used or referenced in Section 3.4.3.2. (Page 3-22, Par.3)	Information on procedures and criteria related to groundwater monitoring is furnished in support documents (EIDs, Environmental Reports, and the Groundwater Protection Plan) referenced in Chapter 3 and Appendixes B and F.
C-50	None of the so-called standards or criteria used here for the chlorinated organic compounds have any legal or regulatory basis under RCRA and should therefore not be used in this or any subsequent table, nor should any decisions based on these criteria be made. Please revise entire EIS accordingly. (Page 3-25)	Table 3-8 (pages 3-25 and 26) summarizes the results of groundwater monitoring in describing the affected environment at the SRP. Comparisons to the standards and criteria are given. The selection of the preferred alternative was not based on these data.
C-51	Entire paragraph is misleading. In most cases contamination at SRP consists of cancer causing chemicals and for these no standard is set for "aesthetic" purposes. Delete the paragraph. (Page 3-26, Par. 1)	"Aesthetic" refers only to iron and secondary drinking water standards (40 CFR 143).
C-52	Please provide reference for an approved metals sampling procedure which requires or condones filtering of samples. (Page 3-26, Par. 2)	EPA protocols and procedures (40 CFR 136, EPA-600 4/79-020) call for field filtration of samples for dissolved metals determinations. Reference has been added to the text, Sections 3.4.3 and 5.2.

Comment number	Comments	Responses
C-53	Provide a reference for the statement that the Middendorf and Black Creek aquifers are not interconnected under SRP. (Page 3-26, Par. 5)	A reference is given in Figure 3-4 and the end of Chapter 3.
C-54	Given the admission here that contaminated groundwater outcrops into streams that flow off-site, please eliminate all statements in the EIS which indicate that no contamination has been released off-site. (Page 3-51, Par. 1)	The statement of offsite contamination refers to offsite groundwater and not surface streams.
C-55	Basing assessments on inapplicable standards and using computer models which are at best only accurate to an order of magnitude invalidates the entire process. The assessments should be revised to use actual data when available and when not available to thoroughly explain and document all assumptions made. Where there is not an interim primary drinking water standard. Assessments should only compare contamination by constituents to background values. (Page 4-2, Par. 4)	See the response to comment C-12. The PATHRAE model was used for comparative, not absolute, purposes. Background concentration information was factored into the assessment process in some cases. See the response to comment C-5.
C-56	The method used does not include synergistic effects. Please justify this omission. (Page 4-3, Par. 5)	Environmental effects, including cumulative impacts, are considered in Chapter 4 of the FEIS.
C-57	No MCL's have been adopted for these compounds. Delete all references to MCL's and redo the analyses only using background concentrations. (Page 4-4, Par. 3)	See the response to comment C-5.
C-58	Why model if real data are available? Also if the model can't predict correctly the known results the validity of the model is greatly suspect. Please explain. Since it is stated that actual decisions regarding closure etc. will be determined by regulatory interaction delete all site-specific references and decisions. (Page 4-5, Par. 4)	The modeling assumptions are acknowledged to be based on preliminary information and to predict environmental impacts or human health risks now or in the future to compare the alternative waste management strategies and project-specific actions. See paragraph 1 on page S-13 and the response to comment C-12.

Comment number	Comments	Responses
C-59	The reference given in footnote "f" for the "standard" for the three chlorinated organics (EPA 1985b) is to the listing document for these wastes. Standards for these wastes in groundwater have not been established. This is an incorrect and misleading reference and should be deleted in this and all other applicable tables. (Page 4-8)	The reference has been revised in all tables to EPA 1987 (52 FR 25690) to include final MCLs.
C-60	There is no primary drinking water standard for trichloroethylene, and referencing the listing document is misleading. Please check all tables for consistency of references and standards. Which standard was used in the analyses? (Page 4-12)	An MCL for this compound was finalized by EPA in July 1987 (52 FR 25690). Tables have been revised to reflect the change.
C-61	Why quote a calculated drawdown rather than provide data on the actual drawdown since the system is in operation. Please explain. (Page 4-33, Par. 3)	Actual drawdown data are discussed in Zeigler et al., 1987 (DPSPU-87-30-1).
C-62	Delete references to the no-action alternative protecting the off-site environment. This is unsupported speculation. Delete all usage of MCLs for reasons previously stated. (Page 4-34, Par. 3)	See the response to comments C-5 and C-25.
C-63	Provide a reference for the statement that "Groundwater withdrawal with discharge to surface waters would have an insignificant effect on water-table elevation in F and H areas." (Page 4-34, Par. 7)	The reference is Duffield et al., 1987, and has been incorporated in text.

Table L-2. DOE Responses to Comments on Draft EIS
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Comment number	Comments	Responses
C-64	Premise is false since groundwater remediation will occur. Please correct or justify these analyses. (Page 4-46, Par. 5)	While groundwater remediation may be required under the Dedication strategy, the values listed in tables throughout Section 4.2 are modeling predictions based on closure under the Dedication strategy but without further groundwater remediation. This paragraph has been clarified in the FEIS (see first paragraph of Section 4.2.2.4).
C-65	Why is the individual peak dose for H-Area retention basin higher for the dedication strategy than for the no-action (Table 4-11) alternative at some sites? This does not appear reasonable. (Page 4-47)	The doses indicated are predominantly from strontium (Sr-90) in groundwater that could be consumed in the year 2085 (i.e., at the end of the institutional control period). Peak concentrations of Sr-90 are much higher for no action than they are for dedication, but both occur during the period of institutional control in groundwater that is not consumed by the public or plant workers. The closure actions under dedication reduce the concentration and slow down the movement of the contaminants. Modeling indicates that in the year 2085 the Sr-90 plume will have moved beyond the 1-meter well such that the residual dose at the 1-meter well in year 2085 is predicted to be slightly higher under the Dedication strategy.
C-66	Why are risks at the radioactive waste burial grounds higher for the dedication strategy than for the no-action strategy? (Page 4-48)	Risks at the radioactive waste burial grounds are lower for the Dedication strategy than for the No-Action strategy. See Tables 4-27 and 4-12, respectively.

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Comment number	Comments	Responses
C-67	Dedication strategy indicated nine groups would require groundwater remediation yet this paragraph says that the number is unchanged for the elimination strategy which indicated only eight groups. Which is right? (Page 4-62, Par. 3)	Nine is correct.
C-68	Why would not the total removal of waste reduce peak groundwater concentrations? (Page 4-72, Par. 1)	Modeling predicts that at many sites constituents have already leached past the areas of practicable excavation. Removal of waste to the extent practicable would not reduce peak groundwater concentrations within the original boundaries of these sites.
C-69	We have already commented on the use of MCLs, but to now further obscure reality by arbitrarily incorporating a factor of three times an MCL is inexcusable. Redo analyses for all sites which either exceed background or are predicted to exceed background, or fully justify another approach. (Page 4-72, Par.4)	Under the Combination strategy, cost-effective remedial actions would be implemented as required. The beginning of Section 4.2.4.1 has been revised to explain the estimate of whether waste removal at a particular site would be a cost-effective remedial action. The paragraph that follows the referenced paragraph explains that waste removal at specific sites was assumed in order to provide a basis for comparison of alternatives and the final decision on waste removal would be determined through regulatory interactions.
C-70	Stating that the no-action alternative continues to protect the off-site environment is unsupported speculation, especially since earlier the EIS states that off-site releases already occur. Please remove all such statements from the EIS. (Page 4-78, Par. 2)	See the response to comment C-27. Offsite releases are below environmental standards.
C-71	The last sentence is unsupported speculation and unless it can be referenced and documented as fact, it should be removed from the EIS. (Page 4-79, Par. 2)	The sentence has been deleted.

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Comment number	Comments	Responses
C-72	Unless all waste and contaminated groundwater is removed from a site it may still require a period of institutional control. Thus the statements regarding site dedication impacts under the elimination and combination strategies are incorrect and should be removed or more fully documented. (Page 4-81)	See the response to comment C-30. Site dedication would not occur during the period of institutional control. Under the Dedication, Elimination, or Combination strategies, contaminated groundwater would be cleaned up as required during this period. If the waste is also removed (i.e., all sites under Elimination, selected sites under Combination), site dedication at the end of the institutional control period would not be necessary.

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Comment number	Comments	Responses
C-73	Entire paragraph is unclear. Please rephrase in plain English. Are you saying that the models etc. are so inaccurate that they really constitute a guess? (Page 4-85, Par. 2)	The model provides a preliminary comparative estimate of environmental impacts and risks. See the response to comment C-12.
C-74	Please provide a reference for the fact that disposal sites are dedicated in perpetuity or remove this statement and redo the appropriate analyses. Use of a site for disposal purposes does not preclude other controlled uses. (Page 4-88, Par. 3)	See the response to comment C-32.
C-75	Nothing precludes siting new facilities above existing disposal sites provided adequate precautions are used. Thus the impact of constructing new facilities would be less than indicated. (Page 4-92, Par. 4)	If the Elimination strategy is selected in the Record of Decision on this EIS, siting of new storage facilities may include the use of existing waste sites following waste removal and closure.
C-76	Please provide information regarding your assessment of the impacts and costs associated with delisting (as it will be required) the hazardous wastes (e.g., incinerator ash) prepared for disposal in the Cement Flyash matrix. Delisting is a long, often expensive process. Was this time delay consideration included in your assessment of the CFM facility? If it was not, please include it in your analysis and redo it. (Page 4-118, Par. 4)	The time for and costs of delisting CFM waste were not considered in this EIS since this proposed project has not reached the conceptual design phase. See the response to comment C-39.
C-77	No area at SRP has been permitted for the disposal of hazardous waste. All are operating under interim status. Please explain this misleading statement. (Page 4-119, Par. 1)	The text has been revised. The permit issued for Z-Area is an industrial landfill permit (see regulations at R.61 issued pursuant to the South Carolina Pollution Control Act).

Comment number	Comments	Responses
C-78	The statements regarding Sandoz Inc. are purely speculative. Since this is an actual facility please replace the speculation with actual facts regarding the facility. Such information may be obtained from SCDHEC as public information. (Page 4-122, Par. 4)	The statement has been deleted.
C-79	Speculative statements regarding economic feasibility are not appropriate in the EIS. Either provide a detailed cost benefit analysis or remove the statement. Many of the mitigative measures required by RCRA are expensive, yet they are required. (Page 4-131, Par. 4)	The sentence has been revised.
C-80	The compliance point at a land disposal facility is far from imaginary. It is a very precisely defined location. Please remove this phrase. (Page 5-2, Par. 1)	The text has been revised.
C-81	Please explain further the rationale for filtering samples for metals analysis. Excess particulate matter in the sample may result from poor well development and/or poor construction techniques. Please discuss these possibilities and explain the data selection criteria which allows the use of samples from poorly developed or improperly constructed wells. A properly constructed and developed monitoring well should not have excess particulate matter. (Page 5-5, Par. 1)	See the response to comment C-52 on filtration of samples for dissolved metals determinations.
C-82	"Compliance monitoring" is only performed at a permitted facility. M-Area is not permitted and any monitoring should be done under the interim status regulations. Please revise this section as it demonstrates a lack of understanding of the regulations. (Page 5-7, Par. 6)	Compliance monitoring is required at M-Area under an Administrative Consent Decree, 85-70-SW.

Comment number	Comments	Responses
C-83	Groundwater is part of the environment and there is no need to attempt to differentiate it from the rest of the environment. (Page 6-1, Par. 1)	The EIS emphasizes groundwater protection, but considers all potential environmental impacts.
C-84	In the event of conflicts who decides what standards provide the greatest protection? Is this a decision making process subject to public review? (Page 6-2, Par. 4)	DOE makes the final decision; however, public participation will be encouraged in accordance with regulations.
C-85	Since the government is both "procedurally" and "substantively" subject to compliance with CERCLA, sites on federal facilities are not "equivalent" to CERCLA sites, they in fact are CERCLA sites. Please make this clear. (Page 6-4, Par. 2)	The text has been revised. Federal sites that come under CERCLA purview are not remediated through CERCLA (Superfund) monies as are commercial sites. None of the sites at SRP are currently on the National Priorities List.
C-86	This is such a misleading and simplistic summary of RCRA and the HSWA. HSWA did not ban land disposal of hazardous waste; rather it required DEPA to evaluate wastes for their suitability for land disposal and to ban any wastes not determined suitable. This is vastly different from an outright ban. Please correct this. (Page 6-5, last par.)	The text has been revised; "land ban" is used commonly and popularly; however, "restricted disposal" or "land disposal restrictions," have been used in the FEIS.
C-87	It is inconceivable how a discussion of RCRA and the HSWA can completely ignore the provision of the HSWA which most significantly affects SRP, i.e., the requirement to perform corrective action at solid waste management units (SWMUs) determined to be releasing hazardous waste constituents into the environment. Any permit issued under RCRA and HSWA must contain provisions requiring such corrective action. This is required regardless of when waste was placed into a unit. Thus all of the sites at	The alternative waste management strategies include project- and site-specific actions which include waste removal, closure, and remedial action (groundwater corrective action) as required by regulations. DOE complies with these requirements. See Chapter 2 for an explanation of the waste management strategies. Section 4.2 and Appendix F identify sites that may require groundwater corrective action.

Comment number	Comments	Responses
	SRP which are discussed in the EIS and which are not subject to RCRA permitting requirements are SWMUs subject to the corrective action provisions of HSWA. There will be no CERCLA actions at SRP since all SWMUs are subject to HSWA. Please correct this discussion or provide an explanation of why this aspect of HSWA is not discussed or considered significant. Further please explain how any, reasonable evaluation of waste management strategies could be made while ignoring the single most important requirement of HSWA. (Page 6-5, Par. 1)	
C-88	Closure dates for F and H area seepage basins must be on or before November 8, 1988 or SRP will be in violation of the statute. Since the EIS states that all recommended actions will comply with the law, please revise the table to indicate closure of these basins by the required date.	A closure plan for the F- and H-Area seepage basins has been prepared and submitted to SCDHEC. Dates of closure will be determined through interactions with SCDHEC. DOE and SCDHEC are aware of potential schedule delays.
C-89	No mention of the SWMU requirements of HSWA is included in the table (Table 6-1), please correct this. (Page 6-7)	SWMU requirements are not included in Table 6-1; the table presents Interim Status information. See the response to comment C-91.
C-90	Who decides which regulation provides the greatest protection? Is this decision subject to public review, and if not why not? (Page 6-8, Par. 3)	DOE makes the determination following interactions with the regulatory agencies. These decisions are reviewed in public meetings and are otherwise available for review by the public through the administrative processes of the reviewing agencies. See the response to comment C-84.

Comment number	Comments	Responses
C-91	This is the only mention of the SWMU provision of HSWA. Please provide a detailed analysis of the effects of the continuing release provision of HSWA at SRP. (Page 6-8, Par. 5)	Some existing waste sites may be closed under Section 3004(u). Addressing SWMU in detail is beyond the scope of this EIS. The SRP has been responsive to the requirements of EPA's National Corrective Action Strategy for SWMU's; RCRA Facility Assessment has been conducted and additional activities for SWMUs are detailed in the Hazardous Waste Management Facility Permit for SRP (Gleason to Wright, 6/29/1987). The need for corrective measures for these sites will be determined in the 3004(u) corrective action process.
C-92	Any facility which closes prior to permitting must meet the requirements for closure and post-closure found in 40 CFR Part 265. The requirements of part 264 only apply to facilities to which a permit has been issued. Please correct this. The failure to discriminate adequately between the 264 and 265 requirements demonstrates the lack of understanding and consideration of the regulations evident throughout the EIS, especially Chapter 6. (Page 6-8, Par. 6)	Text has been corrected to reflect interim status and closure of these and facilities that may be closed under Section 3004(u).
C-93	Although an MOA may recognize the constraints of the federal budgetary process, this does not relieve SRP of the duty to comply with law and regulations. Please make this clear. (Page 6-10, Par. 6)	DOE has stated its commitment to comply with all applicable regulations. Text has been revised.

Comment number	Comments	Responses
C-94	Mr. Brandt is the only individual identified having specific responsibility for preparing the response to the scoping comments in Appendix K. Please provide more information regarding his qualifications to address adequately the various technical issues raised during the scoping process. (Page L-P-2)	Mr. Brandt, listed as preparer of responses to public scoping comments, had the responsibility of assembling the responses from a large number of professional staff contributors.
C-95	Please provide a reference for this statement. (Page A-3, Par. 2)	Siple, 1967 (see the references to Appendix A).
C-96	Use of any model-generated potentiometric map is fraught with assumptions. Wherever such maps are used, please include an estimate of the error associated with them (i.e., a confidence interval). If not available please refrain from using such materials. (Page A-23, Par. 1)	The statement relative to the source of the model has been deleted from the text.
C-97	Provide a reference and an explanation for the statement that the contaminants would require over a hundred years to reach the river. (Page A-27, Par. 1)	Horizontal flow velocity in the Black Creek aquifer is estimated to be 100 meters per year in the direction of the Savannah River. The distance from the M-Area to the Savannah River is estimated to be 16100 meters. The correct elapsed time for contaminants to reach the river is 16100/100 = 161 years or over a hundred years. The text has been revised. (M-Area Part B Post-Closure Application, 1987).

Comment number	Comments	Responses
C-98	How can contamination by manganese be considered improbable when three wells failed Student's t-test? Further, the interim status groundwater monitoring requirements only address using statistical comparisons for the four indicator parameters pH, specific conductivity, TOC and TOX. Please explain how and why a statistical comparison was made using other parameters. Also please discuss assumptions of the statistical methods and their validity for comparisons of data of this sort. (Page A-45)	1. Manganese is not known to be used in the process, therefore, is not released. 2. Manganese was not detected (<0.005 mg/L) in basin influent. 3. Failure in the context of the EIS means failure to reject sampling variations between wells. Discussions of the tests used and their validity is beyond the scope of Appendix A, but is included in references.
C-99	In DOE's transmittal "Additional Information in Response to the U.S. EPA continuing Release Questionaire" contained in a letter to J. E. Revan (2/11/87) several waste sites were listed that were not included in the EIS. Include the following sites in the EIS or explain their absence. 131-L L-Area Burning/Rubble Pit 231-2F F-Area Rubble Pit 231-4F Burning Road Rubble Pit 731-2A A-Area Rubble Pit. (Section B)	These sites were not included in the EIS because available information did not indicate that they contained "criteria" constituents. Recent data indicate that some "criteria" constituents may exist at some of these sites (possibly lead and acid from batteries). Further efforts are underway to fully characterize these sites. The characterization of these sites as "criteria" sites did not affect the conclusions of the EIS or the selection of the preferred alternative. The L-Area Burning/Rubble Pit is included in this EIS (see Sections 2.2, 4.2, B.10.1.1 and F.9.1). The possibility that batteries may have been disposed of in the other three sites was discovered only recently. The site characterization process, source documentation, and EIS preparation has been ongoing for approximately two years. See the response to comment C-14.

Comment number	Comments	Responses
C-100	In DOE's transmittal (See Section B Comment above) many dates of waste receipt are different than those listed in the EIS. Correct the EIS to list the accurate date of waste receipt. (Section B)	Corrections have been made to the text, Table 5-2.
C-101	No hazardous waste storage facilities have received permits. All are operating under interim status. Please explain and correct this statement. (Page B-3, Par. 1)	The text has been corrected to reflect interim status.
C-102	Why are date not available? Sampling has been done for over two years. Please explain. (Page B-5, Par. 6)	Data were available from February 1984 on, but were not evaluated at the time of the first draft of Appendix B. The text in the FEIS has been revised to reflect current (1986) assessments (Zeigler et al., 1987).
C-103	This statement is highly speculative and should either be supported by references or by a thorough explanation of the basis upon which it was made. Either delete it or justify it. (Page B-23, Par. 5)	The sentence has been deleted.
C-104	Given that contamination has already been detected below the green clay please justify by references and explanations how you then conclude the green clay is "a significant barrier to vertical contaminant migration." (Page B-46, Par. 5)	The "green clay" is discontinous but does serve as an aquitard in some locations.
C-105	Given the uncertainty surrounding the use of this site, how do you assume that only hydrofluoric acid was spilled here. (Page B-72, Par. 3)	This area is classified as a waste site only because there may have been a spill of hydrofluoric acid. The selection of chemical constituents for environmental assessment was performed for this site in the same manner that it was for all other sites (see Section 4.2). Lead was detected in monitoring wells and selected for assessment. Fluoride was also selected because of the suspected hydrofluoric acid spill. See the reference to Appendix A, Huber and Bledsoe, 1986a.

Comment number	Comments	Responses
C-106	What constitutes a "significant" concentration of organics? (Page B-74, Par. 2)	The expression has been changed to "elevated."
C-107	What MCLs are being used for lead and mercury and please justify their use if they differ from the interim primary drinking water standards. (Page B-74, Par. 3)	The MCLs are the same as IPDWS and are used for comparative purposes only.
C-108	What applicable regulations will be followed? (Page B-84, Par. 6)	Closure of the new TNX basin will be determined following further basin characterization.
C-109	What other lab chemicals were disposed of and in what quantity? (Page B-85, Par. 2)	Details of disposal of chemicals are given in the EID for this basin. (See references to Appendix B, Kingley, et al.)
	Entire paragraph is not supported by references.	References have been furnished in the FEIS (Kingley et al., 1987). Other chemicals selected for environmental assessment were primarily selected because they were found in groundwater and soil samples, not because they were known to be present in the basin influent. They include barium, chromium, phosphate, uranium, and trichloromethane.
C-110	Either provide references or explanations justifying these speculations or eliminate the paragraph. (Page B-92, Par. 2)	Deleted in part.
C-111	If the tan clay is not there, it is not there. Please provide a reference for the last sentence. (Page B-113, Par. 2)	Reference is provided: Scott et al., 1987.
C-112	_In situ_ treatment comprises many other options than that described. Please provide up-to-date information. (Page C-2, Par. 2)	Appendix C presents treatments that are considered applicable to the SRP. See the response to comment C-113.

Comment number	Comments	Responses
C-113	The references EPA 1982 and 1985 are significantly out of date. SRP is designing waste management operations to continue well into the future. The technology of waste treatment is rapidly expanding and the EIS should consider the very latest technology available. Please update the references and provide information and evaluations of the latest technologies (e.g., plasma torches, in situ vitrification, infrared or microwave destruction etc.). (Page C-1, Par. 4)	DOE will consider state-of-the-art waste management technologies as they become available. The emerging technologies cited in the comment are still in the development stage; their technical and economic feasibility have yet to be demonstrated. Section 4.8 discusses the use of emerging technology at the SRP.
C-114	No matter what level of contamination is involved, leachate from a hazardous waste landfill is defined as being hazardous waste and must be handled as such. Please correct this statement. (Page E-5, Par. 6)	Text has been corrected.
C-115	This is the first indication in the EIS that SRP may accept hazardous waste generated at other government facilities. If SRP contemplates disposal of other than self-generated wastes substantial impacts from transportation etc. are possible and the cost of operation will increase since facilities accepting offsite waste are subject to additional regulatory requirements. None of these impacts are discussed in the EIS. Please do so and more fully explain exactly what other governmental generators SRP will accept waste from and what types and quantities of waste are expected. (Page E-11, Par. 4)	DOE-SR accepts only radioactive waste from offsite: naval hardware, tritiated waste from other DOE facilities (Mound Laboratory and Pinellas), job control waste from Westinghouse-Bettis Atomic Power Laboratory, Shippingport, Knolls Atomic Power Laboratory, and classified wastes from the Naval Reactor Program and DOE facilities. Absolute volume determinations cannot be made; however, offsite waste shipments to the SRP are approximately 5 percent of the onsite-generated volume (about 95,000 ft^3 per month). The types are described in the preceding paragraph. Quantities are described in the Cook reference, DPST-85-862.

Comment number	Comments	Responses
C-116	Please provide complete documentation for all cost estimates including all assumptions made. Simply providing the bottom-line numbers does not supply enough information for a reviewer to determine the validity of the estimates or the accuracy of the assumptions. (Page E-21, Par. 5)	Costs are documented and referenced in Appendix E, Moyer, 1987 (DPSP-87-1008). Accuracy of study cost estimates and validity of assumptions are given in the cited reference (DPSP-87-1008).
C-117	The cost estimates on Table E-5 for disposal of solid wastes are extraordinarily high. The per cubic yard costs for hazardous waste management under the various options equate to: No-action = \$636.00 per cubic meter Dedication = \$1340.00 - \$1826.00 per cubic meter Elimination = \$1763.00 per cubic meter Combination = \$1763.00 per cubic meter	As stated in the narrative that accompanies the cost tables in Appendix E, the cost ranges are given to indicate the relative magnitude of cost. They were not intended for comparison to actual costs nor were they represented as such. Cost estimating of complex waste management facilities uses a process of continual refinement at each stage of planning. Since numerous uncertainties which currently exist will be addressed by future planning and regulatory interactions, the assumptions made for costing purposes have been generally conservative and have resulted in the cost error being higher than the probable cost rather than lower. Costs have been updated and revised in the Final EIS to reflect the most recent estimates but will continue to be revised as future planning and regulatory interactions reduce the uncertainties.
C-118	Attached is a price list dated January 1, 1987 from a commercial hazardous waste disposal facility in Emelle, Alabama. The per cubic yard disposal cost of organic, bulk solids is quoted as \$115.00. This equates to a cost of \$150.65 per cubic meter. Disposal of drummed inorganic solids is given as \$98.00 per drum and since approximately five drums are needed per cubic meter even disposing of all wastes in drums is less than \$500.00	See the response to comment C-117.

Comment number	Comments	Responses
C-119	There is something grossly wrong when a commercial facility designed according to the RCRA standards and operated for profit, can charge less for disposal than it would cost SRP to do nothing, i.e., the no-action strategy. The same facility could dispose of all SRP hazardous waste for less than 1/3 the cost of SRP operating its own facility. Please note that the costs in Tables E-5 etc. are only for operation of the facilities and do not include any post-closure costs. The price quoted from the commercial facility does include the post-closure costs.	See the response to comment C-117.
C-120	Please fully explain and document why waste management at SRP would be so much more expensive than at a commercial facility. Costs for disposal at a nearby South Carolina commercial facility are a little more expensive than at Emelle (see attached) yet are still much less than at SRP. Thus site location alone can not fully justify the excessive SRP costs.	See the references at the end of Appendix E. Also, see the response to comment C-117.
C-121	Was the option of having a professional hazardous waste management firm construct and operate the SRP facilities explored? Please justify these cost estimates with specific data and references.	Justification of preliminary study estimates is not within the scope of the EIS.
C-122	Costs for mixed waste management are also high. Please provide adequate documentation for these costs. (Page E-23, Par. 5)	References for revised cost estimates are given at the end of Appendix E.

Comment number	Comments	Responses
C-123	Utilizing questionable modeling results, when for many sites actual data are available, is not appropriate. Please eliminate all modeling where data are not available.. Where models are used please include error estimates for each parameter and the upper and lower bounds of any predicated results. Otherwise how can the results be reasonably interpreted? (Page F-1, Par. 1)	Reliability of the model is given in Appendix H and in referenced supporting documents. Appendix F provides assessments.
C-124	As stated earlier MCLs that have not been formerly promulgated have no regulatory basis and should not be used. Please revise all analyses to compare to background values or provide a legal justification for use of MCLs. (Page F-1, Par. 5)	See the response to comment C-5.
C-125	Please identify specifically what compounds were modeled and not reported. Further, in absence of a standard, do you conclude that no matter how high the level of contamination, no impacts will occur? Many highly toxic chemicals do not have established MCLs. Background levels must be used when MCLs are not available. (Page F-2, Par. 4)	Compounds and constituents that were modeled or represented are given in Section 4.2. References to constituent selection are given in Appendix H. See the response to comment C-5.
C-126	If the model used is not field-verified then why should its results be trusted? If you cannot compare the model results to actual results in a reasonable manner then the usefulness of the model is very questionable. Please fully justify use of and reliance on such a model, particularly if actual analytical results are available. (Page F-2, Par. 5)	The model was used to compare the relative impacts of the alternative waste management strategies, to predict future concentrations and health risks in a multi pathway/receptor manner. See Appendix H as revised and the Fjeld, et al., reference document.

Table L-2. DOE Responses to Comments on Draft EIS
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Comment number	Comments	Responses
C-127	Explain how it is possible that no environmental releases of any sort are coming from an open pit. (Page F-6, Par. 1)	Expected environmental releases were not determined since no chemical constituents at or near threshold selection criteria were identified for 716-A Motor Shop Basin. See the revised text in Appendix B.
C-128	There are no drinking water standards for tetrachlorethylene and trichloroethylene. (Page F-8, Par. 1)	Text will be revised to state applicable standard or MCL. See the response to comment C-5.
C-129	Why was trichloroethylene not chosen for modeling? (Page F-30, Par. 5)	There is no record of trichloroethylene disposal at the SRL seepage basins. The source of VOCs in SRL wells is not definitely known.
C-130	There is no guarantee that the air stripper will only operate for thirty years. The regulations require it to operate until complete remediation is obtained. This could exceed thirty years. (Page F-44, Par. 2)	The length of time the air stripper will operate is selected as 30 years for the purpose of the EIS assessments. The actual operation period may exceed 30 years. DOE estimates that 75,000 pounds of VOC have been removed from groundwater (Du Pont DPSP 87-26).
C-131	Correct exponentiation on line 6 of this paragraph. (Page F-72, Par. 5)	The text has been corrected.
C-132	Why would the current cap, if it is sufficient, have to be removed? Why would the office trailer have to be relocated? (Page F-146, Par. 1)	The cap is stated not to meet current regulations. The trailer must be removed to provide complete access to the asphalt, the clay cap, and the underlying waste.

Table L-2. DOE Responses to Comments on Draft EIS
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Comment number	Comments	Responses
C-133	It does not seem reasonable that removing a source of contamination would not reduce releases to the groundwater. Please explain. (Page F-147, Par. 4)	In many cases contaminants disposed in the waste have already leached below the area of practicable waste removal; removal of the waste, therefore, does not recover the contaminants.
C-134	This is incorrect, especially since MCLs have not been promulgated for many of these chemicals. The recommended MCLs for benzene and trichloroethylene are zero (ADLFR 141.50). (Page F-188, Par. 3)	The final MCLs for benzene and trichloroethylene are 5 g/L (52 FR 25690).
C-135	RCRA does not contemplate a landfill, designed and operated in accordance with the regulations, but which does not have a low-permeability cap. Eliminate this option from consideration. (Page G-7, Par. 2)	The subject paragraph does not present an alternative or option. Rather, it is describing the results of a modeling effort designed conservatively to evaluate the performance of a low-permeability cap as an integral component of a RCRA facility. The result of this evaluation, Table G-3, clearly shows the contribution of the low-permeability cap, as well as the potential impacts of a failure in the cap.
C-136	A review of this table simply does not support the choice of the combination strategy. There is no significant difference between the dedication and combination strategies and both appear less desirable than the elimination strategy. If this table is thought to justify the choice of the combination strategy, it fails to do so. Please explain. (Page G-31)	The Combination strategy includes storage for low-level radioactive waste (an elimination approach), while the Dedication strategy includes engineered low-level trench disposal which would require dedication at the end of the institutional control period. See Tables G-7 and G-10 for a comparison of the differences in doses.

Table L-2. DOE Responses to Comments on Draft EIS

Comment number	Comments	Responses
C-137	Explain in detail the modifications made to the model. Include information on testing and validation of the modified model. (Page H-1, Par. 3)	References to the models testing and verfication are cited at the end of Appendix H. For details on modifications to include hazardous constituents, see Rogers, V. C., G. B. Merrell, and M. K. Bollenbacher, 1986.
	None of the four assumptions are satisfied. *Aquifers are not one-dimensional *Contaminant release is neither constant nor exponentially decaying. *pH etc. do affect things *plug flows do not describe the movement of contaminants.	
	How then can the model be adequate? (Page H-4, Par. 2)	See the response to comment C-12.
C-138	Many thousands of data points are available to validate the model at SRP. There is no excuse for not doing so. This is poor scientific technique. Basing much of the EIS on a non-validated model is ridiculous. Validate the model using real data and determine if it is appropriate. (Page H-9, Par. 2)	Appendix H, as revised, discusses the appropriateness and adequacy of the model as a basis for comparative evaluations of alternative strategies.
C-139	This paragraph creates a very convoluted and questionable protocol. (Page I-2, Par. 3)	DOE considers the protocol to be conservative and useable for the purposes of the EIS.
C-140	EP toxicity extractions are not designed for nor suitable for use on organic contaminants. The TCLP is better. There is no justification for a factor of ten dilution (leaching); and finally MCLs are not established for many of these constituents. Please explain why this procedure should be acceptable. (Page I-2, Par. 4)	The TCLP test was a proposed method when the selection criteria were established. The EP toxicity test was the standard protocol. The justification for the factor of 10 dilution is given in EPA 1985a and footnote c of Table I-2. See the response to comment C-5 on MCLs.

Table L-2. DOE Responses to Comments on Draft EIS
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Comment number	Comments	Responses
C-141	Soil concentrations for non-radioactive constituents are not properly described in pCi/g. (Page I-5)	The units cited have been changed to read micrograms/gram (g/g).
C-142	Using Looney et al., 1986, an in-house document not subject to peer review, as a major reference (e.g., on pg. I-2) is unacceptable. Please provide published references for the techniques etc. (Page I-14)	All of the references cited in the EIS are available in public reading rooms.
C-143	As indicated throughout our comments we do not feel the regulatory process was taken into consideration. (Page K-4, Par. A-1)	See the response to comments C-1 and C-2.
C-144	The SARA requirements relate to far more than waste sites. Provide the required disclosures except where national security prevents it. (Page K-6, Par. A-14)	The scope of the EIS applies to waste management. The characteristics and constituents detected in waste sites, monitoring wells, and soil samples are discussed in Appendix B, Chapter 4, Appendix F, and referenced documents.
C-145	Why are existing storage and idle production facilities outside the scope of the EIS? These waste storage sites could impact groundwater. Further, the EIS does not address anything regarding underground tanks. (Page K-6, Par. A-16)	Underground storage tanks containing high-level waste and idle production facilities are not used to dispose of hazardous low-level radioactive or mixed waste and are, therefore, outside the scope of this EIS. The rationale for not assessing the hazardous waste storage buildings is presented in Appendix B, Section B.1.1. Major Federal actions which might affect groundwater resources (as defined at 40 CFR 1508.18) are not anticipated for these facilities. If actions at these facilities are proposed, NEPA documentation will be prepared.

Table L-2. DOE Responses to Comments on Draft EIS
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Comment number	Comments	Responses
C-146	Response does not address question asked. In absence of a treatment and disposal option, storage of wastes banned from land disposal is prohibited. Please address this question. (Page K-7, Par. A-18)	With the exception of no action, all alternative new storage/disposal facilities, including retrievable storage, will comply with RCRA, as amended. Pretreatment technologies are presented in Appendix D.
C-147	The RCRA corrective action provisions do not require the presence of regulated hazardous waste to be triggered. Again response does not address how SRP plans to comply. (Page K-9, Par. A-27)	DOE is complying with RCRA at the SRP on a sitewide (Part A) and an individual facility basis. Since individual Part B closure permits generally exceed, in terms of specificity and volume of information, an EIS, the types of permitting actions are clearly beyond the scope of the closure and remedial action strategies discussed in the EIS.
C-148	This question addresses specific sites and their activities required by RCRA. Chapter 6 does not begin to address this question. (Page K-10, Par. A-30)	See the response to comment C-147. Refer to Section B.1.1 for the rationale for not including the experimental sewage sludge application sites and the coal pile runoff containment basins. See the response to comment C-145 regarding the underground storage tanks.
C-149	Chapter 5 provides no information regarding the questions asked. If this or other questions are felt to be out of the scope of the EIS state that but do not attempt a "smokescreen" answer by implying that a comment is addressed in a section where it obviously is not. (Page K-11, Par. A-31)	EIS Section 6.1 summarizes compliance with RCRA and other applicable groundwater assessment requirements. Further detail is beyond the scope of this EIS. DOE publishes annual and quarterly environmental reports that detail data analysis, quality control, and data intercomparisons.
C-150	See response to A-31. Data quality used in the EIS is a major concern and was never addressed. (Page K-12, Par. A-32)	See the response to comment C-149.

Table L-2. DOE Responses to Comments on Draft EIS
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Comment number	Comments	Responses
C-151	This question was not addressed in Chapter 5. See response to A-31. (Page K-13, Par. A-33)	See the response to comment C-149.
C-152	This comment was not addressed in Chapter 6. No place in the EIS is any planning for meeting regulatory requirements done. (Page K-15, Par. A-37)	Chapter 6 identifies Federal and State environmental requirements, including South Carolina hazardous waste management permit regulations (R.61-79.270). This regulation establishes procedures for facilities such as the SRP to follow in order to receive agency approval to construct new hazardous waste management units while the facility is operating under interim status (R.61-79.270.72). The regulation also establishes procedures to be followed once the facility receives its final operating permit but needs agency approval to construct new units (R.61-79.270.10(f)). Before constructing any hazardous waste management units, DOE would obtain applicable agency approvals including hazardous waste management facility permit modifications. To the extent possible, these activities would be carried out concurrently with other preconstruction planning, evaluation, and design activities.
C-153	This response does not address the question of establishing independent monitoring programs. (Page K-40, Par. G-7)	The EIS was prepared to assess the environmental consequences of the implementation of alternative waste management activities at the SRP and to assure compliance with NEPA. The issue of outside oversight of the SRP is not within the scope of the EIS proposed action, and its resolution is not necessary for compliance with NEPA.
C-154	Again the response does not address the question. (Page K-58, Par. K-4)	See the response to comment C-153.

Comment number	Comments	Responses

TESTIMONY OF
JAMES E. BEARD,
NATIONAL COORDINATOR,
FISSILE MATERIAL CUTOFF CAMPAIGN

FOR

GREENPEACE

REGARDING THE
DRAFT ENVIRONMENTAL IMPACT STATEMENT

Waste Management Activities for
Groundwater Protection,
Savannah River Plant

June 4, 1987
Aiken, South Carolina

Good morning. My name is James E. Beard, and I am here representing Greenpeace. Greenpeace is an international environmental activist organization, with members in 17 countries. We are engaged in a peaceful, worldwide effort to protect life and preserve the environment. Our work ranges from a campaign to stop the slaughter of whales and seals to an international effort to end the production of plutonium for use in nuclear weapons.

Greenpeace is very concerned with the grave ENVIRONMENTAL problems associated with the reprocessing of spent nuclear fuel for the production of plutonium. Time and again, at Sellafield in Great Britain, at Cap de LaHague in France, and at the Hanford Reservation in Washington state, these terrible risks to the environment have been demonstrated. The Savannah River Plant, operation of which has caused

Comment number	Comments	Responses
	extensive contamination of soils, surface water and groundwater, is no exception, as indicated by the information contained in the Draft Environmental Impact Statement under discussion today.	
	In the Draft Environmental Impact Statement (DEIS), the Department of Energy identifies four alternative strategies.	
	1. No Action - continuation of current waste disposal practices.	
D-1	2. Dedication - selection of several current waste disposal sites, and "dedicating" them (i.e., dumping waste at these sites and contaminating surface and groundwater in perpetuity).	Under the Dedication strategy, all existing waste sites would be closed in accordance with applicable regulations. Wastes would no longer be placed in these sites but would be disposed of in approved facilities.
D-2	3. Elimination - "elimination of existing waste sites, followed by storage of wastes. It should be noted here that to "eliminate" disassembly basin purge water, DOE plans to dump the contaminated water directly into tributaries of the Savannah River.	Direct discharge or evaporation of the purge water could lead to eliminating the reactor seepage basins, not the purge water.
	4. Combination - a combination of dedication and elimination of existing waste sties, and both storage and disposal of wastes. This is the DOE's preferred alternative.	
	Except for the "no action" alternative, which is required by the National Environmental Policy Act, and which has fortunately been dismissed by the DOE, Greenpeace is concerned not only with the options and their implication but also with the manner in which the options were formulated and selected.	

Comment number	Comments	Responses
D-3	First, all three of the substantive options are, according to the DOE, intended to address the issue of compliance with the Resource Conservation and Recovery Act and all other applicable state and Federal regulations. However, nowhere in the document is the issue of compliance with these laws seriously discussed. The Department of Energy's compliance record with these and other statutes at facilities all over the United States has been abysmal. There is nothing in the Draft EIS that gives any indication the DOE intends to improve this record.	DOE has emphasized its commitment to comply with RCRA, or any other applicable regulations, specifically at pages S-7 and S-8, and elsewhere in the EIS. DOE has not ignored public concerns with regulatory compliance, but states that this EIS is not intended to preempt the regulatory or permitting processes which will be carried out following the EIS Record of Decision.
	The DEIS does not adequately address the issue of securing permits for waste management operations, and it also does not use established standards and terminology for groundwater assessment, necessary for effective review and implementation of the waste management alternatives.	See the response to comments C-5 and D-3 relative to groundwater assessment standards.
	As a result, the DOE has wasted a considerable portion of the time, effort, and money used to prepare this document. More than anything else, the DEIS is a smokescreen, intended by DOE to mask their plans for "business as usual" at the Savannah River Plant.	
D-4	The Department of Energy is a Federal agency, and, as such, they must be held in compliance with the letter and intent of all applicable state and Federal standards.	See the response to comment D-3.
	The second, and most important, concern that Greenpeace has with the Draft EIS is the identification and formulation of alternatives.	

Comment number	Comments	Responses
	The obvious first step when dealing with any waste disposal problem is to end the generation of the waste under consideration. It does no good to make plans for cleaning up a waste disposal site, if the continued dumping of waste is planned, there or anywhere else. However, by DOE's own admission, this option was not considered. The DOE states: "Discontinuing SRP operations...was not considered, because such a strategy would not allow DOE to meet established requirements for production of defense nuclear materials."	
D-5	Greenpeace questions these established requirements, and asks that the Final EIS for Waste Management Activities for Groundwater Protection at the Savannah River Plant consider the alternative of ending the production of 'defense nuclear materials' at SRP. Such a defense materials production cutoff would free large amounts of money for cleanup of the Savannah River Plant, the Hanford Reservation, and other DOE facilities. With little information available on the needs, production and uses of tritium in the United States' nuclear arsenal, it is obviously difficult to discuss the possibilities for a tritium production cutoff. However, there is enough information available in the public domain regarding plutonium that the subject of a plutonium production cutoff can be addressed.	Under the Atomic Energy Act of 1954, the Department of Energy is responsible for developing and maintaining the capability to produce all nuclear materials required for the U.S. weapons program. In accordance with the Atomic Energy Act, approval of proposals for defense nuclear materials by the President and subsequent authorization and appropriation by Congress constitute the legal authority and mandate for the Department of Energy to provide the required defense nuclear materials. The national policy on nuclear weapons, their deployment, and the need for weapons is beyond the scope of this EIS.

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	A plutonium production cutoff would in no way threaten the current United States arsenal of nuclear weapons, due to the slow rate of decay of the plutonium. In fact, there is some indication that, even with such a cutoff, the nuclear arsenal could be expanded by some 3,000-5,000 weapons, through the improved utilization of "scrap" and stockpiled plutonium. The United States currently has approximately 100 metric tons of weapon-grade plutonium available for the manufacture of nuclear weapons. With a stockpile of over 27,000 nuclear warheads, even the Department of Energy and the Department of Defense have trouble justifying continued plutonium production. In 1983, Secretary of Defense Caspar Weinberger could provide no rationale for continued plutonium production. He stated before the House Armed Services Committee that the number of warheads in the United States' nuclear arsenal had "dropped 40 percent" since the 1960's, thus freeing "large amounts" of plutonium for use in new weapons. In December, 1986, in response to a question on the need for continued plutonium production, the person in charge of nuclear weapons materials production for the DOE, Admiral Sylvester Foley, responded as follows: "It would have a measurable impact, measurable being, you can take the amount of nuclear materials required to produce the weapons to meet the President's Stockpile Memorandum and *you can decrement it by the amount* that the N-Reactor puts on out and you are going to be	

Comment number	Comments	Responses
	short that much. Now can you meet the needs? Do you have a reserve you can eat on into or that you can go through? What you are doing is you are building yourself, you are increasing the risk." (DOE Transcript, NW Citizens' Defense Waste Forum, Seattle, Dec. 17, 1986.) This tortured double talk in no way provides a justification or rationale for continued plutonium production. The DOE refuses to elaborate on the needs and risks mentioned by Admiral Foley, yet they continue to ask the American citizen to accept all the costs and risks associated with continued plutonium production. Similarly, the DOE has refused to provide a justification for continued production of tritium, stating that all information on tritium use and need is "classified." The American public is entitled to know whether or not the U.S. has enough tritium and plutonium, if not, when enough will be produced. Again, it is the defense or our country, we are paying for it, and we are facing the risks.	

Comment number	Comments	Responses

TESTIMONY OF W. F. LAWLESS

R. L. Morgan, Manager
Department of Energy
Savannah River Plant
P. O. Box A
Aiken, S.C. 29802

June 4, 1987

Dear Mr. Morgan:

Re: Draft DOE Environmental Impact Statement, Waste Management Activities for Groundwater Protection at the Savannah River Plant, Aiken, South Carolina, DOE/EIS-0120D (1987).

With the publication of the draft EIS (DEIS), my two goals in leaving the Savannah River Plant have been accomplished. First, I left DOE and SRP because I did not trust the DOE Inspector General to expose and to resolve a cover up of significant environmental problems at each DOE waste site (1). I had turned to the Inspector General because no DOE scientist or engineer could stop DOE from issuing a replacement regulation for radioactive waste management (DOE Order 5820.2, issued 1984). This new regulation, still the governing regulation for radioactive wastes (DEIS, p. 6-3), allows the continuation of antiquated practices by DOE contractors, such as seepage basins and cardboard boxes used by Du Pont to dispose of radioactive wastes at SRP. *This DEIS validates that concern.* The conclusion drawn from this DEIS, that partial environmental protection for SRP groundwaters after 35 years of Du Pont operations may cost up to $12.7 billion, would never have become public had it been left up to the DOE Inspector General, DOE, or to Du Pont.

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	Du Pont may not accept its responsibility in causing the damage to SRP. Two examples. In January 1981, when DOE transmitted my report to Du Pont highly critical of Du Pont waste management operations, Du Pont management refused to accept the report and requested that your office recall and convert the report to a draft, inaccessible to Freedom of Information requests (2). DOE did. Next, in August 1982, I asked Du Pont scientists investigating the M-Area groundwater contamination whether contamination had reached the Tuscaloosa aquifer and been found in the drinking water pumped from the Tuscaloosa. Although Du Pont had known since 1981 that drinking water from the Tuscaloosa was contaminated (DEIS, p. 1-1; ref. 3; but compare to ref. 4, pp. 5-10, 11), Du Pont management suppressed that information and requested that your office remove me from the investigation. DOE did. Although I am grateful to the individual Du Pont scientists and engineers who taught me radioactive waste management principles, and showed me the problems that existed at SRP, in my experience, Du Pont management has been wasteful, resistant to oversight, negligent, and a threat to the environment. If Du Pont leaves SRP without fully rectifying the damage caused by its own actions, then Du Pont will not have served in the best interests of our nation. My second goal was to make DOE self-regulation a public issue. Self-regulation and the lack of independent peer review have lead to waste, poor engineering practices, significant environmental damage, and a DOE regulation to cover up that	

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	damage. Whether or not there is justification for nuclear weapons, there is no justification to bury nuclear wastes in cardboard boxes inside leaking trenches, no justification to contaminate the earth and groundwater for future generations, no justification to spew millions of curies of radioactivity and contamination into the air, no justification to contaminate wildlife and to threaten human welfare, and no justification to cover up the evidence. Having failed to carry out its waste management responsibilities under the Atomic Energy Act, DOE has demonstrated that nuclear weapons cannot be produced safely without jeopardy to our environment and to human welfare. Legislation to strip DOE of its right to self-regulate nuclear materials and wastes has been proposed by Sen. Glenn, Rep. Wyden, Rep. Markey, and others. The broad support for legislation probably encouraged DOE recently to relinquish to EPA and the States regulation of mixed hazardous and radioactive wastes, but to retain regulation for nuclear materials and transuranic and high-level radioactive wastes.	
E-1	This draft EIS is gratifying. I applaud the renewed effort by DOE to meet its responsibilities. Although there is much to like in this draft, until such time that it is subjected to independent peer review, with full authority to resolve issues discovered in peer review, followed by public comment, then this DEIS will remain unacceptable.	The CEQ regulations (40 CFR 1503) require agencies that have legal jurisdiction or special expertise on the environmental impacts involved in an EIS and those agencies that develop and enforce environmental standards to review and comment on an EIS. The EIS is also distributed for public comment. Public hearings are also held to encourage full participation by the public, peer groups,

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		Federal, state, and local governments, environmental interest groups, and the news media. In addition to the review of the EIS indicated above, public reading rooms containing all of the available support and background documents are provided and are clearly identified in public notices, newspaper advertisements and articles, and in radio and television announcements.
E-2	DOE states in the draft that it has conducted waste management activities to protect public health and the environment (DEIS, p. 1-1). Little support exists for such a DOE statement, but regardless, the Congress and the public do not believe DOE. However, by its respect for the scientific method, independent peer review will provide DOE with checks and balances to protect the public and the environment and to increase the public trust in DOE. If DOE is committed to a rigorous application of environmental protection principles in the national interest, submit this draft EIS, and all supporting documentation, to independent peer review. Thank you for this opportunity to comment. Sincerely, W. F. Lawless, Professional Engineer, Assistant Professor of Mathematics Paine College 1235 15th Street Augusta, GA 30910 (404) 722-4471 ext. 205 Additional testimony submitted by Mr. Lawless follows.	Examples of DOE conduct of waste management activities to protect human health and the environment, including groundwater, are the M-Area groundwater remedial action; design and construction of liquid effluent treatment facilities; and removal of waste and soil at the CMP pits. See page 1-1. See the response to comment E-1 on peer review.

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ADDITIONAL TESTIMONY OF

MR. W. F. LAWLESS

R. L. Morgan, Manager
Department of Energy
Savannah River Plant
P.O. Box A
Aiken, S.C. 29802

Dear Mr. Morgan June 4, 1987

Re: Draft DOE Environmental Impact Statement, Waste Management Activities for Groundwater Protection at the Savannah River Plant, Aiken, South Carolina, DOE/EIS-0120D (1987).

With the publication of this draft EIS (DEIS), my two goals in leaving the Savannah River Plant have been accomplished. First, I left DOE and SRP because I did not trust the DOE Inspector General to expose and to resolve a cover up of significant environmental problems at each DOE waste site (compare 1 and 19). I had turned to the Inspector General because no DOE scientist or engineer could stop DOE from issuing a replacement regulation for radioactive waste management (DOE Order 5820.2, issued 1984). This new regulation, still the governing regulation for radioactive wastes (DEIS, p.6-3), allows the continuation of antiquated practices by DOE contractors, such as seepage basins and cardboard boxes used by Du Pont to

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	dispose of radioactive wastes at SRP. This DEIS validates that concern. The conclusion drawn from this DEIS, that partial environmental protection for SRP groundwater after 35 years of Du Pont operations may cost up to $12.7 billion, would never have become public had it been left up to the DOE Inspector General, DOE, or to Du Pont. Du Pont may not accept its responsibility in causing the damage to SRP. Two examples. In January 1981, when DOE transmitted my report to Du Pont highly critical of Du Pont waste management operations, Du Pont management refused to accept the report and requested that your office recall and convert the report to a draft, inaccessible to Freedom of Information requests (2). DOE did. Next, in August 1982, I asked Du Pont scientists investigating the M-Area groundwater contamination whether contamination had reached the Tuscaloosa aquifer and been found in the drinking water pumped from the Tuscaloosa. Although Du Pont had known since 1981 that drinking water from the Tuscaloosa was contaminated (DEIS, p. 1-1; ref. 3; but compare to ref. 4, p. 5-10, 11), Du Pont management suppressed that information and requested that your office remove me from the investigation. DOE did. Although I am grateful to the individual Du Pont scientists and engineers who taught me radioactive waste management principles, and showed me the problems that existed at SRP, in my experience, Du Pont management has been wasteful, resistant to oversight, negligent, and a threat to the environment. If Du Pont leaves SRP without fully rectifying the damage caused by its own actions, then Du Pont will not have served in the best interests of our nation.	

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	Draft DOE Environmental Impact Statement, Waste Management Activities for Groundwater Protection at the Savannah River Plant, Aiken, South Carolina, DOE/EIS-0120D (1987).	
	Summary	
E-3	1. The DEIS was not independently peer reviewed by a peer review group with the authority to resolve issues discovered in peer review. Until such time that it is so reviewed, the DEIS is unacceptable.	See the response to comment E-1 regarding peer review.
E-4	2. The DEIS addresses only a partial cleanup of SRP. There are no actions discussed for TRU, HLW, and saltcrete; or for removal of any HLW tanks, reactors, or other SRP facilities. The DEIS does not discuss the total cleanup cost for SRP, nor provide a schedule for total cleanup, nor commit to a schedule for when the total cleanup will be addressed.	Buried TRU waste and TRU contaminated soil is discussed in the EIS in Section B.3.3.1. The impacts of the closure of the old radioactive waste burial ground are discussed in Chapter 4. The impacts of stored and newly generated TRU waste are being evaluated in a separate environmental assessment. The impacts of the management of HLW were discussed in DOE/EIS-0023 and DOE/EIS-0062. Total cleanup costs are given for existing waste sites assumed or believed to contain hazardous, low-level, or mixed wastes. Information relative to schedule is given on page vi.
E-5	3. The DEIS does not clearly state whether regulatory agencies approve of current SRP operations, current remedial actions, and planned SRP cleanup activities.	Ongoing interactions with regulatory agencies and the permitting process will be used to assure regulatory compliance.

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E-6	4. The DEIS demonstrates that DOE was unable to meet the criteria of commercial regulations, that DOE finds many of its radioactive waste activities no longer acceptable (p. 2-1), and that DOE failed to lead the way in research and in applying technology to defense radioactive waste management.	The legal requirements applicable to DOE differ from commercial regulations. Past waste management activites are no longer acceptable because of changes in waste management regulations.
E-7	5. The City of Jackson, SC, has experienced an unexplained, significant increase in radionuclide pollutant concentrations.	Tritium concentrations measured in a Jackson drinking water well averaged 0.55 pCi/ml in 1986. Since 1983, the measured tritium concentration has ranged from 0.18-0.57 pCi/ml. These levels are about 1.0 to 3.0 percent of the drinking water standard.
E-8	6. The DEIS did not provide a summary of total radionuclide and hazardous chemical releases by liquid, airborne, and solid releases from beginning of SRP operations to present. Data presented in DEIS is generally deficient: by not providing references; by not consistently providing standard deviations, ranges, means, number of observations or samples; by not providing comparative occupational health data; and by not providing on and offplant releases into the downstream swamp system.	Summary data on releases from SRP facilities are provided to the public in the "Annual Reports" (e.g., DPSPU-87-30-1). The inclusion of this material was not necessary to develop the EIS alternatives or provide pertinent information on the alternatives to the public. The data and information presented is in keeping with NEPA/CEQ guidelines to provide the public an EIS that is analytical in nature, not encyclopedic. References are provided, as appropriate, at the end of chapters and appendixes.
E-9	7. The DOE Order 5820.2, Radioactive Waste Management, is inadequate and unacceptable, and the use of this order by DOE has not been justified. DOE has not stated whether the objective of this order has been met (p. 6-3, para 4). The DEIS demonstrates that DOE has failed to minimize releases to the environment and to protect public health.	The purpose of this EIS is to evaluate alternative waste management activities at the SRP. The adequacy of DOE Order 5820.2 is not evaluated in the EIS. The data available in the "Annual Reports" (see the response to comment E-8) and epidemiological studies have shown that the intent of DOE Order 5820.2 (to protect the public health) has been met. The intent of Chapter 6 is to discuss applicable waste management statutes, regulations, and orders, generally and specifically (see the response to comment E-20).

Comment number	Comments	Responses
	General Comments	
E-10	1. <u>High-level and transuranic wastes</u>. High-level and transuranic wastes have not been included in this EIS. However, high-level wastes (HLW), HLW spills, HLW tank cooling waters, saltcrete, and transuranic wastes that have been released into the environment should be included in this EIS. This DEIS has proclaimed that part of its purpose is to express the DOE commitments to the "...need for a more comprehensive framework to evaluate its future waste management and groundwater protection projects..." (DEIS, p. 1-3); to "...the protection of groundwater, human health, and the environment." (p. 1-3); and to "...identify and select ... activities [that] have the greatest potential for affecting groundwater resources." (p. 1-3). However, HLW and TRU wastes and their residues may have the largest impact on the environment and the cleanup of SRP. Although HLW has already been addressed, much has changed since the DWPF EIS was	See the response to comment E-8.
E-11	written. HLW and TRU wastes and residues should be included in this EIS. If not included, then this EIS should state when the HLW, HLW tank, HLW cooling water, and TRU waste residue cleanup NEPA actions will be published. State whether saltcrete disposal will meet SCDHEC standards at the point of release.	A permit has been issued by SCDHEC for the construction and operation of Z-Area, the saltstone facility.

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E-12	In the DEIS (p. K-95), a copy of Performance Audit Questions from a planned audit of high-level waste management that was prevented from taking place in 1982 by Du Pont and DOE management were provided to DOE. No response to the questions was made by DOE in the DEIS. These questions deal with long-term performance of the high-level waste tank system in its interactions with the groundwater and the environment. Provide dates and results of completed DOE audits of the prime contractor's operations with HLW and TRU wastes. Specify whether high-level waste performance questions, at the level of detail in the audit that was prevented from taking place in 1982, have subsequently been part of a completed DOE audit of Du Pont.	See the response to comment E-8.
E-13	2. <u>Peer Review.</u> In the past, DOE has used the National Academy of Sciences (NAS) as an independent peer review of DOE programs as requested by DOE. It is interesting to compare three examples of waste management reviews of Du Pont, the prime contractor at SRP. Two of the reviews were by outside organizations independent of DOE. This information was presented to the NAS panel public presentation held in Aiken, SC, January 22, 1987 (5). In its 1981 report (6), the National Academy of Sciences recommended that current management practices of low level waste at SRP should continue. The Academy judged that aqueous releases contained acceptably low concentrations of	See the responses to comments C-153 and E-1.

Comment number	Comments	Responses
	radionuclides released to SRP soil basins, concentrations that would decay to insignificant levels before reaching surface streams at the plant boundary. The Academy noted the SRP was monitoring the movements of radionuclides in the soil, air, and groundwater to detect unexpected migration of buried radionuclides. NAS reported that the measured rate of groundwater flow was low, and sorption by sediments retarded radionuclide migration. The Academy found no fault with the SRP high level radioactive waste program, finding that the construction and use of the high level waste storage tanks was a well-controlled practice; the Academy considered that the high level wastes could be safely disposed at the SRP plant site by pumping a fluid, grout-radioactive waste mixture beneath the plant and the Tuscaloosa aquifer. The National Academy of Sciences concluded that extensive investigations revealed no adverse effects on the Savannah River Plant environment from radioactive waste. In its 1982 field test of SRP radioactive operations (7), including reactor operations, one EPA official stated that the SRP site was "...clean as a hound's tooth..." The EPA field test validated SRP release models, calculations, and releases for airborne and liquid releases. Offplant, milk was tested for strontium-90 concentrations and found to be the exact average concentration published by EPA for strontium-90 concentrations in milk for the southeast. EPA concluded that airborne releases from the reactors and reprocessing plants do not significantly increase the radiation exposure to people living around the plant. However, EPA ignored published Du Pont data on strontium-90 milk concentrations seven times greater than published EPA findings	

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	(8), EPA did not report on the contamination of the Tuscaloosa aquifer by SRP operations (9), the closure of 4 drinking water wells (10), turtles contaminated by strontium-90 to 1000 times background (11), and other problems known to investigators before the EPA report was published (4,12). These omissions by EPA suggest a lack of rigor in EPA reporting and in its field test. The third report (2,12), the result of an internal DOE investigation, was published before either the NAS or EPA study was completed, yet the report was available to NAS or EPA should it have been requested. [The author was the DOE point-of-contact for the Academy during its investigation, and worked with DOE project specialists working with the EPA investigation.] This [DOE] report appraised the operations of the SRP radioactive waste burial grounds. Significant levels of radionuclides were found to be migrating from the SRP burial grounds, reaching streams in concentrations far in excess of the benchmark EPA drinking water standards. The report documented Du Pont's use of cardboard boxes as their primary container for radioactive waste; found that plutonium-239, strontium-90, and cesium-137 were migrating and exceeding benchmark drinking water standards; documented that Du Pont regularly pumped monitoring wells in an effort to reduce concentrations of radionuclides; documented that Du Pont regularly underreported to the public, including NAS and EPA, data from its monitoring wells; and documented that Du Pont operational methods at the SRP radioactive waste grounds were unnecessarily leading to costly future remedial actions. This appraisal concluded that SRP radioactive waste disposal operations were antiquated, not technically sound, were the cause	

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	of observed radionuclide migration, and were unacceptable (12). Other sources have documented extensive corrosion pitting in the high level waste tanks found in 1980 at the end of tank construction but also after 4 tanks were radioactively hot and in service (4,19). Although ignored by the Academy in its report, the corrosion pitting in the high level waste tanks was discovered during the investigation by the Academy. Comparing these three reviews, the most rigorous was performed by the DOE, although it was subsequently covered up (1,2). DOE and NRC generally depend on public reviews as the official peer review (13), and on the Academy and EPA for ad hoc reviews. Although NAS has the expertise and is independent in its assessments, no organization that has independently assessed DOE has had the authority to resolve issues discovered in peer review. In the past, if DOE wanted to act on an outside review recommendation, it was the prerogative of DOE whether to do so or not.	
E-14	Independent peer review (IPR) will not be a panacea, but it will add an important check and balance to impacts on the environment. IPR may not have stopped some abuses that have occurred, but IPR will lend a more objective analysis to waste management impacts and may prevent abuses, especially if IPR is provided authority to resolve issues discovered in review, to prevent documents from being published (e.g., EIS and SAR type documents) or research from being funded or a new facility from being built. IPR should add rigor to the analysis of waste management activities, should reduce costs and wasteful spending (especially by ending the practice of incomplete or partial funding of programs), and should direct research toward purposeful and valid goals (instead of funding researchers in busy work to keep them	See the response to comment E-13.

Comment number	Comments	Responses
	active. *IPR should make research more accessible* to the research community and more cost effective, should prevent coverups of data, remove politics from funding considerations, and should make programs more justifiable and pragmatic. Not only is the public unprepared to peer review EIS and SAR type documents, or their supporting documents, but also the public does not have the time to adequately review these documents. IPR review will then provide the public with an important and timely sense of the adequacy and acceptability of EIS type documents. For example, the supplemental EIS written in 1980 was directed by federal court to review high-level waste tank construction (14). This supplemental EIS stated that corrosion pitting was no longer a problem at SRP because of *the extensive experience of the* SRP prime contractor, Du Pont, in building these tanks and the improved quality assurance program developed by Du Pont (14). Although public review of the supplemental EIS found no fault with the EIS, six months after the EIS was delivered to the federal court, and after 4 of the 18 new tanks went into radioactive service, extensive corrosion pitting was discovered (1,4). Not only was the pitting a threat to the HLW program, and required remedial actions and new procedures to protect the tanks, but the incident was not made public and a second federal court inquiry was not told of the existence of reports or of the incident (4). Independent peer review will be a public safeguard in similar investigations, and will scrutinize DOE claims in future EIS documents.	
E-15	The State of South Carolina has subsumed responsibility for regulation of hazardous chemical, low level radionuclide, and mixed waste releases. This step should be more fully explained	

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	in the EIS. By ending DOE self-regulation in these areas, this joint action by the State and DOE is a positive action, but in the long term, one bureaucracy has replaced another. IPR will relieve the responsibility that the State has assumed, and will make the State a more effective regulator.	
E-16	3. <u>Previously Acceptable Waste Management Practices.</u> This DEIS has made the point that seepage basins and solid waste burial grounds for radioactive waste were previously acceptable waste management practices (p. S-1). However, the DEIS does not state who these practices were acceptable to, and whether or not they were in any way controversial. A report issued to Du Pont in 1981 took specific issue with the operation of the solid waste burial grounds (2), a report recalled by DOE and converted into a draft report (12). Similarly, seepage basins have been increasingly the center of controversy. Because of this controversy, an investigation into the problems from the long-term use of seepage basins at SRP was prevented from taking place in 1982 by Du Pont and DOE management (DEIS, p. K-95). On page 1-1, the DEIS claims that the 1977 ERDA EIS resulted in the adoption of a program to make improvements in existing waste management practices. However, some of these improvements were specifically questioned in the 1981 assessment where Du Pont waste management operations were described as antiquated and the cause of the observed radionuclide migration (2,12).	Previous SRP operations were in compliance with applicable Federal and State standards and/or DOE (and predecessor) agency standards issued pursuant to the Atomic Energy Act.
E-17	One of the missions of DOE is to develop the technology for long-term management of radioactive wastes, to ensure that defense nuclear activities are compatible with public health and safety and national security, and to transfer the developed technology to the commercial nuclear industry and regulators (15). However, the DEIS demonstrates	DOE is committed to compliance with all applicable regulations, orders and statutes to assure human health and environmental protection.

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E-18	that DOE was unable to meet the criteria of commercial regulations, that DOE finds many of its radioactive waste activities no longer acceptable (p. 2-1), and that DOE failed to lead the way in research and in applying technology to defense radioactive waste management.	
E-19	4. Cost of EIS. The cost and person-hours spent in preparation of the DEIS should be specified. Compare the amount spent and work-hours compiled: a) by DOE, b) by Du Pont in preparing supporting reports, c) by NUS, d) by contractors, subcontractors, outside organizations, DOE headquarters, for reviews of the DEIS before release to the public, e) and the total, summary cost for the final EIS.	NEPA or CEQ guidelines do not require that cost for preparing the EIS be included as a part of the EIS. The costs of EIS preparation did not affect the selection of the proposed action or alternatives.
E-20	5. DOE Order 5820.2. Radioactive Waste Management. The EIS should specify whether this order is a regulation or a set of guidelines. If this order has objective performance criteria, specify this criteria. State whether Du Pont or any DOE contractor has been cited for failure to meet the criteria of this order. State whether Du Pont currently meets the requirements of the order. State whether this order has been reviewed in an EIS document.	DOE Order 5820.2 was issued pursuant to the DOE Organization Act, Section 644, and DOE Order 1321.1B. Compliance with this or other DOE Orders is not in the scope of this EIS.
E-21	State whether this order forbids the use of cardboard boxes to contain disposed radioactive wastes. State whether compliance with this order assures that the Atomic Energy Act requirement to minimize releases to the environment and to protect human health (offplant public and onplant employees) will be met.	See the response to comment E-20.
E-22	6. City of Jackson, SC. The DEIS does not clearly spell out the levels of contamination in the City of Jackson's drinking water. State where the chlorocarbon contamination plume in the groundwater	Information related to City of Jackson drinking water quality is given in DOE Annual Environmental Monitoring Reports DPSPU 85-30-1, DPSPU 86-30-1 and DPSPU

Table L-2. DOE Responses to Comments on Draft EIS
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	is in its approach to this city.	87-30-1.
E-23	Report on the progress of the chlorocarbon migration to Jackson and provide the predicted travel time to the city. Compare H-3 concentrations for drinking water, rainwater, air moisture, and dry air. State whether all chemical contamination in the drinking water for the city is increasing or not.	There is no evidence that SRP operations have affected offsite drinking water supplies for Jackson, S.C. See the responses to comments E-7 and E-126. Groundwater flow to Jackson in the Cretaceous aquifer is from offsite (see Figure A-15). Shallower aquifers outcrop into onsite streams before leaving the plant boundary. DPSPU 85-30-1, DPSPU 86-30-1, and DPSPU 87-30-1 do not show a trend toward increasing or decreasing contamination in the city's drinking water.
E-24	Also, note that the 1985 annual report shows a substantial difference for data reported between D-Area, West Jackson, and Jackson (16). This difference holds true back to 1977, but because of the proximity of the locations, does not appear to be easily explained. Provide an explanation.	This appendix responds to comments on the EIS and is not a forum for responding to comments on the annual monitoring reports.
E-25	Provide an explanation for the reported significant increases in radionuclide concentrations for Jackson. Although below EPA drinking water standards through 1985, the average rainwater deposition of tritium between 1980 and 1985 significantly increased ($t(34)=1.61$, $p<.05$ for Jackson; and $t(34)=1.81$; $p<.05$ for West Jackson; see Annual Environmental Reports, esp. ref. 16). However, the 1985 rainwater data for tritium is a difference of 1.9 times greater than the EPA drinking water standard for West Jackson. Reported background gamma has increased 74% since 1972. Discuss and explain these and other trends in the radionuclide and hazardous chemical data.	See the response to comment E-24.
E-26	7. <u>Chapter 2</u>. The method of writing Chapter 2 is choppy and confusing, and it is not entirely clear after reading Chapter 2 exactly what is intended with any option. There is insufficient detail and too many iterations of the 4 strategies and of the dual purposes of the EIS.	See the response to comment C-19.

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Comment number	Comments	Responses
E-27	8. Chapter 4. Sources of information and data are often not cited in the text or at the tables and should be included, e.g., Table 4-1, p. 4-6.	The text has been revised.
E-28	9. Chapter 5. All studies, analyses, modeling activities, monitoring well and sampling designs and locations should receive independent peer review and SCDHEC regulatory agency review. The NRC should review all aspects of radioactive materials production and hazardous and radioactive waste management. The NRC should certify that SRP is safely operated and satisfies all NRC commercial regulations for the environment, and for public health and safety.	See the response to comment E-1. Monitoring wells and their designs and locations are permitted by SCDHEC. Sampling designs are prescribed by EPA groundwater monitoring protocols. DOE operations are governed by the requirements of the Atomic Energy Act.
E-29	10. Chapter 6. DOE should review the historical changes that have affected mixed wastes. Include the 1984 federal court decision regarding the application of RCRA at DOE Oak Ridge (17), The DOE aborted rule for byproducts (11), and the recent decision of DOE to be regulated by EPA and the State of SC.	A statement has been added to Section 6.2.1.1 reflecting the recent DOE interpretive rule on byproduct materials. LEAF vs. Hodel is cited in Chapter 1 (p. 1-1) of the EIS.
E-30	11. Deminimus. Has DHEC approved deminimus releases at SRP? Review the effects of burying radioactive waste below the new deminimus levels in the landfills. Discuss the probability of radioactive waste with concentrations greater than deminimus reaching the landfill. State whether the deminimus levels have been reviewed in an EIS. State whether radioactive contamination levels in groundwater have been affected and to what degree by burying deminimus levels of radioactive waste. Are cardboard boxes used to package deminimus waste releases? Are deminimus wastes dumped into soil trenches?	Ongoing and future regulatory interactions with SCDHEC will address these issues. SCDHEC does not regulate SRP radioactive wastes.
E-31	12. Total Releases. Provide the total releases of radionuclides and hazardous chemicals at SRP by all years and summate for all years. Provide the maximum levels of contamination that have been found on and off SRP for the reported year and for all years.	See the response to comment E-8.

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Comment number	Comments	Responses
E-32	13. Measurement Techniques. Provide a discussion of the SRP method of data collection offsite SRP, i.e., at the time of collection, are tritium data collected up or downwind? Are tritium and other radionucides collected when airborne effluents are being releases or not? If not collected during radioactive and hazardous chemical waste releases, why not? Are airborne effluent samples collected during reprocessing runs and normalized against release data? Are ambient condictions recorded when samples are collected? Why aren't collateral ambient and operational data simultaneously published with pollution data?	See the response to comment E-8.
E-33	The collection data presented in the annual monitoring reports for SRP are presented without supporting collection data and this omission can render the data meaningless in some respects. For example, a sample of tritium oxide concentrations without ambient relative humidity and temperature is difficult to interpret. Samples should be correlated to times of actual stack releases of effluents, collected from the release plumes, collected at times when plumes are not being released, collected at standard times of the month, during rain and dry conditions, when wind is and is not a factor, and reported (see DEIS, p. K-86,87).	See the responses to comments E-8 and E-32.
E-34	14. Operational Performance. Compare DOE Concentration Guidelines and EPA drinking water and other standards with SRP collected release and pollutant data. Note where the CG's are not met.	Comparisons to standards and guidelines are made in the EIS.
E-35	15. 1986 Environmental Monitoring Report. The latest environmental monitoring data should be used in the Final EIS. Include the 1986 reported data.	The 1986 monitoring data from DPSPU-87-30-1 have been included in the FEIS, especially in Chapter 3.

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Comment number	Comments	Responses
E-36	16. <u>Pollutant Releases.</u> DOE should adopt the policy that all waste releases must not exceed EPA drinking water standards at the point of release into the groundwater; that airborne releases must not exceed EPA airborne release standards at the stack; that releases must not lead to unacceptable occupational exposures; that releases must not become a future source for biointrusion; and that groundwaters must not be a source of contaminating surface waters at the point of outcrop.	As discussed in the EIS, DOE will conduct SRP waste management activities in accordance with applicable regulatory requirements.
E-37	17. <u>Miscellaneous.</u> Provide a summary of the Beta-Gamma Incinerator (BGI) operations to date: radionuclides, chemicals, etc. Has SCDHEC approved BGI operations? What are the air releases from the BGI at the stack?	The BGI has been operated as a demonstration program to develop processes to burn beta-gamma contaminated wastes. SCDHEC approved this demonstration. See Appendix J and reference documents.
E-38	Do the planned dedicated areas in the DEIS include the current and predicted aerial extent of the contamination plumes in the groundwater?	Under the Dedication strategy, DOE would dedicate for waste management purposes those waste sites and contaminated areas that could not be returned to public use after a 100-year institutional control period.
E-39	Provide an organization chart with current positions of the EPA, SCDHEC and DOE organizations.	
E-40	The DEIS did not resolve the issue of the significantly greater concentrations of strontium-90 in milk around SRP compared to the EPA average concentration for the southeast (p. K-80).	Information on radiological doses from the alternative waste management strategies are given in Tables 4-12, 4-27, and 4-37. Health risks from these doses are given in Tables 4-13, 4-28, and 4-38.

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Comment number	Comments	Responses
	Specific Comments	
E-41	1. P. v, para 1: P. S-1, para 2. Add that SRP also generates TRU and HLW wastes.	This recommended change has been made.
E-42	2. P.vii. Add hours of operation for the library.	The University of South Carolina - Aiken Library is open from 8 a.m. to 5 p.m.
E-43	3. Summary. P. S-1. The statement "Previously acceptable waste disposal practices have included the use of seepage basins..." is misleading. AEC Manual Chapter described the dangers of the use of natural soil columns, including seepage basins. The danger and contamination potential of seepage basins was early recognized by Du Pont (18). But Du Pont also said that it planned to continue using seepage basins (18, 19).	The statement has been revised.
E-44	4. P. S-11, para 3. The first use of the term 'cubic meters' should be accompanied with a conversion to gallons.	
E-45	5. P. S-13, 2nd bullet. Change to, "Elevated concentrations of tritium, strontium-90, and nitrate in Four Mile Creek." See DEIS, p. B-41.	The conversion has been incorporated in the FEIS.
E-46	6. Chapter 1. P. 1-1, 2nd Para. The statement that SRP adopted improved waste management practices in accordance with ERDA policies and standards is inaccurate. The policies followed at that time were AEC Manual Chapter 0511, Radioactive Waste Management (20), AEC 5480, and the Concentration Guidelines. AEC 0511 warned of the	The text has been revised.

Comment number	Comments	Responses
	dangers of using seepage basins and other natural soil columns, and although Du Pont regularly and knowingly exceeded the Concentration Guidelines in releases at the seepage basins (18), the practice was allowed to continue. Consequently, because practices did not adhere to AEC 0511, the AEC guidelines were changed to fit the radioactive waste management practices of Du Pont and other DOE contractors. That led to the publication of DOE Order 5820.2, Radioactive Waste Management (21). In this replacement (and current) regulation, seepage basins, cardboard boxes, and effectively all current airborne, liquid and solid waste releases became acceptable. That is, all waste management practices, including those that had led to significant contamination of the environment at each DOE site, became acceptable.	
E-47	7. P.1-1, 3rd para. The statement that SRP waste management practices led only to localized contamination is inaccurate. Contamination off the SRP in unacceptable amounts, viz., cesium-137 strewn approximately 7 km downstream offsite SRP, was well-known and studied and reported at that time (10, 22). Further, as a second example, Du Pont's use of the M-Area seepage basin has led to extensive, widespread contamination, contamination that may impact the city of Jackson, SC.	There is no indication that waste management activities at the SRP have affected offsite groundwater water resources. The SRP M-Area remedial action program has stopped the spread of chlorocarbon constituents toward Jackson, S.C. See the response to comment E-23.
E-48	8. P. 1-2, para 3. Define, characterize, and describe the solvents, tritiated waste oil, and liquid scintillation solvents.	These materials are described in Chapter 3
E-49	9. P. 1-2, para 5. Include SARA and SDWA in the List of Acronyms.	SARA and SDWA have been included.

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Comment number	Comments	Responses
E-50	0 P. 1-4, last sentence. Make 'decision' plural.	The text has been revised.
E-51	11. Chapter 2. P. 2-1, para 1. The statement that DOE is modifying its waste management activities solely because of changed environmental concerns and regulations is unacceptable.	DOE is considering changes to SRP waste management activities to assure continued protection of environmental resources and human health.
E-52	As well, the DOE waste management activities should be changed in light of collected scientific data that finds these DOE waste management activities as causal agents in the significant contamination of SRP, wildlife, and groundwater, contamination that potentially may affect human welfare.	
E-53	One of the missions of DOE is to develop the technology for long-term management of radioactive wastes, to ensure that defense nuclear activities are compatible with public health and safety and national security, and to transfer the developed technology to the commercial nuclear industry and regulators (15).	
E-54	However, the DFIS demonstrates that DOE was unable to meet the criteria of commercial regulations, that DOE finds many of its radioactive waste activities no longer acceptable (p. 2-1), and that DOE failed to lead the way in research and in applying technology to defense radioactive waste management.	
E-55	12. Pp. 2-1,2, last and cont. para. The use of the terms 'lower' and 'upper tiers' is confusing and not clear.	The text is clarified in the FEIS, Figures 5-1 and 2-1.
E-56	13. Pp. 2-3,5. Discriminate between upper and lower tiers in Figure 2-1.	See the response to the previous comment.
E-57	14. P. 2-7, cont. para. The examples of incompatible actions are sophomoric. It should suffice to state that the final selected strategy to be published in a Record of Decision must resolve incompatible project-specific actions.	FEIS is revised in the suggested manner.

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Comment number	Comments	Responses
E-58	15. P. 2-7, para 1. Synergistic and overlapping effects from waste management activities and regulations should be considered when appropriate.	Environmental effects, including cumulative impacts, are considered in Chapter 4 of the EIS.
E-59	16. P. 2-7. The 'no-action' strategy would also require action taken when the radioactive low-level waste burial ground closes in 2 years (cf. p. 1-3). If a new burial ground is not allowed to open, no action may not allow the continuation of current activities.	No action, as defined in the EIS, assumes the continuation of current (waste) management activites. Since the proposed action strategies provide for waste management with new storage and/or disposal facilities, the No-Action strategy is briefly defined as waste management with no new facilities. Thus, no action refers only to the <u>construction</u> of new facilities to meet future needs. The future management of waste under no action would require substantial effort and funds (i.e., action). Note that under NEPA, the No-Action strategy does <u>not</u> preclude the unpermitted use of existing facilities. However, as stated in Table 4-46 of the DEIS, a major disadvantage of no action would be DOE's noncompliance with environmental laws and regulations.
E-60	17. P. 2-11, para 2. The L-Reactor seepage basin is not analyzed in this EIS. However, as this EIS stated in the opening paragraph of Chapter 2, the use of seepage basins and other activities are becoming increasingly controversial. The L-Reactor seepage basin should become a part of this EIS. Any decision to discontinue or limit the use of reactor seepage basins should retroactively apply to the L-Reactor.	The L-Reactor seepage basin is fully discussed in the L-Reactor FEIS (DOE/EIS-0108) and referenced in this EIS. The statement in Chapter 2 relates to the acceptability of past waste management activities and the need for modifications in light of current regulations.
E-61	18. P. 2-12. Label the Savannah River at the lower left side of the figure.	The figure has been revised.

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Comment number	Comments	Responses
E-62	19. P. 2-13, 16. For the waste sites that are closed, add the date of closure.	This information is given in Appendix B and new Table 2-2.
E-63	20. P. 2-14. The closed R-Area seepage basins received the remains from a fuel rod failure and may be considered high-level waste (23).	DOE considers these basins to contain low-level radioactive waste.
E-64	21. P. 2-14, 16. C,K,P, and L reactor seepage basins are shown as not receiving wastes. This should be changed to either yes or to periodic. Cumulative volumes, chemicals and radionuclides released should also be included.	The K-Area reactor seepage basin is inactive. Periodic discharges of filtered, deionized disassembly basin purge water from K-Reactor are discharged to the K-Reactor containment basin. The C-, P- and L-Reactor seepage basins are not listed in Table 2-2. The reasons for their exclusion are presented in Section B.1.1. The primary radionuclide released to the active reactor seepage basins is tritium. Tritium releases and associated doses are presented in Sections 4.4 - 4.4.6.
E-65	22. P. 2-17, cont para. Under no action, DOE states that it will continue its ongoing program to remove volatile organics from the Tertiary groundwater through recovery wells and an air stripper. Whether this continuing program continues should be added as a subject to this EIS. The air stripper program should receive independent peer review and be permitted by the State of SC.	See the response to comment E-59. The M-Area Air Stripper is permitted by SCDHEC.
E-66	23. P. 2-17, para 1, sent. 5. "would have decayed or dispersed" should be changed to "may have decayed or dispersed".	Changes have been made to text.
E-67	24. P. 2-17. The dedication of offsite property contaminated by cesium-137 should be included.	There is no offsite property dedicated or requiring dedication due to cesium-137 contamination. See the response to comment E-47.

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Comment number	Comments	Responses
E-68	25. P. 2-17. The dedication strategy should include "Hazardous Wastes" warning devices for future generations for closed basins containing hazardous and radioactive wastes. Warning devices should be used for the offsite cesium-137 in the swamp and alongside the cesium spill on the Savannah River.	If the Dedication strategy is implemented, appropriate exclusion areas and warnings will be established.
E-69	26. P. 2-18, Table 2-3. The no action strategy should consider what will happen when the present burial ground fills up and closes by default (cf. comment 16 above). DOE says that LLW would be stored on surface pads or other safe areas after the LLW burial ground is closed. This implies a site preparation cost.	See the response to comment E-59.
E-70	27. P. 2-33, Figure 2-3. The schematic diagram of two double-liner designs for landfills is unclear. An isometric overview of the design, followed by a top-front-side view and locating leachate collection, in addition to Figure 2-3, may clarify the design.	Figure 2-3 was provided to illustrate the general sequence of protective layers (i.e., low-permeability liners and leachate collection systems) which are applicable to the design of RCRA disposal facilities. They are not intended nor represented as designs which will be based on site-specific details at a later stage of planning in conjunction with regulatory interaction and the RCRA permitting process.
E-71	28. P. 2-34. The CFM vault should not be disposed in containment without liners and leachate collection without long term proof (minimum of ten years <u>operational</u> experience) that such containment leads to zero or acceptable releases into the groundwater <u>immediately below</u> each vault.	If implemented, the CFM vault technology will comply with all regulatory and permit requirements imposed by regulatory agencies. See the response to comment J-7.
E-72	29. P. 2-34. Saltcrete is conspicuously absent from this draft EIS. Since the issues affecting CFM should affect saltcrete, saltcrete should be included in this EIS. Saltcrete disposal has not been reviewed by independent peer review, nor has saltcrete disposal been proved to be safe and noncontaminating to the groundwater immediately below disposed saltcrete.	Saltcrete is discussed in Section 4.7. See the response to comment E-1 on peer review.

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Comment number	Comments	Responses
-73	30. P. 2-35, Figure 2-4. The schematic diagram of liner systems for below ground vaults is unclear. An isometric view of the design, followed by a top-front-side view and locating leachate collection, in addition to Figure 2-4, may clarify the design.	See the response to comment E-70.
E-74	31. P. 2-36, ELLT and LLWV. Past experience at SRP indicates the likely possibility that greater than 300 mrem/hr activity can slip by detection devices in the large scale SRP operation. Describe the radioactive and hazardous chemical detection and quality assurance measures that will be employed to verify that waste disposal limits are observed. Before bypassing leachate collection or liners, DOE should have long term proof of the safety and protection to groundwaters immediately below these facilities (cf. item 28 above).	
E-75	32. P. 2-37. Describe the final disposition of AGO waste. It may not be acceptable to leave waste in AGO disposal after the end of institutional control.	Section 2.3.1.7 (p. 2-37 of the DEIS) describes the Abovegrade Operation (AGO) as a disposal technology which implies final disposition. Under DOE Orders governing the disposal of low-level radioactive waste, AGOs are an acceptable disposal technology. Final disposition of the AGO waste would be determined (if such a facility were constructed) based on studies and applicable permit requirements.
E-76	33. P. 2-38. Volumes of liquid waste releases have not been identified. The cumulative volumes of liquid effluents released to seepage or natural soil columns should be specified by basin.	See the response to comment E-8 and Appendix B and its references.
E-77	34. P. 2-40, Table 2-8. The data in the table are confusing. Explain the difference between minimum and maximum volumes. Explain why the maximum volumes do not equal the volume generated.	New Table 2-9 has been revised in the FEIS to represent the most recently available data and to clarify their meaning. The footnotes to Table 2-9 explain the terminology and bases for the table.

Comment number	Comments	Responses
E-78	35. P. 2-41, para 5. The waste management operations and life cycle costs were left out of the strategy tables (cf. p. 2-18,26). Footnote those tables to see Table 2-10 for total costs.	New Tables 2-4 through 2-7 have been revised in the FEIS and are consistent with revised new Table 2-11. The cost estimates given are considered to be a reasonable forecast of relative life-cycle costs. Uncertainties which could not be reasonably included in the cost estimates are discussed in the narrative.
E-79	36. P. 2-41, para 5. Life cycle costs should be defined, included in Glossary, and differentiated from other costs (cf. P. 2-45).	"Life-cycle cost" has been defined in the Glossary of the FEIS.
E-80	37. P. 2-45, cont para. This paragraph is confusing. How can life cycle costs of $1.7 billion be less than the 20 year costs of $1.9 billion?	These costs have been revised in the FEIS and now show life-cycle costs to be slightly higher than 20-year costs.
E-81	38. P. 2-45, para 3. Explain what the other nuclides are and their source (e.g., fuel or target rod leaks, etc.).	See Section 4.4.1 and Table 4-48.
E-82	39. P. 2-45, bullets. DOE should consider improved radionuclide removal in the reactor basin through filtration, sieves, entrapment, adsorption, removal columns, etc. Tritium could be adsorbed instead of released to the atmosphere by evaporation techniques. (See also pp. 2-46, 47.)	Current treatment processes include filtration and ion exchange columns to remove radionuclides other than tritium. Evaporation and detritiation are discussed in this EIS as project-specific actions.
E-83	40. P. 2-45, Purge water. Volumes released from all SRP reactors to each basin, including L-Reactor basin, should be included.	See Appendix B and its reference documents. Also, see the reference documents cited in response to comment E-8.
E-84	41. P. 2-47, para 1. The direct discharge of radionuclides from reactors should not be allowed, nor considered, with or without dilution. There is already more than enough contamination in the SRP environment, both on and off the plant, without adding to the existing burdens.	The direct discharge of tritium to onsite streams does not cause offsite doses to exceed standards.

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Comment number	Comments	Responses
E-85	42. P. 2-48, Table 2-10. This table should include the $160-$290 million 20-year waste management costs (p. 2-41) for the no action strategy; the $143 million to $1.3 billion 20-year costs and life cycle costs of $275 million to $1.7 billion for the dedication strategy (p. 2-43); and $1.2-$1.5 billion plus for the elimination strategy for operations (p. 2-44); and $143 million to $1.9 billion for 20-year costs and $275 million to $1.7 billion life cycle costs for the combination strategy (p. 2-45).	New Table 2-11 has been revised in this FEIS.
E-86	43. P. 2-48, Table 2-10. This table should summate the range of costs for each option.	A new row in new Table 2-11 of the FEIS provides the total cost ranges.
E-87	44. P. 2-48, Table 2-10. NDF for the no action strategy was not explained in the text. See also p. 2-55, para 3, "The No-Action alternative would involve no new facilities..."	Explanation has been added to the FEIS. With respect to the need for new disposal/storage facilities, the No-Action strategy proposal to continue waste management with no new facilities is described in Section 2.3.3.1 and summarized in Section 2.5.1.1.
E-88	45. P. 2-49, EWS, Groundwater. Hazardous and radionuclide constituents currently exceed applicable standards and guidelines at certain sites. Provide this comparative data.	Exceedances of standards are discussed in Chapter 4 and Appendix F.
E-89	46. P. 2-51, Aquatic Ecology, EWS. The offsite ecosystem of the Savannah River and swamp up to 7 km below SRP has already been and is still significantly affected.	
E-90	Terrestrial Ecology, EWS. Onsite flora and fauna have already sustained and will continue to sustain significant impact.	See the response to comment E-8.

Comment number	Comments	Responses
E-91	47. Table 2-10. Inadvertent biointrusion impacts should be quantified and included.	These impacts are discussed in Chapter 4 and Appendix F.
E-92	48. P. 2-59. The cost estimate of $125 million for moderator detritiation seems excessive and should be reviewed by independent peer review. See also p. 2-64.	This cost is estimated for study purposes only.
E-93	49. P. 2-63, para 5. EIS states that NDF for the combination strategy is about $1.6 billion. However, p. 2-48 lists it at $1.9 billion.	The FEIS costs have been revised.
E-94	50. P. 2-66, para 4. The EIS suggests that the only aquatic impacts from no-action would continue to be minimal. Past DOE experience includes the significant pond-slider turtle uptake incident of strontium-90 at up to 1000 times background, with some of the turtles found in an offsite commercial hogfarm. DOE attempted to coverup the incident because of what DOE considered to be its extreme sensitivity (11,19). DOE should define exactly what is meant by minimal impact.	Five hundred turtles were trapped offsite in 1986; none showed detectable levels of radioactivity (Zeigler et al., 1987). Environmental impacts are discussed in the reports cited in the response to comment E-90.

Comment number	Comments	Responses
E-95	51. Chapter 3. P. 3-3, Figure 3-2. Locate DWPF and FMF.	Figure 3-2 has been revised accordingly.
E-96	52. P. 3-5, Table 3-1. Include increases in population for year 2000 and by location.	Section 3.1.3.2 presents population estimates for the year 2000 for the total study area. Estimates of the population for each of the locations in Table 3-1 would be inaccurate and unnecessary.
E-97	53. P. 3-9. Include the highest recorded wind speed for a tornado at SRP and in the CSRA.	Section 3.2.3 discusses severe weather events.
E-98	54. P. 3-11, Table 3-5. Change title to "Total Reported Tornado Occurrences."	Title changed in FEIS.
E-99	55. P. 3-12, Air Quality. The stack emission concentration of pollutants should be listed and compared to acceptable emission standards at the stack, not at the SRP plant boundary.	Stack emissions are not in the scope of this EIS.
E-100	56. P. 3-13, Figure 3-3. Improve the lower sketch by explaining the shear arrows and by changing the coded representation of the Ellenton Unit.	This figure has been improved in the FEIS.
E-101	57. P. 3-15, Figure 3-4. Change the confined aquifer to the Principle Confined Aquifer.	This requested change is inconsistent with the EIS source documentation.
E-102	58. P. 3-16, Seismology. Similar to the Tornado Occurrence Table 3-2, present the occurrence of earthquakes and their intensities since seismic recording began at SRP.	See Appendix A support documentation.

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E-103	59. P. 3-16, Seismology. Define MMI and compare different levels of intensities.	See the response to comment E-102.
E-104	60. P. 3-16, Seismology. Provide a causal explanation of the June 8, 1985, minor earthquake.	See the response to comment E-102.
E-105	61. P. 3-17, cont para. In addition to Figure 3-4, refer to Figure 3-3.	
E-106	62. P. 3-17, para. 1. Reflect that the green clay is only reported to be continuous, or is only thought to be continuous. Also, note where green clay and other aquitards have been breached by man made objects such as wells, etc. Discuss and list the SRP abandoned wells and closure techniques; list the wells that have penetrated into the Tuscaloosa aquifer. Provide information on plans to improve the integrity of breached clay barriers from abandoned or improperly constructed wells, etc.	Discontinuities of the green clay have been reported. Details on wells, their abandonment and other items in the comment are beyond the scope of the EIS as discussed in the response to comment E-8.
E-107	63. P. 3-18, cont para. Include the minimum reported thickness of the lower clay.	The text in the FEIS has been revised.
E-108	64. P. 3-20, para. 2. The discussion of impacts on Black Creek aquifer, and implications for other aquifers, is unclear. Provide references and define the remediation efforts. In the upper aquifers, M-Area contamination has been previously reported headed to the City of Jackson, SC (4, 24). Provide and reference data that was "analyzed to date." Describe historical and current levels of contamination in drinking water of the cities surrounding SRP, but especially include Jackson, Barnwell, and Snelling, SC.	See the responses to comments E-23 and E-47.

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Comment number	Comments	Responses
E-109	65. P. 3-21, Figure 3-5. Locate U Area. Clarify the location and depiction of obscured facilities in the figure, such as P Reactor.	Figure 3-5 is revised in the FEIS.
E-110	66. P. 3-23, Table 3-7. Report the range and standard deviations of the chemical analysis of groundwater in addition to the mean. Include the range, mean, and standard deviation for rainwater quality analysis at SRP.	See the response to comment E-8. Information on statistics and other data handling is given in referenced documents.
E-111	67. P. 3-24, 25, Table 3-8. Improve Table 3-8 by including the mean of the values reported, standard deviations, number of measurements, the monitoring well numbers and locations reporting maximum values, a map of SRP monitoring wells exceeding or approaching S/C; and for the reported wells: TDS, hardness, toxic chemical and solution densities, pathogens (anaerobic and aerobic), BOD, COD, color, turbidity, and odor; also, normalization distances for each pollutant from each source (25, p. 422), SRP water contamination normalized against other major DOE radioactive waste generators/disposers, groundwater attenuation and sigmoid breakthrough rates (25, p. 398-401) for each pollutant, and an analysis of cores from each monitoring well and plant area (specific and random location samples).	Table 3-5 is intended to provide a brief summary of groundwater monitoring data in describing the affected environment. Detailed discussions and tabulations are found in Chapter 4 and Appendix F. See also the response to comment E-8.
E-112	68. P. 3-26. Qualify the discussion by stating whether the SRP groundwater well monitoring design has been approved by an independent peer review of qualified hydrogeologists and by the State of SC. State whether all contamination release sources are monitored 360 degrees within the zone of influence	SCDHEC approves by review and permitting all monitoring well installations and operations. Drillers are licensed by the State of South Carolina. Sample collection efficiencies are specified at 90 percent in work plans or sampling and analysis plans.

Comment number	Comments	Responses
	of release sources with well screens positioned to monitor all pollutant densities less than and greater than water. State sample collection efficiencies (25). State whether all monitoring wells have published and approved well profiles and by state authorities.	
E-113	69. P. 3-27, Table 3-9. Include S/C, number of measurements, mean, standard deviations, and locate wells approaching or exceeding S/C on an SRP map. Add plutonium 238 and 239. Include historical data. Normalize pollutants by distance and against other DOE sites. The published data in Table 3-9 appears low for cesium 137 and strontium 90 (maximum at outcrop was 340,000 pCi/l in 1984: see p. B-41). All units should be in pCi/l, not in pCi/ml.	See the response to comment E-8.
E-114	70. State whether well closings, openings, designs, and usage facilitate contamination transfer. State what percent of wells are certified by State of SC.	See the response to comment E-8.
E-115	71. P. 3-34, Table 3-10. Provide number of measurements, mean, and standard deviation. Add table for Savannah River up and downstream of SRP. Add table for water treatment facilities, and for other outfalls. State whether the State of SC has permitted all outfalls.	See the response to comment E-8.
E-116	72. P. 3-49, Table 3-18. Provide stack emissions, means, standard deviations, and number of releases and measurements. Summate number of curies into subtotals and a total. Calculate maximum concentration at plant perimeter assuming coherent	See the response to comment E-8.

Comment number	Comments	Responses
	plumes without dispersion or deposition. Compare releases calculated to be at plant boundary with NOAA and other validating measurements (26). Describe the affected occupational population to stack emissions, and discuss mitigation measures for this population, e.g., warnings, notices of releases, precautionary measures, results of health studies, etc.	
E-117	73. P. 3-50. EIS should explain the significant elevated concentration of Strontium-90 found in milk around SRP compared to average EPA concentrations for the southeastern United States (see p. K-80, 81).	See the response to comment E-40.
E-118	74. P. 3-51, para 1. Discuss breakthrough after chemical and radionuclide saturation, and migration with the assistance of enhancers to migration, such as organics.	Chapter 3 is a discussion of the affected environment. Physico-chemical phenomena related to chemical and radionuclide transport are discussed in supporting documents referenced in the FEIS.
E-119	75. P. 3-52. A table of tritium concentration in shallow drinking water wells drawn from around SRP should be included. Tritium concentration data from flora and fauna around SRP should be included. The tritium normalization distance from SRP sources should be provided (25).	See the response to comment E-8.
E-120	76. P. 3-55, Table 3-22. Include mean, standard deviation, maximum concentrations, and add the radionuclides from Table 3-23 that were missing in Table 3-22.	See the response to comment E-8.

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Comment number	Comments	Responses
E-121	77. P. 3-56, Table 3-23. Include number of measurements, standard deviations, and downstream concentrations for Savannah River.	See the response to comment E-8.
E-122	78. P. 3-57, cont para. State whether the United Nations values are corrected for decay. State whether the UN values are more appropriate than the 160 km radius values. State what the normalization distance is for each pollutant (25).	See the response to comment E-8.
E-123	79. P. 3-35, Table 3-24. Provide one standard deviation and the number of measurements N. The table suggests that Sr-90 contributes to offsite soil radioactivity.	See the response to comment E-8.
E-124	80. P. 3-58, Provide stack emissions, number of measurements, and standard deviation.	See the response to comment E-8.
E-125	81. P. 3-58, Discuss sewage distribution fields at SRP.	Sanitary waste discussions are beyond the scope of this EIS as described in Chapter 1.
E-126	82. P. 3-59, M-Area organic contamination. Provide an aerial depiction of plume movement today and compare to 1983.	The latest Annual Environmental Report (DPSPU-87-30-1) indicates that the M-Area plume has been contained.
E-127	83. P. 3-59, M-Area organic contamination. State whether groundwater treatment and cleanup has been reviewed by independent peer review (IPR) and permitted by State of SC.	See the response to comment E-1 on peer review. SCDHEC permitted the M-Area remedial action program.

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Comment number	Comments	Responses
E-128	84. P. 3-59, M-Area organic contamination. Provide table of groundwater contamination found at various listed sites: include the max, mean, number of measurements (N), and standard deviation (SD).	See the response to comment E-8.
E-129	85. P. 3-60, Include specific soil sites and random soil sample analysis for hazardous chemicals and radionuclides. Also, odor and air quality should be analyzed for hazardous chemicals and radioactivity at specific sites and random locations. Specific site analysis should include occupational uptake and health studies and sampling at cardinal points around all facilities that generate and dispose wastes.	See the response to comment E-8.
E-130	86. P. 3-61, Security. Include a map of controlled access roads.	A map of controlled access roads is beyond the scope of this EIS.
E-131	87. P. 3-62, Table 3-25. Table should include those sites that have animal drift fences and where biointrusion devices are deployed. The results of biointrusion studies should be referenced and provided.	Results of studies are discussed in Chapter 5. See the response to comment E-8.
E-132	88. P. 3-63, para 1. Compare the management of each SRP waste site to NRC 10 CFR Part 61. State what current and future facilities meet and which do not meet the NRC regulation for management of radioactive wastes. Provide NRC comments at this point.	DOE is not required by law to have waste management practices which are in compliance with 10 CFR 61 or other NRC regulations. DOE waste management actions for radioactive waste are taken in accordance with the Atomic Energy Act. NRC did not comment on the DEIS.

Comment number	Comments	Responses
E-133	89. P. 3-63, para 2. DOE should commit to zero maintenance after the end of institutional control.	DOE commitments will be developed following the Record of Decision on this EIS.
E-134	90. Chapter 4. P. 4-1. The interaction with regulatory agencies in and of itself will not assure that the optimum specific action has been chosen; however, independent peer review (IPR) in conjunction with public review and regulatory agency review may lead to the best possible solution.	See the responses to comments C-1 and E-1.
E-135	91. P. 4-3, last para. The pathway analysis method may not be the most conservative under actual conditions. It is not conservative until shown to be so. It would be acceptable to say that it attempts to establish a conservative upper bound.	DOE considers the PATHRAE model to be adequate for the relative comparison of the alternative waste management strategies.
E-136	92. P. 4-4, para 1. The 1-meter well may not represent the actual peak concentration for bound nuclides prior to breakthrough. Soil samples and predictions based on them would be more valid for certain nuclides.	See Appendix H for a discussion of the transport models.
E-137	93. P. 4-5. Add a table of common risks for comparison purposes.	A table has been added to the FEIS to provide a perspective on risk values.
E-138	94. P. 4-6, cont para. Include IPR and public review in the decision making process for closure or remedial actions.	Public hearings are required by SCDHEC for all waste site closure actions. See the response to comment E-1 on peer review.
E-139	95. P. 4-6, Table 4-1. Add a 'total number of wells' column by sites and provide source documents with well designs and approvals by SCDHEC.	See the response to comment E-8.

Comment number	Comments	Responses
E-140	96. P. 4-6, last para. Change animals to land and aquatic animals.	The change has been made.
E-141	97. P. 4-10, Table 4-3. The peak concentrations at the 100 meter well is low. The 1984 peak tritium concentration for the radioactive waste burial grounds reading was 4.3 E9 and 10,633 pCi/l for non-volatile beta, primarily strontium-90 (10), both greater than Table 4-3 predictions. Pu-239 has been left off the table and should be included or explained why left out. The strontium-90 reading for F/H seepage basins is unacceptable in that the 1984 published 340,000 pCi/l exceeds that predicted in Table 4-3 (see p. B-41). Np data misprinted in the published table.	Table 4-3 has been corrected.
E-142	98. P. 4-16, Summary. The summary of groundwater impacts under the No-Action strategy should be revised to include the effects of maximum releases that have already occurred at SRP.	The impacts discussed under no action in Chapter 4 are related to the evaluation of the alternative strategies and project-specific actions.
E-143	99. P. 4-18, Table 4-9. Include citations.	Citations have been included.
E-144	100. P. 4-19, Table 4-10. Steel Creek swamp at SRP and Creek Plantation Swamp off SRP have been left out and should be added (10). The cesium-137 and strontium-90 contamination of the swamps at and off SRP should be a principle focus of this EIS. Cleanup of the cesium spills should be reviewed. Strontium-90 has been left off as a contaminant to Four Mile Creek. Add to the table the concentrations of contaminants at the source point of their release. Include contamination of surface waters by contaminated groundwater outcropping into the surface waters.	Cs-137 concentrations in onsite streams at the SRP swamp are available in the annual environmental reports (e.g., DPSPU-87-30-1). See the response to comment E-40. Sr-90 has been added to the table. See the response to comment E-45. Concentration of surface water due to groundwater outcrop is shown in Table 4-10

Comment number	Comments	Responses
E-145	101. P. 4-21, Table 4-11. The maximum doses shown in this table do not agree with previous Dupont reports (p. 19, ref. 18: predicted whole body dose commitments for consumption of fruits and vegetables for one year ranged from 0.95 to 4300 rem, and would require 30 to 390 years to decay to levels that would result in doses less than 500 mrem). Including prior Dupont data will necessitate updating Table 4-12. Include citations.	Tables 4-12 and 4-13 (old tables 4-11 and 4-12) have been revised in the FEIS. Doses are based on the values presented in the EIDs which reflect the doses calculated from each of the waste sites. The results are based on the modeling performed using the input parameters documented in the EIDs.
E-146	102. P. 4-27, Atmospheric releases. Include occupationally exposed individuals in calculating the maximally exposed individual.	Doses to these individuals were calculated separately because of inherent differences in type and length of exposures.
E-147	103. P. 4-29, Table 4-15. Include stack release concentrations. Include occupational exposures from stack releases.	See the response to comment E-8.
E-148	104. P. 4-30. Include a table of maximum uptakes for animals at SRP.	See the response to comment E-8.
E-149	105. P. 4-99. In Table 4-48, include the cumulative releases to date of all radionuclides.	See the response to comment E-8.
E-150	106. P. 105, Combination Strategy. Reduction of radionuclides to the environment should consider detritiation followed by evaporation. Strategies to prevent and protect against accidental liquid releases from the reactors should be incorporated to prevent future unacceptably large releases similar to past releases.	See the response to comment J-11.

Table L-2. DOE Responses to Comments on Draft EIS
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Comment number	Comments	Responses
E-151	107. P. 106, Accidents. A historical accounting of environmental accidents should be included.	See the response to comment E-8.
E-152	108. P. 4-109. D&D. Include D&D costs for all existing and planned facilities at SRP.	Decontamination and decommissioning costs (D&D) will be available as actions are permitted and increased design and planning details are determined.
E-153	109. P. 4-116, Cumulative Effects. Cumulative effects to date should be included.	See the response to comment E-8.
E-154	110. P. 4-116, Existing and Planned facilities. Approval and permitting by regulatory agencies should be obtained before constructing and operating planned facilities and for the continued operation of existing facilities (e.g., incinerators, DWPF, FMF, saltcrete disposal, demonstration facilities, etc.).	Approvals and permits where required have been or will be obtained.
E-155	111. P. 4-123, Health Effects. Include occupational exposures in calculating health effects. Include cumulative health effects to date from all operations.	See the response to comments E-8 and E-146.
E-156	112. Chapter 5. P. 5-1. Although the SRP environmental monitoring program is large and comprehensive in nature, it has been controversial in its effectiveness. In the past, data has been suppressed, not reported, and distorted. In the past, sampling has been less than rigorous, haphazard, and often poorly designed. The collection of 465,000 samples in and of itself, if poorly done, may be of little assurance to the value of SRP monitoring of releases into the environment (2,12,19). State whether SRP environmental monitoring program has been reviewed by IPR and approved by SCDHEC.	See the response to comment E-1. Independent reviews of the monitoring program were conducted in 1985 and 1986 for radiological and chemical constituents in the environment. SCDHEC approves or regulates environmental monitoring where applicable under appropriate regulations.

Comment number	Comments	Responses
E-157	113. P. 5-11. The discussion of tritium contamination of the Congaree is inadequate. A map locating well no. 84 and a more detailed conceptualization of the problem and study should be provided.	A discussion of the Congaree formation is provided in Appendix A. Chapter 5 discusses studies and monitoring.
E-158	114. P. 5-11. SRP should also include occupational exposures in the EIR's submitted to regulatory agencies.	This is not a regulatory requirement.
E-159	115. P. 5-12. The proposed new wells must meet regulatory approval for design and for profiles. Overall design should be reviewed by an IPR group.	SCDHEC reviews and approves all new monitoring or production well designs and permit applications for construction and operation. See the response to comment E-1 on peer review.
E-160	116. Appendices. P. LP-1. Include all individuals who reviewed the draft EIS for DOE. Include draft review comments from outside reviewers.	Appendix L (this appendix) of the FEIS contains comments from all DEIS reviewers and DOE responses.
E-161	117. P. LP-19. Include the organizations that the preparers belonged to. On pp. DL-1, 2, Sen. Glenn and Rep. Wyden were not sent copies of the DEIS and should be.	See pages LP-1 through LP-19. Neither Sen. Glenn nor Rep. Wyden requested copies of the DEIS.
E-162	118. P. A-18. Define KH and KV. Explain dashes.	Kh = horizontal hydraulic conductivity, Kv = vertical hydraulic conductivity in m/day. Dashes indicate missing data.
E-163	119. P. B-7, Table B-2. List waste volumes cumulatively received for each site and annually received. List chemicals and radionuclides received by each site cumulatively and annually.	See the response to comment E-8.

Comment number	Comments	Responses
E-164	120. P. B-19, Mixed Waste Sites. Discuss the historical and current effects of dry basins in the migration of radionuclides and chemicals by physical processes (dust, etc.) and biota (turtles, etc.) (2,12,18,19).	See the response to E-8.
E-165	121. P. B-20. Seepage basin sediments do not compare directly to NRC land disposal because the former is in a mobile environment and in intimate contact with the soil whereas the latter is not.	This comparison has been deleted in the FEIS.
E-166	122. P. B-22, M-Area Basin. Add the historical account of production water well contamination, e.g., Well 53A, etc.	
E-167	123. P. B-38, Burial Ground. Add the concentrations of radionuclides in the groundwater. Discuss the status of plutonium movement, strontium-90 movement, and cesium-137 movement. Provide the number of monitoring wells with concentrations exceeding the EPA drinking water standard (greater than 95%; see 10). The small number of nuclides calculated to be in the groundwater, exceeding the drinking water standard, and migrated from trenches underlies the concern for removal of all radionuclides from trenches in the burial grounds. For example, theoretically, 1 curie of strontium-90 evenly spread into all of the drinking water consumed by the population of the U.S. would exceed the EPA drinking water standard for about 1 year. The SRP burial grounds contain over 12,000 curies of strontium-90.	Appendix F gives groundwater radionuclide concentrations.
E-168	124. Index. The index is missing. A standard subject index should be provided. As well, an index of authors would be helpful.	An index is included in this FEIS.

Comment number	Comments	Responses
E-169	125. P. H-11, 13. Provide validation data and references for MOD3D and SWIFT II. Provide the 4 differential equations for SWIFT II.	References for MOD3D and SWIFT II have been provided. These references include the detailed mathematical bases and user instructions for these models. Validation data are provided in the EIDs referenced in Appendix H. The four SWIFT II differential equations governing flow and transport are available in the referenced report (Reeves, M. R., et al., 1987, pp. 4-5).
E-170	126. Provide a discussion of results of the airborne validation experiment ACURATE and the 1982 EPA field experiment (7,26). Compare the results of ACURATE with predicted airborne releases.	See the response to comment E-8.

Comment number	Comments	Responses

References

1. Richards, J.R., DOE Inspector General, letter to DOE Secretary Hodell, Summary Report on Allegations Made by Mr. William Lawless, February 14, 1984. The DOE response to the August 13, 1984, letter from Rep. J. Dingell to Secretary D.R. Hodel.

2. Hindman, T.B., Jr., Director DOE Waste Management Project Office, letter to Maher, R., *Manager Dupont Waste Management Programs*, Savannah River Plant Burial Ground Management Appraisal, January 26, 1981.

3. Geraghty & Miller, Inc. Assessment of the Presence of Volatile Organic Compounds in Water-Supply Well 53-A, A-M Area, Savannah River Plant. Prepared for Dupont, Atomic Energy Division, prime contractor Savannah River Plant, Aiken SC (1983).

4. US Department of Energy, Final Environmental Impact Statement, L-Reactor Operation, Savannah River Plant, Aiken, SC. DOE/EIS-0108 (1985).

5. Lawless, W.F. Department of Energy Savannah River Reactor Safety. Presented to the National Research Council, National Academy of Sciences, Aiken, SC, January 22, 1987.

6. Radioactive Waste Management at the Savannah River Plant: A Technical Review. Panel on Savannah River Wastes, National Research Council, National Academy Press: Washington (1981).

7. U.S. EPA. An Airborne Radioactive Effluent Study at the Savannah River Plant, EPA 520/5-84-012 (1984).

Comment number	Comments	Responses
	8. Environmental Monitoring in the Vicinity of the Savannah River Plant for 1982, DPSPU 83-30-1 (1984).	
	9. Department of Energy Acting to Control Hazardous Waste at its Savannah River Nuclear Facilities, U.S. General Accounting Office report to the Honorable Ernest F. Hollings, United States Senate, GAO/RCED-85-23 (1984).	
	10. Lawless, W.F. The Savannah River Plant: Hazardous and Radioactive. Public Comment and Meeting Report. A Centers for Disease Control Review Panel's Recommendations on Health Effects and Epidemiological Studies of Operations at the Savannah River Plant, Aiken, S.C. DOE/ER-0225 (1985).	
	11. Lawless, W.F. Testimony. DOE Regulation of Mixed Wastes. Hearing before the Subcommittee on Energy Conservation and Power and the Subcommittee on Commerce, Transportation, and Tourism of the Committee on Energy and Commerce, House of Representatives, Ninety-Ninth Congress, 2nd Session on H.R. 2009 and H. R. 2593, Serial No. 99-119, April 10, 1986.	
	12. Lawless, W.F. Savannah River Plant (SRP) Burial Ground, Building 643-G, Management Appraisal Report, Appraised June 2-13, 1980, DOE draft report (1982).	
	13. U.S. Nuclear Regulatory Commission. Final Environmental Statement related to the operation of Vogtle Electric Generating Plant Units 1 and 2. p. 9-4, NUREG 1087 (1985).	
	14. U.S. Department of Energy, (Supplement to ERDA-1537). Final Environmental Impact Statement, Waste Management Operations, Savannah River Plant, Aiken, S.C. DOE/EIS-0062 (1980).	

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	15. U.S. DOE. FY 1985 Program Summary Document. Office of Defense Waste and Byproducts Management. DOE/DP-0016/1 (1985).	
	16. Zeigler, C.C., Lawrimore, I.B. Heath, E.M. U.S. Department of Energy Savannah River Plant Environmental Report for 1985. DPSPU-86-30-1 (1986).	
	17. U.S. District Court for the Eastern District of Tennessee, Legal Environmental Assistance Foundation, Inc., and Natural Resources Defense Council, Inc., Plaintiffs: State of Tennessee, Plaintiff-Intervenor V. Donald Hodel, Secretary, U.S. DOE, et al., CIV. 3-83-562, filed April 13, 1984.	
	18. Marter, W.L. New Criteria for Seepage Basin Use, DPST-77-444 (1977).	
	19. Lawless, W.F. Problems with Military Wastes. Bulletin of the Atomic Scientists, 41(10), 38-43 (1985).	
	20. AEC Manual Chapter 0511, Radioactive Waste Management, 1973.	
	21. DOE Order 5820.2, Radioactive Waste Management, 1984.	
	22. U.S. Atomic Energy Commission, Final Environmental Impact Statement, Waste Management Operations, Savannah River Plant, Aiken, S.C. ERDA-1537 (1977).	
	23. Lawless, W.F. Testimony. Soviet Nuclear Accident at Chernobyl. Briefing and Hearing before the Subcommittee on Energy Conservation and Power of the Committee on Energy and Commerce, House of Representatives, Ninety-Ninth Congress, 2nd Session, May 1 and 7, 1986, Serial No. 99-136.	

Table L-2. DOE Responses to Comments on Draft EIS

Comment number	Comments	Responses
	24. Technical Summary of Groundwater Quality Protection Program at Savannah River Plant, DPST-83-829 (1983).	
	25. Bouwer, H. Groundwater Hydrology. McGraw-Hill: NY (1978).	
	26. Heffter, J.L., Schubert, J.F., Mead, G.A. Atlantic Coast Unique Regional Atmospheric Tracer Experiment (ACURATE), Rockville, MD (1984).	

Comment number	Comments	Responses
	TESTIMONY OF MR. R. LEWIS SHAW SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL June 4, 1987 Mr. S. R. Wright Director, Environmental Division U.S. Department of Energy Savannah River Operations Office Post Office Box A Aiken, South Carolina 29802 Re: Draft Environmental Impact Statement (DEIS), Waste Management Activities for Ground Water Protection at the Savannah River Plant, April, 1987 Dear Mr. Wright: The South Carolina Department of Health and Environmental Control (DHEC) has reviewed the referenced DEIS and offers the following comments and recommendations for finalizing the EIS. Comments are provided with regard to the general scope and content as well as program specific concerns. E.I.S. - Regulatory Interface The DEIS has been submitted at a time when DHEC's regulatory coverage over a number of waste management activities has recently been clarified creating a somewhat duplicative coverage. For this reason, DHEC's comments today are limited to the programmatic, long-range aspects of waste-management practices at SRP. Our project-specific requirements will be developed and transmitted to DOE in the future through normal regulatory processes, incorporating the applicable	

Comment number	Comments	Responses
	regulatory requirements into a multi-media approach which is consistent with the programmatic and long-range concerns raised in our comments today. In this multi-media, regulatory process, DHEC is fairly confident that the "Combination Strategy" proposed in the DEIS will be conceptually acceptable within the scope of applicable regulations.	
F-1	However, there are two categorical exceptions to this approach. First, sanitary solid waste and land-applied wastewater are not covered in the DEIS, as we requested, in our comment number 2 in the scoping process.	The sanitary landfill and land-applied wastewater facilities are currently operated in accordance with permits issued by SCDHEC. Since these operations are prescribed by the conditions of the SCDHEC permits, alternative operational strategies will not be developed through the general NEPA process or this specific EIS. These facilities are not currently considered to be either mixed, radioactive, or hazardous waste sites. DOE will continue to interact with SCDHEC on these permitted operations.
F-2	Second, high level waste and TRU waste are not clearly covered by any regulatory authorities outside of DOE and are not covered in the DEIS. DHEC recommends that the final EIS, in order to be comprehensive, discuss the impacts of all waste management activities on ground water at SRP.	High-level waste and transuranic (TRU) waste have been evaluated in other NEPA documents prepared by DOE and are referenced in this FEIS. HLW is stored in tanks at the SRP awaiting processing in the Defense Waste Processing Facility (DWPF) and repository disposal. Stored TRU waste will also be disposed of in a Federal repository. The impacts on human health and the environment of buried TRU waste are assessed as a part of the 643-G facility. Pursuant to the <u>Federal Register</u> notice of May 1, 1987, DOE and EPA are consulting to determine the regulatory status of the sites containing these wastes.

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F-3	<u>Waste Minimization</u> As we recommended in the scoping process (comment 5) waste minimization should be preferred over land-based treatment, storage, and disposal. DHEC recommends that Appendix D of the final EIS should be expanded to thoroughly discuss the impacts of recycling; reuse, incineration, and/or further treatment on a project-specific basis for all wastes generated both currently and in the future at SRP.	This FEIS (Appendix D) includes discussion of recycling, reuse, incineration, and other pre-treatment technologies but does not discuss the site-specific impacts of these technologies due to its programmatic focus. Discussions in Appendix D, as well as the FEIS, are limited to "hazardous," low-level radioactive, and mixed wastes, not all wastes (See pages 1-4 and 2-14). The EIS bounds the environmental consequences of alternative actions. Programs which are in place at the SRP (e.g., waste minimization) will reduce the level of impact discussed in the EIS. Further, project-specific actions will be developed as a part of ongoing interactions with SCDHEC following DOE's Record of Decision which deals with the selection of a waste management strategy.
F-4	<u>The Role of Hydrogeologic Considerations in Strategy Development and Site Selection</u> DHEC recommends that the final EIS be revised to further emphasize and clarify that all priority ranking systems, selections of remedies under the "Combination Strategy", and site selections of future land-based waste management facilities will give strong consideration to hydrogeology. Specifically, we feel the following major factors should be ranked and considered, at a minimum: 1) presence or absence of a potentiometric head reversal and the relative difference (location in a recharge or discharge area). 2) quality of confinement. 3) thickness and quality of the unsaturated zone. 4) role of the calcareous zone.	Selection of remedial actions will be based on interactions with SCDHEC and/or EPA and will be reflective of the hydrogeological discussions in Chapter 3 and Appendix A as well as further site-specific studies developed during the regulatory process. The final selection of remedial actions will be based on these regulatory interactions and decisions. Similar regulatory interaction will also precede the selection of new disposal/storage facility sites (See pages 1-4 and 2-35 of this EIS).

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	In the development of DHEC's regulatory requirements, we will consider these variables in the future and recommend that the final EIS outline an approach or ranking system to assist in this effort in order to provide a consistent base for future data collection and decision making. It is further recommended that the priority ranking system and the remedy selection system place a minor weighting factor on proximity to the SRP boundary since environmental standards apply plantwide.	
	In addition to these general programmatic comments on the DEIS, DHEC has the following, more program-specific comments:	
	Bureau of Radiological Health	
	It is our view that an overall combination strategy would provide maximal remediation, evaluated on a case by case basis for each area. As presented in this document the elimination strategy poses a significant occupational risk of radiation exposure. Therefore the elimination strategy should only be considered in cases of extreme radiological contamination, or in special cases where hazardous concerns greatly outweigh the potential radiological exposure.	
F-5	As shown in this report, there are several areas where radionuclide concentrations exceed ground-water standards. It is our opinion that present low level waste trench construction should be modified to decrease the probability of	Technologies considered and evaluated in the EIS for new low-level radioactive waste disposal facilities include liners and leachate collection systems to reduce the probability that radioactive constituents

Comment number	Comments	Responses
	migration of the radioactive constituents. The following should be included in addition to present requirements:	will migrate.
	1. French drains and sumps should be included.	The Engineered Low Level Trench (ELLT) design includes a French drain which is sloped to a central sump. The sump can be checked and pumped to remove any liquids.
	2. Trenches should be excavated so that there is a minimum separation of 5 feet between the trench bottom and the highest recorded water-table elevation.	A minimum separation of ten feet is maintained between the bottom of the trench and the permanent water-table elevation.
	3. Superficial sand layers should be removed. 4. Quality assurance should be inacted to inhibit the severity of future trench subsidence. (i.e., waste placement, backfilling procedures, etc.)	Superficial sand layers are not removed in individual trenches; however, any sand layers present at the boundary of the burial ground will be evaluated and SCDHEC will be consulted to determine how the presence of these layers might affect the ability of the closure cap to retard migration of potential contaminants. A low-level waste compaction process is operational at SRP prior to placement. The compaction program is expected to inhibit subsidence at the disposal facility.
	We also feel that more stringent requirements should be placed on the waste forms to decrease their leachability. All waste should be dewatered to less than 0.5% free standing liquid by volume, and liquid waste solidified. Absorbed liquids, oils, and lubricants should not be accepted.	Current SRP practices require liquids to be absorbed on non-biodegradable absorbent with a 3 to 1 ratio (absorbent to liquid) prior to acceptance which significantly decreases waste leachability. Oils and lubricants are not accepted for disposal. Compliance with DOE Order 5820.2 will be assured before the construction of additional LLW disposal facilities. DOE-HQ

Comment number	Comments	Responses
		is evaluating DOE Order 5820.2 to determine if stricter requirements are warranted for humid, eastern sites. Mixed waste will not be disposed of in the same facility as low-level waste. DOE will continue to work with SCDHEC to define groundwater protection limits.
F-6	It is our understanding the DOE has adopted the general requirements specified in 10 CFR Part 61, Land Disposal of Radioactive Waste. In our opinion, DOE should establish stricter requirements for disposal of radioactive waste and mixed waste due to the specific geohydrology and humid environment of the Savannah River Plant.	
F-7	The proposed ground-water monitoring program states that for most areas, sampling will be performed quarterly for the first year and annually for the next 29 years. Our opinion is that sampling for radionuclides should be performed on a more frequent basis, and for a longer period of time.	The 30-year monitoring requirement was chosen to provide a consistent basis for cost comparisons in this EIS. The type of radionuclides that may be present in groundwater underneath the site would determine the adequacy of the sampling period and the frequency of sampling. Sampling would be performed quarterly for the first year or as negotiated with the regulatory process.
F-8	It is stated on p.3-47 that "The only other nuclear facility operating within 80 kilometers of SRP is the low-level radioactive waste burial site operated by Chem-Nuclear Systems, Inc..." There are several other nuclear facilities within 80 kilometers of SRP. It is also mentioned that "the Alvin W. Vogtle plant is currently under construction." It should be noted that this plant has received an operating license.	Unit 1 of Plant Vogtle began full power operation in May 1987. Page 3-52 of text has been corrected to reflect this changed condition.

Comment number	Comments	Responses
	Bureau of Water Supply and Special Programs	
	General Comments	
F-9	1. The proposed ground-water monitoring to be conducted under each strategy is essentially the same, quarterly for one year and annually for twenty-nine years. As many of the waste sites are considered to be solid waste management units (SWMU's) under RCRA, ground-water monitoring must be conducted such that the spirit of the South Carolina Hazardous Waste Management Regulations (SCHWMR's) is met. In general, for any waste site where either any waste is to remain in place or ground-water contamination exists, ground-water monitoring which meets the requirements of R.61-79.264.98 and 264.99 of the SCHWMR's must be performed. The appropriate monitoring program should be determined based on the requirements of 264.91. If remediation of contaminated groundwater is necessary then monitoring should be performed per 264.100.	The 30-year monitoring requirement was chosen to provide a consistent basis for cost comparisons in the EIS. The specification of the exact monitoring program to be implemented at each site is beyond the scope of this EIS and NEPA objectives. These details are being determined in the RCRA permitting (Part B) process. Where appropriate, solid waste management units (SWMU) are discussed explicitly only in R.61-79.264.101. Groundwater monitoring regulations for SWMUs have not yet been developed under either Federal or state statutes. As part of the RCRA permitting process, the SRP is currently negotiating with SCDHEC and EPA to identify groundwater monitoring requirements for SWMU.
F-10	2. In general, the combination strategy is most compatible with existing closure activities being addressed under the SCHWMR's. However, this strategy calls for waste removal at only seven waste sites, the old F-Area seepage basin and the six R-Area seepage basins. Additional sites should be considered for inclusion on this list. In particular, waste should be removed from sites where the physical nature and/or mode of containment (or lack thereof) would provide an ongoing source of leachate and groundwater contamination. Remediation of contaminated groundwater by pumping at such sites, without source removal, could necessitate corrective action programs without any foreseeable stopping point.	The seven sites included in the Combination strategy were selected based on multipathway transport modeling and are considered preliminary choices for purposes of comparison and strategy selection in this EIS. The final number of sites at which waste will be removed will be determined following DOE's Record of Decision, subsequent regulatory agency interactions, ongoing and future monitoring, modeling, and site-specific characterizations.

Comment number	Comments	Responses
F-11	3. Several remediation methods are described in Appendix C of the EIS (Volume 2). The list of methods includes Permeable Treatment Beds, Ground Water Pumping, and Impermeable Barriers. Of these three major methodologies, pumpage of contaminated ground water is most applicable to the SRP because of physical and technological limitations of the other two methodologies at some sites, and because the use of permeable treatment beds could be considered hazardous waste land treatment and possibly subject to the RCRA permitting requirements as hazardous waste units. The use of impermeable barriers, as stated in Appendix C, is limited to sites where the water table is shallow and a confining unit is present. It should be noted that the use of barriers in a water table aquifer that is hydraulically interconnected with underlying aquifers could increase head pressure in the water table and enhance discharge to the lower aquifer. In these situations ground-water recovery wells should be used in conjunction with the impermeable barriers to relieve head pressures and recover contaminated groundwater. In general, the use of ground-water recovery wells at all sites with ground-water contamination, supplemented with impermeable barriers systems on a case by case basis would be the preferred remedial methodology. In place source remediation technologies, for example, vadose zone extraction, should also be considered.	Appendix C provides a generic description of potential remedial, treatment, and closure action technologies and their applicability to existing waste sites at the SRP. The scope of this EIS is not intended to select any specific remedial, treatment, or closure technique or combinations thereof. Appropriate techniques will be selected as part of project-specific actions subsequent to DOE's Record of Decision (ROD) and future permitting actions and studies.
F-12	4. Special consideration should be given to locating permanent waste disposal facilities in areas where the head reversal between the Congaree and Black Creek Aquifers is not present. As this situation will allow recharge to the Black Creek Aquifer from overlying and potentially contaminated units. Alternate, less vulnerable, areas should be considered.	The sites proposed for new SRP disposal facilities are in locations where there is a head reversal between the Congaree and Black Creek aquifers. The candidate sites selected for the proposed new disposal facilities for hazardous, mixed, low-level radioactive, and cement/fly ash matrix (CFM) wastes are located in areas of upward gradient (i.e., "head reversal") from the Black Creek to the Congaree aquifers.

Comment number	Comments	Responses
	Specific Comments	
F-13	5. The discussions in the DEIS pertaining to the vertical extent of ground-water contamination implies that only water table aquifers have been affected. As ground-water contamination has been observed in the Congaree and Black Creek aquifers the discussion should be revised to include the deeper leaky confined aquifers as well.	The EIS specifically discusses impacts to aquifers on page 3-20. Further discussion of confined aquifers is found at A.2.2 and A.2.3 of the FEIS.
F-14	6. The description of recharge and discharge areas at the SRP should include the A/M area as a potential recharge area for the Black Creek aquifer. The A/M area is characterized in Figure 3-5 as an area where the Congaree head exceeds the head in the Black Creek Aquifer. It has also been determined during the ground-water quality assessment that units of the Ellenton Formation are absent in this area. Figure 3-5 also shows a no head reversal area in the Par Pond and R-Area vicinity.	This comment is addressed in the FEIS (see Section 3.4.2.2; page 3-20, and Appendix A; page A-23, and revised Figures A-6 and A-7 on pages A-25 and A-26.
F-15	7. Paragraph two of section 2.1 (page 2-2) implies that long term monitoring (post closure care) will not be required at sites where the waste is removed as part of the closure operation. It should be noted that clean closure is not possible if ground-water contamination has occurred. Therefore, long term monitoring will be necessary at any site where waste is left in place (i.e., closed as a landfill) or ground-water contamination is confirmed.	The FEIS addresses long-term monitoring in Section 2.1, page 2.2. The following sentence is added. "Long-term monitoring will be necessary at any site where waste is left in place (i.e., closed as a landfill) or ground-water contamination is confirmed."
F-16	8. The discussion of hydrostratigraphy in paragraph four of section 3.4.1 describes the Ellenton Formation as an "effective barrier to downward migration". It should be noted that	See the response to comments F-13 and F-18. Changes have been made to text on pages 3-17 and 3-20.

Comment number	Comments	Responses
	current data confirms the presence of VOC's in the Black Creek aquifer in the A/M area, suggesting that leakage between the Ellenton and Black Creek occurs.	
F-17	9. Additional discussion is needed describing the source and nature of the hydraulic conductivity data presented in Table 3.6. Specifically, are they data lab or field generated, and if lab generated were samples disturbed or undisturbed?	The data on Table 3-6 were obtained from laboratory analyses of undisturbed samples. This information has been added to the EIS.
F-18	10. Section 3.4.2.2 paragraph 3 states that impact to the Black Creek aquifer has been confirmed in only one well cluster at SRP. It should be noted that other Black Creek wells in M-Area exhibit VOC's, specifically MSB-23TA and MSC-37TA, however, the validity of the data is considered by SRP to be questionable due to supposed leakage along the well casings. Also, the contaminant plume concentration and extent illustrations (figure A-13) should be revised to reflect more recent data than the April/July 1984 sampling.	The occurrence of VOCs in wells other than MSB-37 is addressed in this FEIS in Section 3.4.1, page 3-17, and Section 3.4.1, page 3-20.
F-19	11. The potential for plume convergence from the A/M Area and the Silverton Road waste site and it's affect on water quality should be discussed in section 4.2.1.1 regarding ground-water impacts.	This comment is the subject of ongoing discussion with SCDHEC and is being addressed through the RCRA permitting process. If this interaction does occur, it will not significantly affect the type or extent of environmental impacts or change the EIS conclusions.
F-20	12. The discussion of ground-water impacts on page 4-34 describes re-injection of treated ground water as part of the remedial action process. It should be noted that waste injection is not permitted under state regulations.	The EIS discusses reinjection as a potential offset to groundwater impacts such as surface subsidence or excessive drawdown. Reinjection of treated recovered groundwater is not construed in the EIS as waste reinjection. Reinjection will only be used to offset groundwater impacts if permitted using applicable regulatory processes.

Comment number	Comments	Responses
F-21	13. The discussion in Section 5.2.1 regarding ground-water contaminants confirmed in F and H-Areas should be revised to reflect current data. Specifically, the presence of lead, mercury and cadmium should be described. Also, Tables A-10, A-11, and B-13 should be revised accordingly.	First quarter 1987 analytical results indicated that concentrations of lead, cadmium, and mercury exceeded the Primary Drinking Water Standard at some F-Area Seepage Basin Wells. These data are presented in the final EIS at Table 3-8 and new Table B-12.
F-22	14. More of the recent data should be used in describing site ground-water elevations and flow directions. The maps in Appendix A are generally based on 1982 data: Maps should be prepared from several years of data, including current water level measurements, so that any changes in water level can be evaluated.	In preparing the EIS the 1982 groundwater elevation data were compared with the more recent 1985 data; no significant changes were observed. Accordingly, DOE believes that the 1982 data is appropriate for use in the EIS.
F-23	15. The discussion of the hydraulic characteristics of the various units in Appendix A should be expanded to include a description of onsite recharge areas for the Black Creek aquifer. Section A.3.2 describes offsite recharge but no mention is made of the onsite areas of no head reversal (A/M and Par Pond Areas).	Site-specific data will be included as necessary during regulatory interactions.
	<u>Bureau of Solid & Hazardous Waste Management</u>	
F-24	1. Even though the DEIS is not to be considered as a regulatory permitting vehicle, there should be some discussion as to how it may affect current and future permitting activities. Problems may arise between RCRA permitting activities, such as the RCRA Facility Assessment, and waste site identifications performed in the DEIS.	DOE will fully comply with RCRA as stated on page 1-3 of the EIS. The EIS serves as a focal point and provides an overall view of the environmental impacts of alternative waste management activities. Required regulatory actions, including those required by RCRA and/or SCDHEC requirements, will be implemented by DOE. While specific actions at individual waste sites may differ from EIS discussions, significant changes in

Comment number		Comments	Responses
			impacts are not anticipated, and in most cases the actual impacts will be lower. Deviations from the specific action descriptions of the EIS will be made as required by regulatory interactions; however, DOE feels that these deviations will not contradict the value of the EIS or the overall impact conclusions of the Record of Decision.
F-25	2.	The DEIS continuously states that it uses the terms "hazardous", "low level radioactive", and "mixed-waste" in their most common everyday sense, without specific regard to technical or regulatory definitions. Without the knowledge of what is referred to when using these terms, understanding how different sites will be addressed is difficult.	Table 2-4 lists the potential categories of waste vs. waste sites. The terms "hazardous," "low-level radioactive," and "mixed wastes" are primarily terms to identify and categorize the wastes regardless of whether individual constituents levels exceed regulatory definition. Negotiation of the applicable regulations will determine the categorization of individual sites. See page 1-2 for examples of waste terms and types.
	3.	The strategies developed in the DEIS appear to be in accordance with RCRA which allows for either removing the waste (elimination) or leaving it in place with proper monitoring (dedication).	
F-26	4.	When developing alternative strategies for existing waste sites, the term cost-effective is used. The context in which possible cost-effective analysis were used should be discussed.	Cost-effective or cost benefit analyses will be part of future project-specific actions. Although these types of analyses were not used in the EIS, costs were provided to give the decisionmaker a basis for deciding on an alternative strategy).
F-27	5.	The priority that DOE is using in the process of proceeding with waste management activities, to comply with applicable requirements, is unclear.	Site-specific waste management priorities will be established as part of regulatory and permitting activities.

Comment number	Comments	Responses
F-28	6. It appears that the environmental impacts under the dedication strategy and the combination strategy would be basically the same, since there would be dedicated disposal sites included in either strategy.	The most significant differences between the Dedication and Combination strategies are in the number of sites dedicated to waste management use and acreages. The comparison of and differences in environmental impacts of all waste management strategies including differences in impacts between the Dedication and Combination strategies are given in Table 2-10.
F-29	7. Two of the proposed strategies (elimination and combination) provide for removing waste to the extent possible. While this may be acceptable for non-RCRA sites, RCRA requires the removal of hazardous constituents to background levels or provide for post-closure.	The language of the EIS is "to the extent practicable." Future regulatory interactions will be used to determine final cleanup requirements and post-closure care.
F-30	8. Section 6.2.3.1 does not include all of the units which DOE has included in the Part A for SRP. In addition to those units listed, the following units are also operating under interim status at SRP: - Mixed Waste Storage Facility 633-29G - Mixed Waste Oil (Tritiated) Storage Tank S-32 - Process Waste Interim Storage Facility	These units have been added to Section 6.2.3.1
	<u>Bureau of District Services, Lower Savannah District Office</u>	
F-31	1. In the list of sites investigated, the sanitary landfill is excluded. As was the past general practice, hazardous wastes were buried in many sanitary landfills and may have been buried at the SRP landfill. In any case, we believe ground water contamination is beginning to show up beneath the landfill and therefore should be addressed.	See the response to comment F-1.

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F-32	2. Should not the Water Classifications and Standards Regulations, Regulations 61-68 and 61-69, be included, as they relate to groundwater contamination? Table 6-2 on regulations does not include these regulations.	Water Classifications and Standards Regulations R.61-68 and 61-69 have been added to Table 6-2.
F-33	3. The summary states that "Groundwater contamination of some water table aquifers has occurred occasionally at some sites because of these waste management practices." This statement is somewhat misleading in that water table and other deeper aquifers are contaminated around some of the basins. It is misleading in that these areas were contaminated some 30 years ago and waste has been continually released into the aquifer.	This statement in the Summary has been changed to read "Groundwater contamination of some aquifers has occurred because of these previously acceptable waste management practices."

If you have any questions regarding these comments, please contact us.

Very truly yours,

R. Lewis Shaw, P.E.
Deputy Commissioner
Environmental Quality Control

RLS/JMF/cm

cc: Governor's Office

Comment number	Comments	Responses
	STATEMENT OF MR. GARY K. SPEIRAN U.S. DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY Water Resources Division 1835 Assembly St., Suite 677A Columbia, SC 29201-2492 May 29, 1987 Mr. S. R. Wright Director, Environmental Division U.S. Department of Energy Savannah River Operations Office P. O. Box A Aiken, South Carolina 29802 Dear Mr. Wright: I have briefly reviewed the draft environmental impact statement "Waste Management Activities for Groundwater Protection, Savannah River Plant, Aiken, South Carolina." This review has consisted of a general review of the content and organization. Technical merit of the report from a hydrologic and water-quality standpoint was not reviewed because much remains unknown about the geohydrology and water chemistry of the systems affected at the scale necessary to provide such review. The comments provided are ones that I believe would enhance the readability, understanding, and credibility of this and similar reports. The volume of material included makes it easy for the reader to feel overwhelmed and confused by what is provided. If such a volume of material is not presented clearly the reader may feel that there is an attempt to cover up problems and confuse the situation.	
G-1	Impressions are important. One of the first impressions is created by the title, which implies that the report relates waste-management activities	Groundwater protection is the primary EIS focus as cited in the Notice of Intent (50 FR 16535, April 26, 1985). Other

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	to ground-water protection only. The text also relates these activities to surface-water, ecological, and other protection. To bring the report to the attention of those not interested in ground-water protection but interested in other aspects discussed, the contents of the title and text should be the same.	environmental impacts are also evaluated. See the Cover Sheet.
G-2	Section 1 (Purpose and Need) contains a lot of background material relating to waste-management activities that may best be put into an introduction. The purpose and need section should briefly give the purpose and need for this report, not for the waste-management activities. In this way the reader will know why this report has been written. Also, material in the heading and in the body of the section should be put in the same order.	The EIS was prepared in accordance with CEQ regulations (40 CFR 1500-1508) implementing NEPA. 40 CFR 1502.13, Purpose and Need, states, "The statement shall briefly specify the underlying purpose and need to which the agency is responding in proposing the alternatives including the proposed action."
G-3	In some instances material could be more effective if located elsewhere. Subsections 2.5.4-2.5.12 discuss impacts of the waste-management alternatives on the ground water, surface water, and other parts of the environment. These systems have not been described to this point which makes it difficult for the reader to evaluate the validity of the statements made. It appears that an attempt is being made to convince the reader of these points before the data supporting or refuting them is presented. The impacts are also described in Section 4 after the affected environments are described in Section 3. The impact discussion in Section 2 should be deleted.	Chapter 2 is a description of alternative waste management strategies and their associated environmental impacts taken from Chapter 4. The Summary sets the stage for all subsequent discussions. See the response to comment G-2.
G-4	Subsections 3.7 (Radiation and Hazardous Chemical Environment) and 3.8 (Control and Security) do not seem to belong in a section on affected environments as separate subsections. Radiation and hazardous chemicals are not environments, but constituents that can be monitored in the existing environments. Control and security does not relate to the description of environments. Both subsections should be made into separate sections or integrated into existing sections.	See the response to comment G-2.

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G-5	One discrepancy was noted in the text on page A-15 in the second paragraph. In the third sentence, the green clay is said to be continuous, but then is said to be discontinuous north and west of Upper Three Runs in sentence 5. These should be made to agree. I hope that this discussion is useful in helping to improve the readability, understanding, and credibility of the report. Sincerely, Gary K. Speiran Hydrologist GKS/vwf	The EIS text states, "The green clay <u>appears</u> to be continuous...." See also page A-6.

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	STATEMENT OF MS. BARBARA W. GERTH	
	June 10, 1987 1105 Fontanna Avenue West Columbia, S. C. 29169	
	Mr. S. R. Wright Director of Environmental Division U.S. Department of Energy Savannah River Office P. O. Box A Aiken, South Carolina 29802	
	Thank you Mr. Wright for sending me a copy of the Draft Environmental Impact Statement concerning Groundwater Protection at the Savannah River in Aiken, South Carolina.	
H-1	From reading the statement I have concluded that your "dedication" plan either by itself or as it occurs within the combination plan is not a viable plan and should not be tolerated by any citizen of S.C. or this country. You or we will not "dedicate" land that we have destroyed through carelessness, lack of consideration, and ignoring rules and regulations that we impose on others. "Elimination" of all toxic chemicals, radiated particles, and mixed chemicals areas must be the only option. All temporary storage for cleanup and recycling should be above ground. The goal of this draft must be total cleanup through the elimination of toxic wastes and radiation at all sites within an immediate time frame. Due to the magnitude, mixing, and buildup of wastes seeping into the plants environment, this problem will receive top priority at the plant and supercede new plans of creating further wastes at the site.	The alternative waste management strategies considered in the EIS represent a range of waste management activities. The assessments of these strategies provide DOE decisionmakers with reasonable choices.

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	Through our final draft of "Total cleanup" this problem will be given priority status to ensure adequate financing to restore this land and cease seepage of wastes. I am aware that this draft pertains to Savannah River site, but let's set a precedent and actually have DOE clean up a site. Think of the jobs for engineers, chemists, physicists, etc. New technologies may be discovered. Universities could be involved.	
H-2	With all of the technologies used, they must employ strict safety standards concerning the environment and the personnel involved.	Occupational and worker risks are discussed and assessed under each strategy.
H-3	We must also address the problem of nuclear and chemical wastes being created and encourage their reduction due to the massive problem of controlling their wastes. We should not accept wastes from other states. We should halt nuclear weapons testing and decrease the amount of nuclear weapons that are made. We must decrease the amount of wastes from nuclear medicine and research and substitute other less dangerous techniques. DOE must present the draft to other agencies of the Federal government to ensure a reduction in arms and nuclear testing safely due to an inability to handle wastes from the production of these materials. Also to encourage the cleanup of other sites the defense department has polluted in our state.	See the response to comment D-5.
H-4	As our main goal in the final draft DOE must eliminate all polluted waste sites at the Savannah River Plant in Aiken, S.C. to stop the seepage of	DOE has proposed three "action" waste management strategies for removal, closure, and remedial action at existing waste sites;

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	chemicals and radioactive particles into the groundwater aquifers, vegetation, and in the near future us. Sincerely, Barbara W. Gerth	establishment of new disposal/storage facilities, and discharge of disassembly basin purge water.

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	STATEMENT OF MR. JOHN C. SNEDEKER SYNERGISTICS DYNAMICS, INC. US DEPARTMENT OF ENERGY Savannah River Operations Office Box A Aiken, SC 29802 Attention: Mr. S. R. Wright, Director-Environmental Division Re: Draft Environmental Impact Statement 0120D - "Waste Management EIS" Dear Mr. Wright: I respond herewith, as a private citizen, and as President of SYNERGISTIC DYNAMICS, INC., a professional services firm with expertise and experience in the aerospace, defense and high technology industries, to DOE's call for comments on the subject DEIS. These comments are summarized as follows: (1) The DEIS is adequate for the purpose for which it is intended, (2) The "combination strategy" recommended by DOE appears to be the best of the four alternatives, (3) The undersigned supports the concept of an independent Oversight Committee, subject to the reservations set forth herein. The DOE's Savannah River Plant (SRP) is well known as a facility that produces weapons-grade nuclear materials. It is also the second source of fuel materials for Naval Nuclear Propulsion Systems. It is less well known that the entire 300 square mile reservation was designated (in 1972) as the Nation's first National Environmental Research Park. Laboratories and plants within SRP are	

Comment number	Comments	Responses
	involved in a broad range of activities relating to the protection of th environment, including programs for immobilization and subsequent permanent storage of high-level, liquid radioactive waste; continuing high-level radiological waste management; chemical reprocessing technology; and studies of the environmental effects of nuclear and industrial operations. The laboratories administered by the Savannah River Operations Office (SRO) having major missions related to the environment are the Savannah River Laboratory (SRL), the Savannah River Ecology Laboratory (SREL), and the Savannah River Forest Station.	
I-1	Ensuring radiation safety of the public and protection of the environment from a variety of nuclear and non-nuclear wastes has been a primary objective of DOE and its operating contractors at the SRP since 1952, when construction of the facility first began. Many of the waste management strategies and facilities involving low-level radioactive, hazardous, and mixed wastes were not in strict compliance with the National Environmental Policy Act (NEPA), when it was enacted seventeen years later. The DOE has embarked on a major program to bring waste management and disposal facilities at SRP into full compliance with NEPA and other applicable Federal and state statutes. Alternative strategies are presented in considerable detail in a Draft Environmental Impact Statement (DEIS), issued in April 1987, and which was the subject of public hearing held in Savannah and Aiken, S.C. in early June. The strategy recommended by DOE is termed the "Combination Strategy" which will involve removal of wastes at certain sites, closure of others, establishment of new retrievable storage and disposal facilities, and continued research of new technologies for permanent disposal of nuclear	Chapter 6 describes the applicable statutes and regulations (i.e., RCRA, HSWA, CERCLA, SARA, and South Carolina Hazardous Waste Management Regulations, SCHWMR) which govern SRP waste management activities.

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	wastes. Capital costs could be as high as $2 billion. Estimated annual operating costs range from $18 to 26 million. As a large industrial complex, SRP is, in many ways, similar to a small city, and has the same problems of supply of utilities and disposal of a broad spectrum of wastes, including sewage and emissions from coal-fired power plants. Many of the so-called "hazardous" wastes that are the subject of the DEIS are chemicals common to many industrial plants. Few municipalities, if any, have the combination of monitoring stations and laboratories dedicated to waste management that exist at SRP. The research activities of the DOE laboratories at SRP contribute significantly to the public welfare throughout the Nation and the World. The safety record at SRP is outstanding. During construction in the early 1950's, Du Pont and its many sub-contractors earned the distinction of running the world's safest construction project. SRP has consistently been ranked first or very close to first in safety among all industries in the Nation. There has never been an injury or death caused by a nuclear accident at SRP. Environmental surveillance activities at and in the vicinity of SRP (including monitoring stations on the Savannah River as far away as Port Wentworth) comprise the most comprehensive environmental monitoring program at any site in the United States. Results of this monitoring have been reported to the public every year since 1959, showing insignificant impacts on public health.	
I-2	During the past several years, there have been an increasing number of calls from public officials, environmental groups, and private citizens for the appointment of an Oversight Committee to provide	See the response to comment C-153 on oversight.

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	independent monitoring and assessment of the effectiveness of environmental protection strategies involving both the public and workers at the facility. There are management and oversight functions within DOE and within the corporate structure of Du Pont, the SRP's operating contractor. DOE also contracts with outside consultants for performance audits on an annual basis. In addition, all of the review and oversight functions of the Federal government are, and have been available, including the Government Accounting Office (GAO), and the Inspectors General of DOE, DOD, and other agencies having an interest. The South Carolina Department of Health and Environmental Control (SCDHEC) has primary responsibility for enforcement of the Federal Safe Drinking Water Act and its 1986 Amendments (PL 99-339).	
I-3	It would appear, therefore, that the proposed SRP Oversight Committee could contribute very little to the regulatory, monitoring and enforcement functions already in place at the Federal, State and local levels. Moreover, it will require substantial courage to resist placing people on the Committee whose agendas are more political than scientific. Nevertheless, the Savannah River Plant is a vital National resource, not just for its nuclear material production capabilities, but for its research activities that center on the broad problems of environmental protection in the nuclear age, including high-level nuclear waste disposal applicable to both weapons production and to the nuclear power industry. If an independent Oversight Committee could be selected that would possess the proper combination of scientific expertise and personal objectivity, it could make a contribution to better public understanding and support of DOE's missions.	See the response to comment C-153 on oversight.

Table L-2. DOE Responses to Comments on Draft EIS
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	Very truly yours, John C. Snedeker President cc: Senator Sam Nunn Senator Wyche Fowler Congressman Lindsay Thomas Elizabeth Stewart, Savannah Area Chamber of Commerce	

Comment number	Comments	Responses

STATEMENT OF MR. JOSEPH R. FRANZMATHES,
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV, ATLANTA

U.S. Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, GA 30365

Mr. S. R. Wright
Director, Environmental Division
Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29802

SUBJECT: Draft Environmental Impact Statement (EIS) for Waste Management Activities for Groundwater Protection at SRP
EPA Log Number: D-DOE-E26001-SC

Dear Mr. Wright:

Pursuant to our responsibilities under Section 309 of the Clean Air Act and the National Environmental Policy Act (NEPA), the Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for Waste Management Activities for Groundwater Protection at the Savannah River Plant (SRP). Our review of the document, which has focused on the long-range environmental issues of current and future waste management activities at SRP, has involved all the pertinent media programs.

The overall stated general purpose of this EIS is to provide a more comprehensive framework to evaluate SRP's future waste management for groundwater protection projects and to evaluate the cumulative effects of integrating the individual project actions. We commend the Department of Energy (DOE) for preparing this extensive document, using an appropriate 100-year institutional period,

Comment number	Comments	Responses
	and believe the EIS can serve as a useful programmatic framework to assist in guiding future project/site-specific actions. Since State and Federal regulatory actions at SRP are in progress, the regulatory and NEPA actions should occur concurrently as required by law.	
	In addressing its broad objective of modification of waste management practices for protection of groundwater, human health, and the environment, the DEIS considers both programmatic waste management strategies and some project/site-specific actions. In summary these are stated to be:	
	• The selection of a strategy for the removal, remedial and closure actions at active and inactive hazardous, low-level radioactive, and mixed waste sites.	
	• The identification of new waste disposal and storage facilities for hazardous, low-level radioactive, and mixed wastes.	
	• The selection of alternatives to replace the present discharge of disassembly-basin purge water from the C-, K-, and P-Reactors.	
	In our review, therefore, we have considered this stated dual-nature of the EIS and assessed its ability to evaluate both levels of actions for the purpose of complying with NEPA.	
	General Scope	
J-1	First of all, we understand the basis for limiting the scope of the DEIS to hazardous, mixed, and low-level radioactive wastes (LLW). However, since the Final Rulemaking for Byproduct Material (May 1, 1987, FR) clarifies the regulatory responsibilities for mixed wastes, the FEIS should indicate the effects of this recent promulgation on the programmatic strategy as well as the specific	DOE-SR is discussing implementation of the "Byproduct" rule with Region-IV EPA and SCDHEC. Application and implementation of the rule will be made on the basis of site-specific information. Accordingly, DOE feels that it is unlikely that the rulemaking will affect the selection of alternative waste management strategies

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	remedial actions and proposed facilities for the entire SRP operations. This means, that in order for this EIS to provide the necessary, broad frame-work to assess the impacts on groundwater, health and safety and the environment, all waste management activities should be considered including transuranic (TRU) and high level radioactive (HLW). In particular, this should include the impacts of TRU waste disposal, both prior and after 1970, on the siting considerations for future LLW and mixed waste facilities.	since the strategy selection was based on environmental impacts, human health effects, and institutional considerations. Compliance with regulatory requirements, including the byproduct rulemaking is a part of the Combination strategy. TRU waste that was non-retrievably disposed of in the SRP low-level waste burial ground prior to 1970 was considered part of the "source term" of burial ground radionuclides, as were any chemical constituents (Sections 4.2.1, 4.2.2, 4.2.3, 4.2.4 and F.2.7). TRU waste that is retrievably stored is being assessed in a separate DOE environmental assessment. The management of HLW at the SRP and its environmental effects are discussed in ERDA-1537 and the Defense Waste Processing Facility FEIS, DOE/EIS-0082.
J-2	Second, the DEIS goes to some effort to separate the NEPA actions from the on-going or future regulatory processes. We understand the rationale for this approach, however since the actions being addressed are basically of a regulatory nature, a clearer and more extensive discussion of the interrelationship of the NEPA and regulatory process is warranted. This should include a more detailed description of anticipated follow-up NEPA documentation for project - specific actions and other requirements for implementation including permits under RCRA, NESHAPS, etc.	Text in the FEIS has been expanded to provide broader discussions of NEPA-regulatory interactions. A table has been added in Section 2.1.6 to show some of these actions.
J-3	In addition, there should be a discussion of the prioritization system and proposed project implementation schedule that will be used by DOE in achieving the proposed waste management objectives.	Priorities and plans have been established through the regulatory process for some facilities (e.g., see Table 6-1 for plans at interim status facilities); however, the actual implementation of project-level actions will be dependent on completion of required regulatory interactions. Priorities for closure of other sites will be determined through these interactions.

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J-4	Third, in this and subsequent project-specific NEPA documents, the EIS should address the actions necessary under each alternative to meet State and Federal environmental regulations.	See the response to comment J-2.
	Waste Management Strategies	
J-5	For the purposes of bracketing the relative environmental impacts and implementation costs, we note the EIS approach of delineating three discreet action strategies for addressing existing waste sites. The No Action Strategy, in addition to complying with a NEPA requirement, provides one-end of the cost and impact spectrum, although it obviously would not meet current regulatory requirements. The Elimination Strategy, which proposes waste removal at all the 77 sites considered, provides for the other end of the cost and impact spectrum. However, we are not sure the linkage of the generic strategy to more project specific actions in regard to new facilities and purge water discharge is really necessary or is the mix of actions always consistent (i.e., continued discharge of purge water under the Combination Strategy). Our concerns about these site specific actions will be discussed separately.	The linkage of new disposal facilities and disassembly basin purge water disposal to actions of existing waste sites was made so that an SRP waste management strategy could be developed for hazardous, low-level radioactive, and mixed waste. The rationale for linking project-specific actions within a strategy is explained in the Summary under the title heading "Alternative Strategies."
J-6	Of the programmatic strategies identified we accept the Combination Strategy as providing the greatest degree of flexibility in determining the exact measures necessary at each waste management unit. Because of the environmental hazards, worker exposure, and other reasons, removal of waste at all sites is not a desirable option. However, the exact number of sites at which removal of waste is warranted should be based on the result of site specific remedial investigations. For the purposes of this document, we can accept the seven sites proposed in the Combination Strategy for waste removal as a useful starting point.	

Comment number	Comments	Responses
	<u>New Disposal/Storage Facilities</u>	
J-7	In general, the alternative disposal/storage technologies being considered for new facilities for low level radioactive, mixed and hazardous waste are acceptable in so far as they meet the appropriate regulatory requirements. In that regard, alternatives such as the cement/fly ash matrix vault may have limited application for mixed wastes since they do not meet the RCRA engineering requirements and thus would require that any constituent hazardous waste be delisted (40 CFR 260.22). In addition, because of the complex and vulnerable geohydrology of the SRP site, we expect that additional precautions will be necessary for improved near-surface land disposal technologies.	The cement/fly ash matrix vault concept is discussed in the EIS as a facility type which conceptually would comply with the intent of RCRA as well as being a facility which could be built at the SRP by DOE. The final design of such a mixed waste facility, including the appropriateness of the vault matrix and the need for liners and a leachate collection system, will be determined through regulatory compliance activities. DOE's preferred alternative waste management strategy includes design features for new facilities that would include essentially zero release for solid low-level radioactive waste, hazardous waste, and mixed waste.
J-8	In terms of siting new waste facilities, we note that three candidate sites have been identified in the DEIS for consideration. However, if this EIS is to be the definitive NEPA documentation on this action, we do not consider the informaton provided in this DEIS to be sufficient from a NEPA decision-making standpoint. In particular, the entire discussion in Appendix E (and in the main document) needs to be expanded to include: a more complete explanation of the screening methodology and siting criteria, discussion of alternatives considered but not selected, and the rationale for selecting Candidate Sites B, G, and L.	Appendix E has been revised to provide explanation of screening methodology and siting criteria, alternative sites and rationales. Additional maps and tables have also been prepared and included in the FEIS.
J-9	The type of information considered acceptable should be sufficient to ensure a reasonable, yet conservative assessment of radioactivity release into each of the most significant radioactivity transport mechanisms for each of the five periods of concern in the life of the disposal facility. The most significant radioactivity transport mechanisms include: groundwater, air, surface water, direct radiation, and biotic pathways. The five periods of concern include: the operational,	The PATHRAE code, health risk, and air models, such as XOQDOQ, LADTAP, and GASPAR, used to model radioactive releases from existing waste sites take into account the major environmental pathways specified in the comment (see Appendix H). Use of transport models in this document, however, was intended to provide the decision maker with a relative basis for comparison of alternative strategies, not for site-

Comment number	Comments	Responses
	closure, observation and surveillance, active institutional control, and passive institutional control periods. The information should include an analysis that identifies and quantifies the most significant release scenarios on the basis of the specific details of the site environment, waste acceptance criteria, facility design and operating practices. Use of other than the most conservative release models or parameter values should be fully discusssed and justified. If credit is taken for the reduction of radioactivity releases as a result of special waste forms, waste packaging, or disposal techniques; those waste streams that will be disposed of using these techniques should be clearly identified. The influence of these special waste forms, packaging, or disposal techniques on radioactivity releases should be quantified.	specific determinations. A one hundred-year institutional control period is assumed. Health effects were modeled for 1000 years after the assumed closure of the SRP waste site. A conservative health effects model (280 excess cancers per million population per rem) was used throughout the EIS. Other model bases are explained at 4.2, and Appendix H and technical reference documentation (e.g., DPST-85-904, DPST-86-291, and DPST-86-298) provide further detail concerning the selection of conservative parameter values used in the health effects and transport models.
J-10	The issue of appropriate siting criteria also needs further consideration. Any new facilities for hazardous and mixed waste disposal will have to meet siting criteria as part of the RCRA permitting process. This criteria, which is under development by EPA in response to the Hazardous and Solid Waste Amendments (HSWA) of 1984, will give heavy emphasis to geohydrological factors and protection of vulnerable groundwater resources.	See the responses to comments J-7 and J-8. The final siting of new facilities will be coordinated with EPA and SCDHEC as a part of applicable regulatory requirements and will meet RCRA siting criteria, including geohydrological factors, as appropriate. DOE has reviewed recently proposed siting standards in the July 1, 1987, proposed rulemaking for 40 CFR 264, 265, and 270.
	<u>Disposal of Disassembly-Basin Purge Water</u>	
J-11	As was mentioned earlier, we recommend that the alternative means of disposing of disassembly-basin purge water be evaluated separately from the overall waste management strategy. Rather than linking the continued use of the seepage basins with the Combination Strategy, we recommend that appropriate alternatives be pursued to eliminate this practice which has resulted in groundwater contamination with tritium.	Seepage basins are used to treat and dispose of purges of reactor disassembly-basin water because they have proven to be a cost-effective method of reducing occupational and offsite radiation doses. Although tritium levels in water table monitoring wells adjacent to the seepage basins are high, there is no use of these groundwater resources for drinking or process purposes. Offsite releases are

Comment number	Comments	Responses
	The DEIS identifies a number of alternatives to the current practice. Of these, direct discharge to surface streams does not appear to be advisable based on possible stream and Savannah River water quality impacts. Therefore, we recommend that other alternatives be evaluated further including detritiation and evaporation utilizing waste heat from the reactors. Detailed comments on the above actions are attached. <u>Conclusion</u> Based on the our review of the DEIS, EPA rates the proposed action EC-2, i.e., we have environmental concerns with certain aspects of the proposed action(s) which may require modifications and refinements of the preferred alternative. In addition, we request that supplemental information be provided in the FEIS on the selection of the candidate waste disposal sites (along with other requested information and changes). We believe this information is necessary to fully evaluate the project alternatives. We appreciate the opportunity of reviewing this document and will be glad to meet with you and your staff to discuss our concerns. If you have any questions about our comments please call me or Heinz Mueller of my staff at FTS 257-3776. Sincerely yours, Joseph R. Franzmathes Assistant Regional Administrator for Policy and Management Attachment: Detailed Comments	greatly reduced from their initial levels because radionuclide travel time to surface outcrops is increased, allowing radioactive decay to occur. This decay factor is especially significant for radionuclides with exceptionally long travel times. Offsite doses from seepage basin use are calculated to be less than one mrem per year to the maximally exposed individual. There are two alternative treatment/disposal methods which are readily available: evaporation into the atmosphere and direct discharge to onsite streams. Evaporation of tritium to the atmosphere or direct discharge of tritium to the onsite streams would result in an annual release of 17,100 curies. Radiation doses to the public from evaporation are discussed in Section 4.4.6 of the EIS. In addition, direct discharge of tritium to the onsite streams would also result in the release of other radionuclides (e.g., Cr-51, Sr-90, Cs-137). The continued use of seepage basins for treatment/disposal of disassembly-basin purge water would result in annual average tritium releases of 11,700 curies. Detritiation of reactor moderator has also been considered (since its actual implementation would take several years, it is not considered a readily available technology). Initial reviews indicate moderator tritium levels might be reduced by a factor of approximately 10 and environmental releases by a factor of 2. The cost-benefit of a moderator detritiation facility would be in excess of $3.0 million per person-rem averted. The cost-benefit of evaporation would be approximately $500,000 per person-rem averted.

Comment number	Comments	Responses
	cc: J. Leonard Ledbetter, GADNR R. Lewis Shaw, SCDHEC	Accordingly, DOE has proposed in the EIS as a part of its preferred alternative that seepage basin use be continued because: each of the available purge water disposal options increase tritium releases; the direct discharge alternative increases doses to Savannah River drinking water users; and, the evaporation alternative has an extremely high cost per person-rem averted. DOE believes that the continued use of seepage basins is an environmentally sound (resulting in the lowest releases of tritium and calculated onsite and offsite effective whole body doses of less than 1 mrem per year) and cost-effective treatment/disposal method for disassembly-basin purge water. DOE agrees that contamination of groundwater with tritium should be avoided if a practical alternative can be found; none presently exists. DOE will pursue additional monitoring in reactor areas and modeling potential travel paths of tritium in the groundwater beneath the seepage basins to increase confidence that future potential users of groundwater resources will not be affected. If any significant environmental or health effects are predicted, remedial actions will be undertaken.

Comment number	Comments	Responses
	DETAILED COMMENTS	
	Waste Management	
J-12	• Waste minimization should receive additional attention in the preferred Combination Strategy (required under HSWA of 1984). More project-specific information should be provided for proposals such as incineration to provide a basis for NEPA evaluation and eventual permitting action. If these actions are not addressed as part of this overall waste management strategy EIS, then appropriate separate NEPA documentation will be required.	Volume reduction and incineration are discussed in Appendixes D and J of the FEIS. Waste minimization programs are continuing efforts at the SRP; many are in the demonstration phase and are not currently specific alternatives for remedial actions or other actions within the scope of the EIS.
J-13	• Data from EPA's model analysis for LLW indicates that geohydrological conditions which exist at southeastern, humid permeable sites warrant the use of conservative disposal techniques for radioactive and hazardous waste disposal to minimize the need for future remedial action due to possible leaching and groundwater contamination.	See the response to comment J-7.
J-14	• Even though SRP provides waste isolation not normally found at some waste disposal facilities, EPA has reservations about the disposal of LLW in a sanitary/industrial landfill because of the potential for worker exposure and long-term intruder risk. Further assessment and projections of potential releases should be provided dependent on the radionuclide inventory and concentrations.	See the response to comment J-7.
J-15	• Because it does not meet RCRA permitting engineering criteria, Cement/Flyash Matrix (CFM) would only be an appropriate disposal technology for non-RCRA-hazardous waste. Any proposed use for mixed waste would first require delisting of the RCRA hazardous waste and thus may limit its potential operational flexibility.	See the response to comment J-7.

Comment number	Comments	Responses
J-16	• In determining the extent of the clean-up, ALARA considerations, and which waste sites are to be considered for removal, the risk during site cleanup of significant occupational radiation exposure should be an important factor.	DOE agrees that occupational risk is an important factor in determining which waste sites are to be considered for waste removal (see the first paragraph of Section 4.2.4).
J-17	• The issue of LLW regulatory guidance standards used for risk assessment requires more attention. We note that the DEIS uses values that are inconsistent with the emerging regulatory direction. Therefore, the FEIS should contain additional technical justificaton and further evidence that the dose to any member of the public in the general environment does not exceed 25 mrem/yr. The exposure scenarios for the "de minimis" (below regulatory concern) should include: landfill workers, reuse of materials, intruder-construction, intruder-agriculture, off-site exposed individuals, and off-site critical population groups.	DOE's current guidelines for exposure are 100 mrem per year from all pathways of which 25 mrem per year is from atmospheric pathways. These guidelines are used throughout the EIS and also in annual environmental reports. Compliance with current regulations is an explicit component of the Dedication, Elimination, and Combination strategies. Therefore, if the referenced "emerging regulatory direction" is finalized, closure and remedial action plans that meet these regulations would be established through appropriate regulatory interactions.
J-18	• We note that the DEIS uses a number of different criteria in assessing the required clean-up levels. Although we realize these limits were assumed for the purposes of NEPA evaluation, RCRA currently requires either the clean-up to achieve background levels or in-place closure with long-term monitoring for regulated units. Regulations concerning corrective actions at solid waste units are currently under development by EPA. If cleanup standards are promulgated that are more stringent than levels assumed for this DEIS, then all DEIS proposed site-specific closure actions will have to be reconsidered.	Consideration of closure and remedial actions at waste sites to achieve required residual contaminant levels will be made during regulatory compliance interactions. The levels discussed in the EIS are based on modeling and monitoring data and are used for the purpose of illustrating a relative risk level associated with alternative strategies. The final acceptable residual contaminant level will be determined through appropriate regulatory interactions.

Comment number	Comments	Responses
J-19	• DOE considers 77 of 168 waste sites for action in the DEIS. Very little justification is given for not looking at the other 91 waste disposal sites. The DEIS itself does not address site selection criteria. Assuming that the risk assessment selection criteria in the Environmental Information Document (DPST-86-291) was used, we offer the following comments on this criteria:	DPST-86-291 was not used to select the 77 existing waste sites. Section 2.2.1 summarizes the selection of 77 of 168 waste sites for detailed assessment of alternative closure and remedial actions. Section B.1.1 provides justification for not assessing the other 91 sites.
J-20	a) The criteria for nonradioactive constituents does not include all hazardous constituents in 40 CFR §261 Appendix VIII. Justification should be given for any constituents not included in selection criteria.	See the response to comment J-19.
J-21	b) Any site with levels of Appendix VIII constituents that are above background should at least be considered for remedial action.	See the response to comment J-19.
J-22	c) Background documents should present data on all units not selected for consideration. The FEIS should justify choosing the "no action" alternative for these sites.	Background documents, particularly DPST-83-829, present data on units not selected for detailed consideration in this EIS. This EIS neither justifies nor chooses "no action" for these sites.
J-23	• All site specific decisions concerning closure and remedial action at solid waste management units will have to be reviewed through the RCRA permitting process. This authority should be addressed in the FEIS and site-specific recommendations in the document should be identified as "pending regulatory review." The dedication strategy may be deemed unacceptable for some sites.	DOE is committed to comply with RCRA and its authority and all other environmental regulations in pursuing site-specific decisions and actions.

Comment number	Comments	Responses
	<u>Groundwater</u>	
J-24	• A major issue with respect to groundwater protection at SRP is the continued use of the seepage basins for disposal of tritiated purge water from the disassembly basins. It is our recommendation that this practice be discontinued.	See the response to comment J-11.
J-25	Use of these seepage basins has resulted in significant groundwater contamination with tritium, as reported in DOE's Savannah River Plant Environmental Report for 1985. According to the information contained in this report during its migration to the surface water streams, sufficient decay of the tritium to achieve drinking water standards will not occur.	Analyses of raw Savannah River water downriver from the SRP show that average tritium concentrations are 3,900 pCi/L. This tritium concentration is only about 20 percent of the (SRP Environmental Report for 1986) EPA drinking water standard of 20,000 pCi/L for finished water. Offsite drinking water analyses at treatment plants consistently show levels less than Primary Drinking Water Standards. Concentrations at the Beaufort-Jasper and Port Wentworth drinking water supplies were 3,100 pCi/L and 3,400 pCi/L, respectively (SRP Environmental Report for 1986).
J-26	Direct discharge of disassembly-basin purge water to surface streams is cited as a possible alternative to continued use of the seepage basins. However, the DEIS does not indicate the concentration levels of tritium which are discharged to the seepage basins nor are the impacts of these increased concentration levels assessed on the stream environment. Until these issues are addressed, the discharge of disassembly-basin purge water directly to surface waters cannot be considered a viable alternative.	The direct discharge of tritiated disassembly basin purge water to onsite streams, while increasing tritium concentration levels in these controlled access area streams, does not increase offsite drinking water concentrations or radiological doses above standards or guidelines. When compared to the preferred alternative of discharging to the reactor seepage basins, direct discharge would cause an incremental increase in Savannah River concentration of about 779 pCi/L, less than four percent of the current drinking water standard of 20,000 pCi/L (Section 4.4). DOE has no plans for directly discharging disassembly-basin purge water directly to surface water.

Comment number	Comments	Responses
J-27	It is our belief that the use of these seepage basins contributes to elevated tritium levels in the Savannah River and tributaries to the Savannah River. Levels of tritium in excess of 20,000 pCi/l have been observed for short durations in the Savannah River which serves as a source of drinking water supply for cities in Georgia and South Carolina. As such, neither continued use of the seepage basins nor direct discharge of disassembly-basin purge water to area surface streams would appear to be advisable alternatives.	See the responses to comments J-11 and J-25.
J-28	We recommend that other alternatives for disposal of the disassembly basin purge water be developed. Detritiation and/or evaporation utilizing waste heat from the reactors should be examined as alternatives. Of course, the health affects and associated risks involved in evaporative release of tritium to the atmosphere would have to be added to the cumulative SRP facility's releases of tritium. In addition, these releases would have to be further evaluated as potential air emissions of radioactivity under authority of the Clean Air Act NESHAP regulations.	See the response to comment J-11. Health risks for evaporation are presented in Section 4.4.4 Section 4.4.6 states that the cost-benefit of detritiation would be more than $3 million per person-rem averted compared to the DOE preferred alternative and about $500,000 per person-rem averted for evaporation. This substantially exceeds the 10 CFR 50, Appendix I criteria of $1000 per person-rem averted.
J-29	• It is implied throughout the DEIS that release of contaminants into groundwaters at the site will affect only water table aquifers and not underlying confined aquifers such as the Congaree or Black Creek formations. Groundwater contamination has been observed, however, in the Congaree and Black Creek aquifers at Savannah River Plant (SRP), as a result of site-specific activities. Under any strategy which involves containment of contaminated groundwater at a site which lies in a potential recharge zone on SRP, consideration should be given to	The text of the EIS has been revised in terms of groundwater contamination at the SRP. SRP recharge zones are discussed in Appendix A and in Chapter 3. Improved groundwater head data based on April 1987 measurements have been incorporated (e.g., Figures 3-5, A-6, and A-16). The potential for vertical contaminant migration is discussed in Chapter 4 in terms of expected health effects (i.e., the expected contaminant concentrations following closure actions and the end of institutional control).

Comment number	Comments	Responses
	contaminant containment in the vertical direction as well as the horizontal direction. Complete hydraulic separation of the water table aquifer from the underlying formations cannot be assumed, especially in light of the evidence of downward migration in some areas. In discussions of alternative actions for groundwater protection as presented in the DEIS, the need for the prevention of vertical contaminant migration in potential recharge areas should be addressed as part of any containment strategies.	
J-30	• Because of the criticality of impacts on the groundwater resources and the complexity of the geohydrology underlying SRP, greater emphasis should be given in developing a set of siting and evaluation criteria to include geohydrological factors. Under HSWA of 1984, siting criteria are being developed which will be considered in permitting of new facilities.	See the response to comment J-10.
J-31	• On page 4-74, it appears that when the TNX is included, six sites (not five), are predicted to exceed the EPA 4 mrem annual drinking water limit after implementation of the Combination Strategy.	The 10.7 millirem dose from the old TNX seepage basin outfall is not a drinking water dose. It is an atmospheric dose and is below the DOE annual dose limit of 25 millirem for the atmospheric pathway.
J-32	• Discussion of groundwater contamination at SRP should more fully reflect the extent of the problem of the observed contamination in the Congaree and Black Creek aquifers. Statements such as "Previously acceptable waste management practices...have caused occasional cases of groundwater contamination, mostly in water-table aquifers," clearly understate the problem.	The statement has been revised to read "Some aquifers have been contaminated as a result of these practices." Other current data and information on these conditions will be included in the FEIS, particularly in Chapters 3 and Appendix A.
J-33	• For all waste management units regulated under RCRA, groundwater monitoring must comply with	See the response to comment J-23.

Comment number	Comments	Responses
	Part 264 of RCRA. At sites where the waste has been removed and groundwater contamination has occurred, long-term monitoring will be required and a leachate collection system may be necessary as part of post-closure care.	
J-34	• For remedial action of groundwater contamination, pumping appears to be the most effective and applicable to SRP. Impermeable barriers should only be used in cases where geological confining strata is continuously present and complete, and the water table is shallow.	Appendix C discusses the applicability of groundwater pumping and barriers at SRP sites and acknowledges the limited applicability of impermeable barriers (Section C.1.3.3). Groundwater recovery and treatment of VOCs by air stripping is currently under way in the M-Area.
	<u>General</u>	
J-35	• Further clarification is necessary in Chapter 2.0 and Appendix E in regard to the impact of waste minimization on the estimated volumes and costs.	See the response to comment J-7.
J-36	• Further consideration should be given in the FEIS in regard to the cost/benefits of pre-disposal processing, continuing sample analysis, long-term stream/groundwater monitoring, etc. as these ongoing costs affect the selection of appropriate disposal technologies. There may well be a trade-off between the higher, longer-term monitoring and maintenance costs and initial capital savings from the use of alternatives such as near-surface land disposal.	See the response to comment J-7.
J-37	• To ensure that the summary conclusions presented in the body of the EIS are consistent with the more detailed data in the appendices and the EIDs, some supporting technical data should be provided along with the conclusions. This is particularly in evidence in discussions of the de minimis radioactivity levels.	The Summary and Chapters 2, 3, and 4 have been revised.

Table L-2. DOE Responses to Comments on Draft EIS

Comment number	Comments	Responses
J-38	• Although we are aware that the data base is continually evolving and on the whole a good attempt has been made to incorporate the best and most current data, we note the use of outdated data in some instances (e.g., M-Area well sampling data and F- and H-Areas heavy metal contamination, etc.) where more recent than 1984 data is available. The FEIS should reflect the best and most current information (in that regard the *Annual Environmental Report* data base is an important resource that should be more fully utilized).	Updated information and current data have been incorporated in the FEIS as appropriate. The DOE Annual Environmental Report was issued during the DEIS public comment period. It has been referenced and used as a data source in the FEIS (Chapters 3, 4, and 5 and Appendixes F and L).

Comment number	Comments	Responses

STATEMENT OF MR. JOHN C. VILLFORTH
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE

June 26, 1987

Mr. S. R. Wright
Director, Environmental Division
U.S. Department of Energy
Savannah River Operations Office
P. O. Box A
Aiken, South Carolina 29802

Dear Mr. Wright:

The staff of the Center for Devices and Radiological Health have reviewed the Draft Environmental Impact Statement (DOE/EIS-0120D) for Waste Management Activities for Groundwater Protection, Savannah River Plant, Aiken, South Carolina, dated April 1987. Our effort is primarily directed to evaluation of the public health and radiological safety impacts associated with the four alternative strategies for waste management facilities. We have the following comments to offer:

1. The presentation of alternate waste management strategies for hazardous, low-level radioactive and mixed waste in Chapter 2 provides a reasonable assessment of the mechanisms and technology available for reducing the public health impact from the SRP waste management activities and project-specific actions. All of the strategies, except that of No-Action, have merit; but considering our concern for protection of the public from potential sources of radiation exposure, we agree with DOE that the Combination strategy would be the preferred alternative. The summary and comparison of alternate waste management strategies shown in Table 2-10 and the project-specific actions for

Comment number	Comments	Responses
	new low-level radioactive waste disposal facilities and the discharge of disassembly-basin purge water shown in Table 2-11 and 2-12, respectively, provides the data in summary format to support the selection of the Combination alternative as the preferred strategy.	
K-1	2. Section 3.2.3.3 discusses the occurrence of tornadoes in the SRP area. South Carolina is in Region I, as shown in the NRC's Regulatory Guide 1.76, "Design Basis for Nuclear Power Plants." Table 1 of this reference indicates that the maximum wind speed could be 360 miles per hour, which is the sum of the 290 miles per hour rotational speed and a maximum of 70 miles per hour translational speed. Under such tornado conditions, it would be possible for radioactive waste material stored at any waste site awaiting disposal to be lifted up by the force of the tornado and could result in (1) airborne radioactivity, and (2) surface radioactive contamination at some other location on site. If such a situation is likely to occur, it would be appropriate to expand this Section to include predicted extent of environmental contamination and population exposure. In the unlikely event of a tornado striking the SRP, the consequences could be as devastating as those at Saragosa, Texas, on May 23, 1987.	The design-basis tornado has a very low probability of occurrence; therefore, the effects resulting from the scenarios presented in this comment were not analyzed.
K-2	3. It appears from the discussion in Section 3.7 that releases of radioactive material to the atmosphere result in calculated average concentrations at the plant perimeter that range from 10^{-2} to 10^{-5} percent of the DOE derived concentration guide (Table 3-18). A continuing environmental and potential public	The intent of Section 3.7 is to present the environment as it exists at the SRP now. In contrast, Appendixes F and G present the strategies that can be employed to mitigate the impacts that would result from no action such that appropriate standards can be met.

Comment number		Comments	Responses
		health problem that is of concern to us is related to the solid and liquid low-level radioactive wastes that are treated and disposed of on the SRP. Radioactive releases from such operations can enter the groundwater at specific locations. Further, migration of radionuclides to the groundwater can result from (1) seepage basins that have received low-level radioactive waste streams and (2) the leachates from buried solid low-level radioactive wastes. The discussion on the groundwater environment, Section 3.7.1.2, page 3-51, points out that tritium is the most abundant radionuclide entering the groundwater and that the measurements in 1984 and 1985 indicate that the tritium concentrations exceed the EPA drinking water standard of 20,000 pCi/l. We believe that the proposed actions at existing waste sites for alternative strategies as presented in Appendix F and Appendix G would provide the technological means for reducing the releases of radionuclides to the groundwater so that these are either not detectable or less than current radiation protection standards and less than EPA's drinking water standard of 4 mrem per year from all radionuclides.	
K-3	4.	The primary environmental transport pathway is through the groundwater and the secondary pathway is via the atmosphere where population exposure results from deposition of radioactive material and subsequent uptake from food consumption and by inhalation. The computational methodology with models for the groundwater pathway (Appendix H.1) and the atmospheric pathway (Appendix H.2) provide a basis for determining relative environmental consequences of the various approaches	The intent of the EIS is to present a strategy that will allow the implementation of actions which will assure that all applicable standards, including those for radiation protection, will be met.

Table L-2. DOE Responses to Comments on Draft EIS
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Comment number		Comments	Responses
		considered for existing waste site and new disposal facilities. The data from these two models provide reasonable estimates of the annual maximum individual and collective doses. Results of these calculations are shown in Appendix H, Table H-1, and indicate that the doses from SRP are within current radiation protection standards. We note in Chapter 4, Section 4.2.1.3 (No-Action), 4.2.2.3 (Dedication), 4.2.3.3 (Elimination) and 4.2.4.3 (Combination) that the peak annual doses to the maximally exposed individual from 21 low-level radioactive and mixed waste sites should meet three conditions. These are (1) be within the 100 mrem DOE Annual dose limit for all pathways, (2) the 4 mrem per year EPA drinking water standard, and (3) all sites must meet individually the 25 mrem DOE annual dose limit for the atmospheric pathway. The peak annual dose to the maximally exposed individual from radiological releases and the year of peak exposure are shown in Tables 4-11, 4-26, 4-36 and 4-42 for No-Action, Dedication, Elimination, and Combination strategies, respectively. It appears from the discussion of these Tables that meeting the EPA drinking water limit is an important factor that must be considered in the implementation of the selected strategy. We believe that the release of all radionuclides to the groundwater must be controlled to comply with applicable radiation protection standards.	
K-4	5.	The environmental surveillance program for the SRP is considered to be capable of measuring the extent of releases of radioactive materials to the environment, and of verifying that the dose commitment to individuals and populations meets current radiation protection standards. Chapter 5 describes the studies and monitoring	The surveillance program for the SRP has demonstrated its capability to measure the extent of releases of radioactive materials to the environment and verify that the dose commitment to individuals and the public meet radiation protection standards.

Comment number	Comments	Responses
	program that are essential to characterize the SRP radiation environment. We commend DOE in its commitment to conduct a comprehensive monitoring program. In particular, we recognize the extensive monitoring activities that are being conducted to determine (1) the radioactivity in groundwater from F Area to H Area, and reactor seepage basins, (2) the migration of radionuclides from burial ground storage locations, and (3) the potential groundwater contamination by means of an early detection monitoring program to be carried out in conjunction with site closure activities of the mixed waste management facility.	
K-5	6. The DEIS does not contain any specific information on emergency planning and coordination with the State of South Carolina in the unlikely event of an accident. In our judgement, Section 2.5.14, page 2-68, should be expanded to briefly present plans and describe the coordination that would be in place during the modification of waste management activities for hazardous, low-level radioactive and mixed wastes at the SRP.	The recommended change in the EIS has been made.
	Thank you for the opportunity to review and comment on this Draft Environmental Impact Statement.	
	Sincerely yours,	
	John C. Villforth Director Center for Devices and Radiological Health	

Table L-2. DOE Responses to Comments on Draft EIS
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Comment number	Comments	Responses
	STATEMENT OF BEATRICE D. JONES June 27, 1987	
L-1	It should be noted that the Department of Energy has taken two years to respond to comments made during the public scoping period of May 1985.	Responses to scoping comments appear in Appendix K of the draft and final EIS.
L-2	In contrast, members of the public had slightly over two months to study and respond to the D.E.I.S. "Waste Management Activities for Groundwater Protection at the Savannah River Plant, Aiken, South Carolina." I would like to see greater consideration given to those who make comments at D.O.E. hearings Beatrice D. Jones 1829 Senate Street Columbia, SC 29201	DOE makes every attempt to accomodate and encourage public participation in its public hearings in terms of location and schedule. Comments may always be submitted to DOE in writing by these individuals who find it inconvenient or impossible to attend the public hearings.

Comment number	Comments	Responses
	STATEMENT OF MARY T. KELLEY, Ph.D. LEAGUE OF WOMEN VOTERS OF SOUTH CAROLINA June 28, 1987 Mr. S. R. Wright Director, Environmental Division U.S. Department of Energy Savannah River Operations Office Post Office Box A Aiken, SC 29802 Dear Mr. Wright: The League of Women Voters of South Carolina appreciates the opportunity to comment on the Draft Environmental Impact Statement for Waste Management Activities for Groundwater Protection at the Savannah River Plant. Although we were present at the public hearing in Aiken on June 4, 1987 we were unable to prepare testimony in time for that meeting and would like to have the following comments included with the final record.	
M-1	As we stated in our remarks submitted for the scoping phase for this EIS in May of 1985, we believe that the Savannah River Plant should comply with state and Federal environmental laws and regulations for water quality, air quality, groundwater quality and protection, and hazardous waste management; and that state and Federal regulatory agencies must be accorded full access for inspection and monitoring as well as complete cooperation. We applaud the fact that at this time there is much greater compliance and cooperation. We strongly support congressional efforts for independent oversight and monitoring as protective of not only the public interest but the interests of the dedicated and capable people who are entrusted with managing this important defense facility.	DOE is committed to compliance with applicable State and Federal environmental laws and regulations. Agencies with jurisdiction and regulatory authority have access to DOE facilities to perform inspections.

Comment number	Comments	Responses
M-2	Since work on this Draft EIS was initiated two years ago, much has changed in the RCRA law through various amendments, and in the applicability of RCRA to DOE facilities. The law suit that is now pending, brought by Energy Research Foundation and the League of Women Voters could extend even further the number of affected sites. The EIS must take these factors into account. DOE's actions must be based on this new set of circumstances. We are disappointed that so many decision are based on cost- we contend that costs avoided are costs deferred and more expensive in the long run.	DOE is fully committed to implementation of RCRA and ensuing amendments and regulations. The exact number of sites affected by future DOE regulatory interactions will be decided following DOE's Record of Decision on this EIS. See the response to comment C-1. The FEIS has updated and revised its regulatory discussions. The cost comparisons presented in this EIS are identified as preliminary and are subject to revision. See the response to comment C-116.
M-3	Because this draft EIS is intended for use by the general public, it is too bad that it could not have been written in a more lucid, better organized fashion. One gets the impression on reading any such document (there are a few exceptions) that the work of many people was put together, without any real attempt to integrate the parts. It makes it most difficult to read. The data used are in many instances outmoded- why are we spending so much money to collect new and pertinent data if it is not being used?	The EIS uses data obtained in the first quarter of 1987 or the last quarter of 1986.
M-4	It is most important that DOE get its SRP environmental house in order. The prospect exists that a new production reactor could be built at this site. It is most unacceptable that such an action occur until it can be shown that existing environmental problems will be eliminated, and no new ones created.	See the responses to comments A-3, A-4, and A-5.
M-5	Thank you for permitting us to comment on the draft EIS. As an organization dedicated to facilitating the involvement of the public in the public's business, we urge that all the comments you receive be given serious consideration. Many of them suggest changes based on valid technical	

Comment number	Comments	Responses
	considerations. Please evaluate them carefully, and where appropriate, we urge that actions be modified. Sincerely yours, Mary T. Kelly, Ph.D Natural Resources Chairman LWVSC	

Comment number	Comments	Responses

June 29, 1987

STATEMENT BY DR. ZOE G. TSAGOS,
NATURAL RESOURCES CHAIR,
FOR THE LEAGUE OF WOMEN VOTERS OF
NORTHERN BEAUFORT COUNTY,
ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT ON
WASTE MANAGEMENT AT THE SAVANNAH RIVER PLANT

Mr. S. R. Wright
Director, Environmental Division
U.S. Department of Energy
Savannah River Operations Office
P. O. Box A
Aiken, S.C. 29802

Dear Mr. Wright:

The League of Women Voters of Northern Beaufort County thanks the Department of Energy for the work done in the preparation of the Draft Environmental Impact Statement on Waste Management at the Savannah River Plant.

Our specific interest in the waste management changes at the SRP which are now being proposed is on how these would affect the water quality of the Savannah River from which we, living in Beaufort, get our drinking water. However, as residents of South Carolina and located as we are about 100 miles from the SRP, we are also concerned about the broader issues of the impact of the SRP operation upon the environment inclusively.

On the DEIS waste management proposals at SRP we wish to bring to your attention the following points in our position to which we hope you will give serious consideration:

Comment number	Comments	Responses
	1. We support the Elimination Strategy for the removal of all hazardous, low level radioactive, and mixed wastes at all existing waste sites and for the storage of such wastes for the following reasons:	
N-1	a) In the Combination Strategy advocated by DOE, it is proposed that out of the 168 waste sites (DEIS, 2-11) 77 sites only would be considered for new waste management action, less than 50% of the total number. The program would concentrate on 8 out of the 77 sites for full cleanup operations and the remaining 69 sites would be capped and monitored. (DEIS, S-8, 9, 15)	The 77 sites considered for waste management action are those which contain or may have received hazardous, low-level radioactive, or mixed waste ("criteria wastes") that fall within the scope of this EIS.
N-2	To concentrate on 8 out of 77 out of 168 waste sites consisting of "seepage basins for liquids; disposal pits and waste piles for solids; and solid wastes burial grounds for low-level radioactive wastes" (DEIS, S-1) is to do a very limited cleanup job leaving the 69 areas chosen for capping as potential future waste problems, along with the 91 sites not considered in the proposed new cleanup program.	The exact number of sites to be closed by implementing waste removal and remedial actions will be determined through future regulatory actions. The 91 sites not considered in this EIS for cleanup do not contain the criteria wastes cited in response to comment N-1. See the response to comment C-21.
	b) In considering the Elimination Strategy which we support, the DEIS (S-14) states that "The environmental benefits expected from the implementation of the Elimination strategy include improvement to onsite groundwater and surface-water quality from the removal and closure of all existing waste sites..., reduction of potential public health effects and atmospheric releases (except increased tritium air releases under the evaporation option) and no requirement for dedication of sites at SRP."	

Comment number	Comments	Responses
	Further, the DEIS (S-14) states that the use of the Elimination Strategy, "would result in the lowest future risks to future occupants at the waste sites and contaminated areas following the extensive removal, remedial and closure actions." Two major objections to the Elimination Strategy on the part of DOE as indicated in the DEIS are the cost of the program and the risks involved in carrying it out. Quoting the DEIS this strategy has "The greatest risk of spills, leaks, and fires, and the greatest worker exposures due to waste removal and transportation." (DEIS, S-14)	
N-3	Both of these are serious problems but not insurmountable. The capital cost of the Elimination Strategy as estimated in the DEIS would be $12.7 billion (DEIS, S-14) while the Combination Strategy favored by the DOE to clean only 8 sites and to cap 69 others would be an estimated $0.5 to 2.0 billion. (DEIS, S-15). Separate estimates have been made for maintaining and monitoring the capped and other waste sites. When one considers the amount of waste site cleanup proposed in each of these strategies, the cost difference is not out of line. It is unfortunate, of course, that so many polluted areas were allowed to develop in the years when the management at SRP was "self-regulated." The danger to the workers who will have to excavate the waste sites and to load, move and unload the hazardous, low level radioactive, and mixed wastes will have to be approached with the greatest care. But	Cost estimates have been revised in the FEIS. See Appendix E and Chapter 2, new Tables 2-11 and 2-12.

Comment number	Comments	Responses
	surely the Department of Energy which is, after all, part of our Federal government must have access to information about the latest and safest means for protecting the workers. Du Pont, the contracting company at the SRP, with its many years of experience in managing the plant must also be able to find means to provide the greatest possible physical safety for the workers who will be involved in the cleanup as well as measures to take to alleviate the stress and anxiety among them. Because of the above reasoning, we are convinced that the Elimination Strategy is the only acceptable method for waste cleanup at the SRP. As for the magnitude of the estimated capital cost, we consider a complete removal of the dangerous wastes at SRP to be of the highest priority and that money must be found to clean out all the waste sites.	
N-4	2. Our second major concern about the SRP has to do with the increasing number of problems which have developed there besides waste removal. We are convinced that a legally empowered, peer group is needed to maintain an oversight role over the conditions at the plant and the work being done be it waste management or any other operation in a very complex system. We have been drawing the attention of DOE on the need for independent oversight supervision at SRP since 1983. Other organizations and individuals have also stressed such a need. Some have advocated that all plants run by the	See the responses to comments C-153 and E-1 on oversight and peer review.

Comment number	Comments	Responses
	government and working on nuclear programs should be placed as are commercial nuclear power reactors under the requirements and supervision of the Nuclear Regulatory Commission (See editorial in the Charlotte Observer 4/19/87) Since the fall of 1986 there have been many articles in the press on conditions and events at SRP. Some of the newspapers that we have seen containing such coverages have been The New York Times, The Charlotte Observer, The State, The Columbia Record, The Greenville News, and the Beaufort Gazette.	
N-5	They have covered topics ranging from the General Accounting Office report on pollution at SRP which was found to be at a very high level; to the report on SRP by a representative of Physicians for Social Responsibility who advocates NRC oversight; a panel from the National Academy of Sciences whose report was responsible for the lowering of the power level in the three operating reactors because the cooling systems were inadequate; Senator John Glenn's statement that he would introduce a bill for the creation of an independent oversight group to monitor the SRP operations; the GAO's announcement that there are cracks on the reactor walls at SRP, and a statement by SCDHEC (South Carolina Health and Environmental Control) on the 11 enforcement actions taken against the management of the SRP and the appreciable amount paid in fines for environmental pollution since 1979.	Cracks have been observed in piping components of C-Reactor only. C-Reactor is now in standby status.
	We hope that our choice of the Elimination Strategy for waste management at SRP and our stress on the	

Comment number	Comments	Responses
N-6	need for an oversight group for the operation of the plant will be considered helpful in the decisions that must be made on the contents of a final EIS. Please include this among the DOE statements. Sincerely, Zoe G. Tsagos for LWVNBC	DOE considers all comments from the public in its preparation of the FEIS and its Record of Decision.

Comment number	Comments	Responses
	STATEMENT OF RUTH S. THOMAS, PRESIDENT ENVIRONMENTALISTS, INC. June 30, 1987 Mr. S. R. Wright Director, Environmental Division U.S. Department of Energy Savannah River Operations Office Post Office Box A Aiken, South Carolina 29802 RE: Draft Environmental Impact Statement (DEIS), Waste Management Activities for Ground Water Protection at the Savannah River Plant, April 1987. Dear Mr. Wright: Enclosed please find Environmentalists, Inc.'s written testimony regarding the above-cited Draft Environmental Impact Statement.	
O-1	In summary, we find the Draft EIS to be remarkably defective in that it reports evidence of contamination but chooses to continue dangerous practices, and it ignores the scientific recommendations of the National Academy of Sciences, the General Accounting Office, and the Environmental Protection Agency.	The purpose of the EIS is to assess the environmental impacts of modifications of waste management activities at the SRP.
O-2	We find its proposed actions, if implemented, to be dangerous to the environment and its inhabitants. Its recommendations disregard the intent of the National Environmental Policy Act (NEPA). We strongly urge a complete reformulation of proposed waste management practices for the Savannah River Plant.	See the response to comment G-2.

Comment number	Comments	Responses
	Please keep us informed of further developments in this matter. Very truly yours, Ruth S. Thomas President	

Table L-2. DOE Responses to Comments on Draft EIS
(Page 165 of 210)

Comment number	Comments	Responses
	(ENVIRONMENTALISTS, INC.) Written Testimony regarding The Department of Energy's WASTE MANAGEMENT PROPOSALS SAVANNAH RIVER PLANT	
	In its report, <u>Waste Management Activities for Groundwater Protection</u>, <u>Savannah River Plant</u>, <u>Aiken</u>, <u>South Carolina</u> (the <u>Report</u>), the Department of Energy (DOE) proposes future waste management practices for the Savannah River Plant (SRP) complex of atomic weapons facilities.	
	<u>DOE Repeats Mistakes of the Past</u>	
	1. DOE proposes to continue using seepage basins despite evidence that this waste management practice has caused contamination both on- and off-site (GAO 1987, GAO 1986a, GAO 1968b, GAO 1984).	
	2. DOE proposes that land burial of wastes continue despite evidence that this practice has also caused contamination (GAO 1987, GAO 1986a, GAO 1986b, GAO 1984).	
0-3	3. DOE will continue using existing above-ground high-level waste storage. The storage of highly radioactive liquid in above-ground tanks has been recognized for decades as an extremely dangerous practice. Sixteen years ago, the GAO recommended that high-level liquid wastes be converted to a retrievable solid (GAO 1987). Several reports document actual leaks which have occurred (GAO 1974, Du Pont 1974). In all, DOE persists in taking a piecemeal approach to decision-making by omitting information from the <u>Report</u>. This conflicts with the objectives of the National Environmental Policy Act (NEPA).	See the response to comment E-4.

Comment number	Comments	Responses
0-4	4. The Report ignores the waste management option of reducing the amount of waste generated at SRP. For example, discontinuing the operation of aging and dangerous nuclear reactors is not discussed, yet these and other SRP facilities produce large quantities of waste when accidents occur. During a November 9, 1970 accident at K-Reactor, 80,000 curies, mostly of antimony 122 and 124, which are gamma ray sources, were released into the Process Room. An additional 39,000 curies of radio-antimony and beryllium remaining in a failed neutron rod were dumped into the Disassembly Basin. A majority of the highly radioactive materials stuck to the charge machine, requiring manual cleanup. Cleanup operations took 3 months and 850 people (Du Pont 1973).	Waste minimization and reduction are discussed in the EIS. Discussions of reactor operations and nuclear accidents are beyond the scope of this EIS. See the response to comment 0-1.
	DOE Ignores the Evidence	
0-5	1. DOE claims that discharging waste to seepage basins and disposing of wastes in landfills "continue to ensure protection of offsite environment" without providing any evidence to support this claim (the Report, p. S-1).	Ongoing waste management and cleanup activities such as groundwater remedial actions in the M-Area, construction of effluent treatment facilities in the F- and H-Areas, and removal of wastes and soils at the CMP pits are cited in the EIS as examples of environmental protection. See page 1-1.
0-6	2. DOE fails to explain the conflict between this claim and the fact that contamination was caused by both waste disposal practices at SRP. In fact, the Report itself contains information about chemical and nuclear waste migrating into the environment from seepage basins and land disposal sites (the Report, pp. B-5, B-21, B-23, B-25, B-36, B-38, B-39, B-42, B-44, B-46, B-47, B-63, B-74, B-84, B-109, B-111).	Tritium, other radionuclides, and chemicals that are found in surface streams are below standards and guidelines in offsite surface water and groundwater systems and in the atmosphere and vegetation.
0-7	3. DOE also fails to support the claim of adequate environmental protection in the light of the evidence compiled by the U.S. General Accounting Office (GAO) regarding waste operations at SRP	

Comment number	Comments	Responses
	and evidence based on land burial experience at other chemical and nuclear waste sites (GAO 1987, GAO 1986a, GAO 1986b, GAO 1984, OTA 1985, USGS 1982, EPA 1977, EPA 1975).	
	DOE Ignores Scientists' Advice	
0-8	1. DOE continues to ignore the warnings of earth scientists with the National Academy of Sciences (NAS) who concluded that the SRP site is a dangerous location to have radioactive materials, much less dump them into seepage basins and burial pits (NAS 1957, NAS 1966).	
0-9	2. The Report does not address the fact that the chemical and nuclear waste dumping of the past 35 years has weakened the SRP environment. In a suppressed 1966 report of radioactive waste management at SRP and other Federal facilities, the National Academy of Sciences warned against the choice of "disposal practices (which) are conditioned on over-confidence in the capability of the local environment to contain vast quantities of radionuclides for indefinite periods without danger to the biosphere" (NAS 1966).	The EIS addresses the fact that past waste management practices are no longer acceptable in terms of recently enacted regulations.
	DOE Documentation Inadequate	
0-10	1. DOE fails to include adequate information regarding waste disposal and storage sites. There are even uncertainties about what is buried at some sites, while other sites are documented only with "limited data," according to the Report itself (the Report, pp. B-18, B-35, B-38, B-39, B-40, B-44, B-60, B-61, B-71, B-73, B-83, B-92, B-93, B-110. B-119, and B-123).	In some analysis cases, data are limited or missing. The data gaps are identified in accordance with 40 CFR 1502.22.
0-11	2. The Report contains very little specific information connecting referenced documents and	

Comment number	Comments	Responses
	their contents with statements in the text. This defect interferes with its being possible to compare the quantity and quality of evidence presented by the DOE with the quality and quantity of evidence supporting an opposing position.	Citations to over 250 supporting documents are presented in the EIS. A master reference list and the referenced documents are available for review in the public reading rooms.
	LITERATURE CITED	
	The Report: Waste Management Activities for Groundwater Protection, Savannah River Plant, Aiken, South Carolina, Draft Environmental Impact Statement. U.S. Department of Energy, April, 1987. DOE/EIS-0210D.	
	GAO 1987. Environmental, Safety, and Health Aspects of the Department of Energy's Nuclear Defense Complex. J. Dexter Peach, Assistant Comptroller General. Resources, Community and Economic Development Division, U.S. General Accounting Office. Testimony of March 12, 1987 before the Committee on Governmental Affairs, U.S. Senate. GAO/T-RCED-87-4.	
	GAO 1986a. Nuclear Energy: Environmental Issues at DOE's Nuclear Defense Facilities. J. Dexter Peach, Assistant Comptroller General. Report to the ranking minority member, Subcommittee on Energy, Nuclear Proliferation, and Government Processes of the Committee on Governmental Affairs, U.S. Senate. September 1986. GAO/RCED-86-192.	
	GAO 1986b. Nuclear Waste: Impact of Savannah River Plant's Radioactive Waste Management Practices. J. Dexter Peach, director. Report to the Honorable Ernest F. Hollings, U.S. Senate. July 1986. GAO/RCED-86-143.	

Comment number	Comments	Responses
	GAO 1984. Department of Energy Acting to Control Hazardous Wastes At Its Savannah River Nuclear Facilities. J. Dexter Peach, director. Report to the Honorable Ernest F. Hollings, U.S. Senate. November 21, 1984. GAO/RCED-85-23.	
	DOE 1982. Savannah River Plant (SRP) Burial Ground Building 643-G Management Appraisal Report, Appraised June 2-13, 1980. William F. Lawless. U.S. Department of Energy Savannah River Operations Office draft report, 1982.	
	OTA 1985. A Review of EPA's Decision Under the Superfund Program for an Onsite Cleanup of the Lipari Landfill. Prepared for Senator Bradley, Senator Lautenberg, Congressman Hughes and Congressman Florio for review of documents on the onsite cleanup of the Lipari Superfund Site. Staff, Industry, Technology and Employment Program, Office of Technology Assessment, November 5, 1985.	
	USGS 1982. Hydrology of the Low-Level Radioactive Solid Waste Burial Site and Vicinity near Barnwell, South Carolina. James M. Cahill, U.S. Geological Survey. Report No. 82-863. 1982.	
	EPA 1977. Summary Report on the Low-Level Radioactive Waste Burial Site, West Valley, New York. Paul A. Giardina, Michael F. DeBonis and Jeanette Eng, U.S. Environmental Protection Agency, Region II. Issued February 1977, reissued October 1977. EPA-902/4-77-010.	
	EPA 1975. Preliminary Data on the Occurrence of Transuranium Nuclides in the Environment at the Radioactive Waste Burial Site, Maxey Flats, Kentucky. G. Lewis Mayer, Office of Radiation Programs, U.S. Environmental Protection Agency. For presentation at IAEA/ERDA International	

Comment number	Comments	Responses
	Symposium on Transuranium Nuclides in the Environment, San Francisco, California, November 17-21, 1975. EPA-520/3-75-021.	
	NAS 1957. The Disposal of Radioactive Waste on Land. Report of the Committee on Waste Disposal of the Division of Earth Sciences. National Academy of Sciences--National Research Council, September 1957.	
	NAS 1966. Report of the Committee on Geologic Aspects of Radioactive Waste Disposal. Prepared for the Division of Reactor Development and Technology of the U.S. Atomic Energy Commission (AEC) National Academy of Sciences--National Research Council. May 1966.	
	GAO 1971. Progress and Problems in Programs for Managing High-Level Radioactive Wastes. Report to the Joint Committee on Atomic Energy of the Congress of the United States. Elmer B. Staats, Comptroller General. December 18, 1974. U.S. GAO RED-75-309.	
	Du Pont 1974. Leakage from Waste Tank 16: Amount, Fate and Impact. W. L. Poe, with J. W. Fenimore, J. H. Horton, I. W. Marine, and W. E. Prout. E. I. du Pont de Nemours Co., Savannah River Laboratory, Aiken, S.C. 29801. Document No. DP-1358. November 1974.	
	Du Pont 1973. Source Rod Failure and Subsequent Decontamination. F. B. Longtin, Works Technical Department, Savannah River Plant. E. I du Pont de Nemours Co., Savannah River Laboratory, Aiken, S.C. Document No. DP-1305. November 1973.	

Comment number	Comments	Responses

STATEMENT OF WILLIAM A. LOCHSTET, Ph.D.
UNIVERSITY OF PITTSBURGH at JOHNSTOWN

30 June 1987

Mr. S. R. Wright
Director, Environmental Division
U.S. Department of Energy
Savannah River Operations Office
Post Office Box A
Aiken, South Carolina 29802

Dear Mr. Wright:

Enclosed are my comments on the Draft Environmental Impact Statement on Waste Management Activities for Groundwater Protection, Savannah River Plant, Aiken, S.C., DOE/EIS-0120 D. Please note that the opinions presented do not necessarily reflect the position of the University of Pittsburgh.

I will be looking forward to your response to these comments.

Sincerely,

Wm. A. Lochstet, Ph.D.

Comment number	Comments	Responses
	Some Comments on Waste Management at SRP by William A. Lochstet University of Pittsburgh at Johnstown* June 1987	
P-1	The Department of Energy (DOE) has prepared a Draft Environmental Impact Statement on Waste Management Activities for Groundwater Protection Savannah River Plant, DOE/EIS-0120D (Ref.1). This document does not consider the high level wastes, or the transuranic (TRU) wastes at SRP (Ref. 1, P 2-38). The document shows the results of calculations which are intended to show the risks of this waste storage. The volumes of the wastes are described in Appendix E at pages 15 and 16, in particular. However, neither the concentrations nor the total waste contained is given. This makes it impossible to perform an independent assessment of the hazard. It is not possible to determine the total radioactivity contained on the wastes considered.	See the response to comment E-4.
P-2	Such secrecy is in violation of the National Environmental Policy Act of 1969 (NEPA). It is particularly distressing that DOE has taken this position when it was specifically asked to address this question in the Scoping Comments prepared by the Energy Research Foundation and NRDC, which appear at page K-5. This comment (A-6) specifically requested DOE to specify the amounts of wastes. Thus the total curie content should have been given.	Appendix E has been revised in the FEIS. Chapters 2 and 4 of the EIS discuss the quantities and characteristics of hazardous, low-level radioactive, and mixed wastes from ongoing and planned SRP operations, wastes in storage, and wastes from remedial and closure actions requiring disposal. A description of all releases and effluents that are currently generated and not related to the protection of groundwater resources is outside the scope of this EIS; however, these releases are discussed in U.S. Department of Energy Savannah River Plant Environmental Reports for 1984, 1985, and 1986 (DPSPU 85-30-1, DPSPU-86-30-1, and DPSPU-87-30-1).

*Affiliation for identification purposes only.

Comment number	Comments	Responses
P-3	The DOE takes the position that is only necessary to evaluate impacts for the first 1000 years as stated at Ref. 1, P. 4-4. This might be adequate if the radioactivity had half lives which were all much less than 1000 years. Unfortunately, this is not the case, and in particular the impact due to Iodine -129 is greatly underestimated. There is no such legal cut off for NEPA after 1000 or even 10,000 years, so that this analysis is not what NEPA requires. I hope that these issues are addressed in a second draft document which satisfies NEPA. REFERENCE 1 Draft Environmental Impact Statement, Waste Management Activities for Groundwater Protection, Savannah River Plant, Aiken, South Carolina DOE/EIS-0120D, Draft, DOE, April 1987.	NEPA requirements for evaluation of impacts relate to the "reasonably foreseeable future." For the purpose of this EIS, DOE considers 1000 years adequate for modeling and risk assessments. 1000 year analyses are sufficient to include the long-term consequences as recommended by NRC and EPA guidelines.

Comment number	Comments	Responses
	STATE OF SOUTH CAROLINA OFFICE OF THE GOVERNOR June 30, 1987 Mr. R. L. Morgan Manager Savannah River Operations Office United States Department of Energy Post Office Box A Aiken, South Carolina 29802 Dear Mr. Morgan: The South Carolina Project Notification and Review System has conducted an intergovernmental review on the Draft Environmental Impact Statement "Waste Management Activities for Groundwater Protection at Savannah River Plant, Aiken, South Carolina". The intergovernmental review was conducted in accordance with Presidential Executive Order 12372, "Intergovernmental Review of Federal Programs". The resulting comments from the following agencies are enclosed for your use: South Carolina Department of Health and Environmental Control; South Carolina Department of Archives and History; South Carolina Department of Highways and Public Transportation. These comments represent the only responses received by this office as of this date. The State Application Identifier number for this project is EIS-8705-008. This number should be used in any future correspondence with this office regarding this proposal. The State of South Carolina is appreciative of the opportunity to review this proposed activity, and looks forward to reviewing the Final Environmental Impact Statement	

Table L-2. DOE Responses to Comments on Draft EIS
(Page 175 of 210)

Comment number	Comments	Responses
	upon its completion. If I may answer any questions, or be of further service in any way, please do not hesitate to contact me. Sincerely, Danny L. Cromer State Single Point of Contact Intergovernmental Review (Comments of the South Carolina Department of Health and Environmental Control furnished by Mr. Cromer were previously received during the public hearings at Aiken, South Carolina, June 4, 1987, and are given as comments F in this Appendix.)	

Comment number	Comments	Responses
	June 25, 1987 Mr. R. L. Morgan Manager, Department of Energy Savannah River Operations Office P.O. Box A Aiken, South Carolina 29802 Re: Waste Management Activities for Groundwater Protection at Savannah River Plant, Aiken, County DEIS Dear Mr. Morgan: Thank you for sending the Draft EIS for the Savannah River Plant's proposed waste management activities for groundwater protection.	
Q-1	We have previously commented on the "Archaeological Survey for the Plantwide Waste Management/Groundwater Protection of the Savannah River Plant, Barnwell and Aiken Counties". That report dealt with the proposed closing of 82 existing waste sites and six potential locations for new waste management facilities. It was our opinion, after reviewing the report, that the proposed activities would not affect National Register eligible cultural resources. We have enclosed a copy of our October 6, 1986, comments. We note the proposal has not changed; our comments therefore remain unchanged. The Federal regulations for the protection of historic properties (36 CFR Part 800) require that the Federal agency official in charge of a	The text of the FEIS, Sections 3.1.4 and 4.2.1.6, has been revised to reflect this comment.

Comment number	Comments	Responses
	federally funded or licensed project consult with the appropriate State Historic Preservation Officer. The regulations do not relieve the Federal agency official of the final responsibility for reaching an opinion of his own as to whether or not historic values have been adequately taken into account in allowing the project to proceed. The opinion of the State Historic Preservation Officer is not definitive, either by law or by established Federal procedure. In reaching a conclusion of his own, the Federal agency official may well wish to consult other experts. If you have questions, please contact Ms. Nancy Brock, Environmental Review Specialist, at 803/734-8609. Sincerely, Charles E. Lee State Historic Preservation Officer CEL/vdw cc: Mr. Ron Jernigan Department of Energy Savannah River Plant Dr. Bruce E. Rippeteau State Archaeologist Mr. Glen Hanson SCIAA Mr. Danny Cromer State Clearinghouse	

Comment number	Comments	Responses
	June 24, 1987 Mr. Danny Cromer Office of Governor's State Clearinghouse 1205 Pendleton Street Room 477 Columbia, South Carolina 29201 Subject: EIS-8705-008 - Aiken County Dear Mr. Cromer: The Department has reviewed the subject project and has no comments or objections. Sincerely, Noel K. Yobs Director of Preconstruction	

Comment number	Comments	Responses
	WRITTEN STATEMENT OF MR. J. LEONARD LEDBETTER, COMMISSIONER GEORGIA DEPARTMENT OF NATURAL RESOURCES July 28, 1987 Mr. S. R. Wright, Director Environmental Division U. S. Department of Energy Savannah River Operations Office Post Office Box A Aiken, South Carolina 29802 Dear Mr. Wright: The State of Georgia has reviewed the Department of Energy's (DOE) Draft Environmental Impact Statement (DEIS), "Waste Management Activities for Groundwater Protection at Savannah River Plant, Aiken, South Carolina" (DOE/EIS-01200). Our comments have been coordinated with the South Carolina Department of Health and Environmental Control.	
R-1	The major concern of the Georgia Department of Natural Resources is that the wastes and impacts of dealing with buried waste at the Savannah River Plant be kept within the site boundaries. Georgia DNR appreciates this opportunity for comment. Sincerely, J. Leonard Ledbetter Commissioner JLL/jm cc: Mr. R. Lewis Shaw	Discussion of modifications of waste management activities at the SRP and the related environmental impacts are discussed in Chapters 2 and 4 and Appendixes E, F, and G of the EIS.

Comment number	Comments	Responses
	WRITTEN STATEMENT OF MR. J. LEONARD LEDBETTER, COMMISSIONER GEORGIA DEPARTMENT OF NATURAL RESOURCES	
	July 28, 1987	
	Mr. R. Lewis Shaw Deputy Commissioner for Environment South Carolina Department of Health and Environmental Control 2600 Bull Street Columbia, South Carolina 29201	
	Dear Lewis:	
	The State of Georgia recently completed review of the Department of Energy's Draft Environmental Impact Statement (DEIS), "Waste Management Activities for Groundwater Protection at Savannah River Plant, Aiken, South Carolina." Comments on this document are attached.	
	Since this major federal facility is located entirely in South Carolina, DNR feels that comments relative to the proposed activities for management of waste should more appropriately come from your office. If you feel the attached comments are appropriate, please forward to Mr. R. S. Wright at the Savannah River Operations Office and provide this Department with a copy.	[DOE responses to these referenced comments follow.]
	Sincerely,	
	J. Leonard Ledbetter Commissioner	
	JLL/jm	

Comment number	Comments	Responses
	COMMENTS	
S-1	(1) The DEIS is very long and technically quite complex. The Table of Contents, itself, is ten pages long. Because of the complexity of the document, extensive use of high quality graphics (mainly maps) is necessary for any reader to be able to understand the document. For example, there are 77 sites where hazardous, mixed, and low level radioactive wastes have been disposed. DOE's maps generally show these sites as points rather than areas, large sites are treated the same as small sites. Moreover, the inter-relationship of the sites to actual contamination is not shown. The locations of monitoring wells are not shown nor can occurrences of contamination be related to ground-water flow direction. In this regard, the following regional maps (all of which should be at a consistent and readable scale) are necessary:	
	(a) A geologic map is needed so that the outcrop distribution of aquifers and confining units can be understood. (b) A topographic map showing all waste disposal sites. The 77 hazardous, mixed, and low-level radioactive waste sites should be separately delineated. (d) A map showing the location of all wells where contamination was detected. Areas of soil contamination also should be shown. (e) A water table map with data points (e.g., wells). (f) Potentiometric maps with data points (e.g., wells) of each confined aquifer.	The incorporation of more detailed maps of waste sites, including detailed topographic and geologic data, is not feasible for an Environmental Impact Statement, nor is it considered necessary. Much of the information requested is available in the figures and tables in Appendixes A and B and in documents referenced in Appendixes A and B. More detailed information will be provided as required in support of site-specific regulatory/permitting activities.

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		In addition, several cross-section parallel and perpendicular to strike are needed. The cross-sections should show changes in facies so that the inter-relationships between aquifers and confining units are illustrated. In particular, the cross-section should taken into account the known and well documented interfingering and pinch-out characteristics of the Tertiary and Cretaceous strata of the SRP. The above types of maps and cross-sections are generally considered to be standard as part of any ground-water presentation.	
S-2	(2)	The ten waste disposal areas containing the 77 disposal sites are in need of consistent maps for the reasons cited above. The existing maps provided in Appendix B are merely geographic and provide little actual hydrogeological data. In this regard, the following maps are needed: (a) A topographic map of each waste area showing the actual sites (e.g., not as points, but as areas). (b) A map showing all monitoring wells, with contaminated wells being delineated. (c) A map showing plumes of contaminated ground-water or contaminated soil superimposed on water table or potentiometric maps. Data points (e.g., wells) should be shown.	See the response to comment S-1.
S-3	(3)	Approximately 91% of the wastes are disposed in the Radioactive Waste Burial Grounds. Because these sites dominate both closure and monitoring costs, these areas need special attention and should not be lumped with the other waste sites, some of which are a few	Appendix E and Chapter 2 of the FEIS discuss the effects and costs of the Burial Grounds separated from other existing waste sites.

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		feet wide and a few feet deep. It would be to DOE's advantage to develop a general ground-water protection plan which would cover the other sites and a separate Radioactive Waste Burial Ground ground-water protection plan which could have its own special closure and monitoring program.	
S-4	(4)	In the "combination" strategy, there will be continued releases to the seepage basis, most of which are associated with ground-water contamination. Since the soil and vadose zone beneath the seepage basis are most likely contaminated, these contaminated releases will provide a flux for leachate to continue to enter the ground-water regime. This issue should be addressed in the DEIS.	The only seepage basins proposed for continued use under the Combination strategy are those receiving disassembly basin purge water in the reactor areas. No other "leachate" has been observed from these basins. Corrective/remedial actions as required for existing waste sites are discussed in the EIS under all the waste management action strategies, especially in Section 4.2 and Section F.1.
S-5	(5)	The attenuation characteristics of the vadose zone are not fully addressed. Considering that over much of the SRP, the water table is about 30-40 meters below ground-surface, it may be that the bulk of the contamination has *not yet reached the water-table*. This seems to be suggested by the gross nonvolatile beta concentrations increasing over the last few years in the old Radioactive Waste Burial Ground. This issue should be addressed by the DEIS. Monitoring of the vadoze zone, therefore, should be a part of future monitoring efforts.	The attenuation characteristics of the vadose zone are generally presented in the discussion of the individual waste sites or groupings; generally the vadose zone outcrops to surface streams within the SRP boundaries. Monitoring of this zone is being considered by DOE as a part of the groundwater monitoring program. DOE is performing vadose zone monitoring for volatile organics in the M-Area.

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	(6) Quality Control of the DEIS is lacking. Some examples are:	
S-6	(a) Figure A-5 - scale is incorrect;	Figure A-5 has been revised in the FEIS.
S-7	(b) Figure A-5 - only three wells shown; potentiometric maps cannot be derived from data.	Figure A-5 was calculated from a three-dimensional groundwater flow model referenced in Appendix H.
S-8	(c) Page B-19 notes that solvents are from sources other than the basin and yet Figure B-4 shows basin to be at ground-water high.	The basin shown originally in Figure B-4 is the Metallurgical Laboratory Basin. The SRL Seepage Basins discussed on page B-19 are located northwest of the Metallurgical Laboratory Basin and are shown on revised Figure B-4. The source of VOCs in the SRL Basins is not definitely known.
S-9	(d) Figure B-4 - data points mentioned but not shown.	Figure B-4 shows the A/M-Area and has been revised.
S-10	(e) Figure A-23 - shows water table in Burial Ground to be about 73 meters; whereas Figure B-7 shows the water table 275 feet (84 m). A difference of 11 meters seems unreasonable.	Both figures have been corrected; there is little or no difference in water table elevations between 1968 and 1982 figures. The 275-foot contour should have read 235 feet or about 72 meters.
S-11	(f) Figure A-14 shows flow lines that cannot be derived from Figure A-10, which is a potentiometric map for the same aquifer.	Figure A-14 has been revised to reflect the comment.
S-12	(g) Terms such as Cretaceous Sediments Aquifer and Tuscaloosa Aquifer are used interchangeably.	An effort has been made in the EIS to use terminology as consistently as possible; however, the differences in geologic and stratigraphic nomenclature are discussed in Section A.1.1.2 and are given tentative correlation in Table A-2. "Black Creek/Middendorf" is also used interchangeably with "Tuscaloosa."

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S-13		(h) Setbacks on areas of influence around waste disposal sites (e.g., the patterned areas shown on the various Appendix B figures) are arbitrary rather than being based on actual ground-water flow conditions.	The level of detail used to determine the waste disposal site areas of influence are consistent with the scope of the EIS and its purpose and need.
S-14		(i) The ground-water model PATHRAE was developed for low-level radioactive wastes; its significance to transport of solvents and heavy metals is questionable. These latter constituants are not characterized by radioactive decay.	The transport of nonradioactive constituents is accommodated in PATHRAE by assuming an infinite half-life. Direct gamma doses and radioactive decay terms are dropped from the modified code for modeling nonradioactive constituents. Appendix H discusses models.
S-15	(7)	The relative effectiveness of the different closure scenarios is based on the ground-water model PATHRAE. The general viability of PATHRAE is based on the work of Looney, et al, 1986 in which predicted concentrations are compared against measured concentrations. Looney, et al, performed this work on behalf of Du Pont, a DOE contractor. In other words, DOE, rather than an independent group, made the determination that the PATHRAE model is appropriate. Also comparison of a transport model such as PATHRAE to a flow model such as MOD3D, is inappropriate. Independent confirmation of PATHRAE to the hydrogeologic conditions of the SRP is needed.	See the responses to other comments on PATHRAE in regard to applicability and representativeness. Revisions have been incorporated in the Summary and Appendix H of the FEIS in response to comments related to the PATHRAE model and its appropriateness.

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	ORAL STATEMENT OF MR. HANS NEUHAUSER, COASTAL DIRECTOR GEORGIA CONSERVANCY	
	I am Hans Neuhauser, Coastal Director of the Georgia Conservancy. The Georgia Conservancy is a state-wide citizens organization, working actively to maintain and improve the quality of Georgia's environment for present and future generations.	
	While the Savannah River Plant physically exists in South Carolina, its operations have effects on Georgia, as well. It is of particular concern to the Georgia Conservancy that when those effects are the result of release of radioactive and hazardous wastes into the air we breathe and into the water we drink.	
	Our concerns over the management or mismanagement of the Savannah River Plant have twice led us to court, once over the issue of the restart of the L-Reactor, where the Department of Energy contended that the restart would have no significant effect on the environment, and here, over the inappropriate handling of hazardous and radioactive wastes.	
T-1	The Georgia Conservancy wants the Savannah River Plant cleaned up, so that contamination of the Savannah River and the principal aquifers that lie underneath the plant are not going to occur. Our preferred strategy is to excavate the waste sites and properly confine the contaminated material. We realize that this strategy will be an expensive one, but the blame for having to pay such a high cost should be squarely laid on the Department of Energy and its predecessor agencies. As we have learned from many other examples, it is far less expensive to control pollution at its source than	The proposed project actions include waste removal at selected sites or all sites, closure of all the sites, and remedial actions as required (See Chapter 2).

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	to try to clean up the mess after the contaminants have been released into the environment. By not controlling waste at its source, DOE has led us into a very expensive clean-up operation.	
T-2	The Georgia Conservancy wants to see the clean-up job done right, so that our water supplies, both surface and groundwater, will not be at risk. To ensure that the job is done right requires the DOE be supervised every step of the way. The supervision needs to be provided by an independent watchdog group that has, one, the legal authority to force DOE to do the job right if necessary; two, the technical ability to be able to evaluate complicated methodologies and results; three, has the necessary security clearances to deal with nuclear weapons production information; four, has the resources and money and manpower; and, five, has the commitment necessary to ensure both the safety and environment are adequately protected. In our view, the oversight should be provided by the combination of the Environmental Protection Agency and the South Carolina Department of Health and Environmental Control, with the Georgia Environmental Protection Division and public citizens working in an advisory capacity. At this point, we wish to point out three major deficiencies in the draft Environmental Impact Statement, deficiencies that are sufficiently great as to require a rewrite of the draft and not just publication of a final.	See the response to comment C-153 on oversight.
T-3	First, we find that DOE has failed to address waste disposal issues within the regulatory requirements of the Resource Conservation and Recovery Act. The EIS is almost ... almost totally ignores the permitting process of RCRA and the fact that all actions will be subject to EPA and South Carolina	See the response to comment C-1.

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	Department of Health and Environmental Control review. The EIS overlooks the requirement that corrective action is necessary at all solid waste sites that are releasing hazardous wastes into the environment.	
T-4	Our second criticism relates to the first. Many people and organizations commented on the need to comply with RCRA during the scoping process; we did, but DOE has chosen to ignore these concerns, making a mockery of the scoping process and thereby showing contempt for the entire National Environmental Policy Act process.	See the response to comment C-1.
T-5	Our third criticism relates to the standard of groundwater cleanliness to which DOE will adhere. Instead of inventing standards, such as minimum concentration limits and alternative concentration limits which have no legal or regulatory validity, DOE should use standards appropriate for RCRA sites, which is background level. In other words, sites should be cleaned to a quality equal to surrounding noncontaminated areas. These criticisms force us to conclude that DOE still lives in a world of its own, where it adheres to rules of its own making and ignores standards and requirements that are applicable to everyone else. It's about time that this double standard was changed. In conclusion, let me remind the audience, and especially the citizens of Georgia and South Carolina, that corrective action is up to Congress. It will take the Congress to appropriate the money necessary for clean-up and it will take a Congressional action to establish an independent agency to oversee DOE and the Savannah River Plant to make sure that the job is done right. Thank you.	See the response to comment C-5. EPA has frequently indicated their concerns that cleaning sites to background levels may not be economically or technically feasible.

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	ORAL STATEMENT OF MR. NEIL DULOHERY, VICE-CHAIRMAN STUDENTS FOR ENVIRONMENTAL AWARENESS UNIVERSITY OF GEORGIA	
	We, at Students for Environmental Awareness, are glad to have an opportunity to voice our concerns at this hearing but we are aware that as of now, this is, you know, not a democratic process, unless Congress decides otherwise in the future. So our appeal, now, is directed toward the DOE administrators, who will have control of this matter.	
U-1	When I received the two-volume draft Environmental Impact Statement that was thicker than most of my college texts that take about three months to read, I was a little intimidated, but it did not take long to find some damning evidence. In fact, the first bad news comes in the cover letter that comes along with the Environmental Impact Statement that tell us that South Carolina groundwater is contaminated with volatile organic compounds, heavy metals, radionuclides and other chemicals. I wasn't really sure of that fact before hav- ... you know, before receiving the Environmental Impact Statement, but the fact that the groundwater is contaminated at all ... at all is a bad sign. An abundant amount of data in the Environment Impact Statement goes on to identify the seepage basins as the ... as the main source of groundwater contamination and I have spoken with a former plant engineer, Bill Lawless, who I'm sure you may have heard from in the past, who tells me that the seepage basins are undoubtedly the main source of groundwater contaminants and the Environment Impact Statement itself tells us that a tritium plume is present in groundwater at all active reactor seepage basins. Some of the amounts of chemicals released to the basins are ... are staggering. Over a period of years, forty thousand liters --	Chapters 2 and 4 and Appendix F discuss remedial and closure actions at hazardous, low-level radioactive, and mixed waste sites. Appendix B characterizes each of the waste sites considered. Chapters 2 and 4 and Appendix G discuss new disposal facility alternatives for hazardous, low-level radioactive, and mixed waste, including waste removal and remedial and closure actions at existing waste sites. Chapters 2 and 4 discuss alternatives to the continued use of seepage basins for the discharge of disassembly-basin purge water from C-, K-, and P-Reactors.

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	and this is from the Environment Impact Statement -- forty thousand liters of sixty-five percent nitric acid were released to one basin, and over a period of years, about nine hundred thousand kilograms of volatile organic solvents were released to another, and that's out of a long list of many compounds and radionuclides released to many seepage basins at the Savannah River Plant. So it's no mystery that the groundwater is contaminated.	
U-2	Surface streams are contaminated also, as this Environmental Impact Statement points out. In the 1984 Environmental Impact Statement concerning the L-Reactor revealed a surface outcropping of strontium 90 in Four Mile Creek that, I believe, measured three hundred and forty thousand picocuries per liter, which is forty-two thousand times the Environmental Protection Agency's drinking water standard and eleven hundred times the Department of Energy's own guidelines, which also points out the ... the great disparity between the Environmental Protection Agency's standards and the Department of Energy's standards.	EPA drinking-water standards are applicable at the public drinking water treatment plant and at the point of use, not in the surface stream.
U-3	And, of course, wildlife has ... excuse me, wildlife has access to the streams and seepage basins and has become contaminated, also. Turtles contaminated with up to one thousand times background of strontium 90 have been found off of the Savannah River Plant grounds. That's certainly an odd way for radionuclides to migrate away from the Savannah River Plant area.	The Operating Contractor has developed a program for management of contaminated wildlife at the Savannah River Plant, which identifies and monitors potential human exposure pathways to wildlife contaminated by hazardous and radioactive substances. The locations, contaminants, and descriptions of those areas of potential contamination are contained in various reports (DPSP-83-1008, DPSP-84-1054, DPSPS-84-1051, DPSPU-84-302, DPSPU-85-30-1, DPSPU-86-30-1, and DPSPU-87-30-1).

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U-4	There are other problems, as well. In 1982, the Savannah River Plant gathered data on strontium 90 concentrations in milk near the Savannah River Plant, and again, I'd have to credit Mr. Lawless, since he pointed this out in these scoping comments. And that data showed that along certain wind paths, strontium 90 concentrations approached and in one case exceeded the EPA drinking water standard, and most measurements were well above the Southeastern average attributed to atmospheric nuclear test fallout from several decades ago. The Savannah River Plant is responsible for contamination on and off DOE property. I would like to briefly mention some problems experienced at other DOE facilities similar to the Savannah River Plant.	Chapter 4 of the EIS assesses the environmental consequences of the proposed modifications to waste management activities at the SRP, including impacts to aquatic and terrestrial biota and potential health effects from radiological releases that take into account known pathways of exposure.
U-5	At the Hanford facility in Washington, roughly twelve million cubic meters of soil are contaminated with various wastes. There are also or ... excuse me, there also, a hundred and forty-nine high-level waste storage tanks have failed and now cannot be drained safely. At the Oak Ridge facility, in 1983, the largest mercury spill in U.S. history was discovered, having occurred over a period of years. These failures and the ones at the Savannah River Plant point to one fact that has been repeated at this hearing, before I got here apparently -- self-regulation does not work.	Discussion of other DOE facilities such as Hanford and Oak Ridge is beyond the scope of this EIS.
U-6	In 1973, the Atomic Energy Commission, which then ran the Savannah River Plant, recommended in its guidelines that seepage basins be phased out. Well, eleven years later that guideline was rewritten, a rewrite that, incidentally, accommodated the failed storage tank problem at Hanford, put no limits on air emissions and allowed	Chapter 6 discusses the applicable Federal and State regulatory requirements for the proposed modification of waste management activities at the SRP, including the requirements of the Resource Conservation and Recovery Act, as amended, and DOE Orders.

Table L-2. DOE Responses to Comments on Draft EIS
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	the continued use of cardboard containers to store low-level wastes. One year later, in 1985, a new seepage basin was opened to serve the L-Reactor at the Savannah River Plant. Failed self-regulation may also be responsible for the fact that, if I'm not mistaken here, and I wasn't sure, one of your reactors is in mothballs right now, another one is shut down and a third is having some operating problems and ... of your six reactors, three are operating at less than fifty percent capacity. Is that an accurate assessment, I guess?	There are five production reactors at the SRP: C, K, L, P, and R. R-Reactor has been out of service since 1964; C-Reactor is in standby status; K-, L-, and P-Reactors are operating.
U-7	The basic idea is that there are lot of operations problems out there that I think may be not environmental concerns but strictly operational problems that have resulted from self-regulation ... failed self-regulation. And with that kind of record of operational difficulty, I would think that the Department of Energy might even invite regulation.	
U-8	Returning to reality, I compliment the Department of Energy for an excellent job of problem identification. The groundwater and soils are indeed contaminated and the seepage basins are the main source of contamination. It appears to me, however, that you have chosen a waste management strategy that will allow the seepage basins to remain intact and be expanded. The Environmental Impact Statement tell us that under the Department of Energy's preferred strategy, existing ground and surface water effects associated with the seepage basins will continue, whereas, under the elimination strategy, paired with the implementation of evaporation facilities, the effects on ground and surface water would be eliminated. Students for Environmental Awareness, then, rejects the combination strategy outright.	Seepage basins will be closed except for reactor seepage basins which receive periodic purges from reactor disassembly basins.

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U-9	We must insist that the elimination strategy is the only acceptable one. Furthermore, we would insist that the relatively inexpensive evaporation facilities, to replace seepage basins, be considered in connection with any strategy to be implemented out there, not just the elimination strategy, and I didn't understand why the evaporation facilities were grouped under that one strategy alone.	DOE's preferred waste management strategy will be formalized in the Record of Decision on this EIS. The evaporation or direct discharge actions under the Elimination strategy are intended to eliminate the use of reactor seepage basins for the discharge of disassembly basin purge water and are appropriate under the Elimination strategy.
U-10	The Savannah River Plant is a disgrace to this nation right now. If we are to buy nuclear weapons, or anything else for that matter, they cannot be discounted at the expense of our vital natural resources, soil, water and air. The U.S. Government, through the Department of Energy, has shown little respect for its citizens or nature itself. The Savannah River Plant is, in my opinion, an ugly sore on this otherwise beautiful nation, known for its national parks and well-managed natural resources.	The SRP is a National Environmental Research Park. Over 90 percent of the SRP is forested.
U-11	We must insist, as well, that Savannah River Plant at least be comparable to commercial reactors in terms of safety. We must insist that all use of natural soil columns for waste filtration be eliminated. This twelve billion dollar problem will not go away if you chose the wrong strategy. The combination strategy is not fiscally sound. Under the Department of Energy's preferred strategy, that twelve billion dollar bill will only get bigger as more wastes accumulate. Running a dirty operation like the Savannah River Plant is like running up a debt on one of these twenty percent interest charge cards. It's always cheaper to pay as you go in waste management than it is to defer clean up until later.	The cost for the alternative waste management strategies are preliminary costs and are used for comparative purposes only.
U-12	Now is the time to pay that inevitable bill, as honorably as is possible, and to look to the future with a clean slate. I sincerely hope that as a result of this hearing that the so-called	The final decision on the choice of alternative waste management strategies will be made in DOE's Record of Decision.

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	combination strategy will be abandoned in favor of the only acceptable one, the elimination strategy, that evaporation facilities will be constructed to replace seepage basins, and that no new reactor be built until clean-up is completed. Thank you.	

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	ADDITIONAL STATEMENT OF MR. NEIL DULOHERY STUDENTS FOR ENVIRONMENTAL AWARENESS UNIVERSITY OF GEORGIA	
	Instead of repeating my earlier statement, I have a couple of copies of it, I can make it available to anybody that'd like to look at it, I'm just going to try to review some of the main points and elaborate a little bit.	
U-13	The first thing I'd like to do is stand corrected on the number of reactors at the Savannah River Plant; there are five, not six, so the one fact that I tried to recall from memory I was in error on, but the point, still, with the reactors was just that ... with ... with ... with the five of them, I believe one is ... is not ... is in mothballs now, not operating at all, another one is having some difficulties with cracks near the reactor core or something to that effect and the other three are operating at less than fifty percent capacity. Any my contention was that self-regulation, just operation of the reactors under self-regulation might have brought that situation about and with the apparent increased demand and desire from more production with the ... the talk of a new reactor, that might not be necessary if the other ones had been built and operated adequately.	See the response to comment U-6.
U-14	I'd also like to respond to the notion that worker safety might be threatened under the elimination strategy that I prefer, and that being one of the reasons that the Department of Energy would not like to adopt that strategy. I'm familiar with how the EPA handles toxic waste clean-up, and their workers are exposed to toxic waste continuously.	The occupational risk at the low-level radioactive waste burial ground to workers under the Elimination strategy is stated to be the highest of the three action strategies. Proper protective clothing, shielding, air supplies, and other equipment will be provided to workers involved in

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	In this process, the same people go from site and clean up and they do have techniques and ... and equipment that does adequately protect them and there's no reason why that ... those ... that equipment and those techniques couldn't be applied toward the, at least, nonradioactive wastes or some of the nonradioactive basin wastes out at the Savannah River Plant.	radioactive and nonradioactive waste removal activities.
U-15	And as far as the radioactive wastes, I don't doubt but that the potential for, you know, an accident with a worker might be there in the elimination strategy, with them trying to excavate the wastes, but ... and I'm not ... and I'm not familiar with the technicalities of protective gear and so forth for removing radioactive wastes or protecting persons from radioactivity during a clean-up operation involving radioactive waste, but I suspect that equipment is available. I intuitively suspect that equipment is available and that ... that ... that's possible. So at least on the fact that I know that for nonradioactive waste, equipment is available to protect workers, I think that contention is invalid. And I'd just to ... you know, to stress again, and you ... and you've already said it here, the groundwater is contaminated and ... and that might to start sound no so bad after a while, but it really is. It's pretty hard to remove waste and ... and radionuclides from groundwater when it becomes diffuse; it's a ... it's a bad problem. And I'd like to stress, also, that seepage basins are the main source of contamination.	See the response to comment U-14.
U-16	And it's beyond me that the Department of Energy would propose to continue operating seepage basins with that knowledge. I would hardly call that a corrective measure. You know, Mr. Wisenbaker's description of the elimination strategy sounded	See the response to comment U-8.

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	very nice, sounded like the thing was going to be cleaned up, but the Environmental Impact Statement	
U-17	tells us otherwise; it tells us that effects associated with seepage basin operation will continue unless tritium mitigation measures are implemented and then that particular element of waste being sent to the seepage basins would be mitigated somewhat, but that's no guarantee. What the strategy tells us, that tritium mitigation measures might be considered in the future. Well, since the ... the Atomic Energy Commission recommended that seepage basins be eliminated outright in 1973, the fact that the Department of Energy promises to consider tritium mitigation measures really doesn't give me a whole lot of confidence.	Section 4.8 of the EIS discusses other tritium mitigation measures.
U-18	The use of these industrial cesspools just has to stop. The list of compounds and radionuclides going to the seepage basins is ridiculous. Again, the fact of the matter is that discharge will continue under your preferred strategy and I just don't see that as being any kind of correct manner ... measure at all. I also heard earlier today, after the morning hearing, I heard one of your representatives say to a press person that he wished ... he wished that the ... the public could get a better story from the Savannah River Plant more often or a more accurate story, but I'll tell you, I wasn't really too concerned about this issue until I happened to ... to luck up and see Bill Lawless speaking at the University of Georgia, a former plant engineer, who told me how bad the situation was, and I ... you know, the press accounts that I've read ... to respond to that, the press accounts that I've read in the news press, I haven't seen anything technically inaccurate in them and I think they've given adequate response time for the ... for the Department of Energy.	See the response to comment E-81.

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U-19	I'd also like to make the point that this is, indeed, a financial issue and a financial consideration, but in my opinion, the elimination strategy is, in the long run, the cheapest one, as well as the safest one in the long run, as you pointed out ... or Mr. Wisenbaker pointed out. The ... it's only going to get more expensive. You've got a twelve billion dollar problem now, you're proposing to continue discharge to the seepage basins, those wastes are going to continue to build up and contrary to the ... contrary to the idea that ... that the wastes have been greatly mitigated already, that it's mu- ... a much better ... a much cleaner discharge than it once was, that ... that's not the impression that I ... that I got from the Environmental Impact Statement.	The Elimination strategy has the highest total capital and operating costs and occupational risks of all the alternative waste management strategies (Tables 2-11 and 2-12). The costs are preliminary and subject to revision.
U-20	And I'd like to clarify something I said earlier, that the Savannah River Plant should be comparable in terms of safety to commercial reactors; by that I didn't mean worker safety, and I've been informed and would suspect that they ... that y'all have pretty good worker safety record out there, but I meant that it should be comparable ... its guidelines should be comparable, the Department of Energy guidelines should be comparable to NRC regulations, for instance. If we're not going to have outside regulations, unless you see something deficient in the Nuclear Regulatory Commission guidelines, I think you should, basically, copy them. And so, in terms of potential safety problems for the pubic, I think the Savannah River Plant should be comparable to commercial facilities. And just another rather dramatic incident that occurred, and tell me if I'm approaching ten minutes, another dramatic incident that occurred at the Hanford facility and could potentially occur at the Savannah River Plant, but is an example of what	DOE standards are comparable to NRC regulations for commercial reactors (10 CFR 20). DOE-owned, contractor-operated facilities, such as the Savannah River plant, are excluded from NRC licensing requirements under Section 110(a) of the Atomic Energy Act as amended. DOE is therefore responsible for protecting the safety and health of the public and the environment from the effects of activities at DOE nuclear facilities. The need for specific engineered safety features for nuclear reactors varies according to the design and operating differences that exist between different types of reactors. Commercial light-water nuclear reactors, for example, have coolant conditions that are at high-pressure (over 2000 pounds per square inch) and high

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	can go on in an unregulated facility, a near criticality of plutonium occurred in a seepage basin out there and they actually had to go in and mine it out because they had an in- ... or y'all had an increase in reactivity because of the concentration of plutonium. This is not something you'd find happening at a commercial facility; in fact, at a commercial facility, I think some ... some of your folks would probably wind up in jail if they went out and found ... found these kind of things happening.	temperatures (greater than 500°F). SRP reactors operate at much lower temperatures and pressures (212°F and 5 psi).
U-21	I think that covers it, just basically, that ... basically, that it's ... it's, I think, fis- ... the decision that y'all want to make, going with the combination strategy, is both fiscally a bad decision and morally a bad decision. The contention is that y'all want to keep dumping waste into these pits that are going to leak right back down into the groundwater and wastes are going to continue to accumulate and I'm opposed to that.	See the response to comment U-8.

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	ORAL STATEMENT OF MR. KEN MATTHEWS, CHAIRMAN SAVANNAH AREA CHAMBER OF COMMERCE'S NATURAL RESOURCES AND ENVIRONMENT COMMITTEE	
	I'm Ken Matthews, I'm the Comptroller for Chatham Steel Corporation here in town, I'm also the Chairman of the Savannah Area Chamber of Commerce's Natural Resources and Environment Committee. On behalf of the chamber, I want to thank you for the opportunity to express the concern of the chamber membership regarding the operations of the Savannah River Plant. The prospect of modification of the waste management activities for hazardous low-level radioactive and mixed wastes at SRP, indeed provides an opportunity for discussion of increased protection of human health and the environment in areas potentially affected by SRP.	
	Each year since 1983, the Chamber has selected as one of its national legislative priorities, support for independent evaluation of the operations and cumulative impact of nuclear developments, both present and in the future, at the Savannah River Plant. This is an example of one of our publications where we have advocated that since 1983.	
	NOTE: Mr. Matthews refers to publication.	
V-1	Suggestions have included the establishment of an independent Federal/state citizen oversight group, as well as oversight by the Nuclear Regulatory Commission.	See the response to comment C-153 on oversight.
V-2	Whatever the oversight mechanism, and that needs to be determined by the Congress, the nation's weapons facilities must be subject to regulation, at least as stringent as those required by the private sector, by the Federal Resources Recov- ... Conservation and Recovery Act. This is the message that we've been conveying to our congressmen and	DOE's commitment to comply with RCRA and other regulations is stated on page 1-2.

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	our senators in Washington since '83 and the chamber priority ... this chamber priority, the independent oversight, certainly applies to the subject at hand today, waste management activities at the Savannah River Plant, inadequate safeguards in the management of waste at SRP and the health hazards for the health and safety of citizens who live and work in the areas fed by the aquifers which lie beneath the plant and by the Savannah River.	
V-3	Outside technical oversight removes any doubt that the Savannah River Plant is operating in an environmentally unsound measure ... manner. We believe that the protection of the groundwater, as well as the surface water, is essential. The Savannah River Plant should be operated without any adverse effect on those important resources and the contamination of groundwater was, certainly avoidable and is very unfortunate. The measures for operation, waste management and environmental protection require, clearly, complex technical and subjective conclusions. Therefore, we again call for a highly competent and fully independent oversight group for groundwater protection, as well as all other aspects of the plant operations at the Savannah River Plant. Thank you.	See the response to comment V-1.

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ORAL STATEMENT OF
AMY ESTELLE

Although I represent myself, Amy Estelle, I also offer my statement in the name of Jane Doe, as representative of thousands of others who are so full of despair and hopelessness living in this nuclear age that they have temporarily chosen not to speak at this hearing. As a teacher, I've brought with me a classroom model of the earth, commonly called a globe. I would like to bring to the attention of this panel our location in time and space and who we, the people in this room, are.

In time, we are about halfway through the predicted lifetime of the star we call the sun, roughly, five billion years old; we are about three billion years into the evolution of life on the plant earth; we are a scant approximate three millions years into the evolution of our own species, Homo sapiens; and 1987 marks the two hundredth anniversary of the Constitution of this nation. Also, it marks just over forty years of our entry into the nuclear age.

In space, we are on the banks of the Savannah River, a river called Eisondega, the Blue Water, by the Indians called the Guales who lived here before us. We are within a one hundred mile radius of the Savannah River Plant, bordering Georgia and South Carolina; we are situated in a country, the United States, on the edge of the continent, North America, also within about twenty miles of the edge of one of the great oceans of this planet, the Atlantic.

Who are we? We are a handful of human citizens in a nation of about two hundred and thirty million, we are part of the global human family of over five thousand million or five billion, we are all members of one species, the dominant species on

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	this plant, one of only millions of species on the earth. With that preface, I would like to say that the question before the citizens in this room is not, "Should DOE take certain actions to protect the groundwater, the environment, the human and animal environment from radioactive and chemical hazardous waste at Savannah River Plant?" I believe the question that should be asked in this room is, "Should the Savannah River Plant be operating, period?"	
W-1	When I look at the alternatives presented before us, I find them inadequate, irrational, absurd and immoral. The only way to absolutely safeguard present and future generations, much less the groundwater, from the dangers of all radioactive chemical and hazardous wastes is to eliminate the production of these wastes. I repeat, the only to adequately safeguard present and future generations or the groundwater from the dangers of all radioactive and chemical wastes, especially hazardous wastes at SRP, is to stop the production of these wastes.	Under the Atomic Energy Act of 1954, the Department of Energy is responsible for developing and maintaing the capability to produce all nuclear materials required for the U.S. weapons program. In accordance with the Atomic Energy Act, approval of proposals for defense nuclear materials by the President and subsequent authorization and appropriation by Congress constitute the legal authority and mandate for the Department of Energy to provide the required defense nuclear materials. The national policy on nuclear weapons, their deployment, and the need for weapons is beyond the scope of this EIS.
W-2	You may now be wondering, "Who is this strange, simple-minded person who wandered into this room? This is hearsay, everyone knows we need the Savannah River Plant to produce plutonium and tritium for national security reasons." To that, men and women, I say, "hogwash." The real question is, "Should DOE at SRP and Hanford, Washington, continue to produce fissionable material and its by-product, hazardous radioactive and chemical wastes?" My response is a resounding, "No."	See the response to comment W-1.
W-3	A few reasons, besides the safety factors already alluded to by other speakers. It is ridiculous to continue the production of these materials to be	See the response to comment W-1.

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	used in the production of thermonuclear weapons when we already have a global arsenal of over fifty thousand nuclear weapons. The debate over this question, "Who has the most?" and "Who has the most sophisticated delivery system?" is absurd. Once you/re dead, you're dead. There's bumper sticker seen in Savannah that says, "One nuclear bomb can ruin your whole day." Savannah River Plant has been described as the nuclear bomb that has already been dropped by us on ourselves. A similar bumper sticker might read, "One Trident submarine can destroy the whole human population of the six hundred largest cities in the Northern Hemisphere," and our nation proposes to build twenty such submarines. Besides being ridiculous and absurd, I think the production of the nuclear materials at SRP is also illegal, a violation of the Nuremberg Principles signed by this country, which prohibits the preparations for genocide. Since the use of nuclear weapons, as evidenced in Nagasaki and Hiroshima, Japan, is evidence of genocide, mass death of the civilian population, I believe that it is illegal for us to continue the production of these weapons. Third, immoral, for the reasons I stated above and also the fact that we are talking about mass destruction, mass death for civilians. You may be wondering, "Well, if we're going to make these weapons, we're making them so no one can use them." Well, if we're making them because we'll never use them, why are we making them? Why are we allocating billions of dollars to build and produce weapons that can never be used? By whose authority does the government of this nation, the people of this room, the members of DOE, the members of Congress and Senate, the members of the Executive	

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	Branch make the decision, not only to produce the weapons, but also to leave the waste for countless generations of humans and other species?	
W-4	Let us talk about economics. I recently had a personal conversation with an engineer at Savannah River Plant and she said to me, "I took this job, Amy, because it was the best job in town; in fact, it was the only job in town." The economic violence done by the misappropriation of our federal dollars, at the tone of sixty-four cents out of every one hundred cents we pay to the Department of Defense, better called, the Department of War, to finance past wars in the form of eighty percent of the federal deficit and current preparations for war. Let's talk about economic violence, perpetuated by Congress, Senate, Executive Branch, by the military industrial complex, by companies like Boeing, Lockheed, Grumman, General Electric, General Dynamics, TRW, Du Pont, Morton Thiokol, the list goes on and on. Let's talk about the woman and children who are living in poverty in this nation. Let's talk about economic violence, the feminization of poverty, with thirty-eight percent of all families, and there are over twenty million of them in this country, living on less than $10,699 a year for a family of four, thirty-eight percent of those families headed by single women. Let's talk about economic violence, where women are free in this nation to earn sixty-two cents to every one hundred cents that men make. Let's talk about economics, let's talk about the economic exploitation of North Americans .... North American Indians, especially in their homelands in the American Southwest, where uranium has been mined, the tailings have been left on the ground to blow in the wind, even used by the Bureau of Indian	The purpose of this EIS is to assess the environmental impacts of the proposed implementation of modified waste management activities for hazardous, low-level radioactive, and mixed wastes at the SRP.

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	Affairs to build schools on reservations. Let's talk about the economic violence and exploitation of South African miners in uranium mines there. The economic violence perpetuated in our local communities in rural South Carolina and Georgia, where people with the least opportunities for adequate education to give informed consent to the operation of Savannah River Plant are abused.	
W-5	In summary, I would again point out that the wrong question is being asked by the Department of Energy here. What we need the Department of Energy to do is to call a national referendum, not how to protect the groundwater at SRP but should SRP and its sister plant --- although I hate to use that word, sister, referring to it; strike that, please -- and Hanford, Washington Plant, continue to produce plutonium and tritium? Do we, the people of this nation, want it?	See the response to comment W-1.

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	ORAL STATEMENT OF MR. DERBY WATERS, DISTRICT DIRECTOR FOR U.S. REPRESENTATIVE LINDSAY THOMAS Mr. Waters read the letter prepared by U.S. Rep. Lindsay Thomas - Shown in this Appendix as comments A.	

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	ORAL STATEMENT OF MS. TERESA MILLER, EXECUTIVE VICE PRESIDENT OF CONTAMINATION CONTROL SERVICE, INC. Ms. Miller's statement is presented as comment B of this appendix.	

Table L-2. DOE Responses to Comments on Draft EIS
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	PRELIMINARY ORAL STATEMENT OF MR. JIMMY CHANDLER, REPRESENTING ENERGY RESEARCH FOUNDATION AND NATURAL RESOURCES DEFENSE COUNCIL Mr. Chandler's statement is presented as comment C in this Appendix.	

Comment number	Comments	Responses
	ORAL STATEMENT OF MR. JAMES E. BEARD, GREENPEACE	
	Mr. Beard's statement is presented in comment D in this Appendix.	