UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 30, 1998

Mr. Roy J. Schepens
Acting Assistant Manager for High-Level Waste
U.S. Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29802

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION REGARDING SAVANNAH RIVER SITE HIGH-LEVEL WASTE TANK CLOSURE; CLASSIFICATION OF RESIDUAL WASTE AS "INCIDENTAL"

Dear Mr. Schepens:

U.S. Nuclear Regulatory Commission (NRC) staff along with our contractor, the Center for Nuclear Waste Regulatory Analyses, have reviewed the "Regulatory Basis for Incidental Waste Classification at the Savannah River Site High-Level Waste Tank Farms," Rev. 1, as requested in the December 20, 1996, letter from Lee Watkins/ U.S. Department of Energy (DOE), to Carl Paperiello/NRC. In addition to reviewing the Regulatory Basis, we have examined several supporting references and have identified issues that need to be resolved before NRC staff can fully evaluate your request for agreement that the Savannah River high-level waste tanks planned for stabilization on-site can be classified as "incidental waste" that would not be subject to NRC licensing authority. We recognize that Tank 17 and Tank 20 have already been stabilized in place using this methodology.

In general, the concerns address the effects of certain assumptions, models, or parameters on dose calculations with respect to meeting the incidental waste classification criteria set forth in the March 1993 letter from R. Bernero/NRC, to J. Lytle/DOE. Specific questions and comments are listed in the enclosure. Key issues identified in the review include duration of institutional controls, engineered barrier lifetimes, concentration averaging to meet Class C limits, and selection of intruder scenarios.

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We would like to resolve these issues in a meeting with you and your staff and contractors, either in-person, or through a telecon or videocon. Written responses to these comments and concerns should also be provided. Please contact Jennifer Davis at (301) 415-5874, or Richard Weller at (301) 415-7287 to discuss your preferred path toward resolution.

Sincerely,

King Stablein

N. King Stablein, Acting Chief
Engineering and Geosciences Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

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COMMENTS AND QUESTIONS REGARDING REVIEW OF THE "REGULATORY BASIS FOR INCIDENTAL WASTE CLASSIFICATION AT THE SAVANNAH RIVER SITE HIGH-LEVEL WASTE TANK FARMS," REVISION 1

I. SPECIFIC COMMENTS REGARDING REGULATORY BASIS FOR MEETING CRITERION ONE

"...the waste has been processed (or will be further processed) to remove key radionuclides to the maximum extent that is technically and economically practical ... "

A. Waste Characterization Issues

1. Sample analysis results from Tanks 17 and 20 led to a recognition of elevated contents (as compared to predicted values) of three important radionuclides: Tc-99, Pu-238, and Np-237. No discussion was provided concerning other radionuclides for which analyses were not done during the process knowledge acquisition effort. There may be related radionuclides that could be expected--on the basis of revised process knowledge--to accompany Tc-99, Pu-238, and Np-237 at elevated levels. The U.S. Department of Energy (DOE) should address how it plans to consider this issue.

2. Inconsistencies in tank inventories, which are natural consequences of the ongoing characterization effort, are reflected in the various documents. Some differences are causes for particular concern. For example, the Tc-99 inventory in the Tank 20 Characterization Report (d'Entremont and Hester, 1997) is 0.85 Ci based on sample data; this value is 15 times the value assumed for the fate and transport modeling (FTM) in the Tank 20 Closure Module (U.S. DOE, 1997a). However, d'Entremont and Hester (1997) suggest that the higher value was used in the Tank 20 performance assessment (PA). Considering the importance of Tc-99 to groundwater dose, this discrepancy should be resolved so that there is assurance that use of the lower value in modeling has not underestimated the dose. An order-of-magnitude difference is also observed for the Se-79 inventory for Tank 17 when comparing the Characterization Report (d'Entremont et al., 1997) with the Tank 17 Closure Module (U.S. DOE, 1997b). The identified inconsistencies need to be resolved as new inventories are applied in performance evaluations. In addition, the effects of the outdated inventories on FTM and the tank specific Pas should be addressed.

3. The characterization reports for Tanks 17 and 20 utilized analytical data from only two sludge samples each for comparison with process knowledge estimates. In the case of Tank 17, sampling for analysis was performed in January 1997 (d'Entremont et al., 1997) before slurry washing and sludge redistribution operations were conducted. Furthermore, Tank 17 samples were obtained from only the top layer of the sludge. These observations raise concern that the samples may not be sufficiently representative of the tank sludges. Both characterization reports note some variety in the appearance of solids suggesting the possible effects of in-tank chemical processes on the distribution of constituents. More extensive sampling should be undertaken in the tanks, so that greater confidence may be gained that a representative range of sludge radionuclide concentrations has been measured.

Enclosure

B. Technical Practicality Evaluation

The report did not provide information on radionuclide removal efficiencies for any of the waste removal options. For example, it was reported (U.S. DOE, 1996) that oxalic acid washing has been attempted in a few tanks. However, there is no information on the effectiveness of this process on radionuclide removal. In addition, sample analyses of Tanks 17 and 20 do not provide sufficient information to derive radionuclide removal efficiencies of water washing, although the values of radionuclide concentrations after water spray washing are provided in Tank 17 Closure Module (U.S. DOE, 1997b). It is difficult to assess, based on the information provided, whether wastes will be processed to remove radionuclides to the maximum extent technically feasible. Measured or estimated radionuclide removal efficiencies for bulk waste removal, water washing, and oxalic acid washing should be provided.

II. <u>SPECIFIC COMMENTS REGARDING REGULATORY BASIS FOR MEETING CRITERION TWO</u>

"...the waste will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C LLW, as established in 10 CFR 61.55 ..."

A. Application of the Branch Technical Position (BTP) on Concentration Averaging

No analysis has been provided supporting the application of the NRC "Branch Technical Position on Concentration Averaging and Encapsulation." It is unclear <u>which</u> 14 tanks "do not exceed the Class C low-level waste (LLW) limits for radionuclides listed in 10 CFR Part 61... us[ing] concentration averaging based on NRC guidelines in the BTP issued January 17, 1995" (U.S. DOE, 1997c). Similarly, it is unclear which are "the remaining 37 tank systems" which cannot meet the Class C LLW limits even with application of the BTP.

DOE should provide a discussion regarding this application of the BTP, including how it was applied (i.e., discussion of chosen sections, example calculations, safety factors if any, governing assumptions, etc.). This discussion should also address how the "14 tanks" differ from the "37 tanks," including a listing of which tanks fall into each category and list the source references for concentrations used in the analysis.

B. Alternative Provisions for Waste Classification

§61.58 *"The Commission may, upon request or on its own initiative, authorize other provisions for the classification and characteristics of waste on a specific basis, if, after evaluation, of the specific characteristics of the waste, disposal site, and method of disposal, it finds reasonable assurance of compliance with the performance objectives [P.O.] in Subpart C of this part."*

1. Intruder Scenario Basis for Exemption

   As discussed in the Regulatory Basis (U.S. DOE, 1997c), the waste classification system in 10 CFR Part 61 is generally based on intruder protection. Other measures for intruder protection include engineered barriers and active and passive institutional controls. These measures are not assumed to be effective more than 500 years after closure. See further discussion in Section III of this Request for Additional Information (RAI).

   "A maximum concentration of radionuclides is specified for all wastes so at the end of the 500 year period, remaining radioactivity will be at a level that does not pose an unacceptable hazard to an intruder or public health and safety [10 CFR 61.7(a)(5)]."

   To support the basis provided for the alternative waste classification, intruder doses following the 500-year period should be shown to be no greater than 500 mrem/yr, assuming breakdown of engineered barriers and no institutional controls. Any deviation from these assumptions should be technically justified.

2. Additional Comments Related to Intruder Analysis Provided

   a. No rationale is provided regarding which tanks were chosen for the analysis (Cook, 1997). Note also, that the chosen tanks are Type III tanks that appear to be the most robust. If credit is taken for tank structure in the intruder analysis, choosing only Type III tanks could be nonconservative. A rationale for selecting tanks 25-28, 33-34, and 44-47 should be provided.

   b. Only four radionuclides were included in the intruder analysis; Sr-90, Tc-99, Cs-137, and Pu-239. I-129, and the actinides, U, Np-237, Pu (including Pu-238), Am-241, and Cm should be included in the intruder analysis (Cook, 1997), since the long-term hazard is expected to be dominated by actinides, and several of the radionuclides listed above occur in high concentrations, relative to the Class C limits, in Tanks 17 and 20. These radionuclides, along with Tc-99, should be included in the waste inventory at concentration levels commensurate with those detected in actual waste sampling.

   c. To support the alternative provisions for waste classification, the analysis should assume no oxalic acid cleaning of waste tanks, because the request is designed to show that adequate intruder protection can be provided without oxalic acid cleaning. It is not clear whether the current analysis assumes radionuclide inventories after oxalic acid cleaning or not. This should be addressed.

   d. DOE did not provide justification for not considering the groundwater pathway for intruder dose through the drilled borehole. Groundwater ingestion may be an important pathway for an intruder agriculture scenario, even if agricultural practices are not expected to disturb the wastes buried deep under the site. The groundwater pathway should be considered, or justification for its omission should be provided.

3. Remaining Performance Objectives

In addition to the intruder protection performance objective (P.O.), §61.58 requires reasonable assurance that the other P.O.s of Subpart C can be met. Reasonable assurance that these remaining P.O.s (protection of the general population, protection of worker, and site stability) can be met, should be shown assuming there has been no oxalic acid washing of waste tanks. Other assumptions should be consistent with those used in the PA for Criterion Three.

III. SPECIFIC COMMENTS REGARDING REGULATORY BASIS FOR MEETING CRITERION THREE

"...the wastes are to be managed, pursuant to the Atomic Energy Act, so that safety requirements comparable to the performance objectives set out in 10 CFR Part 61, Subpart C are satisfied."

A. General Comments on PA

1. U.S. DOE has performed *a priori* fate and transport modeling for all of the HLW tank systems in F-AREA, however, similar fate and transport modeling does not appear to have been done for the high-level waste (HLW) tanks in H-area. Similar modeling should be done for the H-area, or the rationale for not performing such modeling should be provided.

2. The FTM (Morrison, 1997) states that modeling for radiological dose was performed using only the major contributors to dose (beta-gamma emitters: Se-79, Tc-99, C-14, I-129, and the alpha emitting isotopes of U, Np, Pu, Am, Cm and their decay products).

   a. According to Table 2 of the FTM (Morrison, 1997), Pu-238, an alpha-emitter (and an appreciable contributor to the inventory in both Tank 17 and Tank 20), is not included in the modeling for radiological dose. Further, Np, U, and Pu-238 do not appear to be included in the modeling for the Tank 17 and 20 Closure Modules (U.S. DOE, 1997b and U.S. DOE, 1997a). These omissions should be justified or rectified.

   b. As shown in Table 2 of the FTM (Morrison, 1997), Sr-90 dominates the radionuclide inventory, but apparently contributes negligibly to dose due to retardation or decay, because it is not reported as a major contributor to dose in Table 10 of the same document. The report does not explicitly show why it is a negligible dose contributor. The FTM should list distribution coefficients for all modeled constituents, and make clear why a key radionuclide, such as Sr-90, is not important to dose.

3. It is unclear what degree of tank cleaning was assumed in the PA. Were tank waste concentrations assumed based on spray-washing only, or with additional oxalic acid cleaning? This should be clarified.

4. Effects of long-term (10,000 yr) natural phenomena (e.g., climate changes) were not considered in the PA, although such consideration was recommended by the Draft Staff Branch Technical Position on a Performance Assessment Methodology for Low-Level Radioactive Waste Disposal Facilities (Draft Staff LLW PA BTP (U.S. NRC, 1997)). Effects of long-term natural phenomena should be included in the PA.

5. An explanation should be provided for the conclusion that the estimated peak dose from Tc-99 occurs earlier (315 yrs) at 100 m than at 1 m (385 yrs) in the Water Table Aquifer in the FTM (Morrison, 1997). A similar apparent inconsistency is present in the peak doses for the Congaree Aquifer (Morrison, 1997).

6. The Draft Staff LLW PA BTP (U.S. NRC, 1997) recognizes two different approaches for representing system performance in the context of the post-closure performance objective. One approach provides a single bounding estimate of system performance supported by data and assumptions that clearly demonstrate the conservative nature of the analysis. The other approach provides a quantitative evaluation of uncertainty with regard to system performance represented by a distribution of potential outcomes. The analyses supporting the Regulatory Basis appear to be a mix of these two approaches. A consistent approach would make it much simpler to evaluate conformance with Criterion Three.

B. Engineered Barriers

1. In the FTM (Morrison, 1997), the assumption is made that the tank top, grout and basemat will fail at 1000 yr. Part 61 states that the effective life of these barriers should be no longer than 500 years. Any period of time claimed for the performance of engineered barriers, including periods exceeding 500 years, should be supported by suitable information and justification (U.S. NRC, 1997). No supporting data and analyses are provided for stabilized HLW tank performance other than a reference to estimated E-Area vault lifetime, which is not clearly analogous to stabilized HLW tank lifetime. The engineered barriers of the stabilized HLW tank system should be assumed in the PA to last no longer than 500 years, unless engineered barrier lifetimes greater than 500 years can be technically justified.

2. The hydraulic conductivity of the concrete basemat (Morrison, 1997) is assumed to be 9.6×10^{-9} cm/sec until the concrete basemat and the grout fail. This parameter then has a step-change to 6.6×10^{-3} cm/sec. Prior to total failure of the basemat and/or grout, there may be a period during which cracks and microfractures have significantly affected the hydraulic conductivity of the materials. The potential for time-dependent degradation and the consequent effects on hydraulic conductivity should be considered.

3. The FTM (Morrison, 1997) assumes that all tanks remain above the water table. Some of the HLW tanks are currently partially below the water table (U.S. DOE, 1996). The

effect of the water table proximity to the tanks on the performance of the engineered barrier does not appear to be factored into the PA, and the effect of a fluctuating water table does not appear to be factored into the PA either. If the water table is above the tank bottom, then the assumption of rain water infiltration from the tank roof through the reducing grout becomes tenuous. In such a case, the effectiveness of reducing grout in controlling the source term may be questionable, due to water infiltration from the sides and from below, and because of discrete areas of non-homogeneity. In addition, the increased water flux at the radionuclide source will significantly affect transport away from the source. More realistic (and more conservative) water table heights should be assumed in the PA.

C. Institutional Control Issues

1. The DOE proposal for institutional control of the area near the tank farms and extending to Fourmile Creek should be clarified before a PA that supports conformance with Criterion Three can be accepted. The DOE approach to institutional control does not appear consistent among the reviewed documents. The various reports describe planned institutional controls for the site/portions of the site as: (1) active institutional controls for 100 years with area under federal control in perpetuity thereafter [Regulatory Basis (DOE 1997c)]; (2) zoning as an industrial use area for 10,000 years [FTM (Morrison, 1997)]; (3) active institutional controls for 100 years followed by zoning for industrial use for an indefinite period with deed restrictions on the use of groundwater [Closure Plan (DOE, 1996)]; and (4) "DOE . . . control of the site in perpetuity" (Watkins, 1996).

   Institutional control discussions are not consistent throughout the reviewed documents, nor are they generally consistent with NRC regulations and guidance that do not permit reliance on active institutional controls for more than 100 years [§ 61.59(b)]. Because the safe management of waste under Part 61, consistent with current NRC policy, generally includes the assumption that institutional controls may not be relied on for more than 100 years, DOE's demonstration should incorporate that assumption, unless DOE can provide an appropriate justification for not incorporating the assumption.

2. Without active institutional controls for 10,000 yrs, other onsite exposure scenarios should be considered. For example, if the controlled area is to remain open to industrial use, then the aquifer characteristics should be considered with respect to potential use. The aquifer is currently capable of producing drinking water. The possibility of industrial drilling anywhere in the controlled area, not just through the tank system, should be a scenario in the PA.

D. Groundwater Transport Modeling

1. Model uncertainty may not be adequately addressed by the Multimedia Environmental Pollutant Assessment System (MEPAS) in the framework of the groundwater transport segment (GTS) construct. Benchmarking the MEPAS results for the GTS construct against results from a more detailed, physically based model will provide validation of the MEPAS/GTS abstraction and will support its continued use for the remaining tank

closures. For example, a computer code that models the three aquifers and the intervening confining layers in an integrated manner will provide a better estimate of the doses. The FTM (Morrison, 1997) states that an independent sensitivity and uncertainty analysis by Sandia National Laboratory indicated that uncertainty has been properly addressed (Cook, 1996). It is not clear from the FTM (Morrison, 1997) if Cook (1996) addressed model uncertainty. The specific issues concerning model uncertainty are:

a. the vertical transport of contaminants is not adequately addressed in the GTS construct. At distances horizontally removed from the tanks, the GTS construct does not allow for interaction of the aquifers. The lack of interaction is counter to the conceptual model from which the percentages of contaminants in each aquifer appear to have been calculated; and

b. apportioning the release of contaminants in each aquifer immediately below the source area through the use of pseudo-unsaturated layers in MEPAS is neither a conservative nor a realistic choice. This methodology incorporates dilution that is not likely to be present in the physical system. Furthermore, the percentage of downward flux from the Water Table Aquifer to the Barnwell-McBean Aquifer suggests a predominantly vertical flow system. The vertical flow conceptual model is counter to the layered sedimentary system with partially confining clay layers as described in U.S. DOE (1996).

The methodology used to calculate the percentages, as well as the evidence for no further hydraulic communication between the aquifers down gradient from the tanks, should be provided. This information is discussed in U.S. DOE (1994), the first in the list of additional documents requested in Section IV of this RAI.

2. Streamlines in the Barnwell-McBean Aquifer from the H-Area tank farm potentially intersect those from the F-Area tank farm (Flach, 1993). Accordingly, the GTS framework for the F-Area should incorporate the H-Area tank releases. So, the detailed model used as a benchmark for MEPAS and GTS construct would also include the H-Area tank farm.

E. Parameter Selection

1. There is no adequate description of how the value of pore velocity is estimated for input to the MEPAS code. A description should be provided.

2. Effective porosities in Table 6 of U.S. DOE (1997b) are smaller than field capacities. This does not seem conservative and should be corrected.

3. The potential presence of high conductivity zones such as the one controlling a tritium plume near the H-Area basins (Flach, 1993) has not been incorporated into the estimates of hydraulic conductivity for the F-Area modeling. The existence of the hydraulic conductivity zone was not known until the tritium migration was monitored. The high-conductivity zones should be considered in the FTM.

F. Source Term Issues

The transport model makes no allowance for the possible increase in radionuclide source terms due to decay chain ingrowth. Ingrowth needs to be considered in the model.

G. Protection of Individuals from Inadvertent Intrusion

1. The intruder scenario for PA is different from that used to support application of concentration averaging for Criterion Two. For the former, a worker or teenage intruder exposed at the shoreline of Four-Mile Creek was considered. For the latter, an intruder-agriculture scenario was used. Intruder scenario(s) should be consistent for all aspects of the Regulatory Basis.

2. Given the uncertainty of maintaining active institutional control for 10,000 years, the intruder approach used for PA may be inadequate for evaluating conformance with Criterion Three. For the type of aquifer under the control area, other on-site scenarios, such as those involving wells, are possibilities that should be considered for an industrial zoned area. Intruder scenario(s) should be carefully selected and fully justified. See additional discussion in Section III.C.2 of this RAI.

H. Distribution Coefficients for Radionuclide Transport

The sensitivity analysis done as part of the FTM (Morrison, 1997) shows that radionuclide distribution coefficients (K_ds) are one of the more sensitive parameters. Considering the sensitivity of these parameters, the following should be considered.

a. The K_ds used for some radionuclides do not appear to be conservative. For example, C-14, I-129, and Tc-99, which are generally assumed to have $K_d = 0$, have been assigned non-zero values. Although nonconservative K_ds will not change the peak dose for any radionuclide, the time to peak dose will change. Part of the DOE demonstration of conformance depends upon spreading the arrival times for the peak doses for the radionuclides at the seepline. This should be corrected, or justified.

b. For K_ds in the source waste layer, the FTM (Morrison, 1997) uses values determined or estimated for cementitious materials in a reducing environment. An important potential problem with this assumption arises from consideration of the possible inefficiency of grout-sludge mixing. The sorption behavior of elements in the presence of the sludge may differ significantly from that in the presence of reducing cementitious materials, because aqueous chemistry may change markedly as water percolates from grout into a sludge pocket or layer. Another possibility is that local radiolysis of water by radionuclides present in the sludge may create oxidizing free radicals or hydrogen peroxide that will increase the solubility of some radionuclides. These effects should be considered and discussed as part of the FTM.

c. Similarly, no mention is made of the possible effect of cement degradation on the sorbent properties of Zones II and III (the concrete basemat and the vadose zone). As discussed by Bradbury and Sarott (1995), progressive degradation of cementitious materials affects not only the solid phase characteristics of the material, but also the aqueous chemistry. For example, a significant level of cement-water interaction under reducing conditions can lead to degradation that may lower the K_d for Tc by a factor of 10, or of the actinides by a factor of 5. Such degradation would also affect the hydraulic properties of the grout and basemat. The very high K_ds used in Zone III (the vadose zone) may be nonconservative if the concrete basemat is not composed of strongly reducing concrete. These effects should be considered in the PA.

I. Radionuclide Solubilities

Sensitivity analysis should also be performed with particular attention to Pu and U solubilities.

a. Long-term degradation of cementitious materials can affect aqueous chemistry, and solid phases could affect radionuclide solubilities. These effects do not appear to have been considered.

b. The addition of a solution of calcium hydroxide, sodium thiosulfate, and calcium sulfide as a pretreatment before grout pouring (U.S. DOE, 1997a) could affect U and Pu solubility, and should be considered in the DOE analyses.

IV. <u>ADDITIONAL DOCUMENTS REQUESTED</u>

Please forward two copies each of the following documents:

1. U.S. DOE, 1994. WSRC E-7 Procedure Document Q-CLC-H-00005, Revision 0, August 3, 1997.

2. Hester, J.R., 1996. "High-Level Waste Characterization System," WSRC-TR-96-0264, Aiken, S.C, Westinghouse Savannah Company.

3. Cook, J., 1996. Interoffice Memorandum (May 17) to B.T. Butcher, "Evaluation of Computer Modeling for High Level Waste Tank Closure," Aiken, SC; Westinghouse Savannah River Company.

REFERENCES

1. Bradbury, M.H., and F. Sarott, 1995. "Sorption Databases for the Cementitious Near-Field of a L/ILW Repository for Performance Assessment," PSI Bericht Nr. 95-06, Switzerland: Paul Scherrer Institute.

2. Cook, J.R., 1996. Interoffice Memorandum (May 17) to B.T. Butcher, "Evaluation of Computer Modeling for High-Level Tank Closure," Aiken, SC; Westinghouse Savannah River Company.

3. Cook, J.R., 1997. Interoffice Memorandum (April 24) to B.T. Butcher, "Evaluation of High-Level Tank Residuals versus NRC Class C Criteria," SRT-WED-97-0176, Aiken, SC; Westinghouse Savannah River Company.

4. d'Entremont, P.D. and J.R. Hester, 1997. "Characterization of Tank 20 Residual Waste," WSRC-TR-96-0267, Aiken, SC: Westinghouse Savannah River Company.

5. d'Entremont, P.D., J.R. Hester, and T.B. Caldwell, 1997. "Characterization of Tank 17 Residual Waste," WSRC-TR-97-0066, Aiken, SC: Westinghouse Savannah River Company.

6. Flach, G.P., 1993. "Groundwater Model Calibration and Review of Remedial Alternatives at the F & H Area Seepage Basins (U)," WSRC-TR-93-384, Aiken, SC: Westinghouse Savannah River Company.

7. Morrison, A.S., 1997. "Environmental Radiological Analysis: Fate and Transport Modeling of Residual Contaminants and Human Health Impacts from the F-Area High-Level Waste Tank Farm, Savannah River Site," Aiken, SC: Halliburton NUS Corporation.

8. U.S. Department of Energy, 1996. "Industrial Wastewater Closure Plan for F- and H-Area High-Level Waste Tank Systems, Savannah River Site," Construction Permit Numbers 14,338, 14,520, and 17,424-IW, Rev. 1, July 10, 1996; Aiken, SC: Savannah River Operations Office.

9. U.S. Department of Energy, 1997a. "Industrial Wastewater Closure Module for the High-Level Waste Tank 20 System, Savannah River Site," Construction Permit Number 17,424-IW, Rev. 1, January 8, 1997; Washington, DC: U.S. Department of Energy.

10. U.S. Department of Energy, 1997b. "Industrial Wastewater Closure Module for the High-Level Waste Tank 17 System, Savannah River Site," Construction Permit Number 17,424-IW, Rev. 2, August 26, 1997; Washington, DC: U.S. Department of Energy.

11. U.S. Department of Energy, 1997c. "Regulatory Basis for Incidental Waste Classification at the Savannah River Site High-Level Waste Tank Farms," Rev. 1, April 30, 1997.

12. U.S. Nuclear Regulatory Commission, 1995. "Issuance of Final Branch Technical Position on Concentration Averaging and Encapsulation," January 17, 1995, Washington, DC: U.S. Nuclear Regulatory Commission

13. U.S. Nuclear Regulatory Commission, 1997. "Branch Technical Position on a Performance Assessment Methodology for Low-Level Radioactive Waste Disposal Facilities: Draft for Public Comment," NUREG-1573, May, 1997; Washington, DC: U.S. Nuclear Regulatory Commission.

14. Watkins, A.L., 1996. Letter of December 20 to C.J. Paperiello, U.S. Nuclear Regulatory Commission, "Savannah River Site (SRS) High-Level Waste (HLW) Tank Closure; Classification of Residual Waste as Incidental," Aiken, SC: U.S. Department of Energy, Savannah River Operations Office.