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MAR 2 9 2006

CBU-WMAP-2006-00020
RSM Track #: 10048

Mr. Douglas E. Hintze
Waste Disposition Programs Division
Savannah River Operations Office
P.O. Box A
Aiken, South Carolina 29808

Dear Mr. Hintze:

CLASSIFICATION OF SRNL HIGH LEVEL CELL WASTE AS LOW-LEVEL WASTE (OBU-TRU-2006-00031)

As discussed with your staff, the attachment demonstrates that the SRNL High Level Cell waste, originally stored as TRU waste due to the previous 10nCi/g TRU limit, is LLW (less than the current TRU limit of 100nCi/g). In addition, the South Carolina Department of Health and Environmental Control (SCDHEC) has concurred that this LLW is not RCRA hazardous and agreed to the removal of the hazardous codes from the storage drum labels.

The SRNL High Level Cell Waste is classified as low-level waste, in that it is determined to be incidental to reprocessing by citation and, therefore, is not high-level waste. These are wastes resulting from research and development (R&D) work. The include laboratory items such as tools and equipment used in the SRNL high level cells during R&D associated with the Defense Waste Processing Facility.

We plan to remove this LLW from the TRU inventory and dispose it in the E-Area LLW Facilities. Also, we will add this document to our Radioactive Waste Management Basis (RWMB) at its next revision.

Any questions you or your staff may have may be directed to W. T. Goldston of my staff.

Sincerely,

J. L. Stevens, Manager
Waste Management Area Project

wtg/ccc
Att.

c: H. L. Pope, DOE SR, 704-S
J. M. Simmons, 704-S
ECATS, 730-B
W. A. Morrison, WSRC, 705-3C
D. J. Swale, 704-59E
L. T. Reid, 705-3C
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A. Gibbs, 704-36E
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Document Control, 642-E

WASHINGTON SAVANNAH RIVER COMPANY
INTEROFFICE MEMORANDUM

OBU-TRU-2006-00031
March 21, 2006

TO: W. T. Goldston, 705-3C

FROM: A. Gibbs, 704-36E

Subject: Disposal of SRNL High Level Cell Waste as Low Level Waste at SRS

Summary

SRS has stored a quantity of sludge contaminated waste generated in the Savannah River National Laboratory (SRNL) high level cells (HLC) produced during the research and development for the Defense Waste Processing Facility. This waste was originally stored because of the 10 nCi/g transuranic (TRU) limit. TRU is defined as alpha emitting nuclides with half-lives greater than 20 years. When the TRU limit was raised to 100 nCi/g this waste was no longer TRU, but was only recalculated recently. Generation of the wastes has also been researched and they have been found to be non-hazardous. (Attachment 1) SC DHEC has concurred with the removal of hazardous codes placed during the wholesale placement of "solvent rag" designations on all stored wastes in the Solid Waste Management Facility (SWMF). (Attachment 2). All of the waste containers being considered for disposal as low level waste (LLW) meet the requirements of the SRS waste acceptance criteria.

Since the wastes were contaminated as a result of work with material from the high level waste tanks at SRS we are documenting that these wastes are not High Level Waste, but meet the citation determination for Waste Incidental to Reprocessing as addressed in HLW-SUP-99-0060.

HLW Regulatory Definitions

The first legal definition of HLW was established in 1970 by the Atomic Energy Commission (AEC) defined in 10CFR50 Appendix F as:

"...those aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, in a facility for reprocessing irradiated reactor fuel."

The Nuclear Regulatory Commission (NRC) defined HLW in 10CFR60.02 as:

".... (1) Irradiated reactor fuel, (2) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated waste from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated fuel, and (3) solids into which such liquid wastes have been converted."

The Nuclear Waste Policy Act (NWPA) of 1982 defined HLW as:

"....(a) The highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (b) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation."

The Department of Energy (DOE) Order 435.1 definition of HLW is similar to the NWPA of 1982 except for the reference to the "Commission" and is follows:

"DOE Order 435.1, Chapter II. A. Definition of High-Level Waste. High-level waste is the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation.
B. Waste Incidental to Reprocessing. Waste resulting from reprocessing spent nuclear fuel that is determined to be incidental to reprocessing is not high-level waste, and shall be managed under DOE's regulatory authority in accordance with the requirements for transuranic waste or low-level waste, as appropriate. When determining whether spent nuclear fuel reprocessing plant wastes shall be managed as another waste type or as high-level waste, either the citation or evaluation process described below shall be used:

> (1) **Citation.** Waste incidental to reprocessing by citation includes spent nuclear fuel reprocessing plant wastes that meet the description included in the Notice of Proposed Rulemaking (34 FR 8712) for proposed Appendix D, 10 CFR Part 50, Paragraphs 6 and 7. These radioactive wastes are the result of reprocessing plant operations, such as, but not limited to: contaminated job wastes including laboratory items such as clothing, tools, and equipment.
> (2) **Evaluation.** Determinations that any waste is incidental to reprocessing by the evaluation process shall be developed under good record-keeping practices,"

Discussion of HLW Issue

The definitions contained in the regulations and DOE orders define LLW, transuranic (TRU) and HLW.

Low level waste is any nuclear waste not defined as HLW or TRU. According to DOE Order 435.1, transuranic waste is radioactive waste containing more than 100 nano curies of alpha emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years. These wastes do not have concentrations greater than 100 nCi/g of any alpha emitter with a half-life greater than 20 years; therefore, they are not TRU waste.

High level waste is defined in the same order as highly radioactive waste material resulting from the reprocessing of spent nuclear fuel that contains fission products in sufficient concentrations; and other highly radioactive material that requires permanent isolation. The definition of HLW is further bounded by the definition of Waste Incidental to Reprocessing (WIR) which is waste resulting from reprocessing spent nuclear fuel that is determined to be incidental to reprocessing is not high-level waste. WIR shall be managed under DOE's regulatory authority in accordance with the requirements for transuranic waste or low-level waste, as appropriate. When determining whether spent nuclear fuel reprocessing plant wastes shall be managed as another waste type or as high-level waste, either the citation or evaluation process shall be used. SRS has evaluated its wastes and documented in reference 1 that the type of wastes being considered for disposal in this document are WIR by citation; i.e., they are waste incidental to reprocessing because they were not generated during reprocessing operations, but are wastes resulting from research and development work in the high level cells of the Savannah River National Laboratory. The wastes consist of laboratory items and do not contain any research glass samples.

Conclusion of HLW Issue

The casks of waste which are being considered for disposal at SRS as low level waste were generated in the high level cells of SRNL during the research and development of the Defense Waste Processing Facility. Research was done on the contents of the waste in the high level tanks as well as development of immobilization methods. Immobilization as a glass was the method chosen. Since it was known that the high level tank contents were high level waste (HLW) efforts were taken to keep the HLW separate from the waste generated in analyses and development. Glasses made from real waste were segregated and were taken from the high level cells in specially labeled containers. Unused waste samples were returned to the high level waste system.

The wastes being considered here consist of the equipment used in the analysis of the waste samples and the development of the glass making process. These wastes are cited in Reference 1 and DOE Order, 435.1, Chapter II.B. (1) as being Waste Incidental to Reprocessing by citation and are not HLW.

References

1. HLW-SUP-99-0060, Citation Determination and Evaluation of Waste Incidental to Reprocessing, April, 2000.

2. DOE Order and Manual 435.1, Chapter 2, High Level Waste Requirements.

Attachments

List of container identifications for this disposal
Appendix 1--Characterization of waste for removal of hazardous codes
Appendix 2--SC DHEC letter of approval for removal of hazardous codes

List of Containers for Disposal as LLW

FSN	Quantity Pu-238, g.	Year Generated	Pu-238 Calculation, Ci	Fission Products, Ci	TRU Total, Ci/ g waste
SR110850	5.00E-03	1980	7.17E-08	9.00E+00	8.94E-08
SR118706	4.00E-03	1981	5.78E-08		7.21E-08
SR500254	4.00E-03	1974	5.47E-08		6.82E-08
SR115530	0.00E+00	1980	0.00E+00	1.26E+01	0.00E+00
SR523091	4.00E-03	1983	5.88E-08	1.26E+01	7.33E-08
SR503117	3.00E-03	1974	4.11E-08		5.12E-08
SR516353	1.00E-03	1982	1.46E-08	2.20E+00	1.82E-08
SR516402	1.00E-03	1981	1.45E-08	5.00E-01	1.80E-08
SR518935	2.00E-03	1984	2.96E-08	5.04E+00	3.69E-08
SR519037	2.00E-03	1982	2.92E-08	1.00E+00	3.63E-08
SR520012	2.00E-03	1982	2.92E-08	2.00E+00	3.63E-08
SR520013	2.00E-03	1982	2.92E-08	1.02E+02	3.63E-08
SR523632	2.00E-03	1984	2.96E-08	3.36E-01	3.69E-08
SR523674	2.00E-03	1984	2.96E-08	3.78E+00	3.69E-08
SR110817	1.00E-03	1980	1.43E-08	6.72E-01	1.79E-08
SR115560	1.00E-03	1980	1.43E-08	1.00E+00	1.79E-08
SR125921	1.00E-03	1981	1.45E-08	1.00E+00	1.80E-08
SR514559	1.00E-03	1981	1.45E-08	4.20E+00	1.80E-08
SR514568	1.00E-03	1981	1.45E-08	5.00E-01	1.80E-08
SR516391	1.00E-03	1982	1.46E-08	2.50E+00	1.82E-08
SR516442	1.00E-03	1981	1.45E-08	2.10E+00	1.80E-08
SR520036	1.00E-03	1983	1.47E-08	6.72E-01	1.83E-08
SR520039	1.00E-03	1983	1.47E-08	8.40E-01	1.83E-08
SR521300	1.00E-03	1983	1.47E-08	5.00E-01	1.83E-08
SR523670	1.00E-03	1985	1.49E-08	1.43E+01	1.86E-08
SR523676	1.00E-03	1984	1.48E-08	2.52E+00	1.85E-08
SR523677	1.00E-03	1984	1.48E-08	3.36E-01	1.85E-08
SR110824	0.00E+00	1980	0.00E+00	1.21E+01	1.85E-08
SR503149	0.00E+00	1974	0.00E+00	5.00E-02	1.85E-08
SR509765	0.00E+00	1980	0.00E+00	1.22E+01	1.85E-08
SR514574	0.00E+00	1981	0.00E+00	4.00E+00	1.85E-08
SR516306	0.00E+00	1982	0.00E+00	5.04E+00	1.85E-08
SR516311	0.00E+00	1982	0.00E+00	4.20E+00	1.85E-08
SR516371	0.00E+00	1982	0.00E+00	4.00E+00	1.85E-08
SR516480	0.00E+00	1981	0.00E+00	1.25E+00	1.85E-08
SR517882	0.00E+00	1985	0.00E+00	2.10E-01	1.85E-08
SR518412	0.00E+00	1983	0.00E+00	3.78E+00	1.85E-08
SR518934	0.00E+00	1984	0.00E+00	1.68E+00	1.85E-08
SR519010	0.00E+00	1982	0.00E+00	1.00E+00	1.85E-08
SR519023	0.00E+00	1982	0.00E+00	1.50E+00	1.85E-08
SR519043	0.00E+00	1982	0.00E+00	2.00E+00	1.85E-08
SR519074	0.00E+00	1982	0.00E+00	4.00E+00	1.85E-08
SR520014	0.00E+00	1982	0.00E+00	3.20E+00	1.85E-08

SR520040	0.00E+00	1983	0.00E+00	6.72E-01	1.85E-08
SR520045	0.00E+00	1983	0.00E+00	1.70E-02	1.85E-08
SR520051	0.00E+00	1983	0.00E+00	3.36E+00	1.85E-08
SR520052	0.00E+00	1983	0.00E+00	1.09E+00	1.85E-08
SR520068	0.00E+00	1983	0.00E+00	8.40E-01	1.85E-08
SR520074	0.00E+00	1983	0.00E+00	1.01E+01	1.85E-08
SR520099	0.00E+00	1983	0.00E+00	3.78E-01	1.85E-08
SR521219	0.00E+00	1983	0.00E+00	8.40E-01	1.85E-08
SR521237	0.00E+00	1983	0.00E+00	4.20E+00	1.85E-08
SR521246	0.00E+00	1983	0.00E+00	4.20E-01	1.85E-08
SR521272	0.00E+00	1983	0.00E+00	3.20E+00	1.85E-08
SR521280	0.00E+00	1983	0.00E+00	1.26E+00	1.85E-08
SR522212	0.00E+00	1983	0.00E+00	4.20E-01	1.85E-08
SR522231	0.00E+00	1983	0.00E+00	8.40E-02	1.85E-08
SR522253	0.00E+00	1983	0.00E+00	2.52E-01	1.85E-08
SR522263	0.00E+00	1983	0.00E+00	4.20E+00	1.85E-08
SR522293	0.00E+00	1983	0.00E+00	1.26E+00	1.85E-08
SR522299	0.00E+00	1983	0.00E+00	1.68E-01	1.85E-08
SR522824	0.00E+00	1984	0.00E+00	6.72E-01	1.85E-08
SR523015	0.00E+00	1983	0.00E+00	1.26E+00	1.85E-08
SR523019	0.00E+00	1983	0.00E+00	5.88E+00	1.85E-08
SR523047	0.00E+00	1983	0.00E+00	1.20E-02	1.85E-08
SR523228	0.00E+00	1984	0.00E+00	2.52E+00	1.85E-08
SR523235	0.00E+00	1984	0.00E+00	4.00E-02	1.85E-08
SR523255	0.00E+00	1984	0.00E+00	4.20E-01	1.85E-08
SR523622	0.00E+00	1984	0.00E+00	1.26E+00	1.85E-08
SR523645	0.00E+00	1984	0.00E+00	8.40E-01	1.85E-08
SR523671	0.00E+00	1984	0.00E+00	2.94E+00	1.85E-08
SR523672	0.00E+00	1984	0.00E+00	2.10E+00	1.85E-08
SR523673	0.00E+00	1985	0.00E+00	8.40E+00	1.85E-08
SR523690	0.00E+00	1984	0.00E+00	6.72E-01	1.85E-08
SR524032	0.00E+00	1984	0.00E+00	1.26E+00	1.85E-08
SR524149	0.00E+00	1984	0.00E+00	3.36E-01	1.85E-08
SR524287	0.00E+00	1984	0.00E+00	1.68E+00	1.85E-08
SR524371	0.00E+00	1985	0.00E+00	1.68E+00	1.85E-08
SR524372	0.00E+00	1985	0.00E+00	8.40E+00	1.85E-08
SR524373	0.00E+00	1985	0.00E+00	8.40E-01	1.85E-08
SR524374	0.00E+00	1985	0.00E+00	6.72E+00	1.85E-08
SR528120	0.00E+00	1985	0.00E+00	1.68E+00	1.85E-08

Appendix 1
Letter Detailing Waste Description

SRS

WASHINGTON SAVANNAH RIVER COMPAN
INTEROFFICE MEMORANDU

March 8, 2006
OBU-TRU-2006-00025

TO: H. W. Morris, 705-3C
FROM: A. Gibbs, 704-35E

Re-Classification of High Activity Waste from SRNL High Level Cells

Summary

The Savannah River Site (SRS) has been concerned about the high level wastes which resulted from the recovery of plutonium since startup. The reprocessing wastes were sent to steel tanks after having been made basic and having nitrite scavenger for oxygen added. While this bought some storage time, the problem of permanent disposal forms continued. Research and development was begun in the late 1950's to retrieve the wastes and incorporate them into solid matrices. Incorporation into glass as the final form was eventually decided upon as having the least leachability of plutonium and other actinides and the best long-term stability characteristics. All of this work was done at what is now the Savannah River National Laboratory (SRNL).

When the development phase of working with real wastes began, the high level cells (HLC) at SRNL were used. The wastes must be handled remotely because of their lethal radioactivity. This development work caused solid wastes to be created. There are 92 casks/containers of this highly radioactive solid waste which have been stored on SRS transuranic (TRU) pads as TRU waste. Recent calculations have shown that 82 of these casks/containers are less than 100 nanocuries/gram TRU content and are therefore low-level waste.

The 82 casks were generated between 1974 and 1985 and therefore were subject to the 1990 general declaration that all stored wastes before that date were hazardous because they might contain solvents. The records of the research and development involved in work with the wastes do not indicate any use of solvents in the HLC. Interviews with personnel working in the cells at that time do not reveal any recall of solvents. SRS believes the wastes in these 82 casks/boxes to be non-hazardous as well as non-TRU waste. If SC DHEC agrees that the hazardous designation can be removed, these casks/containers can be disposed of at SRS safely and economically. This will remove a large radiation dose risk and measurably advance the cleanup of SRS.

Discussion

Wastes from nuclear reprocessing to obtain plutonium for weapons created a large volume of very high level activity liquid wastes. The neutralization of these wastes has, in turn, created a large volume of salt solutions and sludges which require stable disposal for historic lengths of time.

(continued as Word document)

Since the real waste has very high radioactivity levels much of the research and development work was done using non-radioactive surrogates. After the preliminary work of characterizing the wastes was done so the surrogates could be made, work on real wastes in the HLC was primarily confined to producing glass forms and testing the forms for stability. Some analytical work was also done in the cells as well as some separations work for precipitation of salts and preparation of concretes. These processes are discussed below.

Characterization

Samples of high level wastes were transferred by heavily shielded casks to the HLC. The samples were separated into phases using centrifugation and filtration and phases analyzed separately. The liquid phases were discarded to the high level drains when analyses were finished. The solid sludge phase has solid salts in the spaces between layers. This salt/sludge phase was mixed with water to dissolve the salts and "wash" the sludge. These sludge/salt solutions were again centrifuged to separate the phases. In some cases filtration was used to remove insoluble particles. Liquids were again discarded to the high level drains after analyses were complete.

Because the wastes contain so much aluminum from the dissolution of fuel cladding and so much iron from the ferrous sulfamate used to adjust the valence for plutonium recovery most of the other elements and radioactive species present have been co-precipitated when the wastes were made basic. Iron hydroxide is used effectively in environmental work to co-precipitate trace elements for analysis in waters, for example. Predominant species present in the liquid and salt phases of the high level wastes are the very soluble and highly radioactive active fission products such as cesium and strontium. The transuranic species and heavy metals are almost completely insoluble and are contained in the sludge.

The complete characterization of the sludges from different high level waste tanks allows a correlation of non-radioactive species such as mercury and chromium from knowledge of the Pu-238 present. The samples used in the work which generated this waste were not completely characterized at one time as the sludges have been for the full-scale process used in the Defense Waste Processing Facility (DWPF). DWPF personnel who produce the glass logs destined for Yucca Mountain maintain an extensive spreadsheet of all of the characterization data of the batches of sludge from different high level waste tanks. The maximum quantity of hazardous element found in any of the batches has been taken as a worst case for the HLC wastes. This data has been summarized in Attachment 1 for the purposes of this document. Attachment 1 shows the concentration of the elements Ag, Cd, Cr, Hg, Ni, Pb, and Ba for the containers having the highest quantity of sludge. The maximum quantity of sludge in any of the containers is equal to 182 g. The waste weight in all of these containers is greater than 1000 lbs. All concentrations of the hazardous elements in the waste are below regulatory limits.

Glass Making

After extensive work with waste surrogates and different frit compositions a formula for glass which had low leachability and did not crack extensively as it cooled was selected. Furnaces were then installed in the HLC to make glass with real wastes. Frits, mechanical tools, scales, containers for frit, and metal or ceramic molds were the primary components used in this work besides the washed sludges.

The glasses made in these tests were cleaned in ultrasonic cleaners, pulverized and tested for leachability. Leach solutions were distilled water, dilute acetic acid, and brines. Solutions were discarded to liquid wastes when tests were completed.

Analytical Chemistry

One of the analyses performed in the cells was the Fe(II)/Fe(III). This ratio was essential because it affects the quality of the glass. One analysis was done on pulverized glass by Mössbauer spectroscopy, so no chemicals were used. A wet chemical method was used out of cell with UV-visible spectroscopy. This method used a Parr digestion bomb with ammonium vanadate and HF to dissolve the glass samples. The dissolved sample had a buffer and ferrozine added to it to develop the color. Solutions were discarded to liquid waste drains.

Fracture and porosity were also important analyses. These analyses were done using microscopic methods on solid samples.

Compositions of the sludges, solutions, and glasses were accomplished by dissolving in the cells and transferring small aliquots to less heavily shielded laboratory facilities for analysis by inductively coupled plasma-mass spectrometer, emission spectrometer, gamma and alpha spectroscopy. Wastes associated with these other facilities are not considered in this memorandum. Residual dissolutions were disposed of through the high level drain.

Separations Work

The disposal of the soluble cesium in the glass form was still being worked during the period when these wastes were generated. There is reference to cesium-137 being captured on a zeolite column and the zeolite being incorporated into a sludge which became glass. Zeolites are silica forms having microscopic cellular structure and are non-hazardous. Mention is also made of one attempt at precipitation of cesium-137 by phosphotungstic acid. This chemical is also non-hazardous. No mention of the use of tetra-phenyl borate (TPB) for the precipitation of strontium or crystalline silicotitanate (CST) for cesium separation is made in any document concerning the HLC during this period. TPB and CST were relatively late in development so their absence for the time period of these wastes is consistent.

List of Items Found in Documents

Analytical Equipment
- Parr "bombs" (pressure dissolution vessels), beakers, pipets, volumetric flasks, cells for spectrophotometers, vials, drying ovens, drying boats, scales, weights, microscopes, crushing equipment.

Filtration Equipment
- Vacuum pumps, flasks, Millipore™ filter holders/filters

Centrifugation Equipment
- Centrifuges, centrifuge tubes

Furnaces
- Muffle furnaces, small scale glass furnaces, boats, molds, frits, scales, various sized containers

Leaching Equipment
- Plastic ware, brines, distilled water, ultrasonic baths

Salt Recovery
- Distilled water, "salt cells", scales, zeolite beds, phosphotungstic acid

Waste Sludge Composition
- Same as analytical equipment

Chemicals
- Ammonium vanadate, HF, HNO_3, acetic acid, buffer solutions, ferrozine, distilled water, isopropyl alcohol, phosphotungstic acid, brines, sand, zeolites, slag.

Interviews

Interviews were held on 11/18/2005 with Ronald Blessing and Gary Blessing. Ron is a current supervisor of the HLC and has worked in the cells since 1982. Gary is retired, but worked in the HLC in the 1970's, particularly during the Curium Program. Their individual and collective memories do not recall the use of any aerosol cans which might have contained solvents in the cells. In fact, the use of any substance which might cross-contaminate the cell atmosphere was required special procedures, as did the use of flammable compounds. Water and alcohol were used in the ultrasonic baths, but the samples were air dried and the bath fluids discarded to the high level drains. Ron's recollection of the glass work was of the microscopic work, which involved equipment not used routinely in the cells previously. We also talked about the mercury which was removed from the sludges, processed separately, and was removed as elemental mercury from the cells separately. This corresponds with waste disposal records for mercury generated in HLC. Elemental mercury and its production wastes are not in the waste casks discussed in this document.

X-Ray Information

As part of an overall assessment of wastes on TRU pads, 54 of the casks on this list were x-rayed in the field. No evidence of any hazardous components other than a mercury vapor light was found. The x-rays are on file and the report on each of these containers is summarized in an Excel spreadsheet. Attachment 2 is a list of the items found in the casks with replicate items removed. Mercury vapor lights are reported in three of the casks. Each light contains a maximum of 40 mg of mercury using figures from The Hazardous Waste Consultant. The weight of the waste in these casks is greater than 1000 pounds. So the quantity of mercury in a cask with one mercury vapor light is: 0.040 g Hg / (1000 lbs x 454 g/lb) = 8.8E-08 g/g. This is less than the 4E-06 g/g limit in regulations. All three of these casks contain at least ten times less sludge than the worst case cask calculated in Attachment 1, so the mercury concentration of the waste with lights (~0.5 ppm) is still below regulatory limits.

Conclusion

There are 82 casks of waste from SRNL high level cells which are non-TRU. While these wastes contain traces of mercury, cadmium, chromium, and lead from the high level tank sludge which contaminates them, the wastes are below the regulatory limits for hazardous metals, including the possible presence of spent mercury vapor lamps. There is no documentation that hazardous materials were used in any the processes which generated these wastes.

Solid waste in SRNL casks being considered for disposal at the SRS Burial Ground should contain no hazardous materials. The generalized imputed hazardous codes placed in 1990 on these containers should be removed.

References

Document Control at SRS prepared a spreadsheet of over 500 documents which had information on the research and development on high level waste containment work. 243 of these documents were read for information, 29 were found to have information directly pertaining to the work in the high level cells which generated the wastes under discussion. While more pertinent documents are referenced below, the entire list of 243 can be made available electronically if needed.

1. Interviews with Ronald Blessing and Gary Blessing, personal communications, November 18, 2005.

2. DP-1397, Evaluation of Glass as a Matrix for Solidification of Savannah River Plant Waste. Radioactive Studies, J. A. Kelley, October 1975.
3. DP-1504, Vaporization of Semi-Volatile Components for Savannah River Plant Waste Glass, G. W. Wilds, August 1978.
4. DP-MS-77-080, Leach Rates of High Activity Waste from Borosilicate Glass, J. R. Wiley, 1980.
5. DP-MS-79-108, Design and Operation of a Small-Scale Glass Melter for Immobilizing Radioactive Waste, J. J. Plodinec and P. H. Chismar, 1979.
6. DP-MS-88-013, The Role of Test Parameters on the Kinetics and Thermodynamics of Glass Leaching, C. M. Jantzen, 1988.
7. DPST-80-0052, Durability of SRP Waste Glasses-Program Document, G. G. Wicks and M. D. Dukes, November 1980.
8. WSRC-RP-91-00762, Procedures for Measurement of Cs-135 Content in DWPF Sludge and Glass Product Samples. R. A. Dewberry, December 1991.
9. WSRC-TR-91-00079, Reinvestigation of Method for Determining Fe(II)/Fe(III) in Glass (U), E. W. Baumann, February, 1991.
10. DPST-88-309, The Determination of the Fe^{2+}/ Fe^{3+} Ratio in DWPF Glass, JM. J. Plodinec and R. T. Hunter, February, 1988.
11. DPST-80-217, Fracture and Porosity in Cooled Glass Castings, P. K. Smith, May, 1980.
12. The Hazardous Waste Consultant, "Reducing Hazardous Waste from Fluorescent Lights", May/June 1993.

Attachment 1
Material Characterization of High Level Waste Sludges

Code No.	1	2	3	4	5	6	7	8	9
Sample	Tk51-Aw	Tk51-B	Tk51-Bw	Tk51-C	Tk42A	Tk42B	Tk42C	Tk51-D	Tk40-Aw
Sample Date	Unk 1988	Oct-95	Oct-95	Dec-95	Oct-92	Jan-98	Jan-98	Dec-98	Jul-01
Reference Documents	WSRC-TR-94-0505	WSRC-RP-95-1003, WSRC-TR-95-481	WSRC-RP-95-1003, WSRC-TR-95-481	WSRC-RP-95-1048	WSRC-RP-94-730	WSRC-RP-98-406	WSRC-RP-98-406	WSRC-MS-99-436, R1	WSRC-RP-2001-971, WSRC-TR-2002-76, WSRC-TR-2002-255 (only for missing istopes)
Ag		1.20E-02	1.40E-02	1.30E-02				1.85E-02	1.06E-02
Ba								4.61E-02	3.68E-02
Cd						1.00E-01		1.10E-01	1.39E-01
Cr	1.90E-01	1.60E-01	1.90E-01	1.70E-01	1.30E-01	1.20E-01	1.40E-01	1.32E-01	1.57E-01
Hg	1.90E-01	1.40E-01	1.60E-01	1.50E-01	9.40E-01			8.61E-01	1.95E-01
Pb								7.48E-02	8.57E-02
Pu-238	5.00E-04	5.10E-04	7.97E-04		5.14E-04			5.81E-04	2.30E-04

Attachment 1 (continuation)
Material Characterization of High Level Waste Sludges

Code No.	15	16	17	Average of Measured Values, wt%	Std. Dev. Of Mesured Values, wt.%	Measured Values, mg/Kg	Maximum Concentration in Waste Container,mg element/Kg waste
Sample	Tk40-E	Tk11-A	Tk11-B				
Sample Date	Nov-04	May-05	Jul-05				
Reference Documents	WSRC-TR-2005-49, WSRC-TR-2005-157	WSRC-TR-2004-473	WSRC-TR-2004-473				
Ag	1.59E-02	4.09E-04	1.03E-03	1.08E-02	6.18E-03	1.08E+02	7.35E-02
Ba	4.83E-02	1.93E-02	2.01E-02	4.06E-02	1.60E-02	4.06E+02	2.77E-01
Cd	1.75E-01	*<3.00E-03*	*<2.00E-03*	1.19E-01	8.41E-02	1.19E+03	8.14E-01
Cr	1.07E-01	4.84E-02	3.27E-02	1.37E-01	5.75E-02	1.37E+03	9.32E-01
Hg	1.46E-01	2.57E-01	9.78E-01	3.78E-01	3.55E-01	3.78E+03	2.58E+00
Pb	*<1.70E-01*	*<8.00E-02*	*<3.00E-02*	8.31E-02	4.71E-02	8.31E+02	5.67E-01
Pu-238	1.51E-04			4.69E-04	2.17E-04	4.69E+00	3.20E-03

Highest waste container has 5.5E-08 Ci Pu-238/g waste

5.5E-08 x 0.058 g/Ci of Pu-238 = 3.2E-09 g of Pu-238/g of waste

Ratio of 3.2E-09 to R11 is as x is to R5 through R10.

Attachment 2
List of Items Found in Casks by X-ray

Absorbent
Agitator Parts
Beakers/Tubing
Bottles
Cabinet/Sight Glass
Can
Caps
Cardboard
C-Clamp
Centrifuge
Corrugated Waste
Dense Metal Object
Electrical Equip./Motor
Equip. Manipulator Arm
Equipment
Eye Hook
Filter
Fittings, Cajun/Tubing
Flasks
Glass Beaker
Glass Beakers
Glass Bottle
Glass Bowls
Glass Condenser
Glass Cups
Glass Equipment
Glass Flasks
Glass Jars
Glass Reaction Vessel
Glass Tubing/Tubes
Glass Vessel
Glass Vials
Glassware
Glassware & Absorbent
Glassware Holders
Glove Port
Hook
Lab Clamps
Lab Equipment
Lamp Cover
Lard Can
Lifting Hook
Lifting Ring
Mech & Elect Connect.
Mercury Vapor Bulb
Metal Banding/Frame
Metal Beakers
Metal Bolts
Metal Bowl/Tubing
Metal Box
Metal Brackets
Metal Cabinet Parts
Metal Can
Metal Can with Lid
Metal Can/Dense Object
Metal Equipment
Metal Eyehooks/Hook
Metal Frame
Metal Funnels
Metal Pan
Metal Pipe
Metal Plate
Metal Rack
Metal Rail
Metal Rings/Fittings
Metal Rod
Metal Shelves
Metal Tray/Metal Box
Metal Tube/Tubing
Metal Vessel/Filter
Metal/Glass Bowl
Metal/Glass Box
Metal/Parts
Motor
Motor/Metal Tube
Motor/Pump
Paper
Parts
Piping
Piping
Plastic
Plastic Bag & Residue
Plastic Bottles
Plastic Lab Equipment
Plastic Tubing
Plastic Vial
Pulley
Pump
Pump/Tubing
Rectangular Dense Obj.
Round Balls
Round Dense Object
Salt Collection Tanks
Sheet Metal
Shelves
Tools
Tools/Electrical Equip.
Tubing
U-Bolt
U-Bolt Handle
U-Bolt/Metal Tools
Valve
Vessel
Wire
Wire Basket
Wire Cable
Wire Mesh
Wire Rope/Wiring
Wire/Wire Mesh

Appendix 2
Letter from SC DHEC

D H E C
PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner
Promoting and protecting the health of the public and the ...

March 9, 2006

Mr. Hal W. Morris
Solid Waste Engineering
Westinghouse Savannah River Company, LLC
Post Office Box 616, Building 705-3C
Aiken, South Carolina 29808

Re: Your request of March 7, 2006 for the removal of the hazardous waste labels from 82 containers of DWPF research waste from SRNL

Dear Mr. Morris:

Based on the information supplied in your request, this office has no objections to the removal of the hazardous waste labels from the above referenced containers.

Sincerely,

Kurt Zollinger

Kurt Zollinger, CHMM
Solid & Hazardous Waste
Region 5, Aiken
Environmental Quality Control

cc: David F. Hoel, DOE, 730-B, Room 2293
Bobby Lee, Land & Waste Management, SC DHEC
Shelly Sherritt, Land & Waste Management, SC DHEC
Richard T. Caldwell, Region 5, EQC, SC DHEC
James Burckhalter, Region 5, EQC, SC DHEC