SC&A S. COHEN & ASSOCIATES
AN EMPLOYEE-OWNED COMPANY

January 17, 2006

Mr. David Staudt
Center for Disease Control and Prevention
Acquisition and Assistance Field Branch
Post Office Box 18070
626 Cochrans Mill Road – B-140
Pittsburgh, PA 15236-0295

Re: Contract No. 200-2004-03805, Task Order 1: Draft *Issue Resolution Matrix Based on the SC&A Review of the NIOSH Site Profile for the Savannah River Site*

Dear Mr. Staudt:

Enclosed is a draft issue resolution matrix for the Savannah River Site Profile Review that was submitted by S. Cohen & Associates (S&A) in March 2005. This matrix was prepared in response to a recommendation of the Site Profile Working Group of the Advisory Board on Radiation and Worker Health at one of its recent meetings. The issues presented in the matrix are divided between "primary" and "secondary" issues, with the former having more direct significance to the adequacy and completeness of dose reconstruction. The intent is to initiate an issue resolution process between NIOSH, the Board, and SC&A regarding the key findings of that report.

Of particular note are three issues that point to the possibility of potential "missing dose" to classes of workers at the Savannah River Site. Also, there is an issue related to regulatory compliance with 42 CFR 82.

The first issue pertains to the lack of consideration of internal dose contributions from impurity radionuclides (e.g., ^{99}Tc, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{237}Np, ^{232}U, ^{233}U and ^{236}U) in recycled uranium. In addition, SRS produced isotopes during the transplutonium program and for non-military commercial use. The transplutonium program included production and processing of ^{252}Cf, ^{242}Pu, ^{244}Cm, and ^{243}Am. The High Neutron Flux program was responsible for production of high-specific activity ^{60}Co. Other campaigns included the production and purification of radionuclides including ^{233}U, ^{210}Po, ^{170}Tm, ^{192}Ir, ^{152}Eu and various isotopes of lanthanum. The potential impact of internal and external exposure to impurity radionuclides and radionuclides from special campaigns should be analyzed and included in the TBD. The issue is presented in the matrix as Comment 1.

Secondly, the TBD has underestimated the true exposure being measured by the dosimeter. The dosimeter calibration is based on an incident angle of zero degrees, which underestimates the actual field dose where exposure angles are greater than zero.

The correction factor applied to recorded dosimeter results is too low for photon energies from 30 to 250 keV, which is the default photon energy. The general standard deviation value is too low for film dosimeters prior to 1971. Furthermore, the dosimeter adjustment factors are inconsistent with the DOE complex-wide technical information bulletins. There is also a lack of guidance pertaining to interpretation of shallow dose. The issue is presented in the matrix as Comment 2.

There are unanswered questions regarding the validity of neutron-to-photon ratios at SRS. The TBD concludes that due to uncertainty in the NTA response to low energy neutrons, neutron-to-photon ratios will be applied from 1953 to 1970. These values are based the interpretation of limited data for defining location-specific neutron-to-photon ratios. Uncertainty factors associated with the neutron-to-photon ratio are neither technically defensible nor likely to be claimant favorable. The TLND recorded neutron dose used from 1971-1995, as well as the pre-1971 neutron doses (derived by neutron-to-photon ratios) suffer from a high degree of uncertainty. SC&A recommends the use of the 95th percentile for all claimants regardless of the compensability of the claim. The issue is presented in the matrix as Comment 3.

The dose reconstruction process must comply with the requirements of 42 CFR 82, *Methods for Radiation Dose Reconstruction Under the Energy Employees Occupational Illness Compensation Program Act of 2000*. 42 CFR 82 Part 82.18(b) states "NIOSH will calculate the dose to the organ or tissue of concern using the appropriate current metabolic models published by the ICRP." For the purpose of calculating maximizing dose, NIOSH has taken the top intake values, averaged them, and used these average values to calculate an organ dose in IMBA. The intake values were derived from a best-fit analysis by the Savannah River Site Internal Dosimetry group based on the ICRP 30 methodology. A more appropriate and compliant approach would be to start with the original bioassay data and use the ICRP 60 series methodology for calculation of intake values. This issue is presented in the matrix as Comment 6.

We would be pleased to discuss these and other issues cited in the Savannah Rive Site Profile Review, as reflected in the enclosed matrix, at your convenience.

Sincerely,

John Mauro
Project Manager

cc: P. Ziemer, PhD, Board Chairperson
Advisory Board Members
L. Wade, PhD, NIOSH, Project Officer
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Project File (ANIOS/001/03)

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Summary of Task 1 Savannah River Site Technical Basis Document Finding Matrix – Vertical Issues

Comment Number	TBD Number	Issue Number	Section Number	Issue Description	SC&A Page No.	NIOSH Response	Board Action
Primary Issue							
1	ORAUT-TKBS-0003	3, 9	5.3 5.9	There is incomplete assessment and guidance pertaining to recycled uranium and some transplutonium radionuclides. The site profile does not contain guidelines for resolving uncertainties related to recycled uranium (RU) in ways that give the benefit of the doubt to the claimants. For instance, the TBD does not consider internal dose contributions for plutonium, other transuranics, or fission products. The TBD has not completely evaluated the potential dose consequences related to the transplutonium program and non-military isotope production.	Pg. 46 Pg. 75		
2	ORAUT-TKBS-0003	4	5.4	There is an incomplete assessment of the beta/gamma dosimeter adjustment factors and uncertainties. The adjustment factors and uncertainties applied underestimate the true exposure measured by the dosimeter. Correction factors applied account for on-phantom calibration and do not consider uncertainty from field exposure conditions. Also, the standard deviation for film dosimeters prior to 1971 is too low. There is a lack of guidance pertaining to shallow dose.	Pg. 51		

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Summary of Task 1 Savannah River Site Technical Basis Document Finding Matrix – Vertical Issues

Comment Number	TBD Number	Issue Number	Section Number	Issue Description	SC&A Page No.	NIOSH Response	Board Action
Primary Issue							
3	ORAUT-TKBS-0003 & OCAS-TIB-007	5	5.5	There are unanswered questions regarding the validity of neutron-to-photon ratios at SRS. The geometric mean and standard deviation that describe the post-1971 neutron-to-photon ratio are not technically sound or likely to be claimant favorable to a large number of claimants. The TLND recorded neutron doses between 1971 and 1995, as well as the pre-1971 neutron doses (derived from neutron-to-photon ratios), suffer from a high degree of uncertainty. The use of the 95th percentile value for the TLND neutron dose of records is recommended for use.	Pg. 61		
4	ORAUT-TKBS-0003	6	5.6	The adequacy of the F- and H-area Tank Farm characterization in the TBD is questionable for use as dose reconstruction guidance. Data evaluation appears to be incomplete with regard to exposure conditions and uncertainty. This is particularly true for early periods of operation, where primary records involving key operations and incidents are lacking. Moreover, no references are provided for the Tank Farm discussion in the TBD, and there is no analysis indicating how the conclusions were reached.	Pg. 66		

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Summary of Task 1 Savannah River Site Technical Basis Document Finding Matrix – Vertical Issues

Comment Number	TBD Number	Issue Number	Section Number	Issue Description	SC&A Page No.	NIOSH Response	Board Action
Primary Issue							
5	ORAUT-TKBS-0003	11	5.11	For early SRS workers, the site profile lacks a comprehensive evaluation of the early monitoring program with respect to its consistent application, adherence to procedures, recordkeeping, and adequacy, all of which hold significant implications for reconstructing doses for unmonitored workers during the early years. Similar gaps in data availability were noted for individual neutron exposure data, internal and external exposure data from special campaigns, and the radionuclide source term lists (and attendant concentrations and activity levels) used in the TBD, including those for the Tank Farms, recycled uranium, and environmental releases.	Pg. 81		
6	ORAUT-TKBS-0003 & ORAUT-OTIB-0001	1	5.1.1	The “high-five” approach is not consistent with the 42 CFR 82-recommended methodologies for calculation of internal dose.	Pg. 30		

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Summary of Task 1 Savannah River Site Technical Basis Document Finding Matrix – Vertical Issues

Comment Number	TBD Number	Issue Number	Section Number	Issue Description	SC&A Page No.	NIOSH Response	Board Action
Secondary Issues							
7	ORAUT-TKBS-0003	2	5.2	There are limitations associated with the assignment of Occupational Environmental Dose. The method used to reconstruct doses to unmonitored outdoor workers due to airborne emissions employs an atmospheric dispersion model, assumptions, and a resuspension factor that do not appear to be claimant favorable and is not entirely appropriate for this class of problem. For modeling of airborne radionuclide releases, one potentially significant issue is the non-conservatism of the standard Gaussian model used in the TBD where it pertains to "non-standardized" short-term releases occurring during stable atmospheric conditions. Based on an SC&A review of the literature, it also appears that the TBD resuspension factor of 1×10^{-9} per meter may not be claimant favorable by 3 to 4 orders of magnitude.	Pg. 38		
8	ORAUT-TKBS-0003 & ORAUT-OTIB-0003	8	5.8	The TBD does not adequately address potential exposures of workers handling tritium and performing decontamination and decommissioning to special tritium compounds including organically bound tritium and stable metal tritides.	Pg. 73		

Comment Number	TBD Number	Issue Number	Section Number	Issue Description	SC&A Page No.	NIOSH Response	Board Action
Secondary Issues							
9	ORAUT-TKBS-0003 & ORAUT-OTIB-0001	1	5.1.2	There are data adequacy issues associated with the high-five approach. The completeness of the data from which intakes were derived is questionable. The criteria for inclusion of individuals in the SRS intake file have changed over time excluding some intakes from the file. Works Technical Department reports contain reports of intakes not mentioned in the SRS intake file. In addition, some radionuclides were present at the site prior to the availability of bioassay techniques.	Pg. 31		
10	ORAUT-TKBS-0003 & ORAUT-OTIB-0001	1	5.1.3	There are technical issues associated with the high-five approach. The use of surrogate data for internal dose for unmonitored workers and for target organs that do not concentrate the radionuclides in question is not necessarily a maximizing approach for making dose estimates, contrary to the claim in the TBD. SC&A was not able to independently validate whether this approach considered chronic intakes (as well as acute intakes), because access was not provided to individual bioassay data that could corroborate such intakes.	Pg. 34		

Comment Number	TBD Number	Issue Number	Section Number	Issue Description	SC&A Page No.	NIOSH Response	Board Action
Secondary Issue							
11	ORAUT-TKBS-0003 & ORAUT-OTIB-0001	1	5.1.3	For internal dose calculations, the use of ICRP 30 methodology to calculate the intake with a subsequent use of ICRP 68 models to calculate the dose did not always result in the intended highest dose to an organ. Similarly, the appropriate solubility types between the two methodologies were not always paired consistently, resulting in discrepancies and non-claimant favorability.	Pg. 34		
12	ORAUT-TKBS-0003	7	5.7.3	There is a need to improve internal dosimetry with regard to radionuclides solubility, oro-nasal breathing, and the ingestion pathway, Solubility, oro-nasal breathing, and ingestion should be carefully considered in regard to internal dose reconstruction. SC&A originally developed these points for the review in the Bethlehem Steel and Mallinckrodt Chemical Works site profile reviews, and they are applicable for all bioassay interpretations for EEOICPA	Pg. 72		
13	ORAUT-TKBS-0003	10	5.10	Incidents and high-risk jobs are not listed in the TBD or referenced to alert dose reconstructors to unique exposure conditions.	Pg. 76		

Comment Number	TBD Number	Issue Number	Section Number	Issue Description	SC&A Page No.	NIOSH Response	Board Action
Secondary Issue							
14	ORAUT-TKBS-0003	12	5.12	Additional sources of external dosimetry data, primarily neutron dosimetry data, exist which are not currently being used in the dose reconstruction process.	Pg. 85		
15	ORAUT-TKBS-0003	13	5.13	Many of the sections of the TBD, especially Chapter 4 related to internal dosimetry, are very difficult to understand, and, together with the large array of TIBs and other OCAS/ORAU procedures, create a virtually impenetrable complex array of guidelines. This situation lends itself to inconsistencies in the way in which dose reconstructions are performed, and makes it difficult to verify the reliability and reproducibility of the dose reconstructions.	Pg. 87		
16	ORAUT-TKBS-0003	14	5.14	The special exposure circumstances for subcontractors and construction workers are currently not included in the TBD; however, NIOSH is aware of this issue and has developed a path forward for resolving it.	Pg. 91		