

Savannah River Site

Historical Radiochemistry Data Peer Review

Executive Summary

A peer review is a documented, critical review performed by peers who are independent of the work being reviewed. The review shall include (as appropriate) an in-depth analysis and evaluation of assumptions, calculations, extrapolations, alternate interpretations, methodology, and acceptance criteria employed, and of conclusions drawn in the original work. It will assess the adequacy of the original work and determine its acceptability for use per the requirements of Code of Federal Regulations Title 40 Part 194 (40 CFR Part 194).

The Department of Energy (DOE) Carlsbad Field Office (CBFO) implements peer reviews in accordance with CBFO Management Procedure (MP) 10.5, Revision 8, *Peer Review*. This procedure applies to the performance of peer reviews prescribed in 40 CFR Part 194, and conducted under the responsibility of the CBFO. The peer reviews may be applied to repository performance demonstrations as specified in 40 CFR §194.27, used to qualify waste characterization data as specified in 40 CFR §194.22(b), and used for other applications requiring the use of Nuclear Regulatory Guide 1297 (NUREG-1297).

The CBFO Office of the National TRU Program (NTP) required this peer review to qualify historical radiochemistry data analyzed by the Battelle Radioanalytical Laboratory, which was used to establish radiological properties for Battelle Columbus Laboratory Decommissioning Project (BCDLP) waste streams SR-BCLDP-004.002 and SR-BCLDP-004.003 at the Savannah River Site (SRS). The two waste streams consist of remote-handled (RH) composite filter debris waste that was packaged into 0.105-inch steel drum liners and placed into 55-gallon drums at the Battelle Memorial Institute, and then shipped to the SRS. The DOE requested that the peer review pertain only to the information used to establish radiological properties for waste streams SR-BCLDP-004.002 and SR-BCLDP-004.003; and that the peer review evaluate the applicable radiological analytical results related to the data quality objectives (DQOs) for radiological properties defined in DOE/WIPP-02-3214, Revision 1, *Remote-Handled TRU Waste Characterization Program Implementation Plan* (RHPIP), specifically for transuranic (TRU) Waste Determination and Activity Determination.

The peer review also evaluated the radiological analytical results against the applicable quality assurance objectives (QAOs) for precision, accuracy, representativeness, completeness, and comparability identified in the RHPIP.

After in-depth analysis and due consideration, the Peer Review Panel concluded the following:

1. The documentation presented provides sufficient evidence that the data from the BCLDP radioanalysis were obtained under an industry-acceptable quality program;
2. The data from the radioanalysis are sufficient for use in addressing the DQOs and QAOs for the characterization of RH TRU waste;
3. The data can be qualified under the requirements of the RHPIP.

Introduction

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Background

For this peer review, the CBFO Office of the National TRU Program (NTP) required a peer review to qualify historical radiochemistry data analyzed by the Battelle Radioanalytical Laboratory, which was used to establish radiological properties for Battelle Columbus Laboratory Decommissioning Project (BCDLP) waste streams SR-BCLDP-004.002 and SR-BCLDP-004.003 at the Savannah River Site (SRS). The two waste streams consist of remote-handled (RH) composite filter debris waste that was packaged into 0.105-inch steel drum liners and placed into 55-gallon drums at the Battelle Memorial Institute, and then shipped to the SRS. The DOE requested that the peer review pertain only to the information used to establish radiological properties for waste streams SR-BCLDP-004.002 and SR-BCLDP-004.003; and that the peer review evaluate the applicable radiological analytical results related to the data quality objectives (DQOs) for radiological properties defined in DOE/WIPP-02-3214, Revision 1, *Remote-Handled TRU Waste Characterization Program Implementation Plan* (RHPIP), specifically for transuranic (TRU) Waste Determination and Activity Determination.

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RH TRU waste characterization involves obtaining chemical, radiological, and physical data, and is a primary component in ensuring Waste Isolation Pilot Plant (WIPP) compliance with regulatory requirements. The RHPIP identifies waste characterization requirements and methods to satisfy requirements in 40 CFR Part 191 (Subparts B and C) and Part 194 (EPA, 1993; EPA, 1996), the U.S. Environmental Protection Agency (EPA) final certification decision contained in 40 CFR 194, and the WIPP Land Withdrawal Act (LWA) (Public Law 102-579).

The RH TRU waste characterization program consists of characterization requirements and objectives that must be met by the generator site waste programs prior to the shipment of RH TRU waste to the WIPP.

DQOs and QAOs serve two separate functions. First, DQOs support decision-making and are developed in order to satisfy the requirements that significant waste components must be tracked and controlled to assure that the inventory-related assumptions in the Performance Assessment (PA) and Performance Assessment Verification Test (PAVT) remain valid. These objectives ensure compliance with legal and regulatory requirements (i.e., they are the bases for decisions on whether compliance is achieved). Second, QAOs are data characteristics used to determine that the quality of data is acceptable. They also support decision-making by assessing the integrity of the data used. In the strictest sense, QAOs are used to assess the quality of analytical data and therefore are quantitative. However, in order to maintain regulatory and programmatic consistency, QAOs may be used with qualitative information. In this case, all of the QAOs (precision, accuracy, representativeness, comparability, and completeness) may not be applicable.

For purposes of implementation of the waste characterization program, DQOs have been developed and are derived directly from a regulatory requirement. Subsequently, QAOs have been developed and are derived from methods used to collect data to satisfy the DQOs. Many times, the regulatory requirement provides a quantitative limit that the total waste inventory must meet. In some cases, the requirement also specifies acceptable methods for assessing compliance with the limit and the amount and nature of documentation needed to demonstrate compliance.

During the course of the peer review, the DOE identified the two DQOs (2.2.2.1, TRU Waste Determination, and 2.2.2.3, Activity Determination) that are pertinent to this peer review.

2.2.2.1 TRU Waste Determination

Purpose for collecting the data:

To determine whether the waste contains 100 nanocuries (nCi) or more of TRU isotopes per gram of waste (Regulatory basis: LWA).

Type of data to collect:

Data on the TRU activity for each waste container shipped to the WIPP.

Tolerable decision error:

The definition of TRU waste does not specify a margin of error or uncertainty. Generator sites must demonstrate that their methods for determining the TRU isotopes per gram of waste are capable of distinguishing TRU waste from low-level waste for those wastes near 100 nanocuries per gram (nCi/g). Instruments performing TRU/low-level waste discrimination measurements must have a lower limit of detection (LLD) of 100 nCi/g or less.

2.2.2.3 Activity Determination

Purpose for collecting the data:

To confirm the total activity for compliance with LWA limits concerning the total waste inventory (i.e., no more than 5.1 million curies of RH TRU waste disposed; 23 curies per liter limit per canister) and to track radionuclides that are important to the calculation of releases (Regulatory bases: LWA, EPA Certification of the WIPP).

Type of data to collect:

Data on the activity of the waste in each container.

Tolerable decision error:

The activity requirements for RH TRU waste are not specified with associated precision or accuracy limits. There may be uncertainties associated with the methods for obtaining the data needed. The generator sites must determine and document the total uncertainty associated with the determination of the activity of the radionuclides in waste to be shipped to the WIPP. For each container, the total activity plus the associated total measurement uncertainty (TMU), expressed in terms of one standard deviation, shall not exceed 23 curies per liter averaged over the volume of the container.

DOE also identified the one QAO, dose to curie (DTC), from Table 2.1 of the RHPIP, RH TRU Waste Characterization Method Quality Assurance Objectives, which is pertinent to this peer review. The other DQOs and QAOs identified in the RHPIP were deemed not applicable to this peer review.

- Precision – Precision shall be established and maintained within the recommendations of the manufacturer of the dose-rate instrument used. The precision of the instrument shall be documented and factored into the TMU determined for the overall method.
- Accuracy – Calibration shall be established and maintained within the recommendations of the manufacturer of the dose-rate instrument. The accuracy of the instrument shall be documented and factored into the TMU determined for the overall method.
- Representativeness – Representativeness of the isotopic distributions will be confirmed by sampling in accordance with an approved sampling plan (see section 4.1.8 of the RHPIP). The representativeness of the sampling shall be documented and factored into the TMU determined for the overall method.
- Completeness – This will be ensured by measuring the dose rate for every container. The sites must verify that the measured dose rate is at least 10 times greater than background.
- Comparability – Standardized instructions must be used in designing and implementing the measurement program.

Peer Review Process and Analysis

Rigorous quality assurance (QA) was applied to the peer review process by assigning an experienced QA professional to serve on the peer review management team to ensure that the peer review process was conducted and documented in accordance with CBFO MP 10.5, Revision 8, *Peer Review*. CBFO MP 10.5, Revision 8 addresses and incorporates requirements from NUREG 1297, *Peer Review for High-Level Nuclear Waste Repositories*, published February 1988, and *CBFO Quality Assurance Program Document*, DOE/CBFO-94-1012, Revision 10. CBFO MP 10.5, Revision 8 provides a controlled process for conducting the peer review, including development of records demonstrating that the process was followed for the peer review. As provided for in CBFO MP 10.5, Revision 8, the CBFO Director of the Office of Quality Assurance appointed a QA observer who performed CBFO Audit A-10-22 addressing the peer review process and documentation. The A-10-22 audit report will be issued under separate cover.

The peer review process included an in-depth analysis and evaluation of the information being reviewed in accordance with CBFO MP 10.5, Revision 8, Attachment I, section 6.2.2, as applicable. Aspects of section 6.2.2 that were not applicable are labeled as such.

- Validity of assumptions
- Alternate interpretations
- Uncertainty of results and consequences if wrong
- Appropriateness and limitations of methodology and procedures
- Adequacy of application
- Accuracy of calculations
- Validity of conclusions
- Adequacy of requirements and criteria, in accordance with approved technical and quality assurance requirements and the applicable peer review plan

After the first round of subject matter expert presentations to the peer review panel, the DOE relaxed its “limitations” on the peer review and allowed the technical presenters to introduce other useful documents that were not formally on the list of allowed documents. They also allowed the peer review panel members to request documents that they thought would be useful to conducting a defensible peer review. The DOE also focused the peer review on specific documents and specific pages that were previously provided to the peer reviews as much of the information provided was not pertinent to the review of waste streams SR-BCLDP-004.002 and SR-BCLDP-004.003. The following table shows the DOE direction of information to be considered to speed and simplify the peer review.

Document	DOE Direction to the Peer Review Panel
C701	Page 7
P032	QA Manual BCLDP D&D, not critical
P517	WA-0P-033, Rev. 3, Pages 2, 3, history of revisions, all relevant documents
P707	Pages 3 – 8, example of work instrument, page 5 item 12
P752	QA Manual all relevant pages
RL-AP-2.0	Not critical
RL-CP-010	Critical
RL-CP-012	Critical
RL-TP-030	Critical
RL-TP-054	Critical
U009	Pages 74 – 95
U015	Laboratory QA process, not critical
U022	Pages 4, 51, 52, 72,73, drum packaging records not critical
U026	Smear sample results, pages 28 – C8
U514_PT1	Sample 99-0615, pages 188 – 200 Sample 99-0534, pages 145 – 154 Sample 99-0500, pages 115 – 124 Sample 99-0474, pages 79 – 89 Sample 99-0334, pages 27 – 40
BC0021	Pages 18 – 30
U719	Page 32

The peer review panel assessed the data and other information presented by the DOE subject matter experts (SMEs) to determine their level of confidence in the analytical results generated by the Battelle Memorial Institute Radioanalytical Laboratory (RAL). The data were used to determine if the DQO in sections 2.2.2.1 and 2.2.2.3, and the DTC QAOs from Table 2.1 from the RHPIP, were met.

This peer review was performed because there were missing data and support information in the permanent record that precluded normal qualification of the analytical data. For example, there are no calibration data, training records are incomplete and several documents do not have required signatures. The peer reviewers were therefore focused on evaluating the effect of the missing information on the acceptability of the data. The following is a discussion of specific questions that the panel addressed:

1. *Did the laboratory have an adequate quality assurance (QA) program? The existence of a robust QA plan would provide evidence that the laboratory was operated in a technically proper and controlled manner.*

The RAL did have a comprehensive QA Program Plan, P752, Battelle RL-QAP-1.0 Revision 4, *Decontamination and Decommissioning Operations Radioanalytical Laboratory Quality Assurance Program Plan For Battelle Columbus Laboratories Decommissioning Project*, that if followed, would result in data of acceptable quality.

The revision dates listed in the revision history page of the QA Program Plan indicates that the document was reviewed on a regular basis and was effective for the dates of concern for this review. The QA Program Plan requires:

- a. Approved vendors – Ensures that supplies and equipment of acceptable quality are used.
- b. Document Control Policy – Ensures that only current approved procedures are used and that documents are properly archived.
- c. Personnel Training – Ensures that scientists and technicians operate the instruments correctly, perform laboratory operations correctly, and were aware of documentation requirements.
- d. Independent Data Review – Each data report must be reviewed by a qualified and independent peer before the data are reported.
- e. National Institute of Science and Technology (NIST) Traceable Standards – Ensures that only acceptable materials are used for instrument calibration.
- f. Use of a Chi (X) squared procedure to demonstrate instrument precision – Indicates the laboratory is operated in a technically sound manner.
- g. Efficiency and Resolution for Gamma and Alpha Spectroscopy – Demonstrates that the instruments are operated as specified by the manufacturer and that the laboratory is aware of proper radioanalytical procedures.
- h. Laboratory and QA Manager Review – Ensures that regular reviews for technical, operational, and quality compliance are verified.
- i. Instrument Calibration Requirements – Ensures that instruments are properly calibrated and therefore produce accurate and precise data.
- j. Participation in Performance Evaluation Programs – Ensures that the laboratory is capable of producing accurate data from an independent source and provides evidence that the laboratory is operating in a technically acceptable manner.

Much of the documentation that was required by the QA Program Plan was not available for the peer review. However, the panel concludes that the plan was comprehensive, well-developed, and indicative of an organization that was operated in a professionally and technically sound manner.

One important requirement of the QA Program Plan that was found on the raw data reports was that all of the data were reviewed by a scientist who was not involved in the preparation or analysis of the samples. The presence of the review provides evidence that

the laboratory was following the QA Program Plan and also that the data were of a quality specified in the laboratory procedures.

2. *Did the laboratory have acceptable Standard Operating Procedures? The presence of operating procedures for instrument operation, data review, and instrument calibration would provide evidence that the data generated by the laboratory would be of a known value.*

The laboratory had several standard operation procedures (SOPs) that were reviewed by the panel. These included:

- RL-CP-012, Revision 2, Decontamination and Decommissioning Operations Radioanalytical Laboratory Calibration Procedure, *Alpha Spectroscopy Instrument Calibration, Operation and Preventative Maintenance Procedures*;
- RL-TP-030, Revision 4, Decontamination and Decommissioning Operations Radioanalytical Laboratory Calibration Procedure, *Gamma Spectrometric Analysis of Laboratory Samples Using Canberra Procount™ Software*;
- RL-CP-010, Revision 3, Decontamination and Decommissioning Operations Radioanalytical Laboratory Calibration Procedure, *Efficiency Calibration of Germanium Detectors Using Canberra Procount™ Software and Preventative Maintenance*;
- RL-TP-054, Revision 3, Decontamination and Decommissioning Operations Radioanalytical Laboratory Calibration Procedure, *Determination of Actinides in All Sample Matrices*; and
- RL-AP-2.0, Revision 0, Decontamination and Decommissioning Operations Radioanalytical Laboratory Calibration Procedure, *Radiochemical Data Validation of Samples Analyzed in the Radioanalytical Laboratory*.

The review of these SOPs provided evidence that the laboratory was operated in a technically sound manner. If the laboratory operations were performed as specified in the SOPs, the data generated by the laboratory would be of acceptable quality.

3. *Additional Considerations for Data Qualification*

- a. The laboratory participated in the semi-annual DOE Environmental Measurements Laboratory (EML) program, which monitors a laboratory's performance for monitoring and sampling water, soil, vegetation, and air. The laboratory had acceptable performance for all measurements except Sr-90 in one set of samples. The laboratory also participated in the EPA Performance Evaluation Study (PES) in ten round-robin events for nuclides in water starting in 1996, with no results outside of acceptance limits. This information was provided in U015, Acceptable Knowledge Source Document Summary, Battelle, Quality Assurance description, Radioanalytical Laboratory Procedures Manual list,

Administrative Operating Procedure for the Radioanalytical Laboratory (JN-2), Acceptable Knowledge Source Document Review Summary, CCP Records Transmittal/Receiving Form (U015), page 2.

The successful performance of the RAL in these PESs provides evidence that the laboratory was generating data of acceptable quality throughout the period of interest for this review.

- b. Several examples of chain-of-custody (COC) documents were found. For example, U514_PT1, Acceptable Knowledge Source Document Summary, Battelle, Container-specific BCLDP documentation for the RH liners (in drums and canisters) (U514), page 21. This indicates that the laboratory was completing COC as required by procedure.
- c. Examples of case narratives could be found in the data provided to the panel. For example, see U514, page 82. The case narrative indicates that the laboratory was following the SOP requirements for data reporting.
- d. Raw data sheets were reviewed for samples from both waste streams. All of these data sheets had been independently reviewed as required by procedure, and indicated that the laboratory was operating in compliance with the applicable SOPs.
- e. The laboratory demonstrated a detailed understanding of the uncertainties associated with the results reported for both of the waste streams. This level of understanding of the process is indicative of a radiological laboratory with a strong technical basis. See CCP-AK-SRS-541A, Revision 0, *Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report For Remote-Handled Transuranic Cartridge Water Filters From Battelle Columbus Laboratories Decommissioning Project at the West Jefferson North Facility*. June 17, 2008 (541A), page 21, and CCP-AK-SRS-541B, Revision 1, *Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report For Remote-Handled Transuranic Tri-Nuc Vacuum Filter Waste From Battelle Columbus Laboratories Decommissioning Project at the West Jefferson North Facility*. October 20, 2009 (541B), page 23, for the uncertainty analysis.
- f. Duplicate results were found for sample 09-0334 (drum BC0001) that demonstrated good precision for the Am-243 and Pu-242 tracers. The Am-243 results for the sample and sample duplicate were 0.1083 and 0.09918 $\mu\text{Ci/g}$ respectively, for a relative percent difference of 8.8%. The Pu tracer results were 1.15 $\mu\text{Ci/g}$ for both the sample and the sample duplicate. These results

demonstrate that the laboratory precision was acceptable and indicates that the laboratory could be expected to produce results of acceptable precision.

4. *Peer Review Analysis*

a. Validity of assumptions

The assumptions under review are that the laboratory was following their procedures with respect to training, instrumental operation, calibration, sampling, sample preparation and data review and verification.

The peer review panel has concluded that this assumption is valid for the following reasons:

- A secondary review was performed on all the raw radioanalytical data, as required by procedure.
- While the documentation was incomplete, there were multiple examples of COC documents, sample preparation sheets, and limited training records that demonstrated that the laboratory was following QA requirements.
- The laboratory passed several PESs during the time of interest, demonstrating that the laboratory was operating the instruments acceptably.

b. Alternative interpretations

- This section is not applicable to this peer review because the data are either acceptable or not and so there are no alternative interpretations available.

c. Uncertainty of results and consequences if wrong

- This section is not applicable to this peer review because the data are either acceptable or not and so there is no uncertainty applicable to this decision.

d. Appropriateness and limitations of methodology and procedures

- The methods and procedures used by the RAL in generating the data were thoroughly reviewed by the peer review panel and found to be appropriate and technically sound.

e. Adequacy of application

- This section is not applicable to this peer review. The results under review did not involve an application, but relied on making assumptions about laboratory operations that could not be verified directly due to incomplete documentation; therefore there is no application.

f. Accuracy of calculations

- This section is not applicable to this peer review. There were no calculations used to verify acceptability of results.

g. Validity of conclusions

- The conclusion under review is that the data provided by the Battelle Radioanalytical Laboratory were acceptable for the characterization of the remote-handled waste. The peer review panel has determined that this conclusion is valid for waste streams SR-BCLDP-004.002 and SR-BCLDP-004.003 for the following reasons:
 - There was evidence of a comprehensive and adequate QA program.
 - While the documentation was incomplete, several examples were presented that demonstrated that the laboratory was following the applicable QA requirements.
 - The laboratory passed several PESs during the time under review, demonstrating that the laboratory was producing accurate and acceptable data.

h. Adequacy of requirements and criteria, in accordance with approved technical and QA requirements and the applicable peer review plan

- The requirements and the criteria to acquire the data were adequate as defined in the BCLDP QA plan.

5. *DTC Quality Assurance Objective Review*

a. Precision

- Documents 541A and 541B present data from multiple gross gamma radiation measurements from selected drums, which demonstrate adequate precision. See document 541A page 19 for multiple gross gamma measurements for drum BC0001 and document 541B page 20 for drum BC-0095.

Furthermore, the precision of the alpha spectrometry data generated at the RAL that was reviewed by the panel appears to not affect the TMU and supports the conclusion that the precision of the data from the RAL was adequate. Sample RL99-0334 is an example of duplicate data.

b. Accuracy

- The accuracy of the data reviewed by the panel appeared to be sufficient to not affect the DTC calculations or the TMU. In particular, the tracer recoveries appeared to be in a normally expected range for this type of measurement and the acceptable performance of the laboratory in the PESs indicate that the laboratory produces accurate data.

c. Representativeness

- The panel found sampling information in document U514 that indicates that multiple sample points were taken for compositing the sample for analysis. This was done to address obtaining a representative aliquot of the filter. The panel cannot determine from the information provided how the multiple samples were taken and, therefore, cannot ascertain if a representative sample was taken. The sampling was, however, performed using an approved sampling plan.

d. Completeness

- Data were observed for all of the drums pertinent to this review. No background data were provided, therefore, it cannot be verified that the measurements were greater than 10 times the background.

e. Comparability

- Standardized procedures were used for the processes related to the DTC method.

Peer Review Conclusions

The Peer Review Panel has concluded, after careful consideration with regard to the results of our review and analysis, that the radiochemical analyses performed by the BCLDP RAL were performed under an established quality program. Based on our professional opinion after a careful review of the data, the peer review panel finds that the data are of adequate quality to properly determine the radiological characteristics of waste streams SR-BCLDP.004.002 and SR-BCLDP.004.003.

Documentation presented to the panel, although not complete, does represent sufficient evidence to establish that the work performed by the BCLDP RAL was performed under a quality assurance program. The documentation was sufficient to address the QAOs and DQOs required by the DOE's QA Program for waste being disposed of at the WIPP. In particular, we find the data and supporting documentation to be sufficient to adequately address DQO 2.2.2.1, the determination of TRU waste, DQO 2.2.2.3, the determination of activity of the waste material,

and the QAO, dose-to-curie estimation for remote-handled waste. The panel, therefore, finds that the work performed by the BCLDP is satisfactory for use in the radiochemical characterization of waste streams SR-BCLDP.004.002 and SR-BCLDP.004.003.

Following a thorough review of the raw data, applicable standard operating procedures, and other supporting documentation, the panel finds the data and documentation to be of acceptable quality to allow the qualification of the data as required by the RHPIP.

Statements by the Peer Review Panel Members Reflecting Dissenting Views and Additional Comments.

There are no dissenting views among the peer review panel members. The panel members are in concurrence on all views and conclusions expressed in this report. We do wish to express the comment that a more complete quality record probably exists within the Battelle records archival system and that any additional material residing in that system would further enhance confidence in the data that we reviewed. We came to this conclusion based on the amount and nature of the material given to us and through discussions during the presentations given to the panel.

List the Peer Review Panel Members and Provide Acceptability Information (i.e., technical qualifications and independence) for Each Member

Edward (“Ned”) S. Patera Jr., Ph.D., and Paul C. Winkler, Ph.D., were selected as the peer reviewers for this peer review. These two individuals were selected by the Peer Review Panel Selection Committee as the two best candidates after determining that two peer reviewers would be adequate to address the scope of this peer review. It was agreed that the selected panel members would be able to address the complexity of the work to be reviewed, its importance to meeting safety or waste isolation performance goals, the necessary technical disciplines involved, the degree to which uncertainties in the data or technical approach exist, and the extent to which differing viewpoints are strongly held within the applicable technical and scientific community concerning the issues under review. It was also agreed that these two gentlemen could represent the major schools of scientific thought regarding the scope of this peer review. Both Dr. Patera and Dr. Winkler are independent of the work being reviewed, as documented and verified on CBFO Form 10.5-2, Determination of Peer Review Panel Member Independence Form.

The Selection Committee agreed that the technical qualifications of each panel member would be readily recognized and verifiable and that each would have the technical qualifications at least equivalent to those needed for the original work to be reviewed. It was also agreed that the two peer reviewers selected could adequately address the technical importance of the subject matter to be reviewed in this peer review. Dr. Patera was subsequently selected as the peer review panel chairman. Dr. Patera holds a Ph.D. in Chemistry from the University of Arizona and Dr. Winkler holds a Ph.D. in Analytical Chemistry from the Georgia Institute of Technology.

Signature of Each Peer Review Panel Member

Signature Page

Savannah River Site Historical Radiochemistry Data Peer Review

As a member of the Savannah River Site Historical Radiochemistry Data Peer Review Panel, I Ned Patera, Ph.D., provided input in the development of the Savannah River Site Historical Radiochemistry Data Peer Review Peer Review Report and discussed the Report's contents and conclusions with the other Panel member, Paul Winkler, Ph.D., throughout the peer review process. I unanimously endorse the Savannah River Site Historical Radiochemistry Data Peer Review Report dated June 3, 2010 and its conclusions, as witnessed by my signature below.

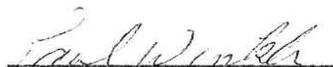


Edward S. Patera Jr., Ph.D.

Signature Page

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As a member of the Savannah River Site Historical Radiochemistry Data Peer Review Panel, I Paul Winkler, Ph.D., provided input in the development of the Savannah River Site Historical Radiochemistry Data Peer Review Peer Review Report and discussed the Report's contents and conclusions with the other Panel member, Ned Patera, Ph.D., throughout the peer review process. I unanimously endorse the Savannah River Site Historical Radiochemistry Data Peer Review Report dated June 3, 2010 and its conclusions, as witnessed by my signature below.

A handwritten signature in cursive script, reading "Paul Winkler", is positioned above a solid horizontal line.

Paul Winkler, Ph. D.

Attachment
Documents Reviewed for the Savannah River Site
Historical Radiochemistry Data Peer Review

QA Procedures and Manuals
Battelle HP-OP-019, Revision 2, <i>Decontamination and Decommissioning Operations Health Physics Operating Procedure Radiation and Contamination Survey Techniques.</i>
Battelle RL-AP-2.0, Revision 0, <i>Decontamination and Decommissioning Operations Radioanalytical Laboratory Administrative Procedure Radiochemical Data Validation of Samples Analyzed in the Radioanalytical Laboratory.</i>
Battelle RL-CP-010, Revision 3, <i>Decontamination and Decommissioning Operations Environmental Laboratory Calibration Procedure Efficiency Calibration of Germanium Detectors Using Canberra Procount™ Software and Preventive Maintenance.</i>
Battelle RL-CP-012, Revision 2, <i>Decontamination and Decommissioning Operations Radioanalytical Laboratory Calibration Procedure Alpha Spectroscopy Instrument Calibration, Operation, and Preventive Maintenance Procedures.</i>
Battelle RL-TP-030, Revision 4, <i>Decontamination and Decommissioning Operations Radioanalytical Laboratory Test Procedure Gamma Spectrometric Analysis of Laboratory Samples Using Canberra Procount™ Software.</i>
Battelle RL-TP-054, Revision 3, <i>Decontamination and Decommissioning Operations Radioanalytical Laboratory Test Procedure Determination of Actinides in All Sample Matrices.</i>
CBFO MP 4.2, Revision 5, <i>Document Review.</i> May 21, 2009, U. S. Department of Energy Carlsbad Field Office.
CBFO MP 10.5, Revision 8, <i>Peer Review.</i> February 16, 2010, U. S. Department of Energy Carlsbad Field Office.
CCP-AK-SRS-501, Revision 6, <i>Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report For Remote-Handled Transuranic Debris Waste From Battelle Columbus Laboratories Decommissioning Project at the West Jefferson North Facility.</i> December 8, 2009.
CCP-AK-SRS-540, Revision 1, <i>Central Characterization Project Acceptable Knowledge Summary Report For Battelle Columbus Laboratories Decommissioning Project (BCLDP) Remote-Handled Transuranic Waste from the Building JN-1 Hot Cell Laboratory Transfer and Storage Pool Waste Streams: SR-BCLDP.004.002 – Cartridge Water Filters SR-BCLDP.004.003 – Tri-Nuc Vacuum Filters.</i> June 10, 2009.
CCP-AK-SRS-541B, Revision 1, <i>Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report For Remote-Handled Transuranic Tri-Nuc Vacuum Filter Waste From Battelle Columbus Laboratories Decommissioning Project at the West Jefferson North Facility.</i> October 20, 2009.
CCP-AK-SRS-541A, Revision 0, <i>Central Characterization Project Remote-Handled Transuranic Radiological Characterization Technical Report For Remote-Handled Transuranic Cartridge Water Filters From Battelle Columbus Laboratories Decommissioning Project at the West Jefferson North Facility.</i> June 17, 2008.
C701, <i>Acceptable Knowledge Source Document Summary, Letter to James Eide, Fuel Pool Filter Waste Form Documentation</i>
DOE/WIPP-02-3214, Revision 1, <i>Remote-Handled TRU Waste Characterization Program Implementation Plan.</i> March 27, 2009, U.S. Department of Energy Carlsbad Field Office.
DOE/WIPP-02-3122, Revision 6.4, <i>Transuranic Waste Acceptance Criteria For the Waste Isolation Pilot Plant.</i> December 10, 2009, U.S. Department of Energy Carlsbad Field Office.
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