OSR 19-255 (Rev 2-19-2009)

Technical Task Request

Proc. Ref. E7, 2.02

Funding Source	Modification Traveler No.	Technical Task Request No.	Revision
SLA-SRNL-0042	N/A	HLE-TTR-2010-004	2

Design Authority Engineer		Date
David Broaden	Trudy Jolly 11/10/10	11/10/10
Performing Organization	**Design Authority Manager* (Signature)**	**Date**
SRNL	W. L. Isom W L Isom	11/10/10

Task Description
Tanks 5 and 6 Final Sample Analysis

Due Date 8/31/11 ~~4/30/11~~ DAJ

Task Activity
- ☐ All activities are to be performed and documented in accordance with Manual E7.
  Specific procedures are referenced with the associated tasks.
- ☒ Task Specific QA Plan, Reference To be developed by SRNL

Definition of Scope
- ☐ Not applicable to this request.
- ☒ Provided, Reference Provided as Appendix A in this TTR
- ☐ To be developed as part of this request. Specific activities are:
  - ☐ Scoping Studies
  - ☐ Feasibility Studies
  - ☐ Technology Assessment
  - ☐ Technology Development
  - ☐ Inputs and Assumptions
  - ☐ Other, Specify _____

Functional Requirements and Basis
- ☒ Not applicable to this request.
- ☐ Provided, Reference _____
- ☐ To be developed as part of this request. Specific activities are:
  - ☐ Develop functional performance requirements to be included as part of the MT or Task Requirements and Criteria.

Facility Hazard Category
- ☐ Nuclear 2 ☒ Radiological ☐ Chemical (Low) ☐ To be developed as part of this request (Manual 11Q)
- ☐ Nuclear 3 ☐ Chemical (High) ☐ Other Industrial

Functional Design Criteria
- ☒ Not applicable to this request.
- ☐ Provided, Reference _____
- ☐ To be developed as part of this request. Specific activities are:
  - ☐ Alternative Studies
  - ☐ Develop functional design criteria to be included as part of the MT or Task Requirements and Criteria.

Functional Classification
- ☐ Safety Class ☐ Production Support ☐ To be developed as part of this request.
- ☐ Safety Significant ☒ General Service

Criteria Technical Review
- ☒ Not applicable to this request. ☐ To be performed as part of this request.

Design and Analysis/Technical Baseline Development
- ☒ Not applicable to this request.
- ☐ Provided, Reference _____
- ☐ To be developed as part of this request. Specific activities are:
  - ☐ Calculations ☐ FDD ☐ Functional Acceptance Criteria
  - ☐ Drawings ☐ SDD ☐ Technical Specifications
  - ☐ Specifications ☐ CHAP ☐ Other, Specify _____
  - ☐ DSA ☐ Quality Inspection Plans

* Design Authority Manager's signature required if request is not associated with an MT.

Technical Task Request (Continued)

Proc. Ref. E7, 2.02

Other Tasks or Clarification

The Savannah River National Laboratory (SRNL) is to provide sample preparation and analysis of the Tank 5 and 6 final characterization samples and report the results of the analyses as described in Attachment A.

Closure & Waste Disposal Authority Concurrence:

C&WDA

11/10/10
Date

Technical Task Request (Continued)

Proc. Ref. E7, 2.02

Design and Analysis/Technical Baseline Document Technical Review

☒ Not applicable to this request. ☐ To be performed as part of this request.

Acceptance Testing

☒ Acceptance Testing is Not Part of this Request

☐ Test Procedure Provided, Reference _____

☐ Test Procedures to be Developed as Part of this Request

☐ Test Results Provided, Reference _____

☐ Test Results Evaluation Not Part of this Request

☐ Test Acceptance Report to be Provided as Part of this Request

Other Reviews/Reports Required?

☒ No ☒ Yes, Specify _____

Technical Agency	Name (Print)
SRNL	Frank M. Pennebaker

Acceptance of Task (Signature of Technical Agency Manager) — Date: 11/10/10

Closure/Deliverables Provided

Design Authority Engineer — Date: 11/10/10

Design Authority Manager* — Date: 11/10/10

* Design Authority Manager's signature required if request is not associated with an MT.

APPENDIX A

1.0 INTRODUCTION

The Savannah River National Laboratory (SRNL) is to provide sample preparation and analysis of the Tank 5 and 6 final characterization samples and report the results of the analyses.

Two (2) types of samples are to be collected from Tank 5, samples of the residual material on the floor of the tank and samples of the vertical cooling coils. For Tank 6, only samples of the residual material on the floor of the tank are to be collected. A detailed summary of the number and types of samples to be collected from Tanks 5 and 6 is provided below.

Tank 5

1. Fifteen (15) samples consisting of:
   a. Three (3) core samples from the mound beneath Riser 1.
   b. Three (3) core samples from the mound beneath Riser 5.
   c. Nine (9) scrape samples from the other areas of the tank floor.
2. Two (2), twenty-four inch (24″) samples of vertical sections of the cooling coils.

Tank 6

1. Fifteen (15) samples consisting of:
   a. One (1) core sample from the mound beneath Riser 5.
   b. Four (4) sub-surface samples from small mounds near Riser 1.
   c. One (1) sub-surface sample from a small mound near Riser 3.
   d. Two (2) sub-surface samples from small mounds near Riser 5.
   e. Seven (7) scrape samples from the other areas of the tank floor.

2.0 TANK 5 SAMPLE LOCATIONS, IDENTIFICATION, COMPOSITION, PREPARATION, AND PRESERVATION

2.1 Tank 5 Composite Sample Locations, Sample Location Identifiers, and Sample Composition

Figure 1 identifies the three (3) areas in Tank 5 (i.e., A, B, and C) where fifteen (15) samples of the residual solids on the floor of the tank are to be collected and the respective sample locations within each area. Table 1 provides the corresponding sample ID numbers and the proportions to be used to create three (3) volume-proportioned composite samples for Tank 5. ***Note, the proportions specified in Table 1 are to be revised based on the results of the final volume determinations for Tank 5 and the results of the Tank 5 "as received" sample density determinations.***

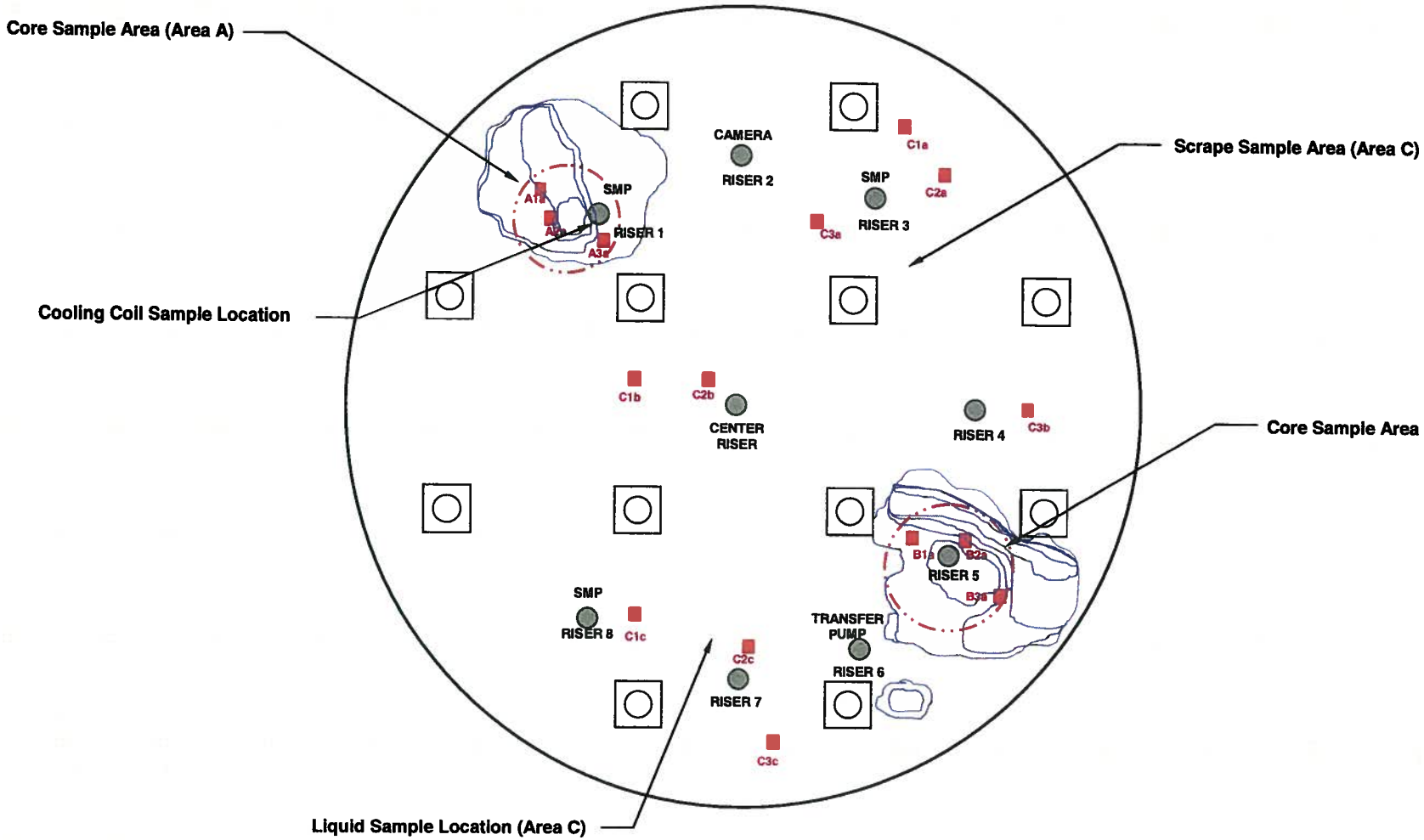

Figure 1: Tank 5 Sample Locations

Table 1: Tank 5 Sample ID Numbers and Composite Sample Proportions

Sample Location	Composite Sample				
	No. 1	No. 2	No. 3	Proportion of Tank Volume (%)	Estimated Required Sample Mass (Grams)[b]
Riser 1 Mound (NW)[a]	5-A1a-T	5-A2a-M	5-A3a-Bt	15.4	10.8
Riser 5 Mound (SE)[a]	5-B1a-M	5-B2a-Bt	5-B3a-T	38.4	26.8
Floor (NE)	5-C1a	5-C2a	5-C3a	15.4	10.8
Floor (Central)	5-C1b	5-C2b	5-C3b	15.4	10.8
Floor (S)	5-C1c	5-C2c	5-C3c	15.4	10.8

[a] ***Subject to condition and amount of material contained within the core sample(s) collected from the mound***
[b] ***Refer to Section 7.0 for an example Volume-Proportional Composite Sample Calculation***

2.2 Composite Sample Preparation and Residual Sample Preservation

The following customer specified preparations are required to be completed by SRNL prior to SRNL initiating analysis of the samples.

1. When a core sample is extracted from the core sampler, confirm that the length of the core is a least 2/3 of the length of the core sampler. For reference, core samples A1a, A2a, and A3a are to be collected with a 4″ long core sampler and core samples B1a, B2a, and B3a are to be collected with a 12″ long core sampler. ***Contact Closure Project Engineering regarding preparations for cores that do not meet this requirement.***
2. For core samples meeting the requirement specified in Step 1, the cores are to be evenly divided into three (3) samples and placed in individual sample vials with labeling to reflect the Tank 5 Sample ID Number and an identifier, which designates whether the sample was obtained from the top, middle, or bottom portion of the core sample (e.g., a T designation for the top sample, a M designation for the middle sample, and a Bt designation for the bottom sample). For example, a sample from the middle portion of a core sample designated as 5-B2a would be labeled as 5-B2a-M.
3. Determine the "as received" bulk density of the scrape samples, top portions of the A1a and B1a core samples (designated as 5-A1a-T and 5-B1a-T, respectively), middle portions of the A2a and B2a core samples (designated as 5-A2a-M and 5-B2a-M, respectively), and bottom portions of the A3a and B3a core samples (designated as 5-A3a-Bt and 5-B3a-Bt, respectively).
4. Individually dry, grind, and homogenize each sample for compositing and return the samples to their respective sample vials.
5. Determine the dry bulk density of each scrape sample and core sample as specified in Step 3.
6. Contact Closure Project Engineering to confirm the final volume proportions to be used to create the three (3) weight-proportioned composite samples from the samples. ***The proportions specified in Table 1 are to be revised by SRNL based on the results of the final volume determinations for Tank 5 and the results of the "as received" sample density determinations. Closure Project Engineering is to document the final volume proportions in a memorandum to the SRNL for use in assembling the composite samples.*** An example of a final composite sample calculation is provided in Section 7.0.

7. For SRNL standard sample preparation activities, which need to be initiated before the updated volume estimates are available, refer to the proportions specified in Table 1.
8. Create three (3) weight-proportioned composite samples as specified in Table 1 based on the final volume proportions specified by Closure Project Engineering.
9. Determine the weight percent (Wt%) solids for each composite sample.
10. Preserve and store the unused portions of the core samples and scrape samples in the event further/additional analyses are required.

2.3 Tank 5 Cooling Coil Sample Locations and Sample Location Identifiers

Two (2) samples of a vertical cooling coil in Tank 5 are to be obtained from Riser 1 (Refer to Figure 1), with one (1) sample from a section of a vertical cooling coil located above the 45″ elevation of the tank (designated as Sample ID Number 5-R1-A45) and the other sample from a vertical section of a cooling coil located below the 45″ elevation of the tank (designated as Sample ID Number 5-R1-B45).

2.4 Cooling Coil Sample Preparation and Residual Sample Preservation

1. No customer specified preparations are required for the cooling coil samples prior to analysis.
2. Preserve and store the unused portions of the cooling coil samples in the event further/additional analyses are required.

3.0 TANK 6 SAMPLE LOCATIONS, IDENTIFICATION, COMPOSITION, PREPARATION, AND PRESERVATION

3.1 Tank 6 Composite Sample Locations, Sample Location Identifiers, and Sample Composition

Figure 2 identifies the three (3) areas in Tank 6 (i.e., A, B, and C) where fifteen (15) samples of the residual solids on the floor of the tank are to be collected and the respective sample locations within each area. Table 2 provides the corresponding sample ID numbers and the proportions to be used to create three (3) volume-proportioned composite samples for Tank 6. ***Note, the proportions specified in Table 2 are to be revised based on the results of the final volume determinations for Tank 6 and the results of the Tank 6 "as received" sample density determinations.***

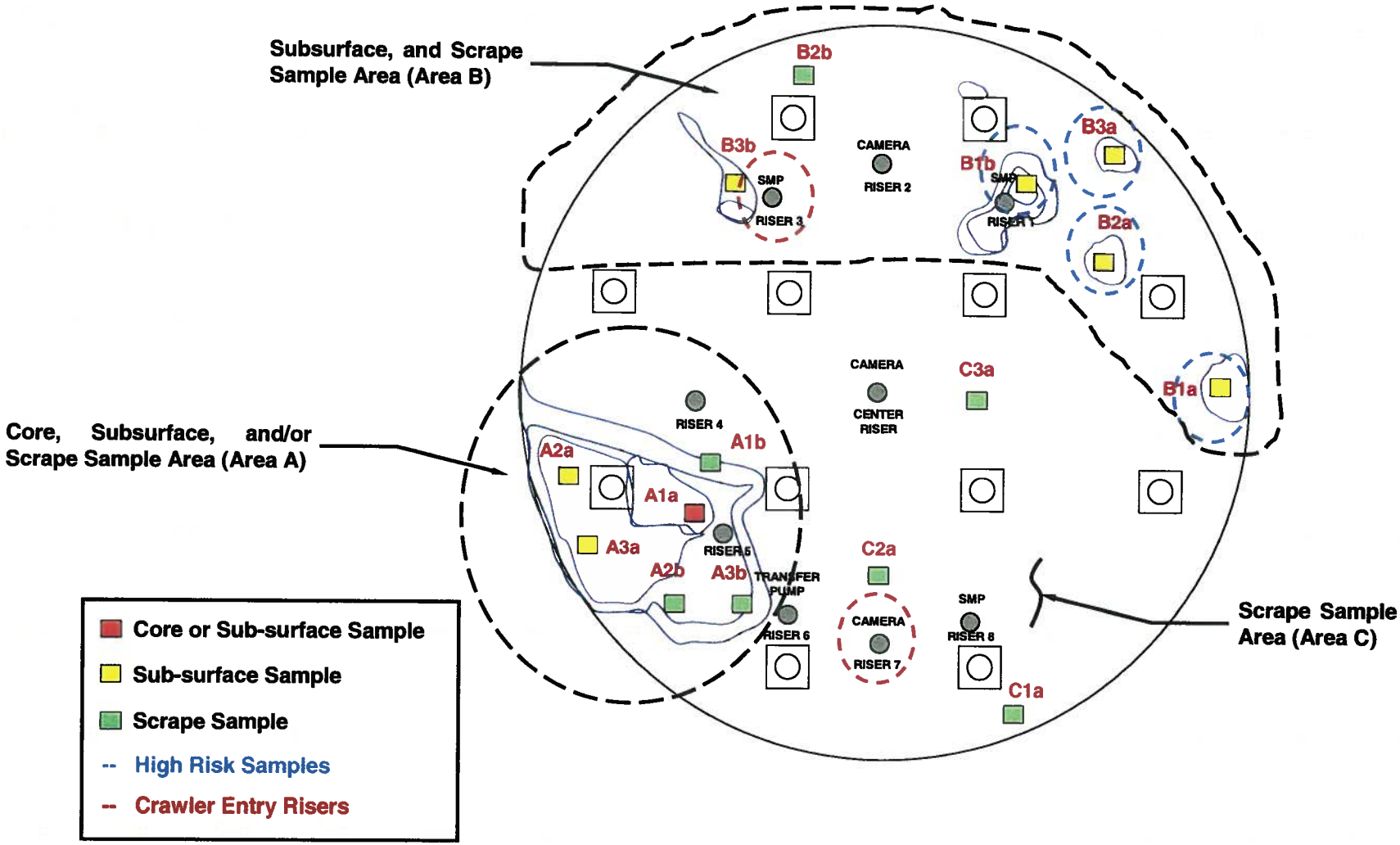

Figure 2: Tank 6 Sample Locations

Table 2: Tank 6 Sample ID Numbers and Composite Sample Proportions

Sample Location	Composite Sample				
	No. 1	No. 2	No. 3	Proportion of Tank Volume (%)	Estimated Required Sample Mass (Grams)[b]
Riser 5 Mound (SW)[a]	6-A1a-Bt	6-A2a	6-A3a	30	21.0
Riser 5 Mound (SW)	6-A1b	6-A2b	6-A3b	30	21.0
Floor (NE)	6-B1a	6-B2a	6-B3a	15	10.5
Floor (N)	6-B1b	6-B2b	6-B3b	15	10.5
Floor (S)	6-C1a	6-C2a	6-C3a	10	7.0

[a] ***Subject to condition and amount of material contained within the core sample(s) collected from the mound***
[b] ***Refer to Section 7.0 for an example Volume-Proportional Composite Sample Calculation***

3.2 Composite Sample Preparation and Residual Sample Preservation

The following customer specified preparations are required to be completed by SRNL prior to SRNL initiating analysis of the samples.

1. When a core sample is extracted from the core sampler, confirm that the length of the core is a least 2/3 of the length of the core sampler. For reference, core sample A1a is to be collected with a 6″ long core sampler. ***Contact Closure Project Engineering regarding preparations for cores that do not meet this requirement.***
2. If core sample A1a meets the requirement specified in Step 1, the core is to be evenly divided into three (3) samples and placed in individual sample vials with labeling to reflect the Tank 6 Sample ID Number and an identifier, which designates whether the sample was obtained from the top, middle, or bottom portion of the core sample (e.g., a T designation for the top sample, a M designation for the middle sample, and a Bt designation for the bottom sample). For example, a sample from the middle portion of core sample 6-A1a would be labeled as 6-A1a-M.
3. Determine the "as received" bulk density of the scrape samples, subsurface samples, and bottom portion of the A1a core sample (designated as 6-A1a-Bt).
4. Individually dry, grind, and homogenize each sample for compositing and return the samples to their respective sample vials.
5. Determine the dry bulk density of each scrape samples, subsurface samples, and core sample as specified in Step 3.
6. Contact Closure Project Engineering to confirm the final volume proportions to be used to create the three (3) weight-proportioned composite samples from the samples. ***The proportions specified in Table 2 are to be revised by SRNL based on the results of the final volume determinations for Tank 6 and the results of the "as received" sample density determinations. Closure Project Engineering is to document the final volume proportions in a memorandum to the SRNL for use in assembling the composite samples.*** An example of a final composite sample calculation is provided in Section 7.0.
7. For SRNL standard sample preparation activities, which need to be initiated before the updated volume estimates are available, refer to the proportions specified in Table 2.
8. Create three (3) weight-proportioned composite samples as specified in Table 2 based on the final volume proportions specified by Closure Project Engineering.
9. Determine the weight percent (Wt%) solids for each composite sample.

10. Preserve and store the unused portions of the core samples and scrape samples in the event further/additional analyses are required.

4.0 CONTROL AND TRACKING OF TANKS 5 AND 6 SAMPLES AT SRNL

When the Tanks 5 and 6 samples are delivered to the Shielded Cells Control, tracking of the samples is to be maintained by the SRNL in accordance with the requirements specified in Procedure 2.33 of the SRNL L1 Manual. When the Tanks 5 and 6 samples are sent from the Shielded Cells to the Analytical Development (AD) group, a unique AD Laboratory Information Management System (LIMS) Number is obtained and cross-referenced to the Tank 5 Sample ID Number.

5.0 SAMPLE ANALYSIS

For the Tank 5 and 6 composite samples, SRNL is to provide triplicate analysis for the target radiological analytes specified in Table 3 and for the chemical and elemental analytes specified in Table 4. For the Tank 5 cooling coil samples, SRNL is to provide triplicate analysis of radionuclides on the exterior of the cooling coils for the target radiological analytes specified in Table 5. SRNL is to develop new or modified analytical methods to meet the requested detection limits specified in Tables 3 and 5, as required.

6.0 REPORTING THE RESULTS OF THE SAMPLE ANALYSES

SRNL is to provide separate written reports of the results of the Tanks 5 and 6 sample analyses. The report is to reflect the respective Tank Sample ID Number and the corresponding SRNL Sample ID Number, if applicable, and LIMS Number(s) associated with each result.

7.0 EXAMPLE OF VOLUME PROPORTIONAL COMPOSITE SAMPLE CALCULATION

The composite sample would be constructed using a volume-proportioning scheme. The composite sample is initially assumed to have a volume of 70 ml with an assumed density of 1.0 g/ml. This 70 ml = 70 g assumption can be used to estimate the approximate composite sample mass needed for an sample location. This provides a conservative composite sample volume since the expected composite sample density is greater than 1.0 g/ml.

To calculate the actual sample mass required for a sample location, the volume must be corrected for the measured sample density using the following formula. For this example, the composite sample mass results in 101.6 grams.

Volumetric Sample Mass (grams) = (70 ml composite sample volume)(Proportion [%] of tank volume at sample location/100%)(measured "as received" bulk density [g/ml])

The ratio of the mass for each sample location to the 101.6 gram total sample mass times the 70 gram total composite sample volume is then used to calculate the Required Sample Mass for Compositing from each sample.

Table 6 provides an example using the hypothetical sample densities, which are to be replaced with the actual densities when determined by the SRNL.

Table 3: Radiological Analytes for Composite Sample Analysis

Analytes	Target Detection Limit	Unit		Analytes	Target Detection Limit	Unit
H-3	1.0E-01	µCi/g		Ac-227**	1.3E-04	µCi/g
C-14	1.0E-01	µCi/g		Th-229**	1.0E-03	µCi/g
Al-26*	1.0E-03	µCi/g		Th-230**	1.0E-03	µCi/g
Cl-36*	1.0E-03	µCi/g		Pa-231**	1.0E-03	µCi/g
K-40*	1.0E-03	µCi/g		U-232	1.0E-03	µCi/g
Ni-59	9.0E-02	µCi/g		U-233	1.0E-03	µCi/g
Ni-63	1.0E-01	µCi/g		U-234	1.0E-03	µCi/g
Co-60	1.0E-03	µCi/g		U-235	1.0E-04	µCi/g
Se-79	1.0E-03	µCi/g		U-236	1.0E-03	µCi/g
Sr-90	1.0E-03	µCi/g		U-238	1.0E-03	µCi/g
Y-90	1.0E-03	µCi/g		Np-237	1.0E-03	µCi/g
Zr-93	1.0E-03	µCi/g		Pu-238	1.0E-03	µCi/g
Nb-94	3.0E-03	µCi/g		Pu-239	1.0E-03	µCi/g
Tc-99	1.0E-03	µCi/g		Pu-240	1.0E-03	µCi/g
Pd-107*	1.0E-03	µCi/g		Pu-241	1.0E-03	µCi/g
Sn-126	1.0E-03	µCi/g		Pu-242	1.0E-03	µCi/g
Sb-126	1.0E-03	µCi/g		Pu-244	1.3E-04	µCi/g
Sb-126m	1.0E-03	µCi/g		Am-241	1.0E-03	µCi/g
I-129	1.0E-04	µCi/g		Am-242m	1.0E-03	µCi/g
Cs-135	5.0E-02	µCi/g		Am-243	1.0E-03	µCi/g
Cs-137	1.0E-03	µCi/g		Cm-243	2.0E-02	µCi/g
Ba-137m	1.0E-03	µCi/g		Cm-244	1.0E-03	µCi/g
Sm-151	3.0E+00	µCi/g		Cm-245	2.0E-02	µCi/g
Eu-152	7.0E-03	µCi/g		Cm-247	1.3E-04	µCi/g
Eu-154	1.0E-03	µCi/g		Cm-248	1.3E-04	µCi/g
Pt-193*	1.0E-03	µCi/g		Cf-249	5.0E-03	µCi/g
Ra-226**	5.0E-03	µCi/g				

* Tank 5 only

** While analysis of these isotopes is needed, meeting the detection limits for these isotopes is a lower priority than meeting detection limits for the other specified isotopes.

Table 4: Elemental and Chemical Analytes for Composite Sample Analysis

Analytes	Analytes
Ag	Mn
As	Ni
Ba	Pb
Cd	Sb
Cr	Se
Cu	U
F	Zn
Fe	Nitrate
Hg	Nitrite

Table 5: Radiological Analytes for Cooling Coil Analysis

Analytes	Target Detection Limit	Unit
Co-60	8.3E-06	Ci/ft^2
Sr-90	5.9E-02	Ci/ft^2
Cs-137	4.2E-03	Ci/ft^2
U-233	1.1E-07	Ci/ft^2
U-234	7.8E-08	Ci/ft^2
U-235	2.7E-09	Ci/ft^2
U-236	4.6E-07	Ci/ft^2
U-238	7.8E-08	Ci/ft^2
Np-237	1.1E-07	Ci/ft^2
Pu-238	6.5E-05	Ci/ft^2
Pu-239	1.5E-05	Ci/ft^2
Pu-240	3.3E-06	Ci/ft^2
Pu-241	1.5E-05	Ci/ft^2
Pu-242	4.6E-07	Ci/ft^2
Pu-244	2.3E-09	Ci/ft^2
Am-241	2.7E-04	Ci/ft^2

Table 6: Example of Volume-Proportional Composite Sample Calculation

Sample Location	Composite Sample			
	Proportional Sample Location Volume[a] (%)	Measured "As Received" Bulk Density[b] (g/ml)	Volumetric Sample Mass[b] (grams)	Required Sample Mass for Compositing[b] (Grams)
Riser 1 Mound (NW)	15.4	1.42	15.3	10.5
Riser 5 Mound (SE)	38.4	1.55	41.6	28.7
Floor (NE)	15.4	1.36	14.7	10.1
Floor (Central)	15.4	1.53	16.5	11.4
Floor (S)	15.4	1.25	13.5	9.3
Total Mass			**101.6**	**70.0**

[a] ***Preliminary***
[b] ***Hypothetical values***

6.0 REFERENCES

1. SRR-LWE-2010-00065, "Sampling Plan for Tanks 5 and 6 Preliminary Samples After Phase II Mechanical Cleaning", Revision 0, March 4, 2010.
2. SRNL-STI-2009-00492, "Analysis of Samples from Tank 5F Chemical Cleaning", Revision 0, December 9, 2009.
3. SRNL-STI-2009-00493, "Analysis of Samples from Tank 6F Chemical Cleaning", Revision 0, February 2, 2010.
4. SRR-LWE-2010-00285, "Tank 5 Sampling and Analysis Plan", Revision 0, November 3, 2010.
5. Procedure 2.33, "Radioactive Sample Labeling and Tracking in the Shielded Cells", L1, Manual, Savannah River National Laboratory.