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Revision 0

Comment Response Matrix for NRC Staff Clarification Questions on DOE Responses to Request for Additional Information on the Draft Basis for Section 3116 Determination and Associated Performance Assessment for the H-Area Tank Farm at the Savannah River Site

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TABLE OF CONTENTS

TABLE OF CONTENTS 2
LIST OF FIGURES 3
LIST OF TABLES 4
ACRONYMS 5
EXECUTIVE SUMMARY 6
CQ-1 7
CQ-2 8
CQ-3 16
CQ-4 18
CQ-5 19
CQ-6 41
CQ-7 42
CQ-8 43
CQ-9 44
CQ-10 45
CQ-11 46
CQ-12 49
CQ-13 50
REFERENCES 51
APPENDIX A 53
APPENDIX B 57

LIST OF FIGURES

Figure CQ-2.1: Comparison of Total Initial Curies of Cs-137 for All HTF Sources 9
Figure CQ-2.2: Comparison of Total Initial Curies of Sr-90 for All HTF Sources........... 9
Figure CQ-2.3: Comparison of Total Initial Curies of Tc-99 for All HTF Sources 10
Figure CQ-2.4: Decay of Total Initial HTF Waste Inventory for Select Radionuclides... 11
Figure CQ-7.1: Low Zone Outside H Area Southwest of HTF (Wells with Residuals > 6 foot).. 42
Figure CQ-9.1: UTRA-LZ Calibration Residuals (ft) 44
Figure CQ-11.1: 100-Meter Concentration Breakthrough Curves for 5-Year Pulse Release.. 48

LIST OF TABLES

Table CQ-2.1: Summary of Fractional Release Table Files Using Base Case Modeling Assumptions and Annular Inventories 12

Table CQ-2.2: Summary of Fractional Release Table Files Using Pessimistic Modeling Assumptions and Annular Inventories 13

Table CQ-2.3: Summary of Fractional Release Table Files Using Base Case Modeling Assumptions and Sand Pad Inventories 14

Table CQ-2.4: Summary of Fractional Release Table Files Using Pessimistic Modeling Assumptions and Sand Pad Inventories 15

Table CQ-5.1: Calibration Targets in the Vicinity of H Area 20

Table CQ-5.2: Well Calibration Targets Used for Table RAI-FF-2.4 20

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 21

Table CQ-5.4: Comparison of WSRC-TR-96-0399, Vol.2, and Credible WSRC-TR-2003-00250 Well targets 37

Table B-1.1: Data Files Supporting Clarification Question Responses 58

ACRONYMS

CC	Clarifying Comment
CQ	Clarification Question
DOE	U.S. Department of Energy
ERDMS	Environmental Restoration Data Management System
GAU	Gordon Aquifer Unit
GSA	General Separations Area
HTF	H-Tank Farm
NDAA	Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005
NRC	U.S. Nuclear Regulatory Commission
OA	Oxalic Acid
PA	Performance Assessment
RAI	Request for Additional Information
SRNL	Savannah River National Laboratory
SRR	Savannah River Remediation LLC
SRS	Savannah River Site
TCCZ	Tan Clay Confining Zone
TER	Technical Evaluation Report
UTRA-LZ	Upper Three Runs Aquifer-Lower Zone
UTRA-UZ	Upper Three Runs Aquifer-Upper Zone

EXECUTIVE SUMMARY

In accordance with the *Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005* (NDAA), Section 3116, certain waste from reprocessing of spent nuclear fuel is not high-level waste if the Secretary of Energy, in consultation with the Nuclear Regulatory Commission (NRC), determines that the criteria in NDAA Section 3116(a) are met. On February 6, 2013, the Department of Energy (DOE) submitted the *Draft Basis for Section 3116 Determination for Closure of H-Tank Farm at the Savannah River Site*, DOE/SRS-WD-2013-001 (hereinafter referred to as: Draft HTF 3116 Basis Document) to support the consultation process for the stabilized residuals in waste tanks and ancillary structures, those waste tanks, and the ancillary structures (including integral equipment) at the Savannah River Site (SRS) H-Tank Farm (HTF) at the time of closure. [ML13044A309]

Prior to submittal of the Draft HTF 3116 Basis Document, DOE interacted with the NRC beginning in 2010 in development of the *Performance Assessment for the H-Tank Farm at the Savannah River Site*, SRR-CWDA-2010-00128 (hereinafter referred to as: HTF PA), the major technical reference document supporting the conclusions contained within the Draft HTF 3116 Basis Document. The interactions included extensive discussion (i.e., scoping meetings) between DOE and NRC on the fundamental technical bases, approaches, and key parameter values prior to development of the HTF PA. [ML100970781]

To support the NRC consultative role, after issuance of the Draft HTF 3116 Basis Document, NRC and DOE engaged in a series of technical exchanges and public meetings to clarify the approaches and rationales documented in the Draft HTF 3116 Basis Document and HTF PA. These clarifications were intended to provide NRC staff an improved understanding of the approaches and supporting technical bases developed by DOE. [ML13086A080, ML13106A338, ML13120A496, ML13154A327, ML13193A072, ML13199A413, ML13183A410] NRC staff comments on both the Draft HTF 3116 Basis Document and the HTF PA in the form of request for additional information (RAI) or clarifying comments (CCs) were provided to DOE on July 31, 2013. [ML13196A135] On August 29, 2013, NRC and DOE held a joint public meeting in Aiken, South Carolina to discuss and clarify the intent of the NRC comments and RAIs. [ML13218A556, ML13246A133]

The DOE provided responses to the NRC staff comments, RAIs and CCs, on November 1, 2013 with the transmittal of *Comment Response Matrix for NRC Staff Request for Additional Information on the Draft Basis for Section 3116 Determination and Associated Performance Assessment for the H-Area Tank Farm at the Savannah River Site*, SRR-CWDA-2013-00106, Revision 1 (hereinafter referred to as: RAI Response Document). On November 21, 2013, the NRC requested clarification on the DOE responses to NRC RAIs and CCs in the form of written questions, which are provided in Appendix A. The DOE responses to the NRC staff questions, referred to in this document as clarification questions (CQs), are provided in this document. DOE submits these responses to facilitate NRC's completion of a Technical Evaluation Report (TER) for consultation regarding HTF at SRS.

CQ-1

NRC staff is requesting clarification regarding the following documents that were referenced in DOE responses to Criterion 2 Requests for Additional Information (RAIs) – namely when DOE anticipates that the following documents will be available for review.

- Procedures for the development of Operating Plans (RAI-MEP-4)
- DOE has commissioned a study which will evaluate OA cleaning against downstream impacts on the Liquid Waste System versus the benefits (RAI-MEP-1)
- Tank 12 and 16 Closure Module (RAI-MEP-2, RAI-MEP-7)
- Tank 12 and 16 Final Removal Report (RAI-MEP-2, RAI-MEP-7)
- A cost benefit analysis [*for additional removal from Tank 16*] will be performed, in part, by the dose impact results and conclusions of the HTF PA with the final radionuclide inventory considered. Please specify if the cost benefit analysis will be part of the Closure Module, Removal Report, or a separate document. (RAI-MEP-7)

Response CQ-1

The procedure for development of operating plans referenced in the response to RAI-MEP-4 is *LW Project and Closure Operating Plans*, S4 Manual Procedure ENG.50. An electronic copy of this procedure was provided on the reference disk supplied with the RAI Response Document. An electronic copy of the procedure is being supplied with this response document as well.

The evaluation of OA cleaning referenced in the response to RAI-MEP-1 is expected to be available during the fourth quarter of calendar year 2014. DOE will provide a copy of the evaluation to the NRC when completed.

Based on the current revision, Revision 18, of the *Liquid Waste System Plan*, SRR-LWP-2009-00001, it was anticipated that the Closure Modules and Final Removal Reports for both Tank 12 and Tank 16 would be available in the second quarter of calendar year 2015. However, Revision 18 does not reflect fiscal year 2014 funding impacts realized at SRS. In particular, funding for both Tank 12 and Tank 16 is currently limited for fiscal year 2014 under the Continuing Resolution. Actual fiscal year 2014 funding availability is still unknown at this time. Additionally, overall schedule impacts are being evaluated as part of an on-going revision to the *Liquid Waste System Plan*. Availability of the Tank 12 and Tank 16 documents will be dependent on the actual closure schedules for these two tanks. DOE intends to keep the NRC updated on the closure schedule for these tanks, for additional information during NDAA Section 3116 monitoring.

The Closure Module and Final Removal Report for Tank 16 will both contain cost-benefit information regarding decisions to cease waste removal activities. It is not planned to issue the cost-benefit analysis for additional waste removal from Tank 16 as a stand-alone document. The same documentation approach is also planned for Tank 12.

CQ-2

It is not clear to NRC staff whether DOE's response to RAI-NF-12, which relied on an analysis described in RAI-NF-8, adequately accounts for annular inventories. Please provide a table of the fractional release of Cs-137, Sr-90, Tc-99 out of the tanks and the mass storage in tank materials (e.g., sand pads, contaminated zone, basemat, annular grout, tank grout, tank wall concrete, preferential flow paths) over time for the analysis provided to respond to RAI-NF-12.

Response CQ-2

Clarification Question-2 and CQ-3 are closely related. The discussion provided in this response addresses both CQ-2 and CQ-3.

Tables of the fractional releases and the mass storage over time for Cs-137, Sr-90 and Tc-99 within waste tank materials (i.e., waste grout, tank grout, primary liner, primary sand pad, annulus, secondary liner, secondary sand pad, basemat, and wall), and within the preferential flow paths through those materials, have been developed. These tables are based on the analyses described in the RAI Response Document responses to RAI-NF-12 and RAI-NF-13 and are provided with this submittal in the form of four Microsoft Excel files (filenames: CQ_BaseCaseAnnulus_Summary.xlsx, CQ_BaseCaseSand_Summary.xlsx, CQ_PessimisticAnnulus_Summary.xlsx, CQ_PessimisticSand_Summary.xlsx). A listing of all data files being provided to support this response document is provided in Appendix B. In addition, the following discussion provides further clarification of the sensitivity analyses offered in the responses to RAI-NF-12 and RAI-NF-13.

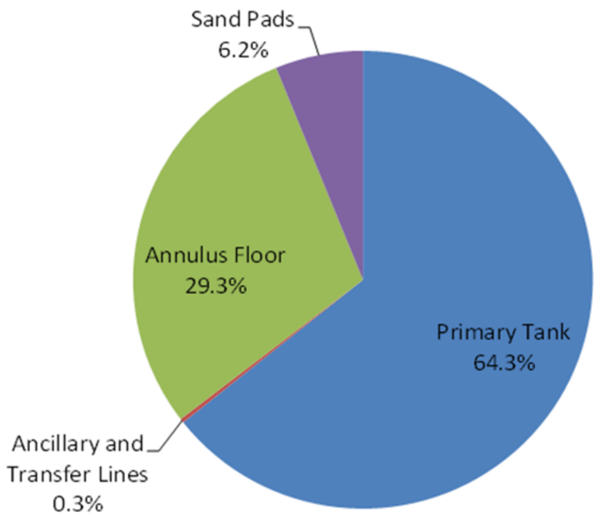
As shown in HTF PA Figure 3.2-16 (*Typical Type II Tank*) the primary sand pad is physically located within the tank annulus directly below the primary tank liner. HTF PA Figure 4.4-2 (*Typical Type II Tank Modeling Dimensions*) shows the primary sand pad and grouted annulus material zones are adjacent. While the inventory values were estimated separately for the annulus inventory and primary sand pad inventory for the Type II waste tanks (see Section 3.4 of the HTF PA), as a reasonable modeling simplification these two inventories were combined and treated as a single inventory in HTF PA modeling and were assigned to the primary sand pad material zones (i.e., no inventory was initially assigned to the grouted annulus material zone). As discussed in HTF PA Section 2.6.4.3 (*Contamination Zone*), "residual material remaining within the waste tank secondary liner (either on the liner floor or within the sand pad in the liner) is modeled as a discrete layer at the bottom of the waste tank annulus".

Figures CQ-2.1 through CQ-2.3 provide graphical representations of the initial inventory locations for Cs-137, Sr-90, and Tc-99, respectively, for the entire HTF inventory. These figures show the entire inventory for each material zone as summed over the entire tank farm. The figures provide a comparison of the "assigned" inventory[1] (i.e., with the sand pad and annular inventories separated in the Type II waste tanks) versus what was modeled for the HTF PA and for the RAI Response Document (i.e., annular inventories included within the primary sand pad zones for the Type II waste tanks). Note that the pie charts for the "as

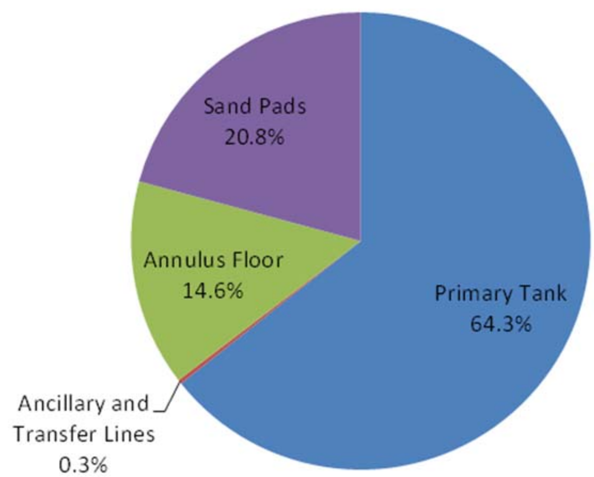
[1] The inventory as described in *H-Tank Farm Waste Tank Closure Inventory for Use in Performance Assessment Modeling*, (SRR-CWDA-2010-00023).

modeled" inventories still include an annulus floor component which is associated with Type I waste tanks. These figures demonstrate that regardless of the assumed initial location of the Type II waste tank annular inventories (i.e., primary sand pad or grouted annulus material zone), the full inventories were considered and the bulk of the total inventory for each radionuclide is initially within the primary tank liner.

Figure CQ-2.1: Comparison of Total Initial Curies of Cs-137 for All HTF Sources

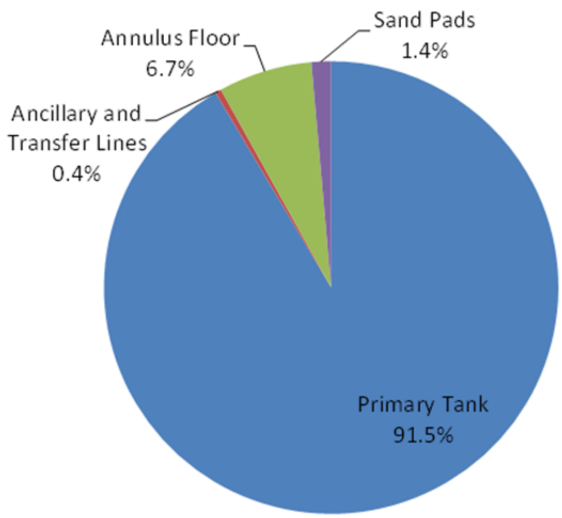


Assigned Initial Locations (per SRR-CWDA-2010-00023) (i.e., Type II annular inventory separate from sand pad inventory)

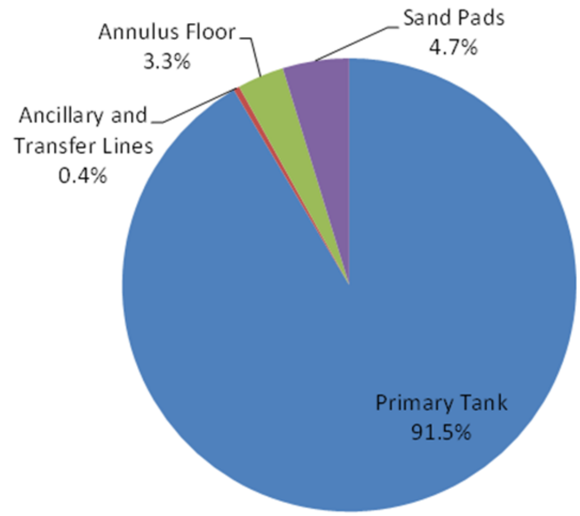


As Modeled Initial Locations (i.e., Type II annular inventory included within the sand pad inventory)

Figure CQ-2.2: Comparison of Total Initial Curies of Sr-90 for All HTF Sources

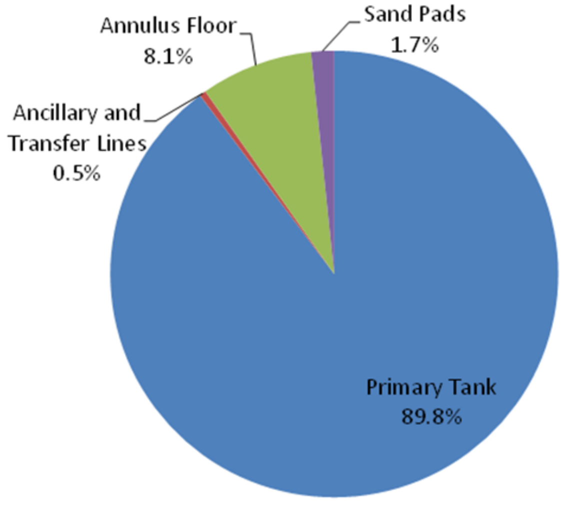


Assigned Initial Locations (per SRR-CWDA-2010-00023) (i.e., Type II annular inventory separate from sand pad inventory)

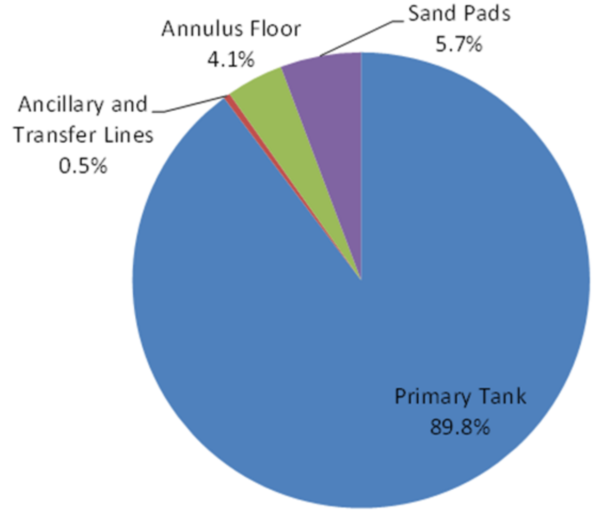


As Modeled Initial Locations (i.e., Type II annular inventory included within the sand pad inventory)

Figure CQ-2.3: Comparison of Total Initial Curies of Tc-99 for All HTF Sources



Assigned Initial Locations (per SRR-CWDA-2010-00023) (i.e., Type II annular inventory separate from sand pad inventory)



As Modeled Initial Locations (i.e., Type II annular inventory included within the sand pad inventory)

Because the response to RAI-NF-12 only considered wastes initially assigned to the grouted annular material zone, and the Type II waste tank annular inventories were assigned to the primary sand pad zones (for both the HTF PA and the subsequent analyses), the grouted annular material zone dose contributions presented in RAI-NF-12 did not include the Type II annular inventories. Alternatively, because the response to RAI-NF-13 only considered wastes initially assigned to the sand pad zones, the sand pad zone dose contributions presented in RAI-NF-13 included the Type II annular inventories along with the primary and secondary sand pad inventories.

Cesium-137 and Sr-90 have relatively short half-lives of approximately 30 years. Due to these short half-lives, within 1,000 years after closure the inventories for Cs-137 and Sr-90 decay to negligible amounts. Figure CQ-2.4 illustrates the decay of the total HTF PA inventories for Cs-137, Sr-90, and Tc-99. This figure combines the entire HTF PA inventories (from waste tank primary tanks, sand pads, and annuli, as well as ancillary equipment). For Tc-99, the differences in the assumed inventory locations only affects approximately 4% of the total available Tc-99 inventory. Therefore, the fractional release tables contained in the Microsoft Excel files being provided with this submittal (see Appendix B) only contain the "as modeled" data, and only show the first 2,000 years of data for Cs-137 and Sr-90. Tables CQ-2.1 through CQ-2.4 provide roadmaps of the information contained within the four Microsoft Excel files being provided in support of this response.

The term "pessimistic" refers to conditions assumed in the sensitivity modeling identified as "Flow Run 65, No Holdup" in the responses to RAI-NF-8, RAI-NF-12, and RAI-NF-13 of the RAI Response Document. This deterministic case was designed to exaggerate the potential dose risks by modifying the Base Case modeling assumptions to create extremely pessimistic conditions. Specifically, this case applies the following changes relative to the Base Case:

- No solubility controls are applied in any cementitious materials (i.e., waste tank grout, annulus grout, basemat concrete, and wall concrete);
- K_d values for Oxidized Region III are applied to all cementitious materials;
- All waste tank liners are set to fail at time zero;
- Full fast flow is applied (using the Case E waste tank configuration for all tanks) to model a channel through the grout and basemat with no flow impedance;
- Faster hydraulic degradation of cementitious materials is assumed (Base Case degradation timing is divided by two); and
- It is assumed that no closure cap is in place (maximizing infiltration and flow).

Figure CQ-2.4: Decay of Total Initial HTF Waste Inventory for Select Radionuclides

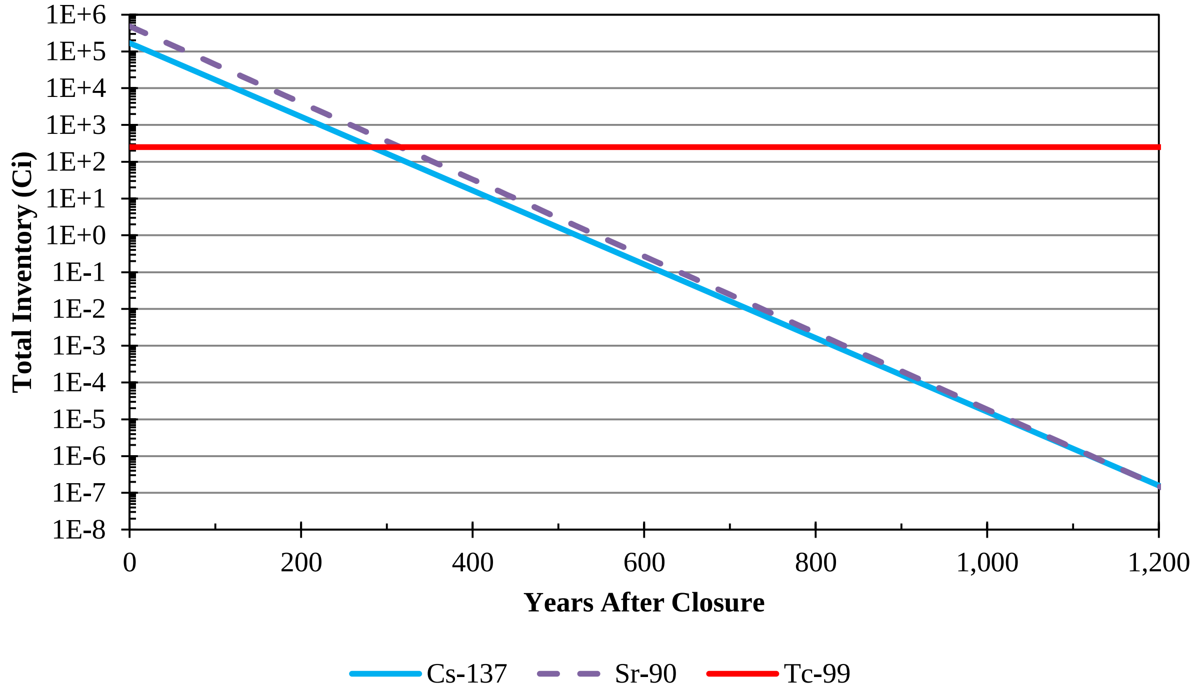


Table CQ-2.1: Summary of Fractional Release Table Files Using Base Case Modeling Assumptions and Annular Inventories

Excel File: CQ_BaseCaseAnnulus_Summary.xlsx		
Sheet	**Cells**	**Description**
Tank09	F11:U212	Tank 9, Fractional Release of Cs-137 using Base Case assumptions and Annular Inventories
Tank09	W11:AL202	Tank 9, Fractional Release of Sr-90 using Base Case assumptions and Annular Inventories
Tank09	AN11:BC2012	Tank 9, Fractional Release of Tc-99 using Base Case assumptions and Annular Inventories
Tank10	F11:U212	Tank 10, Fractional Release of Cs-137 using Base Case assumptions and Annular Inventories
Tank10	W11:AL202	Tank 10, Fractional Release of Sr-90 using Base Case assumptions and Annular Inventories
Tank10	AN11:BC2012	Tank 10, Fractional Release of Tc-99 using Base Case assumptions and Annular Inventories
Tank11	F11:U212	Tank 11, Fractional Release of Cs-137 using Base Case assumptions and Annular Inventories
Tank11	W11:AL202	Tank 11, Fractional Release of Sr-90 using Base Case assumptions and Annular Inventories
Tank11	AN11:BC2012	Tank 11, Fractional Release of Tc-99 using Base Case assumptions and Annular Inventories
Tank12	F11:U212	Tank 12, Fractional Release of Cs-137 using Base Case assumptions and Annular Inventories
Tank12	W11:AL202	Tank 12, Fractional Release of Sr-90 using Base Case assumptions and Annular Inventories
Tank12	AN11:BC2012	Tank 12, Fractional Release of Tc-99 using Base Case assumptions and Annular Inventories
TotalHTF	F11:U212	Total HTF, Fractional Release of Cs-137 using Base Case assumptions and Annular Inventories
TotalHTF	W11:AL202	Total HTF, Fractional Release of Sr-90 using Base Case assumptions and Annular Inventories
TotalHTF	AN11:BC2012	Total HTF, Fractional Release of Tc-99 using Base Case assumptions and Annular Inventories

Notes: Only data for the Type I tanks are provided as all other waste tanks were modeled with no annular inventories. Tank-specific fractions indicate the fraction relative to the inventory available for the specific waste tank (i.e., the combined inventories in the grouted tank, the annulus, and the sand pad). The HTF-specific fractions indicate the fraction relative to the entire tank farm inventory.

Table CQ-2.2: Summary of Fractional Release Table Files Using Pessimistic Modeling Assumptions and Annular Inventories

Excel File: CQ_PessimisticAnnulus_Summary.xlsx		
Sheet	**Cells**	**Description**
Tank09	F11:U212	Tank 9, Fractional Release of Cs-137 using Pessimistic assumptions and Annular Inventories
Tank09	W11:AL202	Tank 9, Fractional Release of Sr-90 using Pessimistic assumptions and Annular Inventories
Tank09	AN11:BC2012	Tank 9, Fractional Release of Tc-99 using Pessimistic assumptions and Annular Inventories
Tank10	F11:U212	Tank 10, Fractional Release of Cs-137 using Pessimistic assumptions and Annular Inventories
Tank10	W11:AL202	Tank 10, Fractional Release of Sr-90 using Pessimistic assumptions and Annular Inventories
Tank10	AN11:BC2012	Tank 10, Fractional Release of Tc-99 using Pessimistic assumptions and Annular Inventories
Tank11	F11:U212	Tank 11, Fractional Release of Cs-137 using Pessimistic assumptions and Annular Inventories
Tank11	W11:AL202	Tank 11, Fractional Release of Sr-90 using Pessimistic assumptions and Annular Inventories
Tank11	AN11:BC2012	Tank 11, Fractional Release of Tc-99 using Pessimistic assumptions and Annular Inventories
Tank12	F11:U212	Tank 12, Fractional Release of Cs-137 using Pessimistic assumptions and Annular Inventories
Tank12	W11:AL202	Tank 12, Fractional Release of Sr-90 using Pessimistic assumptions and Annular Inventories
Tank12	AN11:BC2012	Tank 12, Fractional Release of Tc-99 using Pessimistic assumptions and Annular Inventories
TotalHTF	F11:U212	Total HTF, Fractional Release of Cs-137 using Pessimistic assumptions and Annular Inventories
TotalHTF	W11:AL202	Total HTF, Fractional Release of Sr-90 using Pessimistic assumptions and Annular Inventories
TotalHTF	AN11:BC2012	Total HTF, Fractional Release of Tc-99 using Pessimistic assumptions and Annular Inventories

Notes: Only data for the Type I tanks are provided as all other tanks were modeled with no annular inventories. Tank-specific fractions indicate the fraction relative to the inventory available for the specific waste tank (i.e., the combined inventories in the grouted tank, the annulus, and the sand pad). The HTF-specific fractions indicate the fraction relative to the entire tank farm inventory.

Table CQ-2.3: Summary of Fractional Release Table Files Using Base Case Modeling Assumptions and Sand Pad Inventories

Excel File: CQ_BaseCaseSand_Summary.xlsx		
Sheet	**Cells**	**Description**
Tank13	F11:U212	Tank 13, Fractional Release of Cs-137 using Base Case assumptions and Sand Pad Inventories
Tank13	W11:AL202	Tank 13, Fractional Release of Sr-90 using Base Case assumptions and Sand Pad Inventories
Tank13	AN11:BC2012	Tank 13, Fractional Release of Tc-99 using Base Case assumptions and Sand Pad Inventories
Tank14	F11:U212	Tank 14, Fractional Release of Cs-137 using Base Case assumptions and Sand Pad Inventories
Tank14	W11:AL202	Tank 14, Fractional Release of Sr-90 using Base Case assumptions and Sand Pad Inventories
Tank14	AN11:BC2012	Tank 14, Fractional Release of Tc-99 using Base Case assumptions and Sand Pad Inventories
Tank15	F11:U212	Tank 15, Fractional Release of Cs-137 using Base Case assumptions and Sand Pad Inventories
Tank15	W11:AL202	Tank 15, Fractional Release of Sr-90 using Base Case assumptions and Sand Pad Inventories
Tank15	AN11:BC2012	Tank 15, Fractional Release of Tc-99 using Base Case assumptions and Sand Pad Inventories
Tank16	F11:U212	Tank 16, Fractional Release of Cs-137 using Base Case assumptions and Sand Pad Inventories
Tank16	W11:AL202	Tank 16, Fractional Release of Sr-90 using Base Case assumptions and Sand Pad Inventories
Tank16	AN11:BC2012	Tank 16, Fractional Release of Tc-99 using Base Case assumptions and Sand Pad Inventories
TotalHTF	F11:U212	Total HTF, Fractional Release of Cs-137 using Base Case assumptions and Sand Pad Inventories
TotalHTF	W11:AL202	Total HTF, Fractional Release of Sr-90 using Base Case assumptions and Sand Pad Inventories
TotalHTF	AN11:BC2012	Total HTF Fractional Release of Tc-99 using Base Case assumptions and Sand Pad Inventories

Notes: Only data for the Type II tanks are provided as all other tanks were modeled with no sand pad inventories. Tank-specific fractions indicate the fraction relative to the inventory available for the specific waste tank (i.e., the combined inventories in the grouted tank, the annulus, and the sand pad). The HTF-specific fractions indicate the fraction relative to the entire tank farm inventory.

Table CQ-2.4: Summary of Fractional Release Table Files Using Pessimistic Modeling Assumptions and Sand Pad Inventories

Excel File: CQ_PessimisticSand_Summary.xlsx		
Sheet	**Cells**	**Description**
Tank13	F11:U212	Tank 13, Fractional Release of Cs-137 using Pessimistic assumptions and Sand Pad Inventories
Tank13	W11:AL202	Tank 13, Fractional Release of Sr-90 using Pessimistic assumptions and Sand Pad Inventories
Tank13	AN11:BC2012	Tank 13, Fractional Release of Tc-99 using Pessimistic assumptions and Sand Pad Inventories
Tank14	F11:U212	Tank 14, Fractional Release of Cs-137 using Pessimistic assumptions and Sand Pad Inventories
Tank14	W11:AL202	Tank 14, Fractional Release of Sr-90 using Pessimistic assumptions and Sand Pad Inventories
Tank14	AN11:BC2012	Tank 14, Fractional Release of Tc-99 using Pessimistic assumptions and Sand Pad Inventories
Tank15	F11:U212	Tank 15, Fractional Release of Cs-137 using Pessimistic assumptions and Sand Pad Inventories
Tank15	W11:AL202	Tank 15, Fractional Release of Sr-90 using Pessimistic assumptions and Sand Pad Inventories
Tank15	AN11:BC2012	Tank 15, Fractional Release of Tc-99 using Pessimistic assumptions and Sand Pad Inventories
Tank16	F11:U212	Tank 16, Fractional Release of Cs-137 using Pessimistic assumptions and Sand Pad Inventories
Tank16	W11:AL202	Tank 16, Fractional Release of Sr-90 using Pessimistic assumptions and Sand Pad Inventories
Tank16	AN11:BC2012	Tank 16, Fractional Release of Tc-99 using Pessimistic assumptions and Sand Pad Inventories
TotalHTF	F11:U212	Total HTF, Fractional Release of Cs-137 using Pessimistic assumptions and Sand Pad Inventories
TotalHTF	W11:AL202	Total HTF, Fractional Release of Sr-90 using Pessimistic assumptions and Sand Pad Inventories
TotalHTF	AN11:BC2012	Total HTF Fractional Release of Tc-99 using Pessimistic assumptions and Sand Pad Inventories

Notes: Only data for the Type II tanks are provided as all other tanks were modeled with no sand pad inventories. Tank-specific fractions indicate the fraction relative to the inventory available for the specific waste tank (i.e., the combined inventories in the grouted tank, the annulus, and the sand pad). The HTF-specific fractions indicate the fraction relative to the entire tank farm inventory.

CQ-3

It is not clear to NRC staff how DOE came to the conclusion in RAI-NF-13 that there is no significant contribution from Cs-137 and Sr-90 located in the sand pads. NRC staff notes that the HTF PA has shown the potential for very high doses from Sr-90. In Section 5.6.4.3.2 of the HTF PA, DOE discussed two of the highest realizations from Case D that show Sr-90 doses for the MOP can be as high as 15,000 mrem/yr. NRC staff understands that these are the highest realizations from a case that DOE considers to be a low probability case; however, the parameters that appear to have most significantly influenced these MOP doses (e.g., inventory, Kd, dilution, water consumption) do not appear to account for the difference in results from the Flow Run 65, No Holdup case. Please provide a table of the fractional release of Cs-137, Sr-90, Tc-99 out of the tanks and the mass storage in tank materials (e.g., sand pads, contaminated zone, basemat, annular grout, tank grout, preferential flow paths) over time for the analysis provided to respond to RAI-NF-13.

Response CQ-3

Clarification Question-2 and CQ-3 are closely related. The discussion provided in the response to CQ-2 addresses both CQ-2 and CQ-3. As discussed in the response to CQ-2, DOE is providing the requested information with this submittal. Refer to the response to CQ-2 for a detailed discussion regarding fractional release data as well as additional clarifying discussion regarding the RAI Response Document response to RAI-NF-13.

In addition, more detail is provided here regarding the differences between the Case D modeling and the modeling performed to support the response to RAI-NF-13. The Case D modeling used the full HTF PA inventory (which was further adjusted by inventory multipliers), whereas the modeling performed to support the response to RAI-NF-13 only used the inventories initially assigned to the sand pad zones, as shown in Figure CQ-2.2 (i.e., less than 5% of the total base HTF PA inventory for Sr-90). If the entire HTF PA inventory had been used for the pessimistic analysis ("Flow Run 65, No Holdup Case"), as described in the response to RAI-NF-13, the peak dose from all sectors would have been 144 mrem/yr occurring at year 390. The contribution from Sr-90 would have been about 137 mrem/yr. This 137 mrem/yr dose is primarily attributed to releases from the inventory initially located within the primary tank liner and not from the inventories assigned to the annular or sand pad material zones. The extremely high dose, approximately 15,000 mrem/yr, reported for the Case D outlying realization in Section 5.6.4.3.2 of the HTF PA occurred at year 140 and was primarily associated with Tank 15. If the Case D dose is decayed from year 140 to year 390, the resulting peak dose is only 38 mrem/yr. Therefore, the modeling parameters which impact timing of the dose, and parameters associated with Tank 15 releases, must be considered when accounting for differences in the results of the Case D realization and the modeling done for RAI-NF-13. Differences in uncertainty parameters influencing the release of Sr-90 and the estimate of dose with respect to the Case D realization are identified below, along with their respective values. The pessimistic case value is presented within parentheses:

- Inventory multiplier for Sr-90 in Tank 15 = 5.1 (1.0)
- Sandy soil K_d for strontium = 1.5 mL/g (5 mL/g)
- Clayey soil K_d for strontium = 18.1 mL/g (17 mL/g)

- Well completion stratum = UTR-LZ (UTR-UZ)
- Water consumption rate = 413 L/yr (337 L/yr)
- Transfer factor for strontium fish ingestion = 71 L/kg (2.9 L/kg)
- Vegetable consumption rate = 121 kg/yr (163 kg/yr)
- Leafy vegetable consumption rate = 28 kg/yr (21 kg/yr)
- Fraction of vegetables grown locally = 0.34 (0.17)
- Tank 15 strontium K_ds:
  - Reduced Region II = 11.6 mL/g (15 mL/g)
  - Oxidized Region II = 10.2 mL/g (15 mL/g)
  - Leachate Impacted Clay = 44 mL/g (51 mL/g)
  - Reduced Region II = 11.8 mL/g (15 mL/g)

For the pessimistic analysis performed for RAI-NF-13, the peak dose associated with Sr-90 from the sand pad inventories and the annulus inventories, combined, was less than 0.01 mrem/yr. Based on these results DOE concluded that even in the pessimistic analysis the Sr-90 from the sand pad inventories is not a significant dose contributor.

CQ-4

NRC staff is requesting the thermodynamic databases that were used in Geochemist's Workbench by SRNL to support the HTF PA to clarify how DOE developed longevity of the chemical conditioning as discussed in RAI-NF-3 and CC-NF-2. These databases should include the thermodynamic data for any species and phases that were added by SRNL staff.

Response CQ-4

The thermodynamic database file used in Geochemist Workbench modeling to model chemical conditioning of pore fluids due to grout degradation for the HTF PA is being provided with this submittal in the form of a rich text file (filename: thermocement.v2.radNEA_5-7-2012). Updated values entered by SRNL staff are denoted in the database in comments below each value. A listing of all data files being provided to support this response document is provided in Appendix B.

CQ-5

RAI-FF-1 and RAI-FF-2 discuss review of ERDMS and WSRC-TR-2003-00250 water level data. Table RAI-FF-2.4 presents calibration statistics for HTF. However, a complete listing of HTF wells evaluated in these data sources was not provided. Please indicate the following:

I. What wells in the vicinity of HTF (spatial extent illustrated in Figure RAI-FF-2.2) were used as calibration targets in the GSA/PORFLOW model for the UTR-UZ and UTR-LZ?

II. ERDMS data was evaluated in Table RAI-FF-1.1. Did ERDMS have water table data for all of the wells in the vicinity of HTF that were used as calibration targets in the GSA/PORFLOW model? If not, what well data were missing or what additional wells were available for evaluation?

III. Did WSRC-TR-2003-00250 have water table data for all of the wells in the vicinity of HTF that were used as calibration targets in the GSA/PORFLOW model? If not, what well data were missing or what additional wells were included in Table RAI-FF-2.4 and Figure RAI-FF-2.2? Note: NRC recognizes that some of the wells for which data were reported in WSRC-TR-2003-00250 were omitted as suspect based on the review of ERDMS data in Table RAI-FF-1.1.

Response CQ-5

Response to CQ-5 (I)

Appendix C of *Integrated Hydrogeological Modeling of the General Separations Area; Volume 2: Groundwater Flow Model (U)*, WSRC-TR-96-0399, Volume 2, provides a complete listing of the well water levels used to calibrate the current GSA/PORFLOW groundwater flow model. [WSRC-TR-2004-00106] The subset of these wells that resides in the circular extent depicted in Figure RAI-FF-2.2 of the RAI Response Document is listed in Table CQ-5.1. Table RAI-FF-2.4 of the RAI Response Document presents summary calibration statistics for those water table targets in, *An Updated Regional Water Table of the Savannah River Site and Related Coverages*, WSRC-TR-2003-00250, that were evaluated to be reliable/credible and reside within the circular extent depicted in Figure RAI-FF-2.2. These wells are listed in Table CQ-5.2. Table CQ-5.3 provides the entire listing of WSRC-TR-2003-00250 calibration targets.

Table CQ-5.1: Calibration Targets in the Vicinity of H Area

HC 1A	HAA 4C	HC 2F	HR3 11	HTF 7	HTF 24	SCA 2
HC 2A	HAA 4D	HC 4A	HR3 13	HTF 8	HTF 25	SCA 3
HC 2B	HAA 6A	HC 6A	HR8 11	HTF 9	HTF 26	SCA 3A
HAA 1A	HAA 6D	HC 6B	HR8 12	HTF 10	HTF 27	SCA 4
HAA 1AA	HAA 6AA	HC 11C	HR8 13	HTF 11	HTF 28	SCA 4A
HAA 1B	HAA 6B	HC 12B	HR8 14	HTF 12	HTF 29	SCA 5
HAA 1C	HAA 6C	HCA 1	HSL 2D	HTF 13	HTF 31	SCA 6
HAA 1D	HAC 1	HCA 2	HSL 3D	HTF 14	HTF 32	SLP 1
HAA 2A	HAC 2	HCA 3	HSL 4D	HTF 15	HTF 34	SLP 2
HAA 2B	HAC 3	HCA 4	HSL 5D	HTF 16	P 27B	Z 12
HAA 2C	HAC 4	HCB 1	HSL 6D	HTF 17	P 27C	Z 13
HAA 2D	HAP 1	HCB 2	HSL 7D	HTF 18	P 27D	ZDT 1
HAA 3A	HAP 2	HCB 3	HSL 8D	HTF 19	SBG 1	ZDT 2
HAA 3B	HC 1D	HCB 4	HTF 1	HTF 20	SBG 2	ZW 7
HAA 3C	HC 1E	HET 1D	HTF 2	HTF 21	SBG 3	ZW 8
HAA 3D	HC 2C	HET 2D	HTF 4	HTF 22	SBG 5	ZW 9
HAA 4A	HC 2D	HET 3D	HTF 5	HTF 23	SBG 6	ZW 10
HAA 4B	HC 2E	HET 4D	HTF 6			

Table CQ-5.2: Well Calibration Targets Used for Table RAI-FF-2.4

HAA 1D	HAC 1	HET 2D	HSL 6D	HTF 20	HWP 2D	ZDT 2
HAA 2D	HAC 2	HET 3D	HSL 7D	HTF 21	SBG 2	ZW 7
HAA 3D	HAC 3	HET 4D	HSL 8D	HTF 22	SBG 3	ZW 8
HAA 4D	HAC 4	HGW 2D	HTF 5	HTF 23	SBG 6	ZW 9
HAA 6D	HAP 1	HGW 4D	HTF 6	HTF 24	SCA 2	ZW 10
HAA 7D	HAP 2	HHP 1D	HTF 7	HTF 25	SCA 3	
HAA 8D	HCA 1	HHP 2D	HTF 12D	HTF 26	SCA 3A	
HAA 9D	HCA 2	HR8 11	HTF 13	HTF 27	SCA 4	
HAA 10D	HCA 3	HR8 12	HTF 14	HTF 28	SCA 4A	
HAA 11D	HCA 4	HR8 13	HTF 15	HTF 29	SCA 5	
HAA 12D	HCB 2	HSL 2D	HTF 15D	HTF 31	SCA 6	
HAA 13D	HCB 3	HSL 3D	HTF 17	HTF 32	SLP 1	
HAA 14D	HCB 4	HSL 4D	HTF 18	HTF 34	SLP 2	
HAA 15D	HET 1D	HSL 5D	HTF 19	HWP 1D	ZDT 1	

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
BG26	58810	73958	210.7	230.7	240.8	3
BG27	58810	74357	234.4	254.4	241.1	3
BG28	58810	74752	239.7	259.7	245.7	3
!BG29	58810	75152	231.6	251.6	244	3
!BG30	58809	75550	231.7	251.7	241.1	3
BG31	58804	75950	223.3	243.3	233.2	3
BG32	58803	76350	226.9	246.9	233	3
BG33	58526	76480	221.2	241.2	232.6	3
BG34	58107	76494	217.4	237.4	232.4	3
BG35	57726	76495	228	248	232.8	3
BG36	57620	76748	223.3	243.3	232.3	3
BG37	57251	76805	227.8	247.8	232.4	3
BG38	56851	76805	225.9	245.9	232	3
BG39	56451	76805	226	246	232.2	3
BG40	56051	76805	221.9	241.9	231.4	3
BG41	55869	76576	221	241	231.1	3
BG42	55869	76179	217.1	237.1	231.1	3
BG43	56039	75852	222.9	242.9	231.2	3
BG51	58599	73864	221.2	241.2	240.7	3
BG52	55524	75910	223.8	243.8	229.6	3
BG53	55074	76157	214.7	234.7	228.9	3
BG54	54830	75838	215.2	235.2	228.5	3
BG55	54590	75525	214.9	234.9	227	3
BG56	54482	75206	210.9	230.9	225.4	3
BG57	54820	75000	214.6	234.6	225.3	3
BG58	55162	74791	218.2	238.2	227.2	3
BG59	55508	74593	217.7	237.7	230.2	3
BG60	55850	74386	215.5	235.5	230.5	3
BG61	56361	74075	225	245	233.8	3
BG63	56871	73754	224.2	244.2	236.2	3
BG64	57213	73547	227.3	247.3	238.7	3
BG65	57553	73341	230.9	250.9	236.3	3
BG66	57805	73585	231	251	236	3
BG67	57903	73954	224.7	244.7	236	3
BG68	58251	76554	216.5	242.9	233	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
BG69	58226	76554	222.2	242.2	232.8	3
BG71	58249	76571	226.3	246.3	232.7	3
BG72	58228	76602	226	246	232.5	3
BG73	58245	76620	222.7	243	232.6	3
BG74	58224	76630	221.7	241.7	232.6	3
BG75	58183	76642	221.4	242.8	232.8	3
BG76	58334	76752	223	243	231.7	3
BG77	58279	76772	222.7	242.7	231.5	3
BG78	58277	76806	223.9	243.9	232	3
BG79	58325	76801	223.7	243.7	231.6	3
BG80	57963	76596	226.2	248.6	232.9	3
BG81	57983	76622	222.9	246.9	232.8	3
BG84	57956	76696	227.2	247.2	232.7	3
BG85	57929	76719	228	248	232.8	3
BG86	57979	76721	228	248	232.7	3
BG87	57952	76749	226.2	245.8	232.6	3
BG89	58196	76988	221.6	241.6	230.8	3
BG90	58163	76997	221.2	241.2	231	3
BG92	56828	79020	197.2	227.2	209.4	2
BG93	57161	79931	180.5	210.5	200.9	2
BG94	57494	80867	152.8	182.8	191.9	2
BG96	58298	79396	177.2	207.2	198.2	2
BG98	57399	77598	212.5	242.5	224.5	3
BG99	58404	76905	215.9	245.9	232.5	3
BG100	58899	77816	203.3	233.3	224.8	3
BG101	59277	78741	161.4	191.4	195.7	2
BG103	59752	77884	169.5	199.5	199.5	2
BG104	59888	77039	215.8	245.8	227.4	3
BG107	60120	74804	208.3	228.3	236.2	3
BG108	59828	74383	217.3	247.3	239	3
BG109	59626	73926	228.4	258.4	240.4	3
BG110	59277	73355	224.3	254.3	241.7	3
!BG115	57884	77207	198.9	218.9	215.8	2
BG122	56790	78581	189.9	209.9	211.5	2
BG124	57095	77254	214.8	234.8	231.8	3
BGO1D	58779	73738	225	245	238.2	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
BGO3D	58809	75351	227.6	247.6	235.4	3
BGO3DR	58820	75512	217.5	237.6	230.6	3
BGO4D	58804	76150	220.6	240.6	230.9	3
BGO5D	58785	76477	219.3	239.3	230.4	3
BGO6D	58297	76487	217.2	237.2	231.1	3
BGO7D	57917	76494	220.2	240.2	231.7	3
BGO8D	57618	76589	220.6	240.6	231.9	3
BGO10DR	57074	76805	218.3	238.3	230.6	3
BGO11D	56651	76805	216.3	236.3	231.5	3
BGO11DR	56650	76849	213.1	233	228.8	3
!BGO12CX	56215	76835	212.7	232.8	218.5	3
BGO12D	56231	76805	217.8	237.8	231.4	3
BGO13DR	55840	76825	210.3	220.3	231	3
BGO14DR	55789	76322	218.1	238.1	230	3
BGO15D	55859	75973	218.7	238.7	229.2	3
BGO16D	56202	75751	217.3	237.3	230.6	3
BGO17D	56399	75600	204	224	232.6	3
BGO17DR	56407	75604	216.9	236.9	231.7	3
BGO18D	56711	75600	219.6	239.6	231.8	3
BGO20D	57114	74962	216.3	236.3	233.2	3
BGO21D	57471	74688	217.7	237.7	234.3	3
BGO22DR	57831	74472	219.2	239.2	237.2	3
BGO22DX	57771	74560	217.8	237.8	233.1	3
BGO23D	58133	74238	222	242	235.6	3
BGO24D	58439	74012	221	241	236.4	3
BGO26D	55015	76128	213.4	233.5	226.9	3
BGO27D	54680	75677	209.3	229.3	226.9	3
BGO28D	54458	75348	210.1	230.1	225.6	3
BGO29D	54099	75593	208.5	228.5	225.5	3
BGO30D	54499	75188	207.8	227.8	224.9	3
BGO31D	54842	74985	211.1	231.1	225.3	3
BGO32D	55250	74727	214.5	234.5	226.8	3
BGO33D	55695	74469	213.1	233.1	228.8	3
BGO34D	56083	74229	212.7	232.7	231	3
BGO35D	56557	73946	219.4	239.4	233	3
BGO36D	56888	73744	223.3	243.3	235.7	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
BGO37D	57293	73491	226.1	246.1	238.3	3
BGO38D	57558	73329	222.3	242.3	236.8	3
BGO39D	57831	73583	224.7	244.7	235.3	3
BGO44D	57910	76759	223.4	233.4	232.6	3
BGO45D	54585	75854	209.6	229.6	227.1	3
BGO49D	56199	73932	218.5	238.5	233.8	3
BGO50D	54209	75181	208	228	224.3	3
BGO51D	57861	74118	220.1	240.1	234.7	3
BGO52D	57201	74617	219.4	239.4	232.8	3
BGX1D	58609	76809	214.7	234.7	229.1	3
BGX3D	57780	77577	201.6	221.6	214.5	2
BGX5D	57309	78402	195	215	208.2	2
BGX6D	57525	78740	191	211	205.1	2
BGX7D	58313	78349	194.1	214.1	204.8	2
BGX8DR	58943	77590	183.1	203.1	204.9	2
BGX9D	59522	76936	212.4	232.4	226.5	3
BGX10D	59765	76183	216.2	236.2	225.3	3
BGX11D	59581	75301	216.7	236.7	234.8	3
BGX12D	59674	74411	223.7	243.7	237.7	3
BRR1D	50588	77365	200.4	220.4	217.1	3
BRR4D	50104	77360	198.7	218.7	214.7	3
BRR5D	50009	77267	202.1	222.1	214.5	3
!BRR6D	51089	77071	199.4	219.3	207.3	3
BRR7D	50688	77571	201.9	221.9	217.3	3
BRR8DR	50142	77627	204	219	214.4	3
CRP1	44372	68618	187.8	217.8	208	3
CRP2	44336	69043	171.8	201.8	207.6	3
CRP3	44001	68665	184	214	208	3
CRP3D	44013	68694	194.3	214.3	203.3	3
CRP4	44101	68447	180.7	210.7	207.2	3
CRP5D	44515	68549	194.6	214.6	209.9	3
CRP6DR	44017	68312	194.2	214.2	203.8	3
CRP7D	44082	69197	188	208	205.1	3
CRP8D	43682	68651	191	211	204.4	3
CRP9D	44243	69157	191.4	211.4	203.4	3
CRP10D	43743	69000	189.5	209.5	202.1	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
CRP11D	44164	68714	193.7	203.6	202.2	3
CRP16DU	43978	68877	197.2	207.2	202.1	3
CRP17DU	43827	68895	197.6	207.6	201.2	3
CRP18D	43426	69186	190.8	200.8	198.8	3
CRP23DU	44020	68760	190.8	196.5	198.3	3
CRP24DU	44060	68745	187.7	190.4	201.3	3
CRP25DU	44065	68750	191.1	193.8	200.9	3
CRP26DU	44070	68755	188.6	191.4	200.3	3
CRP27DU	44108	68680	193.4	196.2	200.8	3
CRP28DU	44109	68682	199.3	205	201.2	3
CRP40A	42737	69423	189.4	191.4	196	3
CRP40B	42737	69423	186.4	188.4	196.3	3
CRP45A	42730	69392	192	193.5	195.9	3
CRP45B	42730	69392	188.5	190	197.3	3
CSB6A	44864	67812	189.8	219.8	211.1	3
F2	51484	75677	207	217	219.6	3
F9	50651	75015	202.8	212.8	209.3	3
F10	50444	75155	266.5	276.5	270.4	3
F18A	50108	74170	194.4	204.4	202.9	3
FAB1	54915	77799	215.4	235.4	228.4	3
FAB2	55137	77470	216.5	236.5	229.1	3
FAB3	55031	77151	211.8	231.8	228.6	3
FAB4	54760	77585	214.2	234.2	228.5	3
FAC1	55305	78160	225.2	255.2	235	3
!FAC2	55244	78044	226.8	256.8	235.9	3
FAC3	55323	78018	224.8	254.8	230	3
FAC5	55241	77960	214	234	225.5	3
FAC5P	55315	78176	225.7	235.7	229.6	3
FAC6	55336	78129	216.2	236.2	220.7	3
FAC7	55356	78123	215.7	235.7	223.2	3
FAC8	55366	78091	216	236	229.1	3
FAC10C	55299	78120	200.2	210.2	218.2	2
FAC11C	55232	78100	201.4	211.4	218.2	2
FAC12C	55226	78047	198	208	218.6	2
!FAL1	53756	78116	207	238.5	218.4	3
!FAL2	53757	78232	206.6	238	217.3	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
FBP5D	51074	79194	192.6	212.6	204.6	2
FBP6D	50547	79673	178.3	198.3	194	2
FBP7D	50879	79806	183.2	203.2	194.2	2
FBP9D	51074	79565	177.9	197.9	199.8	2
FBP10D	50536	79330	180.8	200.8	201.1	2
FBP11D	50768	79099	192	212.1	203.1	2
FBP12D	51166	78932	182.1	202.1	208	2
FBP13D	50694	79749	172.7	192.7	194.9	2
FBP43DU	51999	78743	224.5	239.3	226.2	3
!FBP44D	49614	80333	163.6	168.6	167.5	2
FBP45D	49812	80506	160.6	165.6	163.4	2
!FBP46D	49940	80502	161.4	166.4	166.2	2
!FBP47D	50128	80689	165.8	170.8	170.4	2
FBP48D	50229	80974	170.5	175.5	172.6	2
FC1D	53114	79688	217.2	222.2	223.8	3
FC3F	57663	78729	205.1	210.1	206.3	2
!FC4D	53911	82262	146.4	151.4	151	2
FC4E	53915	82269	176.4	181.4	185.6	2
!FCA19D	53719	78272	209.7	229.7	217.1	3
FCB1	54872	76835	205.6	235.6	231.3	3
FCB2	55047	76680	205.2	235.2	229.5	3
FCB3	54874	76428	195.3	225.3	224.8	2
FCB4	54606	76780	204.5	234.5	228.6	3
FCB5	54773	76493	217.1	237.1	228.7	3
FCB6	54733	76582	215.1	235.1	228.8	3
FCB7	54957	76914	218.3	238.3	236.1	3
FET1D	53300	76166	206.9	226.9	223.7	3
FET2D	52981	76046	209.5	229.5	222.4	3
FET3D	53026	75961	203	223	222.7	3
FET4D	53149	75959	205.1	225.1	222.9	3
FNB1	54272	80152	177.2	207.2	211.5	2
FNB2	54362	80442	180.8	210.8	206.7	2
FNB3	54106	80553	182.1	212.1	208.7	2
FNB4	53843	80410	179.6	209.6	213.9	2
FNB5	54295	80556	193.5	203.5	206.8	2
FNB7	54399	80649	192.4	202.4	203.9	2

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
FNB8	54550	80521	195.4	205.4	202.6	2
FNB10	54462	80980	170.2	200.2	196.1	2
FNB11	54795	80660	161.2	191.2	201.5	2
FNB12	54557	81456	164.6	194.6	191.3	2
FNB13	54880	81572	167.2	197.2	189	2
FNB14	55038	81473	172.5	202.5	190.3	2
FOB1D	50027	73812	175.4	195.4	204.8	3
FOB2D	49527	73974	175.5	195.5	205	3
FOB3D	49082	74139	183.4	203.4	204.3	3
FOB7D	50244	76085	193.8	213.8	211.9	3
FOB8D	49940	75772	191.4	211.4	211.8	3
FOB9D	50783	75775	192.6	212.6	214.4	3
FOB10D	51050	75661	195.6	215.5	215.2	3
FOB11D	51909	75603	199	219	219.1	3
FRB1	53915	76230	212.2	232.2	225.5	3
FRB2	53600	76250	213.6	228.6	221.9	3
FRB3	53588	76117	216.2	231.2	222.1	3
FRB4	53653	76076	214.6	229.6	223.1	3
FSB0PD	49850	74549	171.6	215.3	201.8	3
FSB25PD	49832	74534	171.3	216.4	200.7	3
FSB50PD	49874	74601	174.7	219.8	202.9	3
FSB76	51389	76141	197	227	217.8	3
FSB77	50713	75129	186.4	216.4	212.3	3
FSB78	50165	74764	187.7	217.7	208.6	3
FSB79	50140	73663	174.1	204.1	201.9	3
FSB87D	50081	75586	187.4	216.8	213	3
FSB88D	51527	75622	202.1	222.1	216	3
FSB89D	51336	75548	201.9	221.9	215.8	3
FSB90D	51141	75377	205.1	225.1	215.4	3
FSB91D	50947	75208	200.9	220.9	213.8	3
FSB92D	50557	75046	201.7	221.7	211.8	3
FSB93D	50452	74888	197.9	217.9	210.2	3
FSB94DR	50163	74869	183.3	203.4	210.2	3
FSB95DR	49996	74992	187	207	209.9	3
FSB97D	49976	75189	196.9	216.9	210.2	3
FSB98D	50112	75372	200.3	220.3	211.4	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
FSB99D	50327	75692	198.1	218.1	212.6	3
FSB100PD	49921	74512	175.1	215.2	200.7	3
FSB104D	49255	73865	190.4	210.4	203.9	3
FSB105DR	49841	75258	188.5	208.6	210.6	3
FSB106D	50637	74193	202.9	222.9	206.9	3
FSB107D	51150	75177	200.9	220.9	213.7	3
FSB108D	51142	76261	203.8	223.8	217.5	3
FSB109D	50488	75856	205.8	225.8	214.1	3
FSB110D	50142	74193	191.1	211.1	205.1	3
FSB111D	51516	75383	201.7	221.7	215.1	3
FSB112D	48780	74224	188.9	208.9	205.7	3
FSB113D	51098	74155	189.6	209.6	206.5	3
FSB114D	52019	75279	197.7	217.8	216.4	3
FSB115D	49728	72504	182.5	192.5	191	3
FSB116D	50630	72727	186.4	196.4	191.6	3
FSB117D	50487	74070	189.7	209.7	204.5	3
FSB118D	51276	74698	191.3	211.3	210.7	3
FSB119D	50600	74600	193.1	213.1	207.9	3
FSB120D	49164	75569	196.5	216.5	208.8	3
FSB121DR	48430	75152	191.3	211.3	206	3
FSB122D	48202	73866	186.6	206.6	202.4	3
FSB123D	51735	74563	194.1	214.1	211.4	3
FSB150PD	49718	74616	176.2	221.3	203	3
FSL1D	52992	79063	208.5	228.6	224	3
FSL2D	52791	78637	208.7	228.8	224.2	3
FSL3D	52465	77765	205.9	226	221.6	3
FSL4D	52230	77452	204	224.1	216.8	3
FSL5D	51903	77048	203.5	223.7	220.1	3
FSL6D	51728	76733	202.1	222.1	219.5	3
FSL7D	51486	76328	199.5	219.6	217.5	3
FSL8D	51514	76055	202.7	222.8	217.1	3
FSL9D	51544	75768	201.4	221.5	216.7	3
FSL10C	52296	78599	179	199	209.9	2
FSS1D	53898	75258	209.9	229.9	222	3
FSS2D	53919	75103	204.4	224.4	221.3	3
FSS3D	53548	74961	205.8	225.8	219.1	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
FSS4D	52876	75538	202.6	222.6	218	3
FST1D	49102	81243	119.5	129.5	125.4	1
FTF1	53180	77413	221.2	241.2	225.1	3
FTF2	53275	77336	219.4	239.4	225.1	3
FTF3	53245	77235	218.2	221.2	224.8	3
FTF4	53268	77133	216.6	236.6	224.5	3
FTF5	53168	77036	215.3	235.3	224.9	3
FTF7	53090	77236	222.1	226.1	224	3
FTF8	53060	77336	219.6	239.6	224.9	3
FTF9	52770	77483	216.4	236.4	223.1	3
FTF10	52905	77336	215.1	235.1	223.3	3
FTF11	52749	77181	215.8	235.8	223.7	3
FTF12	52648	77321	215	235	227.1	3
FTF13	53099	76638	216.1	236.1	224.8	3
FTF14	52108	76189	218.6	238.6	225.8	3
FTF15	53230	76732	197.5	227.5	225.1	3
FTF16	52880	76759	203.8	233.8	223.6	3
FTF17	52884	76872	200.6	230.6	223.6	3
FTF18	52879	76956	202.3	232.3	223.2	3
FTF19	52670	77139	198.3	228.3	223	3
FTF20	52500	77015	198.3	228.3	222	3
FTF21	52499	76867	198.7	228.7	222.7	3
FTF22	52495	76751	212.6	242.6	221.8	3
FTF23	52660	76612	201.2	231.2	222.1	3
FTF24A	52781	77257	212.7	232.7	223.2	3
FTF25A	52869	77308	212.8	232.8	223.6	3
FTF26	52875	77250	206.3	226.3	223.7	3
FTF27	52823	77227	213.5	243.5	223.6	3
H2	58786	72180	234.5	244.5	237.4	3
H6	58335	72009	225.2	235.2	230.5	3
H7	58336	71949	224.9	234.9	229.8	3
H8	58234	71615	218.4	228.4	227.2	3
H10	57823	71607	222.5	232.5	227.9	3
H11	57779	71566	212	222	228.9	3
H18A	57338	71340	217.5	227.5	224.5	3
!H19	57042	71434	219.6	221.1	228.5	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
HAA1D	62991	69859	261.8	281.8	276.1	3
HAA2D	61251	70945	260.3	280.4	276.4	3
HAA3D	60154	71418	246.7	266.7	263.9	3
HAA4D	61890	72223	255.7	275.7	269.7	3
!HAA5D	62673	70592	268.6	288.8	275.3	3
HAA6D	63900	71440	247.1	267.2	264.7	3
HAA7D	60807	71771	252	272.1	268.9	3
HAA8D	60609	72166	252.1	272.1	266.5	3
HAA9D	60857	72511	247.7	267.8	260.6	3
HAA10D	61205	72308	253	273	266.6	3
HAA11D	61407	72421	254.8	274.8	265.2	3
HAA12D	61759	72425	244.7	264.6	267.8	3
HAA13D	62039	72419	259.4	278.6	267.8	3
HAA14D	62386	72355	253	273	268.6	3
HAA15D	62770	72327	255.9	275.9	269.8	3
HAC1	61415	72171	258.8	278.8	269.4	3
HAC2	61367	72220	258.8	278.8	269	3
HAC3	61314	72183	255	275	269.1	3
HAC4	61372	72120	254.1	274.1	269.6	3
HAP1	63399	71210	256.3	276.3	270.9	3
HAP2	63520	71123	243.8	263.8	270.8	3
!HC8C	60065	77484	187.3	192.3	198	2
HCA1	63109	72522	253.7	273.7	269.1	3
HCA2	62943	72266	242	273.4	269.8	3
HCA3	63109	72652	253.8	273.8	268.8	3
HCA4	62943	72524	241.9	273.3	269	3
HCB2	63798	71290	239.9	269.9	268.1	3
HCB3	63920	71099	233.6	263.6	266.8	3
HCB4	64054	71244	235.9	265.9	264.5	3
HET1D	60546	71948	240.3	260.3	268.8	3
HET2D	60095	72006	239.7	259.7	258.7	3
HET3D	60111	72094	239.9	259.9	259.1	3
HET4D	60167	72178	239.5	259.6	259.6	3
HGW2D	61584	74197	208.4	228.5	232.9	3
HGW4D	65861	72713	212.6	232.7	230.4	3
HHP1D	60534	71027	260.4	270.4	271.3	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
HHP2D	60803	70886	263.2	273.2	274.5	3
HMD1D	56973	78732	199.7	219.7	208.8	2
HMD2D	57270	79666	190.8	210.8	199.8	2
HMD3D	57745	79579	187.7	207.7	199	2
HMD4D	58188	79160	188.9	208.9	198.9	2
HOB1D	56918	72993	204.2	224.2	233.2	3
HOB2D	57274	72812	200.4	220.4	231.1	3
HOB3D	58035	72326	207.7	227.7	231	3
HOB4D	58370	72224	210.4	230.4	230.7	3
HOB5D	58619	72273	213.9	233.9	236.6	3
HOB7D	56289	71880	197.4	217.4	221.2	3
HR811	59560	71946	207.9	237.6	246.8	3
HR812	59330	71780	206.3	235.9	239.7	3
HR813	59300	71559	201.7	231.4	238.1	3
HSB0PD	50429	71518	192.9	223.7	213.3	3
HSB25PD	56412	71536	187.1	217	213.4	3
HSB50PD	56459	71485	186.8	216.7	213.3	3
HSB65	58432	72426	212.4	242.4	234	3
HSB66	56928	72429	198.1	228.1	224.8	3
HSB67	58424	71505	200.7	230.7	223.3	3
HSB68	56901	71528	213.3	243.3	221.1	3
HSB69	56475	71547	199	229	219	3
HSB70	55759	72607	205.7	235.7	223.1	3
HSB71	55279	72876	204.8	234.8	223	3
HSB83D	58602	71628	198.7	228.7	224.3	3
HSB84D	56350	71584	199.5	219.5	218.2	3
HSB86D	55997	72522	206.6	236.6	222.3	3
HSB100D	58797	72074	216.9	236.9	234.1	3
HSB100PD	56379	71445	195	214.9	213.8	3
HSB101D	58595	71997	216.1	236.1	231.2	3
HSB102D	58393	71953	216.3	236.3	228.4	3
HSB103D	58316	71588	213.7	233.7	224.9	3
HSB104D	58076	71370	210.6	230.6	224.1	3
HSB105D	57877	71455	211.8	231.8	224.5	3
HSB106D	57645	71728	210.7	230.7	225.1	3
HSB107D	57412	71697	215.1	235.1	223.9	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
HSB108D	57146	71688	212	232	222.8	3
HSB109D	56885	71685	213	233	222.3	3
HSB110D	56672	71785	211.4	231.4	221.2	3
HSB111E	56487	71933	211.7	231.7	221.1	3
HSB112E	56400	72167	211.7	231.7	221.6	3
HSB113D	56164	72303	216.2	236.2	221.5	3
HSB114D	56105	72474	212.8	232.8	222	3
HSB115D	56040	72662	213.9	233.9	222.9	3
HSB116D	55988	72898	214.5	234.5	224.6	3
HSB125D	58584	71498	199.4	219.4	220.8	3
HSB126D	57170	70633	190.5	200.5	205.6	3
HSB127D	56788	71219	197.8	217.8	217.5	3
HSB129D	55103	71837	185.2	205.2	208.3	3
HSB130D	54652	70757	182.1	202.1	200	3
HSB131D	56891	70365	195.7	205.7	205.1	3
HSB132D	58799	71470	206.5	226.5	220.5	3
HSB133D	59102	71943	208.5	228.5	235.9	3
HSB134D	58297	71217	205.8	225.8	221.3	3
HSB135D	56553	71397	199.9	219.9	217.6	3
HSB136D	55942	71906	200.2	220.2	219.8	3
HSB137D	55696	72279	205.3	225.3	220.7	3
HSB138D	55261	73160	208.1	228.1	222.4	3
HSB139D	57384	71133	206.7	226.7	221.3	3
HSB140D	56561	70036	194.1	214.1	212.7	3
HSB141D	59171	71184	217.8	237.8	237.9	3
HSB143D	52775	73754	196.9	216.9	212.3	3
HSB146D	58493	70470	204	224.1	221.3	3
HSB147D	55804	73828	215.2	235.2	229.4	3
HSB148D	55356	70161	198.1	218.1	212.5	3
HSB149D	57286	71339	207	227	221.7	3
HSB150D	58693	71693	206.9	226.9	225.1	3
HSB151D	54026	72998	197.6	207.6	206.6	3
HSB152D	54362	72012	197	207	202	3
HSL1D	58925	72180	219.8	239.8	235.9	3
HSL2D	59423	72191	225.2	245.3	241.4	3
HSL3D	59771	72251	233.7	253.8	249.2	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
HSL4D	60172	72454	245	265.1	260.9	3
HSL5D	60340	72562	247.8	267.7	266.3	3
HSL6D	60531	72660	243.9	264	258.4	3
HSL7D	60723	72674	242.3	262.4	258	3
HSL8D	61117	72688	248.4	268.4	259.6	3
HSS3D	64710	68257	262.6	282.6	281.6	3
HTF5	62110	71390	264.3	284.3	277.6	3
HTF6	62228	71259	263.6	283.6	275.9	3
HTF7	62112	71130	263.5	283.5	275.3	3
HTF12D	61593	71520	262.2	272.2	273	3
HTF13	61586	71856	262.6	282.6	273.5	3
HTF14	61462	71858	261.9	281.9	272.7	3
HTF15	61353	71700	260.7	280.7	272.7	3
HTF15D	61352	71694	264.6	274.6	271.7	3
HTF17	61188	72600	238.4	258.4	262.6	3
HTF18	61223	71772	251.7	271.7	270.7	3
HTF19	61079	71902	245.7	265.7	268.7	3
HTF20	61087	72073	251.9	271.9	267.6	3
HTF21	61261	71998	242.6	262.6	269.3	3
HTF22	62554	71363	251.4	271.4	274.8	3
HTF23	62670	71363	256.8	276.8	274	3
HTF24	62775	71363	257.8	277.8	273.4	3
HTF25	62902	71224	252.5	272.5	273.5	3
HTF26	62816	71091	255.5	275.5	273.9	3
HTF27	62660	71058	259.1	279.1	274.9	3
HTF28	62516	71080	251.9	271.9	275.1	3
HTF29	62415	71230	259.9	289.9	274.6	3
!HTF30	62536	70892	255.9	275.9	270	3
HTF31	62663	70747	246.7	266.7	275.5	3
HTF32	62808	70881	251.1	271.1	274.4	3
HTF34	61979	71144	251.7	271.7	274.5	3
HWP1D	59853	72158	239.9	249.9	245.2	3
HWP2D	59919	72368	253	263	262.4	3
LFP2WP	45414	82313	124.6	126.6	135.5	1
LFP3WP	45762	82098	124.2	126.2	134.9	1
LFP4WP	46156	82058	125.2	127.2	133.1	1

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
LFP5WP	46399	82323	123	125	134.7	1
LFP6WP	46746	82521	126.2	128.2	135.8	1
LFP7WP	47107	82503	125.6	127.6	134.8	1
LFP10WP	45345	81840	123.2	125.2	133.7	1
LFP11WP	45722	81870	123	125	133.1	1
LFP12WP	46077	81580	122.2	124.2	129.5	1
LFP13WP	46795	82061	126.9	128.9	132.7	1
LFP14WP	46994	81375	121.5	123.5	129.1	1
LFW9	45803	84075	143.1	163.1	149.1	2
LFW10A	45935	84370	134.4	164.4	156.1	2
LFW21	46149	84178	137.9	167.9	155.2	2
LFW37	45667	83113	129.8	150.8	142.8	2
LFW38	46019	83172	130.5	151.5	143.4	2
LFW39	46218	83213	131.2	152.2	143.6	2
LFW40	46395	83249	131.2	152.2	143.5	2
LFW41	46627	83305	130.3	151.3	145.4	2
LFW42	46533	83776	130.2	151.2	147.3	2
LFW59D	46056	83000	129.3	149.3	142.3	2
LFW61D	46471	83089	130.3	150.4	142.8	2
MGA36	57891	73904	234.2	254.2	237.3	3
MGC9	55611	75372	217.3	237.3	229.7	3
MGC11	55771	75252	219.2	239.2	232.7	3
MGC19	56409	74770	230.6	234.6	232.3	3
MGC23	56727	74528	227.9	247.9	234.4	3
!MGC32	57449	73982	232	252	245.2	3
MGC36	57776	73739	234.4	254.4	236.4	3
MGE9	55489	75215	218.1	238.1	228.6	3
MGE15	55971	74849	219	239	231.2	3
MGE21	56446	74488	227.9	247.9	234	3
MGE30	57176	73936	229.3	249.3	237	3
MGE34	57495	73695	237.2	257.2	238.4	3
MGG15	55852	74699	223.3	243.3	233	3
MGG19	56174	74456	226	246	232.9	3
MGG23	56492	74214	227.1	247.1	234.3	3
MGG28	56895	73905	230.3	250.3	235.3	3
MGG36	57542	73413	232.5	252.5	238	3

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
NBG1	53879	79300	200.9	232.3	224.3	3
NBG2	53958	79100	203.6	233.6	225	3
NBG3	54068	78939	202.1	233.5	217.5	3
NBG4	54329	78942	196.1	227.5	217	2
NBG5	54516	78943	194.9	226.4	217.7	2
NEP1D	57021	80391	183.7	193.8	190.4	2
NEP2D	57344	79983	190.3	200.3	194.2	2
NEP4D	59896	78122	186.7	196.7	191.6	2
!NWP1D	56572	77632	202.6	212.7	210.9	2
NWP2D	56810	79307	192.3	202.3	200.2	2
NWP3D	55324	76836	215.3	235.4	225	3
NWP101D	55589	77407	213.6	223.6	225.5	3
P18D	47667	67553	207.1	227.1	223.7	3
SBG2	64940	74570	205.9	235.9	238.2	3
SBG3	65265	73700	206.6	236.6	237.8	3
SBG6	63860	73599	208.1	238.1	245	3
SCA2	64697	73851	215.9	245.9	243	3
SCA3	64571	73959	220.3	240.3	241.7	3
SCA3A	64571	73965	267.1	277.1	271.1	3
SCA4	64564	73856	220.4	240.4	242	3
SCA4A	64567	73855	265.3	275.3	269.2	3
SCA5	64631	74093	223.7	243.7	241.6	3
SCA6	64638	73706	221.3	241.1	242	3
SLP1	64449	72959	228	248	245.8	3
SLP2	64530	72863	217.7	237.7	246	3
YSC1D	65859	78171	216.8	236.8	221.1	3
YSC2D	66130	78320	197.9	218	216	2
!Z1	52962	76220	217.6	218.1	218.7	3
Z2	53182	74785	214	214.5	220	3
Z3	51328	75086	206.6	207.1	212.8	3
Z8	51585	76640	213.6	214.1	219.6	3
Z9	50571	77732	207.5	227.5	214.9	3
Z20	43722	74081	173.4	193.4	185.3	3
Z20B	43721	74085	175.6	195.6	191.5	3
ZBG1	65584	76584	220	240.1	234.2	3
ZBG2	67473	76170	210.9	230.9	221.7	2

Table CQ-5.3: Calibration Target Data Based on WSRC-TR-2003-00250 (Continued)

Well ID*	SRS E (ft)	SRS N (ft)	Screen Bot (ft above MSL)	Screen Top (ft above MSL)	Head (ft above MSL)	Aquifer zone**
ZDT1	65115	71644	227	247	239.7	3
ZDT2	65060	71696	225.1	245.1	241.2	3
!ZW2	54389	80702	194.8	204.8	207.5	2
ZW4	56557	77667	229.2	239.7	232.5	3
ZW5	54709	75767	221	231	227.6	3
ZW6	52031	76166	216.7	227.2	220	3
ZW7	60301	72399	254.5	264.8	266.7	3
ZW8	63801	70801	254.1	264.1	271.7	3
ZW9	61400	73198	242.4	252.4	252.3	3
ZW10	63401	73212	242.2	252.2	249.4	3

* Well IDs preceded by "!" are judged "Not Credible" (see DOE response to RAI-FF-1 in RAI Response Document)

** 3=UTRA-UZ, 2=UTRA-LZ, 1=GAU

Response to CQ-5 (II)

The study documented by WSRC-TR-2003-00250 was focused on definition of the water table. ERDMS data were used to assess the reliability of those wells considered in WSRC-TR-2003-00250, not to develop new calibration target locations. Furthermore, only wells from WSRC-TR-2003-00250 with large residuals were evaluated against current (and possibly more recent) data in ERDMS. Comments in Table RAI-FF-1.1 of the RAI Response Document provide an indication of whether new data were available for a specific well. For example, additional data were not available for wells HTF30, HC8C, BG115 and Z1, whereas the existence of new data was noted for wells BGX8DR, BGX3D and BG94.

Response to CQ-5 (III)

WSRC-TR-2003-00250 presented only wells that represented the water table in the vicinity of HTF. In the immediate vicinity of HTF, these are all wells in the UTRA-UZ. WSRC-TR-96-0399, Vol. 2 evaluated all wells used to calibrate the GSA PORFLOW groundwater flow model. This included wells screened in various aquifers (e.g., UTRA-UZ, UTRA-LZ, and GAU). The left-hand column in Table CQ.5-4 contains a listing of all wells from WSRC-TR-96-0399, Vol. 2 that are located in the HTF Area. Any well captured in WSRC-TR-96-0399, Vol. 2 that is screened to evaluate the water table (UTRA-UZ) in the vicinity of HTF was also considered in determining calibration targets in WSRC-TR-2003-00250. In addition, water table (UTRA-UZ) wells that had not originally been captured in WSRC-TR-96-0399, Vol. 2 (e.g., wells installed after 1996) were also captured in WSRC-TR-2003-00250. The wells were compared to adjacent wells to determine the median water level for the area and to use as calibration targets. Any well with a median water level more than 10 feet above the top of the screen zone was removed from further consideration.

Table CQ-5.4 provides a side-by-side comparison of wells in the vicinity of HTF from WSRC-TR-96-0399 Vol. 2 and from the WSRC-TR-2003-00250 calibration targets. For those wells not included in both documents, the reason for not being included is provided.

Table CQ-5.4: Comparison of WSRC-TR-96-0399, Vol.2, and Credible WSRC-TR-2003-00250 Well targets

WSRC-TR-96-0399, Vol. 2	WSRC-TR-2003-00250 (credible)	Notes
HAA-1A	N/A	1
HAA-1AA	N/A	1
HAA-1B	N/A	1
HAA-1C	N/A	1
HAA-1D	HAA-1D	N/A
HAA-2A	N/A	1
HAA-2B	N/A	1
HAA-2C	N/A	1
HAA-2D	HAA-2D	N/A
HAA-3A	N/A	1
HAA-3B	N/A	1
HAA-3C	N/A	1
HAA-3D	HAA-3D	N/A
HAA-4A	N/A	1
HAA-4B	N/A	1
HAA-4C	N/A	1
HAA-4D	HAA-4D	N/A
HAA-6A	N/A	1
HAA-6AA	N/A	1
HAA-6B	N/A	1
HAA-6C	N/A	1
HAA-6D	HAA-6D	N/A
N/A	HAA-7D	3
N/A	HAA-8D	3
N/A	HAA-9D	3
N/A	HAA-10D	3
N/A	HAA-11D	3
N/A	HAA-12D	3
N/A	HAA-13D	3
N/A	HAA-14D	3
N/A	HAA-15D	3
HAC-1	HAC-1	N/A
HAC-2	HAC-2	N/A
HAC-3	HAC-3	N/A
HAC-4	HAC-4	N/A
HAP-1	HAP-1	N/A

Table CQ-5.4: Comparison of WSRC-TR-96-0399, Vol.2, and Credible WSRC-TR-2003-00250 Well targets (Continued)

WSRC-TR-96-0399, Vol. 2	WSRC-TR-2003-00250 (credible)	Notes
HAP-2	HAP-2	N/A
HC-11C	N/A	1
HC-12B	N/A	1
HC-1A	N/A	1
HC-1D	N/A	2
HC-1E	N/A	4
HC-2A	N/A	1
HC-2B	N/A	1
HC-2C	N/A	1
HC-2D	N/A	2
HC-2E	N/A	4
HC-2F	N/A	4
HC-4A	N/A	1
HC-6A	N/A	1
HC-6B	N/A	1
HCA-1	HCA-1	N/A
HCA-2	HCA-2	N/A
HCA-3	HCA-3	N/A
HCA-4	HCA-4	N/A
HCB-1	N/A	2
HCB-2	HCB-2	N/A
HCB-3	HCB-3	N/A
HCB-4	HCB-4	N/A
HET-1D	HET-1D	N/A
HET-2D	HET-2D	N/A
HET-3D	HET-3D	N/A
HET-4D	HET-4D	N/A
N/A	HGW-2D	3
N/A	HGW-4D	3
N/A	HHP-1D	3
N/A	HHP-2D	3
HR3-11	N/A	2
HR3-13	N/A	2
HR8-11	HR8-11	N/A
HR8-12	HR8-12	N/A
HR8-13	HR8-13	N/A
HR8-14	N/A	2
HSL-2D	HSL-2D	N/A
HSL-3D	HSL-3D	N/A
HSL-4D	HSL-4D	N/A

Table CQ-5.4: Comparison of WSRC-TR-96-0399, Vol.2, and Credible WSRC-TR-2003-00250 Well targets (Continued)

WSRC-TR-96-0399, Vol. 2	WSRC-TR-2003-00250 (credible)	Notes
HSL-5D	HSL-5D	N/A
HSL-6D	HSL-6D	N/A
HSL-7D	HSL-7D	N/A
HSL-8D	HSL-8D	N/A
HTF-1	N/A	2
HTF-2	N/A	2
HTF-4	N/A	2
HTF-5	HTF-5	N/A
HTF-6	HTF-6	N/A
HTF-7	HTF-7	N/A
HTF-8	N/A	2
HTF-9	N/A	2
HTF-10	N/A	2
HTF-11	N/A	2
HTF-12	N/A	2
N/A	HTF-12D	4
HTF-13	HTF-13	N/A
HTF-14	HTF-14	N/A
HTF-15	HTF-15	N/A
N/A	HTF-15D	3
HTF-16	N/A	2
HTF-17	HTF-17	N/A
HTF-18	HTF-18	N/A
HTF-19	HTF-19	N/A
HTF-20	HTF-20	N/A
HTF-21	HTF-21	N/A
HTF-22	HTF-22	N/A
HTF-23	HTF-23	N/A
HTF-24	HTF-24	N/A
HTF-25	HTF-25	N/A
HTF-26	HTF-26	N/A
HTF-27	HTF-27	N/A
HTF-28	HTF-28	N/A
HTF-29	HTF-29	N/A
HTF-31	HTF-31	N/A
HTF-32	HTF-32	N/A
HTF-34	HTF-34	N/A
N/A	HWP-1D	3
N/A	HWP-2D	3

Table CQ-5.4: Comparison of WSRC-TR-96-0399, Vol.2, and Credible WSRC-TR-2003-00250 Well targets (Continued)

WSRC-TR-96-0399, Vol. 2	WSRC-TR-2003-00250 (credible)	Notes
P-27B	N/A	1
P-27C	N/A	1
P-27D	N/A	2
SBG-1	N/A	2
SBG-2	SBG-2	N/A
SBG-3	SBG-3	N/A
SBG-5	N/A	2
SBG-6	SBG-6	N/A
SCA-2	SCA-2	N/A
SCA-3	SCA-3	N/A
SCA-3A	SCA-3A	N/A
SCA-4	SCA-4	N/A
SCA-4A	SCA-4A	N/A
SCA-5	SCA-5	N/A
SCA-6	SCA-6	N/A
SLP-1	SLP-1	N/A
SLP-2	SLP-2	N/A
Z-12	N/A	2
Z-13	N/A	2
ZDT-1	ZDT-1	N/A
ZDT-2	ZDT-2	N/A
ZW-7	ZW-7	N/A
ZW-8	ZW-8	N/A
ZW-9	ZW-9	N/A
ZW-10	ZW-10	N/A

Notes:
1. Not a water table well, monitors deeper aquifers
2. Water level median elevation more than 10 feet above top of well screen, not representative of water table surface
3. Water table well installed after 1996
4. Well monitors perched water above water table surface

N/A Not Applicable

CQ-6

Please explain what is meant by "preferential recharge paths" in Table RAI-FF-1.1. Where are these preferential recharge paths located?

Response CQ-6

The term "*preferential recharge paths*" was not intended to document an identified physical feature, but rather was meant to denote water levels within monitoring well FAL-1 that are somewhat lower than other wells located in the same area. Because there is an overall downward hydraulic gradient within the shallow saturated zone, localized heterogeneities in the flow-field could possibly intersect the FAL-1 borehole and permit more rapid migration of water laterally or downward compared to other wells in the vicinity, resulting in lower water levels within FAL-1. The theory that localized heterogeneities are permitting more rapid water migration has not been confirmed as the cause of anomalous water levels.

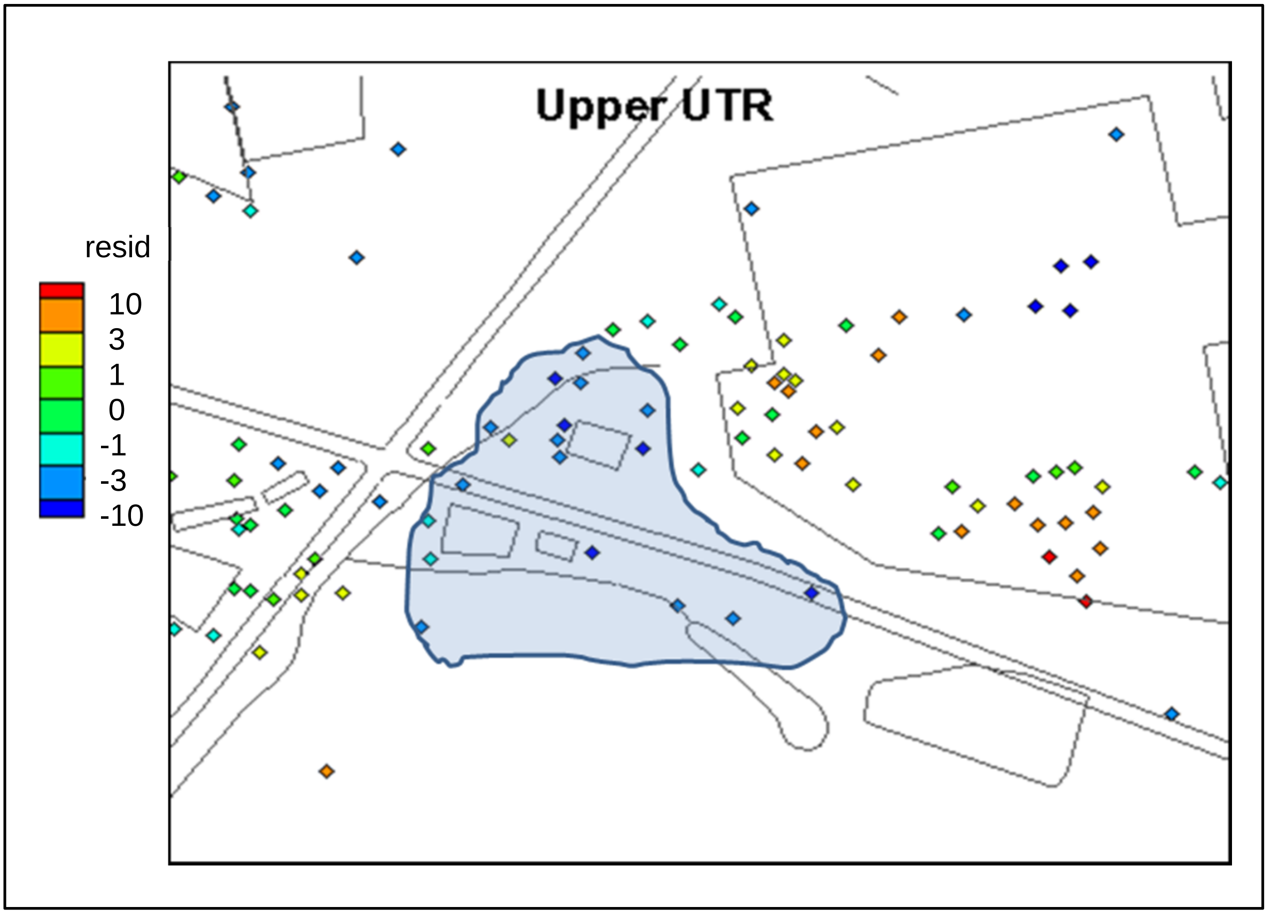
CQ-7

Please provide a legend for Figure RAI-FF-1.1.

Response CQ-7

The legend for Figure RAI-FF-1.1 from the RAI Response Document is the same as that used in Figure RAI-FF-1.2. Figure RAI-FF-1.1 is reproduced below with the addition of a legend for identification of well residuals values, measured in feet.

Figure CQ-7.1: Low Zone Outside H Area Southwest of HTF (Wells with Residuals > 6 foot)



CQ-8

Please indicate why UTR-LZ calibration statistics are provided in Table RAI-FF-2.3 but no calibration statistics are provided in Table RAI-FF-2.4. Note that the source of data, WSRC-TR-2003-00250, appears to only include water table data; however, if the same data source was used for both tables, it is not clear why UTR-LZ data is provided for one and not the other.

Response CQ-8

Table RAI-FF-2.3 of the RAI Response Document summarizes statistics for the entire model domain while Table RAI-FF-2.4 summarizes statistics for the localized area surrounding H Area (circular extent in RAI Response Document Figure RAI-FF-2.2). In the vicinity of H Area, the water table occurs exclusively within the UTRA-UZ, and because *An Updated Regional Water Table of the Savannah River Site and Related Coverages*, WSRC-TR-2003-00250, provides statistics only for "water table" wells, the statistics in Table RAI-FF-2.4 reflect only the UTRA-UZ. Table RAI-FF-2.3, however, summarizes statistics for a larger area, which includes locations (and wells) where the water table progressively drops in elevation such that it occurs within the UTRA-LZ. Table RAI-FF-2.3 therefore provides statistics for both the UTRA-UZ and UTRA-LZ.

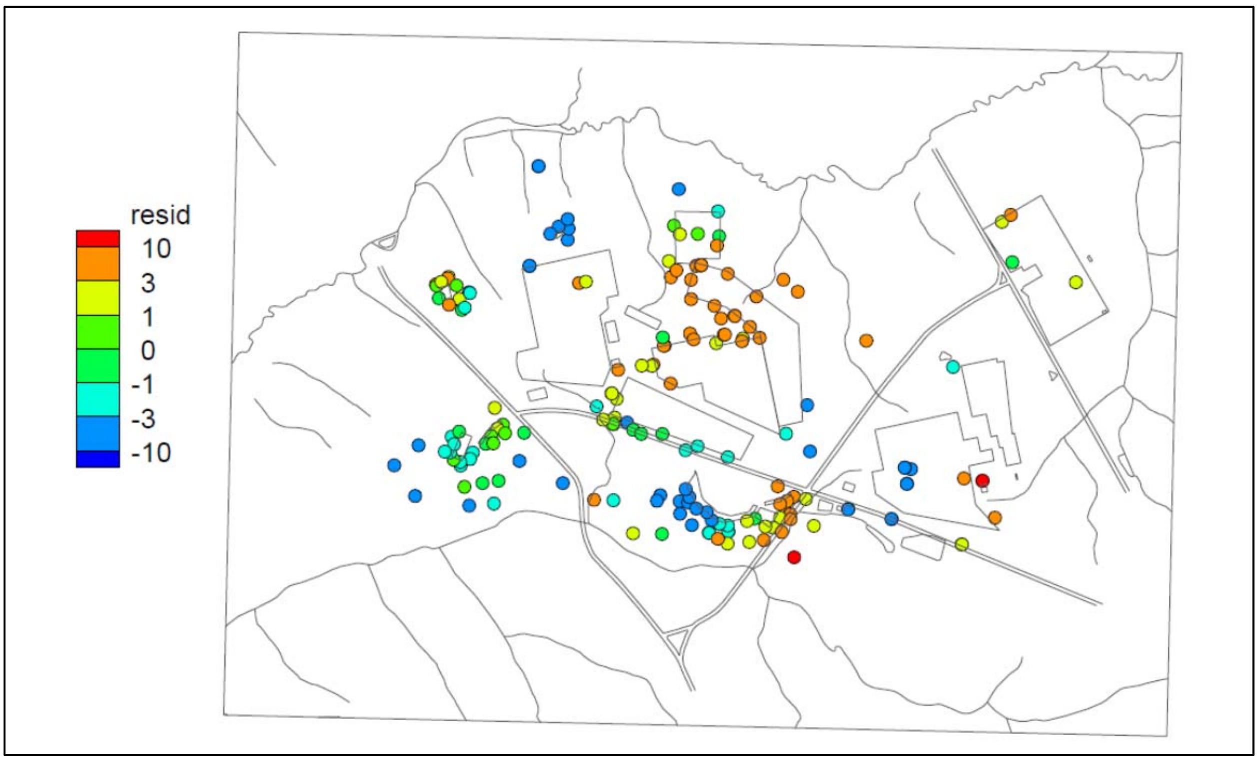
CQ-9

If no UTR-LZ calibration targets were evaluated in Table RAI-FF-2.4 for HTF, please comment on whether UTR-LZ calibration targets are available and on DOE's ability to evaluate HTF PORFLOW model calibration given the strong vertical gradient at HTF.

Response CQ-9

A few UTRA-LZ targets were available in the vicinity of HTF and were considered during calibration of the GSA/PORFLOW model. The calibration results for the UTRA-LZ targets are indicated in Figure 3-4(b) of *Groundwater Flow Model of the General Separations Area Using PORFLOW*, WSRC-TR-2004-00106, reproduced here as Figure CQ-9.1.

Figure CQ-9.1: UTRA-LZ Calibration Residuals (ft)



CQ-10

Figure RAI-FF-3.2 through RAI-FF-3.4 provide the spatial extent of hydraulic conductivity assignments in the GSA/PORFLOW model; however, the vertical extent of the hydraulic conductivity assignments is not clear from the illustrations. Please clarify the vertical extent of the assignments.

Response CQ-10

The polygons depicted in Figure RAI-FF-3.2 of the RAI Response Document were used to select a sediment volume for the area defined by the polygon and within the UTRA-UZ, which lies between the top of the TCCZ hydrostratigraphic (“surf5” in Figure RAI-FF-3.1) and the ground surface (“surf7” in Figure RAI-FF-3.1). Similarly, Figures RAI-FF-3.3 and RAI-FF-3.4 pertain, respectively, to the TCCZ (between “surf4” and “surf5” in Figure RAI-FF-3.1) and UTRA-LZ (between “surf3” and “surf4” in Figure RAI-FF-3.1) zones.

CQ-11

Please explain why Darcy velocity is not expected to impact longitudinal dispersion in the GoldSim model (see CC-FF-4 response on page 195).

Response CQ-11

The DOE response to CC-FF-4 on page 195 of the RAI Response Document indicated that the degree of attenuation is independent of the Darcy velocity. The response to CC-FF-4 did not intend to imply that Darcy velocity had no impact on the dilution process in advective-dispersive transport. The following discussion is being provided to clarify the intent of the statement made in the response to CC-FF-4.

The intention of the analysis described on page 195 of the RAI Response Document was to examine the influence of longitudinal dispersion and associated plume spreading on peak concentration. The statement about Darcy velocity was a thought about the effect longitudinal dispersion has on mass moving through a steady one-dimensional flow field. For example, when applying an instantaneous point source, M, in an infinite one-dimensional flow field, longitudinal dispersion has the effect of spreading the mass outward (parallel to the flow direction) from the center of mass, which moves with the flow field. The degree of spreading becomes a function of the position of the center of mass in conjunction with the dispersivity. Based upon the Green's function describing one-dimensional advective-dispersive transport in the direction of flow of for instantaneous point release at x_{source}, the solution for concentration can be defined as:

$$C(x,t) = \frac{M}{\varphi R}\frac{1}{\sqrt{4\pi\alpha_L Vt}}e^{-\left\{\frac{\{(x-x_{source})-Vt\}^2}{4\propto_L Vt}\right\}} \qquad \text{(Eq. CQ-11.1)}$$

where M is the mass released, φ is the porosity, R is the retardation, α_L is the longitudinal dispersivity, $V = V_{Darcy}/(\varphi R)$ where V_{Darcy} is the Darcy velocity, and t, time. For a point x, a specific value of $V_{Darcy}t$ will dictate the concentration. The term $V_{Darcy}t$ in turn represents the distance advected by the center of mass. This shows that for the case of an instantaneous release, the shape and peak value of the breakthrough curve at point x will be independent of the Darcy velocity; however, the position of the breakthrough curve on a timeline is controlled by the Darcy velocity. Note that attenuation due to decay is not considered here, and molecular diffusion is considered to be negligible.

The truth of the preceding discussion does not preclude the Darcy velocity being important in an advective-dispersive problem. For the time-dependent boundary condition $\dot{M}(t)$, applied in the GoldSim pipe model and a specific longitudinal dispersivity, the peak concentration at a point of interest is a function of the degree of dilution associated with the flow rate and the temporal nature of the release. The degree of dilution associated with the flux of contaminated water released from the vadose zone in the GoldSim model mixing with the water flowing through the aquifer (as simulated by the GoldSim pipe model) has been previously described in the response to CC-FF-4 (see Equation (1) on page 191 of the RAI Response Document) without consideration of dispersion. This dilution phenomena can also be observed from the perspective of the pipe-model solution. Note that for simplicity, the equations for the pipe model described below assume that the radionuclide source is at one end of the pipe (x=0) as opposed to a distributed source beneath a tank. If

the source is given a specified length in the pipe model, the vadose zone release will be equally distributed along the length of the source. To examine the influence of the velocity on dilution, consider the boundary condition for GoldSim's analytical pipe model,

$$V_{SZ}\left(C(0,t) - \alpha_L \frac{\partial C(0,t)}{\partial x}\right) = \dot{M}(t) \qquad \text{(Eq. CQ-11.2)}$$

Where, V_{SZ} is the pipe Darcy velocity, α_L, the longitudinal dispersivity, and $\dot{M}(t) = V_{UZ}A_{UZ}C_{UZ}$, a time-dependent mass release rate from the vadose zone for the Goldsim model, where V_{UZ} is the vertical Darcy velocity at the bottom of the vadose zone, A_{UZ} is the area of the source, and C_{UZ} is the concentration of the water released from the vadose zone. The pipe-model boundary condition can rewritten in the form:

$$V_{SZ}\left(C(0,t) - \alpha_L \frac{\partial C(0,t)}{\partial x}\right) = V_{SZ}C_o(t) \qquad \text{(Eq. CQ-11.3)}$$

where, $C_o(t)$ is the time-dependent concentration at the boundary x=0, and where

$$A_{Pipe}V_{SZ}C_o(t) = \dot{M}(t) \qquad \text{(Eq. CQ-11.4)}$$

or,

$$C_o(t) = \frac{\dot{M}(t)}{A_{Pipe}V_{SZ}} \qquad \text{(Eq. CQ-11.5)}$$

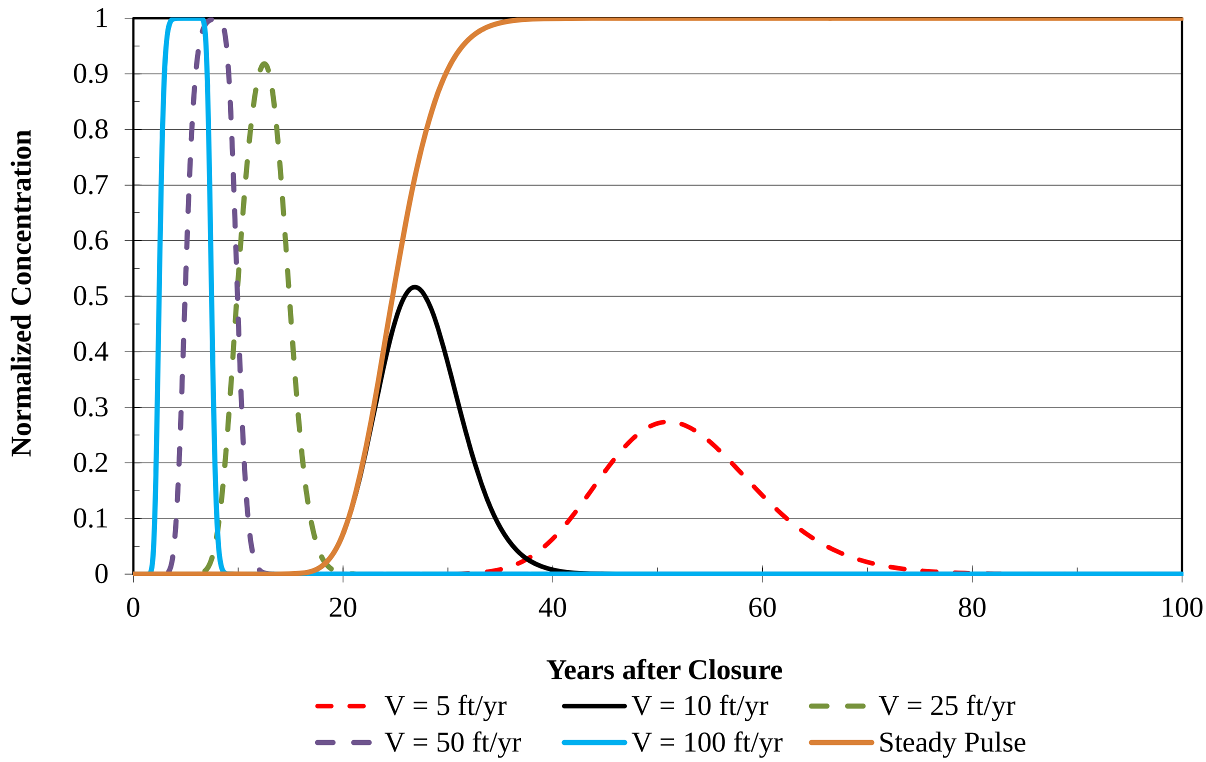
where A_{Pipe} is the cross-sectional area of the pipe model. As shown in Equation CQ-11.5, the concentration, $C_o(t)$, at the upgradient end of the pipe is approximately a function of the Darcy velocity in the pipe. Note that the dilution effect examined here, in terms of the ratio of $C_{UZ}(t)$ to $C_o(t)$, is the same as that described by the dilution factor defined in Equation (1) of the response to CC-FF-4 with the $DF_{Boundary}$ and PF_{Plume} terms removed. Mathematically, this dilution process represents complete and instantaneous mixing of vadose zone and saturated zone waters and occurs whether or not longitudinal dispersion is considered.

The combined influence of the Darcy velocity and release profile will also influence the geometry of the plume. For a pulse release, the length of the pulse and velocity of the flow field together determine when and if the breakthrough curve reaches a quasi-steady state, and for how long the quasi-steady state condition will continue. For example, consider the results for the 5-year pulse simulation presented in Figure CC-FF-4.1 of the RAI Response Document. To show the combined influence of the flow rate and pulse duration, the 5-year pulse model was simulated using the updated velocities of 5 ft/yr, 25 ft/yr, 50 ft/yr, and 100 ft/yr. Note that the mass flux applied was also adjusted by factors of 0.5, 2.5, 5, and 10, respectively making the boundary concentrations, $C_o(t)$, the same so that dilution associated with the vadose zone/saturated zone water flux balance, was negated. The results are presented in Figure CQ-11.1. Notice how the changes in Darcy velocity influence the width and location of the breakthrough curve and how close to reaching a quasi-steady state condition each breakthrough curve comes. In the 100 ft/yr breakthrough curve a quasi-steady state condition is retained for approximately 3 years. As the velocity increases, the quasi-steady state condition will approach the pulse duration. These results can be anticipated by thinking of the pulse release in terms of superposition of two infinite source breakthrough curves as follows:

$$C(x,t) = C(x,t) - C(x,t - t_{Pulse}) \qquad \text{(Eq. CQ-11.6)}$$

where t_{Pulse} is the pulse duration and the time dependent boundary condition presented in Equation CQ-11.2 is a constant mass flux rate of infinite duration.

Figure CQ-11.1: 100-Meter Concentration Breakthrough Curves for 5-Year Pulse Release



CQ-12

Please explain why Darcy velocity only impacts breakthrough time (see CC-FF-4 response on page 195). If Darcy velocity only affects breakthrough time, then it would seem that the RAI-FF-3 results that show differences in dose for three different Darcy velocities in Goldsim would be inadequate to show the impact of changes in HTF flow field on the modeling results.

Response CQ-12

Darcy velocity does not only affect breakthrough time. As noted in the response to CQ-11, the comment on page 195 of the RAI Response Document was a thought about the effect longitudinal dispersion has on an instantaneous mass release moving through a steady one-dimensional flow field. As described in the response to CQ-11, the Darcy velocity can have an influence on dilution and the shape of breakthrough curves independent of whether or not longitudinal dispersion is considered in the model.

In addition to changes in breakthrough curves discussed in the response to CQ-11, the interaction of plumes generated by multiple sources must be considered in examining total influence of Darcy velocity. At an observation point, changes in the Darcy velocity, which influence the mass arrival times and/or shapes of breakthrough curves from individual sources, will in turn affect the concentrations generated by superposition of the individual plumes.

CQ-13

On page 150, RAI-FF-3 response indicates that "Note that because the nominal pathline distances were used to generate all three velocity fields, the sets represent approximations, which can be (and are) used only to examine specific effects on processes such as dilution." Please explain what this sentence means. Figures RAI-FF-3.9 and 3.10 show very significant differences in the flow field between the fast and slow cases. Is the sentence simply stating that only Darcy velocity abstracted from the PORFLOW runs is investigated in Goldsim (and not flow direction, cumulative impacts, and dispersion, for example)?

Response CQ-13

The NRC interpretation stated above is correct in that the additional deterministic sensitivity runs performed to support the response to RAI-FF-3 presented in the RAI Response Document only addressed the impact of Darcy velocity variability. The response to RAI-FF-3 evaluated the combined influence of flow rate changes and other parameters such as K_ds within the context of changes in Darcy velocities only.

REFERENCES

DOE/SRS-WD-2013-001, *Draft Basis for Section 3116 Determination for Closure of H-Tank Farm at the Savannah River Site*, Savannah River Site, Aiken, SC, February 2013.

ML100970781, *Savannah River Site H-Area Tank Farm Input Packages/References*, U.S. Nuclear Regulatory Commission, Washington, DC, April 2010.

ML13044A309, *Draft Basis for Section 3116 Determination for Closure of H-Tank Farm at the Savannah River Site, February 6, 2013 (DOE/SRS-WD-2013-001, Rev. 0),* U.S. Nuclear Regulatory Commission, Washington, DC, February 2013.

ML13086A080, *Summary of Webcast/Teleconference Between U. S. Nuclear Regulatory Commission Staff and U.S Department of Energy Representatives Concerning Consultation, per Section 3116 NDAA, on a Proposed Waste Determination related to H-Area Tank Farm at the Savannah River Site,* U.S. Nuclear Regulatory Commission, Washington, DC, April 2013.

ML13106A338, *Summary of Clarification Discussion Between U. S. Nuclear Regulatory Commission Staff and U.S Department of Energy and Savannah River Remediation Staff Concerning Waste Release Potential Related to H-Area Tank Farm at the Savannah River Site,* U.S. Nuclear Regulatory Commission, Washington, DC, May 2013.

ML13120A496, *Summary of Clarification Discussion Between U. S. Nuclear Regulatory Commission Staff and U.S Department of Energy and Savannah River Remediation Staff Concerning Flow and Transport of Water and Contaminants Related to H-Area Tank Farm at the Savannah River Site,* U.S. Nuclear Regulatory Commission, Washington, DC, May 2013.

ML13154A327, *Summary of Clarification Discussion Between U. S. Nuclear Regulatory Commission Staff and U.S Department of Energy and Savannah River Remediation Staff Concerning Flow Modeling and Calibration Related to H-Area Tank Farm at the Savannah River Site,* U.S. Nuclear Regulatory Commission, Washington, DC, July 2013.

ML13183A410, *Summary of a Public Meeting Between the U. S. Nuclear Regulatory Commission Staff and U.S Department of Energy Staff and Contractors Concerning Requests for Additional Information Related to a Proposed Waste Determination for Closure of H-Area Tank Farm at the Savannah River Site; and a Consultation Visit by NRC Staff to H-Tank Farm,* U.S. Nuclear Regulatory Commission, Washington, DC, August 2013.

ML13193A072, *Summary of Clarification Discussion Between U. S. Nuclear Regulatory Commission Staff and U.S Department of Energy and Savannah River Remediation Staff Concerning Flow Modeling and Calibration Related to H-Area Tank Farm at the Savannah River Site,* U.S. Nuclear Regulatory Commission, Washington, DC, July 2013.

ML13196A135, *U. S. Nuclear Regulatory Commission Staff Comments and Requests for Additional Information on the "Draft Basis for Section 3116 Determination for Closure of H-Tank Farm at the Savannah River Site," DOE/SRS-WD-2013-001 Rev. 0 and on "Performance Assessment for the H-Area Tank Farm for the Savannah River Site," SRR-CWDA-2012-00128 Rev. 1,* U.S. Nuclear Regulatory Commission, Washington, DC, August 2013.

ML13199A413, *Summary of Clarification Discussion Between U. S. Nuclear Regulatory Commission Staff and U.S Department of Energy and Savannah River Remediation Staff Concerning Performance Assessment Modelling Uncertainty/Sensitivity Related to H-Area Tank Farm at the Savannah River Site,* U.S. Nuclear Regulatory Commission, Washington, DC, July 2013.

ML13218A556, *Discussion and Clarification of U. S. Nuclear Regulatory Commission Request for Additional Information Need to Complete Preparation of a Technical Review Report as part of Consultation Regarding H-Area Tank Farm, Savannah River Site,* U.S. Nuclear Regulatory Commission, Washington, DC, August 2013.

ML13246A133, *Discussion of NRC Comments and Requests for Additional Information Needed to Complete Preparation of a Technical Review Report for Consultation Regarding H-Area Tank Farm, Savannah River Site,* U.S. Nuclear Regulatory Commission, Washington, DC, August 2013.

NDAA_3116, *Public Law 108-375, Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005, Section 3116, Defense Site Acceleration Completion*, October 28, 2004.

S4 Manual Procedure ENG.50, *LW Project and Closure Operating Plans,* Savannah River Site, Aiken, SC, Rev. 2, November 13, 2012.

SRR-CWDA-2010-00023, Dean, B., *H-Tank Farm Waste Tank Closure Inventory for Use in Performance Assessment Modeling*, Savannah River Site, Aiken, SC, Rev. 3, May 2010.

SRR-CWDA-2010-00128, *Performance Assessment for the H-Tank Farm at the Savannah River Site*, Savannah River Site, Aiken, SC, Rev. 1, November 2012.

SRR-CWDA-2013-00106, *Comment Response Matrix for NRC Staff Request for Additional Information on the Draft Basis for Section 3116 Determination and Associated Performance Assessment for the H-Area Tank Farm at the Savannah River Site*, Savannah River Site, Aiken, SC, Rev. 1, October 2013.

SRR-LWP-2009-00001, Chew, D. P., *Liquid Waste System Plan*, Savannah River Site, Aiken, SC, Rev. 18, June 2013.

WSRC-TR-2003-00250, Hiergesell, R.A. et al., *An Updated Regional Water Table of the Savannah River Site and Related Coverages*, Savannah River Site, Aiken, SC, Rev. 0, December 2003.

WSRC-TR-2004-00106, Flach, G.P.*, Groundwater Flow Model of the General Separations Area Using PORFLOW*, Savannah River Site, Aiken, SC, Rev. 0, July 14, 2004.

WSRC-TR-96-0399, Flach, G. P., and M. K .Harris, *Integrated Hydrogeological Modeling of the General Separations Area; Volume 2: Groundwater Flow Model (U)*, Vol. 2, Rev. 1, April 1999.

APPENDIX A

REQUEST FOR CLARIFICATION OF DOE RESPONSES PROVIDED IN SRR-CWDA-2013-00106, REV. 1

CRITERION 2

1. NRC staff is requesting clarification regarding the following documents that were referenced in DOE responses to Criterion 2 Requests for Additional Information (RAIs) – namely when DOE anticipates that the following documents will be available for review.

    - Procedures for the development of Operating Plans (RAI-MEP-4)
    - DOE has commissioned a study which will evaluate OA cleaning against downstream impacts on the Liquid Waste System versus the benefits (RAI-MEP-1)
    - Tank 12 and 16 Closure Module (RAI-MEP-2, RAI-MEP-7)
    - Tank 12 and 16 Final Removal Report (RAI-MEP-2, RAI-MEP-7)
    - A cost benefit analysis [*for additional removal from Tank 16*] will be performed, in part, by the dose impact results and conclusions of the HTF PA with the final radionuclide inventory considered. Please specify if the cost benefit analysis will be part of the Closure Module, Removal Report, or a separate document.
    (RAI-MEP-7)

NEAR-FIELD RELEASE AND TRANSPORT

2. It is not clear to NRC staff whether DOE's response to RAI-NF-12, which relied on an analysis described in RAI-NF-8, adequately accounts for annular inventories. Please provide a table of the fractional release of Cs-137, Sr-90, Tc-99 out of the tanks and the mass storage in tank materials (e.g., sand pads, contaminated zone, basemat, annular grout, tank grout, tank wall concrete, preferential flow paths) over time for the analysis provided to respond to RAI-NF-12.

3. It is not clear to NRC staff how DOE came to the conclusion in RAI-NF-13 that there is no significant contribution from Cs-137 and Sr-90 located in the sand pads. NRC staff notes that the HTF PA has shown the potential for very high doses from Sr-90. In Section 5.6.4.3.2 of the HTF PA, DOE discussed two of the highest realizations from Case D that show Sr-90 doses for the MOP can be as high as 15,000 mrem/yr. NRC staff understands that these are the highest realizations from a case that DOE considers to be a low probability case; however, the parameters that appear to have most significantly influenced these MOP doses (e.g., inventory, Kd, dilution, water consumption) do not appear to account for the difference in results from the Flow Run 65, No Holdup case. Please provide a table of the fractional release of Cs-137, Sr-90, Tc-99 out of the tanks and the mass storage in tank materials (e.g., sand pads, contaminated zone, basemat, annular grout, tank

grout, preferential flow paths) over time for the analysis provided to respond to RAI-NF-13.

4. NRC staff is requesting the thermodynamic databases that were used in Geochemist's Workbench by SRNL to support the HTF PA to clarify how DOE developed longevity of the chemical conditioning as discussed in RAI-NF-3 and CC-NF-2. These databases should include the thermodynamic data for any species and phases that were added by SRNL staff.

FAR-FIELD HYDROLOGY AND TRANSPORT

5. RAI-FF-1 and RAI-FF-2 discuss review of ERDMS and WSRC-TR-2003-00250 water level data. Table RAI-FF-2.4 presents calibration statistics for HTF. However, a complete listing of HTF wells evaluated in these data sources was not provided. Please indicate the following:

    i. What wells in the vicinity of HTF (spatial extent illustrated in Figure RAI-FF-2.2) were used as calibration targets in the GSA/PORFLOW model for the UTR-UZ and UTR-LZ?

    ii. ERDMS data was evaluated in Table RAI-FF-1.1. Did ERDMS have water table data for all of the wells in the vicinity of HTF that were used as calibration targets in the GSA/PORFLOW model? If not, what well data were missing or what additional wells were available for evaluation?

    iii. Did WSRC-TR-2003-00250 have water table data for all of the wells in the vicinity of HTF that were used as calibration targets in the GSA/PORFLOW model? If not, what well data were missing or what additional wells were included in Table RAI-FF-2.4 and Figure RAI-FF-2.2? Note: NRC recognizes that some of the wells for which data were reported in WSRC-TR-2003-00250 were omitted as suspect based on the review of ERDMS data in Table RAI-FF-1.1.

6. Please explain what is meant by "preferential recharge paths" in Table RAI-FF-1.1. Where are these preferential recharge paths located?

7. Please provide a legend for Figure RAI-FF-1.1.

8. Please indicate why UTR-LZ calibration statistics are provided in Table RAI-FF-2.3 but no calibration statistics are provided in Table RAI-FF-2.4. Note that the source of data, WSRC-TR-2003-00250, appears to only include water table data; however, if the same data source was used for both tables, it is not clear why UTR-LZ data is provided for one and not the other.

9. If no UTR-LZ calibration targets were evaluated in Table RAI-FF-2.4 for HTF, please comment on whether UTR-LZ calibration targets are available and on DOE's ability to evaluate HTF PORFLOW model calibration given the strong vertical gradient at HTF.

10. Figure RAI-FF-3.2 through RAI-FF-3.4 provide the spatial extent of hydraulic conductivity assignments in the GSA/PORFLOW model; however, the vertical extent of the hydraulic conductivity assignments is not clear from the illustrations. Please clarify the vertical extent of the assignments.

11. Please explain why Darcy velocity is not expected to impact longitudinal dispersion in the GoldSim model (see CC-FF-4 response on page 195).

12. Please explain why Darcy velocity only impacts breakthrough time (see CC-FF-4 response on page 195). If Darcy velocity only affects breakthrough time, then it would seem that the RAI-FF-3 results that show differences in dose for three different Darcy velocities in Goldsim would be inadequate to show the impact of changes in HTF flow field on the modeling results.

13. On page 150, RAI-FF-3 response indicates that "Note that because the nominal pathline distances were used to generate all three velocity fields, the sets represent approximations, which can be (and are) used only to examine specific effects on processes such as dilution." Please explain what this sentence means. Figures RAI-FF-3.9 and 3.10 show very significant differences in the flow field between the fast and slow cases. Is the sentence simply stating that only Darcy velocity abstracted from the PORFLOW runs is investigated in Goldsim (and not flow direction, cumulative impacts, and dispersion, for example)?

APPENDIX B

Table B-1.1: Data Files Supporting Clarification Question Responses

File Name	File Type	Applicable Clarification Question	Description
CQ_BaseCaseAnnulus_Summary.xlsx	Excel Spreadsheet	CQ-2	Tables of the fractional releases and the mass storage over time for Cs-137, Sr-90 and Tc-99 using Base Case modeling assumptions and annular inventories
CQ_BaseCaseSand_Summary.xlsx	Excel Spreadsheet	CQ-2	Tables of the fractional releases and the mass storage over time for Cs-137, Sr-90 and Tc-99 using Base Case modeling assumptions and sand pad inventories
CQ_PessimisticAnnulus_Summary.xlsx	Excel Spreadsheet	CQ-2	Tables of the fractional releases and the mass storage over time for Cs-137, Sr-90 and Tc-99 using Pessimistic modeling assumptions and annular inventories
CQ_PessimisticSand_Summary.xlsx	Excel Spreadsheet	CQ-2	Tables of the fractional releases and the mass storage over time for Cs-137, Sr-90 and Tc-99 using Pessimistic modeling assumptions and sand pad inventories
thermocement.v2.radNEA_5-7-2012	Rich Text File	CQ-4	Thermodynamic database file used in Geochemist Workbench modeling to model chemical conditioning of pore fluids due to grout degradation

Notes: The files listed in Table B.1-1 are being provided electronically to the NRC in the file format noted within the table.