January 19, 2005

Mr. Roy J. Schepens
Office of River Protection
U.S. Department of Energy
P.O. Box 450
Richland, Washington 99352

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON THE OFFICE OF RIVER PROTECTION'S BASIS FOR EXCEPTION TO THE HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER WASTE RETRIEVAL CRITERIA FOR SINGLE-SHELL TANK 241-C-106

Dear Mr. Schepens:

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the "Basis for Exception to the Hanford Federal Facility Agreement and Consent Order Retrieval Criteria for Single-Shell Tank 241-C-106, Revision 1," dated June 2004, and the associated documentation provided with your letter dated October 6, 2004. We have attached a request for additional information (RAI), which is a list of comments that need responses in order to complete our review. It should be noted that at the time of transmittal of this RAI, the NRC has not received the performance assessment and supporting documentation used to develop the estimates of risk from material remaining in Single-Shell Tank 241-C-106. In addition to technical comments and questions pertaining to the performance assessment, additional comments and questions pertaining to tank retrieval may be generated after the performance assessment is reviewed.

If you have any questions about the RAI or our review, please contact me at 301-415-5228.

Sincerely,

/RA/

Anna H. Bradford
Senior Project Manager
Division of Waste Management and
Environmental Protection
Office of Nuclear Material Safety
and Safeguards

Attachment: RAI

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Attachment: RAI

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REQUEST FOR ADDITIONAL INFORMATION FOR THE BASIS FOR EXCEPTION TO THE HANFORD FEDERAL FACILITY AGREEMENT AND CONSENT ORDER WASTE RETRIEVAL CRITERIA FOR SINGLE-SHELL TANK 241-C-106

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the following documents:

[1] "Basis for Exception to the Hanford Federal Facility Agreement and Consent Order Waste Retrieval Criteria for Single-Shell Tank 241-C-106" RPP-20658 Revision 1, June 2004.

[2] "Stage I Retrieval Data Report for Single-Shell Tank 241-C-106" RPP-20110 Revision 2, June 2004.

[3] "Stage II Retrieval Data Report for Single-Shell Tank 241-C-106" RPP-20577 Revision 0, May 2004.

The NRC staff has specific technical comments and clarifying comments on these documents. The comments are provided below, and the NRC cannot complete its review until the U.S. Department of Energy has provided responses to these comments.

It should be noted that at the time of transmittal of this request for additional information (RAI), the NRC has not received the performance assessment and supporting documentation used to develop the estimates of risk from material remaining in Single-Shell Tank (SST) 241-C-106. In addition to technical comments and questions pertaining to the performance assessment, additional comments and questions pertaining to tank retrieval may be generated after the performance assessment is reviewed. For example, Step 6 of the contaminants of potential concern (COPC) screening procedure [3] eliminates contaminants with a K_d value of 0.6 mL/g or greater based on the conclusion that these contaminants are insufficiently mobile to reach potential receptors within the period of the performance assessment. The time required for contaminants to reach potential receptors, and, therefore, the appropriate screening value of K_d, depends on assumptions made about the location of potentially affected wells and hydrologic parameters used in groundwater transport modeling. Thus questions or comments pertaining to the location of wells or other aspects of the groundwater transport model in the performance assessment could generate questions about the COPC screening procedure.

The NRC staff understands that the Hanford Federal Facility Agreement and Consent Order (HFFACO) uses volume as the metric that waste retrieval is evaluated against. However, risk may not be proportional to waste volume. A more risk-informed approach would be to specify retrieval goals based on the reduction in the risk attributable to key radionuclides.

SPECIFIC TECHNICAL COMMENTS

1. Comment: Additional information is required to evaluate the conclusion that dissolution with oxalic acid is the best available chemical treatment of the sludge.

   Basis: Evidence that alternate chemical treatments could not dissolve the sludge to a greater extent or would be impractical to implement is necessary to support the conclusion that the sludge has been removed to the extent that is technologically practical.

Path Forward: Provide the expected efficiency of alternative chemical treatments available for sludge dissolution (other than oxalic acid), or provide information that demonstrates the application of an alternative chemical treatment is not technologically practical.

Provide the description of chemical treatment of sludge and sludge dissolution data provided in the document *Laboratory Testing of Oxalic Acid Dissolution of Tank 241-C-106 Sludge* (CH2M HILL Hanford Group, Inc., 2003).

2. Comment: Additional information is required to ensure that the conditions under which oxalic acid was used to dissolve tank sludge were the most favorable conditions that were technologically practical.

Basis: The documents reviewed do not provide information on the temperature of the acid used during the chemical dissolution process or the expected effect of temperature on the efficacy of acid removal. Temperature can be an important parameter in the stability and dissolution of solid materials. Evidence that a temperature in the optimal range was used is necessary to support the conclusion that the chemical removal method used resulted in sludge dissolution to the maximum extent that is technologically practical.

Path Forward: Provide a discussion of the effects of temperature on tank sludge dissolution showing either that alternate operating temperatures would not cause the sludge to dissolve to a greater extent or that it would not be technologically practical to implement the chemical treatment procedure at a different temperature.

3. Comment: Additional information is needed to evaluate Alternative Removal Method C, Modified Sluicing Followed by New Vacuum Retrieval System [3].

Basis: It is unclear why modified sluicing must be used for the first 795 L (210 gal) of waste removal instead of using the Vacuum Retrieval System (VRS) to remove all of the residual waste in SST 241-C-106. Using sluicing to remove the first 795 L (210 gal) of residual waste increases the water usage and the use of double-shell tank (DST) storage and therefore impacts the technological practicality of the removal option.

Path Forward: Provide an explanation of why additional sluicing must be performed prior to the activation of the VRS or provide an analysis of the expected cost and benefits of using the VRS to remove all of the residual waste in SST 241-C-106.

4. Comment: The basis for using the 95^{th} percentile upper confidence level (UCL)

of residual waste remaining in the tank to compute the volume of residual waste that would need to be removed to meet the residual waste requirement of 10.2 m^3 (360 ft^3) established in the HFFACO is unclear. Similarly, if the 95th percentile UCL is justified as the basis for the removal goal, it is unclear why a removal goal of 4.53 m^3 (160 ft^3) was used in the comparison of the alternative removal technologies instead of the difference between the 95th percentile UCL and the removal requirement of 10.2 m^3 (360 ft^3), or 3.03 m^3 (107 ft^3).

Basis: Although the removal goal reportedly was chosen to be conservative [3, p. 4-4], the effect of using a "conservatively" large removal goal rather than a removal goal based on the best estimate of waste in the tank is to increase projected water usage and removal costs. In addition, results of a "worst case" analysis of the estimated success of continued use of current technology (modified sluicing and oxalic acid dissolution) [3, p. 1-5 and 1-6] indicate that up to 1.27 m^3 (44.8 ft^3) could be removed with the existing technology. This additional removal would be sufficient to decrease the best estimate of the residual waste volume to below 10.2 m^3 (360 ft^3) and to meet the removal goal specified in the HFFACO.

Path Forward: Provide additional justification for the removal goal of 4.53 m^3 (160 ft^3) used in the analysis of potential alternative removal technologies. Alternately, explain why basing the removal goal on the best estimate of the difference between the waste volume left in the tank and the residual waste requirement of 10.2 m^3 (360 ft^3) would not change the conclusion of retrieval sufficiency. Address why the 95th percentile UCL of waste remaining in the tank was used rather than an UCL based on a lower percentile and why an additional 1.50 m^3 (53 ft^3) were included in the removal goal to result in a goal of 4.53 m^3 (160 ft^3).

5. Comment: It is unclear why the inventory of Cr increases from a pre-retrieval best-estimate value of 2.9 kg to a post-retrieval best-estimate value of 3.79 kg [1, Table 8].

Basis: The apparent increase in the inventory of Cr during the 2003 retrieval campaign may be significant to the determination of whether the retrieval operations have been successful because Cr is the dominant contributor to the Hazard Index (HI) [3].

Path Forward: Provide an explanation of why the inventory of Cr increased from 2.9 kg prior to removal to 3.79 kg after the 2003 removal campaign. Consideration should be given to potential acid dissolution of steel.

6. Comment: The logical basis for using a "worst case" estimate of the efficacy of additional sluicing and acid dissolution operations to support the conclusion that current methods could not achieve the waste removal goal is unclear.

Basis: The Stage II Retrieval Data Report for Single-Shell Tank 241-C-106 [3] indicates a "worst case" analysis shows that only 1.27 m^3 (44.8 ft^3) of waste could be removed with the existing modified sluicing and acid dissolution technologies. Although it is noted that "The actual waste volume reduction and efficiency per sluicing operation realized by continued sluicing would likely be greater than predicted by this estimate" [3, p. 1-6], the estimate is used to support the conclusion that additional waste removal operations should not be undertaken. This analysis appears to be non-conservative because the "worst case" removal estimate deliberately underestimates the amount of removal likely to result from additional removal efforts and thus is biased toward a decision not to pursue additional removal.

Path Forward: Provide an explanation of why the results of a "worst case" estimate of the efficacy of additional sluicing and acid dissolution operations can be used to support the conclusion that "regardless of the number of additional modified sluicing and acid dissolution operations undertaken, the waste retrieval goal of less than 10.2 m^3 (360 ft^3) would not be reached" [3, p. 1-5 and 1-6].

7. Comment: The Incremental Lifetime Cancer Risk (ILCR) and HI threshold values used in the COPC screening process were based on a comparison of the performance goals to the predicted dose to an industrial receptor. The use of the predicted dose to an industrial receptor rather than a residential receptor requires a basis.

Basis: ILCR and HI values used in the COPC screening process were based on a comparison of the performance goals to the predicted dose to an industrial receptor. The use of a more reasonably conservative scenario to establish the threshold values of the ILCR or HI may lead to more contaminants being identified as COPCs. A statement is made that the "most likely future land use for the tank farm area is considered industrial" [3, p. 3-6], however there was no additional basis for scenario selection.

Path Forward: Justify the use of the industrial land use scenario as a basis for the calculation of ILCR and HI values of contaminants or recalculate the ILCR and HI values based on a more reasonably conservative land use scenario. If ILCR and HI values are recalculated, repeat the contaminant screening process and repeat the risk analysis for any additional contaminants that were identified as COPCs with the new ILCR and HI values. In justifying the industrial land-use scenario, consideration should be given to the simulated long time-frames over which the compliance calculation will apply.

8. Comment: Additional information is needed to support the conclusion that all relevant contaminants were included in the risk analysis.

Basis: More information is necessary to evaluate the process for developing the data quality objectives (DQOs). Because inventories were generated only for constituents identified in the DQOs, the concern is that there may be constituents that could impact the health of a potential receptor that were not identified in the DQOs. In addition, the meaning of the terms “underlying hazardous constituents” and “secondary constituents” used in the description of the DQO process is unclear. These terms must be explained to clarify the basis for excluding non-detected underlying hazardous constituents and secondary constituents from the risk analysis.

Path Forward: Provide an explanation of the procedure used to identify constituents that were included in the DQOs. Provide a basis for excluding non-detected constituents identified as underlying hazardous constituents or secondary constituents in the DQO from the risk analysis.

Provide the document *Tank 241-C-106 Component Closure Action Data Quality Objectives, Rev. 1* (CH2M HILL Hanford Group, Inc., 2004).

9. Comment: Additional information is necessary to support the conclusion that the estimated residual inventory in SST 241-C-106 reflects uncertainty in the composition of the residual waste.

Basis: Variability in the composition of the solid waste in SST 241-C-106 has not been described. Thus it is unclear whether variability in the composition of the solid waste in SST 241-C-106 has been reflected in the inventory estimates. The concern is that variance in the waste characteristics could lead to greater than expected residual radioactivity in the tank.

Path Forward: Provide a description of the locations in SST 241-C-106 from which sludge samples were taken. Provide the number of samples used to estimate the uncertainty in the radiological composition of the post-retrieval inventory. Provide the sampling and analysis approach described in the document *Best-Basis Inventory Process Requirements, Rev. 4* (CH2M HILL Hanford Group, Inc., 2003).

Provide the sludge concentration data reported in *Analytical Results for the Tank 241-C-106 Solid Clams Shell Samples Supporting Closure Action, Rev. 0.* (RPP-20264) (CH2M HILL Hanford Group, Inc., 2004). Provide the liquid grab sample concentration data provided in *Analytical Results for Liquid Grab Sampling and Analysis Plan for Tank 241-C-106 Component Closure, Rev. 0* (RPP-20226) (CH2M HILL Hanford Group, Inc., 2004).

Provide the description of the statistical method used to determine the standard deviations in the nominal inventory presented in the document *Statistical Methods for Estimating the Uncertainty in the Best-Basis Inventories* (CH2M HILL Hanford Group, Inc., 2000).

10. Comment: It is stated that "DOE continues to consult with the NRC regarding issues associated with near-surface disposal of radioactive waste" [1, p. 2-39]. It is unclear what this statement is referring to in terms of any arrangements between DOE and NRC for consultation regarding waste disposal.

Path Forward: Clarify or delete this sentence.

11. Comment: The volume of waste on the stiffener rings is estimated to be 0.490 m^3 + 0.0850 m^3 - 0 m^3 (17.3 ft^3 + 3 ft^3 -0 ft^3) [2, p. 15 and 16], but an estimate of 0.490 m^3 (17.3 ft^3) of waste on the stiffener rings was used in the estimate of the total amount of waste in the tank [2, Table 4].

Basis: Because the estimated range of the volume of waste on the stiffener rings is 0.490 m^3 to 0.575 m^3 (17.3 ft^3 to 20.3 ft^3), it appears that the most optimistic estimate of the volume of waste on the stiffener rings was used in the estimate of the amount of residual waste in SST 241-C-106. Use of the most optimistic value of a parameter requires justification.

Path Forward: Clarify whether the reported uncertainty range was a typographical error or whether the most optimistic volume of waste on the stiffener rings was used. If the most optimistic value of waste on the stiffener rings was used, justify this choice.

12. Comment: In Table 3-4 on page 3-18 of [3], the Hanford Site Radiological Assessment Methodology (HSRAM) incremental cancer risk (ICR) values for the all-pathways farmer and Native American scenarios are 1.0×10^{-6} and 6.9×10^{-6} , resulting in a ratio of 6.9. The ratio of the all-pathways radiological dose in groundwater for these two receptors is 2.4. It is unclear why these ratios differ significantly.

Path Forward: Provide an explanation as to why the ICR values for the scenarios noted have a different ratio than the ratio for the all-pathways radiological dose in groundwater.

CLARIFYING COMMENTS

1. Comment: The peak ILCR due to residual waste in SST 241-C-106 is identified as 2.48×10^{-8} [1, p. ES-3]. This value is inconsistent with the ILCR due to residual waste in SST 241-C-106 shown in Figure ES-3 [1]. In addition, the ILCR reduction is identified in the text and in text included in Figure ES-3 to be 5×10^{-9}, which is inconsistent with the reduction shown in Figure ES-3.

Path Forward: Identify the correct peak ILCR due to residual waste in SST 241-C-106 and the correct reduction in the ILCR predicted to occur if 4.53 m^3 (160 ft^3) of waste are removed from the tank.

2. Comment: The pre-retrieval Tc-99 inventory in SST 241-C-106 is reported to be 0.887 Ci in one location [1, Figure 5] and 2.87 Ci in another [1, Table 8].

   Path Forward: Identify the correct pre-retrieval inventory of Tc-99 in SST 241-C-106.

3. Comment: The cost per cubic foot of waste removed was reported to be $5,170 in the 2003 retrieval campaign and to range from $35,000 to $84,000 for the removal alternatives considered [3, p. 4-13 and 4-23]. Thus cost per cubic foot of waste removed for each of the evaluated alternatives ranges from approximately 7 to 16 times greater than the cost per cubic foot of waste removed in 2003. However, it also is reported that the cost per cubic foot of waste removed with the removal alternatives considered is expected to be a factor of 100 to 280 times greater than the cost per cubic foot of waste removed in 2003 [3, p. 4-14 and 4-23].

   Path Forward: Identify the correct ratios of the cost per cubic foot of waste removed for the alternatives evaluated as compared to the cost per cubic foot of waste removed in 2003.

4. Comment: The abbreviation “K_d” is defined as the “dispersion coefficient” in the List of Terms [3]. The expected definition is “distribution coefficient”.

   Path Forward: Identify whether the abbreviation “K_d” is used to represent the dispersion coefficient in the text or whether the definition in the List of Terms is a typographical error.