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Office of River Protection, State of Washington Department of Ecology
Tank Waste Retrieval Work Plan/Functions and Requirements Modification Notice
(Per Hanford Federal Facility Agreement and Consent Order Section 9.3)

1. Document Title and Number: RPP-22393, Rev. 5, 241-C-102, 241-C-104, 241-C-107, 241-C-108 and 241-C-112 Tanks Waste Retrieval Work Plan

2. Minor Field Change: (Section 12.4 HFFACO Action Plan)
☐ Yes: (WRPS Signature Only – Attach signed form to Primary Document for record purposes)
x No: Proceed to Box 3

3. Document Issue Date: 11/30/10

4. Document Modification Notice Date: 8/2/11

5. Notice Number: 2011-3

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6. Do proposed changes require schedule changes? (Would this extend completion of retrieval beyond 12 months from date of initiation?)
☐ Yes x No

7. Do proposed changes include specific additions, deletions, or modification to scope and/or requirements which affect the overall intent of the plan?
☐ Yes x No

8. (Check only one box)
☐ Significant Modification
(Check if the answer to question in either section 6 or 7 is "yes". Significant modifications require revision of the primary document.)
Minor Modification
x Requires modification of the document
x Can be accomplished with Modification Notice.

9. Description and Justification of Change:
Change Description: RPP-22393, Rev 5, Appendix C, uses an AN-106 supernate nitrite concentration of 2.55 E+04 g/L for a leak during retrieval. This number is increased to 3.2 E+04 g/L. This 25% proportional impact will be reflected on Figure C-3, in Table C-1, and in Section C2.3.
Justification: The current concentration assumes the C-108 heel is retrieved into AN-106 before C-107 retrieval. Recent schedule changes now show C-107 retrieval may precede C-108 retrieval. Without the C-108 liquid addition to AN-106 the higher current AN-106 nitrite concentration is conservatively assumed for a leak.

10. Impact of Change:
None.

11. Additional Requirements and/or Provisions[1]: 1) units changed to mg/L in box 9 per telecom with J Schofield, 8/29/11 : 2) footnote a in Table C-1 changed to 2011

Approvals

Washington River Protection Solutions, LLC.	Office of River Protection	State of Wash., Dept. of Ecology
☐ Provisional Approval[2] Date	☐ Provisional Approval[2] Date	☐ Provisional Approval[2] Date
☒ Final Approval Date 8/8/11	☒ Final Approval Date 8/11/11	☐ Final Approval Date 8-24-11

Notes
1 - For use by Ecology to identify any additional information needed to make a decision regarding the request for modifications. In addition, Ecology will identify actions, if any, regarding the modification request that DOE may take pending Ecology's final decision
2 – Provisional approval allows DOE and it's contractors to take specific actions identified in section 11, prior to final approval of this modification.

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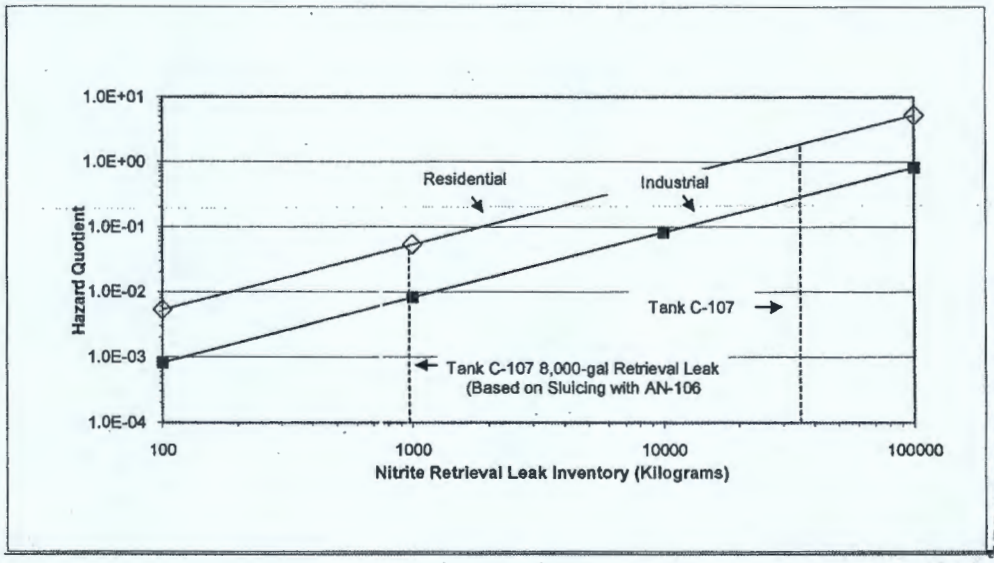
Figure C-3. Tank C-107 Nitrite Hazard Quotient Plot.



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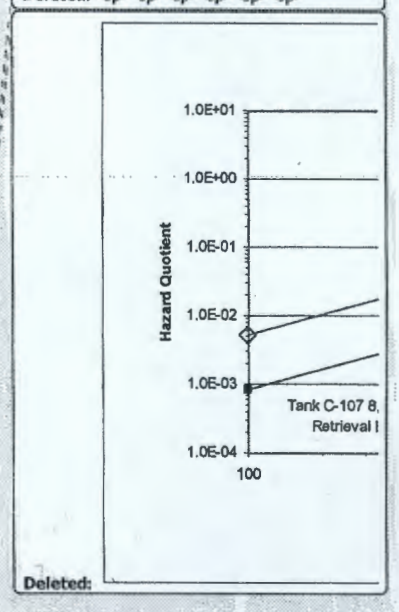

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Figure C-1 shows the peak groundwater pathway incremental lifetime cancer risk (ILCR) from technetium-99 as a function of the amount of technetium-99 leaked from tank C-107 during waste retrieval. Figures C-2 and C-3 show the peak groundwater pathway hazard quotient from hexavalent chromium and nitrite, respectively, as a function of the amount of hexavalent chromium and nitrite leaked from tank C-107 during waste retrieval.

The ILCR and hazard quotient values shown on the graphs were based on the predicted peak groundwater concentrations at the waste management area (WMA) C downgradient fenceline. As discussed in Section 7.1.1.3, the projected arrival time of the peaks is approximately the year 2082 based on the supporting contaminant transport analysis in RPP-13774, *Single-Shell Tank System Closure Plan.* The graphs provide a retrieval leak risk picture for tank C-107 but do not include contributions from other WMA C sources. Projected impacts from other WMA C sources are discussed in Section 7.1.3.

Two sloped lines representing the industrial and residential scenarios were plotted on each graph. The datapoints for these lines were calculated as described in Section 7.1.1 over a range of technetium-99, hexavalent chromium, and nitrite values. Because potential retrieval leak volumes are uncertain, the inventory range was selected to encompass a small leak on the low end and a large leak on the high end.

Vertical dashed lines were added to each graph as points of reference to show the estimated current tank C-107 inventory and the inventory associated with a potential 8,000-gal. retrieval leak. The 8,000-gal. volume was a hypothetical volume used only as a point of reference and for consistency with previous analyses. It was not intended to represent anticipated retrieval leak volumes or leak detection limits for tank C-107.

Hexavalent Chromium	1.86E-04	4.29E-04	kg/L	5.62E+00	1.30E+01	kg
Nitrite	3.2~~2.55~~E-02	1.63E-03	kg/L	9.69~~7.73~~E+02	4.94E+02	kg

[a] From RPP-22392, 2009, *Tanks C-102, C-104, C-107, C-108 and C-112 Long-Term Human Health Risk Calculations to Support Tank Waste Retrieval Work Plan*, Rev. 2, Washington River Protection Solutions, LLC, Richland, Washington. [b] Addendum C1, Table 9 from RPP-13774, 2004, *Single-Shell Tank System Closure Plan*, Rev. 2, CH2M HILL Hanford Group, Inc., Richland, Washington.

Raw water retrieval leak inventories are given in Table C-1 to provide a perspective on the potential effects on retrieval leak impacts caused by sluicing with recirculated DST supernate. The raw water inventories shown are the inventories used for the RPP-13774 base case risk analysis. Those inventories were based on a hypothetical 8,000-gal. retrieval leak volume and retrieval leak fluid concentrations estimated using the Hanford Tank Waste Operations Simulator (HTWOS) model. Because retrieval leak human health impacts are proportional to inventory, comparing the inventory differences provides an indication of the differences in impacts between the two sluicing fluids. Table C-1 indicates raw water leak inventories would be slightly lower than the supernate leak inventories for technetium-99 and nitrite and slightly higher for hexavalent chromium.

C2.3 SUMMARY OF IMPACTS FROM HYPOTHETICAL 8,000-GALLON RETRIEVAL LEAK

The technetium-99 inventory associated with a hypothetical 8,000-gal. retrieval leak from tank C-107 was estimated to be approximately 0.933 Ci (RPP-22392). As shown in Figure C-1, this corresponds to an ILCR of approximately 1.08×10^{-6} for the industrial scenario and 2.63×10^{-5} for the residential scenario. The peak technetium-99 groundwater concentration at the WMA C fenceline from this retrieval leak would be approximately 78.4 pCi/L.

The hexavalent chromium inventory associated with a hypothetical 8,000-gal. retrieval leak from tank C-107 was estimated to be approximately 5.6 kg (RPP-22392). As shown in Figure C-2, this corresponds to a hazard quotient of approximately 0.0018 for the industrial scenario and 0.011 for the residential scenario. The peak hexavalent chromium groundwater concentration at the WMA C fenceline from this retrieval leak would be approximately 0.00047 mg/L.

The nitrite inventory associated with an 8,000-gal. retrieval leak from tank C-107 was estimated to be approximately 969~~773~~ kg (RPP-22392). As shown in Figure C-3, this corresponds to a hazard quotient of approximately 0.00~~6~~480 for the industrial scenario and 0.04~~1~~51 for the residential scenario. The peak nitrite groundwater concentration at the WMA C fenceline from this retrieval leak would be approximately 0.0816~~5~~ mg/L.

C2.4 EXAMPLE CALCULATION

To illustrate the calculation method used for the retrieval leak impact graphs, the following example is provided. The example uses the industrial scenario ILCR result of 1.08×10^{-6}. Using Equation 7-1 from Section 7.1.1, the industrial scenario ILCR was calculated as the

(8,000 gal.) by the estimated retrieval leak fluid concentration. Waste was assumed to be retrieved from tank C-107 by sluicing with recycled supernate from DST AN-106. The retrieval leak fluid concentrations for this retrieval scenario are provided in RPP-22392.

-The predicted liquid phase concentrations and resulting tank C-107 leak inventories for the DST AN-106 recycled supernate retrieval scenario are shown in Table C-1. The table also shows leak inventories for a raw water retrieval scenario.

Table C-1. Tank C-107 Retrieval Leak Inventory Comparison for Different Sluicing Fluids.

Contaminant	Leak Fluid Concentration			Inventory in 8,000-gal. Retrieval Leak		
	Tank AN-106 Supernate [a]	Raw Water [b]	Units	Tank AN-106 Supernate	Raw Water	Units
Technetium-99	3.08E-05	1.75E-05	Ci/L	9.33E-01	5.30E-01	Ci
Hexavalent Chromium	1.86E-04	4.29E-04	kg/L	5.62E+00	1.30E+01	kg
Nitrite	3.2~~2.55~~E-02	1.63E-03	kg/L	9.69~~7.73~~E+02	4.94E+02	kg

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