0076497

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Richland Operations Office
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08-AMCP-0133

MAR 14 2008

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Mr. K. Niles, Assistant Director
Nuclear Safety Division
Oregon Department of Energy
625 Marion Street Northeast, Suite 1
Salem, Oregon 97301

Dear Mr. Niles:

PLUTONIUM/ORGANIC-RICH PROCESS CONDENSATE/PROCESS WASTE GROUP OPERABLE UNIT: INCLUDES THE 200-PW-1, 200-PW-3, AND 200-PW-6 OPERABLE UNITS, REMEDIAL INVESTIGATION REPORT, DOE/RL-2006-51, REVISION 0, – 0074017
0076362 – FEASIBILITY STUDY, DOE/RL-2007-27, DRAFT A, AND PROPOSED PLAN, DOE/RL-2007-40, DRAFT A –

This purpose of this letter is to respond to your November 15, 2007, comments regarding the Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit: Includes the 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units, Remedial Investigation Report, DOE/RL-2006-51, Revision 0, Feasibility Study, DOE/RL-2007-27, Draft A, and Proposed Plan, DOE/RL-2007-40, Draft A.

The U.S. Department of Energy, Richland Operations Office (RL) has reviewed the comments and is providing the attached responses. RL looks forward to meeting with you and your staff on April 1, 2008, to discuss contaminant mobility at the 200-PW-1 waste sites. Comments responses can be discussed further at that time.

If you have any questions, please contact me, or your staff may contact Briant Charboneau of my staff, on (509) 373-6137.

Sincerely,

Matthew S. McCormick, Assistant Manager
for the Central Plateau

AMCP:ACT

Attachment

cc: See Page 2

cc w/attach:
G. Bohnee, NPT
L. Buck, Wanapum
N. Ceto, EPA
D. A. Faulk, EPA
B. H. Ford, FHI
S. Harris, CTUIR
J. A. Hedges, Ecology
R. Jim, YN
S. L. Leckband, HAB
R. E. Piippo, FHI
J. B. Price, Ecology
V. J. Rohay, FHI
A. F. Shattuck, FFS
J. G. Vance, FFS
Administrative Record
Environmental Portal

S&GRP Central Plateau Remediation Project

DOCUMENT REVIEW AND COMMENT FORM

1. Date: 11/15/2007	2. Page 1 of 13
3. Project: 200-PW-1/3/6 OUs Remedial Investigation & Feasibility Study	4. Review No: DOE/RL-2006-51, Rev. 0 & DOE/RL-2007-27, Draft A

5. Document Number(s)/Title(s):	6. Program/Project/Building Number	7. Reviewer	8. Organization/Group	9. Location/Phone
DOE/RL-2006-51, Rev. 0 & DOE/RL-2007-27,Draft A **Remedial Investigation Report for the 200-PW-1, 200-PW-3, and 200-PW-6 OUs** **Feasibility Study for the 200-PW-1, 200-PW-3, and 200-PW-6 OUs**		Oregon	Oregon Department of Energy	

12. Comment Submittal Approval (optional):	15. Concurrence with indicated comment disposition(s)	17. **Closure Approval** ○ **No Comments** (Disposition status is either "Open", "Closed", etc.)
Reviewing Organization Manager (print / sign)	Date / Reviewer/POC (print/sign)	Date / Reviewer/POC (print/sign)
Date	Date / Author/Originator (print/sign)	Date / Author/Originator (print/sign)

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1	General Comment	Our review of the latest version of this document suggests that, except for correcting some erroneous data values that we pointed out, DOE has gone back to a simple vertical flow model, which we believe does not accurately reflect the manner in which water and contaminants move in the subsurface. The concern we have is that significant decisions are being made based on these erroneous conclusions. Perhaps the most significant is the decision to leave substantial contaminants in place in these Operable Units.		Partially accepted	The discussion of the contaminant distribution models is not as clear as was intended – the intent was not to suggest a simple vertical flow model. The revised FS will clarify the following points. The contaminant distribution models for the 200-PW-1, 200-PW-3, and 200-PW-6 waste sites presented in the Rev 0 RI report are based on review of all available information for each waste site that is cited on each figure and described in the tables in Appendix E. Lateral spreading at geologic contacts in the subsurface is noted as a component of these models. Clarification will be added to the discussion regarding the significantly different vadose zone conditions that were present during active liquid waste disposal at these sites in the past and the increasingly unsaturated moisture conditions of today due to both natural processes and the soil vapor extraction system (SVE) in operation at the 200-PW-1 waste sites for the past 15 years (see RI, Section 3.3.1).	
2	General Comment	These waste sites are not fully characterized and there is known to be plutonium and americium in these waste sites – which are both long-lived and, in certain conditions, are mobile. Revision 0 of the RIR presumes that		Discuss with Oregon	A meeting is proposed so that the contaminant mobility at 200-PW-1 waste sites and on-going studies can be reviewed. Although the waste site characterization was completed in accordance with the RI/FS process	

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		plutonium and other contaminants are highly immobile in the soil. Mobile plutonium and americium under these waste sites is not tightly sorbed or retained by the soil. A large fraction of the waste remains in the crib and is slowly converting to highly mobile forms. Moreover, caps and barriers cannot and will not work when a flow of water and waste comes from outside the area under the cap or within the barrier—such as in the waste sites considered here. Revision 0 of the RIR presumes that preferential flow of water and waste is not occurring under these waste sites. However, the historical and investigational data clearly demonstrate this to be the case. Water and waste are moving via preferential horizontal and vertical paths as described in the attached detailed comments.			and the level of characterization is considered sufficient to evaluate risks and evaluate remedial alternatives, ~~the revised FS will be clarified to note that limited characterization was done at most sites.~~ The need for post-ROD additional data collection to confirm the selected remedy or a contingent remedy was discussed in the FS Executive Summary, pp. v-vi, but ~~this too~~ will be clarified. The questions raised about plutonium and americium mobility will also be clarified in the revised FS based on additional review of the process chemistry as well as additional studies concerning this topic currently being conducted by PNNL to better understand K_d values under current conditions that can be used in future fate and transport modeling. The past mobility of the plutonium and americium disposed to the 200-PW-1 waste sites was ~~enhanced in~~ ~~due to~~ the presence of the organic and acidic liquid wastes as noted on the contaminant distribution model figures and shown in the contaminant trend plots in the Rev 0 RI. However, all of the RI characterization data show that significant concentrations of these radionuclides were not found below the Cold Creek unit (i.e. they are present only in the upper half of the vadose zone). In contrast, the 200-PW-3 waste sites that also received plutonium and americium did not receive the organic wastes, and the characterization data summarized on the contaminant distribution model figures in the Rev 0 RI (Figures 3-36, 3-37, and 3-40) show that concentrations of these radionuclides are highest beneath the waste sites and decrease to below detection within 10-15 ft below the waste sites. The key drivers (moisture, organics, and pH) at the 200-PW-1 sites are all significantly different today than in the past, and current conditions ~~are~~ do not ~~likely to~~ enhance the mobility of plutonium and americium. The RESRAD modeling conducted and discussed in the FS report (Appendix E) to evaluate the future	

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					movement of plutonium and americium at the 216-Z-9 Trench used conservative model parameters and contaminant distribution scenarios to demonstrate that these radionuclides will not be transported to groundwater in the future, and clarification of these points will be included in the revised FS.	
3	General Comment	We also note three other major problems with this work. First, many of the wastes disposed in these sites were and are governed by the Resource Conservation and Recovery Act (RCRA) and the Model Toxics Control Act (MTCA), both of which require more stringent protections than those required by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and its amendments. These also include requirements for the closure and postclosure process analysis for the waste sites that received RCRA wastes and cleanup of those wastes.		R	All 17 waste sites within the 200-PW-1, 200-PW-3 and 200-PW-6 Operable Units are CERCLA ~~past practice~~ sites. The CERCLA RI/FS process will be used to remediate these waste sites in accordance with applicable or relevant and appropriate requirements (ARARs).	
4	General Comment	Second, the alternatives evaluated do not achieve the risk range required under either CERCLA or RCRA. Thus, the simple barrier alternative (and others) should have been excluded from further analysis for failure to meet the threshold protectiveness criteria. By continuing to include analysis of these alternatives, DOE biases the resulting feasibility study by including the costs of non-protective alternatives that fail to meet the most minimal requirements of CERCLA or RCRA. The analyses also seemingly discount or ignore the bias for action and treatment EPA requires under CERCLA and that the State of Washington requires under RCRA and MTCA.		Partially accept	All of the remedial alternatives discussed in the detailed analysis (FS, Section 6) meet the threshold criterion of protection of human health and the environment. The CERCLA preference for reduction of toxicity, mobility or volume was evaluated by the range of remedial alternatives that were discussed. The revised FS will clarify how the alternatives address this issue, especially for radionuclide contaminants.	
5	General Comment	Third, DOE devalues and ignores the natural resource injury resulting from the proposed actions. Per DOE and EPA guidance, evaluations of alternatives considered need to include these impacts and costs.		Partially accept	DOE and the other Natural Resource Trustees first need to conduct a Preassessment Screen to determine if natural resource damages have occurred and then complete the assessment – this can be done as part of the RI/FS process or	

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					after completion of the remedial action at a scale that extends beyond a single Operable Unit. Note that the screening level ecological risk assessment discussed in FS Section 3.3 and Appendix B ruled out potential ecological risks at all 17 wastes sites.	
6	General Comment	In summary, proceeding with the proposed alternatives will not be protective or effective. The proposed alternatives will result in continued movement of plutonium, americium, carbon tetrachloride and other wastes beneath the site, requiring more costly and difficult cleanup work later.		Discuss with Oregon	A meeting is proposed so that the contaminant mobility at 200-PW-1 waste sites and on-going studies can be reviewed. The preferred alternative at 200-PW-1 waste sites with carbon tetrachloride includes a targeted SVE system – this technology is a presumptive remedy for volatile organics per EPA guidance and the effectiveness has been shown by the carbon tetrachloride mass removed by the interim action SVE system in the last 15 years.	
7	General Comment	We therefore recommend you retract the draft A of the feasibility study and proposed plan as premature and complete work on the remedial investigation report using accurate and valid conceptual models that are based on the known historical data, which shows rapid transport of all of these contaminants via preferential pathways to groundwater. We further recommend you convene a new team (including regulators and independent external members) to re-evaluate and develop these conceptual models and perform additional data quality objective and field sampling work to define the fundamental nature of the wastes' movement and the fate and extent of that movement.		Partially accept	In addition to meeting with Oregon to discuss comments, the path forward will include revision of the PW-1 FS and Proposed Plan to address review comments received on the Draft A documents. Additional fate and transport studies are currently being conducted as noted in the response to comment 2 above. The need for post-ROD additional data collection to confirm the selected remedy or a contingent remedy was discussed in the FS Executive Summary, pp. v-vi.	
8	Detailed Comment	**Detailed comments focused on the Z-9 crib as an example** Revision 0 of the remedial investigation report (RIR) changes the conceptual models from the RIR draft A, which noted the preferential pathways for movement of contaminants and water. Inexplicably, Rev. 0 discards this more accurate representation and instead returns to a more strictly vertical concept of contaminant movement used in earlier documents and uses		Partially accept	See response to comments 1 and 2 above.	

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		the RESRAD computer code to evaluate protectiveness. Neither the concepts nor the model are valid for these waste sites and neither are protective of public health or the environment. Using these invalid concepts and models leads to proposals for barriers (caps) and long-term institutional control actions that provide little or no real long-term protection.				
9	Detailed Comment	In the RIR draft A, DOE recognized the movement of plutonium and other contaminants via preferential pathways present in the subsurface beneath these sites. More work was and is needed to characterize this movement to establish the extent of waste movement and to understand the fate and transport of the wastes. The data quality objective process did not complete that work, nor identify the limits of waste movement laterally to the south or southeast from the Z-9 crib. It did clearly show that the previous assumption (that lateral transport was not a major issue) was and is wrong. In the revision 0 to the RIR and subsequent documents, DOE presumes again that lateral and vertical transport via preferential pathways is unimportant. In doing so, DOE ignores the historical record showing rapid movement of plutonium and americium in mobile forms under the Z-1A tile field, first noted four decades ago and analyzed in 1967, information we and others have brought to DOE's attention.		Partially accept	See response to comment 2 above. Investigations to define the lateral extent of contaminant migration to the south and southeast of the 216-Z-9 Trench are summarized in FS Figure 2-9, p. 2-43. See also the detailed investigations documented in DOE/RL-2006-58 and DOE/RL-2007-22, which are summarized in the Rev 0 RI. DOE/RL-2007-22, Appendix C also contains the analytical results for soil samples collected from the Hydraulic Hammer Rig (HHR) penetrations around 216-Z-9.	
10	Detailed Comment	The presumption that preferential pathways for transport of water and contaminants do not exist and do not dominate flow is contradicted by the historical records and by field investigations and analyses. Given the substantial lateral flow of water beneath the waste sites, simple and unproven surface barriers are of little to no value. Surface water infiltrating from areas not covered by barriers		Partially accept	See response to comment 1. The key drivers (moisture, organics, and pH) at the PW-1 sites are all significantly different today than in the past, and current conditions are highly unlikely to enhance the mobility of plutonium and americium. The RESRAD modeling conducted and discussed in the PW-1 FS report (Appendix E) to evaluate the future movement of plutonium and americium at the 216-Z-9 Trench used	

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		will move beneath the barriers, mobilizing the wastes. Thus these invalid, no-preferential-transport presumptions mislead decision makers into falsely believing something is being done to limit the movement of wastes although the barriers in reality do nothing of the kind. They certainly provide no long-term protection.			conservative model parameters and contaminant distribution scenarios to demonstrate that these radionuclides will not be transported to groundwater in the future. Additional studies concerning this topic are currently being conducted by PNNL to better understand K_d values under current conditions that can be used in future fate and transport modeling.	
11	Detailed Comment	Plutonium levels are relatively uniform and exceed 100 nanocuries per gram from 13 to 36 meters in depth, with the highest concentrations often occurring in the bottommost 2 meters.		R	At the 216-Z-9 Trench soil samples collected through penetrations in the trench roof in 1973 showed that the highest plutonium concentrations are located at the base of the trench excavation (RI p. 3-11). The 1973 data set was converted to pCi/g units for the FS risk assessment and the highest plutonium-239/240 concentration is over 404 million pCi/g at 22-22.3 ft bgs (i.e. the base of the trench, see FS p. 2-17). The RI borehole soil sample results are shown in vertical trend plots in RI Figures 3-13 and 3-14 and the analytical data are included in RI Appendix B. The deepest soil samples with plutonium concentrations above 100 nCi/g (100,000 pCi/g) are sample B17TM6 from C3426 with 115,000 pCi/g at 63.5-66 ft bgs and sample B1HK32 from C3427 (slant well) with 254,000 pCi/g at 70-72 ft downhole (58.4-60 ft bgs). These data show that the plutonium concentrations are not uniform; they are highest at the base of the trench and generally decrease with depth although secondary peaks are associated with fine grained layers in the Hanford formation and Cold Creek unit. Below the Cold Creek unit the concentrations rapidly decrease to below detection levels.	
12	Detailed Comment	If the plutonium was tightly sorbed by the soil, the plutonium contamination would be concentrated at the top of the soil column and would not extend to such great depths. Clearly a significant fraction of the plutonium is highly mobile and is moving to groundwater, in direct conflict with the RESRAD and other models.		Partially accept	Clarification will be added to the discussion in the revised FS regarding the significantly different vadose zone conditions that were present during active liquid waste disposal at these sites in the past and the increasingly unsaturated moisture conditions of today due to both natural processes and the soil vapor extraction system (SVE) in operation at the PW-	

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					1 waste sites for the past 15 years (see RI, Section 3.3.1). The key drivers (moisture, organics, and pH) at the PW-1 sites are all significantly different today than in the past, and current conditions are not likely to enhance the mobility of plutonium and americium. The RESRAD modeling conducted and discussed in the PW-1 FS report (Appendix E) to evaluate the future movement of plutonium and americium at the 216-Z-9 Trench used conservative model parameters and contaminant distribution scenarios to demonstrate that these radionuclides will not be transported to groundwater in the future. Additional studies concerning this topic are currently being conducted by PNNL to better understand K_d values under current conditions that can be used in future fate and transport modeling.	
13	Detailed Comment	Plutonium levels are high in Well 299-W15-8 at about 20 meters in depth and 30 meters laterally south from the centerline of the trench. There is no further southern well to delineate the southern bound of the spread of contamination. This demonstrates both rapid plutonium movement (showing that the plutonium is not tightly sorbed to the soil) and clear lateral movement. Because there is no well or boring beyond this well, it is not possible to delineate the lateral extent of spread or to know how large the contaminated soil volume or area are.		Partially accept	As previously noted, the RI data show that plutonium mobility was enhanced by the presence of the organic and acidic liquid wastes (RI Figure 2-3). The analytical results of the soil samples collected from the Hydraulic Hammer Rig (HHR) investigations at the 216-Z-9 Trench (see FS, Figure 2-9 and DOE/RL-2007-22, Appendix C for results) show that the highest carbon tetrachloride and plutonium concentrations are bounded on three sides, so the lateral extent is fairly well defined. Additional post-ROD investigations may be needed as part of the remedy design and implementation process (see FS Executive Summary, p. v-vi).	
14	Detailed Comment	Plutonium in Well 299-W15-48 is present in two layers. One is at the H1-H2 textural transition (between relatively sandy and gravelly soils at about 20 meters) and the other is at or above the Cold Creek Unit interface (at about 30 meters, and 20 meters laterally east from the centerline of the crib). Here also, there is no further eastern or southeastern well to bound the southeastern lateral spread of plutonium. As before, this		R	See response to comment 13 above. Note that well 299-W15-48 is a slant well, so the 7 deepest soil samples were collected directly beneath the southern part of the trench (see RI Figures 2-1, 2-2, and 3-14). Contaminant concentrations in those samples are primarily due to vertical movement below the trench.	

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		demonstrates both rapid movement (low plutonium sorption by the soil) and preferential transport on the textural interface formed by the H1-H2 soil horizon and on the Cold Creek Unit. This behavior is in no way modeled or represented in the analysis for alternatives.				
15	Detailed Comment	The contaminant distribution model in Figure 3-10 dramatically downplays the relative importance of lateral movement of the contaminants and misportrays the relative concentration with depth. The diagrams proposed in the date quality objective process for these units and draft A of the RIR are vastly better. Clearly the conceptual model fails to accurately or usefully portray the controlling features, events, and processes for these sites. There is a significant portion of the plutonium still present as plutonium IV oxide polymer in the crib. In time, this waste will mobilize. However, for the fraction of plutonium already mobilized, the presumed high sorption is not occurring, and the recovery opportunity is already lost. For this mobilized plutonium, alternatives that recognize its rapid movement must be analyzed, with a focus on retrieving it before it reaches groundwater.		Partially accept	See response to comments 1 and 2 above. By 1958 it was well understood that the plutonium in the aqueous high-salt waste stream going to 216-Z-9 was present as an anion (Pu[IV]-nitrate complex) that, at least initially, would not be sorbed by the soil column. This waste stream was partially neutralized (to a pH 2.5) to keep the aluminum ions from polymerizing. It was also known that any Pu in the waste stream would remain in solution at pH 2.5. However, this acidic waste stream would have been neutralized by the soil and the Pu(IV)-nitrate complex would decompose. Data in BNWL-CC-649 show the soil neutralization capacity to be about 0.5 meq/g until on reached the high carbonate zone (Cold Creek unit) where the soil neutralization capacity increased to about 6 meq/g. As the aqueous solution was neutralized the plutonium would have sorbed to the soil particles. The situation at the 200-PW-1 waste sites is more complex because of the discharges of spent organic solvents in the same cribs as the aqueous high-salt waste. Additional studies concerning this topic are currently being conducted by PNNL to better understand K_d values under current conditions that can be used in future fate and transport modeling.	
16	Detailed Comment	This mobile plutonium is not concentrated in the near surface. Instead, it exhibits both vertical and lateral movement. The RIR provides no assurance concerning or evaluation of whether vertical migration via preferential pathways (e.g., dikes and wells) is occurring or has occurred. Clearly, lateral		R	See response to comment 1. The key drivers (moisture, organics, and pH) at the PW-1 sites are all significantly different today than in the past, and current conditions are not likely to enhance the mobility of plutonium and americium. The RESRAD modeling conducted and discussed in the PW-1 FS report (Appendix	

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		transport via preferential flow paths on the H1-H2 contact and Cold Creek Unit are dominant transport paths. The RESRAD model and model parameters used (Kds) are clearly inappropriate and invalid for assessing the fate and transport of the contaminants. More over, there is little analysis of the dip of the soil structures which likely is a major factor in how rapidly the wastes move in or on these layers.			E) to evaluate the future movement of plutonium and americium at the 216-Z-9 Trench used conservative model parameters and contaminant distribution scenarios to demonstrate that these radionuclides will not be transported to groundwater in the future. Additional studies concerning this topic are currently being conducted by PNNL to better understand K_d values under current conditions that can be used in future fate and transport modeling. Note that the results of the seismic reflection investigation at the 216-Z-9 Trench (see RI Figures 2-17 to 2-23) did not detect any significant vertical preferential pathways such as clastic dikes in the horizontal layering shown on all of the profiles. The subsurface topography of various sedimentary layers shown in RI Figures 2-21 to 2-23 shows that on a detailed level the layers have local variations in elevation that likely helped control or influence contaminant migration in the past.	
17	Detailed Comment	None of this is or should be a surprise. Bechtel noted all of the issues about preferential pathways in BHI-01311 when writing about the hydrogeological conceptual models for the 200 West Area (p. 9, § 2.1.3): *"Liquid movement is dependent on the degree of cementation, the amount of fines in the formation, initial saturation, and the characteristics of the solution pathway. A liquid entering the strata at the surface will disperse in a relatively narrow, cone-like pattern through the gravel and/or sand facies of the Hanford formation. This distribution will persist until a low permeability silt or sandy silt is encountered, where movement along the vertical path will be restricted or slowed. The liquid will then travel laterally to where the unit pinches out or intersects a clastic dike with a sand to granule infilling, where it*		Comment noted	Vertical preferential pathways such as poorly constructed and sealed wells are being removed by on-going well decommissioning activities at the Hanford Site. Currently, the moisture driver in the vadose zone is from natural precipitation – the RESRAD modeling of future contaminant movement included a scenario using twice the annual average precipitation – even this scenario did not result in contamination migration to groundwater in 1,000 years (see FS Appendix E).	

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		will again migrate vertically, or alternately sufficient hydraulic head will build up until breakthrough and the liquid moves through and below the fine-grained unit. At the contact with the Plio-Pleistocene unit, the liquid will be retarded and will tend to accumulate (historically this horizon has locally produced perched water, especially during the active discharge years when the major processing plants were in production). At this layer, the liquid will move laterally to clastic dikes or other fractures, or possibly to wells that have penetrated the formation and created a preferential pathway to the underlying Ringold Formation and/or the water table, or will again build up sufficient hydraulic head for movement through this unit." Many other researchers have repeatedly documented these same or similar findings throughout the 200 West and 200 East Areas. We will provide references to these reports if you do not have them.				
18	Detailed Comment	More importantly, this isn't new information. DOE has known that plutonium and americium are not tightly bound to the soil since at least 1967, when DOE noted that the measured Kd for plutonium in the soils was about 1.4 – 2.7 (very low retardation). *BNWL-CC-649, June 10, 1966 Battelle-Northwest* *Disposal Characteristics of Plutonium and Americium in high salt acid waste* • *"Previous research by Battelle-Northwest indicated that soil can imbibe this waste (including slugs of organic) almost as readily as water; however,* ***uptake of plutonium by soil was low and of americium negligible.****"*		Partially accept	See response to comment 15 above.	

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		• *"This study confirmed that **adsorption of plutonium and americium on soil material from the surface to ground water was minor** from AAW waste and showed that soil neutralization or complexing agents would not satisfactorily improve adsorption"* • *"Laboratory studies show that disposal of AAW waste to ground will result in plutonium and americium contamination of all soil material wetted by the waste. Both column and batch equilibrium data show that soil adsorption of plutonium and americium is low between the surface and ground water. Thus, **any assumption that plutonium and americium is confined to the upper layers of soil beneath the Z-1A tile field is invalid** for this type waste."* • *Plutonium and Americium both highly mobile at Z-1A (measured Kds)* ***Solution Plutonium Americium*** *Acid Waste (AAW) untreated* *2.4 <1* • *pH 2 (soil neutralized)* *2.7 <1* • *pH 3 (NaOH neutralized)* *2.9 <1* *Alkaline Waste from Precipitation* • *Supernate –* o *Aqueous* * *212* o *Aqueous + organic* *1.4 42* • *Sludge leachate* *1,540 500*				
19	Detailed Comment	**Additional Problems** The conceptual models developed and reported in DOE/RL-96-81 are dramatically		Comment noted	See response to comments 1 and 2 above. The contaminant distribution model figures included in the RI were updated to reflect current	

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		wrong and have not been corrected despite numerous studies, field investigations, and prior work demonstrating that preferential pathways are critical components of the dominant features, events and processes that control the movement of water and contaminants in the Hanford subsurface. The presumed high Kd values are invalid, yet are still being used for establishing risk evaluations and protectiveness.			knowledge.	
20	Detailed Comment	The data quality objectives improved on the portrayal of the distribution and spread of plutonium. However, they failed to resolve fundamental questions about the conceptual models and instead focused on developing criteria for gathering data to select alternatives in the feasibility study. The RIR fails to assess the adequacy of the conceptual models or the data quality objectives processes and went backward in its portrayal of the movement of plutonium. As a result, the RIR failed to bound the vertical and lateral extent of the spread of contaminants, or to note that the current location and distribution of contamination contradicts the conceptual models. This renders the preliminary action levels established in the data quality objectives process invalid. Worse, because all of these processes and evaluations ignored the lateral movement of water so thoroughly documented through more than 40 years of work on these sites, the feasibility study proceeds with the flawed assumption about subsurface transport (that water flux into these subsurface locations occurs via direct downward movement of water through the surface above the disposal sites with no significant intrusion of water laterally from other areas). This is a critical failure that leads the analysts and decision makers to assess protectiveness		Comment noted	See response to comments 1 and 2 above.	

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		of barriers based on assumptions that have proven false.				