S&GRP Central Plateau Remediation Project

DOCUMENT REVIEW AND COMMENT FORM

1. Date: 11/20/2007	2. Page 1 of 11
3. Project: 200-ZP-1 OU Feasibility Study	4. Review No: DOE/RL-2007-28, Draft A

5. Document Number(s)/Title(s): DOE/RL-2007-28,Draft A	6. Program/Project/Building Number	7. Reviewer	8. Organization/Group	9. Location/Phone
Feasibility Study Report for the 200-ZP-1 Groundwater Operable Unit		EPA	U.S. Environmental Protection Agency	

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)

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
1	General	The most substantial technical problem is the lack of evidence for the effectiveness of natural attenuation of carbon tetrachloride. The potential for effective MNA appears high, but more work is needed on demonstrating the hydrolysis rate for carbon tetrachloride under Hanford Site conditions (pH and temperature). As an alternative, a more robust evaluation of far-field flow and transport (as would be available from a well-constructed site-wide model) may indicate that hydrolysis is only "icing on the cake" and concentrations will fall below MCLs by 2150 via other MNA mechanisms (dilution and sorption).		A	A study of the hydrolysis rate for carbon tetrachloride under Hanford Site conditions is currently in progress. The revised FS will indicate that more work on this issue is being done. Also more detailed modeling studies to address flow and transport are being planned for spring 2008 to support the design of a final remedy.	
2	General	As has been the case for other groundwater contamination evaluations in the 200 Areas, a critical assumption is that contamination in the vadose will be adequately addressed by the vadose zone OU remedies. The validity of that assumption has yet to be shown. However, the uncertainty in vadose zone remediation likely presents relatively minor risk because of the proposed remedy. The preferred 200-ZP-1 remedy is a pump-and-treat system that will be designed to essentially capture/contain all groundwater flow from the 200 West Area. Assuming that future monitoring programs would detect future unanticipated contaminant flux from the vadose zone, the pump-and-treat remedy		Partially accept	A key aspect, rather than an assumption, of vadose zone OU remedies is the protection of groundwater. As noted, the preferred 200-ZP-1 remedy will provide backup to these vadose zone remedies in being able to capture a new vadose zone contaminant source. Because the vadose zone OUs are at different points in the CERCLA process, the revised FS will clarify that the duration of this aspect of the remedy (i.e., pump-and-treat operations) has some uncertainty and may need to be extended or potentially shortened, depending on remedy performance monitoring and optimization efforts.	

RECEIVED FEB 27 2008 EDMC

0076366

attached to: 0076363

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
		would likely be able to capture/contain a new 200 West Area contaminant source. The duration of pump-and-treat (and associated institutional controls) under such a scenario would likely need to be extended.				
3	General	Faced with the non-availability of a site-wide or area-wide three-dimensional numerical flow model, the adopted modeling strategy appears sound and is justified. The two-dimensional evaluation of historic and future ground-water flow and contaminant transport provide reasonable results for a moderate effort, but the lack of analysis in the third dimension adds great uncertainty to selected results. Overall, the modeling results appear reasonable for order-of-magnitude pump-and-treat assessment. The assessment of far-field flow and contaminant transport is highly uncertain and unverified. The assumption of aquifer homogeneity in particular is unjustified at the Hanford Site.		A	The principal assumptions of the modeling strategy used in the FS – that flow is dominantly two-dimensional and the aquifer is homogeneous and isotropic – were acknowledged and discussed in Appendix D, Section D10. This modeling strategy was employed solely to evaluate the likely relative performance of potential remedial alternatives, under the assumptions described. It is acknowledged that this analysis strategy will not be suitable for the actual remedial design process. More detailed, three-dimensional modeling analyses in support of the remedial design process are scheduled to commence early in 2008. It should be noted that four well pairs (or piezometers) were used to evaluate vertical gradients, which are presently small, suggesting that groundwater flow in the 200-ZP-1 OU is primarily horizontal at the present time, and that although flow was three-dimensional during periods of historic wastewater loading, flow is likely to be dominantly horizontal under current and projected flow conditions.	
4	General	The FS did not adequately address a number of applicable technologies that must be screened and evaluated before we narrow our approach/ alternatives to the only limited ones described in the FS/proposed plan. The FS should clearly identify these technologies and evaluate applicability based on the CERCLA nine criteria. In the past, we have looked at a number of technologies during the ITRD process. The FS needs to evaluate the application of treatment train concept (e.g., pump-and-treat, bioremediation, and natural attenuation) and provide the results of the assessment. The document failed to evaluate the concept and its application. The concept should be evaluated		Partially accept	Additional discussion of the previous technology screening work will be added to the revised FS. The ITRD process results were used in the technology screening conducted for 200-ZP-1 in PNNL-15954, which is cited in FS Section 4.2, and many of these technologies were evaluated in Tables 4-1 to 4-6. The use of bioremediation or electrical resistance heating were considered as contingency measures in FS Section 5.2.3, primarily because the contaminant distribution model for 200-ZP-1 does not have a defined DNAPL or source zone, which is needed for application of these techniques in a full-scale treatment train remedy. Also, the PNNL-15954 report will be added as a new appendix.	

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
		with a scenario of simultaneous application at the beginning for maximum benefit.				
5	General	There is a large uncertainty of about 40% of the inventory of carbon tetrachloride. The FS should provide a path forward on how to address the uncertainty and associated need for flexibility in remedial investigation, design, and final remediation.		A	Given the widespread groundwater contamination, the preferred remedial alternative indicates a bias for action while efforts continue to refine the current carbon tetrachloride inventory in the vadose zone and groundwater. Some of the uncertainty relates to the lack of a defined DNAPL or source zone, despite specific focused studies on this topic. The FS Section 5.2.3 on contingency measures addresses the need for flexibility in the remedial design and final remedy, should ongoing or future investigations and well drilling confirm a source zone. These aspects can be addressed in the revised FS by providing additional discussion about the inventory uncertainty and its impacts on the FS process.	
6	General	All risk numbers need to be reported in one standard format, such as so many in 10,000, or in one million or 100,000. It is confusing if the risk is expressed in several formats.		A	Risk numbers in the 200-ZP-1 and 200-PW-1/3/6 FS reports will use a consistent format (e.g., $\# \times 10^{-\#}$).	
7	1. Page ES-3,	RAO #1. Suggest adding the statement that RAO #1 is meant to return the water to meet drinking water standards.		A	The revised FS will indicate that RAO #1 is meant to return the groundwater to meet drinking water standards (MCLs).	
8	2. Figure ES-2.	Add flow direction arrows.		A	General groundwater flow direction information will be added to Figures ES-2 and ES-3.	
9	3. Section 1.3.1, page 1-3.	Move the 2nd paragraph to be the lead paragraph.		A	The suggested wording will be incorporated into the revised FS.	
10	4. Section 2.2.4.2, third paragraph.	The paragraph states that recharge in the 200 Areas is still primarily from artificial sources. What is the estimated annual recharge from such sources?		Partially accept	This paragraph will be corrected to indicate that recharge prior to 1995 was primarily from artificial sources, and now it is primarily from natural precipitation.	
11	5. Section 2.5, P 2-17, fourth paragraph item (2).	The statement that the IRM is containing the high-concentration portion of the plume depends entirely on the definition of high concentration. There is a large area with carbon tetrachloride concentrations that are more than 100 times greater than the MCL; many would consider 100xMCL a high concentration. It is safe to say that *much* of the high-concentration portion of the		A	The suggested wording will be incorporated into the revised FS.	

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
		plume *in the upper part of the aquifer* is being contained by the IRM.				
12	6. Section 2.6.1.	Overall, this section is inconsistent and not informative. For example, it is stated that chloroform is a breakdown product of carbon tertrachloride, but "breakdown" is not mentioned as a fate for carbon tetrachloride. There is so much more known about fate and transport than is included in this section that it is of little use as-is.		A	This section will be revised to incorporate fate and transport information relevant to the 200-ZP-1 OU. This will include a more complete discussion of the degradation process for carbon tetrachloride under conditions typical of the 200-ZP-1 OU unconfined aquifer.	
13	7. Table 2-1.	The table contains *selected estimates* of the respective values; many other values have been published.		Partially accepted	The table was meant to include values used in the modeling discussed in Appendix D, with Hanford Site values listed if available. Appropriate notes will be added.	
14	8. Section 2.6.1.1.	The vapor phase is not the most likely transport mechanism in groundwater, and the FS concerns groundwater. This also applies to chloroform and methylene chloride. Also, there was a multi-year investigation with two published reports that addressed the likelihood for carbon tetratchloride DNAPL at the site. Referencing those documents, rather than comparing dissolved phase concentrations to solubility limits, is what would support the assumption.		A	This section will be revised to incorporate fate and transport information relevant to the 200-ZP-1 OU. Also Section 2.4.1.4 will be expanded to discuss findings from the DNAPL source-term investigation.	
15	9. Section 2.6.1.2.	What mechanism leads to chloroform formation from the "breakdown" of carbon tetrachloride? Is the breakdown microbially mediated or abiotic? Under what conditions does it occur? There was no mention of "breakdown" as a fate of carbon tetrachloride in Section 2.6.1.1. What is the fate of chloroform?		A	This section will be revised to incorporate fate and transport information relevant to the 200-ZP-1 OU. This will include a more complete discussion of the degradation process for carbon tetrachloride under conditions typical of the 200-ZP-1 OU unconfined aquifer.	
16	10. Section 3.2.2, page 3-7.	A Tribal use scenario should be developed for the exposure assessment.		A	Regarding the CTUIR Native American subsistence scenario (NASS), RL will include a stand-alone, quantitative analysis of the CTUIR NASS in RI/FS documents. The CTUIR NASS will be analyzed as part of the comparative analysis of remedial alternatives with respect to EPA balancing criteria under CERCLA. The NASS will be analyzed as provided by the CTUIR for comparative purposes and does not represent DOE agreement or endorsement of the scenario or	

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
					underlying assumptions. Discussions are in progress regarding other Tribal use scenarios. These scenarios will be incorporated into the next revision of the FS report.	
17	11. Section 3.2.6, page 3-13.	This section is misleading. It states that industrial land use is being used to screen alternatives, yet one of the RAOs is to meet drinking water standards. Please clarify.		A	The discussion will be clarified to reflect that RBCs are based on an industrial scenario. Then considering ARARs, are used to develop RAOs, which lead to the PRGs being MCLs (which are less than the RBCs).	
18	12. General	(General throughout the document). After defining industrial exclusive once, please refer to it as simply industrial.		A	The suggested wording will be incorporated into the revised FS.	
19	13. Section 4.1, page 4-1.	This section should include a discussion of other technologies that were screened as part of the ITRD process.		Partially accept	Section 4.2 will be revised to include additional discussion of the previous technology screening work. The ITRD process results were used in the technology screening conducted for 200-ZP-1 in PNNL-15954, which is cited in FS Section 4.2, and many of these technologies were evaluated in Tables 4-1 to 4-6. Also, the PNNL-15954 report will be added as a new appendix.	
20	14. Section 5.0, 3rd paragraph, page 5-1.	This paragraph should be clear that enough information exists to determine a need for action and the main uncertainty is the length of time the system may need to run.		A	The paragraph will be revised as suggested.	
21	15. Section 5.2.1.4.	In the previous section, it was stated that hydrolysis of carbon tetrachloride has not been confirmed with site-specific testing. Environmental monitoring will not be useful for confirming this transformation process. A combination of lab experiments with detailed field data evaluation would be warranted.		Partially accept	Environmental monitoring of groundwater concentrations will be a primary tool for assessing the effectiveness of MNA (e.g., implementation). Section 5.2.1.3 will be revised to note that additional testing is being done to understand hydrolysis rates. The response to general comment #1 will be considered in the revision of this section.	
22	16. Section 5.2.3.1.	The cited 100-year half-life for hydrolysis of carbon tetrachloride should be considered a very approximate estimate; the source cited presented a range of 36 to 290 years at 19 degrees Celsius. At the very least, data on groundwater temperature (ambient, rather than a pumped sample) at the site would be helpful.		A	Section 5.2.1.3 will be revised to note that additional testing is being done to understand hydrolysis rates.	

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
23	17. Section 6.3.3.1.	This is the first mention where the less than 100 µg/L plume will be untreated. Such information cannot be gleaned from Figure 5-3.		Partially accept	FS Section 5.2.2 also discusses this issue, but the discussion in both sections will be clarified to indicate that a portion of the less than 100 µg/L plume will be treated by enhanced MNA.	
24	18. Section 9.3.1, Proposed Plan, page 9-6 1st paragraph.	Change EPA to TPA.		A	In the revised FS, "EPA" will be changed to "the Tri-Parties" in two locations.	
25	(Comments 25-44 are all on Appendix D) D2.2	Data on vertical hydraulic gradients has not been presented, although they could be estimated at multiple locations and times using water-level data from pairs of nearby wells screened at different depths. Specify that the hydraulic gradient data presented here is the horizontal component.		A	The section will be revised to clarify. Vertical hydraulic gradient data are presented in Section D10.2. These data suggest that the magnitude of vertical gradients has diminished through time, suggesting that groundwater flow is reverting to a dominantly horizontal, pre-development pattern.	
26	Table D-6	It appears that there are values for two different parameters (specific storage and storativity) mixed together in the table: S_s = specific storage; 1/m S = storativity; dimensionless and equals $S_s b$ where b is aquifer thickness. The two parameters are not the same and should not be averaged together like in the inset table in Section D2.3 (you need to divide S by aquifer thickness b to get S_s). In fact, the reported S_s values (from slug test type-curve analyses) are not "real" as described in PNNL-13378, p. 3.4: "To facilitate the unconfined aquifer slug-test type-curve analysis, an Ss value of 0.00001 m-1 was used for all initial analysis runs. After initial matches were made through adjustments of transmissivity, T, additional adjustments of Ss were then attempted to improve the overall match of the test-response pattern. In most test cases, slight modifications (i.e., increasing Ss) were made to the input Ss values to improve the final analysis type-curve matches. It should be noted, however, that other factors influence the shape of the slug-test curve (e.g., skin effects and K_d). For this reason, the Ss estimate obtained from the final slug-test analyses is considered to be of only qualitative value and should not be used (as in the		Partially accepted	Agree that S_s data and S data are for different parameters. Table D-6 will be revised to clarify. The values in the table in Section D2.3 only summarize the S data and not the S_s data. The S data summarized in Table D-6 represents data from the Ringold Unit E aquifer, which is an unconfined aquifer and, therefore, an average of the S values may give a reasonable site-specific estimate for the Ringold Unit E aquifer.	

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
		case for K_h) for quantitative applications." Thus, the S_s data should best be omitted from the table. And the S values that remain in the table look like a mix of data from confined, partially confined, and unconfined aquifers. That is not unexpected for the Ringold, but again, averaging the data (like in the inset table in Section D2.3) does not make sense.				
27	D3.4, first sentence	COPC distribution maps are Figures 2-8 through 2-34.		A	Sentence will be revised.	
28	D4.2	Assuming you are modeling flow in what is assumed to be an unconfined aquifer, the S term in equation 2 should be specific yield (S_y). The water yield due to compressibility of the fluid and sediments (S) is much less than the yield due to pore space drainage (S_y) in an unconfined aquifer. I have not used the described THEIS-GRID method and Equation 1 (p. D-8), but applications of the Theis equation to predict transient drawdown in unconfined aquifers generally requires knowledge of S_y. The difference may be important in that S_y values are generally two orders of magnitude greater than S values. Please you explain how our interpretation may be incorrect or how the use of different (higher) values for S would not impact results?		A	Concurred with the thrust of the comment. A two-part response is provided, for clarification. First, the THEIS-GRID program is an implementation of the Theis equation, which predicts the drawdown in an aquifer in response to pumping at a well. Use of the Theis equation to predict the response of an aquifer to a stress (e.g., pumping) assumes that the transmissivity is constant and that the release of water from storage is instantaneous. Both assumptions are typically fairly well adhered to in confined aquifers. In particular, in confined aquifers the release of water from storage can be considered instantaneous, whereas in unconfined aquifers the release of water is typically dominated by drainage of pore water which is not instantaneous but shows a 'delayed' response. Given the time-period (approximately 60 years) that the calculations encompass, the simplicity of the modeling approach adopted, and the purpose of the analysis (i.e., to provide information on the likely relative performance of alternate pump-and-treat remedies), it is felt that the use of a calibrated storage value (see response to following comment) that is more representative of the actual, unconfined, conditions encountered at the site is the most accurate depiction of field conditions and that the impact of the delayed yield in response to pore-space drainage on the calculated future extent of hydraulic capture is limited.	

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
					Secondly, under quasi-steady-state conditions, the extent of hydraulic capture is not a function of the storage capacity of the aquifer, but rather of the transmissibility of the aquifer. Therefore, although a storage value was estimated during the history-matching or calibration of the THEIS-GRID program, the long-term performance of a pump-and-treat remedy will depend upon the distribution and rates of the extraction and injection wells, and the aquifer transmissivity, and not upon the aquifer storage.	
29	D4.4	The calibrated storativity was 0.013 suggests that the Ringold is behaving like a confined system in some of the area; that value is too large for a fully confined system, and at the lower end of expected values for an unconfined system. This would affect the design of a pump and treat system, but perhaps is not relevant for FS comparison and scoping purposes.		A	This is an error in the documentation. The storage value estimated through calibration of the THEIS-GRID program was 0.0818, or approximately 8%. This number is fairly consistent with an unconfined aquifer that has been subject to several long-term wetting and drying stresses. The text will be corrected to reflect this value for storage. However, it should also be noted that more detailed analyses of groundwater flow are scheduled to commence early in 2008, which will provide a basis for evaluating these and other aquifer parameters.	
30	D4.5	Overall, the results are consistent with the conceptual model for historic two-dimensional groundwater flow in the 200 Areas. Unfortunately, this model cannot address how contamination got to the bottom of the aquifer. This is why historical water-level measurements from adjacent wells screened at different depths would be so useful for fleshing-out the conceptual model (see comments on D2.2).		Comment noted	See the discussion in Section D10.2. In general, very little traditional well/piezometer pair water-level data are available in the 200-ZP-1 area. Additional evaluation of vertical groundwater flow will be performed during the design phase.	
31	Figure D-34	What is the difference between the blue-toned particles and the red-toned particles?		A	The text and figure will be clarified to explain the difference between these two sets of particles.	
32	D5.5, first paragraph	The particle tracking reasonably explains the current *two-dimensional* distribution of carbon tetrachloride in groundwater; it does not address the vertical distribution.		Comment noted	Additional evaluation of vertical groundwater flow will be performed during the design phase.	
33	D6.2	The symbol π is not in equation 3.		A	Text related to equation 3 will be revised.	

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
34	D6.4	Again, this two-dimensional evaluation overlooks a critical limitation of the IRM; it only captures water and contaminants from near the top of the aquifer.		Comment noted.	Three-dimensional modeling will be performed to support remedial design.	
35	D6.5	It is premature to assume that all existing extraction wells need replacement. Ideally, a three-dimensional numerical model would be available to design the new system using simulation/optimization techniques. That approach would allow a robust assessment of existing and new well locations (and screen depths and pumping rates).		A	Three-dimensional modeling will be performed to support remedial design.	
36	D7.3, inset table	The value of 0.082 for S reflects the specific yield for an unconfined system. It is not clear where the value came from (it is larger than any listed in Table D-6 or the calibrated value from Section D4.0), but it is a reasonable value to use for evaluating pump and treat in this water-table aquifer.		Agree	This storage value was estimated through calibration of the THEIS-GRID program to the historic changes in groundwater levels in response to the waste-water disposal to the aquifer. This number is fairly consistent with an unconfined aquifer that has been subject to several long-term wetting and drying stresses. The text will be revised to clarify the source of this value for storage, and the consistency of this value with the conceptual site model of an unconfined aquifer. It should also be noted that more detailed analyses of groundwater flow are scheduled to commence early in 2008, which will provide a basis for evaluating these and other aquifer parameters.	
37	D7.5	It is actually Section 2.6 that discusses fate and transport, but no results from the evaluation of pump-and-treat remedy scenarios are presented there.		A	The text will be revised to remove reference to Section 2.5.	
38	D7.6,	First paragraph - It is now well recognized that the volume of groundwater that must be pumped and treated is a (poorly known) multiple of the pore volume of currently contaminated aquifer. Second paragraph - References to figures are incorrect; Figures D-41 through D-45 show the pump-and-treat scenarios and modeled water tables. The well configuration in Figure D-42 makes no sense; why are the injection wells immediately *upgradient* from the extraction wells at the downgradient margin of the site? It brings		A	Text in Section D7.6 will be revised to address these comments.	

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
		up the question as to how the specific well fields analyzed were selected. I am anxious to read in the FS how a 95% mass removal target will meet concentration-based ARARs. Third paragraph and bullets – Table D-56 does not include alternatives. Given the assumptions and simplifications required to use this method (particularly two-dimensional and homogeneous), the simulated differences between the $1x10^{-4}$ and preferred scenarios likely fall well within the error bands of the modeling. What was the pumping rate of the preferred scenario that is being compared (840 or 1,615 gpm)?				
39	D8.0	History shows that estimated pump-and-treat cleanup times are systematically underestimated due primarily to heterogeneity in aquifer sediments. Such has been the case for fairly complex three-dimensional numerical models, and such will undoubtedly be the case for this simplified two-dimensional homogeneous model. It is likely that cleanup times will be underestimated for all pump-and-treat scenarios, so this limitation is not critical to selection of a remedy from options that all rely on pump-and-treat.		Comment noted	The comment notes that cleanup times are likely under-estimated but are not critical to remedy selection of options that rely on pump-and-treat. Better estimates will be available from more detailed modeling studies to address flow and transport that are being planned for spring 2008.	
40	D9.3, first paragraph	I suspect the different analytical solutions between the Domenico and ATRANS methods are small compared to the very large uncertainties in simulating far-field groundwater flow and transport at Hanford with the assumption of homogeneous aquifer properties. There is marginal justification for the 100-year carbon tetrachloride "decay rate" (which is actually a half-life, I presume, from the units of years). It is presumed the estimate was from PNNL-13560; uncertainty concerning the rate is discussed in Appendix C of PNNL-13560. The footnote concerning contaminant decay rate calculations in Table D-58 actually refer to retardation, not decay.		A	More work on the hydrolysis rate is being conducted. More detailed modeling studies to address flow and transport are being planned for spring 2008. The footnote in Table D-58 will be revised.	
41	D9.5	There is no Figure D-58.		A	Text will be revised to refer to the proper figure.	

Item	10. Page/Line	11a. Comment (include technical justification for comment)	11b. Recommended Change	13. (A)ccept or (R)eject	14. Disposition (provide justification if **NOT** accepted)	16. Status
42	D9.6	If it is accepted that travel times to the river is hundreds of years, the 100-year half-life for carbon tetrachloride becomes critical. Justification of that number is warranted. Also, the second bullet implies that the river is the point of compliance; which is not accurate.		A	More work on the hydrolysis rate is being conducted. More detailed modeling studies to address flow and transport are being planned for spring 2008. The second bullet will be revised to reflect that the river is not a current point of compliance for the 200-ZP-1 FS.	
43	D10.2.1	According to Table D-7, none of the horizontal gradients exceed 0.0025 m/m. Thus, the vertical gradients you cite are substantial relative to horizontal gradients. There is no discussion of the data, just presentation of raw numbers.		A	Text will be added to this section to add further clarification and discussion. Vertical hydraulic gradient data are presented in Section D10.2. These data suggest that the magnitude of vertical gradients has diminished through time, suggesting that groundwater flow is reverting to a dominantly horizontal, pre-development pattern.	
44	D10.2.2	A critical, but unaddressed, issue concerning partial penetration of extraction wells is related to the aquifer heterogeneity in the vertical. Borehole flow meter tests in long-screened wells commonly show that 90% of the water comes from the most permeable 10% of the aquifer. Those percentages are approximate and vary, but the point has been demonstrated repeatedly even in aquifers that appear relatively homogeneous. Thus, EPA concurs with recommendation that further evaluation is warranted. EPA suggests tempering the blanket recommendation for longer screened recovery wells with the results of "further evaluation." There is generally a trade-off with long-screened extraction wells of improving hydraulic containment at the expense of decreased mass removal.		A	Additional evaluation of partial penetration effects will be performed to support remedial design. In particular, it is intended that the design of the extraction and injection wells (including length of screened interval, screen design, and filter pack design) will be based upon detailed analysis of boring logs obtained prior to the installation of the wells. Section text will be revised based on this comment.	