RECORD OF COMMENTS REVIEW

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

10805-708-6160

Item#	Sec#	Page#	Comments	Resolution
GENERAL COMMENT				
The report (chapter 5) does not adequately address the possibility that other conceptual models of vapor transport are valid given existing data. The report does not address the possibility that advective transport may dominate vapor transport in the basalt. Some monitoring wells completed around the RWMC are reported to have inflows and outflows of air (discussed in FFA/CO meetings, Idaho Falls, March 31, 1993) which strongly indicates that diffusion may not be the dominant transport mechanism. It should be noted that the approach used in the report is a reasonable first cut approximation given the current data base that the author had to work with to conduct this modeling. The issue is that alternate conceptual models should be discussed and that the limitations of the presented model need to be discussed.				We agree that advective transport may play a more significant role in vapor transport than is currently discussed in the site conceptual model. However it should be noted that the model suggests that diffusion can account for the majority of the lateral extent of the plume and appears to be the most prevalent transport mechanism. We will modify the text to reflect the new information regarding barometric pressure effects and its implications regarding advective transport.
Item#	**Sec#**	**Page#**	**Comments**	**Resolution**
SPECIFIC COMMENTS				
1	Executive Summary, Paragraph 3	i	The lateral extent of the OCVZ operable unit is not 1,000 feet.	The text will be changed to reflect that the lateral extent of the operable unit is the lateral extent of VOC contamination. No definitive distance will be stated in the text.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
2	Executive Summary, Last Paragraph	vi	The likelihood of the risk being over-or under-estimated is dependent on the assumptions and potential errors in the risk assessment, and a statement such as this cannot be made without expending considerable resources in an attempt to quantify the uncertainty in the risk assessment process. Recommend deleting this statement.	We agree with the comment and have revised the Executive Summary accordingly.
3	1, Paragraph 3	1-12	Please clarify in the text by whom the RCRA plan for the SDA was approved in 1989. Also, indicate what is meant by "plan" (e.g., RFI work plan).	DOE approved the RCRA workplan. This language has been revised to include this information.
4	1, Paragraph 2	1-14	The text states that "...aqueous transport is minimized by the dry nature of the site..." which may be a valid conceptual model in a semi-arid environment; however, this theory has not been conclusively tested. For example, the perched water sampling (Appendix F) suggested elevated levels of magnesium chloride in well 8802D. If these ions were derived from dust control efforts at the RWMC, initiated in 1984, aqueous phase transport may also be important.	We agree that aqueous transport is occurring at the site; however, the site is located in an arid region and that does limit the amount of aqueous transport beneath the site. Aqueous phase transport has not been disregarded and is included in the fate and transport modeling.
5	1, Paragraph 2	1-17	see comment #58	Language regarding 100 years of institutional control and the basis for it that is contained in the RI/FS for Pad A will be included here.

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Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
6	2, Paragraph 2	2-2	a) The text states that 5% of the vapor samples were sent to the Environmental Chemistry Unit Laboratory (ECU) at the INEL for verification; however, page 2-17 states that approximately 10% of the samples were sent to ECU for verification. Please clarify. b) To illustrate the precision of the GC data, please include a comparative discussion of the analytical results of the verification samples sent to ECU Laboratory. A summary of the QA/QC data, including an analyte list and corresponding detection limits, should also be included in this report for independent interpretation of the results.	a) The text will be changed to at least 5% of the samples were sent to ECU; in actuality it was closer to 10%. b) Comparative discussion is contained in Appendix E on pages 5, 6, and 7

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

Item#	Sec#	Page#	Comments	Resolution
7	2, Table 2-1	2-4	There appears to be some discrepancy between the analyte list presented here and the data in Appendix E. For example, Table 3 of Appendix E lists "NA" for several of the compounds listed in Table 2-1, including chloroform, tetrachloroethene (PCE), Freon 113, 1,1,1-trichloroethane, acetone, and methylene chloride. Please indicate if "NA" represents "not analyzed", and also indicate the detection limits for the portable GC.	Table 2-1 will be changed to only include carbon tetrachloride, TCE, chloroform, toluene, 1,1,1-TCA, and PCE. The other analytes on that list were not detectable by the portable GC with the column being used. However, the mobile laboratory is analyzing vapor samples for all the analytes on Table 2-1. The NA's in Appendix E, Table 3 should actually be ND. However it should be noted that this is because the detection limit on the portable GC is 1 ppm and the ECU laboratory can detect analytes at much lower concentrations.
8	2, Paragraph 3	2-13	Recommend including a discussion of the criteria used to select vapor port locations and/or a reference to the applicable section of the work plan.	The appropriate section of the SAP has been referenced.
9	2, Paragraph 4	2-23	The text discusses the methodology for the basalt tracer studies, which were conducted to generate diffusion coefficients; however, there is no mention of the results of this study and how the estimated diffusion coefficients were applied to the vadose zone model.	The results of the basalt tracer test were not available at the time the draft report was submitted. The results of the study are now included in Section 3.4.4.2.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
10	2, Paragraph 5	2-23	Typographical error: Table 2-4 indicates that port 2 in well 77-1 is at 150 feet.	The text has been revised to accurately reflect port 4 at 111 feet in Well 77-1.
11	4, Paragraph 3	4-22	Until additional data are collected to determine the impact of soil temperature on vapor concentrations, it may be useful to perform a qualitative study using the 1987 and 1992 soil gas survey data. The 1987 survey was conducted in October and November and the 1982 survey was performed in January and February. Note that it is our experience that the time of day the survey was performed influences the results.	Some more discussion will be added comparing the 1987 and 1992 soil gas survey results. However, considering the relatively large uncertainty in the analytical results, it is not possible to state whether soil gas concentrations increased or decreased during this period.
12	3, Paragraph 2	3-7	Add Dames and Moore (1992) to the reference list.	The correct reference, Lewis et al. 1992, will be added to the reference list.
13	3, Paragraph 1	3-18	If possible, quantify the statement that "...the ground beneath the INEL moved very little as the earthquake waves passed through the site."	Discussion of ground motion has been added.
14	3, Table 3-5	3-35	Indicate what the values listed under clay mineralogy pertain to (e.g., percent of total).	Table modified as requested.

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

Item#	Sec#	Page#	Comments	Resolution
15	3, Paragraph 2	3-36	For the purposes of this study, it would be beneficial to indicate if any trends in moisture content and depth were observed in samples collected during the 1985 and 1986 drilling programs.	The data in the FY-85 and FY-86 annual reports were not reported in a manner that allows an evaluation of moisture content vs. depth.
16	3, Figure 3-15	3-52	Drafting error: This figure depicts the RWMC as being located northeast of the Idaho Chemical Processing Plant and should be corrected.	Figure corrected as requested.
17	3, Paragraph 3	3-70	Quantify the statement that "A small amount of recharge occurs directly from infiltration and precipitation."	The statement "a small amount of recharge occurs directly from infiltration and precipitation" does not appear on page 3-70.
18	4, Table 4-8	4-34	Typographical error: The detection frequency for carbon tetrachloride is listed as 25/125. Based on Table 4-9, it would seem it should be 125/125.	Table 4-8 summarizes 1991 data whereas Table 4-10 contains data collected starting in September 1992. Table 4-9 summarizes the data in Table 4-10.
19	4, Table 4-10	4-38	Indicate the units of concentration for the data in this table (appears to be ppm).	Table clarified as requested.
20	4, Figures 4-17 to 4-25		Indicate the source of the data for VOC concentrations in ground water presented in these figures. Also, state whether a blank next to a vapor port indicates that no data is currently available.	The blank next to a vapor port is explained in the table. The figure has been modified to signify source of ground water data.

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

Item#	Sec#	Page#	Comments	Resolution
21	4, Paragraph 3	4-61	List the compounds which are considered to be common laboratory contaminants (i.e., page 5-16; EPA, 1989).	Text modified as requested.
22	4, Paragraph 2	4-62	It seems that the increased concentrations of volatile organic compounds in the perched water wells may be indicative of a "active" source. A discussion of this phenomena, as related to the modeling results, may be beneficial. For example, this may suggest that the drum failure rate used in the model is incorrect or possibly that aqueous phase movement is an important transport process.	Increases in VOC concentrations in perched water between 1987 and 1992 are considered to be questionable because of the two reasons stated at the end of the paragraph. A third factor has been added to the text and that is the small volumes of water in the well casings at the time of the 1992 sampling. This condition prevented proper purging of the monitoring wells prior to sampling. It should also be noted that well USGS 92 is also open from 20 to 245 ft. Any increase in vapor concentrations along this interval could contaminate the perched water at the bottom of the hole. In addition, the depth of both wells 8802D and USGS 92 is approximately the top of the 240-ft interbed. At this depth the vadose zone model with vapor diffusion and aqueous transport currently predicts concentrations to be increasing (see Figures 5-23, 5-24, and 5-25). This is with a source that has become relatively "inactive".

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
23	4.2.3	4-62	The surface soil sampling locations cited in this section are along the perimeter of the Acid Pit and Pit 9, where contaminant levels are expected to be minimal. Furthermore, the Acid Pit is not considered a source for the volatile organic compounds in the vadose zone. Therefore, IDHW does not agree that the surficial soil sampling locations are adequate to characterize the presence of volatiles in the surficial soils over the pits and trenches.	We agree that the Acid Pit is not considered a source of VOC's in the vadose zone and that soil samples collected adjacent to Pit 9, a VOC source, may not be representative of VOC concentrations in soil throughout the SDA. However, the soil ingestion pathway will be considered under Operable Unit 7-05, surface water pathway and surficial sediments. It should be recognized that characterization data for VOCs in soil is a data gap for the soil ingestion pathway.
24	5, Paragraph 2	5-2	The paragraph should reference the limited data on air monitoring presented in section 4.3 to put the statement that "...monitoring has not detected adverse atmospheric concentrations" into proper perspective.	Section 4.3 has been referenced and the fact that the data is limited has been mentioned again in Section 5.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
25	5, Paragraph 2	5-3	Expand the discussion of Texas Regal Oil, Santo Wax, and waste oil to include the compounds which are believed to be present in these materials. This will allow the reviewer to determine the appropriateness of eliminating these wastes as VOC sources. Also, quantify what is considered "small volumes of other organic compounds" and the nature of these "compounds".	A discussion of the compounds believed to be present in Texaco Regal Oil, Santo Wax, and waste oil has been added to the text in Section 4. The statement "and small volumes of other organic compounds have also been disposed in the SDA, however are not considered as VOC sources" has been deleted from the text in Section 5. Section 4 contains a discussion of the types and amounts of organic compounds disposed at the SDA.
26	5, Paragraph 2	5-9	The statement that vapor phase diffusion is "an important mode of transport" for migration of VOCs at the RWMC may or may not be true.	Vapor diffusion is an important VOC transport mechanism as demonstrated by the results of the diffusion tracer study which will be included as an appendix in the Draft Final RI. However, declaring vapor diffusion an important transport process was not meant to rule out other processes as also being important. Aqueous transport also appears to be important depending upon the infiltration rate and moisture present. Both vapor diffusion and aqueous advection were included in the vadose zone modeling. Also see response to general comment.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
27	5, Paragraph 3	5-10	The statement that "the organic compounds of interest have relatively low solubilities in water" is little more than a personal opinion. For example, carbon tetrachloride has a solubility limit of approximately 800 mg/l (Montgomery and Welkom, 1989). To some this may be considered a high solubility, particularly since it is several orders of magnitude greater than the Maximum Contaminant Level of 5 μg/l.	The sentence "The organic compounds of interest have relatively low solubilities in water, however ... than in water." has been deleted from the text.
28	5, Paragraph 3	5-10	Organic carbon content is frequently related to depth, as most soils will develop a relatively organic rich zone at the surface. Therefore, it would be useful to indicate the depth of the "surface soils" at which this parameter was measured by Colwell (1988).	Text has been revised to indicate the samples were obtained from 10 cm deep.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
29	5, Paragraph 1	5-16	a) The rationale for assuming that the layers are homogeneous, horizontal, and continuous layers because the plume extends over several thousand feet is not explained or justified. It is further assumed that small scale heterogeneities can be ignored because of the size of the plume. This assumption is not adequately explained or alternative conceptual models explored such as the presence of a preferential pathway(s) that can be created by different hydrogeologic property values. b) The assumption that all sources can be conservatively portrayed as single disk source is not explained nor is the radius selected for the disk. Does the size of the area selected induce a dilution factor into the source that would not occur if a smaller source area is selected? Some discussion of this subject appears on page 5-26, but does not address the subject in detail.	The statement, "This assumption is considered appropriate because the plume currently extends over several thousand feet. As a consequence, smaller scale heterogeneities within individual basalt flows are less important than the larger-scale average properties of the units with regard to transport over large distances." has been deleted from the text. A more detailed discussion of the how the source size was selected and why the shape of the source is considered appropriate has been added to the text.
30	5, Paragraph 3	5-16	See comment #26	Diffusion is the limiting process for calculating a time step for this conceptual model. The calculated time step based on advection was much larger. This has been reworded in the text to be more clear.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
31	5, Paragraph 4	5-16	Please expand the discussion to clearly indicate which model parameters were based on data collection and which were developed during calibration of the model.	Text has been added to reflect the basis for each parameter.
32	5, Table 5-2	5-20	The reference cited for effective porosity is interoffice correspondence. Please submit a copy of this reference to IDHW so that the source of the raw data and the analyses can be reviewed.	See response to Comment #34.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
33	5, Table 5-3	5-21	The interpretation of vapor port monitoring data on page 4-41 states that the 240-foot interbed (Interbed C-D) appears to provide more of a barrier to vapor-phase transport than the 110-foot interbed (Interbed B-C). However, the retardation coefficients listed in Table 5-3 imply that the reverse of this was used for the modeling. Please explain this apparent discrepancy. Also include references for the values presented in this table.	It is not certain whether the interbeds or some feature adjacent to the interbeds acts a barrier. It is also difficult to compare the relative capability of the interbeds to impede downward movement of VOCs. Therefore, the text has been revised to read "The 110-ft interbed also appears to act as a barrier especially in the central portion of the SDA such as at wells 8801D and 8902D." The retardation coefficient of the 110 interbed is the result of calibration, and calibration was emphasized where measured concentrations are the highest (near the SDA center). Lack of data around the 240-ft interbed prevented a more accurate determination of the retardation by calibration. Retardation coefficients were calculated using Equation O-11 and data from Table 5-2.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
34	5, Paragraph 1	5-22	This section of text states that the porosity data come from Knutson et al (1990) which contradicts the reference in Table 5-2. Please clarify.	The Knutson et al. (1990) reference and the Lee (1990) reference have both been changed to Lee (1991). The Lee (1991) reference (Draft MS Thesis) contains the same data and results as the Lee (1990) reference (interoffice correspondence), but is more complete. The mix-up came about because Knutson et al.'s data was a major subset of the data analyzed by Lee. Lee's findings are also referenced in Appendix J, "Stratigraphy and Physical Properties of the Vadose Zone at the RWMC" (EDF ER-VVED-097) by Hackett.
35	5, Table 5-4	5-27	Please indicate the assumptions (e.g. source compounds) used to calculate the number of moles of Texas Regal Oil and miscellaneous oils which were disposed in the SDA.	The assumptions have been added to the text.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
36	5, Paragraph 1	5-30	The statement that "The net effect of not simulating discontinuities in the interbeds is to underestimate concentration sin the SRPA" appears to be correct using this particular conceptual model; however, other conceptual models may be appropriate, depending on the assumed transport mechanisms (e.g. aqueous phase transport, advective transport due to density and/or barometric pumping). Conservation of mass dictates that a given volume of contaminant must be maintained either concentrated in a small volume of affected material or dispersed throughout a larger volume of affected material. Further discussion is warranted.	Not simulating discontinuities (holes) in the interbeds would likely have the same effect on concentrations in the SRPA for all of the transport mechanisms mentioned (aqueous phase transport, vapor advection due to density gradients, and/or pressure gradients) since the interbeds act to retard movement by each of these mechanisms.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
37	5.3.1.4	5-31	The results of the soil gas survey should also be used for model calibration. This exercise may be particularly beneficial for evaluating the effectiveness of the model in determining near-surface concentrations, and, consequently, atmospheric emissions.	Results of the soil gas survey should probably not be used for calibration. The data is level II. It is better used qualitatively than quantitatively (i.e. to identify hot spots). However, near-surface soil gas data from three wells drilled down to (TEM1, TEM2, and TEM3) basalt was compared to model predictions (Figure 5-15). In addition, the flux to the atmosphere predicted by the vadose zone model compares well with the results of the surface flux chamber measurements. The results of the flux chamber study will be in the Draft Final RI.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
38	5, Paragraph 1	5-35	Well M7S is located approximately 2000 feet upgradient of the SDA (see Figure 3-23), therefore it seems unlikely that VOCs in the vapor phase at this location resulted from volatilization from the Snake River Plain Aquifer. Please explain.	VOCs could have reached the lower vadose zone sampling ports in well M7S via: (1) vadose zone transport directly, or (2) volatilization of VOCs in the groundwater transported to well M7S via groundwater. The volatization of VOCs in the groundwater is a more likely explanation given that the local groundwater flow direction has changed to a northeasterly direction (upgradient) in the past. This temporary shift in direction appears to be the result of recharge from the spreading areas.

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

Item#	Sec#	Page#	Comments	Resolution
39	5, Paragraph 3	5-36	The report states that "For transport the model was most sensitive to moisture content although moisture content was not put directly in the model." This statement appears contradictory to that in the preceding statement. The parameter(s) that was actually varied in the model should be more clearly discussed. It is not stated why other parameters, such as hydraulic conductivity, were not varied to conduct additional sensitivity analyses. It appears other sensitivity analyses need to be conducted or an explanation provided as to why they are not needed.	Air porosity (Equation O-10), tortuosity (Equation O-2), and retardation (Equation O-11) are all dependant upon saturation or moisture content. Although moisture content is not a parameter that is entered directly into the model, it was used for calibration. As the moisture content was changed for a particular material, new values for the other three parameters were calculated according to the functional dependance on moisture content and then entered in the model. This explanation has been added to the text. Aqueous transport in the vadose zone model is based on a unit gradient condition that assumes the hydraulic conductivity is equal to the net water flux or infiltration. A net infiltration rate of 5 cm/yr was used in the risk calculations. Calculations for an infiltration rate of 10 cm/yr have been performed and the results added to Section 5.3.1.4. The uncertainty section will also include a parameter sensitivity analysis for the other following parameters: source parameters (already included), tortuosity, and moisture content of interbeds and surface sediments.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
40	5, Figure 5-12	5-37	Indicate if blanks next to the vapor ports means that carbon tetrachloride was not detected or that no data are currently available.	Blanks next to the vapor port indicate that no data was available when the modeling was performed. The blanks are defined in the explanations of the cross sections.
41	5.3.1.6	5-49	As an aid to the development of the remedial alternatives, it would be useful to define the percentages of the source contaminants which a) migrate to the aquifer, and b) migrate to the atmosphere.	This is a good suggestion and will be incorporated if time permits.
42	5, Paragraph 4	5-67	Add Lewis et al (1992) to the reference list.	Lewis et al. (1992) added to the reference list.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
43	5, Third Bullet Item	5-68	See previous comment. In addition, it should be noted that dispersivity values are scale-dependent (e.g., Luckner and Schestakow, 1991), and hence the values used in the model may not be appropriate at some of the receptor locations. Furthermore, please discuss the impact, if any, that the percolation ponds at the TRA would have on the estimation of dispersivity values (e.g., effects of possible ground-water mounding). Please explain how TRA is analogous to the RWMC.	The values of longitudinal and transverse dispersivity used in the model were taken from the values in the calibrated TRA model. These values are for the SRPA and not the vadose zone. These dispersivity values are well within the range reported by Gelhar et al. (1992). This holds true for all receptor locations. Dispersivity values for TRA were used because site-specific data for the RWMC were not available. Mounding of water beneath the TRA in the SRPA would not affect dispersivity but it may increase the amount of dispersion that could occur. Gelhar L.W., C. Welty, and K.R. Rehfeldt, 1992, A critical review of data on field-scale dispersion in aquifers, *Water Resources Research*, Vol. 28, NO.7, pp. 1955-1974.

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

Item#	Sec#	Page#	Comments	Resolution
44	5, Third Bullet Item	5-72	In fact there is a large body of evidence that the Snake River Plain Aquifer is heterogeneous. For example, section 3.5.3.1 of this report discusses the range of transmissivity values determined from aquifer tests. Furthermore, Wood (1989) has postulated that the abnormal water levels in USGS 88 may in part be due to a zone of low transmissivity. As transmissivity is a function of both hydraulic conductivity and thickness, these variations may be attributable to heterogeneity.	Wood and Wylie (1991) discuss the problem of developing a hydrogeological model at the RWMC due to the difficulty of identifying and correlating individual basalt flows and flow elements at depth. They note "...this problem is acute when small areas in the aquifer are considered in detail. Even though large variations in transmissivity and storativity occur over several feet, the inhomogeneities average out, and large scale ground-water movement is predictable using standard methods." Thus, the modeled hydraulic conductivity value of 700 ft/day represents a best estimate based on limited aquifer test data in the SRPA (Wood and Wylie, 1991). Wood and Wylie (1991) also state "...the water levels measured in this well (USGS 88) are representative of the interval of the aquifer that the well is open to...." Therefore, water levels in USGS 88 may be a result of the small-scale heterogeneities in the SRPA.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
45(a)	5, Fourth Bullet Item	5-72	The text states that the typical screened interval of a domestic water well is around 50 ft; however, the fourth bullet item on page 5-73 indicates that 100 ft approximates the typical screened interval of a domestic well. Please clarify. Furthermore, as discussed in the Pad A RI (Halford et al, 1992), it is unlikely that contaminants have been mixed over a large vertical section of the aquifer at locations near the source.	The active thickness of the SRPA, or the thickness through which much of the flow occurs, has been estimated by several studies. For example, Wood (1991) states that the active portion of the SRPA is generally the upper 250 feet of the saturated zone. Thus, contaminant releases from the RWMC could mix with the upper 250 feet of the SRPA, depending on the location relative to the source. In the SRPA model, predicted concentrations at receptor locations are an average over the entire simulated aquifer thickness. Unfortunately, the vertical extent that mixing may occur at each receptor location is between 0 and 250. Therefore, the exact aquifer thickness, or mixing interval, to simulate is not known.

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

Item#	Sec#	Page#	Comments	Resolution
45(a) (cont.)				Typical water wells in the SRPA have a screened interval of approximately 50 feet. To approximate the potential mixing interval, a 100-foot aquifer thickness (i.e., active thickness) was assumed to represent a plausible mixing interval; a 250-foot active thickness was not considered realistic due to the close proximity of the OU7-08 and WAG7 boundary receptors. In response to the fourth bullet, page 5-73: a 100-foot aquifer thickness was used in the analytical model to approximate the potential dilution in the SRPA over the potential mixing interval. Therefore, each receptor is assumed to "pump" from the upper 100 feet of aquifer thickness. This wording was used because of the inherent assumptions of the two-dimensional model. This bullet will be deleted to avoid confusion. Bullet 4 of page 5-72 will contain this information.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
45(b)	4, Paragraph 4	5-75	Quantify the statement (e.g. show results of the sensitivity analysis) that "A variation in dispersion has only a minor effect in concentration estimates".	General responses (sensitivity) of the model were observed. The relative degree of uncertainty is listed in Table 5-8.
46	5, Paragraph 4	5-76	a) The document states that "assumptions made in the model are generally conservative and, therefore, the predicted concentrations are considered to represent an upper bound of potential ground-water concentrations." This statement contradicts the statements in the preceding paragraph that "A smaller source and/or a smaller active thickness of the SRPA yields higher ground-water concentrations." The source size (disk diameter) used in the report may not be conservative; uncertainty about the size of the source and the impact of changes in the size needs further evaluation. b) IDHW concurs with the statement that "the overall degree of uncertainty associated with model results and predictive simulations is moderate to high". Consequently, it is premature to state that the modeling results are conservative and representative. Particularly since other conceptual site models utilizing different parameters and/or	a) The text has been modified to more clearly differentiate the sensitivity of the model from the uncertainty of the model. The term "source" in the SRPA modeling section refers to the plume migrating from the vadose zone to the SRPA, as predicted by the vadose zone model. The discussion of the SRPA model sensitivity to the source size does not refer to the "disk" source in the vadose zone model. For further discussion of the vadose zone model source diameter refer to comment response 29b. b) The text will be modified to indicate that the uncertainty is associated with the model parameters. However, the model results are considered conservative because upper bound values were generally used for uncertain parameters (see Table 5-8). It is our opinion that the results of the risk assessment

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
46 (cont'd)	5, Paragraph 4	5-76	transport mechanisms may yield equally valid results. Therefore, it seems appropriate to utilize data from the treatability study and ongoing monitoring activities to further refine the vadose zone model. Please explain the impact the delay in start-up of the treatability study will have on data collection efforts needed to refine the model in the RI report.	(unacceptable level of risk) would not be changed by incorporating treatability study results and refining the model.
47	5, Paragraph 1	5-94	In addition to providing a reference, also indicate the values used for dimensions and ventilation rates.	The text will be modified to include these data.
48	5, 5.3.4	5-90	This section would benefit from inclusion of a map illustrating receptor locations. In addition, please indicate which version of ISCLT was used, and note that problems with the source algorithms in the model make predicted impacts nears the source questionable. Furthermore, the model should address receptors at locations where Idaho ambient air quality standards apply (i.e., nearby highways, EBR-1).	Version 2 was used. The text will be modified.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
49	5, Paragraph 4	5-92	The on-site airborne transport model assumes that the length of the source area can be based on the area of the source used in the vadose zone model (Section 5.3.1). It is not clear whether or not this is conservative or addresses other appropriate conceptual models.	The area used in the on-site airborne transport model is much smaller than that actually emitting VOCs to the atmosphere. The larger area is indicated by the vadose zone transport model. In the airborne transport model, all mass was moved through the smaller area, conserving mass but calculating conservatively high concentrations.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
50	5, Paragraph 4	5-94	State the default values for temperature gradients and wind profile exponents which were used in the modeling.	Wind Profile Exponents (WPE): •Stability category A&B and wind speed categories one through six: WPE = 0.07 •Stability category C and wind speed categories one through six: WPE = 0.10 •Stability category D and wind speed categories one through six: WPE = 0.15 •Stability category E and wind speed categories one through six: WPE = 0.35 •Stability category F and wind speed categories one through six: WPE = 0.55. Vertical potential temperature gradients: •0.0 for stability categories A, B, C, and D for all wind speed categories •0.02 for stability categories E for all wind speed categories •0.035 for stability categories F for all wind speed categories.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
51	5, Paragraph 1	5-95	The off-site model uses a modeled area for the source that is smaller than that predicted by the vadose zone model (section 5.3.1) which is reported to provide conservatively high concentrations. Please explain the rationale for this approach.	The same mass is moved through a smaller area. Therefore, less air is mixed with the same mass. This results in higher predicted concentrations.
52	5, Paragraph 3	5-96	Please state the logic for placing the industrial receptor at a distance of 500 m from the source.	The nearest existing and routinely occupied structure is approximately 500 meters from the source.

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

Item#	Sec#	Page#	Comments	Resolution
53	5, Table 5-17	5-98	The mixing height (800 m) used in the model may not be conservative, since observations have indicated mixing heights as low as 100 m in stable situations.	The mixing height specifies the height above which no further dispersion can occur. Simulated concentrations will not be affected until contaminants reach this height; and concentrations near the ground (elevation of the source) will be affected at twice the distance that it takes the mixing height to be reached. Thus, for a receptor at 500 meters, the mixing height would have to be anywhere from 5 to 40 meters. These heights are lower than even the lowest height reported for INEL. This discussion will be incorporated into the text. We conclude from this that the mixing height has no effect on the calculated concentrations. The reference is: Turner, D.B., 1969, Workbook of atmospheric dispersion estimates: U.S. Dept of Health, Education, and Welfare.
54	6, First Paragraph	6-1	Residential development might indeed have an adverse effect on ecological habitats, or it might have a beneficial effect. The purpose of a BRA, however, is to address the potential health and ecological effects of the contaminants under the no-action alternative, not to address hypothetical (and debatable) effects of future land use.	The parenthetical phrase in the last sentence in the first paragraph will be deleted.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
55	6, Paragraph 3	6-3	See comment #60	Surface soil characterization is the subject of another OU and was therefore deleted from the OU7-08 site characterization workplan. The lack of surface soil data will be addressed in the uncertainty section.
56	6, Paragraph 1	6-5	According to the text, the COCs were determined "based on the detection frequencies of individual chemicals". The text should explain what specific criteria (i.e. detected in 10% of the samples) were utilized in this approach. Furthermore, this methodology may not be appropriate as it does not consider the toxicity of the contaminants. Therefore, the contaminant screening procedure should be performed using approved EPA methods (e.g. EPA, 1989; EPA, 1991).	The detection frequency of all analytes will be shown in Section 4. The criteria used to select COCs will be stated. However, to be conservative, further screening (e.g., toxicity screen) will not be conducted.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
57	6, Paragraph 2	6-5	The text states that transformation products were not included in the risk assessment because they "...were not consistently detected in soil, well, or vapor port samples...". However, of the potential transformation products listed in Table 6-2, three compounds (cis 1,2-dichloroethylene, vinyl chloride, and chloromethane) were not included in the GC target analyte list for samples collected from vapor ports (Table 2-1). DOE maintains that vapor diffusion is the dominant transport mechanism, therefore the absence of analytical data from vapor ports for these compounds may impact the risk assessment. Also note that chloroform was detected in ground water and perched water at concentrations of 42 μg/l and 1500 μg/l, respectively (Tables 4-20 and 4-21).	The absence of these compounds from the quantitative risk analysis will be addressed in the uncertainty section.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
58	6, Second Bullet Item	6-8	Please state the logic for assuming 100 years of institutional control. Also, DOE's requirement for 10 years of control will need to be documented in the ROD, along with the specific agency which would be given responsibility to ensure institutional control is maintained. In addition, recommend referring to specific time periods rather than listing specific scenarios to reduce confusion. For example, the "post-institutional control period" would technically extend to infinity.	The reason for assuming 100 years of institutional control is documented in DOE Order 5820.2A. Time periods can be shown in parentheses next to scenario descriptions if this increases clarity. The text will be modified to be consistent with the Pad A risk assessment.
59	6, Paragraph 2	6-15	See comments #60 and #61	See responses to #60 and #61.
60	6, Table 6-4	6-16	With respect to all soil pathways, IDHW does not agree that the surficial soil has been adequately characterized, particularly since very little data has been collected from the surface soils over the contaminated pits and trenches. As the soil pathways are part of the CSM, and may contribute a portion of the total risk, it is not appropriate to eliminate them.	Surface soil characterization is the subject of another OU7-05 and was therefore deleted from the OU7-08 site characterization workplan. The lack of surface soil data will be addressed in the uncertainty section.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
61	6, Table 6-4, administrative controls	6-16	According to page 2-51 of Chatwin et al (1992), "the primary uses of ground water at the RWMC include the fire safety, drinking water, and showers for workers". Analytical data from the RWMC production well presented in Table 4-18 indicates that contamination is present in the ground-water supply well. Unless other sources of potable water have already been utilized at the RWMC, IDHW does not agree that administrative controls can be relied upon to limit exposure in occupational scenarios as it would appear that additive effects may already warrant consideration. See also 55 FR 8710.	In order to be consistent with other risk assessments conducted at the INEL (e.g. OU2-08, OU7-12, OU7-10, etc.), consumption of groundwater by current onsite workers will not be quantitatively evaluated. Onsite production wells used for drinking water puposes are monitored on a monthly basis to ensure that potential contaminats meet drinking water standards.
62	6, Table 6-4	6-18	IDHW agrees that some VOCs would volatilize from ground water used for irrigation; however, residual concentrations may remain in the water. Recommend addressing this issue in the uncertainty section.	Ingestion of homegrown fruits and vegetables irrigated with groundwater will be addressed in the uncertainty section.
63	6, Second Paragraph	6-21	The reasoning for discussing the impact of using 95% upper confidence limits is unclear considering the risk assessment utilized average concentrations derived from the modeling.	The purpose of the discussion was to first define the RME and then to demonstrate how our modeling predictions meet the intent of the RME concentration estimates.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
64	6, Last Paragraph	6-22	Please explain why it is conservative to assume that indoor concentrations are the same as outdoor concentrations. It would seem that indoor air, without the potential for dilution effects, could have considerably higher concentrations than outdoor air. Also, it is unclear how the three inhalation pathways discussed in the report were addressed and what contaminant concentrations were developed for each pathway.	The reason that this is conservative is that the outdoor concentration is simply added to indoor air, rather than mixed. As stated at the end of this paragraph (on the top of page 6-24), "the hypothetical receptors are exposed to the three inhalation pathways (sources) when indoors and one inhalation pathway when outdoors." The other two indoor sources are indoor water use and infiltration of volatiles through the building foundation.
65	6, Table 6-8	6-27	The EPA source cited in Chatwin et al (1992) is not listed in the reference list for that document. Please explain how the ground-water ingestion rates were developed.	The reference from which groundwater ingestion rates were supposed to be taken was EPA 1990: "Statement of Work RI/FS Risk Assessment Deliverables" EPA Region 10, January 31, 1990. The ingestion rates used in the OCVZ BRA will be changed to be consistent with this document rather than the values which were misquoted in the workplan (Chatwin et al, 1992).

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
66	6, Fourth Paragraph	6-42	Although there are limitations to the standard approach of summing risks, in this particular case the limitations should be minimal, as the contaminants have similar toxic effects.	This section is supposed to describe the methodology of summing risks from multiple contaminants for the general case. Adding risk across different weight-of-evidence cancer classes would not be advisable or technically correct. The comment suggests that in this specific case, the limitations inherent in summing risks should be minimal. While this is noted, DOE feels the section should be kept general by changing the example in the last sentence to read "no attempt would be made to add carcinogenic risk across different weight of evidence classes."
67	6	6-58 and 6-59	The time periods in the subheadings for these sections do not agree with those listed on page 6-13.	The time periods in each section will be made consistent.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
68	6, Table 6-1a	6-61	Recommend adding the following items to the uncertainty analysis: - vertical dispersion values used in modeling - unreported quantities of volatile organic compounds which may have been disposed at the SDA - advective transport - degradation products - biotic and abiotic decay	These items will be added to Table 6-18.
69	6, Table 6-18, Exposure Estimation	6-62	Please explain what parameters are considered to be "non-specific chemical constants".	Non chemical-specific constants are those which are not dependent on chemical properties. Examples are breathing rate, ingestion rate, body weight, etc.
70	6, Table 6-18, Toxicological Data	6-62	The question of the exclusion of potential transformation products needs to be addressed, especially as the list includes the Class A carcinogen vinyl chloride. This represents an uncertainty that would lead to underestimation of risk.	"Exclusion of potential transformation products" will be added to Table 6-18.

TITLE/DESCRIPTION: **OCVZ**
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: **Idaho Department of Health and Welfare, Division of Environmental Quality**

Item#	Sec#	Page#	Comments	Resolution
71	6, Table 6-18, Toxicological Data	6-62	The uncertainty associated with the omission of chloroform needs to be addressed. The last sentence on page 6-64 provides a way to estimate the amount of chloroform, so it would seem that a qualitative assessment could have been performed using this estimate.	Uncertainty associated with the omission of chloroform will be addressed in Table 6-18.
74	6, Table 6-18	6-63	Please explain why the lack of an inhalation RfD for trichloroethylene is only expected to have a "slight" impact on the risk assessment, and quantify what is meant by "slight".	Since it cannot be quantified, the word "slightly" will be deleted from this entry.
75	6, First Paragraph	6-65	The reference (CDH, 1992) does not appear in the reference list in Section 8.	This reference will be added to Section 8. It is: CDH, 1992, "Rocky Flats Historical Release Report" Colorado Department of Health, 1992.

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

Item#	Sec#	Page#	Comments	Resolution
76	6, final bullet	6-67	There is not a strong case to be made that summing risks in this case is particularly health-protective or upper-bound. See comment #66.	Adding risks from three compounds classified as "B2" carcinogens is very health protective. This means that none of the compounds has even limited evidence of carcinogenicity in humans. Rather, carcinogenicity has only been demonstrated in animals. As it happens, an epidemiological study has caused EPA to withdraw the slope factor for trichloroethylene from IRIS and will likely downgrade this compound to a "C" carcinogen. The bottom line is that adding risk from several B2 carcinogens is a health-protective estimate of risk.
77	6, 6.2, First Paragraph	6-68	The first sentence states that an Ecological Evaluation (EE) is typically part of a Baseline Risk Assessment; it does not state that an EE is only performed if immediately dangerous exposures are thought to exist. Also, it is unclear at what concentrations the contaminants would be considered to be "immediately dangerous". Please explain.	The text will be changed to state "the ecological risk will be appropriately evaluated as part of the overall WAG-7 BRA (OU7-14)."

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

Item#	Sec#	Page#	Comments	Resolution
78	6, Second Paragraph	6-69	Implicit in the last sentence is the unfounded idea that humans are a sensitive indicator species, and that if risks to human health are low, it follows that ecological risks are also low. In all probability there are ecological receptors which are more sensitive than humans. In short, this paragraph is apparently a justification for the dismissal of any surface pathway as being of possible concern, and appears to be unwarranted.	The text will be revised to explain that the EE will be evaluated in the comprehensive WAG-7 BRA (OU7-14) without making qualitative statements about the magnitude of ecological risks.
79	6, Paragraph 3	6-69	At present, four water production wells are located downgradient (south-southwest) of the RWMC (page 2-52; Chatwin et al, 1992). These wells are used by livestock and wildlife, and are also used for irrigation (Chatwin et al, 1992). Therefore, ground water is currently an ecological exposure pathway, and its use could increase considerably if land near the RWMC is used for agricultural purposes in the future.	The text will be revised to explain that the EE will be evaluated in the comprehensive OU without making qualitative statements about the magnitude of ecological risks.
80	6, Fourth Paragraph	6-69	As IDHW does not believe the presence of contaminants in surficial soil has been adequately addressed, and that risk-based concentrations may not be appropriate for all species, the question of contact by burrowing animals and plant roots cannot be dismissed.	See responses to #60, #78

TITLE/DESCRIPTION: OCVZ
Draft, Remedial Investigation Report for the Organic Contamination in the Vadose Zone (Operable Unit 7-08), February 1993

REVIEWER: Idaho Department of Health and Welfare, Division of Environmental Quality

Item#	Sec#	Page#	Comments	Resolution
81	Appendix F		Appendices D and E, which are supposed to contain the analytical results of the semivolatile organic compounds and gamma spectroscopy data, have been omitted from the report. Please add these appendices to the Draft RI/FS.	These appendices will be added.

RESOLUTIONS ACCEPTED BY REVIEWER: _____