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0083660

EPA

November 16, 1992

Eric D. Goller
Operable Unit Manager
U.S. Department of Energy
P.O. Box 550, A6-95
Richland, Washington 99352

Re: Review of the 100 Area Feasibility Study Phases 1 and 2, Draft A, dated July 1992 (DOE/RL-92-11)

Dear Mr. Goller:

Enclosed are the comments from the U.S. Environmental Protection Agency (EPA) and our contractors on the 100 Area Feasibility Study Phases 1 and 2, Draft A.

In general, the report adequately addresses the scope intended for the 100 Area Feasibility Studies Phases 1 and 2. However, the methodology used to develop potential contaminants of concern are not consistent with the methodology described by the Hanford Baseline Risk Assessment Methodology. In addition, the development and screening of alternatives section does not address all contaminants of concern. These deficiencies are discussed in greater detail in the general and specific comment sections.

These comments have also been transmitted electronically via HLAN. If you have any questions, please contact me at (509) 376-8631.

Sincerely,

Dennis A. Faulk
Unit Manager

Enclosure

cc: Becky Austin, WHC
Audree DeAngeles, PRC
Brian Drost, USGS
Julie Erickson, DOE, w/o Enclosure
Robert Henckel, WHC
Richard Hibbard, Ecology
George Hofer, EPA, w/o Enclosure
Dave Jansen, Ecology, w/o Enclosure
Darci Teel, Ecology
Steve Wisness, DOE, w/o Enclosure
Administrative Record (100 Area Aggregate Area)

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100 AREA FEASIBILITY STUDY

PHASES 1 AND 2, DRAFT A

GENERAL COMMENTS

In general, the report adequately addresses the scope of 100 Area feasibility study Phases 1 and 2. However, there are some deficiencies that need to be addressed.

Potential Contaminants of Concern

The methodology used to develop a contaminants-of-concern list differs from the contaminant identification process described in the *Hanford Baseline Risk Assessment Methodology* (HSBRAM) (DOE-RL 1992a). The HSBRAM screens potential carcinogens against a risk-based concentration corresponding to a 1×10^{-7} risk, which is not included in this feasibility study. Also, only contaminants found to be below risk-based limits should be screened against regulatory limits. The HSBRAM contaminant-of-concern identification methodology should be followed for contaminants for which environmental data are available. Any deviations from the HSBRAM should be explained.

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Potential Applicable or Relevant and Appropriate Requirements

The potential applicable or relevant and appropriate requirements (ARARs) list provided in Section 3.0 and Appendix B of the 100 Area feasibility study report was reviewed for completeness and adequacy in accordance with EPA guidance, *CERCLA Compliance with Other Laws Manual: Interim Final, Volumes I and II, August 1988 and 1989.*

Many of the ARARs have been misidentified as chemical-specific instead of action-specific (see specific comments). While it is more important that all federal and state requirements be identified rather than categorized properly, categorizing helps to ensure that all the necessary ARARs have been identified. In the next round of ARAR identification, categorizing of ARARs should be reconsidered.

The ARARs tables identify specific regulatory sections as ARARs, such as 40 CFR Section 50.4, but systematically exclude broader regulations such as 40 CFR 50. In many cases these broader regulations are also ARARs. At this point in the ARAR review process it may be premature to exclude general regulations in favor of the specific regulation. This is also true for federal laws such as the Resource Conservation and Recovery Act, the Clean Water Act, the Clean Air Act, and the National Pollutant Discharge Elimination System. These laws should be included as ARARs.

Development and Screening of Alternatives

Some of the alternatives developed for solid waste and soil and riverbank sediments do not address all of the contaminants of concern. For examples:

- Removal and disposal alternatives do not include process options for removal and treatment of volatile organic compounds (VOCs) before disposal to the 200 Area. Processing of soils or other solid wastes containing concentrations of VOCs in excess of the criteria for land-banned VOCs either before excavation or before shipment is a requirement for disposal in the 200 Area (DOE-RL 1992)

- In situ treatment for solid waste does not address the handling of drummed wastes containing VOCs (DOE-RL 1992b).

Although existing treatment technologies and process options for tritium separation in groundwater are discussed in Section 2.14.3, page C-72 (Appendix C), these technologies are not individually presented while screening for the ability to implement, effectiveness, and cost. Also, these processes are used to enrich and concentrate tritium in the production of thermonuclear materials. It is not known whether any attempt is made to identify which of these or other technologies may effectively remove tritium as a gas from groundwater.

Some of the technologies and process options found to be effective and implementable are neither screened out nor included in the alternatives development for solid wastes, groundwater, and soil and riverbank sediments. These technologies and process options are discussed in the specific comments that apply to Figures 5-1 through 5-3, of the 100 Area feasibility study.

It is not explained why there will be no detailed analysis, by aggregate area, of the Phase 3 feasibility study as was the case for Phases 1 and 2 (Section 6.2).

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SPECIFIC COMMENTS

1. **Comment: Executive Summary, page i, second paragraph**

   The abbreviation "TPA" should be spelled out once.

2. **Comment: Executive Summary, page iii, first paragraph**

   A statement should be added to this section discussing how the surplus reactors decommissioning activities will be integrated with the remedial actions undertaken under CERCLA.

3. **Comment: Executive Summary, page vi, third paragraph**

   This section discussion RAOs. A statement is made that assumptions were made to develop remedial goals instead of using site-specific data. These assumptions should be specified.

4. **Comment: Executive Summary, page viii, bullets**

   This section discusses the CERCLA evaluation criteria; additional criteria that need to be added to this section include community and state acceptance.

5. **Comment: Executive Summary, page x, xi, xii, 100 Area Alternative Tables**

   The alternative numbers SW-1, SW-3, etc. gives the reader no information on the nature of the alternative. The table must list the title of the alternative, as well as the number.

6. **Comment: Evaluation Criteria, page xiii**

   The weighting factors given differ from those in the 300-FF-1 FS. The weighting factors for "Effectiveness" and "Cost" have values of 0.5 and 0.2, respectively, in the 300 FS. Some consistent set of weighing factors should be used for the entire Hanford Site. This comment is also applicable to Section 5.3.5, page 5-46.

7. **Comment: Section 1.1, page 1-4, second paragraph**

   No mention is made as to where river sediments are addressed.

8. **Deficiency/Recommendation: Section 2.1, page 2-1**

This section describes the methodology used to develop a contaminants-of-concern list. The methodology developed for this feasibility study differs from the contaminant identification process described in the HSBRAM Section 2.1 (DOE-RL 1992a), which screens potential carcinogens against a risk-based concentration corresponding to a 1×10^{-7} risk. This has not been done in this document. Also, only contaminants found to be below risk-based limits should be screened against regulatory limits. The HSBRAM should be followed for contaminants for which environmental data are available. Any deviations from the HSBRAM contaminant of concern identification methodology should be explained.

9. **Deficiency/Recommendation: Section 4.2.1, page 4-3**

Although solid waste, groundwater, and soils and sediments are media of interest, volatilization of organic and emission of particulates through the air pathway can be a concern to human health and environment at radioactive and hazardous waste sites. The text should discuss the remedial action objectives (RAOs) and general response actions (GRAs) for air. Also, RAOs and GRAs for air should be included in Table 4-2 along with those for other media.

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10. **Deficiency/Recommendation: Section 4.2.1.2, page 4-5, top of page**

This section lists the secondary exposure pathways. Ingestion of sediments should be included (DOE-RL 1992a).

11. **Deficiency/Recommendation: Section 4.2.3, page 4-7, top of page**

The text lists criteria used to develop remedial action goals. These criteria should be referenced.

12. **Deficiency/Recommendation: Section 4.5.2.3, page 4-29, fourth paragraph**

Bitumen-based, cement-based, and polymer-based process options are eliminated from stabilization and solidification technology because of the waste volume increase for removal, treatment, and disposal of soil and riverbank sediments. These process options should not be eliminated solely on the basis of an increase in waste volume. As stated in the text (Section 4.5.1, page 4-11), the process options should be screened out primarily on the effectiveness criterion, with the ability to implement and cost as secondary criteria. The bitumen-based process may be eliminated on the basis of its lower effectiveness in reducing the mobility of contaminants, thereby making the waste unacceptable under current land disposal requirements.

Cement-based, polymer-based, and other processes such as lime-based and silicate-based options are compatible for immobilization of heavy metals and radionuclides, but treatability studies should be performed. The cost of these processes has generally been considered to be low compared with those for other treatment technologies such as vitrification. Hence, these process options should be retained for the development of alternatives.

13. **Deficiency/Recommendation: Table 4-1, page 4-31**

This table presents media of interest, exposure pathways, and receptors for the 100 Area. External exposure to soils is not, but should be included.

14. **Deficiency/Recommendation: Figure 4-1, pages 4-35 through 4-37**

In-situ or ex-situ physical treatment options such as vacuum extraction and carbon adsorption are not considered for the treatment of organic contaminants expected to be present in the solid waste, but should be included. These options should also be included in Section 4.5.1.1, page 4-13, first paragraph. In regards to stabilization and solidification there is not adequate information to eliminate vitrification from SW Burial Grounds, as it may be applicable on a site-specific basis.

15. **Deficiency/Recommendation: Figure 4-2, pages 4-38 through 4-41**

The justification for eliminating well-point monitoring should be clarified. Does this justification include current findings with cone penetrometer?

16. **Deficiency/Recommendation: Figure 4-2, page 4-41**

Above ground and below-ground tanks are proposed for the collection of treated groundwater discharge as an interim measure to allow decay of short-lived radionuclides before surface disposal. The type of short-lived radionuclides expected to be present in the treated water should be described in the appropriate section.

Wet air oxidation and tritium treatment are included as chemical treatments for groundwater removal, treatment, and disposal. Wet air oxidation is a thermal process, and tritium treatment is not a single process. It is a category composed of three process options: electrolysis, thermal diffusion, and distillation (Appendix C). These options are all physical processes that should be included as physical treatments. Existing technologies and process options for tritium treatment should be clearly identified and included under the appropriate categories.

17. **Deficiency/Recommendation: Figure 4-3, page 4-42 through 4-45**

- The rational for the elimination of vitrification should be clarified. It is feasible to excavate to the area of contamination and then vitrify and, therefore, this option should not have been eliminated.

- Regarding the elimination of land farming from in-situ biological treatment should be reconsidered. This option may be applicable to soils around the N-Area fuel storage tanks.

- Carbon adsorption should be included as an in-situ physical treatment process for VOCs extracted from soil and river bank sediments. This comment is also applicable in several other places such as table 4-2, page 4-39, and table 4-3, page 4-44.

18. **Deficiency/Recommendation: Figure 4-4, pages 4-46 and 4-48**

- In regards to capping, asphalt based covers and soil/clay based covers may be applicable to specific waste types and, therefore, should not be eliminated from consideration at this point. Same comment also applies to capping on page 4-53.

- Physical treatment using vacuum extraction and carbon adsorption should be included under the in situ general response action for organic contaminant removal and treatment, and should be evaluated for ability to implement, effectiveness, and cost.

- Also, vacuum extraction, carbon adsorption, and solvent extraction should be included as physical treatments for the removal, treatment, and disposal of solid wastes, and should be evaluated for ability to implement, effectiveness, and cost for treatment of organic contaminants from burial grounds and other sources such as drums.

WSRC-RP-93-1204

- In regards to physical treatment, segregation and sorting may be applicable in burial grounds and should not be eliminated from consideration at this point.

19. Deficiency/Recommendation: Figure 4-5, page 4-50

Air stripping and vacuum extraction are considered for the in situ physical treatment for extraction of VOCs from groundwater, but process options for off-gas treatment are not included.

Process options such as carbon adsorption, catalytic oxidation, and thermal oxidation should be included for off-gas treatment.

20. Deficiency/Recommendation: Figure 4-5, page 4-51

The rationale provided for screening out sedimentation and dissolved air flotation under physical treatment for removal, treatment, and disposal of groundwater is not adequate.

Sedimentation in conjunction with coagulation and flocculation may more effectively remove radionuclides and inorganics than indicated. Dissolved air flotation with chemical addition followed by filtration could effectively remove radionuclides and inorganics, but treatability studies should be performed. An innovative design combining coagulation, flocculation, dissolved air flotation, sedimentation, and filtration processes into a single unit is commercially available for metals removal. Such a unit could be used for testing the efficiency of the system for contaminants of concern. Hence, sedimentation and dissolved air flotation should be retained for alternatives development.

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21. Deficiency/Recommendation: Figure 4-1 through 4-6, pages 4-35 through 4-56

Under the Process Option column, the term "RCRA Landfill" is used. Recommend changing the term to "RCRA-type Landfill".

22. Comment: Page 5-1, first paragraph

All comments made concerning tables 4-1 through 4-6 are applicable to chapter 5. Therefore, available technology list should be expanded in chapter 5 to coincide with the tables in chapter 4.

23. Deficiency/Recommendation: Section 5.2, page 5-2

The text assumes that soils and river bank sediments are sufficiently similar to be considered as a single medium. However, river bank sediment and soils found at the 100 Area waste management units may have different physical characteristics. For example, soils at the waste management units are mostly dry, requiring no dewatering during removal and subsequent operations. During removal of river bank sediments, water may be encountered, requiring removal. In addition, particle size, organic carbon content, and carbon exchange capacity may differ because of the depositional and erosional nature of sediments at the river bank and fluctuations in river water levels. Although many of the technologies may be applicable for both soils and river bank sediments, a separate section should be included for river bank sediments in the development of alternatives, taking into account the nature and extent of contamination.

24. Deficiency/Recommendation: Section 5.3.2, pages 5-5 through 5-20 and Figure 5-1, pages 5-53 through 5-55

This section does not include some of the technologies found to be effective and implementable in the solid waste alternatives previously identified. These technologies include slurry walls, pyrolysis, vitrification, polymer-based stabilization, repackaging, and hydrolysis. These technologies should be

evaluated in this section and it should be explained why they are not included among the alternatives developed.

25. **Deficiency/Recommendation: Section 5.3.2.2.1, page 5-6**

The type of monitoring and surveillance program proposed to track the migration of contamination for alternative SW-2 is not described elsewhere in the report, but should be.

26. **Deficiency/Recommendation: Section 5.3.2.3, pages 5-6 through 5-8**

It is not explained why institutional actions will be eliminated while developing alternative SW-3 for containment of solid waste. Although the containment action alternative minimizes mobilization of contaminants by erosion or leaching, access and deed restrictions may be required for this alternative to provide long-term effectiveness. Hence, institutional controls should be included in the containment alternative (SW-3). This comment applies to other sections when the containment alternative is developed as a single alternative.

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27. **Deficiency/Recommendation: Section 5.3.2.3.1, page 5-7**

This section includes groundwater monitoring as part of alternative SW-3. However, groundwater monitoring has not been evaluated for ability to implement, effectiveness, and cost in the screening process for solid waste containment actions (Figures 4-1 and 4-4) and should be. This comment applies wherever appropriate (Sections 5.3.2.5 and 5.3.4.3).

28. **Deficiency/Recommendation: Section 5.3.2.4, pages 5-8 through 5-13**

The removal and disposal alternatives (SW-4, SW-5, and SW-6) for solid waste include sorting of solid waste and demolition debris by radioactivity level, size reduction of waste objects, and repackaging. The alternatives, however, do not include any processes for carrying out these activities. At a minimum, size reduction, segregation and sorting, and repackaging should be included as process options for removal and disposal of solid waste.

29. **Deficiency/Recommendation: Table 5-1, page 5-10**

The solid waste inventory does not include the volume of pipeline to be handled during excavation and disposal. The volume of waste pipeline should be tabulated along with other solid waste components.

30. **Deficiency/Recommendation: Section 5.3.2.5, page 5-13**

The discussion of in situ treatment alternatives (SW-7 and SW-8) for solid waste does not include removal and treatment of drummed and non-drummed buried wastes containing VOCs and high-activity materials before implementing in situ alternatives. The Department of Energy (DOE) estimates that 500 intact drums will be encountered in the 100 Areas (DOE-RL 1992b). All of these drums are assumed to contain free liquids, with half assumed to contain VOCs and high-activity mixed wastes. The text should explain whether the proposed in situ alternatives are applicable, without any additional treatment, to solid waste sites containing buried drums with VOCs and high-activity materials. The text should also clarify whether institutional actions are required for future land use scenarios at sites treated with in situ alternatives. If institutional actions are required, they should be included with these alternatives along with other proposed technologies and process options.

Further, DOE estimates that an extensive amount of pipeline and demolition debris is buried in the 100 Area. The quantity of non-buried waste (e.g., pipelines and structures) is about 104 million loose cubic feet, which is two times the amount of buried wastes (page 5-15), and the text states that limited demolition and excavation is required to prepare some of these wastes for stabilization and

solidification. It also states that such waste could be moved to another location at the Hanford Site or could be buried at new locations within the 100 Area adjacent to the waste sites. However, the discussion of the proposed alternatives (SW-7 and SW-8) does not make clear that the removed materials will also need to be treated by stabilization and solidification, as an ex situ process, before disposal in another area.

These discrepancies should be addressed and alternatives SW-7 and SW-8 should be revised accordingly.

31. Deficiency/Recommendation: Section 5.3.2.6, pages 5-16 and 5-17

According to the *100 Areas Hanford Past-Practice Site Cleanup and Restoration Conceptual Study* (DOE-RL, 1992b), the 200 Area disposal site will require that delivered waste be segregated, at a minimum, according to radiation levels, transuranic waste (TRU) contents, or both (e.g., high-activity/TRU wastes will be segregated, transported, and disposed of separately from low-activity wastes). The proposed alternatives (SW-9 and SW-10) do not include a process option for segregation and sorting of solid waste according to radiation level or TRU content. Both of the proposed alternatives should include the segregation and sorting process option, particularly for pipelines.

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32. Deficiency/Recommendation: Section 5.3.3.3, pages 5-21 through 5-23

Alternative GW-3 does not address any institutional actions for groundwater. In addition to vertical barrier, hydraulic control, and monitoring, the containment actions alternative (GW-3) should include any institutional actions required for groundwater use.

This comment applies wherever appropriate (for example, Section 5.3.4.3, Containment Actions for Soil and Riverbank Sediments).

33. Deficiency/Recommendation: Section 5.3.4.4.1, pages 5-34 and 5-35

Removal and disposal alternatives (SS-4 and SS-6) for soil and riverbank sediments do not address removal and treatment of VOCs before disposal of wastes at the Hanford 200 Area.

The *100 Areas Hanford Past-Practices Site Cleanup and Restoration and Conceptual Study* (DOE-RL 1992b) states that no land-banned VOCs (i.e., VOCs exceeding Resource Conservation and Recovery Act of 1976 [RCRA] land disposal restrictions) can be shipped to the 200 Area. Soils or other solid wastes containing concentrations of VOCs in excess of this criterion must be processed either before excavation or before shipment to the 200 Area. This discrepancy should be addressed.

34. Deficiency/Recommendation: Section 5.3.4.6.1, page 5-44

The alternative SS-11 unit operations do not address the size of soil particles to be used for chemical soil washing. Because of the highly varied sizes (silts and clays, coarse sand, gravel and rocks) of the soils and riverbank sediments, soils classification, similar to that proposed for physical soil washing to separate large particles from the finer-sized material, should be included for chemical soil washing.

Appendix A

35. Deficiency/Recommendation: Section 2.3, page A-4

This section describes five key elements on which the toxicity assessment is based. Determination of slope factors is not but should be included as an element of the toxicity assessment (DOE-RL 1992a).

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36. Deficiency/Recommendation: Figure 1, page A-6

This decision logic diagram for determination of nonradiological contaminants is incomplete and should be reviewed to ensure that all necessary information is provided. For example, the arrow from the "Does contaminant concentration exceed background"? box to the "Suspect list" box is missing.

37. Deficiency/Recommendation: Section 4.1, page A-20

This section describes the qualitative toxicity assessment that was performed on the potential contaminants of concern. The text states that not all contaminants were assessed at this stage. The HSBRAM (DOE-RL 1992a) states that only contaminants below background and those deemed to be essentially nontoxic by Region 10 guidance (EPA 1991) not be assessed in the toxicity screening step. Also, when developing a contaminants-of-concern list, the HSBRAM states that maximum contaminant concentrations should be compared to risk-based concentrations for carcinogenic and noncarcinogenic contaminants. Carcinogenic contaminants are not, but should be included in the risk-based screening. The HSBRAM should be followed when developing the list of contaminants of concern for this feasibility study.

Also, the text describes how carcinogens are sorted on the basis of carcinogenicity (Group A, Group B1, and Group B2). Some Group C carcinogens have established slope factors and should therefore also be included (also see Section 4.2.1, Appendix A). Also, the text cites "HEAST Table B" as a reference; the correct reference is HEAST Table 3 (EPA 1992).

38. Deficiency/Recommendation: Section 4.1, page A-21

The text states that equations 9 and 15 from Region 10 guidance (EPA 1991) are used for toxicity screening. HSBRAM (DOE-RL 1992a) states that risk-based concentrations should be calculated; therefore equations 10 and 16, using a hazard quotient of 0.1, should be used.

39. Deficiency/Recommendation: Section 4.2.4, page A-23

This section describes the calculation of toxicity screening values. The text states that standard default exposure factors were used in the calculations. The HSBRAM (DOE-RL 1992a) contains a set of exposure parameters that should be used in this risk-based screening step.

Appendix B

40. Deficiency/Recommendation: Table 1A, pages B-1 through B-10

The following regulations are listed as chemical-specific ARARs on Table 1A and should instead be listed as action-specific ARARs.

- National Primary and Secondary Ambient Air Quality Standards (40 CFR 50.4, 50.6, 50.8, 50.11, 50.12)
- Standards for New Stationary Sources (40 CFR 60.52)
- National Emissions Standards for Hazardous Air Pollutants (40 CFR 61.32, 61.52, 61.92, 61.150, 61.154)
- National Pollutant Discharge Elimination System (NPDES) (40 CFR 122.41-122.50)

- RCRA Land Disposal Restrictions (40 CFR 268.40-44)
- Toxic Substances Control Act (40 CFR 761.60)
- Landfilling Standards (WAC 173-304-460)

41. Deficiency/Recommendation: Table 1A, page B-5

40 CFR 116, Designation of Hazardous Substances, is identified as an applicable ARAR. It is not necessary to include this regulation as an ARAR because it does not include any chemical-specific limits or any action-specific parameters. It should be deleted. In addition, the selection of 40 CFR 117, Determination of Reportable Quantities for Hazardous Substances, can be removed from the ARARs list. This regulation is redundant because 40 CFR 302.4 of CERCLA already designates reportable quantities for hazardous substances that include those of 40 CFR 117.

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42. Deficiency/Recommendation: Table 1A, page B-6

Table 1A specifies the NPDES requirements of 40 CFR 122.41-122.50 as relevant and appropriate. Although this section correctly states that CERCLA actions conducted on-site do not require permit, on-site remediation activities must still comply with the substantive portions of NPDES regulations. Complying with the substantive portions does not make the ARAR only relevant and appropriate. The requirement is still directly applicable to the situation at the 100 Area. NPDES requirements should be designated as applicable, or it should be more clearly explained why they should be included in the tabulation of potential ARARs.

43. Deficiency/Recommendation: Table 1A, page B-7

Criteria for Classification of Solid Waste Disposal Facilities and Practices, 40 CFR Section 257.3-4, should be listed as a to-be-considered (TBC) requirement. These are criteria that are not enforceable by EPA, and should not be considered as ARARs.

44. Deficiency/Recommendation: Table 1A, page B-8

The appropriate site-specific groundwater contaminant limits should be listed on this table following the regulatory citation, 40 CFR 264.92.

45. Deficiency/Recommendation: Table 1C, page B-17

Table 1C, potential TBCs, should also include:

- EPA directive 9355.4-01FS - 1990 Guide on Remedial Actions at Superfund Sites with PCB Contamination
- Soil cleanup/remediation at Hanford - February 1992
- RCRA Subpart S proposed corrective action regulations

46. Deficiency/Recommendation: Table 2B, pages B-22 and B-23

Three of the contaminants listed on the table of potential water quality criteria and limits have new MCLs as of May 1992. The new MCLs are: beryllium 4 μg/L; nickel 100 μg/L; and cyanide 200 μg/L. Table 2B should include these updated MCLs.

47. **Deficiency/Recommendation: Table 3A, pages B-27 through B-36**

Table 3A should include 29 CFR 1910.120, Occupational Safety and Health Act, as an action-specific ARAR for the 100 Area.

48. **Deficiency/Recommendation: Table 3A, page B-27**

The substantive requirements of 10 CFR 61.40-44 and 61.50-59 should be considered to be applicable ARARs. As stated under the Remarks section, these requirements are applicable to on-site disposal of radioactive materials that will occur under several of the remediation alternatives.

49. **Deficiency/Recommendation: Table 3A, page B-35**

Table 3A identifies the federal underground storage tank (UST) regulations as relevant and appropriate requirements if USTs containing petroleum are installed as part of the remedial action or are closed during the remedial action. If a UST is installed as part of the remedial action, the UST regulations in 40 CFR 280 would be applicable, not relevant and appropriate. However, from the discussions of the various remediation alternatives there does not appear to be any plan to install USTs. This inconsistency should be rectified. This concern also applies to Table 3B and the discussion of Washington state UST regulations on page B-41.

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50. **Deficiency/Recommendation: Table 3B**

Table 3B should include RCW 70.98, Nuclear Energy and Radiation, as a relevant and appropriate requirement. In addition, RCW 70.94, Washington Clean Air Act, should be included as an applicable requirement.

51. **Deficiency/Recommendation: Table 4A, pages B-47 through B-49**

Table 4A should include the Fish and Wildlife Improvement Act (16 USC 742), Fish and Wildlife Conservation Act (16 USC 2901), and Wild and Scenic Rivers Act (167 USC 1271). It is unclear from the background discussion in the document whether these requirements should be listed as applicable or relevant and appropriate. WAC 232-12, the Wildlife Classification Act, should be listed as a relevant and appropriate requirement.

52. **Comment: Assumptions, 1, page D-1**

The assumption that contamination can only occur above the Middle Ringold Member is not valid. In some parts of the 100 Areas, the Middle Ringold may be the unconfined aquifer.

53. **Comment: Conclusion, page D-1**

The estimate of the volume of contaminated groundwater should be changed (to 9.6 billion gallons?) (See comment on page D-2, VOLUME).

54. **Comment: Conclusion, page D-1**

Calculating the volume of groundwater in the plumes does not reflect the amount of contaminated groundwater that might have to be removed in a treatment scenario. The solid portion of the aquifer probably contains contaminants, and as contaminated groundwater is removed, additional contaminants may move from the solids into previously uncontaminated groundwater resulting in a larger volume of contaminated groundwater than that determined from existing plume volumes alone.

55. **Comment: Page D-2, second paragraph**

Use of the tope of the Middle Ringold as the bottom of the unconfined aquifer is not valid throughout the 100 Areas. The water table may be in the Middle Ringold in some places. The derived aquifer thickness of ten feet is probably an underestimate (at the very least a non-conservative estimate) of the thickness of the contaminated zone. A better estimate (and relatively conservative?) would be 20 feet.

56. **Comment: Volume, page D-2**

The calculated volume should be greater (about 9.6 billion gallons?) (see comment on page D-2, second paragraph).

57. **Assumptions, 3, page D-3**

The assumption that no groundwater contaminated soils exist below the minimum river level may not be valid. Groundwater presumably discharge all along the river bottom, and anywhere the groundwater is carrying contaminants, the soil may be contaminated.

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TYPOGRAPHICAL ERRORS & MISCELLANEOUS COMMENTS

Comment Page ii, BACKGROUND, second paragraph, line 2
The Hanford Site (as shown on 7.5-minute topos.) also extends slightly into Adams County.

Comment Page iii, third bullet, line 4
"...alternative from..." should be "...alternatives from..."

Comment Page v, first paragraph, last line
"...Table 1 below..." should be "...Table 1 above..."

Comment Page viii, third paragraph, line 1
"...EPA 1988..." should be "...EPA 1988a..."

Comment Page xviii, IRM
Should "interim response measure" be "interim remedial measure"?

Comment Page 1-1, Section 1.0, first paragraph, line 7
The Ecology et al. reference is given as 1990a; on the reference list it is designated 1989.

Comment Page 1-2, Figure 1-1
The Grant County/Adams County and Adams County/Franklin County lines are incorrectly drawn.

Comment Page 1-4, Section 1.1, item 3., line 4
"...remedial alternative..." should be "...remedial alternatives..."

Comment Page 1-6, Section 1.3.1.1, first paragraph, line 1
The Hanford Site (as shown on 7.5-minute topos.) also extends slightly into Adams County.

Comment Page 1-12, Section 1.3.1.2.3, second paragraph
Reference (Wahlen, 1991), is not on the reference list.

Comment Page 1-39, Section 1.3.1.5.4, last paragraph, lines 1 & 2

Reference (Robertson et. al., 1982), is not on the reference list.

Comment Page 1-41, Section 1.3.1.6.1, second paragraph, line 3
Reference (DOE-RL 1992b), is not on the reference list.

Comment Page 1-45, Table 1-15, footnotes
References (DOE-RL 1992b and Early et. al., 1986), are not on the reference list.

Comment Page 1-47, Table 1-16, heading for nitrate column
The units for the MCL should be mg/l not ug/l.

Comment Page 1-52, Section 1.3.1.7.3, first paragraph, second line Reference (ERDA 1975), is not on the reference list.

Comment Page 1-66, Section 1.3.2.2.2
Recent work has been completed which redefines the Ringold units (Delaney, Lindsey, and Reidel, 1991) and presents a standardized text for the geology of the Hanford Site. We should decide which set of geologic designations we are going to use, and try to use them consistently.

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Comment Page 1-69, Figure 1-9, explanation
The M/H Geologic Contact is not explained.

Comment Page 1-70, Section 1.3.2.4.1, line 4
Reference (ERDA 1975), is not on the reference list.

Comment Page 1-71, Table 1-29
Reference (ERDA 1975)(two occurrences), is not on the reference list.

Comment Page 1-74, Section 1.3.2.6.1, second paragraph, line 3
Reference (Sackschewsky and Landeen, 1992), is not on the reference list.

Comment Page 7-12, first two references
- "...Ecology,..." should be "...Ecology (Ecology),..."
- "...Agency,..." should be "...Agency (EPA),..."
- "...Energy (Ecology)..." should be "...Energy (DOE)..."

Comment Page A-1, Section 2.0, first bullet, lines 2 and 3
Reference (Gloyna and Ledbetter, 1969) is not in the reference list.

Comment Page D-1, Assumptions, 1
The assumption that contaminations can only occur above the Middle Ringold Member is not valid. In some parts of the 100 Areas, the Middle Ringold may be the unconfined aquifer.

Comment Page D-2, Areas
Should the plume designated "Northeast of 100 B/C" be designated "100-K"?

Comment Page D-2, second paragraph
Use of the top of the Middle Ringold as the bottom of the unconfined aquifer is not valid throughout the 100 Areas. The water table may be in the Middle Ringold in some places. The derived aquifer thickness of ten feet is probably an underestimate (at the very least a non-conservative estimate) of the thickness of the contaminated zone. A better estimate (and relatively conservative?) would be 20 feet.

REFERENCES

DOE-RL 1992a. Hanford Site Baseline Risk Assessment Methodology, DOE/RL-91-45, Rev. 1. U.S. Department of Energy, Richland Operations Office. Richland, Washington.

DOE-RL 1992b. 100 Areas Hanford Past-Practices Site Cleanup and Restoration Conceptual Study. U.S. Department of Energy. July 1992.

EPA 1991. Supplemental Guidance for Superfund Risk Assessments in Region X. U.S. Environmental Protection Agency, Region X. Seattle, Washington. August 1991.

EPA 1992. Health Effects Assessment Summary Tables, FY-1992 Annual. Office of Emergency and Remedial Response. U.S. Environmental Protection Agency. March 1992.

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