State of Oregon Comments
Revised Draft Hanford Solid Waste EIS
June 5, 2003

General Comments

13 1) This Environmental Impact Statement (EIS) makes a broad and unspecified claim of Irreversible and Irretrievable commitment of resources. It states that it commits an unspecified quantity of groundwater over an unspecified area for an unspecified and unlimited time. This is contrary to the intents and requirements of the body of environmental laws that govern Hanford cleanup.

14 2) The final Record of Decision (ROD) should provide discussion of contingency actions the U.S. Department of Energy (DOE) would take if it were determined that a key assumption or hypothesis was determined to be false.

15 3) The final ROD should include information from the mapping and monitoring of specific areas in the 600 area to demonstrate appropriate mitigation effectiveness for the three element occurrences detailed in Appendix I.

16 4) The final ROD should acknowledge that the Nevada Test Site has also been designated to receive low-level waste (LLW) and mixed low-level waste (MLLW) from across the complex. The ROD should outline a process for determining which site has the least environmental and public health impact from waste disposal.

17 5) Engineering design optimization must reflect the uncertainty in the contaminant inventory, waste form behavior, temporal variability, range of leaching behaviors, infiltration, and cap failure modes. Key redundancy features must be incorporated into the designs.

18 6) In the HSW-EIS, DOE's preferred alternative includes waste disposal in lined trenches. Oregon supports the use of lined trenches and encourages DOE to discontinue any further disposal of LLW in unlined trenches.

7) This EIS contains numerous deviations from standard practices without adequate explanation:

19 a) Appendix F, Section F.1.6, page F.44 discusses the fact that the EIS analysis deviates from the Hanford Site Risk Assessment Methodology Report (DOE-RL 1995), but does not explain why,

20 b) Page F.47, Section F.2, lines 12-18 states that adjustments in Safety Analysis Report accident scenarios were needed for this analysis but doesn't discuss what adjustments were made or why they were necessary for this EIS.

21 c) Page F.54, Section F.3.2, lines 10-12, describes a two step process for evaluating concentration ratios at the year 2046. Instead, we recommend you just decay the 2046 concentration ratios to the time of interest.

Waste Streams

8) The EIS does not analyze many key waste streams – including the tanks, tank heels, tanks ancillary equipment, leaked tank waste and waste in the PUREX tunnels. These existing and anticipated waste streams must be included in the analysis.

22 9) The EIS discusses the disposition of failed low-activity waste melters but does not include any information on the fate of the high-level waste (HLW) melters. This discussion should include the proposed waste classification of the HLW melters, how this classification was arrived at, and where the HLW melters will be disposed.

23 10) The EIS discussion on the disposal of failed low-activity waste melters is inadequate. In particular, the EIS needs to discuss the condition of any partially vitrified waste remaining in the failed melters, its waste immobilization performance characteristics, and the performance characteristics of the melters themselves as waste containers. This analysis should be conducted for varying amounts of partially vitrified waste in the melters up to the maximum expected for any type of failure.

24 11) The EIS assumes that all the immobilized low-activity waste (ILAW) will be vitrified as borosilicate glass. DOE has proposed that a large amount of this waste be in some form other than borosilicate glass. These potential forms are well known at this time: aluminosilicate glass, aluminosilicate "sand" (steam reforming), or grout. These potential waste forms need to be analyzed in this EIS. Or, the ROD needs to make an explicit statement that based on the analyses in the EIS, which assumed the immobilized form would be borosilicate glass, that any alternate waste form must have performance properties as good as or better than borosilicate glass. Otherwise, a supplemental EIS will be necessary when final waste forms are determined.

25 12) Since this EIS assumes the low-activity tank waste will be vitrified as borosilicate glass, and also that technetium 99 will not be removed from the low-activity waste, this represents an implicit commitment that any supplemental low activity tank waste forms will immobilize technetium 99 to at least the degree that borosilicate glass does.

Drinking Water

26 13) Page 5.244, Lines 7-9 implies that federal Drinking Water Standards don't apply to Hanford groundwater. However, Washington Administrative Code 173-340 requires groundwater be restored to the highest beneficial standards, which it defines as meeting drinking water standards. It further clarifies an aquifer is considered a drinking water source unless it meets a set of criteria which the Hanford aquifer does not.

Vadose Zone and Groundwater

General Groundwater and Vadose Zone Comments

27 14) The revised EIS indicates two general groundwater flow patterns that may exist in the future once the operational discharges decay and their physical influence no longer affects flow streamlines. To resolve these two divergent views of the future, DOE should establish a three-dimensional aquifer characterization program that adds as many monitoring wells as necessary. This characterization activity should include field scale siting studies combined with a large scale infiltration test to verify that the monitoring wells are functioning properly.

28 15) Groundwater across the Hanford Site exceeds drinking water standards today. Approximately 200 square kilometers is contaminated. Contaminants include radionuclides and hazardous constituents (see list below) in excess of drinking water standards in one or more wells. The modeling presented in the revised draft of the EIS presumes that future releases would be into uncontaminated groundwater, since these contaminants "will have migrated out of the unconfined aquifer by then" (Page 5.244 Line 19). This indicates that the complete mass of radioactive and hazardous contaminants, presently in the vadose zone and in groundwater, will have migrated into the Columbia River, been removed through remedial action, or naturally attenuated.

Radioactive Contaminants	Hazardous Contaminants
Carbon-14	Benzene
Cesium-137	Carbon Tetrachloride
Cobalt-60	Chloroform
Europium-154	Hexavalent Chromium
Iodine-129	Cyanide
Plutonium-238/239	Dichloroethene
Strontium-90	Ethylbenzene
Technetium-99	Fluoride
Tritium	Nitrate
Uraniums	Toluene
Trichloroethene	
Xylene	

However, DOE then claims an irreversible and irretrievable commitment of the groundwater based solely on the present impacts from uncontrolled releases to the groundwater from past actions. The irreversible and irretrievable commitment claim for groundwater must be removed from the EIS. See also Comment #1.

29 16) The EIS does not discuss the area or volume of groundwater that will be made unusable by the alternatives proposed, only that it will exceed acceptable risk values in the future. Without information on the quantity and quality of the groundwater beneath the burial grounds, an assessment of impacts is not possible. This precludes adequate planning of mitigation strategies.

Conceptual Model Comments

30 17) The EIS does not adequately deal with the uncertainties in the Systems Assessment Capability (SAC) conceptual model. This document should contain a detailed discussion of the affects of simplifying assumptions and the averaging of parameters in this model.

31 18) Groundwater modeling is predicated on an infiltration rate that increases with time. That is to say that for the first 500 years DOE uses an infiltration rate of 0.01 cm/yr. This is reflective of an assumption about the system constructed to contain the waste. Between 500 years and 1,000 years, the infiltration rate increases to 0.5 cm/yr., which is thought to mimic cover failure. Beyond 1,000 years infiltration is modeled at 0.5 cm/yr. This is a coarse assumption, which should drive a requirement for a field-scale test to verify infiltration rates. Secondarily, this assumption should drive the need to plan redundant systems to assure meeting this modeling input, thus meeting expected performance parameters.

32 19) The uncertainty in groundwater flow directions (G.1.5.2) will dramatically increase the number of groundwater monitoring wells required to verify the impact the burial grounds will have on the underlying aquifer. Additionally, Oregon questions the assumption that basalt is impermeable. This assumption should be verified through additional characterization and continued monitoring. Previous analysis and estimates by Pacific Northwest National Laboratories (PNNL) of the aquifer indicate that water is moving through the basalt. PNNL's inverse U-Code analysis indicated that in most locations water is up-welling through the fractured basalt, but that in some locations the overlying water table is infiltrating downward, into the confined basalt aquifer. The inverse U-Code analysis indicates that the total volume of water upwelling through the basalt is approximately equal to the input from surface water infiltration, and that surface water infiltration is two to three times as large as had been previously believed. The EIS needs to incorporate these facts in its analyses or discuss why they are not being considered.

33 20) Contaminant fate and transport modeling to support the various alternatives does not consider lateral transport of water beneath the proposed surface barriers. Lateral movement in the vadose zone has been monitored and documented beneath the Hanford site. One-dimensional vertical movement should only be used if that can be shown to be conservative when compared to observed fast transport phenomena.

34 21) None of the alternatives considered includes a surface barrier capable of containing a three-year maximum rainfall without releasing water to the subsurface. The Hanford Prototype Barrier is able to contain such events. The modified Resource Conservation and Recovery Act (RCRA) C barrier has less water holding capacity and is not able to contain these events. This potentially increases the likelihood that the barrier will become saturated and release relatively large amounts of water to the subsurface.

Groundwater Modeling Comments.

The modeling may not be as conservative as DOE indicates. The uncertainty and simplicity of the modeling could mean impacts may occur much sooner than predicted. Specifically:

35 22) The large representative elemental volumes used to conduct the numerical fate and transport modeling will tend to minimize DOE's ability to predict contaminant fluctuations at specific vadose and groundwater monitoring wells. Oregon recommends that DOE conduct more specific numerical modeling studies of the proposed waste trenches to verify environmental impacts. Revised modeling should include key model performance and design expectations and refined inventories (based upon mass), while incorporating smaller scale geologic features that have been demonstrated to effect lateral and vertical transport. This modeling can then be used to establish the mass capacity of each trench.

36 23) The EIS contaminant fate and transport modeling is predicated on one-dimensional vertical modeling that is presumed to be conservative and protective of future users. This assumption must also be field tested in a large-scale field test. The final ROD should include specific language requiring verification of numerical modeling assumptions.

37 24) Due to the screening approach used, groundwater modeling is based on technetium 99 and uranium, and appears to exclude the ILAW source term. The EIS states that SAC estimates indicate up to 450 curies of technetium 99 entering groundwater from an estimated inventory of 2,300 curies. ILAW could contain up to 25,500 curies of technetium 99 and DOE hypothesizes that only 86 curies would be released from the ILAW material (Page 5.248, Line 26). Therefore, Oregon recommends that the final ILAW waste form meet a performance requirement to leach a maximum of 86 curies in the next 10,000 years using prevailing waste characterization methods. Additionally, DOE asserts that solid waste to be disposed will only account for 20 per cent (450 curies + 86 curies = 536 curies) of the technetium 99 to be released to groundwater. This indicates that the estimated total release to groundwater will be about 2,680 curies of technetium 99. That is more than the inventory estimated in the SAC. The final EIS should resolve this apparent uncertainty.

38 25) Use of a single partitioning coefficient value (K_d) overlooks the complexity of the system of release actions that may be occurring. It is likely that for each contaminant, Kd is multi-dimensional with discrete values existing within the waste form, in the vadose zone and then in groundwater. In those release instances where an extreme chemistry can be associated with the composition of the release, it is likely additional Kd values should be incorporated. Oregon expects that DOE will demonstrate, through appropriate field and laboratory investigations, that the values used in numerical models are conservative.

39 26) Using four classes of K_ds in the EIS appears appropriate for analyzing potential future risks, however the assignment of contaminants in the groups should be revised, based on the minimum known K_ds for each contaminant. Using a minimum K_d will be conservative in that the contaminant(s) will be more readily released from the source term, which will tend to elevate risks in groundwater. For example, the SAC model includes high estimates for the