3.3 Native American Tribal Comments and Responses

3.3.1 Nez Perce Indian Nation

NEZ PERCE TRIBE
TREATY OF 1855

Nez Perce
ENVIRONMENTAL RESTORATION & WASTE MANAGEMENT
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August 19, 2002

Michael Collins
NEPA Document Manager
U.S. DOE, Richland Operations Office
P.O. Box 550, MSIN A6-38
Richland, Washington 99352

Re: Comments on *Draft Hanford Site Solid (Radioactive and Hazardous Waste Program Environmental Impact Statement (HSW EIS)*

Dear Mr. Collins:

The Nez Perce Tribe's Environmental Restoration and Waste Management Program (ERWM) have reviewed the above-mentioned document.

Since 1855, reserved treaty rights of the Nez Perce Tribe in the Mid-Columbia have been recognized and affirmed through a series of federal and state actions. These actions protect Nez Perce rights to utilize their usual and accustomed resources and resource areas in the Hanford Reach of the Columbia River and elsewhere. Accordingly, the ERWM responds to actions that impact the Hanford ecosystem.

General Comments

Our comments come from reviewing the EIS and by having some of our staff attend the Richland Public meeting on August 6, 2002. It is obvious that a great deal of work went into the preparation of the EIS and
1 the intent is good, but in general we concur with most of the comments that have been previously submitted by the Environmental Protection Agency (EPA) and the Hanford Advisory Board (HAB), and voiced at the public meeting in that it still needs a lot of work to make it a functional EIS. Specific comments made by
2 the EPA and the HAB that need resolution include integration of Long Term Stewardship concerns, more
3 specifics on capping and barriers, and more discussion on modeling and inventory assumptions.
4

For the purposes of brevity we will not reiterate very many of their concerns, but will focus on issues that our program feels are important.

5 The document in its present form doesn't appear to meet the needs for which it was intended. One shortfall of the document is that some of the source terms for the various contaminants are not adequately characterized. An example of this is the newly discovered carbon tetrachloride plume. How does the EIS deal with this?

6 Another concern is the proposed importation of waste from other sites. DOE is currently trying to amend the programmatic EIS to allow TRU waste to come onto site from other sources. In its present form the EIS doesn't deal adequately with that issue.

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Specific comments are listed below.

7 *First sentence of the third paragraph in the EPA general comments on the HSW EIS reads*: "It appears that alternatives were formulated based on cost concerns rather than environmental ones." We agree. One of many examples is found in page S.15, line 20 of the HSW EIS - In general, these three alternatives provide the most cost-effective and environmentally preferable approach to waste management at Hanford for the range of waste volumes that might be managed at the Site as a results of WM PEIS decisions. Such an emphasis alerts us to consider that the over-riding motive of DOE at Hanford may be cost, not clean up.

8 9 *Page 3 of EPA general comments, third paragraph*: The Purpose and Need statement is unclear. It should clearly define the primary and secondary needs of the EIS in relation to Hanford waste and off-site waste. As the HSW EIS currently exists, it cannot adequately address how solid waste management is affecting the environment because it has not clearly described the potential for taking off-site waste. In the current atmosphere of accelerated cleanup, this document seems to leave open many possibilities for shifting legacy waste from site to site across the complex without appropriate adherence to human and ecological environmental protections.

10 *Transportation issues of the HSW EIS in relation to the WM PEIS*: The HSW EIS declines to analyze transportation issues because that was done in the Waste Management Programmatic EIS (1996). The WM PEIS, however, used 1990 census data, which is no longer current or applicable for such analyses.

11 12 *Specifically in reference to TRU wastes:* There seem to be three categories of TRU waste produced at Hanford. Nowhere did we find a description of the categories to be expected from off-site. These three categories of on-site TRU waste are pre-1970 waste, which will apparently continue to be managed as LLW as there is no discussion about attempts to retrieve any of it; 1970-1984 waste that is "suspect", and set aside, apparently for possible retrieval; and post 1985 TRU waste, which is waiting to be processed and certified for disposal at WIPP. It should be remembered that any of these categories may contain either contact-handled TRU waste, or remote-handled TRU waste, which suggests that even small amounts in old LLW trenches may be of considerable danger to the environment.

13 Page 3.8, line 23 states: "Only small quantities of TRU waste are forecast from offsite generators." The alternatives for handling the TRU waste management were "evaluated using the maximum TRU waste volume forecast for management at Hanford." What are the "future TRU waste receipts"? Is it appropriate to give some finite figures and descriptions of these quantities?

14 Page S.6, line 25 – "DOE is determining whether suspect TRU waste should be retrieved and processed as TRU waste, or whether it can remain disposed of in the LLBGs." However, on Page S.9, line 33, we read, "After onsite characterization and packaging, DOE plans to send post-1970 TRU waste to the WIPP repository for disposal." It is unclear what is considered "suspect" TRU, and therefore, what will or won't be processed and sent on to WIPP.

15 Page G.68, line 40: "TRU waste would be retrieved and sent to WIPP for disposal and would not add to Hanford groundwater contamination levels." And again, page 5.24, line 10, "Inventories of retrievably stored TRU waste in trenches and caissons located in the LLBGs were not considered [for long-term impacts on groundwater] because they will eventually be retrieved and sent to the WIPP for disposal." Thus, the EIS does not evaluate an impact of TRU wastes on groundwater because of the assumption these wastes will not remain at Hanford. Realizing that DOE is considering leaving some of the Hanford TRU in place, and in addition not having assurance that all TRU received and processed at Hanford will in the long-term will be shipped off-site for storage, we are very concerned about the lack of evaluation of the potential effect of TRU on-site may have on groundwater. In other words, the need for analysis of TRU impact should not be denied when it is unclear how much TRU will be on-site, and then when and where TRU will be treated, stored, and disposed.

The short-term groundwater quality impacts of LLW (which can contain pre-1970 TRU waste) are summarily dismissed as a problem. Page 5.13, line 6, "Because less rigorous requirements for waste

16 contaminant and content were used prior to 1988, contaminants contained in LLW disposed of prior to 1988 offer the highest potential for leaching and release into the vadose zone prior to the time of site closure. However, releases to groundwater from these earlier disposals are not expected to occur during the period of operations." There is no further explanation as to why this expectation exists. Many waste sites have unexpectedly contaminated the vadose zone and groundwater. Why are these sites held to a different standard?

17 Page 5.19, line 7 indicates that "Preliminary estimates of transport times of constituents in Groups 3, 4 and 5 that considered their affinity to be sorbed onto Hanford sediments indicated their release through the thick vadose zone to the unconfined aquifer beneath the LLBGs would be beyond the 10,000 year period of analysis. Thus, all constituents in these groups were eliminated from further consideration." There are current ongoing studies of the sorption characteristics and conditions for a number of these elements, such as cesium and plutonium, because in some sites at Hanford these elements have moved further through the vadose zone than expected and have actually encountered the groundwater. Thus to eliminate them from consideration of having an environmental impact appears to be inappropriate.

18 *Section S.8.5, Cumulative Impacts:* This section contends that the cumulative impacts for the resources considered in the EIS are small and that they would not be expected to contribute substantially to impacts of other Hanford activities. On the contrary we believe that many of these impacts could potentially be very significant, especially for those impacts that may end up exceeding the MCLs in the groundwater.

19 *Appendix I Ecological Resources:* Area C is defined as an area from which future-capping materials may come from. There is no discussion that provides specific information relative to the amount of material that is proposed to be mined and what mitigation measures will be taken. This area appears to be contained within the Hanford Reach National Monument so there should be some discussion about the ramifications and prudence of creating large physical disturbances on a National Monument.

We respectfully suggest that the EIS in its present form is inadequate for its stated purpose, and needs to be rewritten and updated to reflect our concerns, as well as other concerns voiced by other reviewers and agencies.

Sincerely,

Patrick Sobotta
ERWM Director

Cc: Kevin Clarke
Larry Goldstein
Todd Martin

Responses to Letter L101

Comments	Responses
1	To provide information in response to comments, including those provided by EPA and the HAB, the HSW EIS has been revised.
2	Discussion of long-term stewardship has been added to Section 2.0. Additional information on caps and barriers has been added to Appendix G. Additional discussion on modeling including use of the System Assessment Capability are included in Section 5.3, Section 5.11, Section 5.14and associated appendices. Details on inventory assumptions are included in Appendices B and C .
3	See response 2
4	See response 2
5	Future disposals of waste are subject to applicable regulatory requirements which would apply to carbon tetrachloride and other hazardous waste constituents. Discussion of uncertainties regarding previously disposed inventories of waste has been added to Section 3.5. Inventories and impacts of hazardous materials, including carbon tetrachloride, also are described in Sections 4 and 5 and related appendices of the HSW EIS.
6	The HSW EIS has been revised to present some transportation impacts previously analyzed by the Waste Management Programmatic Environmental Impact Statement. A Hanford Only waste volume is now analyzed in the HSW EIS as a way of showing the incremental impacts associated with the receipt of offsite waste. Since this comment was made, the WM PEIS TRU waste Record of Decision has been amended to allow shipments of TRU waste from Ohio and California to Hanford prior to eventual shipment to WIPP. The HSW EIS has been revised to address receipt of TRU waste from these generators and other offsite generators.
7	DOE's primary concern is the cleanup of Hanford and other DOE sites across the country, and addressing those sites that present the greatest risks to the environment and public/worker health. DOE supports achieving cleanup goals and objectives at a lesser cost, if possible by pursuing innovative approaches to cleanup and new technologies. Resources are not unlimited and to the extent existing resources can be used more efficiently, then more cleanup can be accomplished per dollar spent.

Responses to Letter L101

Comments	Responses
8	This revised draft HSW EIS includes a revised purpose and need statement that was developed in consultation with EPA and Ecology staff. The statement includes disposal of existing and anticipated quantities of Hanford waste streams and potential wastes from offsite sources. A Hanford-only waste volume is now analyzed in the HSW EIS as a way of showing the incremental impacts associated with the receipt of offsite waste. Decisions regarding final waste disposition appropriately adhere to requirements to protect human health and the environment.
9	See response 8
10	The HSW EIS has been revised to present some transportation impacts previously analyzed by the Waste Management Programmatic Environmental Impact Statement.
11	All the offsite TRU waste is evaluated as part of the newly-generated TRU waste. Most offsite TRU waste is assumed to be contact-handled, some is assumed to be remote-handled. A portion of the offiste TRU waste is expected to contain mixed waste constituents. Retrieval of TRU waste from the LLBGs ("the 1970-1984 waste that is suspect") has already started. Shipment of TRU waste to WIPP has also started. Over one third of the TRU waste in the LLBGs is scheduled to be retrieved by 2006 (Hanford Performance Management Plan [HPMP] DOE 2002). Retrieval will be completed before the end of the operational period. No substantial releases are expected to occur before the waste is retrieved. Please see Response 136. Decisions regarding "pre-1970 TRU waste" would be made through appropriate CERCLA or RCRA past-practice processes in collaboration with EPA and/or Ecology. The environmental impacts of "pre-1970 TRU waste" are addressed as part of the cumulative impacts in Section 5.14 and Appendix L.
12	See response 11
13	A greater amount of offsite TRU waste is evaluated in the revised draft HSW EIS. The HSW EIS has been revised to show the TRU waste from offsite.
14	TRU waste retrievably-stored in the LLBGs is considered to be "suspect" because some of it would no longer meet today's definition.

Responses to Letter L101

Comments	Responses
15	The HSW EIS assumes that 50% of the "suspect" TRU waste upon analysis will meet the definition of TRU waste. TRU waste will be sent to WIPP. The remaining waste will stay in the LLBGs. THE HSW EIS does analyze the potential impacts of waste remaining in the LLBGs. All TRU waste received from offsite generators will eventually be shipped to WIPP.
16	All waste (except the retrievably-stored TRU waste) in the LLBGs is addressed as part of the groundwater analysis (see Section 5.3 and Appendix G). The cumulative impacts of Hanford activities not included as part of the alternatives addressed in the HSW EIS, including pre-1970 waste are addressed in Section 5.14 and Appendix L. Most of the contaminants in the vadose zone and groundwater were the result of now-discontinued liquid waste disposal activities.
17	This response will focus on the basis for the screening out of plutonium and other constituents in this analysis as described in detail in Section G.1.1.1. This assessment relied on estimates made by recently completed performance assessments and other analyses. Specific estimates of distribution coefficients for plutonium were taken from estimates described in the Composite Analysis (Kincaid et al. 1998). These estimates ranged from 80 to greater than 1980 ml/g, with a best estimate value of 200 ml/g. In this analysis, all plutonium isotopes was conservatively grouped in with other constituents that were categorized as strongly sorbed in Group 5 where the distribution coefficient were assumed to 40 ml/g or greater. As a part of the screening analysis, estimated travel times of contaminants within groups 3 ($k_d = 1$), 4, ($k_d = 10$), and 5 ($k_d = 40$) categories through the thick vadose zone to the unconfined aquifer beneath the LLBG's were calculated to well beyond the 10,000-yr period of analysis. The evidence cited by the commenter likely is referring to recently collected evidence found in the vadose zone impacted by past leaks at wastes from source areas in tank farms. This evidence may be relevant to these past leak conditions and extreme geochemical conditions associated with Tanks but cannot be interpreted as representative of the geochemical or vadose zone flow and transport conditions that would be expected under solid waste burial grounds. There is no specific evidence that would support similar enhanced movement of cesium or plutonium from sources in LLBGs. The most recent information on distribution coefficients available in Cantrell et al. (2002) summarize available Kd information on plutonium and note the quantity and quality of plutonium adsorption studies conducted with Hanford sediment are much less than those available for many other contaminants of interest at the Hanford Site. Delegard and Barney (1983) conducted a series of plutonium adsorption experiments on Hanford sediment at high base concentrations and variable concentrations of chelating agents. From their results, it was demonstrated that even at high base concentrations

Responses to Letter L101

Comments **Responses**

plutonium adsorption was moderately high. Combination of high base concentration and high ethylenediaminetetraacetic acid concentration reduced plutonium adsorption the most; however, even under these conditions significant adsorption occurred. Hajek and Knoll (1966) conducted Pu adsorption experiments on Hanford sediment from high salt acid waste consistent with some tank waste environment but not geochemical conditions expected for LLW or MLLW. Under these conditions, the K_d values for Pu were determined to be less than 1. In another study conducted by Rhodes (1952, 1957), K_d values for Pu were measured on Hanford sediment at different solution to solid ratios, variable initial Pu concentrations and a range of pH values from 0.5 to 14. In general, these results indicate high Pu adsorption, except at very low pH. The results of Rhodes at low and high pH are not consistent with the previous results discussed. It is possible that the high K_d values determined by Rhodes resulted from precipitation as a result of the high initial Pu [stated to be Pu(IV)] concentrations used in the experiments.

Based on the limited data available for Pu, it appears that Pu will be fairly immobile except at very low pH values or high ethylenediaminetetraacetic acid concentrations. These extreme conditions are not likely to exist in LLW or MLLW associated with LowLevel Waste Grounds.

Cantrell et al. (2002) also summarize the current state of knowledge for cesium. Under normal Hanford conditions, Cs(I) adsorption is high with Kd values in excess of 1,000 mL/g. Even in the presence of acidic process waste, Cs(I) adsorption remains high. This is partially due to the high acid neutralizing capacity of Hanford sediment resulting from its generally high carbonate content. The pH values measured for acidic process waste (initially pH 3.5) after contact with Hanford sediment was 4.1 to 7.5 (at solution to solid ratios of 30). Gee and Campbell (1980) demonstrated that high concentrations of K+ can dramatically reduce Cs(I) adsorption; however, such high K+ concentrations are not likely to occur at the Hanford Site. Serne et al. (1998) has shown that various simulated tank (T-106) waste (pH 12, with various salts at high concentration) can significantly reduce Cs(I) adsorption. The most dramatic decrease in Cs(I) adsorption occurs when high Ca(NO3)2 (3.5 M) is included as a component of the simulated tank waste (along with relatively high concentrations of NH4+ and K+). REDOX liquors that have much higher base (pH>14), Al, Na, and nitrate concentrations, have been found to have higher Kd values than those of the T-106 tank waste simulants. It has been hypothesized that precipitation of high-surface-area aluminum-hydroxide phases may be responsible for this effect Serne et al. (1998). It is also likely that the much lower concentrations of Ca2+, NH4+, and K+ in the REDOX liquors were also very important factors.

One must keep in mind that potassium and ammonia are below cesium in the lytropic series and the only way that it could be affected is through mass effects. The concentration of potassium or ammonia would have to be very high and you'd have to put a lot

Responses to Letter L101

Comments **Responses**

through.

Zachara et al. (2002) have presented a detailed mass action ion exchange model for Cs(I) adsorption onto Hanford sediment. This model is sensitive to the concentration of Cs(I) in the system because of selective adsorption sites (frayed edge sites on mica minerals) that are present in low concentrations that control Cs(I) adsorption at low aqueous Cs(I) concentrations. In addition, high salt concentrations that exist in tank waste greatly reduces Cs(I) adsorption. As a result of this work, it is clear that modeling Cs(I) adsorption in the vicinity of a tank leak will not be amenable to modeling with a single linear adsorption isotherm.

In summary, it appears that Cs(I) transport through the Hanford Site vadose zone and groundwater will be negligible except under conditions of extremely high salt concentration [Ca2+, NH4+, and K+ are particularly good competitors for adsorption sites with Cs(I)] such as conditions in the vicinity of leaks from certain tanks farms or a discharge sites that may have received similar wastes in the past. These extreme conditions are not likely to exist in LLW or MLLW associated with Low-Level waste burial grounds.

With regard to the effect of hazardous chemicals on the mobility of radionuclides, there is no field-scale evidence of organic compound (i.e. solvents or complexing agents) impacts at other nuclear LLW sites across North America (Serne et al. 1990 and 1995). Hanford Site experience and tabulations of metal-organic complex stability constants for organic compounds typically contained in LLW and MLLW such as found in Martell (1971), Martell and Smith (1977), Smith and Martell (1982), would suggest that most of these organics are non-polar and relatively hydrophobic molecules, such as tributyl phosphate. These types of organics cannot complex metals and radionuclides and will not be important in their filed-scale transport from HSW-EIS disposal sites. Such non polar and/or hydrophobic organic compounds if disposed in large quantities and high concentration could potentially affect radionuclide and metal migration by creating a reducing zone, however, field evidence suggests that this did not occur to any significant extent at the Hanford Site (see Serne and Wood 1990 and references therein). One exception would be Tributyl phosphate (TBP) but even TBP is viewed as a weak complexant and after any dilution will not be capable of mobilizing metals and radionuclides over significant distances (Martell 1971, 1977; Serne and Wood 1990; Serne et al. 1990, 1995; Smith and Martell 1982; Cantrell et al. 2002; Delegard and Barney 1983).

Responses to Letter L101

Comments	Responses
18	The HSW EIS has been revised to address additional alternatives. The DOE believes that the reasonably foreseeable cumulative impacts of the proposed actions will be small, as indicated by the draft HSW EIS evaluations of the alternatives (see Section 5.14 and Appendix L). Maximum contaminant levels (MCLs) established under the federal Safe Drinking Water Act provide a useful basis for comparison of groundwater contaminant concentrations that might result from LLBG disposal activities. Only Alternative Group B and the No Action Alternative show MCLs being exceeded (see Section 5.3 and Appendix G). In none of the alternatives would the applicable dose limits be exceeded (see Section 5.11 and Appendix F).
19	Section 5.10 includes a list of the natural resources that would be mined from Area C. Section 5.12 discusses restoration efforts. Additional information on mitgation measures has been provided in Section 5.18. Area C is not part of the National Monument (65 FR 37253).

Letter: L105

3.3.2 Confederated Tribes of the Umatilla Indian Reservation

30 August 2002

Mr. Mike Collins
Department of Energy
Richland Operations Office
825 Jadwin Ave., Mail Stop A6-38
Richland, WA 99352

Dear Mr. Collins;

On behalf of the Environmental Science and Technology Program (ESTP) of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), I am submitting the following comments to the Draft Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement. Given the highly technical nature of this document and the potential impacts this change will have on the operations at the Hanford Site, the CTUIR may provide further comments to your office in the future.

If you have any questions concerning this matter please feel free to contact me at (541) 966-2413.

Sincerely;

Mr. Richard Gay
Acting Manager, CTUIR-ESTP
Cc:
Armand Minthorn, Member, CTUIR-BOT
Kevin Clarke, DOE-RL
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Enclosure

Comments to Summary

Section S.4, Page S.5: "*Waste that does not meet the HSSWAC is stored until it can be treated to permit final disposal.*"

1 **Comment**: The CTUIR is concerned that waste stored at the site will ultimately be abandoned in place.

Requested Action: Please clarify how and where the material will be treated to meet the HSSWAC.

Section S.8.3, Page S.19, Table S.3: "*Potential for impacts on cultural resources "Low".*"

Comment: It is difficult to surmise how the Department can assert that the impact of each scenario on cultural resources is low. Disposal of low-level waste and mixed waste on the Hanford site will have numerous cultural impacts. First, the 200 Areas will become sacrifice zones where access will be permanently restricted for cultural purposes. Second, the springs and seeps along the Columbia River will be contaminated and so
2 unusable for numerous generations. Third, from a Tribal perspective, the biota associated with the Columbia River ecosystem has the potential of being contaminated with radionuclides and so will also be unusable for millennia.

Requested Action: Please reconsider the impacts of these disposal options on cultural resources.

Comments to Chapter 1

Section 1.4.5.1, Page 1.11: "*DOE would construct new disposal capacity using a deeper, wider trench design…*"

Comment: What is the reason for redesigning the trenches? If the new design is superior to the old design why was it not included in both alternatives since both require the
3 installation of new trenches?

Requested Action: Please address the questions listed in the above comment.

Comments to Chapter 2

Section 2.1.1, Page 2.3: *"However, some bulk waste (that is soil or rubble) is disposed of without containers."*

Comment: The disposal of this material without containers will result in the potential for immediate leaching of contaminants from the burial trenches. This should be accounted
4 for in the contaminant transport analysis

Requested Action: Please verify that the indicated assumption was included in the contaminant transport analysis.

Section 2.1.1.2, Page 2.4: *"Cat 3 LLW...high-integrity containers (HICs) or by creating a monolithic waste from the trench..."*

Comment: The assumption implied by placing Cat 3 LLW in containers is that the container will delay the release of contaminants to the environment and reduce the hazard. Has the Department evaluated the lifetime of the containers in comparison to the lifetime of the hazard placed in the containers? Do the containers result in a reduction in
5 the release of contaminants over time or mealy a delay in when the release occurs? If the containers reduce the release, has the Department considered using this additional containment for all LLW?

Requested Action: Please address the questions raised in the above comment.

Section 2.2.2.3, Page 2.18: *"If the leachate does not meet these requirements, an alternative treatment is required."*

Comment: What alternative treatment technologies are being considered?

6 **Requested Action**: Please clarify what alternative treatment technologies being considered for leachate.

Section 3.5.3.1, Page 3.11: *"ERDF was rejected as an option because none of the LLW or MLLW under evaluation in the HSW EIS would be generated by CERCLA actions."*

Comment: This statement indicates that a paper technicality has eliminated a potential option for disposal of LLW and MLLW. If contaminant transport analysis were to
7 indicate that ERDF were a more protective solution for the LLW and MLLW, would it not be possible to get around this regulatory roadblock? Has the Department evaluated

whether ERDF is technically a viable option for the disposal of LLW and MLLW? Would ERDF provide a better technical solution?

Requested Action: Please clarify whether ERDF would provide a better technical solution for disposal of LLW and MLLW.

Comments to Chapter 5

Section 5.2, Page 5.5: General Comment.

8 Comment: The air quality analysis focuses on criteria air pollutant emissions from activities associated with construction and capping of the borrow pit. The analysis fails to examine haze and visibility or consider the cumulative air quality impacts of these activities. Other activities that will be occurring in the area (e.g., the Waste Treatment Plant) will also be producing problematic and regulated air emissions. This assertion is particularly true since diesel powered boilers are proposed for the Waste Treatment Plant.

Requested Action: Conduct a cumulative air quality impact analysis that takes into account all sources of air pollution at Hanford. This analysis should include evaluation of haze and visibility parameters.

Section 5.3 Page 5.12: *"As a result of wastewater management activities during past Hanford Site operations, groundwater beneath the 200 Areas has been contaminated with radionuclides and non-radioactive chemicals. The contaminants emanating from the 200 Areas are moving toward the Columbia River. None of these contaminants are thought to have originated from the LLBGs."*

9 Comment: Contamination is emanating from the 200 area towards the Columbia River from sources that where not direct discharges to the vadose zone, nor were they intended to "leak". An example is the contamination coming from the tank farms. Thus the argument should not be made that LLBG's could not be a source of contamination. In addition, other burial grounds outside of the 200 area, such as the 618-10 and 618-11 site are a source of contamination.

Requested Action: Please provide the quantitative justification for the above statement made in the EIS.

Section 5.3.1, Page 5.12: *"In the case of capping of LLBGs at closure where water is used for short-term dust suppression, the 25-cm (10-in) layer of asphalt at the base of the*

3

cap is expected to divert water away from the waste and would not be expected to result in impacts on groundwater quality."

10 **Comment**: Water could migrate into site laterally due to clay layers under the site. The water is not limited to vertical migration alone.

Requested Action: Provide evidence of the effects of laterally migration of moisture on the movement of contaminants from the proposed LLBGs.

Section 5.3.1, Page 5.12: "*The thick vadose zone (see Section 4.5) between the LLBGs and the underlying water table is expected to limit any release of contaminants from the LLBGs to groundwater until well after the time of site closure.*"

11 **Comment**: Having any waste leak into the ground water is unacceptable and contradictory to the accelerated cleanup plan for site closure. In the past, it was also argued that there would not be any waste leaking into the ground water from past activities on the 200 area due to the thickness of the vadose zone. This theory was found to be invalid once the contamination was discovered beneath the 200 areas.

Requested Action: Reevaluate the waste disposal options that will result in migration of contaminants into the vadose zone and ground water to determine if options exist to further limit contaminant migration.

Section 5.3.1, Page 5.13: "*LLW, disposed in the LLBGs, are largely dry solid waste disposals. Category (Cat) 1 and 3 LLW disposed of since 1988 follow stringent Hanford Site Solid Waste Acceptance Criteria (HSSWAC) for waste containment and content (i.e., use of steel boxes, drums, high-integrity containers, and grouted waste forms) that will minimize leaching and release of contaminants during the period of operations.*"

12 **Comment**: Just because the waste is dry does not mean the containers will not become damaged from moisture. As an example, old drums have been found on the Hanford site that have rusted through. Part of this rusting is the result of soil moisture. In addition, the CTUIR is concerned about leaching and release of contaminants beyond the "period of operations." CTUIR has a long-term interest in this area, and as such, any contaminates that may leach into the environment.

Requested Action: Reevaluate the waste disposal options that will result in migration of contaminants into the vadose zone and ground water to determine if options exist to further limit contaminant migration.

Section 5.3.1, Page 5.13: "*Because less rigorous requirements for waste contaminant and content were used prior to 1988, contaminants contained in LLW disposed of prior to 1988 offer the highest potential for leaching and release into the vadose zone prior to the time of site closure.*"

13

Comment: If the waste was stored in containers prior to 1988, there is a greater chance of this leaching into the environment. Again, the CTUIR is concerned about waste leaching into the environment beyond the time of site closure.

Requested Action: Reevaluate the waste disposal options that will result in migration of contaminants into the vadose zone and ground water to determine if options exist to further limit contaminant migration.

Section 5.3.2, Page 5.13: "*Wastes considered in this assessment include previously disposed LLW and LLW to be disposed in the LLBGs as follows:*

- *LLW disposed of between 1962 and 1970 (referred to as pre-1970 LLW in this section)*
- *• LLW buried after 1970 but before 1988 (referred to as 1970-1988 LLW in this section)*
- *• Cat 1 LLW disposed of after 1988 including LLW forecasted to be disposed of through 2046 (referred to as Cat 1 LLW in this section)*
- *• Cat 3 and greater than Cat 3 (GTC3) LLW disposed of after 1988 including LLW forecasted to be disposed of through 2046 (referred to collectively as Cat 3 LLW in this section)*
- *• MLLW disposed of after 1988 including waste forecasted to be disposed of through 2046 (referred to as MLLW in this section).*"

14

Comment: Many different waste types will be disposed of in the LLBG.

Requested Action: A thorough waste evaluation, type, categorization, and classification is needed for all wastes that will be and have been disposed of in the LLBG. This level of detail is needed to assure the containers are adequate since the classification of waste types have changed over time but the waste has not. This level of detail is also need for modeling any movement of waste through the vadose and ground water system.

Section 5.3.2, Page 5.14: "*Inventories of retrievably stored TRU waste in trenches and caissons located in the LLBGs were not considered because they will eventually be retrieved and sent to the WIPP for disposal.*"

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Comment: TRU waste will be "temporarily disposed" in the same trenches as the MLLW and the LLW. Is there a time-line on when these wastes will be dug up and removed from site? Could the trenches become a *de facto* long-term storage facility for these and other wastes? These wastes were not considered nor the danger analyzed because they will eventually be removed. Yet the danger from having these wastes on-site is still present. DOE's assessment of risk and analysis is somewhat flawed because they are ignoring this data.

Requested Action: Please address the potential impacts of leaving the TRU waste in place. Also add a discussion of the probability that this material might be left in the trenches and not sent to WIPP.

Section 5.3.2, Page 5.14: "*The groundwater modeling results estimate contaminant concentrations in the groundwater associated with selected alternatives evaluated in this HSW EIS from the end of waste operations in 2046 up to 10,000 yr from 2046.*"

16

Comment: Will some of this waste still be present and a potential threat for longer than 10,000 years?

Requested Action: Please provide a detailed analysis of the amount of contaminants that will enter the groundwater and river system over the duration the hazardous materials will exist. This analysis should include the projected concentrations of the material at the river interface over the entire time period that contaminants will enter the river, and the projected cumulative concentrations of the materials in the various components of the river system including the sediments, water, and biota. Also, the health effects of the full release of material on the river system should be discussed.

Section 5.3.2, Page 5.14: "*The points of assessment for this analysis were located on the Hanford Site at hypothetical wells located approximately 1 km (0.6 mi) down gradient of the 200 East and the 200 West Area LLBGs and at a hypothetical well near the Columbia River located down gradient from both areas (see Figure 5.2). All well locations were selected based on simulated transport results of unit releases at selected LLBGs locations used in this assessment. Details of these unit release calculations are presented in Appendix G. The hypothetical wells 1 km down gradient from the LLBGs were selected to represent contaminant concentrations in the unconfined aquifer immediately down gradient of the LLBGs. A hypothetical well near the Columbia River is representative of a well dug in the unconfined aquifer for domestic uses and as a surrogate for conditions at river shore springs. In addition the concentrations of nuclides at the near river well were used to estimate quantities of nuclides reaching the Columbia River. The near river well location was found based on contaminant plume shape to be close to the Old Hanford Town Site.*"

17

Comment: This analysis is strong evidence that this EIS is flawed. There are many reasons why the sampling from a single well is NOT representative of the ground water conditions. Several of these reasons are outlined below:

1. The ground water flow is currently still in a state of flux. The flow conditions are not known well enough to place a signal well in the flow path.
2. A single well for the purposes of monitoring contaminates from these LLBG in even a known ground water table is insufficient to assure ground water quality.
3. As is evident from Figure 5.2, these three wells are not currently located in the path of the current ground water flow directions. The current Tritium and other plumes are trending more to the Southeast. These proposed wells would not be able to capture this plume and define this flow. In fact, the third well along the Columbia River appears to be located on the other side of a ridge or a barrier to the ground water flow direction. This would be a good way to assure that any level of contamination is not measured in this monitoring well.
4. The ground water has been shown to sometimes have preferred pathways of flow. This shows up along the Columbia River as springs day-lighting along the river. The ground water flow directions are currently not well defined (as seen via the recent contamination from 618-10 and 618-11 plume). Thus it can not be expected that a single well would be able to capture a plume nor be in the path of the flow.
5. The hypothetical well near the Columbia River is essentially a shallow well that may be capturing river water or water that may be partially diluted with Columbia River water. The discharge of some of the ground water pathways may be further out under the Columbia River as was shown in Dr. Robert Peterson's ground water simulations.

Requested Action: Please assess the potential impacts of the LLBGs using points of maximum concentration versus time derived from the modeling results. This analysis will provide a better understanding of the predicted concentrations in the ground water.

Section 5.3.2, Page 5.15: "*To establish the relative mobility of the constituents, they were grouped based on their mobility in the vadose zone and underlying unconfined aquifer. Contaminant groupings were used rather than the individual mobility of each contaminant because of the uncertainty involved in determining the mobility of individual constituents.*"

18

Comment: Some of these contaminants interact and affect the overall mobility. For example, if binding sites are occupied by one contaminant, then it is not available for another contaminant. Thus that second contaminant would be more mobile and be transported further than if it was in the system by itself.

Requested Action: Please add a discussion of the potential impacts of multiple contaminants on the mobility of individual species through the vadose zone and ground water. Quantitative estimates of synergistic effects must be included in the discussion.

Section 5.3.2, Page 5.16: "*Because of its affinity to be sorbed onto Hanford Sediments, lead falls within…*"

19 **Comment**: Are the assumptions for contaminant mobility within the vadose zone and ground water consistent with present monitoring data?

Requested Action: Please compare the assumptions, and the results they generate to determine if they are consistent with observed levels of contamination within the 200 Areas.

Section 5.3.2, Page 5.17: "*TRU waste retrievably stored in trenches and caissons would be retrieved, treated, repackaged as necessary, processed, and shipped for final disposal at WIPP, hence no impacts on Hanford groundwater quality would be expected from these wastes and are not considered further.*"

20 **Comments**: Depending on the length of time of storage, state of storage, environmental conditions, etc., there could be impacts from this TRU waste and as such, it should be modeled in the ground water contamination scenario.

Requested Action: Please include the impacts of buried TRU waste in the evaluation of ground water impacts.

Section 5.3.2.1, Page 5.17: "*Source-term release for the LLW was estimated using the soil-debris release model. In this model, the waste itself is assumed to have the same hydraulic characteristics of the surrounding soil materials.*"

21 **Comment**: This assumption appears to be a large departure from the actual properties of the waste. How sensitive are the projected ground water concentrations to this assumption? Also, the last sentence of this bullet lists uranium solubility as 0.2 g/L which is inconsistent with the value reported on Page 5.18.

Requested Action: Please provide a sensitivity analysis for this parameter. In addition, verify that a correct value for uranium solubility is presented in this section.

Section 5.3.2.1, Page 5.17: "*The infiltration rate was assumed to be 0.05 cm/yr to reflect the effective recharge through the assumed RCRA Subtitle C barrier placed over all the LLBGs. In the absence of the RCRA cover, the assumed infiltration rate used was 0.5 cm/yr.*"

22 **Comment**: Was a breakdown in the projected barrier after its design life included in the analysis of contaminant migration? This feature will be important to include in the model since the cap is very unlikely to maintain its integrity for 10,000 years.

Requested Action: Please evaluate the effects of cap degradation on waste mobility over the lifetime of the hazard.

Section 5.3.2.1, Page 5.17: "*In the absence of artificial recharge, vadose simulation results based on this assumed infiltration rate indicated a travel time to the water table of about 500 yr in the 200 East Area and 900 yr in the 200 West Area.*"

23 **Comment**: Hasn't contamination reached the ground water in the 200 areas much faster than these assumed rates? Also, given the differences in the travel times, has the Department considered using only the 200 West Area as a disposal sight?

Requested Action: Please indicate whether this assumption is consistent with present observations. Also, please comment on why the 200 East Area is a suitable site for waste disposal given it is closer to the river and travel times to ground water are substantial shorter than for the 200 West Area.

Section 5.3.2.2, Page 5.18: "*Because all LLW in this category is buried in high-integrity containers (HICs) constructed of concrete or in-trench grouted, the release calculations considered a 300-yr delay in release (expected lifetime of an individual HIC).*"

24 **Comment**: Have some containers and grouting been found to have a shorter lifespan than expected due to the interaction of the radioactive and hazardous waste with the grout and cement material? 300 years is a relatively short time-frame considering the life-span of the contaminants.

Requested Action: Please site the reference used to indicate that a 300 year life span is a reasonable assumption for the HICs and in-trench grouted waste.

Section 5.3.3, Page 5.19: "*Selenium and chlorine were not included in the assessment because the total inventories for both of these constituents were estimated to be less than 0.01 Ci.*"

25 **Comment**: What fraction of Group 1 radioactivity is represented by the projected inventory of selenium and chlorine?

Requested Action: Please indicate in the text the fraction of Group 1 radioactivity that is represented by the projected inventory of selenium and chlorine.

Section 5.3.3, Page 5.19: "*Preliminary estimates of transport times of constituents in Groups 3, 4, and 5 that considered their affinity to be sorbed onto Hanford sediments indicated their release through the thick vadose zone to the unconfined aquifer beneath* *the LLBGs would be beyond the 10,000-yr period of analysis. Thus, all constituents in these groups were eliminated from further consideration."*

Comment: It appears that many assumptions have been made to eliminate constituents from the analysis rather than including them in the event that they could enter the environment. This is not an expectable approach for this EIS since we know that contaminants have migrated in the 200 area vadose zone and aquifer far beyond the distances the extent expected just a few years ago.

26

Requested Action: The contaminant transport modeling used for this EIS does not appear to account for our current knowledge of contaminant transport at Hanford, nor is there an uncertainty analysis for the solution. This is an unacceptable approach since the results of the model are the primary method being used to determine whether or not resources will be impacted by solid waste burial. Please evaluate the transport parameters used in the model and determine if they are consistent with our current understanding of contaminant transport at Hanford. Also, please provide an uncertainty analysis on the solution given the possible variability of the input properties.

Section 5.3.3, Page 5.20: "*....Concentration levels in the Columbia River after groundwater discharges of this magnitude are introduced and mixed with the annual total river flow (at 3300 m3/s) would be significantly diluted.*"

Comment: The ground water is discharged in distinct zones rather than as an overall seep. This can be seen at the surface as locations where springs daylight. These locations are where contaminants would also be more concentrated. In addition, some contaminants could bioaccumulate in the environment. The bioaccumulation of materials will result in the concentration of materials in the food chain and potential negative long-term health impacts on those using natural materials from the Columbia River. As such, it does not seem reasonable to use a drinking water standard as an indication of the
27 impacts of the releases at the river.

Requested Action: Please provide an analysis of the increases in concentration of accumulating contaminants in the Columbia River biota and the long-term health risks associated with those using these materials as a food source. This analysis should include aquatic species, plants, and the terrestrial organisms that consume the plants and river water.

Section 5.5.5, Page 5.24: "*There is no evidence for adverse impacts on aquatic biota for any of the alternatives.*"

28 **Comment**: The authors provide no supporting evidence for this statement, nor does it appear that any analysis was conducted to estimate the potential impacts of bioaccumulative contaminants on the Columbia River ecosystem.

Requested Action: Please provide supporting evidence for this statement.

Section 5.11, Page 5.43: "*The impacts to populations downstream of Hanford have also been evaluated for Tri-Cities, Washington, and Portland, Oregon. The entire populations of the cities were assumed to use the Columbia River as the sole source of drinking water...*"

29 **Comment**: It appears that the only source of contamination ingestion was the drinking of river water. If the consumption of contaminated biota were included would the conclusions of this document be altered?

Requested Action: Please address the question raised in the above comment.

Section 5.14.1, Page 5.102: "*Because of past practices, some of the land within the 200 Area has been already committed in perpetuity for waste disposal. The reason for this commitment is the current presence in soil of radionuclides that had been discharged to ground or leaked from tanks.... Actions addressed in all alternatives in this EIS and similar future disposal actions, such as onsite disposal of immobilized low-activity tank waste, would add to that commitment.*"

30 **Comment**: This is a true statement. Substantial subsurface contamination already exists within the 200 Area at Hanford and the proposed burial grounds will add to this contamination. However, it is not clear whether the presence of the current contamination was taken into account when modeling contaminant transport from solid waste disposal areas. The presence of other contaminants has the potential to both increase detrimental health impacts as well as change contaminant mobility.

Requested Action: Please clarify whether the presence of other contaminant plumes has been included in the analysis presented in this EIS. Also, comment on the cultural impacts on Native Americans of leaving the 200 Areas as sacrifice zones.

Section 5.14.5.3, Page 5.106: "*Leaching of radionuclides from wastes disposed of in LLBGs, within the scope of this EIS; and their transport through the vadose zone to groundwater and on to the Columbia River would, in the long-term, lead to small additional collective doses (less than 0.15 person-rem) to down stream populations as indicated in Section 5.11.*"

31 **Comment**: Are additional doses acceptable to the goal of cleaning up Hanford and the Columbia River reach? If the river corridor is turned over to another agency to manage, are they aware that there will be additional contamination discharging from their managed area into the Columbia River. Also, has the Department of Energy considered the accumulative dose of radiation experienced by down stream populations from all Hanford derived contamination?

Requested Action: Please evaluate the impacts of the proposed burial grounds in light of all contamination entering the groundwater and river.

Section 5.14.5.3, Page 5.106: "*Because of extremely low infiltration rates of water in the absence of process water discharge, and with the very low rate of precipitation; it is expected that it will take centuries to millennia for the contaminants in the plumes and in the vadose zone beneath presently contaminated near-surface soils or LLBGs to be completely delivered up to the Columbia River.*"

32 **Comment**: Unfortunately the hazard associated with these compounds will outlive the projected transport times and resulted in contamination of water.

Requested Action: Note comment.

Section 5.14.5.3, Page 5.106: "*As may be noted in Section 5.3, at a maximum, the concentrations of mobile nuclides at a near-river well or spring would be small in comparison to derived permissible drinking water contaminant concentrations. Future activities, for example, disposal of low-activity tank waste, can be expected to result in small increases in concentrations of contaminants in groundwater in the distant future. Since individual contaminants will move at different rates and be spread over very long time periods, it is not expected that they would add significantly to impacts from past activities.*"

33 **Comment**: The DOE is counting on concentrations near the Columbia River to be small due to dilution of contaminants. These may not be small if the ground water has preferred flow pathways and discharges from smaller, concentrated zones. It does not appear wise to this reviewer to make such assumptions without a better understanding of the true system being represented.

Requested Action: As has been mentioned in previous comments, the contaminant transport modeling must be validated and a sensitivity analysis is necessary to determine the uncertainty of the model results.

Section 5.14.5.3, Page 5.108: "*Because the occurrence of contaminants reaching the Columbia River will be over very long periods of time, the impacts would be multi-generational (that is, extend over many generations in the future) but would be smaller for any given generation than that received by the generation centered on Hanford's period of special nuclear materials production.*"

34 **Comment**: Due to the bioaccumulation of contaminants in the environment, some of these impacts may not be as minor as is claimed. The multigenerational impacts have to assume that contaminants are being removed from the system at a rate equal to, or greater than their entry rate.

Requested Action: As has been stated before, the effects of bioaccumulation of contaminants must be included in this analysis.

Section 5.14.5.3, Page 5.108: "*Plumes of contaminants (for example, tritium and Tc-99) presently in groundwater are moving down gradient toward the Columbia River. Although these contaminants would not be expected to result in substantial doses to downstream users of Columbia River water, quantities and arrival times at sources of public drinking water have not been quantified.*"

35 **Comment**: More work needs to be done to determine what the impacts and quantities are to the public drinking water and to the environment before a statement can be made where it is expected that there won't be any impacts.

Requested Action: Please quantify these impacts.

Section 5.15, Page 5.109: "*In addition, after a few hundred years following disposal, groundwater beneath the LLBGs would be contaminated by continued slow entry of radionuclides and might, depending on concentrations at the time and down-gradient location of interest (generally easterly to north-easterly from 200 Areas to vicinity of the Old Hanford Town Site), constitute a continuing (thousands of years) commitment of a water resource. The criteria for restricted groundwater use and area extent of such commitment have not been quantified. When the groundwater reaches the Columbia River and is diluted by the large flow of the river, the contamination levels would fall well below those for which restricted use would be necessary to comply with the National Primary Drinking Water Regulations (40 CFR 141).*"

36 **Comment**: Will there be resources available for thousands of years to monitor and remediate this site if the contaminants reach unacceptable limits? In addition, if there is a "continuing (thousands of years) commitment of a water resource" from exposure to these additional contaminants, will there be a continuing commitment of financial

resources to help the CTUIR monitor the problem to assure that their treaty rights are not being violated?

Requested Action: Please address the questions mentioned above.

Response Letters to L105

Comments	Response
1	This Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement (HWS EIS) evaluates several alternatives for treatment of waste to allow disposal in accordance with the HSSWAC including offsite commercial treatment, onsite treatment in existing facilities, and treatment at a new onsite facility. All action alternatives evaluated in the EIS include treatment and final disposal of waste. The No Action alternative, mandated for evaluation under NEPA, is the only alternative in which waste remains in storage indefinitely.
2	The NEPA reviews and decisions leading to the development of the HSW EIS are summarized in Section 1.5.2. The HSW EIS analyzes alternatives for radioactive waste management actions that might be taken at Hanford. The HSW EIS addresses the impacts on cultural resources (see Section 5.7 and Appendix K). Analyses performed as part of the HSW EIS indicate that the potential impacts of the proposed action to seeps and springs along the Columbia River would be small. Further, the impacts to plants, animals, and people of the proposed action would be small.
3	A deeper, wider trench design is expected to reduce both the overall cost for waste disposal and the amount of land disturbed for this disposal. Evaluation of both the deeper, wider trench design and the current design provides a basis for comparison of the environmental impacts associated with the two different designs.
4	Bulk waste is generally slightly contaminated soil or construction debris. Bulk waste and other waste not contained in high integrity containers or grouted in place (but possibly contained in other types of waste containers like steel drums and steel boxes) are currently evaluated using the soil debris release model which makes no provision for containment and assumes that the entire inventory is available for leaching at the start of release period. Description of the assumptions and the release modeling used are described in detail in Appendix G.
5	The department has evaluated the performance of the containers and has assumed a 500- year period which is sufficient for most of the curies to decay away. The containers delay the release of the remaining radionuclides. See the following references: Wood M.I., R. Khaleel, P.D. Rittmann, A.H. Lu, S.H. Finfrock, R.J. Serve, K.J. Cantrell, and T.H. De Lorenzo, 1995, Performance Assessment for the Disposal of Low-Level Waste in the 200 West Area Burial Grounds, WHC-EP-0645, Westinghouse Hanford Company, Richland, Washington. Wood M.I., R. Khaleel, P.D. Rittmann, A.H. Lu, S.H. Finfrock, T.H. De Lorenzo, and D.Y. Garbrick, 1996, Performance Assessment for the Disposal of Low-Level Waste in the 200 East Area Burial Grounds, WHC-SD-WM-TI-730, Westinghouse Hanford Company, Richland, Washington.

Response Letters to L105

Comments	Response
6	The waste acceptance criteria for the MLLW disposal trenches are set so that any leachate will meet the waste acceptance criteria of ETF. The sentence has been deleted.
7	The use of ERDF is being considered as an alternative in the revised draft.
8	Cumulative impact discussion of air quality impacts is included in Section 5.14. This discussion includes the contribution of the waste treatment plant based upon its current design. Should the design change then appropriate review of environmental documentation for the WTP would occur.
9	The basis for this statement is found in the main conclusions on groundwater impacts from Low-Level Waste Management Areas 1, 2, 3, and 4 in Sections 2.8 and 2.9 of the Hanford Site Groundwater Monitoring for Fiscal Year 2001 (Hartman et al. 2002), which contain the eight LLBGs in question. Based on results of fence line monitoring of the WMAs, the current interpretation is there is no evidence that the specific WMAs in question have contributed to contaminants found in groundwater underlying these areas. Section 5.3 and Appendix G do evaluate the potential for contaminants from the LLBGs to reach the groundwater in the future.
10	The engineering basis and supporting data and information can be found in Focused Feasibility Study of Engineered Barriers (DOE/RL 1996).
11	DOE has evaluated additional alternatives to better limit contaminant migration, including alternatives for the disposal of LLW in lined trenches. Additonal discussion of mitigation measures is included in Section 5.18.
12	DOE has evaluated additional alternatives to better limit contaminant migration, including alternatives for the disposal of LLW in lined trenches. Additonal discussion of mitigation measures is included in Section 5.18.
13	DOE has evaluated capping of the LLBGs upon closure to limit contaminant migration. This waste will ultimately go through a CERCLA or RCRA past-practice remedial action process prior to closure of the LLBGs. Additonal discussion of mitigation measures is included in Section 5.18. The best available information on waste form and characteristics is used regardless of waste classification. Groundwater/vadose zone modeling reflects these forms and characteristics as described in Section 5.3 and Appendix G.
14	Retrieval of TRU waste from the LLBGs has already started. Shipment of TRU waste to WIPP has also started. Over one third of the TRU waste in the LLBGs is scheduled to be retrieved by 2006 (Hanford Performance Management Plan [HPMP] DOE 2002?).

Response Letters to L105

Comments	Response
14	Retrieval will be completed before the end of the operational period. No substantial releases are expected to occur before the waste is retrieved.
15	Transuranic radionuclides are generally not mobile. Other radionuclides that may be mobile and long-lived can be found mixed with TRU radionuclides. TRU waste is a very small volume (less than 2%) when compared to the overall volume of waste already disposed of in the LLBGs. TRU waste is discussed in Section 2. of this HSW EIS.
16	DOE and NRC guidelines require a 1,000-year evaluation. The HSW EIS evaluates impacts for at least 10,000 years.
17	The analysis was done as suggested by the comment. The hypothetical wells discussed in this HSW EIS are the modelled points of maximum concentration over time along lines approximately 1 km down gradient from the overall waste disposal facilities in the 200 East Area, 200 West Area, and ERDF, and along a line near the river. These hypothetical wells are not intended to represent existing or planned locations of monitoring wells. Section 5.3 and Appendix G have been revised to clarify this. The model does not assume that near-river locations are diluted by Columbia River water. Therefore, the outcome represents undiluted concentrations in the groundwater.
18	Discussion of the synergistic effects among organic and inorganic contaminants has been added to Section 5.3 and Appendix G. To establish the relative mobility of each contaminant, they were grouped based on their mobility in the vadose zone and underlying unconfined aquifer. Contaminant groupings were used, rather than the individual mobility of each contaminant, primarily because of the uncertainty involved in determining the mobility of individual constituents. The groups were selected based on relatively narrow ranges of mobility, and constituents were placed in the more mobile group uncertainty was present concerning which group they should be placed in. Some of the constituents, such as iodine and technetium, would move at the rate of water whether in the vadose zone or underlying groundwater. The movement of other constituents in water, such as americium and cesium, would be slowed or retarded by the process of sorption onto soil and rock.

Response Letters to L105

Comments	Response
19	These data are based on site-specific analysis of adsorption and are consistent with general observations of contaminant mobility at Hanford. The HSW EIS benefited from preceding analyses and field observations, including the performance assessments for 200 West and 200 East post-1988 burial grounds (Wood et al. 1995, 1996), the remedial investigation and feasibility study of the ERDF (DOE 1994b), the disposal of ILAW originating from the single- and double-shell tanks (Mann et al. 1997) and (DOE/ORP 2001), and the Composite Analysis of the 200 Area Plateau (Kincaid et al. 1998). These and other analyses, (for example, environmental impact statements) included development of inventory data and application of screening or significance criteria to identify those radionuclides that could be expected to significantly contribute to either the dose or risk calculated in the respective analysis. The radionuclides identified as potentially significant in these published analyses are also expected to be key radionuclides in this assessment.
20	See Response 15.
21	The assumption is a conservative departure from the actual properties of the waste. The soil-debris model takes no credit for any containment of waste disposed of before 1988. For containerized waste disposed of after 1988, credit is taken for the containers only through the operating period. After the operational period is complete, it is assumed no containers would limit contaminant migration. The actual waste would likely have a lower surface-area-to-volume ratio than soil because of the form of the waste. This results in the model assuming a higher release rate than would be actually observed. In the first draft HSW EIS, two separate solubilities of uranium were used: 1) 200 mg/L for release of uranium in non-cemented wastes, and 2) 0.2 mg/L reflective of a lower solubility expected for uranium within cemented wastes. In the updated analysis, the solubility used for non-cemented wastes was lowered to 64 mg/L to be more consistent with estimates used in Wood et al. (1995 and 1996). The current estimates of uranium solubility are conservative theoretical estimates based on Hanford-specific studies.
22	The analysis has been updated to take into account cap degradation. No guidance is available for specifying barrier performance after its the design life. However, it is likely that this specific barrier will perform as designed far beyond its design life. In the case of the modified RCRA, Subtitle C, cover, which has a design life of 500 years, the starting infiltration rate used in the release modeling begins at 0.01 cm/yr, after which the assumed rate increases stepwise in five equal steps over 500 years after the start of cover degradation (See Figure G.6).

Comments	Response
	After 500 years of degradation, the infiltration rate used in the release modeling is assumed to be equivalent to the rate used to represent recharge for the natural surrounding environment (0.5 cm/yr). This rate was used during the remaining 9,000 years of this assessment.
23	Existing groundwater contamination is largely the result of past liquid disposal practices, leakage from liquid waste storage tanks, and other liquid spills. Groundwater impacts from Low-Level Waste Management Areas 1, 2, 3, and 4 are discussed in Sections 2.8 and 2.9 of the Hanford Site-Groundwater Monitoring for Fiscal Year 2001 (Hartman et al. 2002), which contain the eight LLBGs in question. Based on results of fence line monitoring of the WMAs, the current interpretation is there is no evidence that the specific WMAs in question have contributed to contaminants found in groundwater underlying these areas. Section 5.3 and Appendix G do evaluate the potential for contaminants from the LLBGs to reach the groundwater in the future. The HSW EIS evaluates alternatives for the disposal of waste in the 200 East and 200 West Areas. See Section 3 for a description of those disposal alternatives. See Section 5 for a discussion of the potential impacts of those alternatives.
24	This information is described in the supporting Technical Information Document (HNF-4755, FH 2002). In reality, this 500-year delay in releases has little bearing on the estimated concentrations for the most long-lived constituents evaluated in the long term.
25	This part of inventory represents less than 0.01 percent of the total inventory in Group 1 constituents.
26	Existing groundwater contamination is largely the result of past liquid disposal practices, leakage from liquid waste storage tanks, and other liquid spills. Groundwater impacts from Low-Level Waste Management Areas 1, 2, 3, and 4 are discussed in Sections 2.8 and 2.9 of the Hanford Site-Groundwater Monitoring for Fiscal Year 2001 (Hartman et al. 2002), which contain the eight LLBGs in question. Based on results of fence line monitoring of the WMAs, the current interpretation is there is no evidence that the specific WMAs in question have contributed to contaminants found in groundwater underlying these areas. Section 5.3 and Appendix G do evaluate the potential for contaminants from the LLBGs to reach the groundwater in the future. Besides inventory, the key associated include estimates of infiltration, hydraulic properties, and constituent mobility properties, which in the case of this assessment is the distribution coefficient (kd). The current version of the sitewide model relies on a three-dimensional representation of the aquifer system that was calibrated to Hanford sitewide groundwater monitoring data collected during Hanford operations from 1943 to the present. The calibration procedure and results for this model are described in

Response Letters to L105

Comments	Response
	Cole et al. (2001a). This recent work is part of a broader effort to develop and implement a stochastic uncertainty estimation methodology in future assessments and analyses using the sitewide groundwater model. (Cole et al. 2001b) Resulting distribution of hydraulic conductivities from this recent calibration effort is provided in Figures G.11 and 12 in Appendix G of the revised draft HSW EIS. The assessment benefits from preceding analyses and field observations including the performance assessments for 200 West and 200 East post-1988 burial grounds (Wood et al. 1995, 1996), the remedial investigation and feasibility study of the ERDF (DOE 1994b), the disposal of ILAW originating from the single- and double-shell tanks (Mann et al. 1997) and (DOE/ORP 2001), and the Composite Analysis of the 200 Area Plateau (Kincaid et al. 1998).
27	Accumulation of contaminants and resulting impacts to biota are expected to be small. See Section 5.5 and Appendix I. Impacts to down-river populations are expected to be small. See Section 5.11 and Appendix F. The exposure scenarios described in Appendix F consider direct and indirect use of the Columbia River water and biota (e.g., swimming, consumption of fish).For those contaminants that will reach the Columbia River, the magnitude of dilution by river water is far greater than their CF meaning that they do not accumulate in the ecological system. However, the concentration of contaminants in the river is so low, the amount of accumulation of contaminants in biota is expected to be small. Dilution in the river results in less contaminants being available per unit time. The amount of time to concentrate contaminants in biota to substantial levels is longer than the life of the biota.
28	See Response 27.
29	See Response 27.
30	An analysis using the System Assessment Capability (SAC) has been added to help address the cumulative impacts of past, present, and reasonably foreseeable future impacts to the groundwater. See Section 5.14 and Appendix L. DOE recognizes the concerns of Native Americans are greater than the archaeological-anthropological type of impacts addressed in Section 5.7 and Appendix K. Impacts of other cultural aspects of Native Americans are addressed throughout the EIS (e.g., aesthetic impacts, noise, access, land use restrictions). As described in the Hanford Comprehensive Land-Use Plan Environmental Impact Statement, the Central Plateau is expected to remain an industrial exclusive zone.

Response Letters to L105

Comments	Response
31	Clean up of the Hanford Site has been and will continue to be subject to regulatory dose requirements and ALARA (as low as reasonably achievable) principles. DOE is responsible for contamination regardless of who owns or operates the Hanford Site. Even if that responsibility was transferred to another agency in the future, the other agency would have access to all the available information that DOE has. The HSW EIS evaluates the impacts of contaminants to the groundwater (Section 5.3 and Appendix G), the Columbia River, and potential impacts to biota (Section 5.5 and Appendix I) and people (Section 5.11 and Appendix F). The cumulative dose of radiation experienced by downstream populations is addressed using the System Assessment Capability (Section 5.14 and Appendix L).
32	Potential impacts to groundwater, to biota, and to people within the next 10,000 years are described in the HSW EIS. Some impacts are expected past this time. The current version of the site-wide model relies on a three-dimensional representation of the aquifer system that was calibrated to Hanford Sitewide groundwater monitoring data collected during Hanford operations from 1943 to the present. The calibration procedure and results for this model are described in Cole et al. (2001a). See the discussion of the System Assessment Capability in Appendix L.
34	Bioaccumulation is factored into the HSW EIS analysis.
35	The impacts to downstream populations (near Richland, WA and Portland, OR) are addressed in Section 5.11 and Appendix F. Cumulative impacts to downstream populations are addressed using the System Assessment Capability (Section 5.14 and Appendix L).
36	A discussion of long-term stewardship has been added to Section 2. Active institutional controls are planned for at least 100 years after site closure. Passive institutional controls would be implemented after that time.

Form: F044

3.3.3 Intertribal Fish Commission

Draft Hanford Site Solid (Radioactive and Hazardous) Waste Program Environmental Impact Statement (HSW EIS)

Location: Portland Date: 7/30/02

Comment Form

United States Department of Energy

Name: (optional) Tom Miller, Columbia River Inter-Tribal Fish Commission

Address: 729 NE Oregon, Suite 200, Portland, OR 97232

Telephone: (503) 736-3598 **E-Mail:** milt@critfc.org

1 The Columbia River Inter-Tribal Fish Commission opposes the US DOE's proposal to transport & dump 70,000 truckloads of radioactive waste to Hanford. The Commission is charged with the protection & restoration of salmon & other fishery resources for our member tribes: the Nez Perce, Umatilla, Warm Springs & Yakama tribes.

2 In 1855 our member tribes exchanged by treaty w/the federal govt. lands—including those which today comprise Hanford—in return for the right to retain their salmon-based cultural & spiritual values. Our tribes have honored their promises; the federal govt. has enjoyed use of Hanford without interference.

3 In return, the federal govt. has made Hanford the most radioactively contaminated site in the Western Hemisphere. Moreover, the govt's practices threaten the promises they made to our tribes. Our member tribes have had to cope w/ toxic spills into salmon-bearing watersheds that have affected the treaty fishing resources. Transporting this new volume of nuclear waste undoubtedly increases the risk of such accidents occurring in the future. (over)

Request: ☒ **Full EIS** (includes summary) ☐ **Summary EIS** ☐ **Electronic EIS (CD)**

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3 (cont) The health of the Columbia River and its watersheds — including Hanford — is essential to the tribes' and the region's salmon restoration efforts. For example, the fall chinook salmon run from the Hanford Reach is the most important fishery in the Columbia River Basin & supports important fisheries in Alaska. Importing this new volume of waste to Hanford could place this ~~secured~~ treaty-secured fishery in jeopardy.

Responses to Form F044

Comments	Responses
1	Evaluations that assume no receipt of offsite waste (the Hanford Only waste volume) have been added to the HSW EIS. Information on the potential impacts of transporting waste offsite to Hanford have been added to Section 5.8 and Appendix H. Potential impacts of disposing of waste from offsite have been added throughout Section 5 and related appendices.
2	Hanford and other production sites were used in the national defense effort that benefited all Americans. A major purpose of the activities proposed in the HSW EIS is to support the cleanup efforts that DOE is currently undertaking.
3	DOE shares your concerns for protecting the Columbia River. Analysis of alternatives assess the impacts on water quality in the Columbia River. For all waste alternatives analyzed in this HSW EIS, DOE has analyzed the movement of contaminants through groundwater to the Columbia River. In all cases, it found that the water quality of the Columbia River would be indistinguishable from the current river background levels. The concentrations of all constituent contaminants were well below benchmark maximum contaminant levels at a hypothetical well located near the Columbia River. The health impacts on downstream populations of groundwater reaching the Columbia River are discussed in Section 5.11 and Appendix F. The ecological impacts are discussed in Section 5.5 and Appendix I. The impacts of groundwater reaching the river are discussed in Section 5.3 and Appendix G. Additional discussion of uncertainties has been added to Section 3. Additional discussion of mitigation measures appears in Section 5.18. According to the Columbia River Basin Fish Contaminant Survey (U.S. Environmental Protection Agency. 1996-1998. EPA 910-R-02-006. Region 10, Seattle, Washington), contaminants contributing to the potential risks for Native Americans were PCBs (Aroclors and dioxin-like PCBs), chlorinated dioxins and furans, a limited number of pesticides (DDT and others), mercury and arsenic. These chemicals occur in the Columbia River as a result of agricultural and industrial operations (pulp and paper plants, for example) and are unlikely to be of Hanford origin. These chemicals would not exist in wastes proposed for future disposal at Hanford, or, if present, would be treated to reduce their mobility and toxicity.