Commentor No. 500: Judith Werner

Judith Werner
JW Interiors
4266 Woodside Circle
Lake Oswego, OR 97034
[redacted]

Mary Beth Burandt
U.S. Dept. of Energy
Office of River Protection
P.O. Box 1178
Richland, Wash 99352

I can't believe I even have to tell you this (Office of River Protection???).

You need to stop the plan to import off-site nuclear waste to Hanford! Don't we have enough of our own?? **500-1**

And, why will you not have a comprehensive cleanup of the leaking tanks and contaminated soil? Why would you want to contaminate our groundwater?? It is your JOB to protect the Columbia River and its environs. Just thought I'd let you know. **500-2**

Faxed 5/3
cc Col. Riverkeeper

500-1 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

500-2 As analyzed in this *TC & WM EIS*, 67 of the 149 SSTs at Hanford are known or suspected to have leaked liquid waste to the environment between the 1950s and the present, some of which has reached the groundwater. Estimates of the total leak loss range from less than 2.8 million to as much as 3.97 million liters (750,000 to 1,050,000 gallons). DOE recognizes that groundwater contamination from past leaks is a concern at Hanford and its potential impact on communities downriver from Hanford. One of the purposes of this *TC & WM EIS* is to analyze potential impacts of DOE's proposed actions to retrieve waste from the SSTs, treat and dispose of this waste, and close the SST farms via landfill closure, selective clean closure, or clean closure. This analysis is also intended to aid DOE in making decisions regarding cleanup of the past leaks, including remediation of the contamination in the vadose zone.

Commentor No. 501: Sam Adams, Mayor, City of Portland, Oregon

From: Adams, Sam [Sam.Adams@portlandoregon.gov]
Sent: Monday, May 03, 2010 5:33 PM
To: 'TC&WMEIS@saic.com'
Subject: DOE Draft TC&WM EIS Comments
Attachments: Mayor Adams Comments on Hanford TCWMEIS.pdf

Dear Ms. Burandt,

Thank you for the opportunity to comment on the Hanford Tank Farm Closure and Waste Management Environmental Impact Statement. Please see my comments attached.

Sincerely,

Mayor Sam Adams
City of Portland

Response side of this page intentionally left blank.

Commentor No. 501 (cont'd): Sam Adams, Mayor, City of Portland, Oregon

Office of Mayor Sam Adams
City of Portland

Mary Beth Burandt
DOE Draft TC&WM EIS Comments
TC&WMEIS@saic.com

May 3, 2010

Dear Ms. Burandt,

Thank you for the opportunity to comment on the Hanford Tank Farm Closure and Waste Management Environmental Impact Statement (EIS). Hanford is the world's largest and most complex environmental cleanup project, so I appreciate the complexity of the task ahead of the USDOE in proposing actions to clean up this facility.

It has come to my attention that a number of the recommended alternatives in this draft EIS pose serious threats to regional human and environmental health. While the City of Portland is not qualified to comment on the selection of one particular alternative over another in the draft EIS, we ultimately support the alternative that is most protective over the long term of the Columbia River. Portland sits at the confluence of the Columbia and Willamette Rivers, the health of which are vital to the success of this city. I am troubled that the USDOE's preferred alternatives do not reflect this perspective. *501-1*

In addition to the downstream impacts of the quality of on-site mitigation and clean-up activity at Hanford, I am significantly dismayed by Section 2.3, Waste Management Alternatives of the EIS and the USDOE's preferred Waste Management Alternative of Alternative 2, which allows the retrieval of off-site waste for storage at Hanford. *501-2*

Receipt of off-site waste at Hanford, especially if it contains (as would be expected) mobile long-lived radioactive materials, such as technetium 99 or iodine 129, is projected to have significant adverse long-term impacts on the groundwater, which ultimately impacts the Columbia River. *501-3* Moreover, the transfer of nuclear waste through Oregon on its way to Hanford poses an unacceptable risk to the health of Portland citizens.

Assuming no accidents, the USDOE itself estimated 816 cancer deaths to residents along the route, and to people in traffic near the trucks, from a similar proposal in 2008. That estimate is based on radiation doses for an adult male and does not account for the possibility of traffic accidents, leakages, or acts of terror along the transfer route. *501-4*

The City of Portland adamantly opposes the USDOE's selection of Alternative 2 of the Waste Management Alternatives as the preferred alternative in this EIS. Given that there are already *501-5*

1221 SW Fourth Avenue, Suite 340 ♦ Portland, Oregon 97204-1995
(503) 823-4120 ♦ FAX (503) 823-3588 ♦ TDD (503) 823-6868 ♦ www.portlandonline.com/mayor/

501-1 While DOE's Preferred Alternatives for tank closure, FFTF decommissioning, and waste management in this *TC & WM EIS* may not necessarily represent the most environmentally preferred alternatives, the ROD issued by DOE will identify any additional mitigation and monitoring commitments adopted by DOE and specify other factors considered by DOE in reaching its decision. Please see Section S.5.5 of the Summary and Section 2.10 of Chapter 2 of this *TC & WM EIS* for more information on key environmental findings.

501-2 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

501-3 See response to comment 501-2 for a discussion on the transport and disposal of offsite waste.

The *TC & WM EIS* analysis shows that receipt of offsite waste streams that contain specific amounts of certain isotopes, specifically, iodine-129 and technetium-99, could cause an adverse impact on the environment. Therefore, one means of mitigating this impact would be for DOE to limit disposal of offsite waste streams at Hanford. Other mitigation measures, such as recycling secondary-waste streams into the primary-waste-stream feeds within the WTP to increase iodine-129 capture in ILAW and bulk vitrification glass, are discussed in Chapter 7, Section 7.5, of this final EIS.

501-4 As shown in Appendix H, Figure H–4, solid radioactive waste transports would originate from DOE sites to the east and southeast of Hanford; for this reason, Interstate 5 would not be used for transports analyzed in this EIS. The value of 816 LCFs is from the results provided in the *GNEP PEIS* (DOE 2008b). This value represents the maximum impacts associated with 50 years of transportation activities supporting the operations of all existing U.S. commercial light-water reactors if they all were replaced with high-temperature, gas-cooled reactors. The *GNEP PEIS* was canceled by DOE on June 29, 2009 (74 FR 31017). The transportation of radioactive materials and waste, both coming to and leaving Hanford, must comply with DOT and NRC regulations that promote the protection of human health and the environment. This includes requiring the use of certified packaging that minimizes the radiation dose rate outside the transportation package. As shown in the Summary of this EIS, Section S.5.3;

Commentor No. 501 (cont'd): Sam Adams, Mayor, City of Portland, Oregon

Page 2

many barriers to quickly and adequately cleaning up the existing nuclear waste at Hanford, it is plainly unacceptable to consider importing additional nuclear waste, even temporarily, from outside of the Hanford site. Furthermore, the actual transportation of that waste by river, rail, or road through Portland would be an unacceptable risk to the City. **501-5 cont'd** **501-6**

We recognize that the treatment of nuclear waste is a regional and national issue that requires the collaboration of all levels of government to develop practical and safe solutions. In objecting to the transport of nuclear waste through this region, I offer this city's support in developing a plan for the on-site treatment of nuclear waste to either mitigate the health risks of the waste in transport or to eliminate the need for transport altogether. Treating nuclear waste on-site is the best opportunity for our communities to avoid further health and environmental impacts from waste produced from regional, decommissioned nuclear facilities. **501-7**

The City of Portland, in solidarity with the City of Spokane, Washington, urges the USDOE to follow through on the agency's fourth strategic theme: ***Environmental Responsibility:*** *Protecting the environment by providing a responsible resolution to the environmental legacy of nuclear weapons production.* **501-8**

The Portland City Council opposes the transportation of massive amounts of nuclear waste through our region and supports the alternatives in the Hanford Tank Farm Closure and Waste Management Environmental Impact Statement which are most protective of the long-term health of the Columbia River. **501-9**

Sincerely,

Sam Adams, Mayor
City of Portland

1221 SW Fourth Avenue, Suite 340 ♦ Portland, Oregon 97204-1995
(503) 823-4120 ♦ FAX (503) 823-3588 ♦ TDD (503) 823-6868 ♦ www.portlandonline.com/mayor/

Chapter 2, Section 2.8.3.10; and Chapter 4, Section 4.3.12, it is unlikely that the estimated total public radiation exposures from transporting radioactive waste to Hanford for disposal would result in any additional LCFs during either incident-free transportation or postulated transportation accidents.

501-5 In general, the scope of this *TC & WM EIS* does not include groundwater remediation activity as part of the proposed actions evaluated. DOE is implementing an extensive, ongoing cleanup program at Hanford as required under RCRA, CERCLA, and/or the TPA, a legal agreement between DOE, Ecology, and EPA. The TPA identifies cleanup actions and schedules, called milestones. The TPA agencies completed negotiations on several Hanford cleanup projects, including the establishment of 29 additional and/or accelerated groundwater and Columbia River protection milestones and target dates.

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

501-6 Because the radioactive waste analyzed in this *TC & WM EIS* would originate from DOE sites to the east and southeast of Hanford, no waste shipments are expected to pass through or near Portland, Oregon.

501-7 DOE has a national strategy for disposing of radioactive waste that requires transportation between DOE sites. This strategy was analyzed in the *WM PEIS* (DOE 1997). As part of this strategy, radioactive waste could be transported to Hanford for disposal and transported from Hanford for treatment and disposal at other DOE sites. Because radioactive waste analyzed in this *TC & WM EIS* would originate from DOE sites to the east and southeast of Hanford, no waste shipments are expected to pass through or near Portland, Oregon. DOE minimizes the generation of radioactive waste as much as practical and treats waste streams to make them acceptable for disposal. DOE is constantly reviewing new treatment technologies and looking for opportunities to cost-effectively minimize the need for transporting radioactive waste.

501-8 DOE's current mission at Hanford is the environmental cleanup of the facilities and areas where DOE previously engaged in activities in support for America's defense program. DOE's efforts are aggressively focused on deactivating, decommissioning, decontaminating, and managing resulting waste in an environmentally responsible manner. ORP's mission is to retrieve and treat

Commentor No. 501 (cont'd): Sam Adams, Mayor, City of Portland, Oregon

Hanford's tank waste and to close the tank farms to protect the Columbia River. Additional information on Hanford's mission is available at http://www.hanford.gov.

One of the purposes of this *TC & WM EIS* is to address the environmental impacts of retrieval, treatment, and disposal of tank waste and final (i.e., permanent) closure of the SST system. This EIS also evaluates the impacts of FFTF decommissioning, including management of waste generated by the decommissioning process. Finally, this *TC & WM EIS* evaluates the potential environmental impacts of ongoing solid-waste management operations at Hanford, as well as the proposed disposal of Hanford LLW and MLLW and a limited volume of offsite LLW and MLLW.

501-9 DOE is supportive of approaches that would best protect human health and the environment while also meeting its legal obligations.

Commentor No. 502: Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

Confederated Tribes *of the* Umatilla Indian Reservation
Department of Science & Engineering

46411 Timine Way • Pendleton, OR 97801
(541) 429-7040 • fax (541) 429-7040
info@ctuir.com • www.umatilla.nsn.us

March 19, 2010

Ms. Shirley Olinger
Office of River Protection
US Department of Energy
PO Box 550
Richland, WA 99352

Subject: CTUIR Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site

Dear Ms. Olinger,

The CTUIR appreciates the opportunity to provide comments on the subject document. A tremendous amount of work has gone into this document, and the analyses contain information that is very important to understanding the future conditions at Hanford. We appreciate the amount of effort that DOE clearly made to explain everything clearly and cross-reference information. Nevertheless, the CTUIR has only been able to scratch the surface and is providing high-level comments. There are many aspects that we were unable to evaluate in depth; any topic on which we remain silent is due to lack of review time, not lack of interest. We also expect that many comments could be answered if DOE had held workshops on each major topic (as the WMA-C process is doing), or if we had hundreds of hours to search through the EIS and the many supporting documents that were prepared over the last several years. ***502-1***

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have a vital interest in the current and future condition of Hanford, the Hanford Reach, and Hanford-affected lands and resources. The USDOE's Hanford site was developed on land ceded by the CTUIR under the 1855 Treaty with the United States. The CTUIR reserved rights to this land and retained and reserved the perpetual rights to hunt, fish, gather, pasture livestock and pursue other activities throughout the region, including the area in and around Hanford. The Hanford site contains critical and unique shrub steppe habitat, and the Hanford Reach is the last free-flowing segment of the Columbia River and is home of the last remaining naturally spawning fall Chinook.

Through nuclear weapons production activities, it has taken less than one lifetime to contaminate and thereby affect the ability of CTUIR to safely use all the Hanford Nuclear Reservation Area and its resources. CTUIR developed a Hanford Policy that reflects our responsibility to protect, preserve, and enhance Hanford natural resources including the air, water, and ground, and all that grows and lives there. The goals of the CTUIR Hanford Policy are to ensure that Hanford-generated pollution is not allowed to further contaminate on- and off-site natural resources, to protect the health of Tribal members when on Hanford or Hanford-affected lands, to evaluate the effectiveness of clean-up and restoration actions at Hanford, and to contribute advice and the

502-1 The first Waste Management Area C workshop was held in May 2009 and the *Draft TC & WM EIS* was published in October 2009; the workshop formats used for the draft EIS and Waste Management Area C were for different purposes and therefore were slightly different. DOE held numerous workshops on this *TC & WM EIS* on specific topics identified by interested parties, including the CTUIR. The specific workshops on groundwater modeling, known as Technical Review Group meetings, are identified in Appendix C, Section C.3, and summarized in Table C–1. DOE also held a full-day workshop in December 15, 2009, specifically related to helping stakeholders such as the CTUIR understand the information in the published *Draft TC & WM EIS.* Tables C–2 and C–3 summarize DOE's communication and consultation efforts related to the CTUIR. In addition, the CTUIR also has representation on the HAB. Section C.4 identifies the communication and briefings provided through that additional forum. As a result, DOE believes a reasonable effort was made to educate the CTUIR on this EIS.

scientific underpinnings to DOE to help DOE make the best, most stable, and protective cleanup decisions it can make.

Except for Alternative 6B, the alternatives contained in the draft EIS are not compliant by several orders of magnitude. Further, they are clearly not the actual alternatives, but rather artificial constructs used for analytical purposes. Although there are some significant technical problems with the EIS, the CTUIR believes that there is probably enough information buried in the EIS to craft some practical and compliant alternatives. **The CTUIR believes that another EIS document is needed with real alternatives that are compliant with requirements to protect human health and the environment.** If this additional document is not written, then DOE will be choosing an alternative that has not been evaluated, whose impacts are not known, and that might perpetuate groundwater conditions that are lethal for thousands of years. *502-2*

We recognize that DOE has offered to discuss the EIS and its implications with us. We will be calling to set up a meeting with our staff and the Science and Technology Committee.

Sincerely,

Stuart Harris, Director
CTUIR Department of Science and Engineering

2 Attachments:
Technical comments
Environmental Justice

Cc:
Dave Brockman, DOE/RL
Jane Hedges, WA Ecology
Dennis Faulk, EPA
Gabe Bohnee, NPT ERWM
Russell Jim, YN ER/WM
Ken Niles, ODOE
file

502-2 The alternatives presented in this *TC & WM EIS* were developed under NEPA (42 U.S.C. 4321 et seq.) to address the essential components of DOE's three sets of proposed actions (tank closure, FFTF decommissioning, and waste management) and to provide an understanding of the differences between the potential environmental impacts of the range of reasonable alternatives. Consistent with CEQ guidance, this EIS analyzes the range of reasonable alternatives that covers the full spectrum of potential combinations. The alternatives considered by DOE in this EIS are "reasonable" in the sense that they are practical or feasible from a technical and economic standpoint and meet the agency's purposes and needs. Potential conflicts with laws and regulations do not necessarily cause an alternative to be unreasonable, but additional mitigation commitments may be required if it is selected for implementation. For a more comprehensive discussion on compliance with regulatory requirements, see Section 2.7 of this CRD.

DOE has satisfied NEPA requirements by responding to public comments in the CRD and by making changes to the draft EIS where appropriate and necessary. Subsequent to the issuance of the *Draft TC & WM EIS*, DOE prepared an SA to analyze 14 topics it identified where it is unclear whether updated, modified, or expanded information warrants preparation of a supplemental or new draft EIS. DOE concluded, based on analyses in the SA, that the updated, modified, or expanded information developed subsequent to the publication of the *Draft TC & WM EIS* does not constitute significant new circumstances or information relevant to environmental concerns and bearing on the proposed action(s) in the *Draft TC & WM EIS* or their impacts. Further, DOE has not made substantial changes in the proposed action(s) that are relevant to environmental concerns. Therefore, in accordance with CEQ regulations (40 CFR 1502.9(c)) and DOE regulations (10 CFR 1021.314(c)), DOE determined that a supplemental or new *Draft TC & WM EIS* is not required. See Chapter 1, Section 1.8.2, for more information.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

ATTACHMENT 1 – Technical comments

Over-Arching Comments:

Since DOE has repeatedly stated that it will not repackage the parts of the alternatives, we have to evaluate the alternatives as currently presented.

502-3

1. DOE selected and packaged the alternatives for analytical reasons, not to develop alternatives to meet specific regulatory requirements. There is nothing wrong with this, but the analytical packages are being presented as if they are real NEPA alternatives.
   a. When presenting alternatives for actual use, DOE should have started with a list of health and risk criteria it must meet. The NEPA analysis must use CERCLA and MTCA criteria if DOE wants to reach a stable decision.
   b. Which alternatives meet criteria for protecting human health and the environment? Only 6A and 6B, possibly.
   c. Which alternatives are compliant with CERCLA and ARARs and TPA milestones? Unknown.
   d. Which alternatives are congruent with actual plans? For example, what was the rationale for an alternative that replaces the WTP twice when that is clearly not going to happen, or uses a different WTP design than the one being built? Unknown.

502-4

2. The DOE preferred alternatives are not in compliance.
   a. How can DOE choose a remedial alternative that does not meet state health and risk standards? How can WA Ecology assure the citizens of Washington State will be protected if MTCA is not an ARAR and state risk targets will not be met?
   b. How can DOE try to make a decision that drastically affects the TPA milestones and endstates? Is this even legal?
   c. Just because DOE has NEPA 'coverage' does not mean that CERCLA or RCRA requirements will be met, or that CERCLA and RCRA closure decisions will follow the NEPA decision if the primary CERCLA criteria would not be met.

502-5

3. Now that some analysis has been performed, a document that evaluates actual alternatives is needed. This time, compliance should be the overall criterion. The different components should be packaged and repackaged until a set of alternatives, *all of which are in compliance,* are found.
   a. It appears that compliance can only be reached if no more waste is imported unless it is all vitrified, more Hanford-generated waste is immobilized and disposed in an offsite deep geologic repository, more deep vadose remediation occurs, the LAW fraction is treated as GTCC and disposed in a deep geologic repository, 99.9% of tank waste is retrieved, and the maximum amount of clean closure is achieved. Contamination under the tanks is extensive and landfill closure is not protective or compliant.
   b. These may not be the optimum determinations, but this is the conversation that needs to happen.

502-3 See response to comment 502-2 for a discussion of the range of alternatives analyzed and their role in the eventual ROD.

DOE intends to make decisions based on its analysis of the proposed actions and the range of reasonable alternatives evaluated in this *TC & WM EIS*. This *TC & WM EIS* addresses the potential laws and requirements that would apply to the proposed actions, depending on the alternative. Issues concerning the ability to meet legal standards or requirements are also discussed, along with the potential mitigation measures that may be needed and that are feasible for DOE to implement. Additional mitigation measures could also be required in future permits issued by the State of Washington, or be addressed under the scope of the TPA as part of future remedial actions that are subject to CERCLA. ARARs analyses, including the MTCA, are conducted under CERCLA to determine cleanup levels for ongoing environmental remediation being conducted under the TPA. Regarding the rationale for analyzing an alternative that replaces the WTP twice, the assumption of replacing WTP twice in selected alternative(s) was made to estimate the potential impacts over the timeframe associated with implementing the proposed actions. This may represent an overly conservative assumption (that is, it may not be necessary to replace WTP twice) that would tend to overestimate the impacts.

502-4 This EIS is not being prepared under CERCLA; therefore, the ARARs process does not apply. However, some of the ongoing Hanford site activities that are considered in the cumulative impacts analysis are currently undergoing remediation under the TPA, which is the legally binding process used at Hanford to implement CERCLA and RCRA (hazardous waste) requirements. All environmental restoration actions conducted at Hanford under CERCLA must evaluate the "legally applicable, relevant and appropriate requirements of Federal and State laws and regulations" to establish the appropriate cleanup level that must be achieved at an individual cleanup site.

However, the scope of the proposed actions evaluated in this *TC & WM EIS* does not include CERCLA remedial actions. Under NEPA, agencies identify the laws, regulations, and requirements that may apply to the proposed action and alternatives and identify where standards may be exceeded. This is not the same as an "ARARs analysis" under CERCLA, and it serves a different purpose. The identification of legal requirements in a NEPA document assists an agency in its planning, funding, and decisionmaking process. It also provides full disclosure to members of the public, stakeholders, and other agencies regarding

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

4. The role of Ecology and the TPA in developing the EIS is unclear.
   a. It is not clear whether Ecology endorses DOE's preferred alternative, the groundwater model, the assumptions, and so on. **502-6**
   b. Why did Ecology agree that 1E-4 lifetime cancer risk is acceptable when the MTCA standard is 1E-5 (cumulative) and 1E-6 (individual)? How can Ecology assure citizens that state standards will be met if they have already agreed to something less? It is not protective to hedge this by saying that MTCA applies only to chemicals, and radiological risks are allowed to add another order of magnitude. **502-7**
   c. DOE can issue a NEPA ROD and try to do final planning *outside* the TPA process with an emphasis on capping, but EPA and Ecology still make the decisions *within* the TPA process. What was Ecology's rationale for going along with a non-TPA product that seems to conflict with the TPA? **502-8**
   d. How will WA Ecology develop mitigation measures (a SEPA requirement) to balance the tremendous impacts to the vadose zone, groundwater, human health, and the ecology? **502-9**
   e. Are DOE's preferred alternative and its tremendous environmental consequences allowed in the Sitewide RCRA Permit? Can a site that causes many millennia of natural resources that are lethal to biota and people ever be legally closed? CTUIR does not think so. **502-10**

5. The assumptions, uncertainties, and decision instabilities need further discussion.
   a. If the model is still not calibrated and the document is based on a single deterministic set of model parameters (and only on the tritium model run), then it is impossible to determine the level of uncertainty. **502-11**
   b. Other parameters such as exposure parameters may be equally problematic. For example, DOE made up a "native american" exposure scenario that is totally incorrect, but that nevertheless has enough information to show that risks are at least 10-fold higher, and possibly 100-fold higher, than presented. **502-12**
   c. Actual RCRA closure is not clearly described. What additional modeling will be required for the CRCA-CERCLA actions and performance assessments? **502-13**
   d. NRD liability has not been accounted for. The consequences of failing to clean up adequately will last tens of thousands of years. Clean closure (6B) costs only twice as much as landfill closure, within the middle range of costs, whereas the NRD liability f any other alternative is chosen could be much higher both in actual dollars and in health and ecological consequences. **502-14**
   e. Even if clean closure takes 100 years to achieve, this would still be preferable to 10,000 years of lethal groundwater and destruction of the river (as shown by the cumulative analysis and the northwest groundwater flow). **502-15**
   f. DOE assumes the river channel will remain in the same place for 10,000 years. Has there been any change in the last 10,000 years? Similarly, the likelihood of a Blackrock reservoir is fairly high given the issues surrounding Yakima Valley irrigation. **502-16**

the potential scope of an agency's effort to implement a proposed action (or an alternative) in terms of the subsequent permitting, other approvals, consultations, and coordination requirements, all of which would include additional public involvement opportunities in the future.

See response to comment 502-2 for a discussion of potentially applicable laws and regulations, as well as potential mitigation measures.

502-5 See response to comment 502-2 for a discussion of the range of alternatives analyzed and their role in the eventual ROD.

502-6 Ecology has been a cooperating agency since 2003, and one of Ecology's primary responsibilities as identified in the MOU is to help ensure that the contents and analyses in this *TC & WM EIS* are sufficient to satisfy SEPA requirements. See Appendix C for the MOU and Ecology's foreword to this EIS for more information.

502-7 The "benchmark standards" used in this *TC & WM EIS* represent dose or concentration levels that correspond to known or established human health effects. For groundwater, the benchmark is the MCL if an MCL is available. For example, the benchmark for iodine-129 is 1 picocurie per liter; for technetium-99, it is 900 picocuries per liter. These benchmark standards for groundwater impacts analysis were agreed upon by both DOE and Ecology as the basis for comparing the alternatives and representing the potential groundwater impacts. In addition, this approach is consistent with the MTCA standards Method A, which is used to establish cleanup levels under the separate CERCLA and RCRA processes established by the TPA. Method A draws from current Federal and state standards, including the MCLs listed in Table 720-1 of the MTCA.

502-8 See response to comment 502-6 regarding Ecology's role in this *TC & WM EIS*.

502-9 Chapter 7, Section 7.1, of this *TC & WM EIS* discusses mitigation measures that could be used to avoid or reduce potential impacts on all resource areas. Many of the mitigation measures discussed would apply across all alternatives because of the similar nature of some of the activities analyzed in this EIS (e.g., construction of facilities). However, the resource subsections of Section 7.1 do acknowledge specific alternatives where only certain mitigation measures would apply or where additional mitigation consideration may be warranted for a specific alternative. Washington State RCRA/Hazardous Waste Management Act permit decisions will be undertaken to ensure that the necessary environmental investigations, evaluations, and mitigation measures are implemented. The

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

Topical Comments

Inventories

1. There may be differential removal of radionuclides during sluicing. Sluicing preferentially removed soluble forms (3H, Tc, Cs), but leaves less soluble radionuclides (Pu, U) in the tank heel. **502-17**
2. CTUIR is not sure that the chemical inventories are adequate? For example, does the US Ecology inventory show 95% of the U on site? No; the US Ecology inventory is 0 which gives another reason why risks could actually be much higher than presented. **502-18**
3. The CTUIR does not think that uncertainty is adequately discussed. Similarly, a good sensitivity analysis is needed, and that may not be adequate either. **502-19**
4. The EIS contains some very good information, such as discussion of what inventories are not known.
5. A discussion of which radionuclides and chemicals are and are not included, and why, is needed. What is the definition of "risk driver"? **502-20**
6. There are many 'what ifs' that may not be adequately discussed. What if waste must remain at the CSB indefinitely? What if the spent fuel at the ENW has to remain there for an extended time? What if landfills are closed and buildings demolished without full characterization (as is currently planned)? Much uncertainty exists regarding what is in tanks, how much is in tanks, and what form it is in. **502-21**
7. The inventories at the various landfills, for the cumulative analysis, need further discussion as we were unable to locate all the information we were looking for in the relatively short review window. **502-22**

Waste Treatment

1. DOE has said for years that bulk vitrification is not a proven technology (page S-37) and will not be considered. Why is it being evaluated? **502-23**
2. Steam reforming consists of diluting waste with water, converting water to steam, and as a by-product, getting radioactive waste as minerals again that have to be disposed of. Unless the waste is in a form that is as stable as glass, then it can enter the environment over time. So this seems like a waste of energy and time. (Page S-37) **502-24**
3. What is the longevity of "cast stone"? It is still cement. Is it different from grout? Page S-37. **502-25**
4. It appears that removal of Technetium-99 is necessary, yet apparently this has not been decided yet because the alternatives treat it as an open question. The CTUIR was under the impression that Tc removal was clearly recognized as required and that the Vit Plant is designed to do so. Why isn't TC-99 removal considered under any of the other alternatives except 2B and 3B? Could Alternative 6B include it? **502-26**

Modeling Method

1. A central tendency or best guess set of parameters, run multiple times, only provides information about the variability caused by different combinations of single unvarying parameters. Apparently there is no variation in the individual parameters themselves (such as using a range of infiltration rates). This means that a true upper bound and true amount of uncertainty is impossible to determine. **502-27**

permitting process will consider the measures provided in this *TC & WM EIS* and may include other measures that the State of Washington determines are necessary for protection of human health and the environment. Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

502-10 See response to comment 502-6 regarding Ecology's role in this *TC & WM EIS*. Also, see Chapter 7, Section 7.1, on the permit process and how decisions through this EIS will follow that process.

502-11 DOE disagrees with the commentor's premise that the model is not calibrated, that the document is based on a single set of deterministic model parameters, or that the tritium model run is the sole basis for the calibration. Appendices L, N, and O of the *Draft TC & WM EIS* include discussions of the calibration of the groundwater flow model (more than 10,000 parameter sets were evaluated), the calibration of the vadose zone flow and transport model (more than 8,000 parameter sets were evaluated), and the calibration of the groundwater transport model (more than 200 parameter sets were evaluated). In evaluation of these parameter sets, comparisons between model results and field data were made for the site as a whole (water table elevations), individual source areas (BY Cribs, TY Cribs, and the 216-B-26 Crib), and groups of sources that combine to create region-scale plumes (the REDOX and PUREX plumes). As stated in the Summary; Chapters 2 and 5; and Appendices O, Q, and U, DOE's view is that differences between the alternatives that are greater than a factor of 10 (one order of magnitude) are significant discriminators with respect to uncertainties within the modeling chain.

502-12 Regarding the exposure parameters used in the American Indian scenarios, the intent of those scenarios was to collectively reflect American Indian lifestyles for the purpose of comparison. Both the activities and parameters used in those scenarios are based on existing reports and compilations. It was never the intent to analyze all possible American Indian scenarios. However, exposure data provided by the tribes are used in Appendix W, Section W.3, to estimate peak impacts on a CTUIR hunter-gatherer (and on a Yakama hunter-gatherer) for a representative alternative combination, Alternative Combination 2. Those analyses suggest that the exposure pathways and parameters used for the EIS

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

2. A side-by-side comparison of actual plumes from the annual groundwater report and EIS-modeled plumes should be included for calibration. The calibration doesn't appear to be that good. This needs a broader discussion. *"The best overall fit with the groundwater monitoring data was based on tritium concentrations values reported at the Core Zone and Columbia River. As a result of these calibration tests, the values from Runs P10 and R10 were selected as the best fit parameter set."* (Page O-8) How did the other plumes fit their calibration tests? Why did they not fit as well as the Tritium plume? **502-28**
3. "The sitewide natural recharge rate should be 3.5 millimeters (0.14 inches) per year". (Page L-3). Can localized recharge be more? The model does not account for localized impacts. Further, infiltration occurs in pulses, not in a smooth annual average. **502-29**
4. "*The lowest top of the basalt elevation in Gable Gap (i.e., the "cutoff" elevation) determines the water level at which flow through the gap is possible."* (Page L-9) *"The results of the groundwater transport analysis presented in this appendix were calculated using the Base Case flow field. The results from the Alternate Case flow field were compared to those from the Base Case flow field as part of a sensitivity analysis for both the operational and postoperational time periods. The data from these sensitivity analyses are presented in Section O.6."* (Page O-4). **502-30**
   - The Alternative Case may be more representative, but both cases show substantial northwest flow.
   - Along with localized recharge rate, the TOB is such a critical factor that a broader discussion with the Hanford communities is needed.
5. "*the basalt layer beneath the unconfined aquifer is assumed to be a no-flow boundary, i.e., no water enters the unconfined aquifer from the underlying basalt*." (Page L-11). **502-31**
   - This is not a good assumption. Basalts will typically be flow boundaries. The rates may not be as high as the Hanford formation; but for the area of the entire Hanford site, the amount flowing from the basalt aquifer can be significant. This has been seen in areas such as Gable Mountain Pond where the ground water chemistry shows discharge from the basalt aquifer. Several authors have also theorized a "window" in the basalt where parts of the Elephant Mountain formation is missing and the lower basalt interbed is in direct contact with the younger Ringold formation. The only basalt cells that they allowed to be "active" or to allow flow through are a few cells in Gable Gap (Page L-13). These were allowed to be active to prevent model instability. (Page L-26).
6. For calibration, "no more than one observation well could be assigned to any given MODFLOW cell." (Page L-28). This equates to roughly 270 wells used for calibration. Other well data sets were used as independent calibrations. For a 200x200 meter size cell, this seems to be small. "*The RMS error (calculated versus observed) should be less than 5 meters (16.4 feet), approximately 10 percent of the gradient in the water table elevation*." (Page L-29). How does this large difference relate to areas such as Gable Gap with a relatively flat ground water table? The sensitivity of the model to this was shown later in the EIS document on page L-37 "*The flow model requires a highly conductive zone of Hanford gravel across the center of the model through the Gable Gap area to satisfy the extremely flat water table conditions measured across this region over a large variation in operational recharge."* **502-32**
7. *"…each particle-tracking simulation must be preceded by a vadose zone simulation. An interface was developed to transfer the contaminant flux from the STOMP simulations to* **502-33**

hunter-gatherer is sufficiently representative for use in the EIS alternatives analyses.

502-13 To address the commentor's remarks regarding clarity of presentation in the *Draft TC & WM EIS*, particularly with respect to closure and end states of the cumulative impacts sources, DOE has added an analysis of the impact of mitigation measures that would reduce the flux to the aquifer. This analysis can be found in Chapter 7, Section 7.5, of this *Final TC & WM EIS*. As part of the closure and permitting processes, additional subregional-scale site characterization data would be developed to support smaller-scale, more-detailed modeling assessments.

502-14 Chapter 2, Section 2.11, of this *TC & WM EIS* summarizes and compares the relative consolidated costs of continued operation of existing facilities; construction, operation, and deactivation of new or modified facilities; and associated activities in support of the proposed actions, including administrative controls, institutional controls, and postclosure care. Cost estimates associated with natural resource damage liability are considered beyond the scope of this EIS. Decisions made by DOE on the proposed actions will be based on a number of factors, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. The decisions on the selected course of action and supporting rationale will be documented in a ROD issued no sooner than 30 days after the EPA Notice of Availability for this *Final TC & WM EIS* is published in the *Federal Register*.

502-15 See response to comment 502-14 regarding factors influencing future DOE decisions.

502-16 As clarified in Chapter 1, Section 1.10, of this *TC & WM EIS*, the U.S. Bureau of Reclamation issued its *Final Planning Report/Environmental Impact Statement, Yakima River Basin Water Storage Feasibility Study, Yakima Project, Washington* (BOR 2008) in December 2008, with Ecology as a cooperating agency. The Bureau identified the No Action Alternative, which includes activities currently planned or under construction, as the Preferred Alternative. The Bureau informed Ecology that a formal ROD is not required and will not be prepared.

DOE retained Appendix V of the *Draft TC & WM EIS* in this final EIS to provide an analysis of scenarios that could potentially result in an increase in groundwater elevation at Hanford and increased Columbia River elevation at Hanford (model recharge sensitivity analyses). There is no evidence that would support

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

the particle-tracking model." (Page O-5). If the particle tracking from the vadose zone is not representative, as discussed above, then the particles calculated as going into the ground water would not be truly representative. **502-33 cont'd**

8. *"Dispersivity is a measure of the degree of spreading of a contaminant plume. In the standard implementation of the particle-tracking method, the dispersivity is a constant and does not depend on distance from the source (scale). This TC & WM EIS uses a regional-scale model, which was considered important to describe the scale dependence of dispersivity…. At distances greater than this threshold, the dispersivity remains constant at its maximum value."* (Page O-6). Would this be a good representative approach in light of preferential flow pathways and differences in hydraulic conductivity? Under fast flow conditions, a contaminate plume may remain more concentrated before it has time to disperse. **502-34**
9. Table M-3 (Page M-15). Are the leak loss estimates accurate? Too low? Is DOE using biased estimates? In addition, what about leak estimates from the removal of the ancillary equipment such as the pipelines? All the retrieval leaks are estimated to occur in only one year – 2018. When would they actually be retrieving these tanks? How does the retrieval method and estimation account for HLW that is entrained BETWEEN the metal tank liner and the concrete bottom and sides of the tanks? **502-35**
10. Page N-90 and N-91 discuss very long travel times of 4,270 years for locations with recharge rates of 0.9 millimeters per year. This rate was only calculated for the undisturbed IDF-East site in a portion of the 200-East Area. This is significantly less than the background conditions calculated over the balance of the 200-East and 200-West Areas of 3.5 millimeters per year and much less than for disturbed areas. This long travel time is much longer than the lifespan of any caps placed over the sites. If these caps break down, then the travel times would also be significantly affected as the infiltration rates would be affected. **502-36**
11. Why doesn't the IDF barrier, after its post-design life period of time, have an infiltration rate equal to that of pre-Hanford background levels and the post-design life of the sitewide barrier? (Table M-2, page M-14). Their models show that the IDF barrier will never degrade? **502-37**
12. Since past leaks at a tank farm, range from 4 cubic meters (1,057 gallons) to 400 cubic meters (105,700 gallons) (page N-91) their modeled recharge conditions has an increase from 3.5 millimeters per year to 100 millimeters per year for a period of 1 year. This increases the recharge to an immediate area to 10,570 gallons per year. First of all, this amount seems low compared to the amount that has potentially be leaked in the past. In addition, this amount is spread out through an entire year's period. This is unrealistic and doesn't represent a true pulse of water. **502-38**
13. Why was a test of the influence of a silt layer use an infiltration rate of 50 millimeters per year rather than the 100 millimeters per year used previously? (Page N-92). Is DOE assuming the silt will only allow for half the amount of infiltration? This isn't explained. **502-39**
14. When DOE looked at the influence of tilt angle on the migration of contaminants, the area of discharge was only 5 meter by 5 meter in size. This seems small. (page N-92). Also, the interface that is tilted is between an upper layer of Hanford Gravel and an underlying Hanford Sand. Their results did not show much horizontal migration. What would be the effects if the tilted layer was a composed of a finer silt layer? **502-40**

CTUIR comments on the TC&WM EIS 7

a significant change in the Columbia River location or elevation in the last 10,000 years. Further, there are no reasonably foreseeable changes in the position and/or elevation of the Columbia River (manmade or geologic) in the next 10,000 years. As such, this EIS cannot evaluate these highly uncertain potential river position impacts (or biases) on the NEPA alternatives.

502-17 With regard to the disproportionate amount of radioactivity in the residues at the bottom of the tanks, DOE currently does not have a technical basis for making more-specific assumptions about the expected compositions of the waste "heels" that would remain in the tanks after retrieval. Retrieval has been completed for only a small number of SSTs, and not much is known about the behavior of, or ability to remove, small volumes of residual waste. However, the tank closure process, which includes detailed examinations of the tanks and residual waste, requires preparation of detailed performance assessments and a closure plan. These documents will provide the information and analysis necessary for DOE and the regulators to make specific decisions on what levels of residual tank waste are acceptable in terms of short- and long-term risks.

502-18 DOE conducted a detailed review of available inventory data and believes the inventory estimates analyzed in this EIS represent the best-available data at the time of its publication. None of the reviewed documents included a total uranium inventory estimate for this disposal site. However, DOE again reviewed the data and revised US Ecology inventory to include a calculated total uranium inventory. This inventory was included in this final EIS and analyzed appropriately.

502-19 DOE disagrees with the assertion that uncertainty and sensitivity are not adequately addressed in this *TC & WM EIS*. DOE's view is that NEPA requires a comparison of the impacts of the various alternatives in the context of the cumulative impacts; that the comparison be technically sound and traceable to reliable sources of data; and that important sources of uncertainty in the analyses be identified and their potential implications for decisions and alternatives impacts discussed. In light of technical review and other comments, DOE is of the view that the discussion of the nature and role of uncertainty in the groundwater modeling can be expanded and clarified, and has revised this *Final TC & WM EIS* accordingly.

502-20 The screening process that DOE used in this EIS to select the set of COPCs is described in Appendix Q, Section Q.2. The results of this screening provided the COPCs (radionuclides and chemicals) that were used in the analysis of the tank

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

15. This discussion on page N-94 shows that dikes have a strong influence on plume migration to the ground water. This need to be incorporated in the models since they are so prevalent across Hanford. **502-41**

Modeling results – groundwater

1. A side-by-side comparison of the EIS and from the DOE 2005 Annual Ground Water Monitoring Report shows that the tritium plumes don't appear to match. Is this the best fit? At least for the Iodine and Nitrate, the DOE model does not appear to match the actual plumes. **502-42**
2. Both the base case and the alternative case clearly show that contamination from the 200 E area moves to the southeast, while contamination from the 200 W area moves to the northwest. Although this confirms our worst fears, it is refreshing to finally have a sitewide official groundwater model that we can rely on and cite. **502-43**
3. Does the Uranium analysis presented in section O.6.4 account for the rapid movement of Uranium currently seen coming from the B-BX-BY tank farms? **502-44**

Secondary waste

1. Secondary waste must be immobilized.
2. The CTUIR believe that secondary waste is a very important aspect that needs much more review and discussion. **502-45**

Retrieval

1. 99.9% retrieval is the only option that results in compliance, even if the regulatory requirement is only 99% **502-46**
2. DOE must consider Tc for both vitrification and containerization. **502-47**
3. The soil under every tank needs to be characterized, either to confirm no leaks, or to estimate what has leaked. **502-48**

Waste Importation

1. Off-site importation results in a significant impact if the waste is not immobilized. Page S-100 shows that acceptance of off-site waste that contains radionuclides like iodine-129 and technetium-99 could have an adverse and major impact on the environment. **502-49**
2. The ROD that allows waste importation must be rescinded since this analysis shows that risks are unacceptable if waste is imported. **502-50**
   a. There is no alternative which does not add off-site waste. This needs to be corrected when the real alternatives are developed. **502-51**
   b. Alternatives for mitigation conditions that will achieve standards are needed since the only way to meet health and environmental protection standards. If DOE imports waste and does not immobilize it, other areas must be made cleaner in order to keep the long-term risks within acceptable limits, or other waste must be removed from Hanford Site to a geological site. **502-52**
3. Reasonable alternatives which USDOE did not examine in the TCWMEIS include:
   a. disposal options at regulated disposal facilities for the 3 million cubic feet of off-site waste which USDOE proposes to dispose at Hanford, where the addition of these wastes will not be projected to result in groundwater contamination in excess of standards; **502-53**

waste and the cumulative impacts. "Risk driver" was not defined in the draft EIS, but has been added to Chapter 9, "Glossary," in this final EIS.

502-21 Although the comment is not clear, DOE believes the commentor is referring to uncertainty of HLW being stored at Canister Storage Building-type facilities. This EIS evaluates the necessary storage capacity needed to store all the HLW canisters for each of the alternatives for up to 145 years.

502-22 The estimated inventories (radionuclide and chemical) for the burial grounds can be found in Appendix S, Tables S-35a through S–86b.

502-23 DOE has conducted a number of supplemental technology reviews and technology selection processes, as discussed in Appendix E, Section E.1.2.3.5.1. As discussed in this section, in April 2002, DOE evaluated over 50 potential supplemental technology options. From this list, the Hanford Cleanup Challenge and Constraints Team Mission Acceleration Initiative working subgroup performed the final evaluation to select appropriate technologies for further development. The six goals of this working subgroup are included in Section E.1.2.3.5.1, along with the conclusion that bulk vitrification, cast stone, and steam reforming should be further evaluated.

502-24 As discussed in Appendix E, Section E.1.2.3.8.5, bench-scale and recent pilot-scale testing leading to full-scale implementation of steam reforming to treat sodium-bearing tank waste at INL have continued to produce favorable results. However, the remaining technology development needs for steam reforming include engineering-scale tests using actual Hanford tank waste and continued assessment of waste product performance.

502-25 The long-term performance of the cast stone waste form is discussed in Appendix E, Section E.1.2.3.7.5, Waste Form Performance. Retention of waste constituents within the cast stone waste is enhanced by adding fly ash and slag to the grout formulation. The rate of release of hazardous constituents depends strongly on the nature of the waste form used to immobilize the constituents. The nature of the waste forms, analysis of long-term performance assessment, and the methods used to estimate the release rates and values of parameters characterizing release rates from cast stone are presented in Appendix M. A description of the grout mixture assumed in the EIS analysis is presented in Appendix E, Section E.1.2.3.7.2.

502-26 As discussed in Appendix E, Section E.1.2.3.1.1, the Pretreatment Facility (of the WTP) was originally designed to remove technetium-99. Based on reviews of technetium-99 in ILAW glass, DOE and Ecology agreed in 2008 to eliminate

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

b. exhuming and disposing offsite from Hanford significant quantities of long-lived radioactive wastes (e.g., pre-1970 buried TRU, for which exhumation and offsite disposal in a geologic repository is needed; and,
c. an alternative under which all tank wastes are vitrified in a reasonable time period and tank farms are cleaned up with characterization and removal of wastes to the extent practicable based on risk analyses. **502-53 cont'd**

Closure with capping

1. The EIS shows that tank leaks cause unacceptable risks, and also that capping does not work. Therefore, there is no doubt that more contamination in soil needs to be removed. **502-54**
2. Appendix R relies on the Fluor document that presumed capping, as did the CP Strategy. This is contrary to the CTUIR Policy, HAB advice, and various public statements from the Tri-Parties. **502-55**
3. The clean closure assumptions are not clear. Does it mean that only a few feet of soil (from the ground surface or below the tank) will be excavated, or that excavation to groundwater will occur (as stated repeatedly by Mary Beth Burandt in presentations)? **502-56**
4. DOE has repeatedly stated that clean closure includes excavation all the way to groundwater. Since a careful 2-volume cost evaluation was prepared, we take this as indication that full excavation is not only possible, but it is cost-effective. Since DOE has now demonstrated that contamination can be completely removed and the tanks clean-closed, there is no reason to settle for anything less. Regardless whether the tanks themselves are HLW or something else, DOE has now demonstrated that clean closure is possible and within the central range of costs. **502-57**
5. The results prove that caps do not work in the long run. The CTUIR agrees.
6. The results prove that TRU must be excavated. The CTUIR agrees.
7. Filling the tanks with gravel would not prevent water intrusion and possible mobilization of contaminants from residue. Likewise, filling the tanks with grout will not prevent mobilization of residual tank waste. The waste will not evenly mix with the grout. Instead, it will be in more concentrated zones at the bottom of the tank. When water leaks in the tank, it will travel along the edges of the tank and flow down to the bottom to pool around this waste and eventually out to the ground. **502-58**
8. Does DOE assume an equal mixing of grout and residuals in tanks and ancillary equipment under Alternatives 2B, 3A, 3B, 3C, 4, 5, and 6C? (Page M-16). Even though DOE states that the inventory is assumed to reside in the bottom meter of the tank (Page M-16), it is likely that the remaining waste that is grouted will not mix evenly within the tanks when grout is added. Any waste that is between the liner and the concrete tank will not be able to mix with the added grout. **502-59**
9. CTUIR disagrees disagree with the statement on page S-96 that states "*clean closure would provide little, if any, reduction in long-term impacts to the groundwater before the calendar year 6000, due to the early release from past leaks and cribs and trenches contiguous to the SST farms.*" If DOE removes the contaminated soil via excavation, then long-term benefits would be observed immediately. **502-60**

technetium removal from the WTP permit. Construction of the Pretreatment Facility to date has eliminated the capability to remove technetium from the LAW stream. This *TC & WM EIS*, however, assumed for analysis purposes that technetium-99 removal could be completed in the existing Pretreatment Facility; however, design and construction modifications would be necessary to add technetium removal capability, if required. To facilitate evaluation of the relative efficiency of retention of this radionuclide in the LAW forms, separation of technetium-99 from the 200-East Area liquid stream and immobilization into IHLW glass was considered under Tank Closure Alternatives 2B and 3B. Analysis of technetium-99 removal for these two alternatives was sufficient to discern long-term waste-form performance on site and show the impact of the decision to eliminate the technetium-99 capability from pretreatment. Therefore, DOE determined it was not necessary to evaluate this pretreatment capability as a part of every alternative, including Tank Closure Alternative 6B. Based on the analyses of Tank Closure Alternatives 2B and 3B in this EIS, DOE could reach a decision concerning technetium-99 removal that would be documented and explained in a ROD for this final EIS.

502-27 DOE assumes the comment is referring to the Monte Carlo optimization and uncertainty analysis in Appendix L, Section L.9, of the *Draft TC & WM EIS*. The Monte Carlo analysis evaluated the sensitivity of the model to changes in hydraulic conductivity values for the 13 different material zones within the model. This resulted in over 6,000 Base Case model runs, with each model run having a different set (within a reasonable range) of hydraulic conductivity values for each of the 13 material zones. This approach is similar to the example, "such as using a range of infiltration rates," given in the comment of an acceptable approach to analyzing uncertainty. Please see Section L.9, specifically Section L.9.1, of the draft EIS for additional details regarding the method used to analyze uncertainty in the flow model.

502-28 As discussed in Appendix L of the *Draft TC & WM EIS*, the primary calibration of the flow model was accomplished by matching model results to observed heads. Appendix L, Section L.9, discusses the hydraulic conductivity distributions and their influences on calculated heads. This method of calibration is preferred because of the long record of observed heads during the operational period. Following calculation of the calibrated flow field, the calculation in Appendix O referenced by the commentor was made to vary transport parameters. This was done to obtain the most appropriate values for representing the regional-scale behavior of the aquifer to facilitate comparison

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

Landfills

1. Under WA state law, new landfills must have no impact on groundwater at all. This means treating everything before new disposal. The long half-lives of imported waste would be so long that only vitrification would be acceptable.
2. CTUIR does not support landfill closure, even of tanks that are non-leakers.
3. Even ERDF would release hazardous substances if (when) leachate collection stops. **502-61**
4. The new IDF with grouting would not meet the requirement for no impact. So why is Ecology agreeing with the EIS? **502-62**

Human Risk Scenarios and methods

1. Methods are opaque; this section was clearly not written by a risk assessor, because the information that a risk assessor needs to review is largely absent.
2. It seems strange that the clean closure (alt. 6B, Base Case) appears to show a greater radiological risk than only a partial clean closure risk (alt. 4) Page S-101.
3. It is unfathomable why DOE totally ignored the CTUIR exposure scenario after years of consultation and promises made by DOE. Instead, DOE made up its own scenario, and as a consequence get every single exposure factor wrong. The "scenario" that DOE labeled Native American is little more than part of a scenario for a Richland gardener with a sauna. We asked on several occasions to meet with the SAIC risk assessor to make sure this did not happen, but DOE refused. As far as we can tell, the Native American risks are at least 10-fold higher than stated. **502-63**

Human Risk results

1. As CTUIR has stated on many occasions, DOE's concept of how to treat reasonably foreseeable land use is problematic, particularly if DOE intends to maintain site land use controls for 10,000 years. **502-64**
2. The Core Zone boundary and the river are not the only locations where risks need ot be presented. Given the underlying analysis, it should be possible to show risk isopleths across the site (as the TWRS EIS did). **502-65**
3. Short-term risks cannot be compared to long-term risks. **502-66**
4. 1E-4 is the maximum allowed under CERCLA, and 1E-5 is the maximum excess lifetime cancer risk allowed under MTCA. This is equivalent to 15 mrem. Yet DOE assumes that 100 mrem is acceptable. This is incorrect – it is the offsite public dose limit for operating facilities. For closed facillities it is 25 mrem/yr (NRC) or 15 mrem/yr (CERCLA). **502-67**
5. It is unclear whether the dose to risk conversion factor includes fatal and non-fatal cancer and heritable mutations? **502-68**
6. DOE lists the benchmark standard for Chromium (Cr) as 100 micrograms per liter. This may be the drinking water standard, however the aquatic standard is more strict at 10 micrograms per liter. The benchmarks that should be adopted would be the stricter and more protective ones. **502-69**

Ecological risk methods and Ecological risk results

Not evaluated; no determination as to quality, consequences, or uncertainty.

of the alternatives. The tritium plume was selected for this calculation because of its regional scale and relatively well-characterized sources. In Appendix U, the calculated plumes are compared with observed plumes on a regional scale to help understand uncertainties on the overall modeling system and their influence on the comparison of the alternatives. Appendix U concludes that, with the exception of uranium-238, total uranium, and carbon tetrachloride, the modeling system is capable of reproducing observed plume shapes and concentration to within an order of magnitude. This was the design objective for the modeling system, and provides the reader with a sense of the degree of discrimination that should be considered significant when comparing the alternatives.

502-29 Due to the 10,000-year analysis period of the *Draft TC & WM EIS*, the temporal resolution of data detail encoded into the model is annualized. This simplifies the model from an encoding and numerical analysis perspective, but also limits the model's ability to simulate infiltration events, which occur more frequently than is reflected by the smooth annual averages encoded into the model. This model simplification, although it smoothes out the annual recharge pulses that actually occur in any given year, reasonably represents the overall recharge impacts of the sum of the estimated pulse events minus the sum of the estimated evapotranspiration that is estimated to occur annually across the model domain. As additional information, *TC & WM EIS* guidance for use of the sitewide natural recharge rate of 3.5 millimeters per year is provided in the *Technical Guidance Document* (DOE 2005), dated March 25, 2005. The *Technical Guidance Document* was developed and agreed upon by DOE and Ecology.

502-30 In an effort to incorporate the opinions and ideas available from developers and users of groundwater models for Hanford, the *TC & WM EIS* groundwater model development process included periodic meetings with Hanford's Local Users' Group. The top-of-basalt surface, recharge rates, and numerous other modeling parameters and assumptions were communicated to the Local Users' Group; comments from the group were collected and addressed; and the model development process was updated based on the comments received. A summary of this interactive process is included in the November 2007 document, *MODFLOW Flow-Field Development: Technical Review Group Process and Results Report*, available on the Hanford Site website at http://www.hanford.gov/files.cfm/Modflow%20Report.pdf.

502-31 A simplifying assumption was made that there is no hydraulic connectivity between the unconfined aquifer and any existing confined aquifers. It is likely that some interaction between unconfined and confined aquifers exists. However,

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

Air Quality

Not evaluated; no determination as to quality, consequences, or uncertainty.

Cumulative risks and impacts

1. The cumulative impacts of DOE's preferred alternative show that groundwater will remain so contaminated for over 10,000 years, that it would be lethal to use for more than a short time. Since DOE assumed that current closure plans would be carried out, the CTUIR interprets the cumulative impacts to reflect DOE's current best guess at sitewide risks posed by the current set of planned and proposed sitewide closure configurations. **502-70**

Short-term and Long-term impacts

1. Long-term impacts are inadequately described
2. It is improper to compare short-term worker risks with long-term impacts. Workers will not be excessively exposed – it would be illegal to do so. DOE has used short-term doses to bias the results toward capping.
3. Institutional controls fail quickly. DOE contradicts itself about perpetual federal control. This is a high-risk assumption. DOE must choose UU/UE remedial alternatives. **502-71**

Environmental Justice

1. While the EJ analysis follows conventional methodology, it is completely irrelevant for Native Americans. The CTUIR requests that DOE work with the DOSE to prepare a more useful analysis. CTUIR's draft language is included in Attachment 2. **502-72**
2. Common sense says that Tribes have a closer relationship to the natural resources, and that Tribes bear a higher risk burden, and therefore they obviously have a disproportionately high share of the impacts and consequences. **502-73**
3. It is odd that visual resources are titled Native American interests. Visual resources belong to everyone, but the general public and the Tribes may place different value on different aspects of visual resources. Similarly, Native Americans have many more interests than simply visual resources. **502-74**

NRDA

1. NRDA liability is not considered and NRD costs are not discussed. Some of the impacts (acreage) are presented, but this is an area that needs more discussion. **502-75**
2. DOE should not use I&I language instead of remediation even for borrow areas. **502-76**
3. The intent of separating 'unavoidable' from 'irreversible' impacts is not clear. Does DOE intend them to have different treatment under NRDA? **502-77**

the availability of data that describe the locations, sizes, and water flux amounts between the aquifers is not sufficient to encode these features into the model. This simplifying assumption should not bias the EIS analysis, and is, therefore, believed to be reasonable in light of the uncertainty related to this feature.

502-32 There is a high frequency of observation wells in areas where waste sites are located due to site interests over time. This frequency provides a high number of available observations in some areas and fewer to zero observations in other areas. To mitigate the model calibration statistics being biased toward particular regions of the model where greater numbers of observations have been taken over time, the decision was made to constrain the assignment of observation wells so that only one observation well could be assigned to any model cell location. This procedural approach to observation well assignments limited the number of wells that could be assigned in the model. Appendix L, Figures L–33 and L–34, provide the *Final TC & WM EIS* base case model's calibration statistics for the 200-East and 200-West Areas, respectively. One of the primary calibration statistics calculated in these figures, the root mean square error, ranges between 1.572 meters (5.158 feet) in the 200-East Area and 2.22 meters (7.284 feet) in the 200-West Area. This is an indication that the model's head predictions more closely match field observations in areas where the gradient of the water table is less steep.

502-33 This comment is predicated on the assumptions that STOMP is a particle tracking-like analysis, and that needing an interface between STOMP (vadose zone analysis) and particle tracking (groundwater analysis) indicates that there is a problem with the STOMP analysis results. These assumptions are inaccurate. The purpose of the STOMP-to-particle-tracking interface is to translate the STOMP model output into an efficient format that is useable as input by the particle tracking model. Using this type of interface code is not uncommon when off-the-shelf separate models (in this case, STOMP and particle tracking) are used together and there is a desire to make the interface more efficient. This interface does not change the behavior of either the STOMP or the particle tracking models. Thus, the need for this interface does not indicate a problem with either of the models.

502-34 DOE agrees that the representation of dispersion in heterogeneous systems is important to predicting outcomes. DOE also agrees with the well-established hydrologic concept that dispersion in heterogeneous groundwater systems contains two components. The first is macrodispersivity, which represents heterogeneity on a scale larger than the finest material zonation that can be

ATTACHMENT 2 – Environmental Justice

A Method for Tribal Environmental Justice Analysis under NEPA

Barbara Harper[1] and Stuart Harris[2]

1) Manager, Environmental Health Program, Department of Science and Engineering, Confederated Tribes of the Umatilla Indian Reservation, P.O. Box 638, Pendleton, OR 97801. bharper@amerion.com; 541-966-2400
2) Director, Department of Science and Engineering, same as above. Stuartharris@ctuir.com.

ABSTRACT

The goal of environmental justice (EJ) is for all peoples to receive or achieve the same degree of protection from environmental and health hazards. However, methods for EJ analysis under NEPA have never been suitable for Native American tribes, particularly in the western US. The Confederated Tribes of the Umatilla Indian Reservation have developed a method for evaluating and quantifying disproportionate impacts under NEPA. Because many traditional tribal communities are inseparable from their environment, we recommend identifying whose resources are affected as the first step, rather than simply counting the numbers people in various ethnic groups within a predefined zone of analysis. The second step is to describe the eco-traditional system that pertains to the tribe and its resource interests. The features, attributes, goods, and services provided by the baseline conditions of the ethno-habitat and its resources are described, and quantifiable measures to evaluate interruptions in service flow and risks to traditional lifeways over multiple generations are applied. A subsistence exposure scenario and risk assessment based on traditional lifeways is included in this step. Finally, we look at cumulative impacts to the eco-traditional system and to the subsistence economic systems that are crucial for tribal health and well-being. To evaluate cumulative disproportionality or risk disparities for the entire tribe, we evaluate what proportion of the community is affected and the pre-existing co-risk factors that make the community more vulnerable, and compare the results to other population segments or communities.

encoded (i.e., heterogeneities on the scale of several MODFLOW cells or larger). This component of dispersivity is addressed through the encoding of different material properties into the model, with the geologic boring records as the basis. This is the scale on which the preferential pathways (e.g., the highly conductive Hanford formation) are included in the flow model. The second component of dispersion, hydrodynamic dispersion, represents processes operating on a finer scale (i.e., scales smaller than a MODFLOW cell). This component of dispersion is introduced into the model through the concept of the dispersion coefficient. The behavior of a particle in a preferential pathway is governed mostly by advection, with the particle path tending to follow the flow field, which tends to be aligned with the preferential pathway. The relatively smaller (hydrodynamic dispersion) jumps are not as important, and the evolution of the plume is dominated by the presence and shape and connectivity of the heterogeneities. The behavior of a particle inside a relatively homogeneous portion of the flow field is influenced more strongly by the hydrodynamic dispersivity.

502-35 DOE conducted a detailed review of the tank past leaks inventory evaluated in the draft EIS and determined that the inventory for a number of unplanned releases needed to be revised. This inventory is relatively minor, but the inventory estimates in Appendix D and the groundwater human health dose and risk analysis in Appendix Q were updated for this *Final TC & WM EIS*. However, as noted by the commentor and discussed in Appendix D of the draft EIS, due to lack of supporting data, there is uncertainty regarding the volume of tank waste leaked. To provide additional insight, DOE performed a sensitivity analysis to evaluate the potential impacts if certain remediation activities were conducted at some of the more prominent waste sites on the Central Plateau and along the river corridor. The goal of the sensitivity analysis is to help DOE, EPA, and Ecology prioritize cleanup efforts in the future. This analysis is provided in Appendix U of this EIS and is discussed further in Chapter 7, Section 7.5.

Appendix D, Section D.1.2, Tank Ancillary Equipment Waste, provides a discussion of the estimated inventories of waste that could remain in the tank ancillary equipment, including waste transfer piping. DOE conservatively assumed that all of the tank retrieval leaks occurred in a single year, 2018. Assuming a release earlier than the time when waste retrieval is currently scheduled supports a bounding analysis of the impacts of retrieval losses. Finally, the inventory of tank waste that may have leaked from the tanks and would be contained below the steel tank liner is included in the volumes of past leak waste shown in Tables D–26 and D–27, as well as Appendix M, Table M–4.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

A. INTRODUCTION

Environmental Justice has been defined by EPA's Office of Environmental Justice[1] as:

"The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies."

We believe that the goal of this "fair treatment" is not to distribute risks evenly among populations, but to identify potential disproportionately high and adverse impacts in different populations and reduce the inequities. Although inequities can exist in any setting, impacts of federal actions are most often evaluated through an environmental impact statement prepared under the National Environmental Policy Act (NEPA). All federal agencies are encouraged to consider environmental justice in their NEPA analysis, evaluate disproportionate impacts, and identify alternative proposals that may mitigate these impacts. The fundamental policy of NEPA is to "encourage productive and enjoyable harmony between man and his environment," so that the United States may:

(1) fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
(2) assure for all Americans safe, healthful, productive, and aesthetically and traditionally pleasing surroundings;
(3) attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences;
(4) preserve important historic, traditional, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choice;
(5) achieve a balance between population and resource use which will permit high standards of living and a wide sharing of life's amenities; and
(6) enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

In considering how to evaluate progress in reaching these aspirational goals, the Council on Environmental Quality (CEQ) defined effects or impacts to include "ecological...aesthetic, historic, traditional, economic, social or health impacts, whether direct, indirect or cumulative."[2] Recognizing that these types of impacts might disproportionately affect different communities or groups of people, President Clinton issued Executive Order12898 in1994[3], directing each federal agency to, among other things,

[1] http://www.epa.gov/compliance/resources/policies/ej/ej_guidance_nepa_epa0498.pdf
[2] http://ceq.hss.doe.gov/nepa/regs/ej/justice.pdf
[3] President Clinton, WJ: "Federal actions to address environmental justice in minority populations and low-income populations," 59 FR 32: 7629-7633 (Executive Order 12898; February 11, 1994).

Remediation of these waste tank farm past leaks and associated contamination in the vadose zone tank farm past leaks and associated contamination in the vadose zone is being evaluated under the RCRA Facility Investigation/Corrective Measures Study process. As such, the vadose zone contamination associated with tank farm past leaks is considered an RCRA operable unit rather than a CERCLA operable unit and is assessed in this *TC & WM EIS*.

502-36 The value of 0.9 millimeters per year for that site was identified in the *Technical Guidance Document* (DOE 2005), signed by DOE and Ecology. The discussion on the rate of release for an IDF-East barrier (i.e., design life recharge rate of 0.5 millimeters per year, less than the background for this location) is discussed in Appendix N, Section N.3.6, of the *Draft TC & WM EIS*. DOE did an additional analysis of IDF-East performance that involved looking at a range of infiltration rates. This analysis has been added to Appendix N, Section N.5, and is discussed in Chapter 7, Section 7.5.2.9, of this *Final TC & WM EIS*.

502-37 As discussed in Appendix M, Section M.3, the rates of infiltration adopted for use in this EIS are those recommended in the *Technical Guidance Document* (DOE 2005), signed by DOE and Ecology. The infiltration rates in the area of IDF-East are as follows: pre-Hanford background rate, 0.9 millimeters per year; rate for the IDF barrier design life, 0.5 millimeters per year (the modified RCRA Subtitle C barrier is assumed to perform for 500 years; the Hanford barrier, for 1,000 years); and rate for the IDF barrier post–design life, 0.9 millimeters per year.

502-38 The values of 10,570 gallons and 105,700 gallons are within the range of documentation on past leaks, as presented in Appendix M, Table M–4, of this *Final TC & WM EIS*. Due to the period covered in the draft's analysis (10,000 years), the data encoded into the model are annualized. This simplifies the model from an encoding and numerical analysis perspective but also limits the model's ability to simulate infiltration events, which occur more frequently than is reflected by the smooth annual averages encoded into the model. Although this simplification tends to smooth out the recharge pulses that occur in any given year, it reasonably represents the overall recharge impacts calculated as the sum of the estimated annual pulse events minus the estimated annual evapotranspiration across the model domain.

502-39 The sensitivity analysis for the tilt of geologic layers represented a discharge to a small crib; therefore, the appropriate infiltration rate is 50 millimeters per year, as listed in Appendix M, Table M–3. That rate was obtained from the *Technical Guidance Document* (DOE 2005), signed by DOE and Ecology.

- *"Make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations,"*
- *"Identify differential patterns of consumption of natural resources among minority populations and low-income populations,"*
- *Evaluate differential consumption patterns by identifying "populations with differential patterns of subsistence consumption of fish and wildlife," and*
- *"Collect, maintain, and analyze information on the consumption patterns of populations who principally rely on fish and/or wildlife for subsistence."*

The CEQ's Guidance for Environmental Justice under the National Environmental Protection Act[4] recognized that tribes might bear disproportionate burdens (emphasis added):

- Agencies should consider the composition of the affected area, to determine whether minority populations, low-income populations, or Indian tribes are present *in the area* affected by the proposed action, and if so whether there may be disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, or Indian tribes.
- Agencies should consider the potential for multiple or cumulative exposure to human health or environmental hazards in the affected population and historical patterns of *exposure* to environmental hazards; Agencies should consider these multiple, or *cumulative effects*, even if certain effects are not within the control or subject to the discretion of the agency proposing the action.
- Agencies should recognize the *interrelated* traditional, social, occupational, historical, or economic factors that may *amplify* the natural and physical environmental effects of the proposed agency action. These factors should include the physical sensitivity of the community or population to particular impacts; the effect of any disruption on the *community structure* associated with the proposed action; and the nature and degree of impact on the physical and social structure of the community.
- Agencies should be aware of the diverse constituencies within any particular community Agencies should seek tribal representation in the process in a manner that is consistent with the government-to-government relationship between the United States and tribal governments, the federal government's *trust responsibility* to federally-recognized tribes, *and any treaty rights*.

Methods for identifying and evaluating disproportionate environment burdens still lag far behind these goals[5], particularly for Native Americans. We believe this is due to the language in EPA

[4] http://ceq.hss.doe.gov/nepa/regs/ej/justice.pdf
[5] Bowen, W. (2002). An analytical review of environmental justice research: what do we really know? Environ. Management, 29(1):3-15.
Brulle, RJ and Pellow, DN (2006). Environmental Justice: Human Health and Environmental Inequalities. Ann. Rev. Public Health. 27:103-124.
Boone, CG. (2009) Environmental Justice as Process and New Avenues for Research Environmental Justice 1(3):149-154
Northridge, ME, Stover, GN, Joyce E. Rosenthal, JE, and Sherard, D. (2003) Environmental Equity and Health: Understanding Complexity and Moving Forward. Am. J. Pub. Health 93: 209-214.

502-40 The sensitivity analysis referenced by the commentor was designed to look at a high-discharge source, which is the most common type of source at Hanford. An inner release area of 5 meters by 5 meters is typical for the majority of cribs that make up this class of source. As discussed in Appendix N, Section N.5.4, the degree of horizontal migration is determined by the hydraulic contrast between the tilting layers and the discharge of the source. Greater hydraulic contrast tends to lead to greater lateral migration, and higher discharge tends to favor vertical migration. In response to this comment and others, further explanation and description have been provided in Appendix N of this *Final TC & WM EIS*.

502-41 The STOMP model is entirely capable of simulating clastic dikes when adequate characterization data are available to encode them in the model. However, the availability of data on the locations and sizes of clastic dikes at Hanford is limited. Such dikes were included in the STOMP model to the extent that they were represented in the boring logs and other information used to develop the geology. A sensitivity analysis of the effect of a clastic dike was included in Appendix N, Section N.5.5, to allow the reader to assess the impact of any such feature on the outcomes of the analysis. DOE does not believe that clastic dikes have a strong influence on plume migration, as asserted by the commentor.

502-42 The discussion of the agreement between the modeled and measured tritium plumes is in Appendix L of the *Draft TC & WM EIS*. Comparisons involving the locations of peak concentrations and their values between 1980 and 2005, the first arrival of the plume at the Columbia River, and the general shapes and extents of the plumes show agreement to first order. The discussion of the agreement between modeled and measured iodine-129 and nitrate plumes is in Appendix U, and again, the comparisons show agreement to first order. The major areas of disagreement between model results and field measurements are with plumes involving uranium and carbon tetrachloride. The discussion of the sources of the disagreement and the implications for comparison of the alternatives has been revised in this *Final TC & WM EIS* in response to similar comments.

502-43 DOE shares the view that such a model is an important component of a NEPA analysis.

502-44 The SX tank farm was selected as the uranium-238 source for the long-term analysis discussed in Appendix O, Section O.6.4, of the *Draft TC & WM EIS*. This analysis would not apply to uranium-238 flux originating from the B/BX/BY tank farms or other sources if the peak concentration of uranium-238 occurred during the standard analysis period of 10,000 years.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

guidance directing agencies to "collect, maintain and analyze information on the race, national origin, income level, and other readily accessible and appropriate information for areas surrounding facilities or sites expected to have substantial environmental, human health, or economic effect on the surrounding populations," which led to developing guidance and data based solely on spatial analysis of demographic data[6]. Compounding this is the conventional threshold criterion that 20% of a local community must be of a single ethnic group or below a certain income level in order to be recognized as an environmental justice community[7].

Identifying an EJ community by geospatial ethnicity is not the same as identifying a disadvantaged layer coexisting within a community[8]. Distinct populations may live differently and separately, and if federal actions or pollution sources are unevenly spaced, then exposures and impacts may be unequal[9]. Multi-variate analysis may be required to determine whether race plays an explanatory role in risk distribution even after controlling for other economic, land-use, and population factors[10].

Using this combined threshold determination (does a particular ethnic group comprise >20% of the population within a certain distance of the site?), disproportionate impacts to Native Americans are often overlooked. Further, reliance on conventional methods for economic and cumulative analysis as well as lack of consideration of the federal Trust obligations (and Treaties, where they exist) makes most EJ analysis under NEPA almost completely irrelevant to American Indians.

Strife, S. (2009) Childhood Development and Access to Nature: A New Direction for Environmental Inequality. Research Organization & Environment, 22: 99-122.
[6] http://www.epa.gov/compliance/resources/policies/ej/ej_guidance_nepa_epa0498.pdf;
Mohai, P. and Saha, R. (2006) Reassessing Racial and Socioeconomic Disparities in Environmental Justice Research. Demography, 43: 383-399.
[7] Buhrmann, J. (2002). A Framework to Assess Environmental Justice Concerns for Proposed Federal Projects. In: Muntz et al. (eds). Justice and Natural Resources: Concepts, Strategies and Applications. Washington, D.C.: Island Press.
[8] Robert W. Williams (1999). The contested terrain of environmental justice research: community as unit of analysis. Social Sci. J., 36:313-328.
M Taquino, D Parisi, DA Gill (2002). Units of analysis and the environmental justice hypothesis: the case of industrial hog farms. Social Sci. Quarterly, 83:298-316.
[9] Waller LA, Louis TA, Carlin BP. (1999) Environmental Justice and statistical summaries of differences in exposure distributions. J Expo Anal Environ Epidemiol. 9(1): 56-65.
Corburn, J (2002), Environmental Justice, local knowledge, and risk:he discourse of a community-based cumulative exposure assessment. Env. Mgmt. 29:451-466.
Satterfield, TA., Mertz, CK., and Slovic, P. (2004) Discrimination, Vulnerability, and Justice in the Face of Risk. Risk Analysis: 24: 115-129.
Shapiro, MD. (2005). Equity and information:
[10] Morello-Frosch, R., Pastor, M., and Sadd, J (2001). Environmental Justice and Southern California's "Riskscape:" The Distribution of Air Toxics Exposures and Health Risks among Diverse Communities. Urban Affairs Rev. 36: 551-578.

502-45 Both DOE and Ecology believe there is sufficient information regarding secondary waste presented in this *TC & WM EIS* to support future DOE decisions.

502-46 The decision to leave 0.1 percent, 1 percent, or more of the waste in the SSTs is one of the decisions supported by this *TC & WM EIS* (see Section S.1.3.1 of the Summary and Chapter 1, Section 1.4.1). Retrieval has been completed for only a small number of SSTs, and not much is known about the behavior of, or ability to remove, small volumes of residual waste. However, the tank closure process, which includes detailed examinations of the tanks, residual waste, and surrounding waste in the soil, requires preparation of detailed performance assessments and a closure plan. These documents will provide the information and analysis necessary for DOE and the regulators to make specific decisions on what levels of residual tank waste are acceptable in terms of short- and long-term risks.

502-47 Comment noted.

502-48 TPA Milestone M-45-00 requires, as part of the closure process, characterization of every tank farm and the soils surrounding the tank farms, detailed examinations of the tanks, and evaluations of actual tank residual waste following retrieval. Using this information, site-specific radiological performance assessments and a closure plan will be prepared. These documents will provide the information and analysis necessary for DOE and the regulators (i.e., Ecology) to make specific decisions on what levels of residual tank waste are acceptable in terms of short- and long-term risks. Waste Management Area C is the first waste management unit that is currently undergoing this process. The State of Oregon is participating in this process as well.

502-49 The impacts of the offsite waste in terms of radiological risk are presented in the *TC & WM EIS* Summary, Section S.5.5, and Chapter 2, Section 2.10, Key Environmental Findings. This section discusses the differences in the radiological risks between including and excluding offsite waste disposal at IDF-East.

The *TC & WM EIS* analysis shows that receipt of offsite waste streams that contain specific amounts of certain isotopes, specifically, iodine-129 and technetium-99, could cause an adverse impact on the environment. Therefore, one means of mitigating this impact would be for DOE to limit disposal of offsite waste streams at Hanford. Other mitigation measures, such as recycling

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

The Trust relationship between Native Sovereign Nations and the Federal Government

"The Federal Government has enacted numerous statutes and promulgated numerous regulations that establish and define a trust relationship with Indian tribes. The United States continues to work with Indian tribes on a government-to-government basis to address issues concerning Indian tribal self-government, tribal trust resources, and Indian tribal treaty and other rights"[11]. The Supreme Court, in defining the trust responsibility, has held that:

> [The federal government] has charged itself with moral obligations of the highest responsibility and trust. Its conduct, as disclosed in the acts of those who represent it in dealing with the Indians, should therefore be judged by the most exacting fiduciary standards. *Seminole Nation v. United States*, 316 U.S. 286, 296-97 (1941).

Both CERCLA and OPA define "natural resources" broadly to include "land, fish, wildlife, biota, air, water, ground water, drinking water supplies, and other such resources..." Both statutes limit "natural resources" to those resources held in trust for the public. While there are slight variations in their definitions, both CERCLA and OPA state that a "natural resource" is a resource "belonging to, managed by, held in trust by, appertaining to, or otherwise controlled by" the United States, any State, an Indian Tribe, a local government, or a foreign government [CERCLA §101(16); OPA §1001(20)].[12] Thus, for American Indian Tribes the evaluation of disproportionate impacts is more often a question of natural resource use rather than demographics.

B. Framework for EJ Analysis

A framework for Tribal EJ analysis is presented here, including natural resource usage patterns, tribal health risk assessment that considers traditional uses of natural resources, and cumulative analysis that considers preexisting stressors that may cluster in tribal communities. [13]

---

[11] Executive Order 13175, 65 Fed. Reg. 67249 (November 6, 2000); Presidential Memorandum of November 5, 2009, 74 Fed. Reg. 215: 57881 (published on November 11, 2009

[12] http://www.epa.gov/superfund/programs/nrd/primer.htm

[13] Harper,B.L. (1995). *The Earth and Myself Are of One Mind: Achieving Equity in Risk Based Decision Making and Land Use Planning*. EPA's State and Tribal Risk Forum, Albuquerque, NM.
Harris, S. & Harper, B. (1998). Using eco-traditional risk in risk-based decision making. *American Nuclear Society Environmental Sciences Topical meeting, Richland WA.*
Harris, S. & Harper, B. (1998). Traditional risk and traditional toxicity. *Testimony to EPA's Science Advisory Board Executive Board. October 31, 2000.*
Harris, S. & Harper, B. (1998). Characterizing risks: Can DOE achieve intersite equity by 2006? *DOE's Waste Management Conference (Waste Management '98, Albuquerque, NM).*
Harris, S. (1999). Environmental justice and permitting in Indian country. *Presentation to the National Environmental Justice Advisory Council, Arlington, Virginia.*
Harris, S. (1999). Native American perspectives on environmental justice and environmental permitting. *Keynote Speaker, Native American Heritage Month, sponsored by Argonne National Laboratory, the Department of Energy's Center for Risk Excellence. Chicago.*
Harper, B.L. & Harris, S.G. (1999). Measuring Risks to Community Health and Quality of Life. *9th ASTM Symposium on Environmental Toxicology and Risk Assessment, (Paper #6034, Committee E47), published in "Environmental Toxicology and Risk Assessment" (F Price, K Brix and N Lane, eds.), 2000, pages 195-211.* Harris,

CTUIR comments on the TC&WM EIS 16

secondary-waste streams into the primary-waste-stream feeds within the WTP to increase iodine-129 capture in ILAW and bulk vitrification glass, are discussed in Chapter 7, Section 7.5, of this final EIS.

502-50 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

502-51 The alternatives presented in this *TC & WM EIS* were developed under NEPA (42 U.S.C. 4321 et seq.) to address the essential components of DOE's three sets of proposed actions (tank closure, FFTF decommissioning, and waste management) and to provide an understanding of the differences between the potential environmental impacts of the range of reasonable alternatives. Consistent with CEQ guidance, this EIS analyzes the range of reasonable alternatives that covers the full spectrum of potential combinations. The alternatives considered by DOE in this EIS are "reasonable" in the sense that they are practical or feasible from a technical and economic standpoint and meet the agency's purposes and needs. Potential conflicts with laws and regulations do not necessarily cause an alternative to be unreasonable, but additional mitigation commitments may be required if it is selected for implementation. For a more comprehensive discussion on compliance with regulatory requirements, see Section 2.7 of this CRD.

502-52 Chapter 7, Sections 7.1 and 7.5, discuss potential mitigation measures that could be used to avoid or reduce adverse environmental impacts associated with implementation of the alternatives, in this case waste importation. As discussed in Chapter 5 of this *TC & WM EIS*, DOE acknowledges that "benchmark standards" could be exceeded in groundwater at the Core Zone Boundary and/or at the Columbia River nearshore at various dates. The term "benchmark standards" as used in this *TC & WM EIS* represents dose or concentration levels that correspond to known or established human health effects. For groundwater, the benchmark is the MCL, provided an MCL is available.

In response to comments received on the *Draft TC & WM EIS*, additional sensitivity analyses were performed and are included in this final EIS. The additional analyses evaluate potential impacts if certain remediation activities are conducted at some of the more prominent waste sites on the Central Plateau and

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

Step 1. *Resource and Community Identification.*

The Resource Identification regarding a site or area is defined as the probability of a natural or traditional resource of tribal importance being present and potentially impacted. Particularly in the western United States, asking the following questions may reveal unrecognized potential for disparate impacts:

- What potential EJ populations use the resources from the impacted zone?
- How is the area or resource used; how important are those resources or places to the EJ population; what attributes of the resource or system does the community value?
- Is the affected area linked ecologically, traditionally, visually, or hydrologically to other tribal resources or areas? Is the affected area within a tribal historic area (usual and accustomed area, ceded area), a traditional traditional property, a viewshed, or a tribally important landscape?
- Is a tribe a Natural Resource Trustee of the affected resource or lands?
- Does the affected area include sacred sites, historical/ archaeological sites, burial sites, and sites containing important traditional traditional materials or with associated traditional uses or history?

Step 2. *Damage Potential.*

This step describes the baseline and existing conditions and potential for damage due to physical disturbance, contamination, desecration or aesthetic degradation.

- Describe the affected resources and eco-traditional systems, and the uses that different population segments make of the area and its resources.
- Describe the features and attributes of the ecosystem or eco-traditional system that people value.
- Describe the goods and services flowing from the system under baseline conditions. For convenience, these may be grouped in various ways, such as (a) ecological, traditional, recreational and general impact categories[14], (b) health, ecological, socio-traditional, and socio-economic endpoints[15], or (c) natural, human, built, and economic systems[16].
- Estimate the time until, and duration of, adverse impact (a measure of threat imminence or urgency as well as recovery time).

Harris, S. & Harper, B. (1999). Environmental justice in Indian country: using equity assessments to evaluate impacts to trust resources, watersheds, and eco-traditional landscapes. Proceedings of "*Environmental Justice: Strengthening the Bridge Between Tribal Governments and Indigenous Communities, Economic Development and Sustainable Communities*" (posted at http://www.iiirm.org/publications/EnvJust/papero~1.pdf)
S.G. (2000). Environmental Justice and Native Perspectives. *Invited presentation at the meeting "How Should Environmental Justice be Addressed in Indian Country?" Sponsored by the Federal Interagency Working Group, Albuquerque.*
Harris, S.G. (2000). Risk analysis: changes needed from a Native American perspective. *Human and Ecological Risk Assessment 6, 529-535.*
Harper, B. & Harris, S. (2001). Equity Assessment and tribal eco-traditional risk. *Alaska Forum on the Environment.*
Harper, B. & Harris, S. (2001). *An Integrated Framework for Characterizing Cumulative Risks To Tribal Health And Well-Being And Subsistence Lifeways.* IIIRM, Denver CO (www.iiirm.org), and Report to EPA/OSWER.
[14] C. Ridolfi, personal communication, 2009.
[15] Harper and Harris, ibid.
[16] http://climlead.uoregon.edu/sites/climlead.uoregon.edu/files/reports/ROGUE%20WS_FINAL.pdf

along the river corridor. Furthermore, the sensitivity analyses evaluate scenarios that could restrict or reduce certain waste types from being imported to Hanford. The discussion found in Section 7.5 was added to summarize these results.

502-53 See response to comment 502-51 regarding the development the alternatives in this EIS.

See response to comment 502-50 for a discussion on the transport and disposal of offsite waste.

Since 2004, DOE has buried all LLW in lined trenches. DOE continues to have strict limits for the amount of waste Hanford can accept, and ensures that disposal activities are protective of the environment and meet regulatory requirements. Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

As discussed in the *TC & WM EIS* Summary, Chapter 1, and Chapter 2, this EIS analyzes additional waste treatment capability that includes expanding the vitrification process capability currently being constructed in the WTP or supplementing the WTP's capability with supplemental treatment technologies. Thus, decisions to be made by DOE regarding whether to treat all waste in the WTP, as is or expanded, or to supplement its capacity by adding new treatment capability depend on demonstrating the feasibility of supplemental treatment technologies.

The Tank Closure alternatives analyzed in this *TC & WM EIS* were developed to analyze potential impacts of DOE's proposed actions to retrieve waste from the buried tanks, treat and dispose of this waste, and close the SST farms by landfill closure, selective clean closure, or clean closure. This analysis is also intended to aid DOE in making decisions regarding cleanup of the past leaks, including remediation of the contamination in the vadose zone. The EIS analysis shows that the level of waste retrieved is important in long-term impacts. Once the tank waste in a waste management area has been retrieved, then the actual residuals would be evaluated during the tank closure process for that waste management area. Activities would include detailed examinations of the tanks and residual waste and preparation of a performance assessment and a closure plan. These documents would provide the information and analysis necessary for DOE and

- Describe the existing stressors and resiliency of the affected systems, both ecological and human (a measure of vulnerability).
- Describe the socio-economic system; subsistence economy if applicable.

Step 3. *Consequence Potential.*

This step evaluates the interruptions of service flows, the cumulative impacts (health risk, impacts to the subsistence or socio-economic system, cumulative health risks and impacts, and socio-traditional impacts), and the disparity between the tribe's impacts and those of the general population.

- Measure injury or impact to individual and combined resources and reductions in service flows, at local, eco-system, and regional scales.
- If the potential for any amount of contamination exists, evaluate multi-pathway, multi-contaminant health risks using exposure scenarios for each population segment (traditional subsistence scenario for tribal uses).
- Evaluate cumulative health impacts considering existing community circumstances and tribal definitions of health and well-being.
- Measure socio-traditional and socio-economic impacts using tribally-relevant parameters.
- Describe of disparities between populations across all consequences.

Table 1 presents an example of the systematic consideration of affected resources and the information needed for the equity analysis and cumulative impact analysis in an Environmental Impact Statement. This format is followed in the Hanford example that follows.

Table 1. Example of table for each resource

Affected Resource	Features and Attributes of the baseline resource	Goods and Services provided under baseline conditions	Measurement Endpoints (parameters, direction of improvement or decrement)
Landscape	Sacred geography	Religious experience Linguistic landmarks Traditional mnemonics	Degrees of vision with undisturbed viewshed
Groundwater	Undegraded GW	Drinking water Domestic uses Agriculture-Pasture Sweatlodge use	Gal-yrs > dw std Gal-yrs > cum risk Acre-ft-yrs > Ag std Gal-yrs > d.l.
Salmon	Wholesome food, eco-traditional resource, indicator of ecosystem health	First Food, income and barter services, oral tradition, language, education, behavioral role model, ecological services	Detectable Hanford-related contaminants; Degree of health risk at tribal consumption rates (modeled and measured).

the regulators to make specific decisions on what levels of residual tank waste are acceptable in terms of short- and long-term risks.

502-54 As analyzed in this *TC & WM EIS*, 67 of the 149 SSTs at Hanford are known or are suspected to have leaked liquid waste to the environment between the 1950s and the present, some of which has reached the groundwater. Estimates of the total leak loss range from less than 2.8 million to as much as 3.97 million liters (750,000 to 1,050,000 gallons).

See response to comment 502-53 regarding groundwater contamination and remediation.

502-55 DOE is implementing an extensive cleanup program at Hanford as required under RCRA; CERCLA; and/or the TPA, a legal agreement between DOE, Ecology, and EPA. The TPA identifies cleanup actions and schedules, called milestones. The TPA agencies completed negotiations on several Hanford cleanup projects, including the establishment of 29 additional and/or accelerated groundwater and Columbia River protection milestones and target dates. Appendix R describes other actions considered in the cumulative impacts analysis, including activities and future end states at 403 waste sites across the Hanford Site. Appendix R and the cumulative impact analyses reflect the plans for closure of these waste sites that were in effect at the time the *Draft TC & WM EIS* was prepared.

DOE received comments on the potential impacts of future remediation activities that are in various stages of planning (which, given the inherent uncertainty, were not included in the cumulative impacts analysis). In response, DOE performed a sensitivity analysis to evaluate the potential impacts if certain remediation activities were conducted at some of the more prominent waste sites on the Central Plateau and along the river corridor. The goal of the sensitivity analysis is to help DOE, EPA, and Ecology prioritize cleanup efforts in the future. This analysis is provided in Appendix U of this EIS and is discussed further in Chapter 7, Section 7.5.

502-56 This *TC & WM EIS* has evaluated large-scale soil excavation/removal strategy. This approach is considered in Tank Closure Alternatives 6A and 6B. Under these alternatives, all 12 SST farms in the 200-East and 200-West Areas would be clean-closed following deactivation. As discussed in Chapter 1, Section 1.9.1.6, clean closure of the tank farms would involve removing all SSTs, associated ancillary equipment, and contaminated soil to a depth of 3 meters (10 feet) below the tank base, all of which would be managed as HLW. Where necessary, deep soil excavation would be conducted to remove contamination plumes

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

C. Hanford Site NEPA Analysis

This section is an example of language from the perspective of the Confederated Tribes of the Umatilla Indian Reservation that could be included in Hanford Environmental Impact Statements.

C.1 Environmental Setting and Worldview

People have inhabited the Columbia Basin from the Younger Dryas era (13,000 to 10,000 years ago) at the end of the Pleistocene era and throughout the Holocene era to the present. Throughout this time climate changed, vegetation changed, and water tables fell, rose, and fell again.[17] The human ethnohistory in the Columbia Basin is divided into traditional periods that parallel the climatic periods and represent traditional adaptations to changing environmental conditions. Throughout this entire period the oral history continually added information needed for survival and resiliency as the climate fluctuated. These teachings were built over thousands of years, and still teach each generation how to live and behave to sustain themselves and the community. The oral tradition provides accounts and descriptions of the region's flora, fauna, and geology. Some stories and oral histories contain factual information and accurate explanations of environmental processes such as ancient floods, lava flows, the meaning of fossils, identification of extinct plants and animals and their habitats, or ecological principles and relationships such as the role of salmon carcasses in the riverine nutritional cycle. Other oral teachings are expressed in symbolic terms and contain social principles and traditional values (e.g., a coyote fable associated with a physiographic feature used to teach a moral lesson or serve as a mnemonic for practical behavioral instructions). Oral histories impart basic beliefs, teach moral values and the land ethic, and help explain the creation of the world, the origin of rituals and customs, the location of food, and the meaning of natural phenomena. Cameron (2008)[18] examined archaeological, ethnographic, paleo-environmental, and oral historical studies from the Interior Plateau of British Columbia, Canada, from the Late Holocene period, and found correlations among all four sources of information.

The Columbia River flows through what was a traditional and economic center for the Plateau communities. The land and its many entities and attributes provided for all their needs: hunting and fishing, food gathering, and endless acres of grass on which to graze their horses, commerce and economy, art, education, health care, and social systems. All of these services flowed among the natural resources, including humans, in continuous interlocking cycles. Adverse impacts to any resource ripple through the entire web and through interconnected biological and human communities. Therefore, if the link between a person and his/her environment is severed through the introduction of contamination or physical or administrative disruption, natural resource

[17] http://www.oregon-archaeology.com/archaeology/oregon/; http://www.wac6.org/livesite/precirculated/1803_precirculated.pdf; Mehringer, P.J. (1996) "Columbia River Basin EcosystemsL Late Quaternary. http://www.icbemp.gov/science/mehringe.pdf.
[18] Cameron, I (2008) "Late Holocene environmental change on the Interior Plateau of Western Canada as seen through the archaeological and oral historical records." World Archaeological Congress 6, Dublin, Ireland.

within the soil column. DOE would like to point out to the commentor that the initial removal of the 3 meters (10 feet) of soil below the bottom of the tanks is the assumption used to determine the extent to which the soils would be managed as HLW and therefore, removed and managed as HLW. The remaining contaminated soil beneath this depth would be removed and treated; however, it would not be managed as HLW and would be disposed of on site in the proposed RPPDF after appropriate treatment. This is further explained in Appendix E, Section E.1.2.5.3.2, and clarified in the *TC & WM EIS* Summary, Section S.2.1.

502-57 Tank Closure Alternatives 6A and 6B evaluate clean closure of the SST system. See response to comment 502-14 regarding factors influencing future DOE decisions.

As discussed in Section S.5.2.1.5 of the Summary, and Appendix E, Section E.1.2.5, of this *TC & WM EIS*, there are technical uncertainties associated with tank removal and deep soil remediation beneath the tanks that would have to be weighed against the order(s)-of-magnitude increase in short-term impacts on resource areas that would result from implementing these alternatives. In addition, the key environmental findings discussed in the *TC & WM EIS* Summary, Section S.5.5, and Chapter 2, Section 2.10, describe in more detail the potential short-term impacts and other concerns or issues DOE has identified related to clean closure of the SST system, which leads DOE to believe that clean closure is not preferred.

Under "Cost-Benefit Analysis" (40 CFR 1502.23), a Federal agency may prepare a cost-benefit analysis; however, one is not required. Chapter 2, Section 2.11, of this *TC & WM EIS* summarizes and compares the relative consolidated costs for continued operation of existing facilities; construction, operation, and deactivation of new or modified facilities; and associated activities to support the proposed actions.

502-58 The only Tank Closure alternative that analyzes filling the tanks with gravel is Alternative 1, No Action Alternative. As stated in Chapter 2, Section 2.5.2.1, "SSTs showing signs of deterioration that would threaten the structural integrity of the tanks would be filled with grout or gravel as a corrective action or emergency response. Waste contained in DSTs showing similar signs of deterioration would be removed from the tanks and consolidated in existing DSTs to the extent possible. The deteriorated DSTs would then be filled with grout or gravel as a corrective action or emergency response." No credit for stopping water intrusion and possible mobilization of contaminants was taken for gravel-

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

service flows may be interrupted, the person's health suffers, and the well being of the entire community is affected[19].

These relationships form the basis for the unwritten laws or *Tamanwit* that were taught by those who came before, and are passed on through generations by oral tradition in order to protect those yet to arrive. The ancient responsibility to respect and uphold these teachings is directly connected to the culture, the religion, and the landscape along the Columbia Plateau. Individual and collective well-being is derived from membership in a healthy community that has access to, and utilization of, ancestral lands and traditional resources, so that each person may fulfill his or her part of the natural cycles and the responsibility to uphold the natural law. The traditional identity, survival, and sovereignty of the native nations along the Columbia River and its tributaries are maintained by adhering to, respecting, and obeying these ancient unwritten laws.

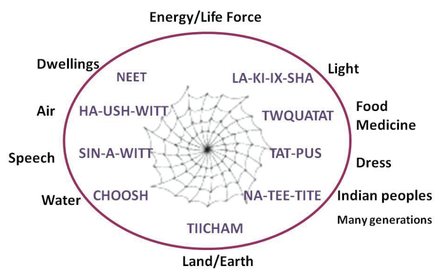


Figure 1. Depiction of CTUIR Tamanwit, the Natural Law.

[19] S Harris. "Traditional Legacies: Challenge to the Risk Community." Plenary Address, Society for Risk Analysis Annual Meeting, Phoenix, AZ, December 7, 1998;
Cajete, G (1999). A People's Ecology. Clear Light Publishers, Santa Fe, New Mexico.

filled tanks under Tank Closure Alternative 1. With regard to immobilizing the tank residual waste with grout, as discussed in Appendix E, Section E.1.2.5.1.1, under "Residual Waste Stabilization," this EIS assumes that physical stabilization of the residual waste would be achieved through introduction of dry powders, dry granular material, and grout. The goal of such physical stabilization would be to reduce the residual waste constituent's mobility by physically isolating the residual waste from the environment and/or chemically treating the waste to reduce its mobility. Thus, while complete immobilization of the residual waste may never be achieved, DOE is trying to achieve this goal and this effort was considered appropriate for this EIS. However, as explained in Appendix M, releases to the environment from this grouted waste form were assumed and analyzed in this EIS.

502-59 The grout fill is discussed in Appendix E, Section E.1.2.5.1.1, of the *Draft TC & WM EIS*. As stated in this section, "the grout hardens in the tanks to stabilize the residual waste and provide structural stability for landfill closure of the tank farms." Further discussion in this appendix includes the following: "a volume of residual waste would remain in the tanks for closure. Physical stabilization of the residual waste would be the preferred approach for treatment. Grout has physical as well as chemical waste stabilization properties that would make it an effective technology for stabilization of residual waste. However, chemical stabilization using sequestering agents may also be considered if needed to further immobilize specific contaminants."

502-60 To address the commentor's position regarding the potential impacts on groundwater that may result from soil excavation in the tank farms, DOE has provided clarifying text on the descriptions, as well as discussions of the key environmental findings in the Summary, Section S.5.5, and Chapter 2, Section 2.10, of this *Final TC & WM EIS*.

502-61 DOE must comply with certain legal requirements to undertake specific activities that are part of the proposed actions and alternatives; these requirements are identified throughout this EIS. For example, Chapter 1, Section 1.2.1, discusses Hanford regulatory compliance requirements; Section 1.2.7 discusses the WAC regulations DOE must meet for the proposed closure of the SSTs. Section 1.9, which describes the alternatives evaluated in this EIS, refers to the RCRA, WAC, and DOE order requirements that must be met for DOE to implement the Tank Closure alternatives.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

C.2 Affected Resources

In a NEPA analysis, impacts of proposed federal actions on a range of environmental attributes are evaluated, as well as potential impacts to a variety of health, economic, and other endpoints. The term "impact" implies an adverse effect, but of course a federal action may also result in improvements, so the metrics used for the evaluation need to be amenable to both decrements and benefits.

C.2.1 Aesthetic and Physiographic Resources

It is well known that environmental attributes or qualities such as wilderness, solitude, peace, calm, quiet, and darkness are important to individual species that need large undisturbed habitat as well as to humans who value those experiential qualities[20]. Quiet is an important resource. Noise can affect living organisms in the ecosystem through interruption of reproductive cycles and migration patterns, and driving away species that are sensitive to human presence. Non-natural noise can be offensive while traditional ceremonies are being held. Light at night affects nocturnal animals such as bats, owls, night crawlers and other species. Night light also has known affects on diurnal creatures and plants by interrupting their natural patterns. Light can affect reproduction, migration, feeding and other aspects of a living organism's survival. Light at night also disrupts the quality of human experience, including star gazing and traditional activities.[21]

Viewscapes tend to be panoramic and are traditional and sacred landscapes when they contain prominent topography or vantage points from which to view a panorama composed of multiple songscapes and storyscapes. Traditional landscapes have been defined by the World Heritage Committee as distinct geographical areas or properties uniquely representing the combined work of nature and of man. They identified and adopted three categories of landscape: the purely natural landscape, the human-created landscape, and an associative traditional landscape which may be valued because of the religious, artistic or traditional associations of the natural and/or human elements. Traditional landscapes may be invisible unless they are disclosed by the peoples to whom they are important. Tribal values lie embedded within the rich traditional landscape and are conveyed to the next generation through oral tradition by the depth of the Indian languages. Numerous landmarks are mnemonics to the events, stories, and traditional practices of native peoples. Within this landscape are songs and fables associated with specific places; when access is denied a song or fable may be lost.

Within a broad sacred landscape there may be numerous individual traditional sites and resources. They can be mountains, rivers, lakes, caves, forest groves, coastal waters, and entire islands. The reasons for their sacredness are diverse. They may be perceived as abodes of deities and ancestral spirits; as sources of healing water and plants; places of contact with the spiritual, or communication with the 'beyond-human' reality; and sites of revelation and transformation. As a result of access restrictions, many sacred places are now important reservoirs of biological

[20] http://findarticles.com/p/articles/mi_m1145/is_n8_v29/ai_15769900/; http://findarticles.com/p/articles/mi_m1145/is_n8_v29/ai_15769900/

[21] http://www.miller-mccune.com/science_environment/blinded-by-the-light-1501

The very nature of "environmental impacts analysis" requires DOE to analyze and describe in this EIS how proposed processes and technologies would operate; what results they are expected to achieve; what end products or byproducts might result; and how these measure up against the legal requirements that apply. Statutory, regulatory, Executive order, and DOE requirements are discussed in the context of each chapter and are listed in the references at the end of each chapter.

As discussed in the *TC & WM EIS* Summary, Chapter 1, and Chapter 2, this EIS analyzes additional waste treatment capability that includes expanding the vitrification process capability currently being constructed in the WTP or supplementing the WTP's capability with supplemental treatment technologies. Thus, decisions to be made by DOE regarding whether to treat all waste in the WTP, as is or expanded, or to supplement its capacity by adding new treatment capability depend on demonstrating the feasibility of supplemental treatment technologies. Any offsite waste destined for disposal at Hanford must be treated to land-disposal-restriction treatment standards at the site of origin prior to shipment to Hanford.

502-62 The scope of this *TC & WM EIS* includes decisions on storage, retrieval, treatment, and disposal of tank waste and closure of the SST system, including the tank system and the vadose zone impacted by the tank farms (i.e., past leaks). The *TC & WM EIS* closure alternatives for the tank farms include no action, landfill closure, selective clean closure, and clean closure (which would involve actions to remove the source of contamination). The State of Washington has agreed that the alternative descriptions identify the information needs necessary to meet SEPA requirements. Ecology expects that the analysis provided in this *Final TC & WM EIS* will provide enough information to adequately inform its permitting requirements. When Ecology provides approval of DOE's proposed actions by issuing a permit, the applicable WAC regulations will be applied and enforced. The state closure standards for the owners and operators of all dangerous waste facilities are defined (WAC 173-303-610(2)); references to the tank systems (WAC 173-303-640) and corrective action requirements (WAC 173-303-645) are included. The regulations describe specific requirements for closure of the tank system (WAC 173-303-640(8)(a) and (b)), including a requirement for DOE to "remove or decontaminate all wastes residues, contaminated soils, and structures and equipment contaminated with waste" from the tank system. If DOE "demonstrates that no contaminated soils can be practically removed or decontaminated," then the corrective action regulations (WAC 173-303-645) will apply.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

diversity. Sacred natural sites such as forest groves, mountains and rivers, are often visible in the landscape as vegetation-rich ecosystems, contrasting dramatically from adjoining, non-sacred, degraded environments.[22]

Aesthetic and Physiographic Resources			
Affected Resource	**Features and Attributes of the baseline resource**	**Goods and Services provided under baseline conditions**	**Measurement Endpoints (parameters, direction of improvement or decrement)**
Landscape(s) and viewshed	Intact scape for places, names, songs, calendar, other services. Undisturbed physiographic profile. Sacred geography; Vista for general public	Religious experience Linguistic landmarks Traditional mnemonics Quality of recreational experience	Impact on physiographic profile; Loss or recovery of native scapes. Degrees of vision with undisturbed viewshed; Degradation or improvement in viewshed; changes in physiographic profile over time (lifecycle); Significance of direction or features of interruption (line of sight); Duration of impacts; Quality of recovery plan after operation is over.
Wilderness	Solitude, 'nature'	Quality of religious or recreational experience; safety from intrusion	Distance to nearest disturbance; Preservation of or recovery of baseline or target conditions (uncontaminated, biodiverse)
Quiet			Detectable noise night and day
Darkness			Degrees of vision with and without lights

C.2.2 Water, Soil, and Air.

Water sustains all life. As with all resources, there is both a practical and a spiritual aspect to water. Water is sacred to the Indian people, and without it nothing would live. When having a feast, a sip of water is taken either first or after a bite of salmon, then a bite of salmon, then small bites of the four legged animals, then bites of roots and berries, and then all the other foods.

[22] Oviedo, G. (2002). member of the Task Force of Non-Material Values of Protected Areas of the World Commission on Protected Areas (WCPA), at the Panel on Religion, Spirituality and the Environment of the World Civil Society Forum, Geneva, 17 July 2002.
Stoffle, R.W., Halmo, D.B., Austin, D.E. (1998). Traditional Landscapes and Traditional Traditional Properties: a Southern Paiute View of the Grand Canyon and Colorado River. American Indian Quarterly, Vol. 21: 229-250.
Walker, D.E., 1991. "Protection of American Indian Sacred Geography," in: *Handbook of American Indian Religious Freedom,* Vecsey, C., Ed., Crossroad, New York, NY, pp. 100-115.
Greaves, T., 1996. "Tribal Rights," *Valuing Local Knowledge,* Brush, S.B. and Stabinsky, D., eds., Island Press, Washington, D.C., pp. 25-40.

502-63 Current standard practices by U.S. agencies were followed to calculate human health impacts. References are provided in Appendix Q of this EIS. The apparent discrepancy in the alternative comparison noted by the commentor is addressed in the text. As indicated in the paragraph above Figure S–23 in the Summary of this *Final TC & WM EIS*, the higher lifetime radiological risk under Tank Closure Alternative 6B, Base Case, is due to the disposal of large amounts of vadose zone sediments excavated from all SST farms. In comparison, the estimates under Tank Closure Alternative 4 are due to disposal of vadose zone sediments from only two SST farms (BX and SX).

Early stakeholder participation in the EIS planning and development process is important to DOE, and DOE has provided numerous opportunities for such interaction. Hanford-area tribes have had the opportunity to provide, and have provided, extensive input to the *TC & WM EIS* preparation process and analysis. Chapter 8, Section 8.3, and Appendix C, Section C.3, of this *TC & WM EIS* identify the process for tribal interaction and the primary occasions for DOE's interactions with the tribes on the subject of the *TC & WM EIS* preparation process. In addition, Section 8.3 of this *Final TC & WM EIS* includes a description of the outcomes of the meetings with the tribes, and a new appendix (Appendix W) describes the tribal perspective as provided by the Hanford-area tribes. The intent of the American Indian scenarios was to collectively reflect American Indian lifestyles for the purpose of comparison. Both the activities and parameters used in those scenarios are based on existing reports and compilations. It was never the intent to analyze all possible American Indian scenarios. However, in Appendix W, Section W.3, exposure data provided by the tribes are used to estimate peak impacts on a CTUIR hunter-gatherer and on a Yakama hunter-gatherer for a representative alternative combination, Alternative Combination 2. The comparison of those analyses to those for the EIS hunter-gatherer suggest that both of the exposure pathways modeled and the parameter values used for the EIS hunter-gatherer are representative for use in the EIS analyses. In addition, one or two exposure pathways account for essentially all of the peak impacts (and variability) across the hunter-gatherer scenarios. Notable also is the strong similarity between the EIS hunter-gatherer and the CTUIR hunter-gatherer—from the perspective of both exposure factors and predicted impacts.

502-64 This *TC & WM EIS* assumes several different types of end-state management, as described in Chapter 2, the Glossary, and the Summary. These include administrative controls, institutional controls, and postclosure care, as

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

The concept of sacred water or holy water is global, and often connects people, places, and religion; religions that are not land-connected may lose this concept.[23] The quality of purity is very important for ceremonial use of water. For example, making a sweat lodge and sweating is a process of cleansing and purification, and the water used for sweat-bathing should be uncontaminated. From a ceremonial perspective, the most important drop of contamination is not the drop that causes a body of water to exceed a numerical standard, but the drop that changes the quality of the water from pure to impure. Additionally, concepts related to the flow of services from groundwater and the valuation of groundwater are receiving increased attention.[24]

Air, Water, Soil

Affected Resource	Features and Attributes of the baseline resource	Goods and Services provided under baseline conditions	Measurement Endpoints (parameters, direction of improvement or decrement)
Surface water	Ecological	Habitat and provisions for plants, fish and wildlife; ground water recharge	Ecological measures include water quality standards, and other measures not listed here.
	Traditional	Habitat for sacred plants, fish, and wildlife; subsistence use; ceremonial drinking; support for traditional lifeways	Gal-yrs > tribal risk-based std Gal-yrs > cum risk target level Gal-yrs > d.l. Multiplier for traditional importance; Any institutional control needed to protect human (including tribal) health
	Recreational	Sport fishing; hunting; boating; swimming; wildlife observations	Gal-yrs > general dw std
	General	Commercial fishing; transportation; irrigation; drinking; pasture	Acre-ft-yrs > Ag std
Groundwater	Ecological	Surface water recharge; wetland recharge, river upwelling	See other sections
	Traditional	Ceremonial and spiritual use and drinking	Gal-yrs > d.l. Gal-yrs > cum risk
	Recreational	Drinking water	Gal-yrs > dw std
	General	Commercial, municipal, industrial, and domestic use; irrigation; pasture; public drinking	Gal-yrs > dw std Acre-ft-yrs > Ag std Any institutional control needed to protect human (including tribal) health
Air		Human health	Sitewide emissions profile over lifespan of activity; Standards: NAAQS, NESHAPS, PM, diesel, ozone, other standards. Dust resuspension

[23] Altman, N. (2002) Sacred Water: the Spiritual Source of Life. Mahwah, NJ: Hidden Spring Publ.;
Marks, W.E. (2001) The Holy Order of Water. Vancouver BC: Steiner Books Inc.;
Burmil, S., Daniel, T.C., and Hetherington, J.D. (1999). Human values and perceptions of water in arid landscapes. *Landscape and Urban Planning,* 44: 99-109;
Mazumdar, S. and Mazumdar, S. (2004). Religion and place attachment: A study of sacred places. Journal of Environmental Psychology, 24: 385-397.
[24] National Research Council (1997) Valuing Ground Water: Economic Concepts and Approaches. Washington D.C.: National Academy Press.

appropriate. Each of these end-state management options would take place at the completion of an action and is assumed to occur for 100 years following the end of the action (e.g., active institutional controls would be maintained for 100 years following final placement of waste in a storage facility). The 10,000-year time period described in this *TC & WM EIS* represents the period of analysis used for the long-term impact analyses for groundwater, human health, and ecological risk; it does not represent the assumed period of institutional controls. For clarity, the definition of "10,000-year period of analysis" is included in this final EIS in Chapter 2, the Glossary, and the Summary, as appropriate.

502-65 Appendix Q of this EIS presents radiological and chemical risk for 12 onsite locations, the 10 barriers, the Core Zone Boundary, and the Columbia River nearshore.

502-66 This *TC & WM EIS* presents both short-term (operational period) and long-term human health impacts of the proposed actions. The reported results reflect the different receptors and different exposure pathways associated with short- and long-term impacts. During the operational phase of the proposed actions, airborne radionuclides would be the principal concern. Thus, the analysis considers an MEI at an offsite location and the population within 50 miles that might be exposed to airborne radionuclides. The analysis also includes the potential dose to a person who practices a subsistence-type lifestyle. The short-term impacts are presented in terms of dose and LCFs. As discussed in Appendix K, Section K.1.1.6, a risk factor of 0.0006 is used in calculating the fatal cancer risk; however, a factor of 0.0008 could be used to estimate cancer morbidity.

Over the long-term, the movement of radionuclides to the human environment from buried sources is of concern. The pathways can be through migration to the groundwater and the Columbia River, or by intrusion into the buried materials. A number of individuals are considered, as discussed in Chapter 5 and Appendix Q: a well-driller, a resident farmer, an American Indian resident farmer, and an American Indian hunter-gatherer. This EIS also presents estimated human health impacts on the downstream population based on the exposure scenarios described for the resident farmer. The radiological impacts are presented as dose and cancer risk.

502-67 See response to comment 502-4 regarding NEPA requirements and the ARARs concept under CERCLA.

		Visibility	Airborne doses Haze rule; Indirect impacts from energy production, ozone emissions, diesel use. Contribution or benefit to PSD area or attainment status. Greenhouse gas emissions.
Soil and sediment	Clean soil	Matrix for life support	Total vadose zone inventory of contaminants; Undisturbed soil profile;
		Human health	Soil pathways with tribal soil ingestion rate; Soil pathways as part of cumulative multimedia exposure Exceedance of sediment standards (biota) and dose to people (as above) Any institutional control needed to protect human (including tribal) health Exceedance of human or biotic standard
		Tribal uses (pigments, clays, etc.), pottery	Degree of Tribal access to special materials
		Biotic health; Habitat for sacred plants, fish, and wildlife;	Microbial quality (crust, nutrient cycling, etc.)
		Fill material	Volume, area, and diversity of clean fill area; Quality of mitigation actions; Minimization of disturbance and linked resource impacts

C.3 Terrestrial and Aquatic Biological Resources

Ecosystem Scale.

An ethnoecological approach to describing terrestrial resources will complement the purely ecological descriptions that conventionally are included in sections about affected resources in an EIS. These sections begin with descriptions of the potential natural vegetation within the Columbia Basin ecozones (e.g., using EPA Ecoregion Level 1-4 maps and vegetation descriptions), and then describe the natural resource usage patterns of the Plateau Area.[25]

Biological resources are integral to many traditional practices and celebrations throughout the year, many of which honor the traditional foods or First Foods. Based on the importance and many uses of the natural resources, an exposure scenario reflecting the underlying ethnohabitat or eco-traditional system was developed for use in dose and risk assessments at Hanford (Harper and Harris 1997; Harris and Harper 2000; CTUIR 2004)[26]. Ethno-habitats or eco-traditional

[25] http://www.fs.fed.us/land/pubs/ecoregions/ch48.html#342I
[26] Harris, S.G. and Harper, B.L. "A Native American Exposure Scenario." Risk Analysis, 17(6): 789-795, 1997;

This *TC & WM EIS* considers requirements from a number of sources. These include Federal and state requirements, as well as DOE requirements for protection of the public (100 millirem from all exposure modes from all DOE activities) (DOE Order 458.1). Also, this EIS considers the requirements under the Washington State MTCA. For example, the "benchmark standards" used in this EIS represent dose or concentration levels that correspond to known or established human health effects. For groundwater, the benchmark is the MCL if an MCL is available. These benchmark standards for groundwater impacts analysis were agreed upon by DOE and Ecology as the basis for comparing the alternatives and representing potential groundwater impacts. This approach is consistent with the MTCA standards Method A used to establish cleanup levels under the separate CERCLA and RCRA processes established by the TPA. Method A draws from current Federal and state standards, including the MCLs as listed in Table 720-1 of the MTCA.

502-68 Appendix K, Section K.1.1.6, discusses the scientific evidence relating radiation exposure to the incidence of cancers, fatal and nonfatal. This discussion indicates that use of the fatal cancer risk factor of 0.0006 is conservative, but also provides the reader with the information from which the incidence of nonfatal cancers can be estimated. The EIS tables that reflect health impacts of normal operations and hypothesized facility accidents present both the doses and the resulting risk to an exposed individual or the number of LCFs in an exposed population. Appendix Q, Section Q.2.4.2, explains that nuclide-specific risk coefficients, developed using techniques that account for gender and age, were used for the long-term human health impacts analysis.

502-69 DOE disagrees with the commentor's assertion that aquatic standards are an appropriate benchmark or reference for evaluating or referencing groundwater concentrations. The groundwater results in Chapters 5 and 6 are applicable only to the subsurface groundwater system; the ecological risk portions of Chapters 5 and 6 deal with surface water systems and use an entirely different reference system.

502-70 This *TC & WM EIS* does not consider groundwater remediation; its scope includes non-groundwater remediation activities for tank closure and FFTF decommissioning. Other Hanford remediation activities as required under RCRA, CERCLA, and/or the TPA are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. Cleanup decisions regarding the non-tank-farm contamination sites will be made in consultation with Federal and state agencies. The other Hanford remediation

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

systems can be defined as the set of traditional, religious, nutritional, educational, psychological, and other goods and services provided by intact, functioning ecosystems and landscapes. A healthy ethno-habitat or eco-traditional system is one that supports its natural plant and animal communities and also sustains the biophysical and spiritual health of its native peoples. Ethno-habitats are places clearly defined and well understood by groups of people within the context of their culture. These are living systems that serve to help sustain modern Native American peoples' way of life, traditional integrity, social cohesion, and socio-economic well-being. The lands, which embody these systems, encompass traditional Native American homelands, places, ecological habitats, resources, ancestral remains, traditional landmarks, and traditional heritage. Larger ethno-habitats can include multiple interconnected watersheds, discrete geographies, seasonal use areas, and access corridors.[27] A depiction of the eco-traditional system for the CTUIR is shown as a seasonal round that includes both terrestrial and aquatic resources.

The Columbia River, which cuts through the Hanford site, is the life blood of the region, with rich diverse fisheries delicately balanced on thriving aquatic ecosystems. The Hanford Reach is the last free-flowing segment of the Columbia River and is home of the last remaining naturally spawning fall Chinook. Ancestral CTUIR fisheries sites are located throughout the Hanford

S Harris and B Harper. "Using Eco-Traditional Dependency Webs in Risk Assessment and Characterization." Environmental Science and Pollution Research, 7(Special 2): 91-100, 2000;
Harper, B.L., Harding, A.D., Waterhous, T. & Harris, S.G. (2008). *Traditional Tribal Subsistence Exposure Scenario and Risk Assessment Guidance Manual* US Environmental Protection Agency EPA-STAR-J1-R831-46; posted at http://www.hhs.oregonstate.edu/ph/tribal-grant-main-page.
[27] Modified from the East-Side EIS of the Interior Columbia Environmental Management Plan (ICBEMP).

activities are considered in the *TC & WM EIS* cumulative impacts analysis, although this EIS is not able to fully reflect the effectiveness of remediation activities, and does not consider groundwater remediation.

There are significant uncertainties in estimating the degree of cleanup to be achieved by the remediation activities. Among these are (1) the inventories of contaminants released to the ground at many of the sites; (2) for liquid release sites, the portion of the originally disposed contaminants remaining in the vadose zone and the portion that has migrated into the groundwater; (3) the selection of specific cleanup/containment methods for some sites; and (4) the effectiveness of the cleanup/containment methods. Therefore, the cumulative impacts analysis for this *TC & WM EIS* is conservative in that it does not account for cleanup/containment of waste and contaminated soil at liquid release sites, or cleanup/containment of current or future groundwater contamination.

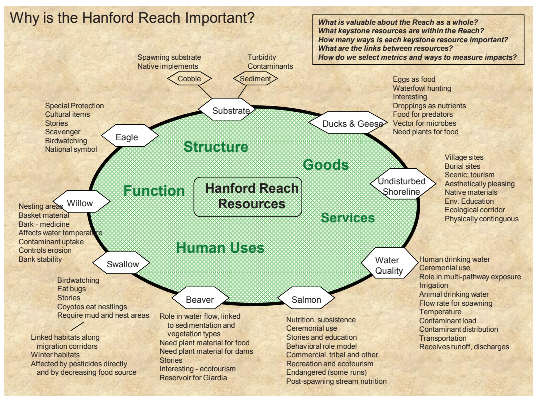
In recognition of concerns about the effects of remedial actions, DOE has added sensitivity analyses to Appendix U of this *Final TC & WM EIS* to provide information on the potential effects of reasonably foreseeable remedial actions on the concentrations of contaminants in groundwater. The results of these sensitivity analyses are discussed in Chapter 7, Section 7.5.

502-71 This *TC & WM EIS* provides information on the potential short- and long-term impacts for each of the alternatives analyzed, but does not compare these two types of impacts. To fully understand the impact of an alternative, it is necessary to consider both the short- and long-term impacts, which are discussed in the Summary, Sections S.5.3 and S.5.4, respectively, and Chapter 2, Sections 2.8 and 2.9, respectively, of this EIS.

This *TC & WM EIS* assumes several different types of end-state management, as described in Chapter 2, the Glossary, and the Summary. These include administrative controls, institutional controls, and postclosure care, as appropriate. Each of these end-state management options would take place at the completion of an action and is assumed to occur for 100 years following the end of the action (e.g., active institutional controls would be maintained for 100 years following final placement of waste in a storage facility). The 10,000-year time period described in this *TC & WM EIS* represents the period of analysis used for the long-term impact analyses for groundwater, human health, and ecological risk; it does not represent the assumed period of institutional controls. For clarity, the definition of "10,000-year period of analysis" is included in this final EIS in Chapter 2, the Glossary, and the Summary, as appropriate.

Reach. The health of the Hanford Reach is the keystone essential to the survival of Columbia Basin fisheries and CTUIR Treaty rights and resources.

Aquatic resources in the Hanford Reach (the area of the river flowing through the Hanford site) include many species, including people[28]. An illustration of resource interconnections and services is shown in the following figure.



Traditional and ecological keystone species

All natural resources are significant to tribal culture as part of functioning ecosystems, and many are individually important as useful for food, medicines, materials, or other uses. As both the seasonal round and the Hanford Reach web show, some species have more prominent roles than others for a variety of reasons. Identifying the keystone species important to different groups of people provides information about the disproportionate impacts to those groups of people.

[28] Harris, S.G. & Harper, B.L. (2000). Using eco-traditional dependency webs in risk assessment and characterization of risks to tribal health and cultures. *Environmental Scence and Pollution. Research* 2, 91-100.

DOE agrees with the commentor that DOE would not intentionally expose a worker to excess radiation. The analysis assumes that most of the clean closure activities (including removal of tanks from the ground) would be done remotely, using shielded equipment and other techniques to reduce worker exposure to ALARA.

502-72 DOE recognizes that the tribes feel a strong connection and association with their surrounding environment. For example, DOE appreciates receiving the CTUIR's narrative, which provides its perspectives. DOE included this narrative in this *Final TC & WM EIS* as a new appendix (Appendix W), with references to this appendix added in the main volume of this EIS. Also, this EIS includes a number of analyses of the potential impacts of the various alternatives on the local American Indian population over the short term (see Appendix J) and long term (see Appendix Q). In addition, sensitivity analyses using the specific American Indian parameters provided by the Yakama Nation and the Umatilla Tribes were completed for Alternative Combination 2; the results are included in Appendix W of this *TC & WM EIS*.

502-73 DOE recognizes that the tribes feel a strong connection and association with their surrounding environment. In Appendix J, Sections J.5.7.1.1 through J.5.7.1.3, this *Final TC & WM EIS* compares estimated radiation doses to the American Indian population and an average individual in that group, to the radiation dose to the remainder of the population and an average individual within the remainder of the population. As shown in Tables J–16, J–20, J–27, J–31, J–37, and J–41, the estimated dose to the average member of the American Indian population, under every alternative in which there is an estimated dose to the public, is lower than the estimated dose to an average member of the total population. This EIS also analyzed the impacts on an MEI residing at the border of the Yakama Reservation and compared those results to an MEI residing at the Hanford boundary. As shown in Tables J–24, J–35, and J–45, the dose to an MEI residing at the Yakama Reservation boundary over the life of the project is very low, and the probability that an individual at this location would develop an LCF from this exposure is essentially zero. These estimated doses are a fraction of those estimated for an MEI residing at the Hanford boundary. Also, impacts were estimated for an MEI living at or near the Hanford boundary who subsists predominantly on the consumption of homegrown produce, animal products from a family farm, and foodstuffs harvested from the wild (e.g., fruits, vegetables, fish, and game). This scenario could represent a member of a minority group who practices a subsistence lifestyle, such as members of the American Indian community.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

D. EJ Analysis

EJ analysis is basically a comparison of the degree of impacts among different human communities. This can entail comparing Town A to Town B, comparing impacts on migrant workers to the general population, comparing impacts on children and elders to healthy adults, or comparing impacts on resources and services important to different population segments. The summary step should provide a thoughtful comparison of impacts and benefits; for example, development might provide a few jobs for the general population at the expense of losing a ceremonial spring that affects an entire tribe. A strict economic analysis might portray the project as a net benefit to a county, while not recognizing the negative impacts that accrue to a tribe. If reduced to simply a dollar valuation, tribal impacts are inevitably undervalued. Therefore, part of the EJ analysis must find another way to bring tribal interests into parity. One way to do this is by examining the proportion of the EJ population that is adversely affected rather than absolute numbers.

Some of the aspects that are most relevant to many tribal situations include (but are not limited to):

1. Disparities in the significance of natural resource impacts across various human populations (e.g., tribal, general population, recreational community);
2. Disparities in contamination-based human health risk based on exposure scenarios relevant to different populations;
3. Disparities in socio-traditional impacts (interruptions of socio-traditional services);
4. Disparities in economic impacts;
5. Disparities in cumulative risk (risk to health, culture, economy, homeland security, etc) based on the tribal definition of health and well-being; identification of vulnerabilities and co-risk factors.
6. Overall equity summary; proportion of EJ population affected.

D.1 Natural Resource Impacts

Parameters for evaluating harm to natural resources have been suggested above, so they are not further discussed here.

D.2 Health Risk Analysis

> "The Superfund law requires cleanup of the site to levels which are protective of human health and the environment, which will serve to minimize any disproportionately high and adverse environmental burdens impacting the EJ community"[29].

When tribal resources and services are impacted by contamination, a tribal exposure scenario may be warranted. Traditional or subsistence scenarios are similar in format to existing residential, recreational, or occupational exposure scenarios, but reflect and are inclusive of tribal traditional and lifestyle activities[30]. They are comprised of:

[29] http://www.epa.gov/region02/community/ej/superfund.htm
[30] Harris, S.G. & Harper, B.L. (1997). A Native American exposure scenario. *Risk Anaysis.* 17, 789-795.

Table J–25 presents the comparative food consumption rates for the subsistence consumer and the general population MEI.

Section J.5.7.3 summarizes the estimated impacts on long-term human health for three receptors: a resident farmer, an American Indian resident farmer, and an American Indian hunter-gatherer (see also Appendix Q, Section Q.3). The analysis shows that under the alternatives analyzed in this EIS, the impacts on a member of the general public would be similar to those on an American Indian living in the region. Under some alternatives, the American Indian resident farmer or American Indian hunter-gatherer may be exposed to higher doses or Hazard Indices greater than 1, but under these alternatives, the typical resident farmer would be exposed to similarly elevated risks. The alternatives with the highest risks are those in which onsite receptors could be affected far into the future. As discussed in Section J.5.7.3, these onsite exposure scenarios do not currently exist and have never existed during Hanford operations. It is unlikely that any of the Tank Closure alternatives would pose a disproportionately high and adverse health risk to the offsite American Indian population.

502-74 Visual resources in general are described in Chapter 3, Sections 3.2.1.2 and 3.3.1.2. American Indian visual resources, as well as other American Indian interests, are described in Sections 3.2.8.3 and 3.3.8.3.

502-75 It is DOE policy to integrate natural resource and restoration concerns through the CERCLA cleanup process. This process is being conducted at Hanford under the TPA and provides multiple opportunities for tribal governments and other interested parties to participate in cleanup-related decisionmaking. DOE also appreciates the CTUIR's participation in the ongoing natural resource injury assessment process, which is separate from and outside the scope of this *TC & WM EIS*.

502-76 As discussed in Chapter 7, Section 7.3, construction of new facilities, emplacement of engineered surface barriers, and/or selective or complete clean closure of the SST system would require relatively large volumes of geologic materials from Borrow Area C for backfilling of excavations. While the land itself underlying Borrow Area C would not be irreversibly or irretrievably lost or committed as a result of using geologic materials, the area would be physically altered in an irreversible manner. More-detailed discussion of these impacts on Borrow Area C can be found in Section 7.2.1. Sections 7.1.1 and 7.1.5 discuss the potential mitigation actions that could be used to minimize visual and aesthetic impacts and restore Borrow Area C, such as regrading, contouring the landscape, and planting native vegetation to match the natural landscape.

1. standard exposure pathways and exposure factors (such as inhalation rates or soil ingestion rates but with increased environmental contact rates),
2. traditional diets composed of native plants and animals, and
3. unique pathways such as the sweatlodge, gathering and use of basket materials, etc.

Tribal exposure scenarios pose a unique problem in that much of the specific traditional information about the uses of plants and animals for food, medicine, ceremonial, and religious purposes is proprietary. However, the basic activities (e.g., fishing, hunting, gathering) as well as significant traditional activities (e.g., basketmaking, pottery, firewood gathering, sweating) are shorthand labels that identify some of the most visible activities within this personally self-sufficient or subsistence economy. Major activities in the generally-recognized activity categories can be described in enough detail to understand the basic frequency, duration, and intensity of environmental contact within each category and habitat. This allows the identification of exposure pathways and estimation of exposure factors.

Table 1. Major Activity Categories

Activity Type	***General Description***
Hunting	Hunting includes a variety of preparation activities of low to moderate intensity. Hunting occurs in terrain ranging from flat and open to very steep and rugged. It may also include setting traplines, waiting in blinds, digging, climbing, etc. After the capture or kill, field dressing, packing or hauling, and other very strenuous activities occur, depending on the species. Subsequent activities include cutting, storing (e.g., smoking or drying), etc.
Fishing	Fishing includes building weirs and platforms, hauling in lines and nets, gaffing or gigging, wading (for shellfish), followed by cleaning the fish and carrying them to the place of use. Activities associated with smoking and constructing drying racks may be involved.
Gathering	A variety of activities is involved in gathering, such as hiking, bending, stooping, wading (marsh and water plants), digging, and carrying.
Sweatlodge Use	Sweatlodge building and repairing is intermittent, but collecting firewood is a constant activity.
Materials and Food Use	Many activities of varying intensity are involved in preparing materials for use or food storage. Some are quite vigorous such as pounding or grinding seeds and nuts into flour, preparing meat, and tanning hides. Many others are semi-active, such as basket making, flintknapping, construction of storage containers, cleaning village sites, sanitation activities, home repairs, and so on.

Together, this information is then used to calculate the direct and indirect exposure factors. This process follows the general sequence:

1. Environmental setting – identify what resources are available (or would be available if uncontaminated and undegraded);
2. Lifestyle description – activities and their frequency, duration and intensity, and uses of natural resources;

Harris S.G. & Harper B.L. (2004). *Exposure Scenario for CTUIR Traditional Subsistence Lifeways.* Pendleton, OR: Confederated Tribes of the Umatilla Indian Reservation

502-77 NEPA requires that an EIS include consideration of "any adverse environmental effects which cannot be avoided should the proposal be implemented" and "any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented" (42 U.S.C. 4332 (2)(C)). The CEQ's regulations, which govern how NEPA should be implemented, require that this discussion be included with the environmental consequences of the proposed action and alternatives (40 CFR 1502.16). Chapter 7, Section 7.2, of this *TC & WM EIS* defines and discusses unavoidable adverse environmental impacts. Section 7.3 defines and discusses the irreversible and irretrievable commitments of resources that may be involved if the proposed actions are implemented.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

3. Diet (indirect exposure factors);
4. Pathways and media;
5. Exposure factors - Crosswalk between pathways and direct exposure factors; cumulative soil, water and air exposures.

The basic components of the exposure scenario are given below. Details are posted at www.phs.oregonstate.edu/ph/tribal-grant-main-page.

- Soil ingestion = 400 mg/d for all age groups
- Inhalation rate = 25 m^3/d for adults, with children scaled from the adult value
- Drinking water = 3L/d for adults, with children scaled from the adult value; an additional 1L is ingested during each use of the sweat lodge.
- Based on the ecological resources and on the anthropological literature, the CTUIR developed two relevant diets, one for the Columbia River regions where salmon forms a large percentage of the protein source, and one for upland and mountain areas with resident fish and spawning areas for anadromous species.

D.3 Socio-traditional Impacts

Examples of socio-traditional activities that are generally tied to the land and that might be disproportionally affected by federal actions are listed below. For individual sites, tribes should be consulted to develop site-specific measures.

- Impact on societal structure and cohesion (e.g., hours per year unavailable for social interaction through loss or reduced value of the resource or area)
- Educational opportunity (e.g., lost study areas associated with traditional stories or place names or family history or traditional practices; lost R&D opportunity)
- Integrity of traditional resources: number of sites with any disturbance or contamination, weighted by type and years of history associated with the site.
- Access to traditional lands: degree of restricted access (e.g., full restriction to any area or resource evidenced by institutional controls or barriers or reduced visits), fraction of ceremonial resources available relative to original quantity and quality
- Traditional landscape quality: proxy scale with elicited judgment based on original condition; total remaining landscape size without encroachments
- Degree of compliance with Treaty rights (e.g., proxy scale based on access, safety, natural and traditional resource integrity and quality, freedom from encroachments, hassle-free exercise of rights)
- Degree of Compliance with Trusteeship obligations with evaluation of tribal services.
- Preservation of future land use and remedial options (e.g., acres of permanent losses including plumes, number of uses no longer viable, number of curies x half-life in irretrievable waste forms)
- Degree of sustainability of the resource, its degree of permanent administrative protection, and associated exercise of Treaty rights of access and use.

Response side of this page intentionally left blank.

D.4 Economic Impacts

The eco-traditional system described in other sections includes human, biological, and physical components, and supports the flow of nutritional, religious, spiritual, educational, sociological, and economic services. In the general population these service flows are quantified in the symbolic form of dollars or other trusted and agreed-on exchange systems.

Indigenous economies provide the same types of services as any other economy, including employment (i.e., the roles of individuals in maintaining the functional community and ensuring its survival), shelter (house sites, construction materials), education (intergenerational knowledge required to ensure sustainable survival through time and maintain personal and community identity), commerce (barter items and stability of extended trade networks), hospitality, energy (fuel), transportation (land and water travel, waystops, navigational guides), recreation (scenic visitation areas), and economic support for specialized roles such as religious leaders and teachers.

As in dollar-based economies, indigenous subsistence communities use exchange systems composed of networks of materials with labor-based value (how long does it take to acquire or make the item, what skill is required, what effort is expended, what importance does the item have, what status does the item confer). Indigenous communities ensure the flow of goods and services with interlinked networks of reciprocity, obligation, and trust. Together these networks determine how materials, services, and information flow within the community and between the environment and the community. Wealth and security include the accumulation of knowledge, skills, and obligations as well as, or more than, the accumulation of material items including 'money.' In economic terms, this system is called a subsistence economy. An explanation of "subsistence" developed by the EPA Tribal Science Council is as follows.[31]

> "Subsistence is about relationships between people and their surrounding environment, a way of living. Subsistence involves an intrinsic spiritual connection to the earth, and includes an understanding that the earth's resources will provide everything necessary for human survival. People who subsist from the earth's basic resources remain connected to those resources, living within the circle of life. Subsistence is about living in a way that will ensure the integrity of the earth's resources for the beneficial uses of generations to come."

A subsistence economy includes people with a wide range of 'jobs' such as food procurement, processing, and distribution; transportation (pasturing and veterinary); botany/apothecary services; administration and coordination (chiefs); education (elders, linguists); governance (citizenship activities, conclaves); finance (trade, accumulation and discharge of obligations); spiritual health care; social gathering organization; and so on. The categories of 'fish, hunt, and gather' each include a full cross section of these activities. This is why 'hunting' is not just the act of shooting and eating an animal, but includes a full cross-section of all the activities that a hunter-specialist does within their community.

[31] Tribal Science Council (2002). "Subsistence: A Scientific Collaboration between Tribal Governments and the USEPA." Provided by John Persell (jpersell@lldrm.org).

Response side of this page intentionally left blank.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

Many contemporary tribal families include members engaged in both monetary and subsistent activities as wage-laborers, part-time workers, professional business people, traditional craft makers, seasonal workers, hunters, fishers, artisans, and so on. Tribal governments engage in the western dollar-based economies but also use traditional and modern technologies for harvesting and preserving foods as well as for distributing goods and services through communal networks of sharing and caring.

NEPA analysis should include subsistence economics, and not simply dollar economics.

D.5 Cumulative Risk

There is a growing recognition that conventional risk assessment methods do not address all of the things that are "at risk" in communities facing the prospect of contaminated waste sites, permitted chemical or radioactive releases, or other environmentally harmful situations. Conventional risk assessments do not provide enough information to "tell the story" or answer the questions that people ask about risks to their community, health, resource base, and way of life. As a result, cumulative risks, as defined by the community, are often not described, and therefore the remedial decisions may not be accepted. The full span of risks and impacts needs to be evaluated within the risk assessment framework in order for cumulative risks to be adequately characterized[32] (National Research Council, 1994, 1996; President's Commission, 1997).

Health, Security, and Quality of Life

Because many communities need more information than simply risk and dose results, the Environmental Protection Agency developed a Comparative Risk method over a decade ago for adding a community welfare or quality of life component[33]. The Comparative Risk field has been developing methods for community Quality of Life (QOL) that combine traditional, social, and economic measures along with aesthetics and any other factor the community identifies as important[34]. We have modified this concept to reflect traditional tribal traditional values as well

[32] National Research Council, 1994. *Building Consensus: Risk Assessment and Management in the Department of Energy's Environmental Remediation Program*. National Academy Press, Washington, D.C.
National Research Council, 1996. *Understanding Risk: Informing Decisions in a Democratic Society*. National Academy of Science, Washington, D.C.
Presidential/Congressional Commission of Risk Assessment and Risk Management, President's Commission: *Framework for Environmental Health Risk Management (Final Report, Volume 1* (1529 14th Street, NW, Suite 420, Washington, D.C., 1997) and (http://www.riskworld.com).
[33] U.S. Environmental Protection Agency, 1993. "A Guidebook to Comparing Risks and Setting Environmental Priorities." EPA-230-B-93-003.
[34] L Lindholm, M Rosen and M Emmelin How many lives is equity worth? A proposal for equity adjusted years of life saved. *Journal of Epidemiology and Community Health* 1998;52:808-811;
Ponce, RA., Bartell, SA., Wong, EY, LaFlamme, D., Carrington, C., Lee, RC., Patrick, DL., Faustman, EM., and Bolger, M. (2002) Use of Quality-Adjusted Life Year Weights with Dose-Response Models for Public Health Decisions: A Case Study of the Risks and Benefits of Fish Consumption. Risk Anal. 20: 529-542.

Response side of this page intentionally left blank.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

as secular or social community aspects that apply to suburban as well as to tribal communities[35] (Harper et al., 1995; Harper and Harris, 2000).

John M. Last defines individual human health as "a state characterized by anatomic integrity, ability to perform personal, family, work, and community roles; ability to deal with physical, biological, and social stress; a feeling of well-being; and freedom from the risk of disease and untimely death" [36]. This definition is broader than the regulatory approach which tends to equate good health with lack of excessive exposure. Definitions of health and functionality from the public health literature include a variety of medical and functional measures, but may not specifically call out the fact that the survival and well-being of every individual and culture depends on a healthy environment. This broader approach used with risk assessments is adaptable to indigenous communities that, unlike westernized communities, turn to the local ecology for food, medicine, education, religion, occupation, income, and all aspects of a good life.[37]

Homeland Security. A secure homeland means the same for tribal sovereign nations as it does for any other level of government. Impacts to homeland security of native sovereign nations may be a relevant part of EJ analysis.

- Land Base – a secure land base with jurisdiction and ownership, free from encroachment or legal threat to sovereignty or self-government or jurisdiction.
- Governance – stable, balanced government with self-determination of the tribal nation.
- Resources – natural, traditional, legal, technical, organizational, and human resources adequate to define and meet threats to stability, self-determination, resources, culture, mental and physical health, religion, economy and security. Technical and legal staff. Health and human services adequately funded.
- Capital Resources – infrastructure, cyber, and domestic resources designed to respond to threats and protect tribal values and resources with strength and understanding in a traditional manner. Adequate housing, etc.
- Security – confidence in natural resource adequacy and quality, confidence in a leadership that looks out for the members and the resources, confidence in adequate economic well-being; confidence that the culture, language, values, and people will survive; freedom from legal battles brought by the federal and other governments.
- Culture – appreciation of individuals, creativity, support of the needy, devotion to the people, justice, and the shared history and blood ties to the land and to each other, according teachings of our elders.

---

[35] Harper, B.L., Bilyard, G.R., Broh, E.H., Castleton, K.J., Dukelow, J.S., Hesser, W.A., Hostick, C.J., Jarvis, T.T., Konkel, R.S., Probasco, K.M., Staven, L.H., Strenge, D.L., Thiede, M.E., and Traynham, J.C., 1995. "Hanford Risk Management Program and Integrated Risk Assessment Program: Cost/Risk/Benefit Analyses: A K-Basin Example." Pacific Northwest National Laboratory, Richland, WA., May 1995.
[36] John Last, 1998. *Public Health and Human Ecology, 2nd ed.* Stamford, CT: Appleton & Lange.
[37] Harris and Harper, ibid and loc. Cit.
Donatuto, J. and Harper, B. (2008). Issues in Evaluating Fish Consumption Rates for Native American Tribes. Risk Analysis 26(6): 1497-1506;
Donatuto, J. (2008). When Seafood Feeds the Spirit yet Poisons the Body: Developing Health Indicators for Risk Assessment in a Naitve American Fishing Community. Dissertation. University of British Columbia.

Response side of this page intentionally left blank.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

- Religion – freedom to choose and practice any religion.
- Economy – adequate food, clothing, shelter for individual and tribal needs, both in dollars and barter, but also including riches of the landscape, heritage, and knowledge.

Vulnerability

EPA is required to identify populations who are more highly exposed; for example, subsistence populations and subsistence consumption of natural resources (Executive Order 12898[38]). EPA is also required to protect sensitive populations.[39] Some of the factors known to increase biological sensitivity include developmental stage, age (very young and very old), gender, genetics, and health status[40], and this is part of EPA's human health research strategy.[41]

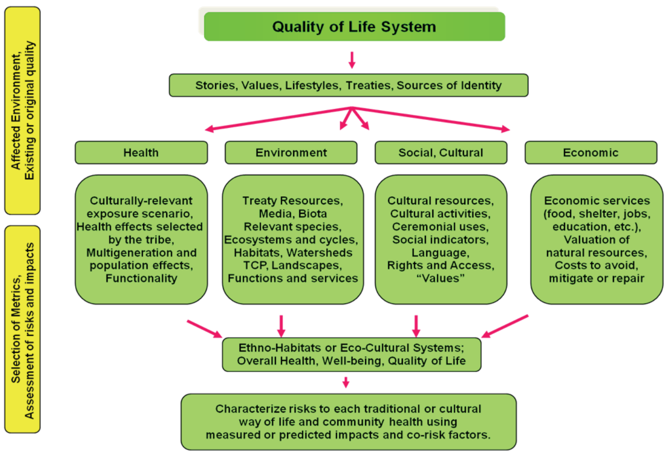
In addition, disadvantaged groups may also experience a wide range of stressors or co-risk factors[42], such as poverty, disproportionate job hazards, existing health disparities and co-morbidities, limited access to health care, later diagnosis and less access to advanced care, pervasive discrimination, overburdened or aged infrastructure, dependence on subsistence resources with increasing legal threats to hunters and fishers, loss of access to fishing, hunting, and gathering grounds, contamination of subsistence resources (fish toxics in particular), rural dumps, lower quality of utilities and communication capabilities, poorer schools, increased domestic violence, loss of religion, loss of language, increased mental health issues, greater jail time than non-natives, higher smoking and substance abuse rates, poorer housing (mold, lead, asbestos, crowded, not handicap-accessible), lack of homeowner loans and higher interest rates, and lack of money to get technical and legal expertise needed for equal participation to decision processes,

Because these factors tend to cluster in tribal communities, the overall psychological impact is the assumption that tribal lives are less important, and tribal perspectives are not important, and that tribes do not deserve the same level of protection. Consistent federal actions and attitudes over the centuries have taught many tribal members that they are not deserving of the same level of assistance from the federal government and should not expect equal treatment, becoming a self-fulfilling prophecy that tribal governments are struggling to overcome.

[38] White House, 1994. Federal Actions To Address Environmental Justice In Minority Populations And Low income Populations: Feb. 11, 1994; 59 FR 7629, Feb. 16, 1994.
[39] *Superfund Exposure Assessment Manual*. EPA/540/1-88/001 OSWER directive 9285.5-1. U.S. Environmental Protection Agency Office of Remedial Response, U.S. Environmental Protection Agency, Washington, D.C. 1988.
[40] http://www.epa.gov/nheerl/research/childrens_health.html
[41] EPA/600/R-02/050, September 2003 (posted at http://www.epa.gov/nheerl/publications/).
[42] Flaskerud, JH. and Winslow, B. (1998). Conceptualizing Vulnerable Populations. Nursing Research, 47:69-78.

Response side of this page intentionally left blank.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering



D.6 Equity analysis.

Evaluating disproportionate impacts to Native Americans involves the following:

- Are the exposures different when the tribal subsistence scenario is used as compared to the rural residential or other non-native scenario? Whose risks are highest?
- Are the natural resources of tribal interest more impacted than those identified by the general population? How important are those resources or places? How many ways are those resources or places important? How large is the impacted area from a tribal perspective?
- Do disparities in impact accumulate over many generations, and do they accumulate at a higher rate in the EJ communities? Have the next seven or more generations been taken into consideration? [43]

[43] Harper, B. and Harris, S. (2001) An Integrated Framework for Characterizing Cumulative Tribal Risks. Posted at www.iiirm.org.; Harper, B.L. and Harris, S.G., **"Measuring Risks to Tribal Community Health and Culture,"** *Environmental Toxicology and Risk Assessment: Recent Achievements in Environmental Fate and Transport, Ninth Volume, ASTM STP 1381,* F. T. Price, K. V. Brix, and N. K. Lane, Eds., American Society for Testing and Materials, West Conshohocken, PA, 1999.

Response side of this page intentionally left blank.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

- Is the tribe already vulnerable (at risk) due to existing health disparities, economic disadvantages, higher exposure to other toxics, or existence of several dozen co-risk factors (e.g., poor housing, high unemployment, etc – contact authors for more details)?
- What proportion of tribal members is affected (rather than absolute numbers of people)?
- Is the federal fiduciary Trust obligation being met?
- Is traditional awareness and respect shown equitably to the affected tribes as to the local civic entities?[44]

Example of Summary Impacts (complete for each population segment).

Resource or Topic	Features, Attributes, Functions, Goods, Services	Measures of loss or benefit (positive or negative movement; degree of movement)
Sitewide Integrity	*(See above tables)*	
Landscape		
Light, Noise, other aesthetic attributes.		
Viewshed		
Air quality, dust		
Soil,		
Minerals, gravel, fill, barrier material		
Sediments		
Water		
Terrestrial Ecosystems		
Terrestrial habitats and species		
Aquatic Ecosystems		
Aquatic habitats and species, shorelines		
Transportation	Features and events related to safety and vulnerability of adjacent areas.	General transportation risks; Routes through tribal lands; Routes near critical habitats, rivers.
Hazardous substances; safety aspects	Baseline (target) is lack of contamination; current condition is tremendous contamination.	Amount of hazardous material imported, generated, stored, or disposed. Amount of hazardous material already on site, both permitted and contaminated.
Human Health	Target is both lack of excessive exposure and active multi-dimensional health promotion.	Individual and community doses and risks using Tribal scenarios, Multigenerational exposures and risk, Consideration of broader health context.
Env Justice	Tribally-appropriate EJ analysis needed to understand disproportionate impacts.	Compliance with Treaty and Trust; Presence of disadvantaged or disproportionally affected groups-Tribes;

[44] From: American Indian and Alaskan Native Environmental Justice Roundtable. Albuquerque, New Mexico August 3-4, 2000; Final Report, January 31, 2001. Edited by the Environmental Biosciences Program, Medical University of South Carolina Press.

Response side of this page intentionally left blank.

Commentor No. 502 (cont'd): Stuart Harris, Director, Confederated Tribes of the Umatilla Indian Reservation, Department of Science and Engineering

		Eco-spatial basis for tribal EJ analysis.
Economic	Recognition of subsistence economy methods.	Convention analysis for general pop; Impacts to subsistence for tribes.
Traditional Resources	Need evaluation of likelihood of adverse or beneficial impacts to sites, zones, districts.	Amount of activity in TCP, archaeological zone, sacred sites, and NHPA sites.
Energy and Infrastructure	Need lifecycle energy and infrastructure evaluation, including adequacy of closure plans.	Energy requirement Infrastructure footprint Replacement-mitigation of resources Road needs, water and sewer needs. Intensity of security needs
Climate-Energy Values	Targets of energy efficiency, net zero, sustainability, planning for climate change.	Net-zero operations Carbon footprint
Cumulative	Lifeways support	Impacts to health, ecology, traditional, socio-economic, other analyses. Space-time mapping of impacts. Lifecycle impacts and costs. Sitewide totals of hazardous materials, footprints; impact on the ability to reach a fully restored endstate.
Homeland Security		

Making the Decision

In the case that disproportionate impacts occur, what would cause (or allow) a regulator to make a decision that reduces the disparities in impacts, especially if it costs money? Often the community at disproportionate risk is expected to take responsibility for reducing their risk by changing their heritage, religious, or ceremonial activities, rather than removing the underlying cause of the inequity.[45] In reality, this magnifies the disproportionate impacts rather than reducing them. One of the most visible examples of this is the expectation that native sovereign nations reduce their fish consumption due to contamination, in effect requiring the Tribe to choose between health and religion.

A methodology for evaluating disproportionate impacts is presented here. The real challenge is to the federal government to reduce the inequity by making more protective decisions.

[45] O'Neill, C.A. (2003). Risk avoidance, traditional discrimination, and environmental justice for indigenous peoples. *Ecology Law Quarterly* 30, 1-57.

Response side of this page intentionally left blank.

Commentor No. 503: Rosemary Sikes

From: Rosemary Sikes [rosemarysikes@olympus.net]
Sent: Monday, May 03, 2010 5:50 PM
To: tc&wmeis@saic.com
Subject: EIS public comment from Dept. of Energy

I am writing to comment on the Environment impact statement (EIS) that was required to be written by the Department of Energy (DOE) concerning treating and managing waste at Hanford Nuclear Reservation. I am a life long resident of Washington state, born and raised in eastern Washington, now living in Port Townsend, WA. I am outraged the EIS proposes adding millions more cubic feet of radioactive waste at the 560-square mile Hanford Nuclear Reservation near the Columbia River before cleaning up the vast mess already there. Hanford already ranks as the most contaminated site in North America. **503-1** The Washington State Department of Ecology says that more than a million gallons of highly toxic waste already has leaked from Hanford's 177 underground storage tanks, which contain 53 million gallons of high-level radioactive material. The Hanford situation poses serious threats to human communities and ecosystems, particularly the Columbia River. **503-2** The notion that the federal government would allow Washington's burden of radioactive waste to escalate is unfathomable, especially considering the treatment facility to convert a portion of the existing waste to a more stable glass form for underground burial is now delayed for operations until at least 2019. Washington state has already taken way more than our share of the nations nuclear waste. NO MORE!!!! Let each state store the radioactive waste it produces. I believe this strategy will also reduce the amount of radioactive waste produced. **503-1 cont'd**

Sincerely,

Rosemary Sikes
1709 Gise Street
Port Townsend, WA 98368
rosemarysikes@olympus.net

503-1 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

503-2 DOE recognizes that groundwater contamination from past leaks is a concern at Hanford and its potential impact on communities and the ecosystems around Hanford. One of the purposes of this *TC & WM EIS* is to analyze the potential impacts of DOE's proposed actions to retrieve waste from the buried tanks, treat and dispose of this waste, and close the SST farms by landfill closure, selective clean closure, or clean closure. This analysis is also intended to aid DOE in making decisions regarding cleanup of the past leaks, including remediation of the contamination in the vadose zone.

Commentor No. 504: Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

From: Tom Carpenter [tomc@hanfordchallenge.org]
Sent: Monday, May 03, 2010 6:09 PM
To: tc&wmeis@saic.com
Cc: 'Fettus, Geoffrey'; kaltofen@aol.com; 'John Brodeur'; David Brockman; 'Olinger, Shirley J'
Subject: Comments of Hanford Challenge and NRDC
Attachments: 2010 05.03 HC NRDC Comments on the Draft Tank Closure and Waste Management.pdf

May 3, 2010

Mary Beth Burandt, NEPA Document Manager
U.S. Department of Energy, Office of River Protection
P.O. Box 1178
Richland, W A 99352
TC&WMEIS@saic.com

Re: Draft Tank Closure and Waste Management Environmental Impact Statement Comments by Hanford Challenge and NRDC

Dear Ms. Burandt,

Attached please find the written joint comments submitted by Hanford Challenge and the Natural Resources Defense Council (NRDC) regarding the Department's Tank Closure and Waste Management Draft Environmental Impact Statement.

Thank you for the opportunity to provide these comments.

Sincerely yours,

Tom Carpenter, Executive Director
Hanford Challenge
219 First Avenue, S., Suite 120
Seattle, WA 98104
(xxx) xxx-xxxx, ex xx
tomc@hanfordchallenge.org

Geoff Fettus, Senior Project Attorney
Natural Resources Defense Council
1200 New York Avenue, NW
Suite 400
Washington, D.C. 20005
(xxx) xxx-xxxx
gfettus@nrdc.org

Response side of this page intentionally left blank.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

hanford challenge

NRDC
THE EARTH'S BEST DEFENSE

May 3, 2010

Mary Beth Burandt, NEPA Document Manager
U.S. Department of Energy, Office of River Protection
P.O. Box 1178
Richland, W A 99352
TC&WMEIS@saic.com

Re: Draft Tank Closure and Waste Management Environmental Impact Statement Comments

Dear Ms. Burandt,

Hanford Challenge and the Natural Resources Defense Council (NRDC) hereby submit our joint comments regarding the Department's Tank Closure and Waste Management Draft Environmental Impact Statement.

Hanford Challenge is a membership-based, regional public interest organization based in Washington State. Our mission is to help create a future for Hanford that secures human health and safety, advances accountability, and promotes a sustainable environmental and economic legacy for Northwest communities.

NRDC is a national non-profit membership environmental organization with offices in Washington, D.C., New York City, San Francisco, Chicago, Los Angeles and Beijing. NRDC has a nationwide membership of over one million combined members and activists. NRDC's activities include maintaining and enhancing environmental quality and monitoring federal agency actions to ensure that federal statutes enacted to protect human health and the environment are fully and properly implemented. Since its inception in 1970, NRDC has sought to improve the environmental, health, and safety conditions at the nuclear facilities

Response side of this page intentionally left blank.

operated by DOE and the civil nuclear facilities licensed by the NRC and their predecessor agencies.

Our vision for the Hanford Site is that the environs around it are safe and accessible for all potential uses, without restriction. In particular, any environmental remediation project at Hanford should:

- Protect the Columbia River over the long term, which means effectively addressing groundwater and soil contamination
- Not rely on institutional barriers or take any credit for human control beyond 100 years after the completion of the cleanup
- Protect human health and the environment, including workers, future residents, consumers of agricultural products, recreational and commercial river users, and tribal peoples
- Honor tribal rights and treaties
- Retrieve, treat and secure any contamination that poses significant risks to the ecology and current and future generations.

These comments were prepared by Tom Carpenter, Executive Director of Hanford Challenge, Geoffrey Fettus, Senior Project Attorney at NRDC, and expert technical comments were provided by two reviewers:

1. Marco Kaltofen, PE, (Civil, Mass.)
   Boston Chemical Data Corp.
   Natick, MA (Attachment 1)

2. John Brodeur, PE, LEG
   Energy Sciences & Engineering
   Kennewick, WA (Attachment 2)

Executive Summary of Comments

Generally:

1) The DOE should revise and reissue the draft EIS and not move forward with a final EIS until such time as a complete site characterization is conducted and after valid risk assessment models are developed. **504-1**

2) The Draft EIS must conform to existing federal law and it must conform to lawfully rendered agreements. Metrics which do not meet the lawfulness test or do not carry the force of regulations fail to meet NEPA **504-2**

504-1 In response to previous comments regarding the adequacy of site characterization, DOE and Ecology have reviewed the data and associated uncertainties and concluded that there are sufficient site characterization data to support this EIS, and that risk assessment models used are valid. Under CEQ NEPA regulations, agencies must "apply NEPA early in the process" and "integrate the NEPA process with other planning at the earliest time possible" (40 CFR 1501.2). There must be a balanced judgment concerning an agency's decision to start the NEPA process early enough to inform its decisions, while recognizing that all of the necessary information may not be available. CEQ regulations have long recognized this tension and provided appropriate ways to proceed with an EIS (40 CFR 1502.22). Valid risk assessment models were used in the draft EIS impact analyses. DOE and Ecology have determined the data and analyses are adequate to ensure a credible evaluation of the reasonably foreseeable impacts of the alternatives. Uncertainties in the analyses are discussed as required under CEQ regulations (40 CFR 1502.22). The methodology used to analyze the impacts of the alternatives is described in Appendix F; the methodology used to analyze the cumulative impacts is described in Appendix R.

504-2 DOE must comply with certain legal requirements to undertake specific activities that are part of the proposed actions and alternatives; these requirements are identified throughout this EIS. For example, Chapter 1, Section 1.2.1, discusses Hanford regulatory compliance requirements; Section 1.2.7 discusses the WAC regulations DOE must meet for the proposed closure of the SSTs. Section 1.9, which describes the alternatives evaluated in this EIS, refers to the RCRA, WAC, and DOE order requirements that must be met for DOE to implement the Tank Closure alternatives. The very nature of "environmental impacts analysis" requires DOE to analyze and describe in this EIS how proposed processes and technologies would operate; what results they are expected to achieve; what end products or byproducts might result; and how these measure up against the legal requirements that apply. Statutory, regulatory, Executive order, and DOE requirements are discussed in the context of each chapter and are listed in the references at the end of each chapter.

Additionally, NEPA regulations do not require alternatives to be fully compliant with laws or regulations (40 CFR 1502.2(d)), as explained in NEPA guidance (NEPA's Forty Most Asked Questions [46 FR 18026]), which states that "An alternative that is outside the legal jurisdiction of the lead agency must still be analyzed in the EIS if it is reasonable. A potential conflict with local or federal

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

standards. One such example is the use of future areal extent of groundwater above standards, as opposed to a metric which does carry the force of law, such as future human health risk to individuals or populations. Metrics for the NEPA alternatives selection must meet all established and lawful standards such as cancer and non-cancer risks to individual resource users, environmental risks, species level risks, and adverse impacts to Native American Indian cultural resources. **504-2 cont'd**

3) The existing failures to meet completeness standards for significant portions of the draft proposed EIS nevertheless are likely to legally preclude final approval of a comprehensive EIS. The failure to address groundwater in the saturated zone is an obvious weakness of the draft proposed EIS. This level of omission has not survived scrutiny in other formerly used defense facilities which have completed their respective EIS processes. Likewise, the failure to identify or even screen for preferential underground pathways for groundwater transport is another glaring omission, which has a significant bearing on the risk numbers generated by this drafting process. **504-3**

   These omissions are so significant that severability of the various milestones on the road to creating a complete, comprehensive, and lawful EIS is essential.

4) Rather than use single scalar averages to represent all portions of the entire site uniformly, the Draft EIS should use of ranges of values or at least statistically significant values matched to actual site conditions. The current Draft EIS assumes that no preferential pathways exist in the subsurface, and that the site is perfectly homogeneous and well-characterized. Such conditions barely exist in the simple laboratory simulations, and never exist in any real-world systems. There can be no confidence in risk estimates that are based upon average values that imply homogeneity throughout the site. The use of such values fails to meet the standard of engineering practice demanded by the regulations upon which the EIS process is based. **504-4**

5) The Draft EIS should conform to CERCLA and for Washington State's Model Toxic Control Act[1] requirements for protecting human health. Lifetime cancer risks, under those laws should not exceed 1 x10^{-5}, applicable under MTCA when multiple carcinogens are considered. **504-5**

[1] Washington Administrative Code (WAC) 173-340-200)

Hanford Challenge and NRDC Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site Page 3

law does not necessarily render an alternative unreasonable, although such conflicts must be considered."

Chapter 8 identifies and discusses the laws and legal requirements that are potentially applicable to the proposed actions and alternatives, as well as the permits and approvals DOE must obtain from Federal, state, and local agencies. In Sections 8.1.7 and 8.3, DOE identifies the consultations and coordination that DOE has undertaken with American Indian tribes and would need to continue for the purpose of implementing the proposed actions and alternatives.

Chapter 7, Sections 7.1 and 7.5, discuss potential mitigation measures that may be needed and are feasible for DOE to implement to offset the potential impacts that might result from implementing an alternative. While DOE's Preferred Alternatives for tank closure, FFTF decommissioning, and waste management in this *TC & WM EIS* may not necessarily represent the most environmentally preferred alternatives, the ROD issued by DOE will identify any additional mitigation and monitoring commitments adopted by DOE and specify other factors considered by DOE in reaching its decision, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. In announcing its decision in the ROD based on the EIS analyses, DOE will be obligated to carry out the decision consistent with the requirements identified in this EIS. These requirements will be interpreted and applied by Federal, state, and local regulatory agencies through their independent authorities. These agencies may also impose additional mitigation measures through future permitting processes or remedial actions under the scope of the TPA, which would include additional opportunities for public comment.

504-3 DOE disagrees with the commentor's supposition that this *TC & WM EIS* fails to address groundwater in the saturated zone. Both groundwater flow and transport in the saturated zone are discussed in Chapters 5 and 6 and Appendices L and O of the *Draft TC & WM EIS*. DOE also does not agree with the supposition that this *TC & WM EIS* fails to identify or screen for preferential underground pathways. The discussions in Appendix L regarding the zonation and parameterization of the flow model explicitly mention that a high-conductivity channel in the unconfined aquifer is necessary to achieve a good calibration and is a necessary feature of the model framework. DOE agrees with the commentor's view that heterogeneities in the hydraulic conductivity zonation can influence projections of risk through the groundwater pathway.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Offsite Wastes

6) Alternatives in the Draft EIS which include off site waste acceptance should be severed from this EIS process in order to maintain consistency with existing federal regulations. The acceptance of offsite wastes is neither required to proceed with any of the remaining Alternatives described in the EIS, nor does it further any of the NEPA required actions at the Hanford Facility, such as limitation of adverse environmental affects, prevention of negative alterations of short or long term land-uses, or the prevention of adverse outcomes from the irretrievable commitments of cleanup resources.

The DOE is poised to spend tens of billions of tax dollars on one of the most complex and challenging remediation campaigns ever undertaken. Importing and disposing of offsite waste that will in fact add new contamination to the groundwater and violate drinking water standards for thousands of years is indefensible, and defeats the purpose of the remediation effort. **504-6**

High-Level Waste Tanks

7) Hanford Challenge and NRDC support Oregon's Proposed Alternative 7 identified in its preliminary comments to the Department of Energy in a letter dated January 5, 2010. However, we believe that all the tank waste should be removed from the tanks, adequate characterization be performed to determine whether certain tanks need to be removed, and leaked waste that has leaked from the tanks into surrounding soils be retrieved and treated. **504-7**

8) Per the above comments, additional clarity is needed in the Draft EIS on the long term environmental and public health impacts of leaving at least 1 percent of the HLW in place in the heel of the tanks. **504-8**

9) Also, we write to clarify some areas of altered statutory requirements. Specifically, DOE should be aware that neither *NRDC v. Abraham*, 271 F.Supp. 2d 1260 (D.Idaho 2003) nor *NRDC v. Abraham*, 388 F.3d 701 (9th Cir. 2004) collectively, the "HLW Decisions," bar DOE from removing high-level radioactive waste (HLW) from the tanks and **504-9**

Hanford Challenge and NRDC Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site Page 4

504-4 DOE disagrees with the premise of the comment, specifically with the assertion that single-scalar averages were used to represent the entire site uniformly. Spatial heterogeneity was explicitly considered in the groundwater flow analysis (Appendix L), vadose zone flow and transport analysis (Appendix N), and groundwater transport analysis (Appendix O). Appendix L documents the finding that a zone of high hydraulic conductivity is required to match field observations across the central portion of the site (Section L.4.3.2.2). DOE believes that inclusion of spatial heterogeneity (at a scale sufficient to support the analyses of contaminant transport from the sources that contribute to long-term impact) is a requirement of an unbiased comparison of the impacts under the alternatives.

504-5 This EIS is not being prepared under CERCLA; therefore, the ARARs process does not apply. However, some of the ongoing Hanford site activities that are considered in the cumulative impacts analysis are currently undergoing remediation under the TPA, which is the legally binding process used at Hanford to implement CERCLA and RCRA (hazardous waste) requirements. All environmental restoration actions conducted at Hanford under CERCLA must evaluate the "legally applicable, relevant and appropriate requirements of Federal and State laws and regulations" to establish the appropriate cleanup level that must be achieved at an individual cleanup site.

However, the scope of the proposed actions evaluated in this *TC & WM EIS* does not include CERCLA remedial actions. Under NEPA, agencies identify the laws, regulations, and requirements that may apply to the proposed action and alternatives and identify where standards may be exceeded. This is not the same as an "ARARs analysis" under CERCLA, and it serves a different purpose. The identification of legal requirements in a NEPA document assists an agency in its planning, funding, and decisionmaking process. It also provides full disclosure to members of the public, stakeholders, and other agencies regarding the potential scope of an agency's effort to implement a proposed action (or an alternative) in terms of the subsequent permitting, other approvals, consultations, and coordination requirements, all of which would include additional public involvement opportunities in the future.

The "benchmark standards" used in this *TC & WM EIS* represent dose or concentration levels that correspond to known or established human health effects. For groundwater, the benchmark is the MCL if an MCL is available. For example, the benchmark for iodine-129 is 1 picocurie per liter; for technetium-99, it is 900 picocuries per liter. These benchmark standards for groundwater

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

treating that waste for disposal. Nor do the HLW decisions bar DOE from separating some portion of that waste into a stream that meets low-level radioactive waste (LLW) standards and disposing of that waste outside of a geologic repository in a properly licensed disposal site. Section 3116 of the 2005 National Defense Authorization Act, DOE's response to the original Idaho Federal District Court HLW Decision was a significant change to the entire structure and purpose of the Nuclear Waste Policy Act (NWPA), not a "clarification." That law has application in South Carolina and Idaho. Section 3116 does not have application in Washington or Oregon. See, Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005, Pub. L. No. 108-375, § 3116, 118 Stat. 1811, 2162-64 (2004). **504-9 cont'd**

10) The "waste incidental to reprocessing" concept codified in Section 3116 does not set cleanup standards of "99 percent," "most of the radioactivity," or an "inch and half of waste at the bottom of the tank." In fact, it sets no cleanup standard whatsoever and leaves the matter of how much radioactive waste to leave behind entirely up to the DOE. DOE should ensure that this concept is left out of its consideration of final and preferred alternatives for the Hanford Draft EIS.

11) Under the current NWPA, the Environmental Protection Agency (EPA) and the Nuclear Regulatory Commission (NRC) regulate the geologic disposal of HLW – and decide what is (and what is not) HLW. At the Hanford Reservation, DOE may not unilaterally decide that HLW has been transformed into "waste incidental to reprocessing." If the concepts embodied in Section 3116 are in any way adopted or used in the Hanford Draft EIS, then EPA, NRC and the states will not have meaningful oversight over the amount of radioactive waste DOE decides to leave in the tanks. **504-10**

12) NRDC and literally dozens of environmental and public interest groups stood with Washington, Oregon, New York, and New Mexico and objected to the concepts embodied in Section 3116. Only the states of South Carolina and Idaho – who sided with the other states as recently as March 2004 in objecting to DOE's assertion of "waste incidental to reprocessing" authority –submitted to DOE's cleanup budget-threatening tactics and supported the legislative change. Via Section 3116, DOE obtained an exemption from the NWPA and the ability to reclassify HLW as "incidental waste" without any **504-11**

Hanford Challenge and NRDC Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site Page 5

impacts analysis were agreed upon by both DOE and Ecology as the basis for comparing the alternatives and representing the potential groundwater impacts. In addition, this approach is consistent with the MTCA standards Method A, which is used to establish cleanup levels under the separate CERCLA and RCRA processes established by the TPA. Method A draws from current Federal and state standards, including the MCLs listed in Table 720-1 of the MTCA.

504-6 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

504-7 Chapter 2, Section 2.6.4, of this *Final TC & WM EIS* has been revised to include a discussion of the Oregon Department of Energy's proposal and how DOE has addressed the range of reasonable alternatives for tank waste storage, retrieval, and treatment and remediation of the existing tank farms in its original alternatives. DOE has carefully considered the Oregon proposal and, as explained in Section 2.6.4, has determined that it is not reasonable.

The impacts of different levels of tank waste retrieval and of different types of SST system closure are addressed in the *TC & WM EIS* analyses. For both Tank Closure Alternatives 6A and 6B, Base Cases, the assumption is that the SST system would be cleaned to levels that would allow for unrestricted use, which would involve removal of the tanks, ancillary equipment, and soils beneath the tanks (contaminated as a result of past leaks) down to the water table. The two Option Cases represent this type of clean closure along with removal of soils beneath the tank farms (contaminated as a result of infiltration from the contiguous cribs and trenches [ditches]). The analysis shows that the removal of the contaminants from the vadose zone does not capture the contaminants that may have already reached the groundwater table due to past practices (i.e., past leaks and infiltration from contiguous cribs and trenches [ditches]).

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

congressional or state oversight. No such similar path forward exists at the Hanford site. **504-11 cont'd**

13) Clean closure of the tanks is the preferred alternative. The Draft EIS should be revised to include alternatives for Double Shell Tank closure. The Draft EIS does not consider and evaluate a true clean closure scenario that includes cleanup of the groundwater, deep vadose zone contamination and groundwater contamination from past practice facilities. Instead, all of the Alternatives fail to meet regulatory compliance standards for groundwater contamination at some point. If alternatives are presented and analyzed in the Draft EIS that fail to meet regulatory standards, that should be identified, discussed and explained in the Draft EIS. All Alternatives should be compared to a true clean closure alternative. Alternative 6(b) is the closest acceptable alternative presented. **504-12**

14) DOE should adopt an interim policy that the farms will be clean-closed. Tank farm closure decisions can be revisited and made final after completing a more comprehensive characterization of the groundwater and vadose zone in order to understand the basic characteristics of the contamination migration processes. **504-13**

15) No action should be undertaken by DOE that would serve to preclude clean closure of the tanks, including grouting of tanks. **504-14**

16) All tank waste should be immobilized through vitrification. None of this waste should be disposed of on the Hanford Site, however. Adequate provision for temporary storage should be made at Hanford until a deep geological repository becomes available for use. Hanford Challenge opposes bulk vitrification and stone-casting. We support Option 2B for two high-level waste and six low activity waste melters. **504-15**

17) Safety and worker protection should be paramount considerations in the tank farm closure and vitrification processes. **504-16**

Groundwater and Vadose Zone

18) The Draft EIS also does not include or consider decisions about groundwater remediation at the tank farms. Instead, all of the Alternatives create groundwater sacrifice zones by default because all **504-17**

504-8 The decision to leave 0.1 percent, 1 percent, or more of the waste in the SSTs is one of the decisions supported by this *TC & WM EIS* (see Section S.1.3.1 of the *TC & WM EIS* Summary and Chapter 1, Section 1.4.1). The environmental and human health impacts of leaving 1 percent of the tank waste prior to closure is presented in several part of this EIS, including the Summary and Chapters 2 and 5. With regard to the disproportionate amount of radioactivity in the residues at the bottom of the tanks, DOE currently does not have a technical basis for making more-specific assumptions about the expected compositions of the waste "heels" that would remain in the tanks after retrieval. Retrieval has been completed on only a small number of SSTs, and not much is known about the behavior of, or ability to remove, small volumes of residual waste. However, the tank closure process, which includes detailed examinations of the tanks and residual waste, requires preparation of a performance assessment and a closure plan. These required documents will provide the information and analysis necessary for DOE and the regulators to make specific decisions on what levels of residual tank waste are acceptable in terms of short- and long-term risks.

504-9 As described in Chapter 8, Section 8.1.5, of this *TC & WM EIS*, DOE Order 435.1 and its associated manual and guidance establish responsibilities and requirements for management of DOE HLW, TRU waste, LLW, and the radioactive component of mixed waste. These detailed radioactive waste management requirements include requirements for management of waste incidental to reprocessing determinations; waste characterization and certification; waste storage, treatment, and disposal; and radioactive waste facility design and closure. The terms "incidental waste" and "waste incidental to reprocessing" refer to a process for identifying waste streams that are incidental to SNF reprocessing; such waste is subsequently managed as LLW or TRU waste if the "waste incidental to reprocessing" requirements contained in DOE Manual 435.1–1 are met. Thus, through this process, DOE is able to make a determination that, for example, waste residues remaining in tanks, equipment, or transfer lines can be managed as LLW or TRU waste if the requirements in Section II.B of DOE Manual 435.1–1 have been or will be met. These requirements are divided into two processes, the "citation" process and the "evaluation" process. Waste resulting from processing SNF that is determined to be incidental to reprocessing is not HLW and would be managed under DOE's regulatory authority in accordance with the requirements for LLW or TRU waste, as appropriate. When determining whether SNF processing plant waste is another waste type or HLW, either the citation or evaluation process in DOE Order 435.1 can be used.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Alternatives fail to meet regulatory compliance standards for groundwater. Long-term groundwater impacts would result in extensive regions of contamination along the Columbia River shoreline making the area uninhabitable. Yet the Draft EIS states that groundwater decisions are not a part of this Draft EIS. The DOE cannot say that they are going to clean up the tank farms by sacrificing the groundwater, and then claim that decisions about groundwater cleanup are not part of the Draft EIS. Clearly the Draft EIS must include consideration of groundwater cleanup decisions. **504-17 cont'd**

19) There should be no grouting and "closure" of the tanks with amounts of HLW in place, as DOE would be unable to remove any additional waste from the tanks or further maintain the integrity of the tanks. While DOE can be expected to environmentally monitor the tank fields as long as DOE has custodial responsibility over the sites, it is not contemplated that the tanks would be monitored for any specified period of time beyond that and passive institutional controls will need to be in place. Currently, we are unaware of any requirement for markers to alert future generations to the hazards posed by the waste similar to the requirements for passive institutional controls at geologic disposal site(s) for high-level radioactive waste. Such a situation would be the equivalent of abandoning waste in place. The prevailing attitude of the scientific community also uses the term "abandon." The National Academies had this to say on the performance of grout in binding radioactive waste: **504-18**

> Predicting performance in resisting water infiltration can be difficult because of uncertainties that include the degree to which the first layers of grout take up the residue, the water pathway effects of the cold joints between successive pours of grout, and the effects of preferential corrosion of the tank metal and penetrating structures (thereby offering a partial bypass path). Moreover, waste tank residue is likely to be highly radioactive and not taken up in the grout, so there is substantial uncertainty associated with the volumetric classification and average concentration of the waste

In July 2003, parts of DOE Order 435.1 dealing with the procedures for determining waste incidental to reprocessing were declared invalid by the U.S. District Court for the District of Idaho in *Natural Resources Defense Council v. Abraham*, 271 F. Supp.2d 1260 (D. Id. 2003). On November 5, 2004, the court's decision was reversed on appeal by the U.S. Court of Appeals for the Ninth Circuit and remanded to the District Court with instructions to dismiss the case (*Natural Resources Defense Council v. Abraham*, 388 F.3d 701 [9th Cir. 2004]). On March 6, 2006, the District Court dismissed the case.

Some alternatives analyzed in this *TC & WM EIS* evaluate SST system closure, as well as disposal at Hanford of ILAW, ancillary equipment, WTP melters, and other supplemental-waste streams that meet the *Hanford Site Solid Waste Acceptance Criteria*, Revision 12 (Fluor Hanford 2005). DOE would proceed with SST system closure and disposal of these wastes only if closure and disposal activities complied with applicable laws. (For a more comprehensive discussion on the compliance with regulatory requirements, see Section 2.7 of this CRD) LLW and MLLW disposal facilities that would be sited, constructed, and operated under the alternatives analyzed in this EIS would be subject to the appropriate DOE Manual 435.1–1 requirements. Closure of HLW facilities, including the tank farms, also would be subject to DOE Manual 435.1–1 requirements.

504-10 The analytical approach and evaluation methods utilized in this *TC & WM EIS* are consistent with NEPA requirements and applicable law. Section 3116 of the 2005 National Defense Authorization Act is not currently applicable to the State of Washington, and only applies to the States of Idaho and South Carolina. At Hanford, the requirements for management of DOE HLW, TRU and LLW, and the radioactive component of mixed waste are provided in DOE Order 435.1 and its associated manual and guidance and are described in Chapter 8, Section 8.1.5, of this *TC & WM EIS*. Furthermore, as discussed in the *TC & WM EIS* Summary, Section S.5.2.1.4, and Chapter 2, Section 2.7.4, the final waste classifications of certain waste streams have not yet been determined. Nevertheless, to ensure consideration of the full range of alternatives, the EIS analyzes two alternatives, Tank Closure Alternatives 6A and 6B, both of which assume that the tank waste is all managed as HLW either because (a) the waste has been determined to be HLW, or (b) the historical processing data for the waste streams do not support management of the waste as non-HLW. It is also important to note that DOE is not making decisions based on this *TC & WM EIS* on the ultimate disposition of waste streams that are currently managed as HLW at Hanford, and will make and prediction of the isolation performance of the system.[2] **504-18 cont'd**

20) A comprehensive workplan for achieving the legally mandated levels of groundwater restoration must be included among the alternatives in the draft final EIS. In effect, this draft EIS contains only a "No Action Alternative" for contaminated groundwater at Hanford. **504-19**

21) The invalidity of the vadose zone model is demonstrated by the fact that there is a complete misunderstanding of the source of the contamination plume that was used in the attempt to calibrate the vadose zone model. Vadose zone modeling is not properly calibrated and is inappropriate for assessing risk from contaminant migration through the vadose zone. **504-20**

22) There is inadequate characterization of the nature and extent of the vadose zone contamination. None of the larger vadose zone contamination plumes at the tank farms have been adequately characterized to the extent that they can be used to perform the type of model validation that is needed for the risk assessments. **504-21**

23) When some of the massive past releases occurred, soils were at near-saturation conditions, causing downward flow along preferential drainage pathways to the groundwater. This type of contaminant migration is common at most of the Hanford tank farms as indicated by patterns of contamination distribution and as is found in the similar geologic conditions in the lower Columbia Basin. With these conditions, it is inappropriate to use the type of vadose zone contamination migration model that was used in the Draft EIS. **504-22**

24) The first step to completing a valid risk assessment is to characterize the nature and extent of contamination in the soil around the tank farms. This means tracing the contamination from the source through the unsaturated zone soil and into groundwater at most of the contamination plumes. Currently active sources of groundwater contamination are not included in the risk models. Active sources of **504-23**

[2] National Research Council, Commission on Geosciences, Environment, and Resources. Board on Radioactive Waste Management, Committee on the Remediation of Buried and Tank Wastes, Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites. Washington, DC: National Academy Press. 2000, p. 40.

Hanford Challenge and NRDC Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site Page 8

those decisions in accordance with applicable law.

504-11 Comment noted regarding the Section 3116 "waste incidental to reprocessing" process.

504-12 Potential conflicts with laws and regulatory compliance standards do not necessarily cause an alternative to be unreasonable, but additional mitigation commitments may be required if it is selected for implementation. This *TC & WM EIS* addresses the potential laws and requirements that would apply to the proposed actions, depending on the alternative (see Chapter 8). Issues concerning the ability to meet legal standards or requirements are also discussed, along with the potential mitigation measures that may be needed and that are feasible for DOE to implement. Additional mitigation measures could be required in future permits issued by the State of Washington, or be addressed under the scope of the TPA as part of future remedial actions that are subject to CERCLA. In the ROD, DOE will identify and discuss the factors considered in reaching its decisions, such as economic, technical, and national policy considerations, along with mitigation and monitoring measures that DOE will implement. With respect to the DSTs, as noted in the *TC & WM EIS* Summary, Section S.1.3.2, and Chapter 1, Section 1.4.2, a closure configuration for the original 28 DSTs was evaluated in this EIS for engineering reasons related to the closure barrier placement. However, a decision on closure of DSTs is not part of the proposed actions because the DSTs are active components needed to complete waste treatment. Closure of the DSTs would need to be addressed at a later date subject to appropriate NEPA review.

504-13 As outlined in DOE's Preferred Alternative for tank closure, DOE prefers landfill closure, which could include implementation of corrective/mitigation actions, as described in Chapter 7 of this EIS, that may require soil removal or treatment of the vadose zone. Decisions on the extent of soil removal or treatment, if needed, will be made on a tank farm- or waste management area-basis through the RCRA closure permitting process. DOE does not prefer alternatives with clean closure components because DOE believes that removal of the tank structures is technically infeasible and, due to both the depth of the contamination and the technical issues associated with removal of the tank structures, that it presents significant uncertainty in terms of worker exposure risk and waste generation volume.

504-14 Comment noted.

504-15 DOE believes the commentor actually supports Tank Closure Alternative 6B,

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

vadose zone contamination are also not included in the risk models. It is premature to make tank closure decisions and create groundwater sacrifice zones until the subsurface conditions are understood and vadose zone plumes are adequately characterized. 504-23 cont'd

25) The Draft EIS should also evaluate a large scale soil excavation/removal strategy for deep contamination removal. 504-24

26) The DOE uses full clean closure costs but only partial clean closure benefits in its cost benefit analysis. 504-25

27) Technitium-99 contamination related to the BY Cribs (Figure N-5 in the Draft EIS) shows an increasing trend from about 500 pCi/L to 20,000 pCi/L and rising from about 1983 to the present. This trend indicates a dynamic groundwater contamination condition, not a steady state flow as modeled, and it indicates that an active vadose zone plume is just now entering the groundwater in the immediate vicinity of the well. 504-26

28) DOE should not plan to undertake any remediation that requires institutional controls beyond 10 years after closure. The Draft EIS appears to assume that the DOE, or another agency of the US government, will control the Hanford Site for 10,000 years (vol 2., p. Q-31). This is an extremely unlikely scenario, and defies common sense. 504-27

Detailed comments from Marco Kaltofen, PE, (Civil, Mass.), Boston Chemical Data Corporation, and John Brodeur, PE, LEG, are attached to this letter and should be incorporated in full as part of these comments.

In addition to the attached expert comments, we also offer the following detailed comments:

29) The Draft EIS alternatives should be amended to identify mitigation to protect the soil, groundwater, environment and future generations. 504-28

30) Please identify how Quality Assurance/Quality Control (QA/QC) procedures and protocols were used in the performance of the draft TC&WM EIS analysis. 504-29

31) p. 24, Vol. 1, 1.7.1: Retrieval should be governed by more than the 99 percent volumetric goal. After the 99 percent volumetric retrieval, if 504-30

Hanford Challenge and NRDC Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site Page 9

which would use a 2 HLW melter by 6 LAW melter configuration, because Alternative 2B assumes onsite disposal of ILAW glass. However, even Alternative 6B assumes secondary waste generated during treatment operations would be disposed of on site in an IDF.

504-16 Many of the technologies that DOE anticipates using allow work to be accomplished with low exposure of workers. For example, as described in Appendix E, the various tank waste retrieval technologies would use remotely controlled and robotic equipment to mobilize and remove waste from the tanks, and many of the waste treatment operations at the WTP also would be performed remotely.

As discussed in Appendix K, Section K.2.1.2.1, DOE and its contractors would implement controls to limit the exposure of individual workers for all activities in accordance with applicable regulations and guidance (10 CFR 835; DOE Standard 1098-2008). Site procedures and job control plans would incorporate ALARA techniques such as reducing time of exposure, increasing the number of workers and/or shielding, and using remote operations. DOE does use robotics when practical as a means of limiting worker exposure. As individual projects proceeded, DOE and its contractors would continue to look for ways to reduce worker doses.

504-17 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

504-18 The decision to leave 0.1 percent, 1 percent, or more of the waste in the SSTs is one of the decisions supported by this *TC & WM EIS* (see Section S.1.3.1 of the *TC & WM EIS* Summary and Chapter 1, Section 1.4.1), in addition to clean closure of the SSTs. The tank closure process, which includes detailed examinations of the tanks and residual waste, requires preparation of a performance assessment and a closure plan. These required documents will provide the information and analysis necessary for DOE and the regulators to make specific decisions on what levels of residual tank waste are acceptable in terms of short- and long-term risks.

504-19 A comprehensive work plan for achieving the legally mandated levels of groundwater restoration is clearly not a requirement of this *TC & WM EIS*, and DOE strongly disagrees with the assertion that this EIS needs to validate the specific radionuclides remain that pose unacceptable health or environmental hazards, then they should be targeted and more retrieval should be required until their health and environmental hazards are at or below acceptable level. **504-30 cont'd**

32) p. 24, Vol 1,: "Using currently available liquid-based waste retrieval and leak detection systems, waste would be retrieved" may be problematic. No retrieval method should unduly increase the amount of contaminants that leak into the surrounding soil. Sluicing tanks that are known to be leakers is not an acceptable option, unless it can be clearly demonstrated that future leaks will not occur. The leak detection systems must be accurate and the retrieval process must be highly regulated to ensure that the retrieval process will be stopped before any significant leaks can occur. **504-31**

33) p. 24, Vol1: "For analysis purposes, it was assumed that the WTP would need to be replaced after 60 years" means that DOE must guarantee that the replacement will occur, else the analysis is meaningless. **504-32**

34) p. 24, Vol1: "filled with grout to immobilize the residual waste" is inaccurate. The grout may serve to reduce the mobility of the residual waste contaminants, but it will not completely "immobilize" them. **504-33**

35) p.27, Vol1: "closed as an RCRA hazardous waste landfill unit under WAC 173-303, "Dangerous Waste Regulations," and DOE Order 435.1, as applicable," Remove "as applicable" because both requirements do apply. **504-34**

36) p.27, Vol1: "The BX and SX tank farms would be clean-closed by removing the tanks, ancillary equipment, and soils to a depth of 3 meters (10 feet) below the tank base." The selection of 10 feet must be addressed here (based on contaminant concentrations and costs) and must be justified elsewhere. "Where necessary, deep soil excavation would also be conducted to remove contamination plumes within the soil column." "Where necessary" needs to be replaced by specific requirements or at least a reference to a section where the specific requirements are located. **504-35**

Hanford Challenge and NRDC Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site Page 10

entire Hanford cleanup strategy. The purpose of this document is to compare the relative environmental impacts of alternatives associated with tank waste disposition, offsite waste disposal, and FFTF disposition. The cumulative impacts analysis presented in Chapter 6 of this EIS attempts to portray impacts against a background of current contamination levels. DOE is committed to cleaning up the site to agreed-to regulatory levels through its ongoing CERCLA / RCRA programs, and the burden of showing their ultimate effectiveness remains with those programs.

504-20 The STOMP models in this *TC & WM EIS* were calibrated to groundwater conditions attributable to three reasonably well characterized sources: the BY Cribs, the BC Cribs, and the 216-T-26 Crib. Comparisons between model results and field data were made for the site as a whole (water table elevations), individual source areas (BY Cribs, TY Cribs, and the 216-B-26 Crib), and for groups of sources that combined to create regional-scale plumes (the REDOX and PUREX plumes). As stated in the Summary; Chapters 2 and 5; and Appendices O, Q, and U, DOE's view is that the differences between the alternatives that are greater than a factor of 10 (one order of magnitude) are significant discriminators among the uncertainties within the modeling chain.

504-21 DOE disagrees with the commentor's assertion that characterization data are inadequate for an understanding of the nature and extent of vadose zone contamination. The STOMP models in this *TC & WM EIS* were calibrated to groundwater conditions attributable to three reasonably well characterized sources: the BY Cribs, the BC Cribs, and the 216-T-26 Crib.

504-22 The STOMP model used for the vadose zone flow and transport analysis in this *TC & WM EIS* does account for the large discharges that occurred at Hanford. One of the features of the STOMP model, as explained in Appendix N, Section N.2, is a three-dimensional representation of geology, hydraulic properties, and grid geometry. Selected to incorporate spatial heterogeneity of geologic and recharge conditions, this representation explicitly simulates the complexity of travel time behavior due to the lateral spreading and preferential flow that reflect local conditions.

504-23 DOE disagrees with the commentor's premise that current sources of groundwater and vadose zone contamination are not included in the risk models. For both the alternative and cumulative impact assessments, past, current, and future releases are modeled and their impacts evaluated for the entire 10,000-year period of analysis. As indicated in Appendix N, Section N.3.4, of this

37) p.27, Vol1: "The MLLW would be disposed of on site." The proposed location for future disposal must be identified and analyzed, else DOE may only be transferring a problem from one location to another. **504-36**

38) p.27, Vol1: "Using currently available liquid-based retrieval and leak detection systems, waste would be retrieved to a volume corresponding to 90 percent retrieval, less than the TPA Milestone M-45-00 minimum goal of 99 percent." DOE agreed to the TPA Milestones, thus there is no need to analyze or present an alternative that would violate DOE's legally-binding commitments. **504-37**

39) p.29,Vol. 1: "The HLW debris from clean closure would be managed as HLW and stored on site." Debris needs to be defined. Hanford Challenge supports the DOE's proposal to characterize the melters as HLW, and disposed of according to the requirements in the Nuclear Waste Policy Act. **504-38**

40) p.29,Vol. 1, Tank Closure Alternative 6C: While the soil cleanup is to a deeper level than for other alternatives, cleanup may be needed at even greater depths. Also, for this alternative and all others, plans for cleanup of soil that is not directly under tanks must be included. **504-39**

41) Vol. 2, p541, D.1.1 (D-2): "All radionuclides are decayed to January 1, 2001 (DOE 2003a)." It is unclear whether ingrowth of progeny is properly considered, which can be of vital importance. If ingrowth was not considered, please do so and make the appropriate corrections. **504-40**

42) Vol. 2, p542, D.1.1 (D-3): "For the groundwater release screening scenario, only drinking water consumption was considered." If screening is not performed for all groundwater pathways, key contaminants may be screened out that should not be. Either provide evidence that the limited screening is bounding or extend the screening to all groundwater pathways that are analyzed. **504-41**

43) Vol. 2, p542: "Radionuclides contributing less than 1 percent of impacts" is unclear. Was the total contribution from the screened out contaminants less than 1 percent or was the contribution from each individual radionuclide less than 1 percent? If the latter case is true, then it is possible that slightly less than 36 percent of the impacts were ignored. Please clarify the statement and ensure that the former case is what was adopted. Please provide details on how the screening analyses **504-42**

Final TC & WM EIS, field-sampling data from approximately 150 vadose zone boreholes were used to calibrate the vadose zone model as well as regional-scale groundwater plume measurements for the BY Cribs, BC Cribs, 216-T-26 Crib, and the REDOX and PUREX waste sites. Furthermore, in Appendix U, modeled results of contaminant plumes are compared against field measurements for the COPCs. DOE's view is that the overall level of characterization data for Hanford supports differentiation among the alternatives, which is a key feature of a NEPA analysis.

504-24 This *TC & WM EIS* has evaluated large-scale soil excavation/removal strategy. This approach is considered in Tank Closure Alternatives 4, 6A, and 6B, which involve selective or complete clean closure of the SST system and are representative of excavation actions that result in removal of the source of contamination from the vadose zone (i.e., contaminated soils between the tank farms and the groundwater). Clean closure of the tank farms would involve removing all SSTs, associated ancillary equipment, and contaminated soil to a depth of 3 meters (10 feet) below the tank base, all of which would be managed as HLW. Where necessary, deep soil excavation would then be conducted to remove contamination plumes within the soil column.

504-25 Chapter 2, Section 2.11 of this *TC & WM EIS* summarizes and compares the relative consolidated costs of continued operation of existing facilities; construction, operation, and deactivation of new or modified facilities; and associated activities in support of the proposed actions, including administrative controls, institutional controls, and postclosure care. For analysis purposes, these cost estimates were calculated using constant 2008 dollars and, where applicable, existing cost information. Where cost information was not directly applicable, relevant data were scaled to estimate costs, or, where appropriate, scoping-level cost estimates were developed.

See response to comment 504-6 regarding factors influencing future DOE decisions.

504-26 Appendix N, Figure N–5, of the *Draft TC & WM EIS*, depicts the gross beta and technetium-99 concentrations at monitoring well 299-E33-7 near the BY Cribs. The graph is a reflection primarily of the operational history of the BY Cribs, with an early (ca. 1956) peak groundwater concentration of approximately 1,000,000 picocuries per liter. The subsequent groundwater concentrations (after ca. 1970) result from residual vadose zone contamination from the BY Cribs and potentially other neighboring sources. DOE disagrees with the assertion that

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

were performed, whether the same computer programs and models were used as in the final analysis or if surrogates were utilized.

- Also, it is unclear whether daughter ingrowth was considered in the screening analyses. Please state exactly what was analyzed. If progeny ingrowth was not considered, then the screening analyses must be corrected.
- Please state how uncertainty was included in the screening analysis. If uncertainty was ignored, then the screening could easily miss important contaminants. If uncertainty was not included, then the analysis needs to be corrected.
- Please provide a complete list of the expected inventories for all contaminants before the screening process was performed and what their impacts were.
- Inventories of all organics that could complex with contaminants and affect their mobility are required.

504-42 cont'd

44) Vol. 2, p2231, Q.2.4.2 (Q-25): "Physical characteristics of soil were based on site-specific measurements, description of the soil as silty clay loam (Mann et al. 2001)" Please provide a complete set of soil physical properties, rather than relying on a single description. Hundreds of soil measurements have been performed over decades and clay has almost always only been detected in very minute quantities. Much better support is required before such an important analysis can rely on a single statement from an author that is not a geologist. Any covers have conceptually been considered to be impregnated silt overlying sand, gravel and basalt.

a. If impregnated silt is considered, then rock corrections are needed for porosities and other physical properties.

504-43

45) Table Q–7. No evidence of rock corrections is evident. Please make the appropriate corrections here and throughout all the physical property data and analyses.

504-44

46) Tables Q-7 to Q-8. Properties such as the hydraulic gradient, dry bulk density and vadose zone thickness will vary across the site. Also the use of a single strata would cause any bona fide geologist to go into

504-45

an active vadose zone plume is just now entering groundwater in the immediate vicinity of the well. The operational history, characterization data, and vadose zone physics all suggest an early impact from this site approximately two orders of magnitude greater than currently observed.

504-27 This *TC & WM EIS* provides information on the potential short- and long-term impacts for each of the alternatives analyzed, but does not compare these two types of impacts. To fully understand the impact of an alternative, it is necessary to consider both the short- and long-term impacts, which are discussed in the Summary and Chapter 2 of this EIS.

This *TC & WM EIS* assumes several different types of end-state management, as described in Chapter 2, the Glossary, and the Summary. These include administrative controls, institutional controls, and postclosure care, as appropriate. Each of these end-state management options would take place at the completion of an action and is assumed to occur for 100 years following the end of the action (e.g., active institutional controls would be maintained for 100 years following final placement of waste in a storage facility). DOE chose this time period for institutional controls based on current regulations. For disposal facilities licensed by NRC for the disposal of Class A and Class B low-level waste without special provisions for intrusion protection, institutional control of access to the site is required for up to 100 years. For hazardous waste management disposal units, RCRA and Ecology hazardous waste regulations require a 30-year postclosure care period; however, due to the types of waste planned for disposal, it is assumed that this period would be extended to 100 years. The 10,000-year time period described in this *TC & WM EIS* represents the period of analysis used for the long-term impact analyses for groundwater, human health, and ecological risk; it does not represent the assumed period of institutional controls. For clarity, the definition of "10,000-year period of analysis" is included in this final EIS in Chapter 2, the Glossary, and the Summary, as appropriate.

504-28 Chapter 7, Sections 7.1 and 7.5, of this *TC & WM EIS* discusses mitigation measures that could be used to avoid or reduce potential impacts on all resource areas. Many of the mitigation measures discussed would apply across all alternatives because of the similar nature of some of the activities analyzed in this EIS (e.g., construction of facilities). However, the resource subsections of Section 7.1 do acknowledge specific alternatives where only certain mitigation measures would apply or where additional mitigation consideration may be warranted.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

shock. Unless it can be demonstrated that the current analysis is bounding, individual analyses for each tank farm is needed.

504-45 cont'd

47) Table Q-12 contains the following contaminants:

Hydrogen-3 (tritium)
Carbon-14
Potassium-40
Strontium-90
Zirconium-93
Technetium-99
Iodine-129
Cesium-137
Gadolinium-152
Thorium-232
Uranium-238
Neptunium-237
Plutonium-239
Americium-241

Table D-2 contains the following radionuclide:

Hydrogen-3 (tritium)
Carbon-14
Strontium-90
Technetium-99
Iodine-129
Cesium-137
Uranium isotopes
Neptunium-237
Plutonium isotopes
Americium-241a

504-46

504-29 DOE applies quality management systems to its NEPA document preparation process and is committed to developing NEPA documents of the highest quality and technical accuracy. This *TC & WM EIS* was prepared in compliance with the requirements of DOE Order 414.1D, *Quality Assurance*, as well as project-specific quality management plans and procedures that govern data management, calculations and analyses, and analytical software development and use. As a result of the 2006 Settlement Agreement between DOE and Washington State ending litigation concerning the *HSW EIS* (DOE 2004a), Ecology conducted its own quality assurance reviews of the *Draft TC & WM EIS* to ensure that quality assurance processes were in place and being followed.

504-30 The impacts of different levels of tank waste retrieval and of different types of SST system closure are addressed in the *TC & WM EIS* analyses. These include Tank Closure Alternatives 4, 6A, and 6B, which evaluate 99.9 percent retrieval of the tank waste and clean closure of all or part of the SST system. DOE's preferred retrieval option (i.e., to retrieve at least 99 percent of the tank waste) is consistent with the TPA goal of residual waste not exceeding 10.2 cubic meters (360 cubic feet) for 100-series tanks or 0.85 cubic meters (30 cubic feet) for the smaller 200-series tanks, corresponding to 99 percent retrieval. The EIS analysis shows that the level of waste retrieved is important in long-term impacts. Once the tank waste in a waste management area is retrieved, the actual residuals will be evaluated during the closure process for that waste management area. Activities include detailed examinations of the tanks and residual waste and preparation of a performance assessment and closure plan. These documents will provide the information and analysis necessary for DOE and the regulators to make specific decisions on what levels of residual tank waste are acceptable in terms of short- and long-term risks. DOE has already begun the process of retrieving waste from the tanks, such as tanks located in Waste Management Area C.

See response to comment 504-6 regarding factors influencing future DOE decisions.

504-31 Because of concerns regarding the use of sluicing methods to retrieve waste from leaking or suspect leaking tanks and agrees with that concern, as described in Appendix E, Section E.1.2.2., this EIS assumes that the modified sluicing retrieval method would not be used to retrieve waste from leaking or suspected leaking tanks. Instead, a vacuum-driven MRS was assumed to be used for these tanks. Leak detection and monitoring is described in Section E.1.2.2, which

It is clear that there is a disconnect between these tables. Also, it appears that ingrowth of progeny has not been considered which invalidates the analyses. **504-46 cont'd**

48) E.1.2.2.5 Leak Detection and Monitoring – Acceptable leak volumes need to be defined. Those definitions need to be developed based on contaminant concentrations and distributions from past leaks and spills and residual concentrations. Modeling should be able to predict risks from potential future leaks and those risks must be within acceptable levels. **504-47**

49) p. 710, Vol. 2, E.1.2.2.53 (E-29): "However, given the limited sensitivity of some SST leak detection systems, larger leak volumes could occur." Maximum allowable leak volumes must be defined and leak detection systems must be demonstrated that will ensure that leaks greater than the maximum allowable cannot occur. **504-48**

50) p. 1734, Vol. 2, L.1.3 (L-3) - "The Technical Guidance Document specifies five key requirements for development of the TC & WM EIS groundwater flow field, as follows: **504-49**

a. The flow field should be transient (i.e., change with time).
b. The factor driving the transient behavior should be operational recharge to the aquifer rather than time-changing boundary conditions.
c. The sitewide natural recharge rate should be 3.5 millimeters (0.14 inches) per year.
d. Both a Base Case and a Sensitivity (Alternate) Case should be investigated; the difference between the two cases should take into account the uncertainty in the top of basalt (TOB) elevation in the Gable Mountain–Gable Butte Gap (Gable Gap). The intent of the TC & WM EIS is to illustrate any potential differential effects this uncertainty might have on simulated alternative impacts. This approach was preferred (as opposed to presentation of results for all alternatives for each flow field) for brevity and clarity of presentation.
e. Flow field development should be consistent with the frameworks for vadose zone and contaminant transport modeling.

Hanford Challenge and NRDC Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site Page 14

states that safe retrieval of tank waste would involve the use of procedures, technologies, and systems for detecting environmental releases.

504-32 The assumptions made in this *TC & WM EIS* are for analytical purposes only. DOE's goal is to consider the best-available information to inform the agency's decisionmaking process about the potential impacts that may result from a particular course of action. Predicting the exact timing of replacement for a new technology facility is not feasible at this time. Therefore, conservative analyses and assumptions tending toward overestimating the impact, were provided in this EIS. CEQ regulations (40 CFR 1502.9(c)) require an agency to consider whether there are substantial changes in the proposed action that are relevant to environmental concerns or significant new information or circumstances that have developed over time. DOE will ensure appropriate NEPA review is conducted consistent with CEQ requirements as facility upgrades or replacements are needed.

504-33 Regarding this EIS's use of the word "immobilize," as discussed in Appendix E, Section E.1.2.5.1.1, under "Residual Waste Stabilization," this EIS assumed that physical stabilization of the residual waste would be achieved through the introduction of dry powders, dry granular material, and grout. The goal of such stabilization would be to reduce the residual waste constituent's mobility by physically isolating the residual waste from the environment and/or treating the waste chemically to reduce its mobility. Thus, while complete immobilization of the residual waste may never be achieved, DOE is seeking to achieve this goal and it is considered appropriate for consideration in this EIS.

504-34 DOE's intent in using the phrase "as applicable" is to clarify that the two requirements will need to be integrated during the closure process and as part of decisions made by the regulator, including agreements made under the TPA, a legal agreement between DOE, Ecology, and EPA.

504-35 DOE understands the comment to refer to the draft EIS Chapter 1, Section 1.7.1.4, statement, "The BX and SX tank farms would be clean-closed by removing the tanks, ancillary equipment, and soils to a depth of 3 meters (10 feet) below the tank base." As further discussed in Appendix E of the draft and final EISs, Section E.1.2.5.3.2, under Tank Closure Alternative 4, the tank slab, footing, and 3 meters (10 feet) of soil under the tank slab were assumed to be highly contaminated and, thus, were required to be decontaminated in the Preprocessing Facility. The depth of 3 meters (10 feet) below the tank slab is an average depth assumption that was made for analysis purposes in the draft and

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

f. Even if DOE provides an edict on the natural recharge rate, scientific justification is still required to use that value, else the analysis is useless. **504-49 cont'd**

51) p. 1742, Vol. 2, L-11, L.4.2: "The only time-varying fluxes of water across the model boundary are anthropogenic are recharges." The above statement is known to misrepresent field conditions. A detailed discussion of the misrepresentations is needed including an analysis of their effects. Examples of misrepresentations are that the river elevations change over time, leakage occurs through the basalt, and areas modified by man do not receive the natural recharge (e.g., buildings, roads, etc.). **504-50**

52) p.1745, Vol.2, L.4.2 (L-11): "tank farms receive 100 millimeters (4 inches) per year." Because all cell footprints are 200 m X 200 m, a discussion of boundary conditions over cells only partially containing tank farm or other unnatural entities is needed. **504-51**

53) "p.1745, Vol.2, L.4.2.4 (L-14): Values for over 200 sources (or sinks) of water were taken from the Cumulative Impacts Inventory Database (SAIC 2006) and encoded into the model." Information on which sources were selected and any rejections is needed to help check the model. Also comments from the LUG and experts are needed with the accepted resolutions. **504-52**

54) p.1757, Vol 2, L.5.1.1 (L-26): "To mitigate the rewetting problem in the Gable Gap area within the model, inactive cells that represented the TOB were made active and assigned hydraulic conductivity values that are more than 500 times smaller than that of Hanford and Ringold Muds (0.001 meters [0.00328 feet] per day). Making the inactive cell active and using a low hydraulic conductivity value allowed the active water table cells above the TOB to rewet from below but also maintained the TOB as an impermeable boundary." **504-53**

a. The DOE's claim to have an impermeable boundary of active cells with a non-zero conductivity is not possible. Also, a computer program that does not allow rewetting from any adjacent cell cannot represent physical reality, thus any analyses using such a computer program for Hanford sediments cannot duplicate certain physical processes and its results are suspect. Results

final EISs. The actual depth and volume of soil would be evaluated on a tank-by-tank basis after the contaminant levels within the soil were determined. This level of discussion was considered inappropriate for inclusion in Chapter 1 of this EIS, but was described in detail in Appendix E. Similarly, a description of deep soil removal activity under Alternative 4 was included in Section E.1.2.5.3.2. As explained in this section, there is considerable uncertainty regarding the size and concentration of the contaminants within the past tank leak plumes. Therefore, for analysis purposes, conservative estimates were made concerning these past tank leak plumes so that their impacts could be analyzed. The extent of the soil-cleaning efforts required to meet the waste acceptance criteria for onsite disposal of the decontaminated debris and soil at the RPPDF was unknown, as were the details of the Preprocessing Facility flowsheet. Therefore, assumptions were made concerning the "acid wash" soil-washing treatment system that would be employed in the Preprocessing Facility and the throughput of the facility. Details of these assumptions are included in Section E.1.2.5.3.2.

504-36 The discussion to which the commentor refers is a summary of the closure actions addressed under Tank Closure Alternative 4. As detailed in Chapter 2, Section 2.5.2.4, this MLLW would be disposed of on site in the RPPDF, a proposed new facility that would be built between the 200-East and 200-West Areas. The impacts of constructing and operating this facility are addressed within the scope of this *TC & WM EIS*.

504-37 One *TC & WM EIS* alternative addresses a retrieval goal of 90 percent, less than the TPA Milestone M-45-00 minimum goal of 99 percent. Retrieval to 90 percent represents a range, depicting the potential programmatic risk analysis process for the tank farms as defined by Appendix H of the TPA, Single Shell Tank Waste Retrieval Criteria Procedure. This alternative evaluates the potential impacts that could occur from implementing that process. To date, Ecology and DOE have initiated the Appendix H process for one tank, 241-C-106.

504-38 As used in this *TC & WM EIS*, the term "debris" is defined as waste that results from the cleanup and closure of the tank farms. This waste would include contaminated construction rubble and any metals and plastics used during the actual cleanup such as clothing, equipment, or pipes. Its use in this EIS was not intended to meet the EPA definition of debris as codified in "Land Disposal Restrictions" (40 CFR 268).

504-39 DOE would like to clarify that Tank Closure Alternative 6C involves landfill closure and is discussed on page 1–30 in Chapter 1, Section 1.7.1.6, of the *Draft*

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

from representative test cases must be benchmarked against computer program that can duplicate those physical processes to estimate the amount of error that is introduced by applying the computer program with known errors. **504-53 cont'd**

55) p. 1758, Vol 2, L.5.4 (L-27): "Pre-Hanford head observation data are not available." The TC & WM EIS groundwater flow model was assigned an initial arbitrarily high water table and run in transient mode for 500 years to simulate pre Hanford (1940–1943) conditions with only natural recharges applied per the Technical Guidance Document (DOE 2005). This initial 500-year model run approached long-term steady state conditions, which is assumed to represent pre-Hanford conditions." Residents lived at the Hanford location, probably farming. Their effect on the environment must be included when establishing initial conditions. **504-54**

56) p. 1758, Vol 2, L.6.1 (L-27): "Closer than 600 meters (1,969 feet) to the Columbia River, to remove the periodic fluctuations in the river stage from the head observation data" The periodic fluctuations in the river stage may be one of the most important factors affecting the transport of contaminants into the Columbia River, yet it is being rejected. At a minimum, separate analysis is needed to determine its importance and how to include that importance. **504-55**

57) N.1.2; "Boundary conditions for the upper surface at each site are a specified recharge determined by technical guidance (DOE 2005)" For the saturated zone model, the recharge was altered annually based on human activities. The same rule applies to the vadose zone analysis, although the timing should be more refined. **504-56**

58) N1.2; "More than 400 subarea models are required" for the vadose zone analyses. The edges of the subarea models were extended to the point where the side contaminant fluxes were set to zero. This approach requires that there is no interaction between the subarea models. **504-57**

a. Please provide a single figure showing the footprints of all subarea models and state that there is no interaction between any subarea models.
b. Other: The tank T106 leak (and possibly others) was so great that it altered the vadose zone. A typical release to the vadose zone **504-58**

Hanford Challenge and NRDC Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site Page 16

TC & WM EIS. Tank Closure Alternatives 6A and 6B involve clean closure of the tank farms, which includes the removal of all tanks, associated ancillary equipment, and contaminated soil to a depth of 3 meters (10 feet) directly beneath the tank base and, where necessary, deep soil excavation to remove contaminated plumes within the soil column. Under Alternatives 6A and 6B, Option Case, in addition to clean closure of the tank farm sources, clean closure of the contiguous cribs and trenches (ditches) would also occur, which involves removal of contaminated plumes within the soil column as a result of the operation of these cribs and trenches (ditches).

504-40 DOE agrees with the commentor's observation that the concentration of daughter products can increase with time, and that, given enough time, a closed system will attain a state of secular equilibrium. This was considered in developing the screening process used in determining the COPCs for this *TC & WM EIS*. It turns out that the rate of production of the daughter products is low for the conditions relevant to a 10,000-year groundwater analysis. A discussion of this issue has been included in this *Final TC & WM EIS*.

504-41 Appendix Q featured consideration of both groundwater release and direct intrusion scenarios and their long-term human health impacts. For the groundwater release scenario, only drinking water consumption was considered; for the direct intrusion scenario, only inadvertent soil ingestion and inhalation pathways. It has been found that direct consumption of contaminated drinking water entails potential exposure to all of the radionuclides and chemicals identified in the cumulative impacts and alternative impacts waste inventories.

504-42 The radionuclides and chemical constituents used in the *Draft TC & WM EIS* analysis are the product of the extensive database compilations, reviews, and drinking water–based preliminary human risk assessment described in detail in Appendix S. The preliminary risk assessment determined that many of the radionuclides and chemical constituents in the initial compilations would not contribute significantly to either the alternative or cumulative impacts described in this *Final TC & WM EIS*. Thus, radionuclides contributing less than 1 percent of the impacts under well scenarios were eliminated from the detailed analyses, as were chemicals present in the inventories at levels at or below health-based limits. The screening resulted in reduction of the original inventory to the final analytical set of 14 radionuclides and 26 chemical constituents.

The response to the commentor's specific question regarding daughter ingrowth is yes; ingrowth was considered in developing the screening process model is not applicable and is not acceptable for such leaks. One example of the vadose zone alteration is that Cesium traveled so far, because so much Sodium (Na) flooded the vadose zone that it tended to occupy the sorption sites where the Cs typically would occupy. **504-58 cont'd**

59) p. 1933, Vol. 2, N.1.2 (N-3): "In summary, the process for the selection of hydraulic parameter values involved the matching of predicted to measured borehole moisture content profiles for all 16 soil types followed by the matching of randomly generated soil types to observed unconfined aquifer conditions for 3 primary soil types. It also provided for consistency with values of saturated hydraulic conductivity" Quantification of the random generation process is needed and numerical values for determining consistency are required, because as stated the values may not even be realistic, but could match what is stated. **504-59**

a. Other: Using 200 m X 200 m cells throughout the model domain will result in excessive smearing and likely numerical dispersion for contaminant transport analyses. What was done to address these concerns? **504-60**

60) p.1937, Vol. 2, N.1.2 (N-7): "The early peak of the predicted technetium-99 profile occurs at the same time as the early peak of the measured total beta profile (see Figure N–5) but is lower because of the presence of radionuclides other than technetium-99 among beta emitters. The concentration level measured and predicted for technetium-99 for the current time period are in general agreement. Thus, the predicted concentration profile for technetium-99 shows qualitative agreement with the reported concentration of gross-beta activity."

a. The above interpretation is highly suspect. First, information for Figures N-5 and N-6 are plotted separately making any interpretation difficult. Second, the time axes are entirely different, making any interpretation even more difficult. While the early peak Tc-99 concentration (~1E6) may be lower than the total beta peak concentration (~1E9), it is 3 orders of magnitude lower, while at later times, the measured values for Tc-99 actually exceed the measured value for total beta. Additionally, the latest measured values for both Tc-99 and total beta are trending upwards, while the **504-61**

for determining the COPCs used in this EIS, and it turns out that the rate of production of the daughter products is low for the conditions relevant to a 10,000-year groundwater analysis. A discussion of this issue has been added to this EIS, along with more detail on how the screening process was completed.

504-43 In Appendix Q of this *TC & WM EIS*, the term "soil" refers to topsoil in which plants consumed by both humans and livestock (or game) are growing. As such, it is altered by natural processes at the ground's surface and, in the case of agricultural scenarios, by human activities. Soils are distinctly different from those subsurface materials for which "hundred of measurements" have been made and will vary across the site. Hence, the analysis in this EIS uses statistically derived parameters that are conditioned on qualitative descriptions of materials found at the site. Site-specific properties, such as those used in the unsaturated zone modeling of the subsurface materials, are discussed in Appendix N of this EIS.

504-44 DOE does not believe that rock corrections to Appendix Q, Table Q–7, are needed. As indicated in the text, the properties addressed in that table are the saturated-zone input for the RESRAD [RESidual RADioactivity] code. Written as a systems performance assessment code, RESRAD handles the indirect water use pathways (e.g., gardening) adequately, but is unable to sufficiently account both for the variable releases of contaminants over space and time and for the complex hydrogeology found at the site. Thus, the approach taken to assessing long-term doses and risks for the radionuclides employs a combination of RESRAD calculations for the non–water exposure pathways and postprocessed STOMP and MODFLOW/RAN3D numerical flow and transport calculations for those pathways involving use of groundwater. As a practical matter, this means that the groundwater pathway results from RESRAD, based on the parameter values indicated in Tables Q–7 and Q–8, are not used in the analyses.

Still, it is necessary for RESRAD to have parameters in order to run. While RESRAD offers default values, the inputs either are taken to be broadly representative of conditions found at the site or are used to actively suppress/control the unused groundwater component in the RESRAD runs; for example, the well pumping rate is 0.0. Hence, even these parameters are reported in Table Q–7. The soil and sediment hydraulic properties referred to elsewhere in this *TC & WM EIS* are those used in the numerical models. The parameterization of these properties, discussed in Appendix N, Section N.3, has been based on matching observations at a field scale, not a laboratory scale. Hence, once again corrections are not required.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

predicted value are essentially constant. There is no general agreement here. Because the Tc-99 measurements are greater than the total beta measurements, some measurements are clearly in error. The measurement errors need to be addressed. 504-61 cont'd

61) p.1938, Vol. 2, N.1.2 (N-8): "Estimates of isopleths of concentration of technetium-99 near the BY Cribs based on measurements reported for 2007 are presented in Figure N–7. These data were used to provide additional testing of the proposed set of values of vadose zone hydraulic parameters. The approach used TC & WM EIS source data for the BY Cribs, the STOMP vadose zone model, the MODFLOW-predicted transient flow field, and a particle tracking transport model to predict spatial distribution of technetium-99 in the unconfined aquifer for calendar year 2005. The results of this analysis are presented in Figure N–8." There is no reason why model results could not be presented for year 2007 to allow direct comparison with measured results. 504-62

a. The color scheme and inclusion of the mesh in Figure N-8 makes even trying to read the figure almost impossible. The two figures should be combined using simple contours, but different colors for measured vs. predicted values, with a zoom-in figure if needed. 504-63

b. Other: No mention of Courant numbers or Peclet numbers, common modeling metrics, could be found in Vol 2, calling into question the accuracy of any and all results. 504-64

62) p.1938, Vol. 2, N.1.2 (N-8): "The predicted concentrations show both qualitative and quantitative agreement with measured concentrations, with high levels near the sources and decreasing levels in the northwest direction. The predicted concentrations also show movement to the southeast due to transient flow in that direction under the influence of high aqueous discharges from past Hanford operations."

a. The "quantitative agreement" is questionable. Even 1D models would show higher levels near the sources. For quantitative agreement, a metric must first be established, such as an root-mean-square approach (as was used for the saturated zone well heads) where differences between predicted concentrations at well locations are compared to measured concentrations at the same wells. Next, an acceptable level for differences must be 504-65

Note that RESRAD, as described in Section Q.2.3, is also used for intruder scenarios. These scenarios involve exposures to waste brought to the surface or excavated; they do not entail any groundwater exposure pathways.

504-45 The approach taken in assessing long-term doses and risks for the radionuclides employs a combination of postprocessed STOMP and MODFLOW/RAN3D numerical flow and transport calculations for those pathways involving use of groundwater and RESRAD calculations for the non–water exposure pathways. In regard to the former, there are 16 soil types, each with distinct hydraulic properties, employed in the numerical models for groundwater flow and transport calculations. A qualitative and quantitative hydraulic characterization of each material type at field scale has been developed, and each material is associated with a known stratigraphic unit. Further, that material can and does appear in a discontinuous manner at several locations within a stratigraphic unit, resulting in a hydrological characterization at a scale finer than that of the major geological strata found at the site. Details are provided in Appendix N.

The particular hydraulic properties given in Tables Q–7 and Q–8 are the saturated and unsaturated zone input for the RESRAD code, a multipathway systems performance assessment code. RESRAD handles the indirect water use pathways (e.g., gardening) adequately, but is unable to sufficiently account for both the variable releases of contaminants over space and over time and the complex hydrogeology found at the site. As a practical matter, this means that the groundwater pathway results from RESRAD, based on the parameter values indicated in Tables Q–7 and Q–8, are not used in the analyses, and the parameter values in those tables do not matter.

Still, it is necessary for RESRAD to have parameters in order to run. While RESRAD offers default values, the inputs in the tables either are taken to be broadly representative of conditions found at the site or are used to actively suppress/control the unused groundwater component in the RESRAD runs. Tank farms are individually analyzed, for long-term as well as intruder scenarios.

504-46 Appendix D, Table D–2, of the *Draft TC & WM EIS* provides a listing of the final set of constituents used in the analysis of the tank waste, which set was screened from the original BBI of the underground waste storage tanks at Hanford. It is also noted in Section D.1.1 that a screening of the cumulative impacts analysis data resulted in the addition of other COPCs that are not included in Table D–2 but are included in Appendix Q, Tables Q–1 and Q–12 (noted in the comment).

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

established. Differences must be calculated for all the times when measurements were recorded for each subarea model. In that manner quantitative measures can be established for each subarea and can be compared against a pre-specified standard. **504-65 cont'd**

b. Merely providing graphical results for a very small sample of subarea models is of limited value. It does not allow anybody to draw any meaningful conclusions, if for no other reason than the sample may not be representative. The preponderance of the evidence should demonstrate the accuracy and usefulness of the models.

c. Some more meaningful examples would be:
   i. compare model predictions with actual contaminant discharges to the Columbia River for a total system evaluation
   ii. compare model predictions with actual contaminant movement from the T-106 tank leak for a near-field release that has been well studied and documented
   iii. compare with pump-and-treat operations that combines the effects of large scale and long term contaminant migrations with the efficacy of human intervention with its implications on the various proposed alternatives

504-66

63) p.1941, Vol. 2, N.1.2 (N-11): "On the basis of this quantitative agreement of a factor of less than five quantitative agreements…" This makes no sense. Presentation of results over an extended period of time would be much more valuable and would provide much more information than a single snapshot in time **504-67**

64) Figure N-9: please explain "Tritium picocuries per cubic liter" **504-68**

65) Figure N-12: It appears that a considerable amount of numerical dispersion has infected the model, producing more widespread pollution than is real and lowering peak concentrations. A simple contour plot (without contour flooding) overlaying wells with zero or < 100 pCi/L of H-3 is needed to address this issue and help evaluate the accuracy of the modeling predictions. **504-69**

66) Table N-1: "Plio-Pleistocene Cement" needs explanation. It does not appear that any rock (gravel) corrections have been included in this table. Please explain why not and provide justification. **504-70**

Hanford Challenge and NRDC Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site Page 19

Therefore, DOE disagrees with the commentor's statement that there is a disconnect between these tables.

504-47 DOE has developed and implemented a very advanced system for detecting and monitoring leaks and spills from the waste tanks. As discussed in Appendix D, Section D.1.6, Tank Waste Retrieval Leaks, this EIS conservatively assumes a leak of 15,000 liters (4,000 gallons) of tank waste from each of the SSTs. This waste volume is considered conservative because of the advanced leak-detection-and-monitoring systems DOE now has in place at the tank farms.

504-48 Both the maximum allowable leak volumes and what DOE considers to be conservative leak volumes for the SSTs are included in the EIS analysis, as described in Appendix D, Section D.1.6, Tank Waste Retrieval Leaks. This EIS conservatively assumed a leak of 15,000 liters (4,000 gallons) of tank waste from each of the SSTs. This volume is considered conservative because DOE now has advanced leak-detection-and-monitoring systems in place at the tank farms.

504-49 Regarding "scientific justification" of parameters and inputs to the groundwater modeling, the authors of the *Technical Guidance Document* (DOE 2005) were of the view that a value of 3.5 millimeters per year is within the scientifically agreed-upon range of estimates for background infiltration and that there is certainly some spatial and temporal variation in the real world, but that, given the relative insensitivity of a groundwater flow model to this parameter and given the comparative nature of a NEPA analysis, the estimate contained in the *Technical Guidance Document* was reasonable for the purposes of a NEPA analysis. DOE, Ecology, the Technical Review Group, and the technical contributors to the development of this *TC & WM EIS* are in agreement with this view.

504-50 DOE does not misrepresent field conditions, but may make simplifying assumptions for analysis purposes. Appendix L, Section L.2.2, of this *Final TC & WM EIS* has been revised to expand the boundary condition discussion, including more detail about the potential effects when model-encoded boundary conditions are simplified for analysis. This discussion also includes more detail about the data limitations and uncertainties in areas where simplifying assumptions are applied.

504-51 Appendix L of this *Final TC & WM EIS* has been revised to include a discussion of boundary conditions over cells containing tank farms or other unnatural entities that do not fully cover the 200-by-200-meter MODFLOW cell.

504-52 A detailed description of the methodology for evaluating all of the sources included in the Cumulative Impacts Inventory Database is included in

67) Table N-1: No mention of horizontal hydraulic conductivity or anisotropy is provided. Please provide the missing information and its justification. **504-71**

68) Table N-1: Please explain why the Hanford gravel has a hydraulic conductivity (0.0125 cm/s) that is less than that for Hanford sand (0.0202 cm/s). Those values do not agree with the basic material definitions and can lead to extremely erroneous model predictions. **504-72**

69) Please identify how Quality Assurance/Quality Control (QA/QC) procedures and protocols were used in the performance of the draft TC&WM EIS analysis. **504-73**

70) As noted by the Hanford Advisory Board's independent contractor's analysis, there are a number of unit conversion or data errors that raise serious doubts about the quality of the analysis. **504-74**

Appendix S of the *Draft TC & WM EIS*. This appendix includes details about contaminant inventories and liquid volume releases. The MODFLOW Technical Review Group process (which included Local Users' Group input), including a summary of the meetings conducted, is included at http://www.hanford.gov/files.cfm/Modflow%20Report.pdf.

504-53 DOE agrees that active cells with non-zero hydraulic conductivity values do not provide an impermeable boundary. Appendix L of this *Final TC & WM EIS* has been revised to remove the implication that the active top-of-basalt cells in the Gable Gap area are an impermeable boundary. In a transient model of an unconfined aquifer, cells can become saturated or unsaturated as a function of time, depending on the boundary conditions. Given this, the problem of rewetting must still be resolved. The rewetting problem is a numerical problem and not one that attempts to mimic any real-world condition. If the model solution meets the model's convergence criteria, then that solution is an acceptable solution, whether or not the model settings allow rewetting of cells from adjacent cells. DOE disagrees that only model solutions that allow rewetting from adjacent cells are acceptable model solutions.

504-54 There is uncertainty regarding what the water table elevations were across Hanford prior to the beginning of the operational period. Without any data with which to compare and calibrate the pre-Hanford water table, it was decided that the background recharge assumptions would be used to determine the initial heads for the model simulation. This included the base background recharge of 3.5 millimeters per year across most of the site, but also included a city of Richland recharge rate of 50 millimeters per year in the southernmost model region, which accounts for some human land use prior to Hanford operations. It is understood and agreed that these assumptions simplify and may not represent actual pre Hanford recharge conditions. However, given no available date to calibrate the model to during this timeframe, these assumptions seem reasonable.

504-55 The regional nature of the flow model required that data encoding resolution (e.g., river stage) be represented at a level no finer than one value for each year. It is known that river stage elevations vary during the course of a day at times, even more so over a week or a month timeframe. Given that only a single value (per calendar year) could be encoded to represent the river stage at any given location, and given that the river stage boundary condition strongly affects simulated model heads nearby, combined with the fact that fluctuations in the river occur much more frequently than once per year, it was determined that it would not be helpful for the head observation data set to include these

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Conclusion

We request that you withdraw this draft TC&WM EIS, and revise it to provide legally-compliant alternatives. We look forward to the DOE's response to our comments. 504-75

Sincerely yours,

Tom Carpenter

Tom Carpenter, Executive Director
Hanford Challenge
219 First Avenue S., Suite 120
Seattle, WA 98104
(206) 292-2850
tomc@hanfordchallenge.org

Geoff Fettus (per TEC)

Geoffrey H. Fettus, Senior Project Attorney
Natural Resources Defense Council
1200 New York Avenue, NW
Suite 400
Washington, D.C. 20005
(202) 289-2371
gfettus@nrdc.org

cc: Shirley Olinger, Manager, Office of River Protection, ORP
David A. Brockman, Manager, Richland Operations Office

detailed river fluctuations when the model encoding for the river stage does not. Therefore, it was decided to remove from the head calibration data set those head observation wells located within 600 meters of the river, as these wells are the ones most likely affected by river stage fluctuations.

504-56 In response to this comment and others, further explanation and description have been provided in Appendix N of this *Final TC & WM EIS*.

504-57 In response to this comment, a discussion of the interaction among sites, with specific reference to anthropogenic discharge, has been added to Appendix N of this *Final TC & WM EIS*.

504-58 The STOMP model used for the vadose zone flow and transport analysis in this *TC & WM EIS* does account for the large discharges that occurred at Hanford. One of the features of the STOMP model, as explained in Appendix N, Section N.2, is a three-dimensional representation of geology, hydraulic properties, and grid geometry. Selected to incorporate spatial heterogeneity of geologic and recharge conditions, this representation explicitly simulates the complexity of travel time behavior due to the lateral spreading and preferential flow that reflects local conditions.

DOE agrees with the comment that the groundwater model must simulate the interactions between COPCs within the vadose zone. The *Draft TC & WM EIS* groundwater modeling process achieves this objective by encoding into the model the various subsurface material types ascertained from well boring data collected across Hanford, and, consistent with the encoded material types and their respective hydraulic properties, simulating flux along preferential flow pathways.

504-59 In response to this comment and others, further explanation and description have been provided in Appendix N of this *Final TC & WM EIS*.

504-60 Appendix L, Section L.4.12, of this *Final TC & WM EIS* has been revised to expand the groundwater flow model gridding discussion to include factors that were considered as part of selecting model cell size. It should be noted that, for groundwater transport analysis purposes, source areas are modeled at their actual locations and at their actual sizes. The *TC & WM EIS* groundwater modeling methodology retains the utility to model sources at their actual locations and sizes, although the flow model models flow conditions (heads and velocities) only to a resolution of 200 meters by 200 meters in the horizontal plane.

504-61 DOE has combined the two curves referenced by the commentor into a single graph to facilitate data presentation, and that revision is included in

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009

Prepared for
Hanford Challenge
By Marco Kaltofen, PE, (Civil, Mass.)
Boston Chemical Data Corp.
May 3, 2010

Contents

Appendix N, Figure N–12, of this *Final TC & WM EIS*. As to the commentor's concern regarding general agreement of the calibration, DOE disagrees with the commentor's observations. It should be noted that the gross beta data reported in the 1950s during the first peak are not specific measurements of technetium-99; those data include beta activity from a variety of short-lived radionuclides. DOE's view is that these measurements, taken as a whole, suggest peak concentrations of technetium-99 of about 1 million picocuries per liter, with an uncertainty of about two orders of magnitude. The later (i.e., 1990 to 2000) plateau suggests technetium-99 concentrations of about 10,000 picocuries per liter, with an uncertainty of about one order of magnitude. The model result is in general agreement with these suggestions. The reader is strongly cautioned in Appendix N not to overinterpret the gross beta measurements. In response to this comment and others, further explanation and description have been provided in this *Final TC & WM EIS*.

504-62 DOE agrees with the commentor and has updated the comparison data to 2010.

504-63 In response to this and other comments, the data presentation in Appendix N, Figures N–7 and N–8, in the draft EIS has been revised for Appendix N, in Figures N–13 and N–14, of this *Final TC & WM EIS* to facilitate interpretation.

504-64 As noted in the comment, the text of Volume 2 of the *Draft TC & WM EIS* does not make explicit reference to values of Courant or Peclet numbers for vadose zone flow and transport analysis. The text of Appendix N in Volume 2 (page N–3 and Figure N–1 of the draft EIS), does make reference to actions taken to control grid size, but does not mention time step control or the need for each of these actions. As an initial step in the approach to vadose zone analysis, an extensive set of sensitivity analyses were completed to investigate requirements for time and space step control for the range of recharge and aqueous volumetric injection conditions reported for past and expected for future activities. The results of the analyses were that time and space step control as may be summarized in the Courant and Peclet numbers is required to provide reproducible calculations of vadose zone conditions and adequate closure of mass balances. The approach adopted for this *TC & WM EIS* was use of the STOMP feature of Courant number control coupled with site-specific determination of horizontal and vertical space step sizes required for the recharge and injection conditions specified for the site. Thus, time step, grid sizes, and model extent were selected to provide accurate simulations of associated recharge and injection conditions. In addition, each simulation completed for the EIS analysis was subject to a postprocessing mass balance check to identify cases with computation challenges. Such cases were

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

Executive Summary

504-76

1) The EIS must conform with existing federal law and it must conform with lawfully rendered agreements. These laws and agreements include:

- The Hanford Federal Facility Agreement and Consent Order, also called the Tri Party Agreement.
- The Nuclear Waste Policy Act, which requires the permanent isolation of specific waste streams at the Hanford Site.
- The Native American Graves Protection and Repatriation Act of 1990, 43 CFR 10.
- NEPA, the National Environmental Policy Act. By this statute, (Section 102(2)(C) NEPA), the actions proposed in an EIS should be protective of the environment and human health. The EIS must address the environmental impact of the proposed action, adverse environmental effects under an implemented proposal, alternatives to the proposed action, the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.
- Washington State, Model Toxics Control Act Statute and Regulation - Chapter 70.105D RCW, Uniform Environmental Covenants Act Chapter 64.70 RCW, and MTCA Cleanup Regulation Chapter 173-340 WAC
- Resource Conservation and Recovery Act
- Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA or more commonly, Superfund)

2

subject to reanalysis. The text of Appendix N, Section N.3, has been revised to provide clarification of the procedure followed in vadose zone analysis.

504-65 As discussed in Appendix N, the uncertainties in the input data, the noise in the field data, and the nonlinear response of the simulation to changes in parameters all combine to render the exercise a qualitative search for a parameter set that reproduces general features of three different types of sites.

504-66 The goal of the analysis, presented in Appendix N, Section N.3, is to derive material property parameters for the vadose zone that permit an unbiased comparison of the long term impacts of the combination of sources for each alternative. The approach discussed in Section N.3.6 of this *Final TC & WM EIS* is predicated on the observation that there are a limited number of sites at which conditions are attributable to a single source with a well-known inventory. Further, such sites must be close to a groundwater monitoring well with a long observational history. After the material properties of the vadose zone were derived, a systems-level test of the groundwater modeling machinery was conducted (Appendix O). For this test, the PUREX and REDOX plumes were modeled and compared with the regional-scale tritium plume. DOE's view is that calibrations at well-characterized, small-scale sites must be supplemented with regional-scale simulations to build a model that facilitates the comparison of alternatives.

504-67 In response to this comment and others, further explanation and description have been provided in Appendix N of this *Final TC & WM EIS.*

504-68 The words "tritium picocuries per cubic liter" are a typographical error from the legend of the original figure that was not corrected before the figure was incorporated into the *Draft TC & WM EIS.* The legend has been revised for this *Final TC & WM EIS.*

504-69 DOE disagrees with the commentor's assertion that a considerable amount of numerical dispersion has infected the model. The text of Appendix N, Section N.1.2, of the draft EIS does make reference to actions taken to control grid size, but does not mention time step control or the need for each of these actions. As an initial step in the approach to vadose zone analysis, an extensive set of sensitivity analyses were completed to investigate requirements for time and space step control for the range of recharge and aqueous volumetric injection conditions reported for past and expected for future activities. The results of the analyses were that time and space step control as may be summarized in the Courant and Peclet numbers is required to provide reproducible calculations of

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

2) The major decisions to be made, as described in this EIS, (storage of tank waste, percent retrieval of tank waste, tank waste treatment, treated tank waste disposal, SST closure, creation of facilities to accept and treat offsite waste, and FFTF decommissioning), should be treated as severable matters. Waste Treatment Plant (WTP) closure, DST closure, groundwater remediation, CERCLA past practice units, and FFTF deactivation have already been severed from this EIS. Likewise, portions of the EIS found to meet applicable laws and agreements should go forward, even if an independent and individual major decision outlined above can not meet the standard of lawfulness.

The existing failures to meet completeness and lawfulness standards for significant portions of the draft proposed EIS nevertheless are highly likely to legally preclude final approval of a comprehensive EIS. The failure to address groundwater in the saturated zone is an obvious weakness of the draft proposed EIS. This level of omission has not survived scrutiny in other formerly used defense facilities which have completed their respective EIS processes. Likewise, the failure to identify or even screen for preferential underground pathways for groundwater transport is another glaring omission, which has a significant bearing on the risk numbers generated by this drafting process.

These omissions are so significant that severability of the various milestones on the road to creating a complete, comprehensive, and lawful EIS is essential. Without this, the redrafting/reapproval process will become so drawn out that it will become impossible to meet the existing agreements between the many agencies which are responsible for the Hanford cleanup. *504-77*

3) A comprehensive workplan for achieving the legally mandated levels of groundwater restoration must be included among the alternatives in the draft *504-78*

3

vadose zone conditions and adequate closure of mass balances. The approach adopted for this *TC & WM EIS* was use of the STOMP feature of Courant number control coupled with site-specific determination of horizontal and vertical space step sizes required for the recharge and injection conditions specified for the site. Thus, time step, grid sizes, and model extent were selected to provide accurate simulations of associated recharge and injection conditions. In addition, each simulation completed for the EIS analysis was subject to a postprocessing mass balance check to identify cases with computation challenges. Such cases were subject to reanalysis. The text of Appendix N has been revised to provide clarification of the procedure followed in vadose zone analysis.

504-70 In response to this comment and others, further explanation and description have been provided in Appendices L and N of this *Final TC & WM EIS*. In particular, the nomenclature on material type adopted for this EIS and its relationship to other nomenclatures in use at the site have been addressed.

504-71 An anisotropy ratio of 10:1 (horizontal to vertical) was used in the vadose zone and groundwater models of this *TC & WM EIS*. This is standard industry practice in the absence of specific information to the contrary. In response to this comment and others, further explanation and description have been provided in Appendix N of this EIS.

504-72 Terms such as "sand," "gravel," and "loam" are classifications based on textual properties such as particle size distribution, and while suggesting hydraulic characteristics, such terms do not dictate them. The hydraulic conductivity of a material depends on particle size distribution in a complicated manner related to the nature of particle packing and the contiguous pore space in the material. It is not uncommon to find a "sand" that has a higher hydraulic conductivity in the field and/or laboratory than a "gravel" from the same site. Such deviations from what might be expected from a texture classification alone can even be found in some previous characterizations of Hanford materials.

504-73 DOE applies quality management systems to its NEPA document preparation process and is committed to developing NEPA documents of the highest quality and technical accuracy. This *TC & WM EIS* was prepared following the requirements of DOE Order 414.1D, *Quality Assurance*, as well as project-specific quality management plans and procedures that govern data management, calculations and analyses, and analytical software development and use. As a result of the 2006 Settlement Agreement between DOE and Washington State ending litigation concerning the *HSW EIS* (DOE 2004a), Ecology conducted

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

final EIS. In effect, this draft EIS contains only a "*No Action Alternative*" for contaminated groundwater at Hanford. *504-78 cont'd*

4) The State of Oregon and the State of Washington have produced official statements regarding the acceptance of specific alternatives in the EIS. These important stakeholders support minimum 99 percent tank waste removal, off site storage of high levels wastes in a deep geological repository, pretreatment of tank or low activity wastes, and avoidance of "supplemental" treatment technologies. Hanford Challenge generally supports these two State-sponsored proposals, and is opposed to alternatives in the EIS which do not meet the requirements of the States of Washington and Oregon and the Tri Party Agreement.

Hanford Challenge supports Oregon's Proposed Alternative 7 identified in its preliminary comments to the Department of Energy in a letter dated January 5, 2010. Hanford Challenge, however, believes that all the tank waste should be removed from the tanks, and adequate characterization be performed to determine whether tanks be removed and leaked tank waste retrieved and treated from beneath the tanks. Hanford Challenge does not support categorically treating all soil overburden as high level waste, as this may draw resources away from important cleanup requirements. Overburden should be treated according to relevant and applicable environmental laws, legal agreements, and regulations. *504-79*

5) Acceptance of offsite wastes is not related to any of the required activities described by the EIS. The acceptance of offsite wastes is a fully separate regulatory process permitted under 10 CFR 61, NUREG 1300, 40 CFR 270.11, 270.13, 270.14, and 40 CFR 264.18, 264.95, 264.97 and others. Alternatives in the EIS which include off site waste acceptance should be severed from this EIS process in order to maintain congruence with existing federal regulations. The *504-80*

4

its own quality assurance reviews of the *Draft* and this *Final TC & WM EIS* to ensure that quality assurance processes were in place and being followed.

504-74 In response to this comment, DOE reviewed the draft EIS and identified some errors where data were incorrectly input into the text of the document. These errors have been corrected.

504-75 The alternatives presented in this *TC & WM EIS* were developed under NEPA (42 U.S.C. 4321 et seq.) to address the essential components of DOE's three sets of proposed actions (tank closure, FFTF decommissioning, and waste management) and to provide an understanding of the differences between the potential environmental impacts of the range of reasonable alternatives. Consistent with CEQ guidance, this EIS analyzes the range of reasonable alternatives that covers the full spectrum of potential combinations. The alternatives considered by DOE in this EIS are "reasonable" in the sense that they are practical or feasible from a technical and economic standpoint and meet the agency's purposes and needs. Potential conflicts with laws and regulations do not necessarily cause an alternative to be unreasonable, but additional mitigation commitments may be required if it is selected for implementation. For a more comprehensive discussion on compliance with regulatory requirements, see Section 2.7 of this CRD.

504-76 DOE must comply with certain legal requirements to undertake specific activities that are part of the proposed actions and alternatives; these requirements are identified throughout this EIS. For example, Chapter 1, Section 1.2.1, discusses Hanford regulatory compliance requirements; Section 1.2.7 discusses the WAC regulations DOE must meet for the proposed closure of the SSTs. Section 1.9, which describes the alternatives evaluated in this EIS, refers to the RCRA, WAC, and DOE order requirements that must be met for DOE to implement Tank Closure alternatives. The very nature of "environmental impacts analysis" requires DOE to analyze and describe in this EIS how proposed processes and technologies would operate; what results they are expected to achieve; what end products or byproducts might result; and how these measure up against the legal requirements that apply. Statutory, regulatory, Executive order, and DOE requirements are discussed in the context of each Chapter and are listed in the references at the end of each chapter.

Chapter 8 identifies and discusses the laws and legal requirements that are potentially applicable to the proposed actions and alternatives, as well as the permits and approvals DOE must obtain from Federal, state, and local agencies.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

acceptance of offsite wastes is neither required to proceed with any of the remaining alternatives described in the EIS, nor does it further any of the NEPA required actions at the Hanford Facility, such as limitation of adverse environmental affects, prevention of negative alterations of short or long term land-uses, or the prevention of adverse outcomes from the irretrievable commitments of cleanup resources. **504-80 cont'd**

6) Hanford Challenge supports decontamination of the FFTF via removal and closure. The actions required to clean close this facility, while substantial, are far less daunting than upcoming tasks at Hanford, such as groundwater remediation and closure of former cribs and trenches. **504-81**

7) Alternatives selected as a result of this EIS must not create a legal or technical condition which prevents or adversely affects closure of the WTP, DST closure, groundwater remediation, and closure of CERCLA past practice units. **504-82**

8) Alternatives selected through this EIS process must meet all lawful and applicable regulations and standards. Metrics which do not meet the lawfulness test or do not carry the force of regulations fail to meet the NEPA standard. One such example is the use of future areal extent of groundwater above standards, as opposed to a metric which does carry the force of law, such as future human health risk to individuals or populations. Metrics for alternatives selection must meet all normal and lawful standards such cancer and noncancer risks to individual resource users, environmental risks, species level risks, and adverse impacts to Native American Indian cultural resources. **504-83**

9) Alternatives were compared and site conditions modeled using a limited set of environmental constants and receptor values. Individual scalar values were **504-84**

5

In Sections 8.1.7 and 8.3, DOE identifies the consultations and coordination that DOE has undertaken with American Indian tribes and would need to continue for the purpose of implementing the proposed actions and alternatives. In addition, Chapter 7, Sections 7.1 and 7.5, discuss potential mitigation measures that may be needed and are feasible for DOE to implement to offset the potential impacts that might result from implementing an alternative. While DOE's Preferred Alternatives for tank closure, FFTF decommissioning, and waste management in this *TC & WM EIS* may not necessarily represent the most environmentally preferred alternatives, the ROD issued by DOE will identify any additional mitigation and monitoring commitments adopted by DOE and specify other factors considered by DOE in reaching its decision, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. In announcing its decision in the ROD based on the EIS analyses, DOE will be obligated to carry out the decision consistent with the requirements identified in this EIS. These requirements will be interpreted and applied by Federal, state, and local regulatory agencies through their independent authorities. These agencies may also impose additional mitigation measures through future permitting processes or remedial actions under the scope of the TPA, which include additional opportunities for public comment.

504-77 See response to comment 504-17 regarding groundwater remediation at Hanford.

504-78 A comprehensive work plan for achieving the legally mandated levels of groundwater restoration is clearly not a requirement of this *TC & WM EIS*, and DOE strongly disagrees with the assertion that this EIS needs to validate the entire Hanford cleanup strategy. The purpose of this document is to compare the relative environmental impacts of alternatives associated with tank waste disposition, offsite waste disposal, and FFTF disposition, and their relative environmental impacts. The cumulative impacts analysis presented in Chapter 6 of this EIS attempts to portray impacts against a background of current contamination levels. DOE is committed to cleaning up the site to agreed-to regulatory levels through its ongoing CERCLA / RCRA programs, and the burden of showing their ultimate effectiveness remains with those programs.

504-79 Chapter 2, Section 2.6.4, of this *Final TC & WM EIS* has been revised to include a discussion of the Oregon Department of Energy's proposal and how DOE has addressed the range of reasonable alternatives for tank waste storage, retrieval, and treatment and remediation of the existing tank farms in its original alternatives. DOE has carefully considered the Oregon proposal and,

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

used for critical modeling constants such as soil bulk densities, soil porosities, hydraulic conductivities, particulate concentrations in air and so on. Rather than use single scalar averages to represent all portions of the entire site uniformly, the EIS should use of ranges of values or at least statistically significant values matched to actual site conditions. The current EIS assumes that no preferential pathways exist in the subsurface, and that the site is perfectly homogeneous and well-characterized. Such conditions barely exist in the simple laboratory simulations, and never exist in any real-world systems. There can be no confidence in risk estimates that are based upon average values that imply homogeneity throughout the site. The use of such values fails to meet the standard of engineering practice demanded by the regulations upon which the EIS process is based.

504-84 cont'd

as explained in Section 2.6.4, has determined that it is not reasonable. It should be noted, however, that Ecology did not offer its own alternatives, but, rather, is a cooperating agency on this EIS. Ecology's participation as a cooperating agency has enabled the agency to help formulate the alternatives presented in this *TC & WM EIS*, and its views on the proposed actions and alternatives analyses are presented in the foreword to the draft and final EISs.

The impacts of different levels of tank waste retrieval and of different types of SST system closure are addressed in the *TC & WM EIS* analyses. For both Tank Closure Alternatives 6A and 6B, Base Cases, the assumption is that the SST system would be cleaned to levels that would allow for unrestricted use, which would involve removal of the tanks, ancillary equipment, and soils beneath the tanks (contaminated as a result of past leaks) down to the water table. The two Option Cases represent this type of clean closure along with removal of soils beneath the tank farms (contaminated as a result of infiltration from the contiguous cribs and trenches [ditches]). The analysis shows that the removal of the contaminants from the vadose zone does not capture the contaminants that may have already reached the groundwater table due to past practices (i.e., past leaks and contiguous cribs and trenches [ditches]).

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

504-80 See response to comment 504-6 for a discussion on the transport and disposal of offsite waste.

504-81 DOE's Preferred Alternative is FFTF Decommissioning Alternative 2: Entombment (see Section 2.12.2). See response to comment 504-6 regarding factors influencing future DOE decisions.

504-82 Chapter 1, Section 1.4.2, addresses decisions not to be made in this *TC & WM EIS*. As noted in that section, decisions on closure of the WTP, closure of the DSTs, groundwater remediation, and closure of CERCLA past-practice units are not within the scope of the proposed actions. Groundwater remediation and closure of these facilities would be addressed at a later date, subject to appropriate reviews. DOE does not believe that decisions made based on this *TC & WM EIS* will have any adverse effect on future actions or decisions.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

Review of Tank Farm Alternatives

Tank Farm Alternative 1 – No Action - The no action alternative is not considered, nor is it acceptable or lawful. Hanford Challenge does not support Tank Farm Alternative 1. ***504-85***

Tank Farm Alternative 2A – Existing WTP Vitrification; No Closure
This alternative does not comply with the existing Tri-Party Agreement, based upon this alternative's prolonged schedule, failure to pretreat 99Tc waste streams, and failure to dispose of high level wastes offsite in a geological repository as required under the Nuclear Waste Policy Act, (NWPA). Hanford Challenge does not support Tank Farm Alternative 2A. ***504-86***

Tank Farm Alternative 2B – Expanded WTP Vitrification; Landfill Closure.
This alternative does not comply with the existing Tri-Party Agreement, based upon this alternative's failure to prevent existing contamination in the vadose zone, which is currently greater than 15 feet below ground surface, from ultimately reaching the Columbia River. This alternative requires the construction of a second vitrification plant. With this investment, the expanded vitrification for low activity waste reduces overall risks compared to alternative 2A. This alternative fails, as does alternative 2A, because of its reliance on landfill closure, which does not meet the requirements of the Tri-Party Agreement or the Nuclear Waste Policy Act. Hanford Challenge does not support Tank Farm Alternative 2B. ***504-87***

7

504-83 See response to comment 504-75 for a discussion on the development of the alternatives in this EIS.

The scope of this *TC & WM EIS* includes decisions on storage, retrieval, treatment, and disposal of tank waste and closure of the SST system, including the tank system and the vadose zone impacted by the tank farms (i.e., past leaks). However, as discussed in the Summary, Section S.1.3.2, and Chapter 1, Section 1.4.2, of this EIS, DOE will not make decisions on groundwater remediation, including the remediation of groundwater contamination resulting from non-tank-farm areas within the 200 Areas, because that is being addressed under the CERCLA (42 U.S.C. 9601 et seq.) process.

The *TC & WM EIS* closure alternatives for the tank farms include no action, landfill closure, selective clean closure, and clean closure (which would involve actions to remove the source of contamination). This EIS does not include proposed actions to address potential groundwater impacts resulting from the tank farms (i.e., past leaks), as such actions will be addressed as part of CERCLA remedial action for the non-tank-farm areas of the 200 Areas. All CERCLA remedial actions must meet the applicable, relevant, and/or appropriate requirements of Federal and state laws and regulations governing such actions or can be waived by EPA.

504-84 DOE disagrees with the premise of the comment, specifically with the assertion that single-scalar averages were used to represent the entire site uniformly. Spatial heterogeneity was explicitly considered in the groundwater flow analysis (Appendix L), vadose zone flow and transport analysis (Appendix N), and groundwater transport analysis (Appendix O). Appendix L documents the finding that a zone of high hydraulic conductivity is required to match field observations across the central portion of the site (Section L.4.3.2.2). DOE is of the view that inclusion of spatial heterogeneity (at a scale consistent with the comparative nature of the NEPA analysis) is required for an unbiased comparison of impacts of the alternatives.

504-85 The No Action Alternative is included in the analysis as required by CEQ regulations (40 CFR 1502.14[d]). The regulations require the analysis of the No Action Alternative even if the agency is under a court order or legislative command to act. This analysis provides a baseline, enabling decisionmakers to compare the magnitude of potential environmental effects of the action alternatives.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

Tank Farm Alternative 3A, 3B, and 3C – Existing WTP Vitrification with Supplemental Treatment (3A - Bulk Vitrification, 3B – Cast Stone, and 3C – Steam Reforming); Landfill Closure. These alternatives fail to remove wastes from the tank farm, substituting inferior bulk stabilization methods for more appropriate treatment via the Vitrification plant(s). Engineering scale studies have found these measures to be less effective than removal and treatment options. These closure options are not permanent measures and thus they fail to meet the criteria of the Tri-Party Agreement and they fail to dispose of high level wastes offsite in a geological repository as required under the Nuclear Waste Policy Act, (NWPA). Leaving these wastes stored in situ at Hanford indefinitely is not a legal option. These alternatives are not supported by Hanford Challenge. *504-88*

Tank Farm Alternative 4 – Existing WTP Vitrification with Supplemental Treatment Technologies; Selective Clean Closure/Landfill Closure. This alternative is not supported by the State of Oregon, which correctly notes that this alternative does not meet Tri-Party Agreement requirements for the quality of the final waste form. This alternative is not supported by Hanford Challenge. This alternative does not comply with the NWPA which requires permanent isolation of the Tank Farm wastes and any accompanying remedial wastes. Leaving these wastes stored at Hanford indefinitely is not a legal option. *504-89*

Tank Farm Alternative 5 – Expanded WTP Vitrification with Supplemental Treatment Technologies; Landfill Closure. This alternative does not retrieve 99 percent or more of the tank waste. The State of Oregon correctly notes that this alternative does not meet Tri-Party Agreement requirements for the quality of the final waste form. This alternative is not supported by Hanford Challenge. This alternative does not comply with the NWPA which requires permanent isolation *504-90*

8

504-86 See response to comment 504-75 for a discussion on the development of the alternatives in this EIS.

504-87 See response to comment 504-75 for a discussion on the development of the alternatives in this EIS.

504-88 DOE conducted a number of supplemental technology reviews and technology selection processes as discussed in Appendix E, Section E.1.2.3.5.1. As discussed in this section, in April 2002, DOE evaluated over 50 options for potential supplemental technologies. From this list, the Hanford Cleanup Challenge and Constraints Team Mission Acceleration Initiative working group performed the final evaluation to select the appropriate technologies for further development. The six goals of this working group are included in this section of Appendix E with the conclusion that bulk vitrification be further evaluated along with cast stone and steam reforming.

Regarding the commentor's concern about the disposition of HLW, the current Administration has established a Blue Ribbon Commission on America's Nuclear Future that has issued a report and recommendations for a path forward for managing the country's HLW. DOE's decisions regarding management of Hanford waste will be consistent with Administration policies. For a more comprehensive discussion of this topic, see Section 2.10 of this CRD.

504-89 See response to comment 504-88 for a discussion of Yucca Mountain and the Blue Ribbon Commission.

See response to comment 504-75 for a discussion on the development of the alternatives in this EIS.

504-90 The removal of 99 percent or more of the tank waste is also DOE's preference as discussed in Chapter 2, Section 2.12.1. This level of waste removal would be achieved under all Tank Closure alternatives, with the exception of Alternative 1 (No Action) and Alternative 5. As discussed in Chapter 2, Section 2.2.2.1.1.5, DOE has developed a tiered strategy for maximizing tank waste retrieval while minimizing the potential for causing leakage. Appendix D of this EIS discusses uncertainties regarding the residual waste inventories. Retrieval has been completed on only a small number of SSTs and not much is known about the behavior of, or ability to remove, small volumes of residual waste. However, the tank closure process, which includes detailed examinations of the tanks and residual waste, requires the preparation of a performance assessment and a closure plan. These documents would provide the information and analysis

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

of the Tank Farm wastes and any accompanying remedial wastes. Leaving these wastes stored at Hanford indefinitely is not a legal option. 504-90 cont'd

Tank Farm Alternative 6A – All Vitrification/No Separations; Clean Closure. This alternative does not meet existing scheduling requirements, primarily due to the lack of pretreatment separations. It is in other respects the same alternative as 6B. This alternative is not supported by Hanford Challenge because of its extended timetable. This option fails to meet legal requirements. 504-91

Tank Farm Alternative 6B – All Vitrification with Separations; Clean Closure. This alternative has one distinct advantage over all of the other proposed alternatives. This alternative does not commit the US DOE to any irreversible actions or irretrievable commitments of resources to actions which violate NEPA, CERCLA, RCRA, and other legislation which enables the Hanford clean up. Other stakeholders have made detailed comments regarding additions to alternative 6B and the draft EIS generally which would enable this specific alternative to meet legal as well as State, Community, and Tribal requirements. As a single illustrative example, multiple stakeholders, (Oregon DOE, Nez Perce Tribe ERWM Program analysis, Hanford Challenge, and others), request that technecium-99 removal be included for this option.

(For explicit details on these see, Alternative 7 – the Oregon Proposal, dated January 4, 2010 by the Oregon DOE, and the Affiliated Tribes of Northwest Indians Resolution 10-02 on 99.9% removal of single-shell tank wastes). 504-92

Tank Farm Alternative 6C – All Vitrification with Separations; Landfill Closure. This alternative fails to meet legal requirements due to the inclusion of landfill closure as the final disposal option for the single shell tank farms. This 504-93

9

necessary for DOE and the regulators to make specific decisions on what levels of residual tank waste are acceptable in terms of short- and long-term risks.

504-91 See response to comment 504-75 for a discussion on the development of the alternatives in this EIS.

504-92 Chapter 2, Section 2.6.4, of this *Final TC & WM EIS* has been revised to include a discussion of the Oregon Department of Energy's proposal and how DOE has addressed the range of reasonable alternatives for tank waste storage, retrieval, and treatment and remediation of the existing tank farms in its original Tank Closure alternatives. DOE has carefully considered the Oregon proposal and, as explained in Section 2.6.4, has determined that it is not reasonable.

504-93 See response to comment 504-75 for a discussion on the development of the alternatives in this EIS.

DOE does provide geologic repository disposal for Hanford's (and other DOE sites') TRU waste at WIPP in New Mexico. The current Administration has established a Blue Ribbon Commission on America's Nuclear Future that has issued a report and recommendations for a path forward for managing the country's HLW. DOE's decisions regarding management of Hanford waste will be consistent with Administration policies. For a more comprehensive discussion of this topic, see Section 2.10 of this CRD.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

alternative thus fails for the same reasons described for alternatives 2B, 3, 4, and 5, namely the failure to meet the standards of legal agreements and regulations. These failures are, once again, failure to be protective of the Columbia River and failure to provide for disposal in an offsite repository. This alternative is not supported by Hanford Challenge. ***504-93 cont'd***

Review of FFTF Decommissioning Alternatives

FFTF Decommissioning Alternative 1 – No Action

The no action alternative is not considered, nor is it environmentally acceptable nor is it lawful. This alternative is also the most expensive. Keeping the FFTF in surveillance and maintenance status comes at a significant cost economically, and increases short term environmental impacts. This alternative is not supported by Hanford Challenge. ***504-94***

FFTF Decommissioning Alternative 2, Entombment & Alternative 3, Removal

The treatment of the RH-SCs and the disposition of bulk sodium is the same for alternatives 2 and 3. Costs are similar between alternatives 2 and 3. Hanford Challenge supports alternative 3, removal, as having the lowest long term risk. ***504-95***

Review of Waste Management Alternatives

Waste Management Alternative 1 – No Action. The no action alternative is not acceptable or lawful for the disposition of onsite-generated wastes in that it contradicts existing federal and state laws. No action is the preferred alternative ***504-96***

10

504-94 FFTF Decommissioning Alternative 1: No Action is included in the analysis as required by CEQ regulations (40 CFR 1502.14[d]). The regulations require the analysis of the No Action Alternative even if the agency is under a court order or legislative command to act. This analysis provides a baseline, enabling decisionmakers to compare the magnitude of environmental effects of the action alternatives. This *TC & WM EIS* presents a discussion of ongoing surveillance and maintenance actions (see Chapter 2, Section 2.5.3.1) and short-term impacts (see Chapter 4, Section 4.2) associated with FFTF Decommissioning Alternative 1: No Action.

504-95 See response to comment 504-6 regarding factors influencing future DOE decisions.

504-96 Waste Management Alternative 1: No Action is included in the analysis as required by CEQ regulations (40 CFR 1502.14[d]). The regulations require the analysis of the No Action Alternative even if the agency is under a court order or legislative command to act. This analysis provides a baseline, enabling decisionmakers to compare the magnitude of environmental effects of the action alternatives. As noted in Chapter 2, Section 2.5.4.1, under the No Action Alternative, limited amounts of offsite waste would continue to be sent to Hanford, consistent with the enforceable January 6, 2006, Settlement Agreement with the State of Washington (as amended on June 5, 2008) regarding *State of Washington v. Bodman* (Civil No. 2:03-cv-05018-AAM), signed by DOE, Ecology, the Washington State Attorney General's Office, and DOJ.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

to the acceptance of offsite-generated wastes, given that it is not possible to accept such offsite-generated wastes and yet remain within the boundaries of existing federal regulations. *504-96 cont'd*

Component 1: All onsite-generated LLW and MLLW would be treated and disposed of in the existing, lined 218-W-5 LLBG trenches. Component 1 of Alternative 1 is contrary to existing laws and legal agreements, including, the Hanford Federal Facility Agreement and Consent Order, also called the Tri Party Agreement, the Nuclear Waste Policy Act, which requires the permanent isolation of specific waste streams at the Hanford Site, NEPA, the National Environmental Policy Act, Washington State's Model Toxic Waste Act, the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA or more commonly, Superfund). Hanford Challenge does not support Component 1 of Alternative 1. *504-97*

Component 2: No offsite-generated waste would be accepted. There is no environmental benefit which accrues to the Hanford facility for this option, nor is any other alternative in the EIS dependent on completion of this component, thus the lowest risk option is no action for this component of Waste Management Alternative 1. Hanford Challenge supports component 2 of Alternative 1 for waste management. *504-98*

Waste Management Alternative 2

Component 1: Would continue treatment of onsite-generated LLW and MLLW in expanded, existing facilities and dispose of onsite-generated LLW and MLLW in a single IDF (IDF-East). *504-99*

504-97 See response to comment 504-75 for a discussion on the development of the alternatives in this EIS.

504-98 Comment noted.

504-99 Comment noted.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

Component 2: Extends this alternative to include previously treated offsite-generated wastes. Component 1 of alternative 2 does not provide the mandated level of risk reduction, nor does it comply with existing state and federal regulations. Component 2 of Alternative 2 is contrary to existing laws and legal agreements, including, the Hanford Federal Facility Agreement and Consent Order, also called the Tri Party Agreement, the Nuclear Waste Policy Act, which requires the permanent isolation of specific waste streams at the Hanford Site, NEPA, the National Environmental Policy Act, Washington State's Model Toxic Waste Act, the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA or more commonly, Superfund). Hanford Challenge does not support Components 1 and 2 of Alternative 2.

504-99 cont'd

Waste Management Alternative 3

Component 1: Would continue treatment of onsite-generated LLW and MLLW in expanded, existing facilities and dispose of onsite-generated in a single IDF (IDF-East); and would continue treatment of onsite-generated LLW and MLLW in expanded, existing facilities, but would dispose of onsite-generated LLW and MLLW in two IDFs (IDF-East and IDF-West). This component provides the maximum total risk reduction for receptors, and comes closest to meeting the requirements of existing state and federal regulations. Hanford Challenge supports Component 1 of Alternative 3.

Component 2: Extends this alternative to include previously treated offsite-generated LLW and MLLW. Component 2 of Alternative 3 is contrary to existing laws and legal agreements, including, the Hanford Federal Facility Agreement and Consent Order, also called the Tri Party Agreement, the Nuclear Waste Policy

504-100

12

504-100 DOE notes the commentor's preference for the treatment component of Waste Management Alternative 1 and the storage component of Alternative 3, with the understanding that all applicable and relevant regulations are presented in this final EIS. Throughout this EIS, DOE identifies the legal requirements that DOE would need to comply with for the specific activities that are part of the proposed action and alternatives. The very nature of "environmental impacts analysis" requires DOE to analyze and describe in this EIS how proposed processes and technologies would operate, what results they are expected to achieve, what end- or by-products might be produced, and how this measures up against the legal requirements that apply. Statutory, regulatory, Executive order, and DOE requirements are discussed in the context of each chapter and are listed in the references at the end of each chapter. Also, Chapter 8 identifies and discusses the laws and legal requirements that are potentially applicable to the proposed action and alternatives and the permits and approvals DOE would need to obtain from Federal, state, and local agencies.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Act, which requires the permanent isolation of specific waste streams at the Hanford Site, NEPA, the National Environmental Policy Act, Washington State's Model Toxic Waste Act, the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA or more commonly, Superfund). Hanford Challenge does not support Component 2 of Alternative 3.

The preferred waste management alternatives are Component 2 of Alternative 1 and Component 1 of Alternative 3, so long as component 1 of Alternative 3 meets all applicable and relevant state and federal regulations as presented in a final EIS. 504-100 cont'd

Response side of this page intentionally left blank.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

General comments

Standing – The comments presented are offered in matters of law only, and are not meant to represent or replace a technical commentary.

Legality – A final EIS must meet all applicable and relevant state and federal regulations, and meet the requirements of legal agreements.

Any portion of a final EIS which is contrary to any laws, regulations, standards, or lawful agreements has no legal viability in any judicial authority, whether state, federal, or other United States jurisdiction. ***504-101***

Severability - If a portion of a final EIS is determined to be lawful and is agreed to by the signatories of existing relevant lawfully-made agreements, then this portion of the final EIS should proceed into force, without regard to nonrelevant portions of the final EIS which do not achieve this same standard of lawfulness. ***504-102***

Standards - The use of a, "Maximum area to exceed criteria or standards" benchmark is an unacceptable criterion for measuring remedial success. The minimizing of human health and safety and environmental risks is the more accepted precedent. All standards and criteria used in the final EIS must meet state and federal regulatory requirements for applicability and enforceability. The use of benchmarks which do not have a basis in law, precedent or regulation is not an acceptable means of proving that an alternative presents the lowest practical environmental or public health risk level. ***504-103***

Failure to meet standards – The presumed failure to meet river water quality, groundwater quality, (based on radionuclide concentrations), and air quality ***504-104***

504-101 This EIS is not being prepared under CERCLA; therefore, the ARARs process does not apply. However, some of the ongoing Hanford site activities that are considered in the cumulative impacts analysis are currently undergoing remediation under the TPA, which is the legally binding process used at Hanford to implement CERCLA and RCRA (hazardous waste) requirements. All environmental restoration actions conducted at Hanford under CERCLA must evaluate the "legally applicable, relevant and appropriate requirements of Federal and State laws and regulations" to establish the appropriate cleanup level that must be achieved at an individual cleanup site.

However, the scope of the proposed actions evaluated in this *TC & WM EIS* does not include CERCLA remedial actions. Under NEPA, agencies identify the laws, regulations, and requirements that may apply to the proposed action and alternatives and identify where standards may be exceeded. This is not the same as an "ARARs analysis" under CERCLA, and it serves a different purpose. The identification of legal requirements in a NEPA document assists an agency in its planning, funding, and decisionmaking process. It also provides full disclosure to members of the public, stakeholders, and other agencies regarding the potential scope of an agency's effort to implement a proposed action (or an alternative) in terms of the subsequent permitting, other approvals, consultations, and coordination requirements, all of which would include additional public involvement opportunities in the future.

504-102 See response to comment 504-6 regarding factors influencing future DOE decisions.

504-103 See response to comment 504-5 regarding benchmark standards used in this EIS.

504-104 Chapter 7, Sections 7.1 and 7.5, of this *TC & WM EIS* discuss mitigation measures that could be used to avoid or reduce potential impacts on all resource areas. Many of the mitigation measures discussed would apply across all alternatives because of the similar nature of some of the activities analyzed in this EIS (e.g., construction of facilities).

standards, (based on particulate matter, carbon monoxide, and sulfur and nitrogen oxides), is not an acceptable foundation for a final EIS. Final approval of remedial alternatives must include a timetable and roadmap for meeting these legal obligations. In particular, the failure to meet air quality standards for particulate matter is problematic in that radionuclide transport is facilitated by particulate matter. This represents a direct pathway for increased human exposure to radioactive material. **504-104 cont'd**

Cultural and Paleontological Resources, (Native American Indian Interests), are described in the draft EIS as sensitive to impact from ground disturbance as well as sensitive to visual disturbances which may impact sites of cultural and religious significance. In addition the impacts on the Columbia River system and its fisheries should receive consideration in the selection of preferred alternatives. Alternatives which fail with respect to Columbia River protection also fail to respect issues of Native American Indian cultural and paleontological resource protection. **504-105**

Offsite wastes – Acceptance of offsite wastes does not provide an environmental benefit to the mandated Tank Farm closure and FFTF Decommissioning programs, nor is it a requirement to complete these mandated programs. The acceptance of offsite wastes comes at the cost of increased risks to the environment and the safety and health of the public at the Hanford site. For example, from the EIS Tank Farm Summary document, p. S-109, the applicant notes that, "receipt of offsite waste streams that contain specific amounts of certain isotopes, specifically iodine-129 and technetium-99, could have an adverse impact on the environment." Alternatives which include the acceptance of offsite wastes should be excluded categorically from the final EIS. **504-106**

Completeness – No comprehensive evaluation of current groundwater **504-107**

504-105 As described in Chapter 4 of the *Draft TC & WM EIS*, there would be no short-term impacts on the Columbia River under any of the *TC & WM EIS* alternatives. The analysis of long-term impacts on Columbia River ecological resources included the impacts of both radioactive and chemical constituents on a number of species. Species or groups of species (i.e., receptors) selected to represent Columbia River aquatic and riparian ecological resources include benthic invertebrates, muskrat, spotted sandpiper, raccoon, bald eagle, least weasel, and aquatic biota, including salmonids. The results (see Appendix P, Section P.3.2, of this *Final TC & WM EIS*) indicate that exposure to radioactive COPCs from groundwater discharge under all alternatives would be below the 0.1-rad per-day benchmark for wildlife receptors and the 1-rad-per-day benchmark for benthic invertebrates and aquatic biota, including salmonids. Thus, no adverse effects are expected. With respect to chemical COPCs, the analysis results indicate that chromium is the only COPC that could have a potential toxic effect, as it would exceed 1 for salmonids under all Tank Closure alternatives (including the No Action Alternative) and some Waste Management alternatives. However, based on the conservative nature of the exposure assumptions and the fact that the chromium is likely from a source other than the tank farms, no adverse impacts are expected as a result of actions taken under the alternatives (see Chapter 6, Section 6.4.3.2, and Appendix P, Section P.3.2.2, of this *Final TC & WM EIS*).

504-106 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

The impacts of the offsite waste in terms of radiological risk are presented in the Summary, Section S.5.5.3, and Chapter 2, Section 2.10, Key Environmental Findings. These sections discuss the radiological risk differences between including and not including offsite waste disposal at IDF-East.

The *TC & WM EIS* analysis shows that receipt of offsite waste streams that contain specific amounts of certain isotopes, specifically, iodine-129 and technetium-99, could cause an adverse impact on the environment. Therefore, one means of mitigating this impact would be for DOE to limit disposal of offsite waste streams at Hanford. Other mitigation measures, such as recycling secondary-waste streams into the primary-waste-stream feeds within the WTP to

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

conditions, baseline risks, or potential remedial/restoration measures is included in the draft EIS. This omission by itself threatens the integrity of the entire EIS process and the accompanying restoration schedule. **504-107 cont'd**

Insufficient risk/exposure model verification and calibration - Alternatives were compared using a very limited set of environmental constants and receptor values. Individual set values were used for critical modeling constants such as soil bulk densities, soil porosities, hydraulic conductivities, particulate concentrations in air and so on. (See EIS-0391 V2 p. Q-26)

Individual values appear to be selected to minimize apparent exposure risks, such as the use of 4.5 microgram per cubic meter PM10 as the only reference value for exposure to dusts. This value is 1/5th the value for US urban sites, and less than 1/15th the values for high dust events in the Pacific Northwest. (M. S. Wolff et al, EHP, 2005;113(6):739-748, and Center for Air Pollution Impact and Trend Analysis, R. B. Husar et al, 1998 respectively). The prevalence of high dust events in the region is well documented. A handful of days at the elevated dust storm levels would raise the Time Weighted Annual Ambient Average PM10 levels to concentrations far above the 4.5 EE-6 g/cubic meter used to evaluate risk in the EIS.

The use of these values also implies a level of environmental homogeneity which does not exist in the real world. For subsurface pathways, for example, preferential pathways are known to exist at various parts of the site. These preferential pathways may cause ground water hydraulic conductivities to increase by orders of magnitude compared to surrounding strata. Likewise, these preferential pathways can cause breakthrough times for radioactive wastes to reach the Columbia River to drop by orders of magnitude. **504-108**

16

increase iodine-129 capture in ILAW and bulk vitrification glass, are discussed in Chapter 7, Section 7.5, of this final EIS.

504-107 Chapter 3, Sections 3.2.6.2 and 3.2.6.3, of this EIS summarize existing vadose zone and groundwater conditions, respectively, including sources of environmental contamination and its extent across Hanford. Where appropriate, contaminant concentrations are compared with DOE derived concentration guides (DOE Order 458.1) and/or Federal and state drinking water standards, as appropriate, in part to establish the environmental "baseline" for assessing long-term groundwater and human health impacts, as presented in Chapter 5 of this EIS. More-detailed hydrogeologic information and data used to prepare the groundwater flow model in support of the long-term impact analyses are included in Appendix L. Additional hydrogeologic data specific to the evaluation of long-term impacts on the vadose zone are presented in Appendices M and N, and data and interpretation specific to the groundwater transport analysis are included in Appendix O. Groundwater beneath Hanford is described in Section 3.2.6.3, including the fact that groundwater quality beneath large portions of Hanford has been affected by past liquid waste discharges. The commentor is also referred to the latest groundwater monitoring report (which may be accessed through http://www.hanford.gov/page.cfm/SoilGroundwaterAnnualReports) and/or the current Hanford Site environmental report (Poston, Duncan, and Dirkes 2011) for more-detailed information on groundwater conditions; these references are cited throughout Chapter 3 and are listed in Section 3.4.

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

504-108 Estimation of human health impacts for this *TC & WM EIS* involves modeling of releases to the vadose zone from hundreds of sources at Hanford, transport of water and solutes through both the vadose zone and the unconfined aquifer, and estimation of human health impacts based on contact with and use of contaminated groundwater and direct contact with waste material. As discussed in Appendix M, estimates of rate of release are based on site- and source-specific conditions, including physical dimensions, waste inventories, and physical and chemical characteristics of waste forms. Analysis of transport through both the vadose zone and unconfined aquifer is based on a three-dimensional, spatially heterogeneous, site-specific description of soil types and characteristics. These

Comments on the Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA, USDOE, Oct. 2009
Prepared by Marco Kaltofen, PE, (Kaltofen@wpi.edu), May 3, 2010

End note

The nuclear engineering profession has understood from the outset that the Columbia River and the Pacific Ocean itself must be protected from radioactive contamination. Actions at Hanford are sometimes evaluated through the false perspective that its original operators were unaware of the potential damage that radiation does in the environment.

A prominent 1954 text on reactor design notes that, "The danger that is always present is that sea plants and animals that utilize minerals from water will concentrate the active material in their bodies, and the radioactivity may ultimately reappear in sea food consumed by human beings." (From, Introduction to Nuclear Engineering, Raymond L. Murray, 1954, Ch. 15 Radioactive Waste Disposal, p. 300, Prentice Hall Publishers). This author was a student of Robert Oppenheimer and was a research assistant to Ernest Lawrence. Fifty six years later, protection of the Columbia remains the underlying principle of the laws that regulate nuclear wastes at Hanford.

analyses reflect the variability observed in the environment and in the different types of facilities located at Hanford and reflect preferential flow to the extent that the pathways are present in the underlying geologic data. With respect to individual values incorporated into the human health exposure scenarios, the objective was to construct a reasonably conservative rather than worst case analysis. As an example, the value adopted for airborne mass loading (4.5 micrograms per cubic meter) is a time-weighted average incorporating exposure at low values indoors and high values encountered outdoors, as in gardening.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

ATTACHMENT 2

Review of Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington.

Prepared for Hanford Challenge
May 3, 2010

Review comments by:
John Brodeur, PE, LEG
Energy Sciences & Engineering
Kennewick, WA

A discussion of Clean Closure and groundwater sacrifice
My first concern with the EIS is that it does not consider and evaluate a true clean closure alternative. By "clean closure" I refer to the concept of removing the tank waste, tank structures and ancillary equipment and excavation/removal of the vadose zone contamination plus the cleanup of the groundwater contamination resulting from past leaks, spills, and intentional discharges from the tanks and adjacent cribs and trenches.

Alternatives 6 A & B with the option of clean closure of the adjacent cribs best represent a clean closure alternative. However, Alternatives 6A&B do not include cleanup of the groundwater. Section S.1.3.2 indicates that groundwater remediation decisions are not made or included in the proposed actions in the EIS. The EIS does not adequately explain exactly what that means or how key groundwater decisions impacting the risk assessments are represented in the risk assessments for each alternative.

In my review of the EIS I attempted to determine if there was an alternative that resulted in removal or treatment of all forms of contamination, from the tank farms to the vadose zone and groundwater. I was not successful due to the difficulty in determining just what contamination sources went into what portions of the models of each alternative.

In the Summary section of the EIS, key figures are the calculated radiological risk from drinking groundwater at the core boundary for three radiological sources including: 1)the tank farms cribs and trenches (Figure S-16), 2) the past leaks at the SSTs (Figure S-17) and 3)tank closure residuals, ancillary equipment and retrieval leaks (Figure S-18).

504-109

Page 1

504-109 The scope of this *TC & WM EIS* includes decisions on storage, retrieval, treatment, and disposal of tank waste and on closure of the SST system. This closure includes the tank system and the vadose zone impacted by the tank farms (i.e., past leaks). However, as discussed in the Summary, Section S.1.3.2, and Chapter 1, Section 1.4.2, of this EIS, DOE will not make decisions on groundwater remediation, including the remediation of groundwater contamination resulting from non-tank-farm areas within the 200 Areas, because that is being addressed under the CERCLA (42 U.S.C. 9601 et seq.) and TPA processes. The *TC & WM EIS* Tank Closure alternatives considered for the tank farms include no action, landfill closure, selective clean closure, and clean closure (which would involve actions to remove the source of contamination). This EIS does not include proposed actions to address potential groundwater impacts resulting from the tank farms (i.e., past leaks), as such actions will be addressed as part of CERCLA remedial action for the non-tank-farm areas of the 200 Areas. All CERCLA remedial actions must meet the ARARs of Federal and state laws and regulations governing such actions or can be waived by EPA.

The clean closure alternatives considered for the SST system are represented by the Base and Option Cases of Tank Closure Alternatives 6A and 6B. For both Base Cases, the assumption is that the SST system would be cleaned to levels that would allow for unrestricted use, which would involve removal of the tanks, ancillary equipment, and soils beneath the tanks (contaminated as a result of past leaks) down to the water table. The two Option Cases represent this type of clean closure along with removal of soils beneath the tank farms (contaminated as a result of infiltration from the contiguous cribs and trenches [ditches]). The analysis shows that removal of the contaminants from the vadose zone would not capture those contaminants that may have already reached the groundwater table due to past practices (i.e., past leaks and contiguous cribs and trenches [ditches]).

The Summary, which the commentor is referring to, provides an upper level presentation of the results of the *Draft TC & WM EIS*. Chapter 5 and Appendix Q of the *Draft TC & WM EIS* and again in this *Final TC & WM EIS* presents the human health impacts related to tank farm operations, retrieval and closure. The first type of release presented is the past practice of direct discharge of liquid to cribs and trenches (ditches). The second type of release presented is due to past activity at the tank farms and includes past leaks from damaged tanks. The third type of release presented is due to future activities and includes leaks during retrieval of waste from the tanks, and long-term leaching of waste material in tanks and ancillary equipment and the results are presented beginning

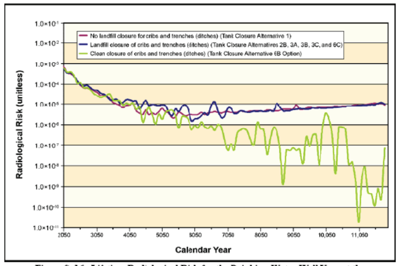


Figure S–16. Lifetime Radiological Risk for the Drinking-Water Well User at the Core Zone Boundary due to Releases from the Six Sets of Cribs and Trenches (Ditches)

Figure S-16 shows long-term radiological risk from releases from cribs and trenches. Clean closure of cribs (Alternative 6B, light green trace in the figure) includes removal of the contamination sources in the vadose zone. The long-term radiological risk shown on the plot, reflects conditions resulting from an absence of groundwater cleanup. This supports the contention on page S-92 that "Cribs and trenches are major contributors to potential long-term groundwater impacts for all Tank Closure alternatives due to early discharges …" That is exceptionally true if the groundwater is not cleaned up under the clean close scenario and one drags this groundwater contamination into the risk model that is used to represent a clean closure scenario.

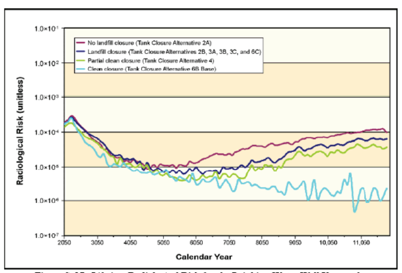


Figure S–17. Lifetime Radiological Risk for the Drinking-Water Well User at the Core Zone Boundary due to Past Leaks at Single-Shell Tank Farms

Page 2

504-109 cont'd

in the calendar year 2050. This presentation of the analyses allows the reader to specifically compare the alternatives using information on past and future potential impacts.

DOE does not agree with the commentor's statement that "DOE is arguing that the groundwater is already contaminated and we will only be making it a little worse by adding add a little more contamination that will exceed groundwater standards." There are potential compliance issues identified today with the tanks as well as the associated CERCLA cribs and trenches (ditches) adjacent to them. This *TC & WM EIS* indicates that, over the long term, removal of the waste from the SSTs and closure of the tanks has long term benefits over not closing the SSTs. Following completion of the mitigation action plan and before implementing closure actions DOE will develop a tank farm system closure plan that will be implemented for each of the waste management areas. The first waste management area to be addressed is Waste Management Area C. The TPA has a milestone for the completion of a soil investigation for Waste Management Area C (M-045-61), submittal of a closure plan (M-045-82), and for the completion of Waste Management Area C closure (M-045-83). DOE will complete the soil investigation to determine the nature and extent of the contamination. To inform the decision process for closure, DOE will complete a Waste Management Area C Performance Assessment and risk assessment. Following completion of the tank retrievals, data collection activities for residuals in the pipelines, ancillary equipment, and soil, the performance assessment will be revised to include all data. This revised performance assessment and closure plan will be presented for public review and comment, and the Waste Management Area C closure plan will be modified and incorporated into the Hanford site wide permit.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Figure S-17 shows the long-term radiological risk from past leaks at the tank farms. On page S-93 it indicates that clean closure of the SST Farms means that contamination from past leaks would be removed at all SST Farms. However, groundwater contamination remains and it is left to the reader to figure out that the blue trace in Figure S-17 results from the absence of groundwater cleanup. On page S-93 it states "Past leaks are major contributors to potential long-term groundwater impacts".

On page S-96 it states that Figures S-16 and S-17 show that clean closure would provide little reduction in long-term impacts to groundwater before CY6000 due to past leaks and cribs and trenches. This is only true because their clean closure scenario is not a clean closure. Under Alt 6A&B with option, the groundwater contamination from past leaks is not remediated and is included in the clean close alternative risk calculation creating substantial risk. As a result, when you compare the relative risks, there is little reduction in long-term impacts to groundwater resulting in the false conclusion of the true benefit of an actual clean closure scenario.

Figure S-18 shows the tank farm closure risk from drinking groundwater at the core zone. Specifically absent from that graph is a plot for Tank Closure Alternative 6B because "there are no long-term human health impacts…" because the "groundwater sources … are completely removed under this alternative" *pg S-95*. In other words, when you remove the contamination, the long-term risk is gone. That concept of clean close as applied to Tank Closure also needs to be applied to the closure concept for the crib and trench sources and for the past leak sources.

504-109 cont'd

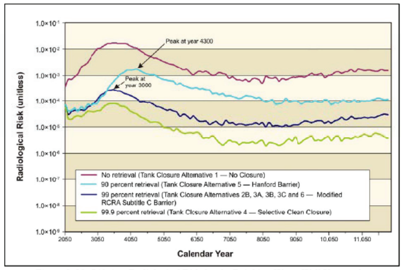


Figure S–18. Lifetime Radiological Risk for the Drinking-Water Well User at the Core Zone Boundary due to Releases from Tank Farm Residuals and Ancillary Equipment and to Retrieval Leaks

On page S-96 the DOE proffered alternative of landfill closure of the tank farms and associated cribs versus clean closure of the same, is based on the excessive cost of clean

Response side of this page intentionally left blank.

closure and on the conclusion that clean closure would only provide an incremental decrease in radiological risk. That argument is apparently based on the preceding Figures S-16 and S-17 which in effect, compares the relative long-term radiological risks only for alternatives where the groundwater is not cleaned up and does not compare risks to a true clean-closure alternative.

Figures S-16 and S-17 are terribly misleading without a clear explanation of what contamination is and is not represented in the radiological risk determination. DOE's argument of only incremental decrease in radiological risk with clean closure is not a valid argument when comparing it against the risk from an alternative that includes cleanup of the groundwater during and following the retrieval period.

It appears that the DOE is prematurely assuming a cleanup path where the groundwater at the tank farms will not be remediated. This approach biases the risk assessment by producing significant long-term impacts to groundwater that may not necessarily be present. Since DOE's alternative preference is based on a comparison of relative alternative risks, at least one of the alternatives must include groundwater cleanup for a proper risk comparison. In effect, the DOE is arguing that the groundwater is already contaminated and we will only be making it a little worse by adding add a little more contamination that will exceed groundwater standards.

This argument amounts to making the determination in the EIS that the groundwater beneath the tank farms is irretrievably contaminated and now, since it is already contaminated we might as well contaminate it some more and really make it irretrievable and save some money on cleanup. This is all done in light of the fact that the EIS is not intended to make decisions on cleanup of the groundwater.

Including past groundwater contamination in all Alternatives creates a groundwater sacrifice zone by default yet the EIS provides no mention or discussion of this. In fact, it was very difficult to determine how the existing groundwater was included in the risk calculations.

504-109 cont'd

Vadose zone flow and transport model validation
On pages N-6 and N-7 the EIS discusses the selection of van Genuchten parameters for the vadose zone model using a process described in Figure N-1 where they match parameters with actual conditions. In effect, this is an empirical calibration of their vadose zone model where they change some of the variables of the basic equation to make the model a better match to actual conditions.

Three data sets are used to represent contamination migration conditions resulting from a single vadose zone source. One of the data sets is discussed and explained in Appendix N.

504-110

Page 4

504-110 There appears to be some confusion. The *Draft TC & WM EIS* Appendix N, Figure N–1, reference is to three soil types and not three data sets. In the *Draft TC & WM EIS* these three soils, Hanford gravel, Hanford sand, and Ringold gravel, are the three dominantly occurring soil/sediment types found in the vadose zone, and in our simulations flow in the vadose zone is most sensitive to characteristics. Other materials such as silts and mud are important features in some locations, but by and large flow and transport are through the three soil types.

DOE recognizes that it is difficult to compare the historical data presented in Figure N–5 to model results in Figure N–6 of the draft EIS. This has been revised in this *Final TC & WM EIS* by presenting both on the same graph, Figure N–12. DOE would like to clarify that the comparison of these two data sets is a "qualitative agreement." DOE believes this qualitative agreement is evident in that the observed data show gross beta and the predicted technetium-99 peak in the mid-1950s, with concentrations falling off rapidly thereafter and ending in the 1970s. Given the log scale, the size of the initial peak, and approximate agreement even over long periods, qualitative agreement is a reasonable characterization. There indeed may be trend as a result of flows from a distant source to the well, but that trending value is still of the same order of magnitude. Thus, there are two points to be made in this regard: first, there is qualitative agreement; and second, the structure evident in the field data is not explained solely by the BY Crib model. Note in Figure N–5 of the draft EIS that the technetium-99 activity exceeds the gross beta. Explanations for this range from measurement uncertainties to multiple and distant sources. Appendix N has been revised in this final EIS to provide this additional explanation.

DOE would like to clarify that neither the flow nor the transport model is a steady-state model.

DOE believes that the commentor's conclusion regarding the active vadose zone plume is too restrictive. All that is suggested by the observations in well 299-E33-7 is that a new pulse or band of technetium-99 contamination is arriving in the vicinity of the well. This could be by way of the vadose zone or the saturated zone. The commentor's argument that the technetium-99 arriving at the vadose zone is from a distant source via lateral movement through a perched water table is examined in detail in the following paragraphs.

DOE disagrees with the commentor's interpretation of the Sobczyk (2004) document. Sobczyk indicates the movement of uranium in the vadose zone,

Figure N-5 shows the historical gross beta activity and Tc-99 concentration measured in the groundwater beneath the BY cribs (well 299-E33-7). The source of this groundwater contamination is reported to be from the BY cribs.

Figure N-6 shows the modeled or predicted Tc-99 concentration, although I do not understand why they did not plot the data on Figures N-5 and N-6 on a common graph.

On page N-7, the EIS indicates that the measured and predicted Tc-99 concentrations are in general agreement and the predicted Tc-99 concentration profile shows qualitative agreement with the gross beta profile. I am not certain what this means relative to the model and I would normally request that a sensitivity analysis be done to provide an estimation of the error of the model, but this is all moot point as I will explain.

I will mention first that the predicted Tc-99 curve reaches a steady state concentration of near 20,000 pCi/L after 50 years. On the other hand, measured Tc-99 concentration shows an increasing trend from about 500 pCi/L to 20,000 pCi/L and rising. In my opinion, this does not appear to be a qualitative match nor does it appear to represent a condition of general agreement.

On review of the Tc-99 groundwater data shown in Figure N-5, I conclude that a clear rising trend in groundwater contamination is occurring at this location from about 1983 to the present. This trend indicates a dynamic groundwater contamination condition, not a steady state flow as modeled, and it indicates that an active vadose zone plume is just now entering the groundwater in the immediate vicinity of the well.

504-110 cont'd

Unfortunately, the Tc-99 contamination shown by Figure N-5 originated from the BY Farms or from the large leaks from tank BX-102. It did not originate from the BY cribs as indicated and it certainly is not from a single vadose zone source. This has all been documented by the Nez Perce and Sobczyk (et al., 2003, 2004), and DOE 2004.

Tc-99 and Uranium have relatively high migration rates. Uranium can be tracked through the vadose zone with passive spectral gamma ray logging, but Tc-99 cannot because it requires actual sampling to determine soil concentration. What Sobczyk and the DOE Grand Junction Office did was to follow the uranium from the BX-102 through the vadose zone on a northward preferential pathway to a place below the BY cribs where it is entering groundwater. This vadose zone data is all correlated with groundwater data including trends in Tc-99, Uranium and Nitrates. This combination of vadose zone uranium plume tracking and correlation with multiple groundwater contaminants makes Sobczyk's conclusions quite solid. These references on the BX-102 contamination plume are all available and the information provided by Sobczyk is summarized in the annual Hanford Site Groundwater Monitoring Report so it is inexplicable why the data would be so totally misused for such a critical thing as calibrating the model forming the basis of the entire risk assessment.

This contamination migration pathway through the vadose zone soil and into groundwater at the B-BX-BY complex as mapped out by Sobczyk, probably represents a

Page 5

once reaching the perched system, was to the northeast in the vicinity of well 299-E33-18, where it is implicated as the origin of the saturated zone plume observed moving to the northwest. That plume extends to the BY Cribs and beyond (Sobczyk 2004:Figure 6).

An additional complication is the likelihood of changes in the direction of the groundwater flow in this area over the years.

DOE disagrees with the commentor's assertions regarding DOE's calibration of the model. As stated in Section N.1.2 of the draft EIS, concentration data at several locations were used in the final step of the calibration of the vadose zone parameter. This included unconfined-aquifer data considered, by virtue of location and history, to be attributable to single-site sources, and data attributable to grouped sources (e.g., tritium plume data). Three sets of gross beta concentration data were used for single-source sites, including the concentrations at well 299-E33-7 immediately downgradient from the BY Cribs. (The other locations were the BC Cribs [gross beta] and the vicinity of the 216-T-26 Crib [iodine-129].) The BY Cribs are judged to be suitable as a calibration site because of (1) the location of the well relative to the cribs, (2) the fairly well quantified release with respect to both flow and inventory, resulting in a simple response in the aquifer below, (3) the availability of a significant quantity of geologic data for the area, and (4) the adequate density of concentration data available at the time when the release was expected to have impacted the well.

In regard to the near-saturated soil conditions, the release from the cribs involved larger volumes of water than did leakage from the tanks. During operation of the BY Cribs, conditions in the vadose zone were at or near saturation for a short time—a couple of years—and this is precisely what was modeled—with an emphasis on agreement with the peak occurring in the mid-1950s immediately after operation of the cribs.

DOE disagrees with the commentor's assertion that the models used—implemented using the STOMP code—were inappropriate. The STOMP code can be used, and in fact in our models was used, to simulate the variety of hydrogeological conditions—varying in time and ranging from arid conditions to saturation—associated with the multiple types of releases that have occurred at the site.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

local drainage that drained to the north toward a paleo-channel that ran from west to east between the west area and Gable Mountain. This migration pathway most likely resulted from contamination moving through the soil at or near saturated soil conditions. The near saturated soil conditions resulted from the characteristically large volumes of effluent or tank liquid that was released in the B complex. It is also likely that all of the large volume releases from the area went down the same migration pathway. Because of the near-saturated soil conditions that most likely occurred at the B complex, it is inappropriate to use the BY groundwater data for the empirical calibration process describe in Figure N-1. I believe this shows that the type of vadose zone contaminant migration model used in the EIS is entirely inappropriate for the types of conditions that existed at many of the tank farms.

The vadose zone model should consider and appropriately model the expected saturation of the soil during a large leak or release event as well as the increased soil moisture resulting from placement of gravel covers over the tank farms and the water releases from water line leaks and the massive effluent releases from nearby cribs.

I concur with Sobczyk's interpretation that the rising Tc-99 in the groundwater beneath the BY cribs most likely originated from the BX-102 leak which, along with uranium, is just now reaching groundwater in this area. Current conditions along the migration pathway are probably close to some form of steady state conditions but for the increased infiltration at the tank farms and other recent water releases in the area.

504-110 cont'd

In the above discussion, I used words like "likely" and "most likely" demonstrating an educated but limited understanding of actual site conditions as a result of inadequate characterization of the vadose zone contamination at Hanford. They simply don't have the site characterization data to confirm or reject any theories on subsurface conditions. Likewise, there is obviously also not enough data to do the type of model calibration that was attempted. I believe that the site that is used for the empirical calibration of the vadose zone model must be extraordinarily well characterized both spatially and temporally because the model accuracy is critical for developing and demonstrating accurate risk assessments.

I believe it is entirely premature to make the closure decisions proposed in the EIS before the site characterization is completed and we at least have an understanding of how the contamination migrates through the vadose zone soil. The current vadose zone model using unsaturated flow is inappropriate and the calibration of the model is simply wrong because the contamination actually originated from a different source.

504-111

Groundwater Transport Model
The groundwater contaminant transport analysis is described in Appendix O and groundwater transport results for tank closure alternatives are presented in a series of tables from Table O-6 to O-32. Groundwater concentration plots and groundwater plume model results are shown and discussed in Chapter 5.

Page 6

504-111 The analyses of the *Draft TC & WM EIS* rely on various modeling approaches to predict the future consequences of RPP mission activities that DOE may undertake. Appendix L, Section L.4.3, reveals that field-sampling data from over 5,000 boring logs were used to support lithologic encoding of the regional-scale flow model; Section L.6.1, that field-sampling data from approximately 1,800 groundwater wells were used to calculate the regional-scale flow model; and Appendix N, Section N.1.2, that field-sampling data from approximately 140 vadose zone boreholes were used to calibrate the vadose zone model as well as regional-scale groundwater plume measurements for the BY Cribs, BC Cribs, 216-T-26 Crib, and the REDOX and PUREX waste sites. In Appendix U, modeled results of contaminant plumes are compared against field measurements for the COPCs. DOE's view is that the overall level of characterization data for Hanford supports differentiation among the alternatives, which is a key feature of a NEPA analysis. As part of the closure and permitting processes, additional subregional-scale site characterization data may be developed to support smaller-scale, more-detailed modeling assessments.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

My first comment about the model is that a description of the physical model that the model represents could not be found. I was looking for areas in the model with high permeability representing old drainage channels and other ties to the actual geology and hydrogeology of the site. Even a basic cross section showing model resolution and the different Ringold layer parameters would have been useful. Questions remain about how well the model represents actual subsurface conditions. **504-112**

The calibration of the groundwater transport model was accomplished using two tritium plumes but not with any lower mobility contaminant plumes or a plume containing multiple contaminants. The tritium plume calibration model runs appear to represent historical conditions at Hanford.

It is also difficult understand groundwater impacts of each Alternative with no way to compare the groundwater conditions between Alternatives. I cannot determine exactly what contamination went into each model and specifically what were the differences between the sources. **504-113**

Figure 5-240 shows Alternative 6A base case groundwater total uranium concentration for 2005. This model result apparently does not include existing uranium groundwater contamination and has not been compared to existing conditions. The uranium plume on the north side of the B complex where the uranium concentration exceeds the MCL is not shown (see Missing Groundwater Contamination below) **504-114**

Relative to the end risk associated with each alternative and the Alternative impact on groundwater it is clear that the no action Alternative 1 will result in widespread groundwater contamination of the Hanford site and rivershore areas. It was difficult to compare groundwater impacts from the rest of the Alternatives because the impacts were similar and there were no comparison plots or discussion of the differences. In addition, the absence of a clean groundwater alternative makes it a game of comparing bad groundwater impacts to slightly worse impacts with no concept of what could be. My interest at least is in assessing the possibility of clean groundwater. **504-115**

I-129 distribution coefficient sensitivity modeling reported on page O-91, used a soil bulk density of 2.6 g/cm^3, corresponding to a soil density of 162 lb/ft^3. An actual in-situ soil density, considering a soil porosity of 25% by volume would be about 110 lb/ft^3 or 1.7 g/cm^3. This unrepresentative soil density results in inaccurate migration rates in the sensitivity analysis.

The sensitivity of the model to contaminant inventory variations (O.6.5) uses the vadose zone model output for Tc-99 from the "BY cribs" in the calculations. On page O-107 it indicates that the BY crib sensitivity analysis shows "variations of source strength on the order of 50% would result in large variations in the near field … with resulting variations in (groundwater) concentrations of over an order of magnitude". This leads to groundwater concentration predictions at the three output points with error ranging from 50% to 100%. In other words, the model shows the groundwater concentration is very sensitive to variations in vadose zone source strength. **504-116**

Page 7

504-112 This *Final TC & WM EIS* has been updated to add a site conceptual hydrogeologic model to Appendix L, Section L.2. The conceptual model is depicted at a general/summary level. Additional details regarding data selection, qualification, and justification are included in appropriate sections within this EIS, and/or included in EIS calculation and analysis packages.

504-113 The calibration method (tritium plume matching) included in Appendix O was based on a compilation and interpretation of observed tritium plume data provided in the *Hanford Site Groundwater Monitoring for Fiscal Year 2003* (Hartman, Morasch, and Webber 2004). For this *Final TC & WM EIS*, this interpretation was supplemented with information up to and including the *Hanford Site Groundwater Monitoring and Performance Report for 2009* (DOE 2010). The purpose of the calibration was to determine transport parameters for the groundwater transport model; in DOE's view, this is best accomplished by comparing results for conservative tracers. The first reason for this choice is that conservative tracers (from high discharge sites, like the PUREX and REDOX sources) are least likely to have confounding influences from vadose zone transport processes. The second reason for this choice is that conservative tracers sample more of the area and volume of the aquifer, and thus provide a more robust test for developing parameters. The third reason is that conservative tracers are the most likely to have well-developed, regional-scale plumes that are amenable to field sampling and analysis. The working hypothesis underlying this process is that, when parameters are chosen that match model results and field measurements for conservative tracers, these same parameters are applicable to retarded tracers. This is a well-established, standard hydrogeologic approach. DOE disagrees with the commentor's observation that plumes containing multiple contaminants were not used in this process. The plumes used in all of the contaminant transport calibrations contain multiple constituents. A comparison of the COPCs by alternative is included in Chapter 5. The analysis performed in Chapter 5 includes lower mobility contaminants such as uranium-238 and a detailed description of the contaminant sources. The inventory data for each alternative by source are provided in Appendix D and the cumulative impacts analysis inventories by source are provided in Appendix S.

504-114 Chapter 5, Figure 5–240, of the *Draft TC & WM EIS* represents a model result for sources related to Tank Closure Alternative 6A. Figures in Chapter 5 are not intended to represent current conditions. The comparison of model predictions to current measurements is presented in Appendix U.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

This sensitivity to source strength is probably correct, at least for the environmental conditions that are modeled. Unfortunately, the sensitivity test empirical model was based on the BY Crib groundwater plume data and the Tc-99 did not originate from the cribs but from a tank source. As a result there are differences in the vadose zone release to groundwater that are not considered in the sensitivity model. For model quality validation concerns the sensitivity to source strength modeling is totally invalid but the underlying trend conclusion is probably correct, at least for the conditions that were modeled.

It is clear that additional site characterization must be completed before any reliable groundwater contaminant transport calculations or model sensitivity analyses can be completed.

The validity of the other inventory sensitivity calculation in this section (TY cribs) was not assessed due to an inability to review the T complex site characterization data because most of the data and reports were not available either on the web or in the WSU public reading room. However, considering the sensitivity of the BY groundwater model to the inventory and to the uncertainty of the model source term, it can be concluded that the groundwater transport calculation errors are too large to support the risk assessments in the EIS.

504-116 cont'd

Missing Groundwater Contamination

Results of the vadose zone and groundwater modeling as shown in Figures 5-205 to 5-206 are not accurate. All of the figures show very low initial uranium concentrations in the groundwater at this time when we know this is not the case.

I again pick on the work of Dr. Sobczyk and DOE GJO characterization of the B complex as an example where uranium from the BX-102 tank has made its way through the vadose zone soil and entered groundwater where it currently exceeds the drinking water standard benchmark. So current uranium concentrations in the groundwater exceeds anything predicted in the modeling.

504-117

My concern is that the EIS apparently missed this groundwater contamination and did not properly assess the resulting long-term risks. I also have concerns that there is no way to determine what specific contamination plumes at Hanford are represented by the models. It is apparent that the BX-102 contamination is not represented.

Somewhere from the source characteristic data of leak volume and composition to the release model, to the vadose zone transport model, the uranium did not make it into the groundwater and is not accounted for in the risk assessment.

"Possibly" some Short-term environmental consequences

Some short-term environmental consequences/impacts do not appear to have been reviewed, evaluated, assessed or recognized in the EIS. I refer to the short-term environmental impacts resulting with existing groundwater contamination as well as the

504-118

Page 8

504-115 See response to comment 504-107 regarding groundwater contamination and remediation.

504-116 In response to this and similar comments, Appendix O of this *Final TC & WM EIS* has been revised and includes an update to the iodine-129 distribution coefficient sensitivity analysis found in Section O.6.3.

The comment regarding the model's sensitivity to contaminant inventory values implies that the analysis of the model's sensitivity to contaminant inventory variations is invalid because "the Tc-99 did not originate from the [BY] cribs but from a tank source." DOE disagrees with the comment that no technetium-99 was discharged from the BY Cribs. As described in Appendix D, Table D–30, 128 curies of technetium-99 were discharged from the BY Cribs. Although this is an important correction to the comment, more importantly, the Appendix O sensitivity to contaminant inventory variations would be valid regardless of whether there was technetium-99 inventory released from BY Cribs. This Appendix O sensitivity analysis compares 100 model runs to one another—not to an absolute or known result. The purpose of this sensitivity analysis is to show how differently a groundwater plume may behave if the inventory of its contaminant source varies by plus or minus 50 percent. This Appendix O analysis reasonably meets this objective. DOE notes that there is no comment on the TY Cribs portion of this Appendix O contaminant inventory variation sensitivity analysis. DOE disagrees with the commentor's conclusion that groundwater transport calculation errors are too large to support the risk assessment in this EIS.

504-117 All of the figures and tables in Chapter 5 represent model results for sources related only to specific Tank Closure, FFTF Decommissioning, and Waste Management alternatives. In particular, Figures 5–205 and 5–206 of the *Draft TC & WM EIS* present model results for only the sources involved in Tank Closure Alternative 6A. Figures in Chapter 5 are not intended to represent current conditions. The comparison of model predictions to current measurements is presented in Appendix U.

504-118 Short-term impacts analysis, as described in the Summary and other places within this EIS, covers impacts associated with the active project phase during which construction, operations, deactivation, and closure activities would take place, and extending through the applicable 100-year administrative control, institutional control, or postclosure care period. Short-term impacts are summarized primarily in Chapter 4 of this EIS. Long-term impacts are presented

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

deep vadose zone contamination that is currently entering groundwater. Page 4-66 mentions that direct short-term impacts of tank closure activities are "mainly" limited to retrieval induced leaks but it does not mention anything about impacts from past leaks or cribs and trenches.
Even under the no action Alternative 1 the EIS indicates (pg 4-67) "no short term impacts would occur because no tank waste retrieval would be performed", implying that only retrieval leaks are considered as short term impacts.

Under the clean closure Alternative on page 4-62, it mentions historical tank leaks and the fact that contamination has migrated deep into the vadose zone "and possibly to the water table" (underline added). This is about as close to an admission that we will get that contamination from tank leaks has reached groundwater. In reality this is a statement of the uncertainty associated with the contamination distribution in the vadose zone and the extent of migration. It supports a conclusion that we don't have adequate site characterization information to properly evaluate or assess short-term impacts. The uncertainty is so great at this point that there still appears to be some confusion over whether or not the contamination may "possibly" have reached groundwater. It seems to me that this should possibly be resolved before trying to assess environmental impacts.

It is all very confusing trying to figure out where and how the EIS modeling considers and includes the existing deep vadose zone contamination and groundwater contamination.

Short-term environmental impacts to groundwater resulting under Alternatives 1 and 2A (no Closure), should be compared to the short-term environmental impacts from landfill closure and clean closure in order to properly evaluate and quantify the true benefit of removing the contaminated vadose zone soil and cleaning up the groundwater.

At Hanford we find several tank farms where the vadose zone contamination is now entering the groundwater, including the B farm complex, C farm, SX farm and T farm. At other farms this conclusion of groundwater contamination is not as certain due to a lack of site characterization data.

These short term impacts should be identified and evaluated in the EIS so that they may be prioritized in the overall scheme of the closure process to perhaps address some of the short-term impacts on a priority basis and thereby prevent some of the potential long-term impacts.

The BX-102 contamination plume comes to mind as a specific example where impacts to groundwater are occurring and will increase in the short-term. In this case, a small pump and treat effort may be advisable to minimize the extent of the new groundwater plume until clean closure can occur and the groundwater plume can be remediated.

Another example is the SX Farm where very high concentrations of Tc-99 contamination have been identified in the groundwater. Over the short-term remediation and institutional control period these plumes could increase and spread to cause very

504-118 cont'd

Page 9

primarily in Chapter 5 of this EIS and include potential impacts on groundwater and human health, as well as ecological risks during the 10,000-year period of analysis. Long-term impacts analysis during this time period, which starts in the year 1940 and extends out to 11,940, captures the impacts associated with past tank leaks, retrieval leaks, and past practices involving contiguous cribs and trenches (ditches).

See response to comment 504-107 regarding groundwater contamination and remediation.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

significant long-term impacts on the groundwater. Right now, they are short term impacts that need to be recognized, addressed and resolved in the EIS. Perhaps proper consideration will lead to cleanup of a small groundwater plume rather than expansion of the problem until an irrecoverable condition exists.

Discussing short-term impacts to groundwater is moot point however if the EIS does not address groundwater remediation or at least adopt a clean-groundwater interim management goal.

As discussed above, the DOE preference for the landfill closure Alternative versus the clean-closure alternative is based on the incremental difference in risk that results with a less-than-clean closure. I believe that if the short-term impacts to groundwater were properly considered, that preference would have to be reconsidered.

504-118 cont'd

Assumed Sound Source Uncertainties

If we accept the basic conclusions of the groundwater sensitivity analysis presented in Appendix O and discussed earlier in this review, we understand that the groundwater contaminant concentrations are sensitive to source term strength and that a 50% change in source strength could result in a 10 fold increase in groundwater concentration. Source strength refers to the output of the vadose zone portion of the model.

Under the EIS clean closure Alternative 6 A&B, the resulting groundwater contamination from past leaks and adjacent cribs and trenches has a large impact on the long term groundwater contamination levels and associated risk. The existing contamination migrating through the vadose zone and into groundwater is the principal source of groundwater contamination that occurs with the clean close Alternative.

This leads to Appendix M and a review of the releases to the vadose zone. Table M-3 provides tank leak volume estimates which create the principal clean-close contamination input to the vadose zone model and has the greatest impact on future groundwater contamination, except for the in-tank waste that would be released under the no action Alternative. My concern is that, except for a few cases, the tank leak volume estimate data provided in Hanlon and shown on Table M-3 are often nothing more than biased guesses.

504-119

None of the tank leaks have been adequately characterized to determine the nature and extent of the contamination and allow a correlation of liquid loss data to the existing contamination distribution. Even vadose zone contamination from the large leak from T-106 has not been properly characterized for we do not know the extent of the deep contamination and the extent of groundwater contamination from that leak. In the early 1990's a characterization effort was undertaken in an attempt to resolve concerns by the GAO. That characterization effort started with a plan for about 10 borings but was quickly reduced and turned into a site characterization effort that included only one new borehole.

504-120

Page 10

504-119 DOE notes that NEPA analysis is a comparison of the alternatives under consideration; that assumptions used in the analysis must be clearly identified and the uncertainties discussed; and that the assumptions underlying the analyses should not bias one or more alternatives relative to the others. In Appendix D of this *TC & WM EIS*, the derivation of the inventory in the SSTs is discussed. In Appendix M, modeling assumptions are discussed, including those related to the portrayal of tank farm past leaks. It should be noted that the same modeling assumptions were used to derive environmental consequences for all alternatives. DOE disagrees that uncertainties related to modeled inventories preclude an unbiased comparison of alternatives.

504-120 See response to comment 504-119 regarding the assumptions used in the analysis of the alternatives.

Where data are available, estimates of the volume of past leaks are based on measurement of changes in height of material in the tanks or on measurement of radioactivity measured in soil adjacent to the tank. This information represents the best available information and provides an adequate basis for decisionmaking on remediation and closure of the tanks.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Tank leak volume estimates used in the vadose zone modeling to determine groundwater impacts are severely biased toward the low-volume extreme and selectively ignore significant leak data. For example, tank SX-109 experienced several leak episodes and various leak volume estimates were produced over the years using different types of analyses. In 1987 Lewis (1987) prepared a leak volume estimate that determined as much as 56,000 gal of waste could have leaked from the tank. This included an estimate of 33,000 gal that leaked from the tank between 1965 and 1973 when contamination was detected in the laterals below the tank and they recorded a 4-inch drop in liquid.

In 1992, it was determined that the 56,000 leak volume estimate was too high so the leak volume estimate was reassessed by an "independent" contractor (DOE, 1992). The new estimate was completed by mere amateurs who had little knowledge of the subsurface contamination migration at Hanford (nor did anyone at that time). The new estimate was based on a phony calculation of the contamination distribution in the soil, which was largely uncharacterized at that time, and postulated that most of the vadose zone contamination originated from tank SX-108. From this postulation, the leakage estimate was reduced to 10,000 gal. This report was not subjected to a qualified peer review and the analysis completely ignored the previous estimate (Lewis, 1987) which was based on in-tank liquid level drop combined with plume detection in the laterals. The new leakage estimate was included in Hanlon (Table M-3) where it remains as the official estimate.

In 1995 a rigorous analysis of historical process data was completed by Agnew (et al.,1995 and Agnew and Corbin, 1998) indicating much larger leak volumes for most of the SX Farm tanks. That information appears to not have been included in Table M-3.

504-121

I believe that to determine environmental impacts from previous tank leaks, the DOE should perform an unbiased analysis of tank leaks and the leak volume estimates should be correlated and verified with vadose zone characterization data. Unfortunately correlation of the tank leak data with the vadose zone data is not possible at this time because the nature, extent and distribution of contamination in the vadose zone soil has not been determined. Considering the sensitivity of the contaminant migration model, until the tank leak estimates are properly determined with the application of a valid scientific method, I do not believe there is adequate precision in the tank leak volume data to reliably calculate groundwater impacts.

Regarding the statement that "Sixty seven of the SST's are known or suspected to have leaked liquid waste to the vadose zone between the 1950's and the present, although it is likely that some of the tanks have not actually leaked"; This statement indicates a level of uncertainty associated with determining whether or not a tank has leaked and it demonstrates the bias in regards to tank leak status designations. This of course, leads to questions and concerns about the source term and source term bounding conditions used for the vadose zone modeling and groundwater impacts assessments.

First, I must object to performing an analysis of environmental impacts when they still haven't figured out which tanks leaked. This historical argument over tank leak designation and the associated source term uncertainty would not exist be it not for an

504-122

504-121 The conclusion that the Hanlon estimate was most appropriate for the analyses in this *TC & WM EIS* was documented in the *Technical Guidance Document* (DOE 2005). Appendix D, Section D.1.1.4, discusses the use and uncertainties associated with the Hanlon estimates.

504-122 See response to comment 504-119 regarding the assumptions used in the analysis of the alternatives.

inadequate characterization of the vadose zone contamination around the tank farms (see comments above).

To move forward with vadose zone modeling in light of characterization inadequacies would require an extensive investigation and analysis of the uncertainty associated with the tank leak source term. Such an assessment must be prepared in a scientific and unbiased manner. Once the source term uncertainties are determined, upper and lower bounds for the source term would need to be established and modeling of the bounding source term conditions would need to be accomplished.

Even with the known uncertainty associated with tank leak volume estimates, the draft EIS provides no bounding assessment or even a sensitivity analysis of the effect of varying tank leak source volumes. The only such sensitivity analysis in the EIS was that completed for the groundwater model as discussed above.

504-122 cont'd

The statement shown above "that some of the tanks have not actually leaked" clearly indicates a bias in the tank leak designation. This is a very well developed historical bias that has always been present at Hanford and clearly continues. The truth is that there are some tanks that are listed as sound but are actually leakers. Tanks at Hanford are categorized as "sound" or "assumed leakers" instead of calling them "assumed sound" and "leakers" as would be appropriate.

In 1998, an assessment of the vadose zone contamination (US DOE, 1998) concluded that contamination plumes at the base of tank TY-102 "most likely resulted from leakage from tank TY-102". This contamination was located right at the base of the tank on the side of the tank were no other tanks are nearby that could have contributed to the plume. This condition was about as clear of a conclusion for tank leak that can be found by assessing the soil contamination distribution.

As a result of the vadose zone findings, a committee was collected to reassess the tank leak designation. That group quickly divided into two respectively intractable groups and the issue could not be resolved. As a result, a consultant was called in to establish a decision making process for tank leak designations. The consultant developed a tank analysis process (Epple, et al., 1998) based on a Bayesian logic framework and tank TY-102 was used in an example of the implementation of that process. The result of the test run was a 95% probability determination that the tank had leaked versus a posterior probability of no leak of 45%.

In 1999, the use of the newly developed tank leak designation was discontinued and tank TY-102 remains listed as a "sound" tank.

The bias described here relative to the tank leak designations is clear and it is also clear that Table M-3 is missing contamination release estimates from tanks TY-102, BY-111 and BX-106. Data indicates that all three tanks have leaked.

504-123

504-123 See response to comment 504-119 regarding the assumptions used in the analysis of the alternatives.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

504-123 cont'd

As long as the very basic question about whether or not a tank (or 149) has leaked remains uncertain, I do not believe the estimate of the vadose zone source term is adequate for assessing risk. If, in spite of this source term uncertainty, we were to move forward with the environmental assessment, bounding conditions on the source term would have to be established and the model would have to be run with the high and low extreme conditions.

The uncertainty of a tank's leak status would all but disappear if the vadose zone soil contamination is properly characterized and the bias is removed from tank leak status decisions.

Summary of critical concerns

My review was focused on the tank farms and associated contamination in the tanks, vadose zone soil and groundwater. I followed the contamination through the model to see how the different contamination sources are dealt with (or not) in each component of the risk assessment model.

504-124

The most important concern is that the EIS does not consider and evaluate a true clean closure scenario that includes cleanup of the groundwater, deep vadose zone contamination and groundwater contamination from past practices facilities. Instead, all of the Alternatives fail to meet regulatory compliance standards for groundwater contamination at some point. If alternatives are presented and analyzed in the EIS that fail to meet regulatory standards, that should be identified, discussed and explained in the EIS. All Alternatives should be compared to a true clean closure alternative.

504-125

The EIS also does not include or consider decisions about groundwater remediation at the tank farms. Instead, all of the Alternatives create groundwater sacrifice zones by default because all Alternatives fail to meet regulatory compliance standards for groundwater. Long-term groundwater impacts would result in extensive regions of contamination along the Columbia River shoreline making the area uninhabitable. Yet the EIS states that groundwater decisions are not a part of this EIS. The DOE cannot say that they are going to clean up the tank farms by sacrificing the groundwater, and then claim that decisions about groundwater cleanup are not part of the EIS. Clearly the EIS must include consideration of groundwater cleanup decisions.

504-126

I believe the invalidity of the vadose zone model is demonstrated by the fact that there is a complete misunderstanding of the source of the contamination plume that was used in the attempt to calibrate the vadose zone model. Vadose zone modeling is not properly calibrated and is inappropriate for assessing risk from contaminant migration through the vadose zone.

This complete misunderstanding of the source of that contamination is caused by inadequate characterization of the nature and extent of the vadose zone contamination. None of the larger vadose zone contamination plumes at the tank farms have adequately been characterized to the extent that they can be used to perform the type of model validation that is needed for the risk assessments.

Page 13

504-124 In general, the scope of this *TC & WM EIS* does not include groundwater remediation activity as part of the proposed actions evaluated. Rather, the scope of this *TC & WM EIS* includes decisions on storage, retrieval, treatment, and disposal of tank waste and the closure of the SST system. This closure includes the tank system along with the vadose zone as impacted by the tank farms (i.e., past leaks). The *TC & WM EIS* Tank Closure alternatives considered for the tank farm system include no action, landfill closure, selective clean closure, and clean closure, which would involve actions to remove the source of contamination. The State of Washington has agreed that the alternative descriptions identify the information needs necessary to meet the State of Washington SEPA requirements. Ecology expects that the analysis provided in this *Final TC & WM EIS* will provide enough information to adequately inform its permitting requirements. When Ecology provides approval of the proposed actions of DOE by issuing a permit, the applicable WAC regulations will be applied and enforced. The state closure standards for the owners and operators of all dangerous waste facilities are defined (WAC 173-303-610(2)); references to tank systems (WAC 173-303-640) and corrective action (WAC 173-303-645) requirements are included. The regulations describe specific requirements for closure of the tank system (WAC 173-303-640(8)(a) and (b)). This part of the regulations provides a requirement for DOE to "remove or decontaminate all wastes residues, contaminated soils, and structures and equipment contaminated with waste" for the tank system. And if DOE "demonstrates that no contaminated soils can be practically removed or decontaminated," then the corrective action regulations (WAC 173-303-645) will apply.

504-125 See response to comment 504-17 regarding groundwater remediation at Hanford.

504-126 As indicated in Appendix N, Section N.1.2, of the draft EIS, field-sampling data from approximately 140 vadose zone boreholes were used to calibrate the vadose zone model and to make regional-scale groundwater plume measurements for the BY Cribs, BC Cribs, 216-T-26 Crib, and the REDOX and PUREX waste sites. DOE's view is that the overall level of characterization data for Hanford supports differentiation among the alternatives, which is a key feature of a NEPA analysis. As part of the closure and permitting processes, additional subregional-scale site characterization data may be developed to support smaller-scale, more-detailed modeling assessments.

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

When some of the massive releases occurred, soils were at near-saturation conditions, causing downward flow along preferential drainage pathways to the groundwater. This type of contaminant migration is common at most of the Hanford tank farms as indicated by patterns of contamination distribution and as is found in the similar geologic conditions in the lower Columbia Basin. With these conditions, it is inappropriate to use the type of vadose zone contamination migration model that was used in the EIS.

The first step to completing a valid risk assessment is to characterize the nature and extent of contamination in the soil around the tank farms. This means tracing the contamination from the source through the unsaturated zone soil and into groundwater at most of the contamination plumes. Currently active sources of groundwater contamination are not included in the risk models. Active sources of vadose zone contamination are also not included in the risk models. I believe it is premature to make tank closure decisions and create groundwater sacrifice zones until the subsurface conditions are understood and vadose zone plumes are adequately characterized. **504-126 cont'd**

The EIS should also evaluate a large scale soil excavation/removal strategy for deep contamination removal. **504-127**

I recommend that the DOE should revise and reissue the draft EIS and not move forward with a final EIS. The problems with the existing draft EIS are too extensive to simply fix. A complete rewrite is required after site characterization is complete and after valid risk assessment models are developed. **504-128**

DOE should adopt an interim policy that the farms will be clean-closed. Tank farm closure decisions can be made after completing a more comprehensive characterization of the groundwater and vadose zone in order to understand the basic characteristics of the contamination migration processes. **504-129**

References

Agnew,S.F., J.Boyer, R.A. Corbin, T.B. Duran, J.R. FitzPatrick, K.A. Jurgensen, T.P. Ortiz and B.L. Young. 1996. *Hanford Tank Chemical and Radionuclide Inventories: HDW Model,* LA-UR-96-858, Rev. 3, Los Alamos National Laboratory, Los Alamos, New Mexico

Agnew, S.F. and R.A. Corbin, 1998. *Analysis of SX Farm Leak Histories — Historical Leak Model, HNF-3233, Rev. 0*, prepared by Los Alamos National Laboratory, Los Alamos, New Mexico for Lockheed Martin Hanford Corporation

Epple,T., D.A. Seaver and D. von Winterfledt, 1998 *Tank Leak Assessment Process: Technical Background* HNF-3747, prepared for Lockheed Martin Hanford Corporation, Richland, WA

Page 14

504-127 This *TC & WM EIS* has evaluated large-scale soil excavation/removal strategy. This approach is considered in Tank Closure Alternatives 4, 6A, and 6B, which involve selective or complete clean closure of the SST system and are representative of excavation actions that result in removal of the source of contamination from the vadose zone (i.e., contaminated soils between the tank farms and the groundwater). Clean closure of the tank farms would involve removing all SSTs, associated ancillary equipment, and contaminated soil to a depth of 3 meters (10 feet) below the tank base, all of which would be managed as HLW. Where necessary, deep soil excavation would then be conducted to remove contamination plumes within the soil column.

504-128 DOE has satisfied NEPA requirements by responding to public comments in this CRD and by making changes to the draft EIS where appropriate and necessary. Subsequent to the issuance of the *Draft TC & WM EIS*, DOE prepared an SA to analyze 14 topics it identified where it is unclear whether updated, modified, or expanded information warrants preparation of a supplemental or new draft EIS. DOE concluded, based on analyses in the SA, that the updated, modified, or expanded information developed subsequent to the publication of the *Draft TC & WM EIS* does not constitute significant new circumstances or information relevant to environmental concerns and bearing on the proposed action(s) in the *Draft TC & WM EIS* or their impacts. Further, DOE has not made substantial changes in the proposed action(s) that are relevant to environmental concerns. Therefore, in accordance with CEQ regulations (40 CFR 1502.9(c)) and DOE regulations (10 CFR 1021.314(c)), DOE determined that a supplemental or new *Draft TC & WM EIS* is not required. See Chapter 1, Section 1.8.2, for more information.

504-129 The clean closure alternatives considered for the SST system are represented by the Base and Option Cases of Tank Closure Alternatives 6A and 6B. For both Base Cases, the assumption is that the SST system would be cleaned to levels that would allow for unrestricted use, which would involve removal of the tanks, ancillary equipment, and soils beneath the tanks (contaminated as a result of past leaks) down to the water table. The two Option Cases represent this type of clean closure along with removal of soils beneath the tank farms (contaminated as a result of infiltration from the contiguous cribs and trenches [ditches]). The analysis shows that removal of the contaminants from the vadose zone would not capture those contaminants that may have already reached the groundwater table due to past practices (i.e., past leaks and contiguous cribs and trenches [ditches]).

Commentor No. 504 (cont'd): Tom Carpenter, Executive Director, Hanford Challenge; Geoffrey Fettus, Senior Project Attorney, Natural Resources Defense Council

Lewis, W.S. to D.R. Groth, 1987. Internal Memo, Subject: 241-SX-109 Leak Volume, 65950-87-091, Westinghouse Hanford Company, Richland, WA

Sobczyk, S.M., P.D. Henwood, R.G. McCain, and J.M. Silko, 2003. *Vadoze Zone Characterization of the B-BX-BY Waste Management Area and Surrounding Disposal Facilities, Hanford Site, Washington*, presented at the National Groundwater Association's Pacific Northwest Focus Conference, Anchorage, AK, June 25, 2003

Sobczyk, 2004. *Interpreted Extent of Subsurface Contamination Resulting from the 241-BX-102 Tank Leak, 200 East Area, Hanford Site*, Washington. Prepared for Confederated Tribes of the Umatilla Indian Reservation, Dept. of Sciences and Engineering, Mission, OR

US DOE, 1992, *Tank 241-SX-109 Leak Assessment*, WHC-MR-0301, prepared by Westinghouse Hanford Company, Richland, WA

US DOE, 1998, *TY Tank Farm Report*, GJO-97-30-TAR, US Department of Energy Grand Junction Office

US DOE, 2004, B-*BX-BY WMA and Adjacent Waste Sites Summary Report (Draft)*, GJO-2003-545-TAC, prepared by SM Stoller Corp for the US Department of Energy Grand Junction Office.

See response to comment 504-107 regarding groundwater contamination and remediation.

See response to comment 504-6 regarding factors influencing future DOE decisions.

Commentor No. 505: Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

From: Lauren Goldberg [lauren@columbiariverkeeper.org]
Sent: Monday, May 03, 2010 6:20 PM
To: tc&wmeis@saic.com
Cc: 'Brett VandenHeuvel'; 'Daniel Serres'
Subject: TC and WM EIS Comments, Columbia Riverkeeper
Attachments: FINAL TCWMEIS_CRK Cmnt (5-10).pdf; Att. A 4.29.10 Letter to Chu.pdf; Att. B OrDOE Letter.pdf; Att. C. OrDOE Altern Ltr.pdf

On behalf of Columbia Riverkeeper, please accept the following comments and comment attachments. If possible, please send me an email to confirm receipt of these public comments.

Regards,

Lauren Goldberg
Staff Attorney
Columbia RIverkeeper

Response side of this page intentionally left blank.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

COLUMBIA RIVERKEEPER®
Clean Water ~ Healthy Rivers ~ Our Future

P.O. Box 912 Bingen, WA 98605
724 Oak Street,
Hood River, OR 97031 (mailing)
Phone: 541.387.3030
www.columbiariverkeeper.org

May 3, 2010

Ms. Mary Beth Burdant
Document Manager
U.S. Dept. of Energy, Office of River Protection
P.O. Box 450
Mail Stop H6-60
Richland, WA 99352
TC&WM@saic.com
Fax: 509-376-7701
TC&WMEIS@saic.com

Via U.S. Mail and Email

RE: Tank Closure and Waste Management Environmental Impact Statement Public Comments

Dear U.S. Department of Energy:

On behalf of Columbia Riverkeeper ("CRK"), please accept these comments on the Tank Closure and Waste Management Environmental Impact Statement ("TC/WM EIS"). These comments supplement CRK's testimony at the public hearings in Hood River, Portland, and La Grande.

Columbia Riverkeeper is a membership-based 501(c)(3) nonprofit organization. CRK's mission is to protect and restore the Columbia River, from it headwaters to the Pacific Ocean. Since 1989, CRK has played an active role in monitoring and improving cleanup activities at the Hanford Nuclear Reservation ("Hanford"). A legacy of the Cold War, the Hanford site continues to leach radioactive pollution into the Columbia River. Hanford's legacy is not a local issue. Nuclear contamination from Hanford threatens the Pacific Northwest's people, a world renowned salmon fishery, as well as countless other cultural and natural resources. Cleary, Columbia Riverkeeper and our members have a strong interest in the U.S. Department of Energy's EIS.

Response side of this page intentionally left blank.

I. **Columbia Riverkeeper Supports "Clean Up First."**

CRK's staff and members are dedicated to a long-term solution for Hanford cleanup. As DOE is well aware, Hanford is one of the world's most contaminated sites. Despite this status, the public and CRK members continue to catch and consume fish from the Columbia River and recreate near and downstream of Hanford. For example, each summer CRK leads a series of kayak trips on the Hanford Reach of the Columbia River. The Hanford Reach is particularly unique because it is the last free-flowing stretch of the Columbia. On these outings, our members and staff pass the shores of the Hanford Nuclear Reservation and learn about the ESA-listed salmon and steelhead that spawn, rear, and migrate in the Hanford Reach.

Columbia Riverkeeper's members and staff kayaking the Columbia River's Hanford Reach.

DOE's current decision on the level of tank cleanup is a pivotal decision: what is an acceptable level of risk for the people and heritage of the Pacific Northwest? Columbia Riverkeeper joins thousands of individuals, organizations, and entities in urging DOE to adopt a protective cleanup standard that reflects the long-term future of the Northwest. This future includes a fishable, swimmable Columbia River.

As the TC/WM EIS clearly demonstrates, importing new waste to the site will only compound the waste treatment and disposal problems, not accelerate the cleanup. Moreover, shipping waste to Hanford or near other waterways of the Columbia Basin raises significant concerns for CRK and our members. In turn, CRK respectfully requests that DOE carefully consider these EIS comments.

505-1

On April 29, 2010, Columbia Riverkeeper and twenty of region's leading public health and conservation organizations submitted a letter to DOE Secretary Chu and Ines Triay, Assistant Secretary for Environmental Management. Columbia Riverkeeper, by this reference, incorporates the April 29 letter into these comments. *See* Attachment A (Apr. 29, 2010 Letter). In the letter, CRK and others urged DOE to withdraw its 2000 and 2004 Records of Decision selecting Hanford as a disposal site for large volumes of radioactive low-level waste (LLW) and mixed low-level waste (MLLW) from across the Nation. The letter is a direct outcome of DOE's TC/WM EIS. As the letter explains, the Department's own draft EIS clearly demonstrates that importing and burying off-site waste at Hanford poses serious human health and environmental impacts.

CRK's letter joins the State of Oregon Department of Energy's formal request, submitted to the Department on March 23, 2010. *See* Attachment B (Letter from Oregon Dept. of Energy to Asst. Sec. Triay). Oregon's letter discusses both the impacts and the flawed process relied upon by DOE in issuing a Record of Decision before analyzing the impacts at Hanford from importing and disposing of off-site waste. DOE's TC/WM EIS is a critical opportunity to

505-1 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

Subsequent to the issuance of the *Draft TC & WM EIS*, DOE prepared an SA to analyze 14 topics it identified where it is unclear whether updated, modified, or expanded information warrants preparation of a supplemental or new draft EIS. DOE concluded, based on analyses in the SA, that the updated, modified, or expanded information developed subsequent to the publication of the *Draft TC & WM EIS* does not constitute significant new circumstances or information relevant to environmental concerns and bearing on the proposed action(s) in the *Draft TC & WM EIS* or their impacts. Further, DOE has not made substantial changes in the proposed action(s) that are relevant to environmental concerns. Therefore, in accordance with CEQ regulations (40 CFR 1502.9(c)) and DOE regulations (10 CFR 1021.314(c)), DOE determined that a supplemental or new *Draft TC & WM EIS* is not required.

DOE has carefully considered and, in this CRD, provided detailed responses to all comments received on the *Draft TC & WM EIS*, including those received from HAB.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

reverse its 2000 and 2004 Records of Decision selecting Hanford as a nation-wide nuclear waste depository.

DOE's TC/WM EIS disclosed the long-term impacts adding more nuclear waste to Hanford's existing nuclear waste legacy. Against this backdrop, CRK urges DOE to:

a) withdraw its prior decisions selecting Hanford to dispose of off-site waste;
b) issue a new formal decision that DOE will not add more waste to Hanford;
c) commit that DOE will conduct a new environmental impact statement if DOE revisits this decision after 2022; and
d) commit to issuing a new, revised draft of the TC/WM EIS for public comment which does not propose adding off-site waste and cures the numerous defects in the current draft, as the Department was advised by its Hanford Advisory Board (March 4, 2010).

505-1 cont'd

In addition to critical decisions on the issue of waste importation, DOE's TC/WM EIS also addresses the "acceptable" levels of toxic and radioactive waste from underground tanks that will remain untreated. Specifically, DOE is deciding how thoroughly to clean up the 55 million gallons of waste currently held in 177 underground storage tanks. DOE is considering 90%, 99%, and 99.9% waste retrieval rates. Figure S-14 of the TC/WM EIS demonstrates that the risk of cancer significantly increases if DOE leaves waste in the tanks. In turn, CRK urges DOE to adopt a 99.9% retrieval tank waste rate.

505-2

Furthermore, CRK urges DOE to clean up the millions of gallons of nuclear waste that has already leaked and is reaching the Columbia River. DOE's TC/WM EIS proposals fail to address important soil and groundwater contamination that threatens the Columbia. CRK urges DOE to excavate and fully clean miles of ditches and trenches that contain toxic and radioactive waste.

In particular, DOE should treat the soil and groundwater beneath the leaky storage tanks. As the TC/WM EIS discloses, unchecked plumes of this contamination are moving toward the river. Complete cleanup is necessary to protect people and salmon from Hanford's long-lived radioactive and chemical waste.

505-3

II. NEPA REQUIRES THAT DOE TAKE A "HARD LOOK" AT THE ENVIRONMENTAL IMPACTS OF ITS DECISION.

NEPA is "our basic national charter for protection of the environment." 40 C.F.R. § 1500.1(a). By design, NEPA "is a procedural statute that requires the Federal agencies to assess the environmental consequences of their actions before those actions are undertaken." *Klamath-Siskyou Wildlands Ctr. v. Bureau of Land Mgmt.*, 387 F.3d 989, 993 (9th Cir. 2004). It "contains

505-2 The impacts of different levels of tank waste retrieval and of different types of SST system closure are addressed in the *TC & WM EIS* analyses. These include Tank Closure Alternatives 4, 6A, and 6B, which evaluate 99.9 percent retrieval of the tank waste and clean closure of all or part of the SST system. Decisions made by DOE on the proposed actions will be based on a number of factors, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. The decisions on the selected course of action and supporting rationale will be documented in a ROD issued no sooner than 30 days after the EPA Notice of Availability for this *Final TC & WM EIS* is published in the *Federal Register*.

505-3 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

One of the purposes of this *TC & WM EIS* is to analyze potential impacts of DOE's proposed actions to retrieve waste from the buried tanks, treat and dispose of this waste, and close the SST farms. This analysis is also intended to aid DOE in making decisions regarding cleanup of the past leaks.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

'action forcing' provisions to make sure that federal agencies act according to the letter and spirit of the Act." 40 C.F.R. § 1500.1. An Environmental Impact Statement "ensures that the agency, in reaching its decision, will have available, and will carefully consider, detailed information concerning significant environmental impacts; it also guarantees that the relevant information will be made available to the larger [public] audience that may also play a role in both the decisionmaking process and implementation of that decision." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 349 (1989).

Columbia Riverkeeper submits the following specific TC/WM EIS comments:

- ***Adopt a 99.9% Tank Waste Cleanup Standard:***

  For the reasons stated above, CRK strongly urges DOE to adopt a 99.9% tank waste cleanup standard. Compared to the alternative standards reviewed in the TC/WM EIS, the 99.9% cleanup standard best reflects public's extensive use of the Columbia River as a food and drinking water resource, as a source of irrigation water from large portions of Washington and Oregon agricultural land, as a spiritual and cultural resource for multiple Native American tribes and their members, and as a recreational resource for swimmers, boaters, windsurfers, kite boarders, and many others who use the Columbia River, and in turn, support river communities, for recreational purposes. **505-2 cont'd**

- ***Permanently Reverse Plans to Import Off-site Nuclear and Toxic Waste to Hanford:***

  The Department's claims that it prioritizes cleanup of Hanford and will honor a voluntary moratorium on disposing of off-site waste at Hanford until the vitrification plant is operational (estimated for 2022) have no credibility so long as the Department continues to insist that the TC/WM EIS include disposal at Hanford for 3 million cubic feet of off-site waste. The promised moratorium on adding off-site waste until 2022 does nothing to diminish the severe impacts to groundwater, the Columbia River, and human health projected by DOE itself in the draft TC&WM EIS. The Department's insistence that it will implement its decision made in 2000 to add that waste – prior to any site specific impact analysis – does, however, greatly diminish the Department of Energy's credibility.

  Thousands of citizens have sent in comments on the TC&WM EIS objecting to the Department's insistence that it will use Hanford to dispose of off-site waste, and hundreds turned out at the public hearings held in Washington and Oregon. The people of the Northwest, including many of the members of our organization, responded to the analysis put forth by the Department in the TC/WM EIS with unified objections to disposing of off-site waste at Hanford. **505-4**

  The latest information, disclosed to the public in the TC/WM EIS, confirms that the assumptions underlying DOE's 2000 decision have not withstood the test of time.

  - Question 1: How does importing new waste comport with Hanford's cleanup mission? Please explain.

Page 4 of 9
Columbia Riverkeeper
TC/WM EIS Comments

505-4 DOE is implementing an extensive, ongoing cleanup program at Hanford, as required under RCRA, CERCLA, and/or the TPA, a legal agreement between DOE, Ecology, and EPA. The TPA identifies cleanup actions and schedules, called milestones. The TPA agencies completed negotiations on several Hanford cleanup projects, including the establishment of 29 additional and/or accelerated groundwater and Columbia River protection milestones and target dates. In the *WM PEIS*, DOE indicated that additional analyses would be prepared to implement these programmatic decisions. This *TC & WM EIS* analyzes the potential environmental impacts associated with a number of proposed actions, including disposal of LLW and MLLW potentially shipped to Hanford from offsite DOE locations. Depending on the outcome of this *Final TC & WM EIS* and its ROD, DOE will evaluate whether additional NEPA reviews or updates to previous decisions are appropriate, as needed.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

- Question 2: How does importing new waste raise conflicts with DOE's obligations under the Tri-Party Agreeement? Please explain. **505-4 cont'd**

- ***Cumulative Impacts:***

  In assessing Hanford as candidate site for off-site waste, DOE must carefully examine the cumulative impacts of this proposal and the past, present, and reasonably foreseeable future actions at Hanford. DOE must analyze how adding more toxic waste to existing nuclear and toxic waste at Hanford will impact cleanup. In this analysis, DOE must consider DOE's history at Hanford, including delays in cleanup milestones and budget miscalculations. DOE has a poor record of managing and cleaning up nuclear waste. For example, the states of Washington and Oregon sued and settled a lawsuit against the U.S. Department of Energy for delays and failures in cleanup at Hanford. **505-5**

  In its comments to DOE, Friends of the Columbia Gorge raised substantial concerns about the cumulative impacts of transporting waste along the Columbia River and through the Columbia River Gorge. Columbia Riverkeeper, by this reference, incorporates the TC/WM EIS comments of Friends of the Columbia Gorge. For example, in a previous, non-route-specific EIS, DOE estimated that trucking radioactive wastes to Hanford could cause approximately 816 fatal cancers in adult humans. Notably, this statistic is incomplete and inadequate because it fails to include children, who are three to ten times more likely to get cancer from exposure to radioactive waste than adults. DOE's TC/WM EIS fails to analyze the cumulative environmental impacts of adding more waste to Hanford's existing waste challenges. **505-6**

- ***Consider and Disclose Environmental Impacts of the "Oregon Proposal" and Respond to the Serious Critiques Raised by the State of Oregon:***

  On January 4, 2010, the Oregon Department of Energy (ODOE) submitted a letter to DOE outlining Alternative 7, dubbed the "Oregon Proposal." *See* Attachment C (ODOE Jan. 4, 2004 Letter and Attachment). ODOE developed the Oregon Proposal based on the following criteria: (1) long-term protectiveness of the Columbia River, primarily associated with preventing additional migration of contaminants into Hanford's groundwater; (2) compliance with the Tri-Party Agreement (i.e., meeting schedules for waste treatment and requirements for quality of the final waste form); (3) permanence of the actions (i.e., durability of the waste form so as to prevent future releases); (4) minimizing natural resource injury liability; (5) protectiveness of human health and the environment. CRK requests the DOE carefully consider and respond to both the serious concerns raised by ODOE as well as the viability and environmental impacts of the Oregon Proposal. **505-7**

  In particular, CRK requests that DOE respond to following critiques raised in ODOE's letter:

  Question 3 [Alternative 2A]: ODOE described Alternative 2A as "a step backward from existing plans." Does DOE agree that "treating waste until 2093 would likely result in extensive tank leaks during that period and additional wide- **505-8**

Page 5 of 9
Columbia Riverkeeper
TC/WM EIS Comments

505-5 Chapter 6 of this *TC & WM EIS* presents an analysis of cumulative impacts. This analysis includes the impacts of past, present, and reasonably foreseeable future actions at Hanford. Section 6.4.1 shows the cumulative impacts on groundwater quality of the actions evaluated in this EIS, including the disposal of offsite waste.

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

505-6 Please see responses associated with comments 237-1 through 237-4 for DOE's responses to Friends of the Columbia River Gorge. No waste shipments are planned through the Columbia River Gorge because no waste shipments would originate along the West Coast, thus negating the need to use either Interstate 5 or Interstate 84 west of its intersection with Interstate 82.

The value of 816 LCFs is from the results provided in the *GNEP PEIS* (DOE 2008b). This value represents the maximum impacts associated with 50 years of transportation activities supporting the operations of all existing U.S. commercial light-water reactors if they all were replaced with high-temperature, gas-cooled reactors. The *GNEP PEIS* was canceled by DOE on June 29, 2009 (74 FR 31017). As shown in the Summary of this *TC & WM EIS*, Section S.5.3; Chapter 2, Section 2.8.3.10; and Chapter 4, Section 4.3.12, it is unlikely that the estimated total public radiation exposures from transporting radioactive waste to Hanford for disposal would result in any additional LCFs.

There is no existing guidance that recommends dose coefficients for children's exposure to external radiation. DOE acknowledges that children have an elevated sensitivity to radiation exposure. The most recent guidance for use of exposure-to-dose coefficients related to external exposure (ionizing radiation) is used in the analysis. This guidance can be found in Federal Guidance Report No. 12, *External Exposure to Radionuclides in Air, Water, and Soil* (Eckerman and Ryman 1993). This guidance provides estimates for an adult, but not for children. For internal exposure to radiation through inhalation and ingestion, EPA currently recommends that assessors calculate chronic exposures by summing time-weighted exposures that occur at each stage of life (EPA 2009). Using this approach, exposure-to-dose coefficients for internal exposure could be determined; however, guidance that provides this information has yet to be developed.

spread environmental contamination"? If DOE does not agree with this statement, please explain. **505-8 cont'd**

Question 4 [Alternative 2A]: How is Alternative 2A a "reasonable alternative" under NEPA, given that it excludes technetium from pretreatment and technetium is one of the primary radionuclides in terms of projected long-term impacts? Please explain. **505-9**

Question 5 [Alternative 2B]: Alternative 2B includes removing soil and tank infrastructure down to 15 feet from two tank farms. On what basis does DOE contend that the 15 foot removal will adequate address contamination existing at greater depths in many, if not all, of the single-shell tank farms? Please explain. **505-10**

Question 6 [Alternatives 3A – 3C]: Does DOE agree with ODOE's statement that "[n]one of these [i.e., technologies in Alternatives 3A, 3B, and 3C] supplemental treatment technologies are demonstrated to be effective at safely immodbilizing the waste once disposed in Hanford's soils"? Please explain. **505-11**

Question 7 [Alternatives 3A – 3C]: Does DOE agree with ODOE's assessment that Alternatives 3A, 3B, and 3C were "effectively eliminate[d]" by DOE decision ruling out treating and sending some waste to the Waste Isolation Pilot Plant? If so, why did DOE retain these alternatives in the draft TC/WM EIS? Specifically, how could they be "reasonable" alternatives pursuant to NEPA and its implementing regulations? **505-12**

Question 8 [Alternative 4]: Does DOE agree with ODOE's assessment that supplementing the WTP with a combination of cast stone and bulk vitrification is not a protective form of treatment? Please explain. **505-13**

Question 9 [Alternative 4]: How is Alternative 4 "reasonable" given its exclusion of technetium 99 from pretreatment? **505-14**

Question 10 [Alternative 5]: DOE notes that "[t]ank waste retrieval to only 90 percent would leave an amount of waste within the tanks that would likely eventually cause significant adverse environmental impacts." Alternative 5 also calls for the use of cast stone and bulk vitrification and excludes technetium 99 from the pretreatment process. Given the serious concerns and critiques raised in the ODOE letter, please explain why DOE considered Alternative 5 as an alternative that falls within "range of reasonable alternatives" for this action. **505-15**

Question 11 [Alternative 6A]: Does DOE agree or disagree with ODOE's statement that Alternative 6A "does not comply with the Tri-Party Agreement"? Please explain. **505-16**

Question 12 [Alternative 6A]: Does DOE agree or disagree with ODOE's assessment that "the increased time to vitrify all the wastes [proposed under **505-17**

Page 6 of 9
Columbia Riverkeeper
TC/WM EIS Comments

As stated in the National Research Council's Report in Brief on BEIR VII, *Health Risks from Exposure to Low Levels of Ionizing Radiation: BEIR VII Phase 2* (National Research Council 2006), BEIR VII estimates excess deaths for the sex and age distribution of the U.S. population in terms of the number of excess deaths per million people per absorbed dose, which supports the previously reported dose-to-risk conversion factor estimate for developing LCFs (DOE 2003a). The National Research Council report also shows that the maximum number of excess deaths would be 610 LCFs per million people per person-rem of dose, compared with about 42 out of 100 individuals who are expected to develop solid cancer or leukemia from other causes, assuming a sex and age distribution similar to that of the entire U.S. population. The BEIR VII dose-to-risk conversion factor is essentially equivalent to the estimate of 600 LCFs per million people per person-rem used in the transportation analysis in this *TC & WM EIS*. The health risk effect in the *Draft* and *Final TC & WM EIS* transportation analysis is therefore consistent with BEIR VII in regard to determining the number of LCFs.

This *TC & WM EIS* takes into account the additional waste that would be disposed of at Hanford in the modeling of the long-term impacts on groundwater and the Columbia River. The *Draft TC & WM EIS* analyzed the transportation of RH-LLW from INL to Hanford for disposal. Based on the public's input and concerns about offsite waste disposal at Hanford, DOE has included in this *Final TC & WM EIS* an example of a potential mitigation measure that could be taken by DOE. Specifically, an offsite waste stream containing a significant inventory of iodine-129 (i.e., RH-LLW resins from INL) was eliminated from the analysis. This mitigation measure has been incorporated into the Waste Management alternatives.

505-7 Chapter 2, Section 2.6.4, of this *Final TC & WM EIS* has been revised to include a discussion of the Oregon Department of Energy's proposal and how DOE has addressed the range of reasonable alternatives for tank waste retrieval, treatment, and storage, and remediation of the existing tank farms in its original alternatives. DOE has carefully considered the Oregon proposal and, as explained in Section 2.6.4, has determined that it is not reasonable.

505-8 The alternatives presented in this *TC & WM EIS* were developed under NEPA (42 U.S.C. 4321 et seq.) to address the essential components of DOE's three sets of proposed actions (tank closure, FFTF decommissioning, and waste management), and to provide an understanding of the differences between the potential environmental impacts of the range of reasonable alternatives.

Alternative 6A] increases the chances of additional tank leaks during the treatment mission, which could pose an increased threat to the Columbia River and would not be protective of human health and the environment"? Please explain. **505-17 cont'd**

Question 13 [Alternative 6B]: Under Alternative 6B, would technetium end up in shallow burial at Hanford? Please explain. **505-18**

- ***Threatened & Endangered Species:***

For thousands of years, the Columbia River supported the most abundant salmon runs on Earth.[i] Today, the Columbia River is a highly regulated and used river, with eleven federal hydroelectric dams on the Columbia's mainstem alone. Beginning in the late 1990s, the National Marine Fisheries Services listed thirteen stocks of migratory salmonids as threatened or endangered under the Endangered Species Act. These fish spend part of their life-cycle in the Columbia River and its tributaries and part of their life in the Pacific Ocean, eventually returning to the Columbia to reproduce and die.

Among the forty-three species of fish present in the Hanford Reach are several endangered and threatened species, including the upper Columbia River spring-run chinook salmon, steelhead, and bull trout. Critical habitat for both salmon and steelhead includes the entire Hanford Reach of the Columbia River.[ii] Spring-run Chinook salmon juveniles pass through the area during migration, and use the areas for forage and nursing.[iii] Steelhead also use the Hanford Reach area for spawning, nursing, foraging and as a migration corridor. Juvenile steelhead may overwinter in the Reach; thus steelhead are present in the area at all times of the year.

The Hanford Reach is well documented as the only remaining significant spawning grounds for the fall run Chinook salmon on the mainstem of the Columbia River.[iv] According to the U.S. Fish and Wildlife Service, "[t]he [Hanford] Reach contains islands, riffles, gravel bars, oxbow ponds, and backwater sloughs that support some of the most productive spawning areas in the Northwest, including the largest remaining stock of wild fall Chinook salmon in the Columbia River."[v] The fall Chinook salmon that spawn and rear throughout the Hanford Reach support in-river commerical and tribal fisheries, commercial fisheries in the North Pacific Ocean, and sport fisheries.[vi] Biologists conduct annual, aerial surveys of fall Chinook salmon spawning nests (referred to as "redds") in the Hanford Reach. The peak redd count in the fall of 2008 was estimated at 5,588, which was higher than the 2007 count of 4,018 and below the previous 5-year average of 7,206.[vii]

Chromium, strontium-90, uranium and other contaminants are well documented entering salmon spawning grounds along the Reach.[viii] Chromium is a contaminant of major concern and is associated with groundwater seeps. The concentrations of chromium in groundwater upwellings exceed the chronic ambient water quality criteria for the protection of aquatic life, established by the U.S. Environmental Protection Agency and the Washington State.[ix] Spring Chinook, unlike fall Chinook, spend a year in the

Page 7 of 9
Columbia Riverkeeper
TC/WM EIS Comments

Consistent with CEQ guidance, this EIS analyzes the range of reasonable alternatives that covers the full spectrum of potential combinations. DOE disagrees with the commentor's reference to Tank Closure Alternative 2A as being a "step backward"; rather, it is a reasonable alternative that evaluates the current design of the WTP. The construction of the WTP has already commenced and its currently planned configuration includes two HLW and two LAW melters. Treatment of tank waste with this configuration without expanded capacity or supplemental treatment would take significantly longer to complete and is analyzed under Tank Closure Alternative 2A, where treatment through the WTP would last until 2093. It should be noted that not all of the Tank Closure alternatives are projected to require operation through 2093, for example, under Tank Closure Alternative 2B operations are projected to occur through 2043. DOE completed interim stabilization of SST wastes in 2009 to limit the potential for tank leaks to occur.

See response to comment 505-2 regarding factors influencing future DOE decisions.

505-9 DOE does believe that Tank Closure Alternative 2A is reasonable because it represents the current permitted configuration of the WTP, which does not include technetium-99 removal in the pretreatment process. As discussed in Appendix E, Section E.1.2.3.1.1, the Pretreatment Facility (of the WTP) was originally designed to remove technetium. Based on reviews of technetium-99 in ILAW glass, DOE and Ecology agreed to eliminate technetium removal from the WTP permit. Construction of the Pretreatment Facility to date has eliminated the capability to remove technetium from the LAW stream. This *TC & WM EIS*, however, assumed that technetium-99 removal could be completed in the existing Pretreatment Facility and analyzes it under Tank Closure Alternatives 2B and 3B. Design and construction modifications would be necessary to add the technetium-99 removal capability, if required. Technetium-99 is a risk driver and is one of the reasons its removal from ILAW and immobilization in IHLW is analyzed in two of the Tank Closure alternatives.

505-10 As discussed in this *TC & WM EIS*, Appendix E, Section E.1.2.5.3, removal of near-surface soils to a depth of 4.6 meters (15 feet) is based on the estimates of the contaminated soil or suspect contaminated soil and the partial removal of ancillary equipment. Based on eventual soil characterization data, some tank farms may require less than 4.6 meters (15 feet) of soil excavation, while others may require deeper excavation. The 4.6-meter (15-foot) depth was chosen as an average for analysis purposes in this EIS.

freshwater habitat after hatching, with potentially higher exposure to the ill-effects of Hanford contamination.[x]

The EIS must disclose and analyze DOE's ESA obligations and how the action and no action alternatives may adversely affect listed species and their critical habitat. This includes threats posed by shipping, storage, and cleanup levels. Among the forty-three species of fish present in the Hanford Reach are several endangered species, including the Upper Columbia River spring-run Chinook salmon and steelhead ESUs. DOE must pay particular attention to the direct and indirect effects of this proposal on cleanup delay and impacts to listed species. Pursuant to Section 7 of the Endangered Species Act, DOE must consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) to determine how the alternatives would impact any threatened or endangered species. *505-19*

Question 14: Has DOE, or will DOE in the future, consult with NMFS and/or USFWS on the impacts of its actions under the TC/WM EIS on ESA-listed species? Please explain.

- ***Decommissioning the Fast Flux Test Facility*:**

CRK joins other public interest organizations in recommending that DOE decommission the Fast Flux Test Facility and treat the waste at Hanford. This alternative avoids the human health and environmental risks associated with putting more radioactive waste on the road. *505-20*

III. Conclusion.

Columbia Riverkeeper urges DOE to carefully consider the testimony and comments on the TC/WM EIS, as well as the April 29, 2010 letter to Secretary Chu.

Thank you in advance for considering Columbia Riverkeeper's comments on the TC/WM EIS.

Sincerely,

/s/Lauren Goldberg

Lauren Goldberg
Staff Attorney, Columbia Riverkeeper

---

[i]National Resource Council, *Managing the Columbia River: Instream Flows, Water Withdrawals, and Salmon Survival* (2004).
[ii]*See* 65 Fed. Reg. 7764, Feb. 9, 2000; 65 Fed. Reg. 7778, Feb. 9, 2000.

505-11 As DOE understands the comment, the commentor is asking whether DOE agrees with the Oregon Department of Energy's statement that none of the supplemental treatment technologies analyzed in Tank Closure Alternatives 3A, 3B, and 3C (i.e., bulk vitrification, cast stone, and steam reforming) are demonstrated to be effective at safely immobilizing the waste after it has been disposed of in a Hanford disposal facility. DOE disagrees with this Oregon Department of Energy statement. As discussed in Appendix E, Section E.1.2.3.5, DOE has spent years and resources researching and evaluating different technologies for treating Hanford tank waste. As a result of recent reviews, three supplemental treatment technologies were selected as representative technologies for immobilizing LAW. Cast stone represents a nonthermal supplemental treatment technology because it does not require heat to solidify the waste. Bulk vitrification and steam reforming represent two types of thermal supplemental treatment technologies because they both would require heat to solidify the waste. As discussed in Chapter 2, Section 2.12, DOE does not have a preferred alternative regarding supplemental treatment for LAW. DOE believes it is beneficial to study further the potential cost, safety, and environmental performance of supplemental treatment technologies. DOE is committed to meeting its obligations under the TPA regarding supplemental treatment for LAW.

505-12 The alternatives presented in this *TC & WM EIS* were developed under NEPA (42 U.S.C. 4321 et seq.) to address the essential components of DOE's three sets of proposed actions (tank closure, FFTF decommissioning, and waste management) and to provide an understanding of the differences between the potential environmental impacts of the range of reasonable alternatives. Consistent with CEQ guidance, this EIS analyzes the range of reasonable alternatives that covers the full spectrum of potential combinations. The alternatives considered by DOE in this EIS are "reasonable" in the sense that they are practical or feasible from a technical and economic standpoint and meet the agency's purposes and needs. Potential conflicts with laws and regulations do not necessarily cause an alternative to be unreasonable, but additional mitigation commitments may be required if it is selected for implementation. For a more comprehensive discussion on compliance with regulatory requirements, see Section 2.7 of this CRD.

Chapter 2, Section 2.7, of this EIS presents an overview of the key parameters associated with each of the alternatives, including the methodology for developing the alternatives so as to provide comparisons of how parameter differences may affect potential impacts. In the ROD, DOE will identify and

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

[iii] U.S. Department of Energy, *Threatened and Endangered Species Management Plan*, DOE/RL 2000-27; *Preliminary Natural Resource Survey for the four Hanford Aggregate (100, 200, 300 and 1100) Superfund Sites*, NOAA Fisheries, Dec. 9, 1988, Pg. 8. http://www5.hanford.gov/pdw/fsd/ar/fsd0001/fsd0008/da06370969/1.pdf.
[iv] "The Hanford Reach of the Columbia River provides the only major spawning habitat for the upriver bright race of fall Chinook salmon in the mainstem Columbia River." USDOE-PNNL, PNL-7289; USDOE OSTI ID: 7051730. "Today, however, the 51-mile Hanford Reach is the only significant spawning habitat that remains for the upriver bright race of fall Chinook salmon in the main stem Columbia River." USDOE-PNNL at: http://science-ed.pnl.gov/pals/resource/cards/Chinooksalmon.stm (2009).
[iv] U.S. Fish and Wildlife Service Website, http://www.fws.gov/hanfordreach/salmon.html.
[v] *Id.*
[vi] *Id.*
[vii] U.S. Department of Energy, *Summary of the Hanford Site Environmental Report for Calendar Year 2008*, at 30.
[viii] *See e.g. Groundwater Contaminants at Hanford*, Washington Dept. of Ecology http://www.ecy.wa.gov/programs/nwp/gwhanfordcont.htm; *Hanford Site Groundwater Monitoring for Fiscal Year 2008*, Department of Energy, DOE/RL-2008-66; *Hanford Integrated Groundwater and Vadose Zone Management Plan*, Department of Energy, DOE/RL-2007-20, Pg. 3.
[ix] Woodward, DF *et al.* The Potential for Contaminated Ground Water to Adversely Affect Chinook Salmon (*Oncorhynchus tshawystcha*) under Exposure Conditions Simulating the Hanford Reach of the Columbia River, Washington, USA, http://toxics.usgs.gov/pubs/wri99-4018/Volume2/sectionD/2509_Woodward/pdf/2509_Woodward.pdf.
[x] NW Power and Conservation Council: http://www.nwcouncil.org/history/SalmonAndSteelhead.asp

Page 9 of 9
Columbia Riverkeeper
TC/WM EIS Comments

discuss the factors considered in reaching its decisions, such as health and safety, environmental, economic, technical, and national policy considerations, along with mitigation and monitoring measures that DOE will implement.

DOE disagrees with the commentor's assessment that Tank Closure Alternatives 3A, 3B, and 3C were "effectively eliminated." As stated in Chapter 2, Section 2.2, of this EIS, DOE believes there may be certain IHLW storage tanks that it could demonstrate should be classified as TRU waste based on the origin of the waste. This EIS evaluates the environmental impacts of managing this waste as TRU waste because it assumed the historical processing data support this classification. For Tank Closure Alternatives 3 through 5, this EIS evaluates treating the waste stream associated with the TRU waste portion as both TRU waste and HLW because this waste has not yet gone through the TRU waste confirmation and certification process.

505-13 The commentor is referred to Chapter 2, Section 2.12, for a discussion of DOE's Preferred Alternatives for tank closure, FFTF decommissioning, and waste management. See response to comment 505-2 regarding factors influencing future DOE decisions.

505-14 As described in Chapter 2, Section 2.7.1, Tank Closure Alternative 4 analyzes treatment of waste streams in the WTP and/or by using a thermal or nonthermal supplemental treatment process (bulk vitrification or cast stone). DOE does believe that Tank Closure Alternative 4 is reasonable because, consistent with the current permitted configuration of the WTP, it does not include technetium-99 removal in the pretreatment process. As a result, the ILAW glass, bulk vitrification glass, and cast stone waste would contain most of the technetium-99 and would be disposed of on site in an IDF, allowing a comparison of a range of closure conditions relative to the long-term impacts on groundwater of bulk vitrification and cast stone waste forms that include technetium-99. As discussed in Appendix E, Section E.1.2.3.1.1, the Pretreatment Facility (of the WTP) was originally designed to remove technetium. Based on reviews of technetium-99 in ILAW glass, DOE and Ecology agreed to eliminate technetium removal from the WTP permit. Construction of the Pretreatment Facility to date has eliminated the capability to remove technetium from the LAW stream. This *TC & WM EIS*, however, assumed that technetium-99 removal could be completed in the existing Pretreatment Facility and analyzes it under Tank Closure Alternatives 2B and 3B. Design and construction modifications would be necessary to add the technetium-99 removal capability, if required. Technetium-99 is a risk driver, which is one of the reasons its removal from ILAW and immobilization in IHLW is analyzed in two of the Tank Closure alternatives.

505-15 See response to comment 505-12 regarding the development of the alternatives in this EIS.

Chapter 2, Section 2.7, of this EIS presents an overview of the key parameters associated with each of the alternatives, including the methodology for developing the alternatives so as to provide comparisons of how parameter differences may affect potential impacts. In the ROD for this EIS, DOE will identify and discuss the factors considered in reaching its decisions, such as health and safety, environmental, economic, technical, and national policy considerations.

505-16 See response to comment 505-12 regarding the development of the alternatives in this EIS.

505-17 The commentor is directed to Chapters 4 and 5 of this EIS for discussions of the potential impacts of Tank Closure Alternative 6A. DOE has not chosen Alternative 6A as the Preferred Alternative (see Chapter 2, Section 2.12, for a discussion of DOE's Preferred Alternatives). See response to comment 505-2 regarding factors influencing future DOE decisions.

505-18 As discussed throughout this EIS and shown in Appendix D, Table D–57, approximately 98.6 percent of the technetium-99 would be captured in the IHLW glass, ILAW glass, and ILAW retired melter. In the case of Tank Closure Alternative 6B, the ILAW glass and ILAW retired melter would be managed and disposed of as IHLW glass; i.e., they would be disposed of off site. As explained throughout this EIS, the current Administration has established a Blue Ribbon Commission on America's Nuclear Future that has issued a report and recommendations for a path forward for managing the country's HLW. DOE's decisions regarding management of Hanford waste will be consistent with Administration policies. For a more comprehensive discussion of this topic, see Section 2.10 of this CRD.

505-19 In 2003, DOE initiated informal consultation with USFWS and NMFS, as well as the State of Washington, at a time when the proposed scope of this EIS was limited to the retrieval, treatment, and disposal of tank waste and closure of SSTs. However, since that time, the scope of this EIS has been expanded to include decommissioning of FFTF and waste management. Accordingly, DOE reinstituted informal consultation with USFWS, NMFS, and the state in

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

2008 (see Appendix C, Section C.2.1). While responses to consultation letters were received from the state, none was received from USFWS or NMFS (see Appendix C, Section C.2.3). Each agency was also provided a copy of the *Draft TC & WM EIS*; however, whereas USFWS commented on the document, NMFS did not. It should be noted that neither the 2003 nor 2008 letter to NMFS implied that the proposed actions "may affect" Columbia River resources, but rather sought information from the agency concerning what species DOE should consider in its analysis. In addition, while the *Threatened and Endangered Species Management Plan, Salmon and Steelhead* (DOE 2000b) defines DOE's commitment to stocks of steelhead and spring Chinook salmon, it was not used to support DOE's position relative to the commentor's statement.

Potential long-term impacts on salmonids of actions taken under the various alternatives presented in this *TC & WM EIS* are addressed in Appendix P. The analysis indicates that chromium is the only COPC that could have a potential toxic effect on salmonids (i.e., the Hazard Quotient was above 1 under all Tank Closure alternatives, including No Action, and some Waste Management alternatives). However, it should be noted that there is virtually no difference between the Tank Closure action alternatives and the No Action Alternative, indicating that a source(s) other than the tank farms is contributing significantly to the results. Further, when Hazard Quotients for chromium under Alternative Combinations 2 and 3 are compared to values that include Alternative Combinations 2 and 3 plus nontank sources (i.e., cumulative impacts), it can be seen that the Hazard Quotient of the latter is approximately 10 times that of the former (see Chapter 6, Section 6.4.3.2), again indicating that a source(s) other than the tank farms is contributing the majority of chromium at the Columbia River. Analysis has shown that the majority of chromium comes from the 100-K Mile-Long Trench, 216-C-1 Hot Semi Work Crib, 216-S-8 Trench, and certain ponds in the 200-West Area and 300 Area. Considering that actions proposed in this *TC & WM EIS* would not be the major contributors to a Hazard Quotient that is greater than 1 for chromium at the Columbia River, they cannot lead to a finding of "may affect" relative to threatened or endangered species, or critical habitat, associated with the river. Thus, further consultation with NMFS is not indicated.

As noted above, communications have occurred with DOE and with USFWS, NMFS, and the state concerning listed species that are potentially present on Hanford (see Appendix C). Further, as reported in Chapter 3, Section 3.2.7.4, special studies were undertaken to identify the presence of special status species within areas potentially disturbed by the various Tank Closure, FFTF Decommissioning, and Waste Management alternatives. Potential impacts on special status species at Hanford are addressed in Chapter 4, Section 4.1, and there is no impact (that is, "no effect") on any federally or state-listed threatened or endangered species. If circumstances change, DOE will evaluate the need and undertake additional informal consultation with the appropriate agencies to ensure protection of listed species.

It should be noted that the analyses of impacts on threatened and endangered species presented in this *TC & WM EIS* address construction and normal operations. Any analyses of potential impacts of shipping accidents would be highly speculative, considering the very low probability of an accident (see Chapter 4, Section 4.1.12).

505-20 Radioactive waste is transported in DOT-certified containers that meet strenuous technical standards established by NRC. See response to comment 505-2 regarding factors influencing future DOE decisions.

505-21 The response to this comment is the entire letter from Frank Marcinowski, DOE-EM, to Ken Niles dated April 22, 2010, provided below.

Oregon

Theodore R. Kulongoski, Governor

OREGON DEPARTMENT OF ENERGY

625 Marion St. NE
Salem, OR 97301-3737
Phone: (503) 378-4040
Toll Free: 1-800-221-8035
FAX: (503) 373-7806
www.energy.state.or.us

March 23, 2010

The Honorable Inez Triay
Assistant Secretary for Environmental Management
U.S. Department of Energy
1000 Independence Avenue, SW
Washington D.C. 20585

Dear Dr. Triay:

505-21

The issue of bringing additional waste to the Hanford Site for disposal has been a contentious and divisive issue for the Northwest throughout the entire period of Hanford cleanup. The issue was greatly exacerbated in the late 1990s when the U.S. Department of Energy (DOE) considered and then selected Hanford, along with the Nevada Test Site, as a disposal site for potentially large volumes of low-level waste (LLW) and mixed low-level waste (MLLW) from throughout the DOE complex. DOE ratified that decision on February 25, 2000 with the issuance of a Record of Decision (ROD).

In October 1998, the Oregon Department of Energy had expressed concern with DOE's proposal to select Hanford to receive LLW and MLLW from other sites. In a letter to DOE Headquarters, we expressed the view that:

> "Hanford's vadose zone and groundwater are currently contaminated and much uncertainty associated with the type, extent, and movement of this contamination exists. Times of travel for contaminants in Hanford's vadose zone to down-gradient wells have been measured as short as seven to nine years…The presence of the Columbia River on the Hanford site connects all the downstream communities directly to events at Hanford and puts large populations in Oregon and Washington at risk. For this reason, it is imperative that DOE Richland's sole mission at Hanford be cleanup of existing wastes and contamination."

DOE disregarded this comment and comments by others who expressed similar concerns – that past waste disposal at Hanford was already causing environmental problems and would lead to greater problems in the future.

DOE took what it termed a "tiered approach" to its decision to select disposal sites. It first made broad Department-wide decisions about which sites would manage which wastes. DOE then followed these broad decisions with site-wide National Environmental Policy Act reviews.

DOE's decision to select Hanford prior to the site-wide analysis was based on unconvincing rationale. The "Basis for Decision" for the selection of Hanford, as generically explained in

1

Department of Energy
Washington, DC 20585

April 22, 2010

Mr. Ken Niles
Nuclear Safety Division Administrator
State of Oregon Department of Energy
625 Marion Street NE
Salem, Oregon 97301-3737

Dear Mr. Niles:

Thank you for your March 23, 2010, letter to Assistant Secretary Inés Triay expressing the State of Oregon's concerns about disposal of low-level wastes (LLW) or mixed low-level wastes (MLLW) at the Hanford Site. Your letter refers to the Record of Decision (ROD) (65 FR 10061; February 25, 2000) issued by the U.S. Department of Energy (DOE) for the final Waste Management Programmatic Environmental Impact Statement (WM-PEIS, DOE-EIS/0200-F), choosing Hanford and the Nevada Test Site as the regional locations for the disposal of LLW and MLLW from across the DOE complex.

DOE explained in the WM-PEIS that additional site-specific National Environmental Policy Act (NEPA) analyses would be prepared in order to implement DOE's programmatic decisions. The draft *Tank Closure & Waste Management Environmental Impact Statement* (TC&WM EIS, DOE-EIS-0391) analyzes the potential environmental impacts associated with a number of proposed actions, including disposal of LLW and MLLW potentially shipped to Hanford from offsite DOE locations. Until Hanford-specific analyses are complete, DOE believes it is premature to revisit these programmatic decisions.

The public comment period for the draft TC&WM EIS ends on May 3, 2010. At that time DOE will review all the comments received, including those provided by the State of Oregon, and decide what changes, clarifications, or additional information are needed in the final TC&WM EIS. In the Final EIS, DOE will provide detailed responses to comments and identify where any changes or information have been added to the document, based on the comments received.

Depending on the outcome of the final TC&WM EIS and its ROD, DOE will evaluate whether additional NEPA reviews or updates to previous decisions are appropriate. Please be assured that any such additional NEPA reviews or considerations thereof will be conducted with a full opportunity for public input, consistent with Council on Environmental Quality and DOE NEPA requirements.

Printed with soy ink on recycled paper

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

the February 2000 ROD, was "low impacts to human health, operational flexibility, and relative implementation cost." The only "environmental safety benefit" that the ROD specifically mentioned for Hanford was that as an arid site, "evaporation rates exceed rainfall by approximately 10 to 1 or more." There was no acknowledgement of the fact that the vadose zone and groundwater were already widely contaminated and that the contamination concentrations were far above acceptable levels.

Hanford and the Nevada Test Site were acknowledged as the only two DOE sites that had MLLW disposal facilities already constructed. LLW disposal facilities at Hanford were also cited as having expansion capability that could dispose of a wide range of radionuclides. To summarize, Hanford was selected because it had disposal facilities, disposal capacity, and was located in a desert. There was no recognition of potential impacts to the soil, to the groundwater or most importantly to the Columbia River.

Potential site-specific impacts were finally assessed and documented with the release late last year of the draft Hanford Tank Closure and Waste Management Environmental Impact Statement (TC&WM EIS). This document clearly shows that the adverse impacts of disposing of additional off-site waste at Hanford, especially if it contains certain mobile and long-lived radionuclides, would be significant. The analysis in the draft TC&WM EIS shows that no matter where at Hanford DOE proposes to dispose of off-site waste, the impacts exceed standards and are unacceptable. Moreover, the impacts from Hanford-origin wastes in these same areas already exceed standards under the most aggressive cleanup considered, leaving no room for any additional impact from off-site wastes.

505-21 cont'd

Therefore, given that the February 2000 ROD was contingent upon the assumption that the site-specific analysis would demonstrate that the impacts would not be significant, and the draft TC&WM EIS assessments show that they are very significant, the 2000 ROD should be immediately amended to withdraw Hanford as an acceptable disposal location for LLW and MLLW from throughout the DOE complex.

We recently pursued this issue through an unofficial inquiry to DOE Headquarters, and were told that because the draft TC&WM EIS was out for official comment, it would be inappropriate for Headquarters to engage in a separate discussion on a matter related to findings within the draft EIS. We understand that position.

However, the issuance of the February 2000 ROD was a Headquarters action, and we have already been told that the Hanford Site has no authority to revisit that decision. Therefore, we formally request this action by Headquarters as a part of the Waste Management Programmatic Environmental Impact Statement (WMPEIS). The serious problems with the draft TC&WM EIS will necessitate revision and release of a revised draft. DOE Headquarters can greatly simplify the work of the TC&WM EIS team by issuing a revised Record of Decision to the WMPEIS that removes Hanford from further consideration for LLW and MLLW disposal.

In addition, we believe that analyses within the draft TC&WM EIS also makes it clear that Hanford should be withdrawn from consideration as a disposal site for Greater Than Class C

2

2

I appreciate your interest and active participation in DOE's NEPA process. If you have any additional questions, please contact me at (202) 586-0370. If you need further information concerning the TC&WM EIS process, please contact Ms. Mary Beth Burandt, Document Manager, at (509) 372-7772.

Sincerely,

Frank Marcinowski
Acting Chief Technical Officer
Office of Environmental Management

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

waste, and Hanford should no longer be routinely considered as a reasonable alternative for other, future waste disposal missions.

With the exception of some very limited waste streams, DOE has been unable to use Hanford for disposal of complex-wide wastes since the 1990s, and has currently agreed to extend that moratorium to 2022. As a practical matter, DOE does not need Hanford for disposal of off-site waste now or after 2022. There are commercial options with the Energy Solutions and Waste Control Specialists sites in Utah and Texas, respectively, and DOE is pursuing licensing of a new MLLW disposal trench in Nevada.

Now that DOE's own analysis demonstrates the folly of bringing more waste to Hanford, DOE needs to stand behind its own analyses and once and for all eliminate Hanford from consideration for these and other future waste disposal missions.

Thank you for consideration of this request.

505-21 cont'd

Sincerely,

Ken Niles
Nuclear Safety Division Administrator

c.c. Jane Hedges, Washington Department of Ecology
Dennis Faulk, U.S. Environmental Protection Agency
Dave Brockman, U.S. Department of Energy, Richland Field Office
Shirley Olinger, U.S. Department of Energy, Office of River Protection
Stuart Harris, Confederated Tribes of the Umatilla Indian Reservation
Russell Jim, Yakama Indian Nation
Gabriel Bohnee, Nez Perce Tribe
Susan Leckband, Hanford Advisory Board Chair
Max Power, Oregon Hanford Cleanup Board Chair

Response side of this page intentionally left blank.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

Columbia Riverkeeper•Heart of America Northwest•Sierra Club Cascade Chapter •Oregon Chapter of the Sierra Club• Washington Physicians for Social Responsibility•Oregon Physicians for Social Responsibility•Spokane Riverkeeper•Republicans for Environmental Protection, Washington Chapter•Northwest Environmental Defense Center•Friends of the Columbia Gorge•The Lands Council•Center for Environmental Law & Policy•Oregon Toxics Alliance• Rosemere Neighborhood Association• Eastern Washington Voters•Hanford Challenge •Alliance for Democracy, Portland Chapter• Hanford Watch• Hells Canyon Preservation Council •Olympic Environmental Council•Silver Valley Community Resource Center

April 29, 2010

The Honorable Steven Chu
Secretary of Energy,
U.S. Department of Energy
1000 Independence Ave., SW
Washington D.C. 20585

The Honorable Inés Triay
Assistant Secretary for Environmental Management
U.S. Department of Energy
1000 Independence Ave., SW
Washington D.C. 20585

RE: End Waste Import/Storage Mission at Hanford

Dear Secretary Chu and Assistant Secretary Triay:

On behalf of the undersigned organizations, we are writing to request that the U.S. Department of Energy (DOE) withdraw its 2000 and 2004 Records of Decision selecting Hanford as a disposal site for large volumes of radioactive low-level waste (LLW) and mixed low-level waste (MLLW) from across the Nation. The Department's own draft *Tank Closure and Waste Management Environmental Impact Statement* (TC&WM EIS) clearly demonstrates that importing and burying off-site waste at Hanford poses serious human health and environmental impacts.

We join the State of Oregon Department of Energy's formal request, submitted to the Department on March 23, 2010. Oregon's letter discusses both the impacts and the flawed process relied upon by DOE in issuing a Record of Decision before analyzing the impacts at Hanford from importing and disposing of off-site waste.

//
//

Page 1 of 4
April 29, 2010

This letter was submitted as an attachment and is a duplicate of Commentor No. 499. Please see Commentor No. 499 for responses to this letter.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

Against this backdrop, we urge DOE to:

a) withdraw its prior decisions selecting Hanford to dispose of off-site waste;
b) issue a new formal decision that DOE will not add more waste to Hanford;
c) commit that DOE will conduct a new environmental impact statement if DOE revisits this decision after 2022; and
c) commit to issuing a new, revised draft of the TC&WM EIS for public comment which does not propose adding off-site waste and cures the numerous defects in the current draft, as the Department was advised by its Hanford Advisory Board (March 4, 2010).

The Department's claims that it prioritizes cleanup of Hanford and will honor a voluntary moratorium on disposing of off-site waste at Hanford until the vitrification plant is operational (estimated for 2022) have no credibility so long as the Department continues to insist that the TC&WM EIS include disposal at Hanford for 3 million cubic feet of off-site waste. The promised moratorium on adding off-site waste until 2022 does nothing to diminish the severe impacts to groundwater, the Columbia River, and human health projected by DOE itself in the draft TC&WM EIS. The Department's insistence that it will implement its decision made in 2000 to add that waste – prior to any site specific impact analysis – does, however, greatly diminish the Department of Energy's credibility.

Thousands of citizens have sent in comments on the TC&WM EIS objecting to the Department's insistence that it will use Hanford to dispose of off-site waste, and hundreds turned out at the public hearings held in Washington and Oregon. The people of the Northwest, including many of the members of our organizations, responded to the analysis put forth by the Department in the TC&WM EIS with unified objections to disposing of off-site waste at Hanford.

The latest information, disclosed to the public in the TC&WM EIS, confirms that the assumptions underlying DOE's 2000 decision have not withstood the test of time. As the Oregon Department of Energy stated in its letter:

> Potential site-specific impacts [of importing LLW and MLLW] were finally assessed and documented with the release late last year of the draft Hanford Tank Closure Waste Management Environmental Impact Statement (TC&WM EIS). This document clearly shows that the adverse impacts of disposing of additional off-site waste at Hanford, especially if it contains certain mobile and long-lived radionuclides, would be significant. The analysis in the draft TC&WM EIS shows that no mater where at Hanford DOE proposes to dispose of off-site waste, the impacts exceed standards and are unacceptable. Moreover, the impacts from Hanford-origin wastes in these same areas already exceed standards under the most aggressive cleanup considered, leaving no room for any additional impact from off-site wastes.

The Hanford Advisory Board also issued formal consensus advice to the Department urging DOE to issue a formal Record of Decision that DOE will not add off-site waste to Hanford, stating, in part:

Page 2 of 4
April 29, 2010

Response side of this page intentionally left blank.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

> Importation of this waste is projected in the draft TC&WMEIS to increase the contamination levels in groundwater by as much as tenfold above the impacts projected for key contaminants of concern for on-site waste. It could reach a cancer risk level for groundwater in excess of one hundred times Washington State's cleanup risk level for cleanups and landfills.
>
> The draft TC & WM EIS does not include a reasonable alternative to adding more waste to Hanford . . . The draft document clearly shows both alternatives (for where DOE would dispose of off-site waste) analyzed by DOE have contaminants above legal standards due to quantities and composition of the projected wastes disposed. DOE should have and did not consider an alternative that did not import waste for disposal at Hanford.[1]

The Department's draft TC&WM EIS fails to consider and disclose the route specific impacts from trucking 3 million cubic feet of waste to be disposed at Hanford, and fails to meet the legal requirement under the National Environmental Policy Act to disclose to the public that the Department has a pending related proposal to import and dispose of highly radioactive "GTCC" wastes at Hanford – which would greatly increase the cumulative environmental and health impacts. The Department's failure to disclose these plans in TC&WM EIS and in materials discussing the EIS has greatly harmed the Department's credibility, and increased public resolve to oppose the Department's plans to import and dispose of more waste at Hanford.

As evidenced by the overwhelming public outcry at the TC&WM EIS hearings, citizens of the Pacific Northwest will not tolerate off-site waste exacerbating Hanford's existing threats to the Columbia River and people of the Northwest. The Department faces certain litigation if it does not withdraw its decision to use Hanford as a national radioactive waste dump.

In light of these serious issues, we urge the Department to remove consideration of off-site waste in the draft TC&WM EIS and to issue a Record of Decision that off-site waste will *not* be added to Hanford.

Sincerely,

Brett VandenHeuvel
Executive Director
Columbia Riverkeeper

Gerry Pollet
Executive Director
Heart of America Northwest

Sierra Club Cascade Chapter

Oregon Sierra Club

[1] Hanford Advisory Board (HAB) Advice 229, March 4, 2010, Page 11 (parenthetical added).

Page 3 of 4
April 29, 2010

Response side of this page intentionally left blank.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

Spokane Riverkeeper

Republicans for Environmental Protection, Washington Chapter

Northwest Environmental Defense Center

Friends of the Columbia Gorge

The Lands Council

Center for Environmental Law & Policy

Oregon Toxics Alliance

Rosemere Neighborhood Association

Eastern Washington Voters

Hanford Challenge

Alliance for Democracy, Portland Chapter

Hanford Watch

Hells Canyon Preservation Council

Washington Physicians for Social Responsibility

Oregon Physicians for Social Responsibility

Olympic Environmental Council

Silver Valley Community Resource Center

CC: Governor Chris Gregoire
Governor Ted Kulongoski
Senator Patty Murray
Senator Maria Cantwell
Senator Ron Wyden
Senator Jeff Merkley

Page 4 of 4
April 29, 2010

Response side of this page intentionally left blank.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

Oregon
Theodore R. Kulongoski, Governor

OREGON DEPARTMENT OF ENERGY

625 Marion St. NE
Salem, OR 97301-3737
Phone: (503) 378-4040
Toll Free: 1-800-221-8035
FAX: (503) 373-7806
www.Oregon.gov/ENERGY

January 4, 2010

Mary Beth Burandt, Document Manager
Office of River Protection
U.S. Department of Energy
Post Office Box 1178
Richland, WA 99352

Dear Ms. Burandt:

The Oregon Department of Energy has completed a preliminary analysis of the draft Tank Closure and Waste Management Environmental Impact Statement (TC&WM EIS). In our initial review, we have focused in large part on the 11 Tank Closure alternatives that are analyzed in the EIS. We reviewed each against the following criteria:

- Long-term protectiveness of the Columbia River, primarily associated with preventing additional migration of contaminants into Hanford's groundwater
- Compliance with the Tri-Party Agreement; meeting schedules for waste treatment and requirements for quality of the final waste form
- Permanence of the actions (for example, durability of the waste form so as to prevent future releases)
- Minimizing natural resource injury liability
- Protectiveness of human health and the environment

While the various proposed alternatives provide useful information by analyzing and comparing potential impacts and differences among the alternatives, to our concern we found that perhaps only one of the Tank Closure alternatives satisfied all of these criteria. Many failed most or all of the criteria (see Attachment 1).

The U.S. Department of Energy's (DOE) recent decision not to pursue treating and sending some waste to the Waste Isolation Pilot Plant eliminates alternatives 3A, 3B, 3C, 4 and 5. Notwithstanding that decision, each of these alternatives, along with five of the remaining six alternatives, had one or more fatal flaws that prevented each from meeting our criteria.

There are elements scattered within the range of many of the alternatives which, if combined in a new alternative, would likely provide a preferable long-term approach for

This letter was submitted as an attachment and is a duplicate of Commentor No. 15. Please see Commentor No. 15 for responses to this letter.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

successfully immobilizing Hanford's tank waste, closing the tank farms, and protecting the public and the environment.

Therefore, we propose and strongly encourage DOE to analyze the potential impacts of the following new alternative:

Alternative 7 – (the Oregon Proposal)

Tank Waste Storage. Continue current waste management operations using existing tank storage facilities. No new double-shell tanks would be required, *unless* there is a delay in getting the Waste Treatment Plant (WTP) operational. New Waste Receiver Facility tanks would be constructed. These tanks should be sized so that all necessary waste transfers will be possible, and to ease retrieval operations.

Tank Waste Retrieval. Retrieve a *minimum* 99 percent of the waste from each of the tanks. Determine on a tank-by-tank basis whether a final chemical wash, mechanical removal step, or other additional retrieval is necessary.

Tank Waste Treatment. Construct and operate the existing WTP as currently configured (two high-level waste melters and two low-activity waste [LAW] melters). Supplement the existing WTP by expanding LAW vitrification capacity to the extent necessary to complete LAW treatment no later than 2040. Do not use supplemental technologies such as bulk vitrification, cast stone or steam reforming. Pre-treat all waste streams routed to the WTP, and include technetium 99 removal in the pre-treatment process so that technetium is routed to the high-level waste melter. Assume that no waste will qualify as transuranic for disposal at the Waste Isolation Pilot Plant, but programmatically continue to pursue that as an option for the near future for a limited amount of waste.

As a sub-option, DOE should analyze the value of using iron phosphate glass in the second LAW treatment facility to determine whether that would provide useful flexibility in treating some waste streams and also whether it would result in a more durable glass form for those waste streams.

DOE should also analyze the impacts and benefits of using fractional crystallization to remove the bulk of the non-radioactive waste from the tank waste streams, in order to potentially reduce the volume of the glass waste form destined for the deep repository. The separated sodium wastes should be treated to destroy any RCRA hazards and to produce a waste form meeting the land disposal restrictions under RCRA, the Atomic Energy Act and Nuclear Regulatory Commission requirements for near-surface land disposal of mildly radioactive wastes.

Cesium and Strontium Capsules. Do not include the cesium and strontium capsules in the WTP waste stream. Instead, convert from pool storage to dry

Response side of this page intentionally left blank.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

storage and continue to pursue ultimate disposal into a geologic repository in a form suitable to meet the waste acceptance criteria for the facility as an alternative secondary waste form.

Tank Waste Disposal. Store immobilized high-level waste canisters on site in interim storage facilities until a national disposal facility is available. Assuming shallow burial of the immobilized LAW will be allowed, dispose of vitrified LAW on site. Since vitrified LAW may remain classified as high-level waste, flexibility will be required for planning for its permanent disposal.

Tank Farm Closure. Characterize leaked tank wastes in and beneath the tank farms, along with waste trapped between the steel and concrete tank structures and in pipelines and ancillary equipment. Use that information to make a risk-based decision on which tanks, pipelines and ancillary equipment have leaked and whether contamination may have spread beneath non-leaking tanks. As appropriate, exhume tanks to provide access to contaminated soils. This may include leaking tanks, adjacent (clean) tanks in contact with contaminated soil, and possibly some additional clean tanks that block access to heavily contaminated soil. Sample and characterize the below-tank contaminated soils and remediate soils as deeply as necessary. Build and operate a facility to treat contaminated soils as described in Alternatives 6A and 6B. Replace removed, contaminated material with clean soil from onsite sources.

After waste retrieval of at least 99 percent from tanks, pipelines and ancillary equipment, fill remaining (clean) tanks and ancillary equipment with a highly durable fill material to immobilize the residual waste, prevent future tank subsidence, and discourage intruder access. Close these remaining tanks using a landfill barrier designed to ensure long term permanence and isolation of the remaining wastes. It may be necessary first to remove some soil and ancillary equipment if there have been leaks from pipelines and other equipment.

Dispose of treated contaminated soils, tank shells and ancillary equipment on site in a new disposal facility. Monitor the site using post-closure care.

Tank Farm Cribs and Trenches Closure. As single-shell tank farm closure operations are completed, sample and characterize the associated cribs and trenches (ditches) disposal sites. Remove-treat-dispose of the contaminated materials and soils that exceed protectiveness criteria. Close the cribs and trenches (ditches) using a landfill barrier.

We won't know whether the proposed Alternative 7 will meet the criteria that we have identified until and unless DOE analyzes each of these actions individually and collectively. We hope that DOE will agree to conduct that analysis.

We will provide additional written comments prior to the comment deadline that will address additional details related to tank waste treatment and tank closure. We will

Response side of this page intentionally left blank.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

also provide comments on the Waste Management and Fast Flux Test Facility alternatives.

If you have questions or comments on Oregon's proposed alternative, please contact me at 503-378-4906.

Sincerely,

Ken Niles
Assistant Director

c.c. Jane Hedges, Washington Department of Ecology
Dennis Faulk, U.S. Environmental Protection Agency
Shirley Olinger, U.S. Department of Energy Office of River Protection
Dave Brockman, U.S. Department of Energy Richland Office
Stuart Harris, Confederated Tribes of the Umatilla Indian Reservation
Gabriel Bohnee, Nez Perce Tribe
Russell Jim, Yakama Indian Nation
Oregon Hanford Cleanup Board
Hanford Advisory Board
Hanford Natural Resource Trustee Council

Response side of this page intentionally left blank.

ATTACHMENT 1

Why Existing Tank Closure Alternatives Are Not Acceptable

Alternative 1 – No Action. Leaving the waste in Hanford's tanks for 100 years and canceling the planned waste treatment program would result in wide-spread environmental contamination. Moreover, the "No Action" alternative need not be a stop action alternative. It can and usually is presumed to continue the actions in progress as the basis for which further actions are contrasted.

Alternative 1 is not protective of the Columbia River; does not comply with the Tri-Party Agreement; there are no actions taken that would have a positive permanent affect; natural resource injury liabilities are not minimized; and this alternative is not protective of human health and the environment.

Alternative 2A – Existing WTP Vitrification; No Closure. Treatment capacity must be expanded beyond the 2 + 2 configuration of the WTP in order to accomplish immobilization of Hanford's tank waste in a somewhat reasonable time frame. Treating waste until 2093 would likely result in extensive tank leaks during that period and additional wide-spread environmental contamination. Eventually ceasing administrative control of the tank farms without closure would also likely have significant adverse environmental impacts. Prolonging the treatment mission so as to have to replace the WTP, the double-shell tanks, and other major facilities is not reasonable. This alternative also excludes technetium 99 from pre-treatment. As technetium is one of the primary radionuclides in terms of projected long-term impacts, we believe a robust system must be in place to ensure that technetium 99 is diverted to the high-level vitrification waste stream. Alternative 2A is a step backward from the existing plans.

Alternative 2A is not protective of the Columbia River; does not comply with the Tri-Party Agreement schedules; natural resource injury liabilities are not minimized; and this alternative is not protective of human health and the environment.

Alternative 2B – Expanded WTP Vitrification; Landfill Closure. Our major objection with this alternative is closing the entire tank farm system using a landfill barrier. That does nothing to deal with leaked waste beneath the tanks farms that is currently in the vadose zone – much of which will likely eventually reach the groundwater and potentially the Columbia River. This alternative does include removing soil and tank infrastructure down to 15 feet from two tank farms. We believe this is a concept that should be expanded to include other tanks farms, but the 15 foot limit does not adequately address contamination existing at greater depth in many if not all of the single-shell tank farms. This alternative does include technetium 99 removal in the pre-

Response side of this page intentionally left blank.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

treatment process, which would help get one of the longer-lived radionuclides into the high-level glass.

Alternative 2B is not protective of the Columbia River; natural resource injury liabilities are not minimized; and this alternative is not protective of human health and the environment.

Alternative 3A – Existing WTP Vitrification with Supplemental Treatment (Bulk Vitrification); Landfill Closure.

Alternative 3B – Existing WTP Vitrification with Supplemental Treatment (Cast Stone); Landfill Closure.

Alternative 3C – Existing WTP Vitrification with Supplemental Treatment (Steam Reforming); Landfill Closure.

None of these supplemental treatment technologies are demonstrated to be effective at safely immobilizing the waste once disposed in Hanford's soils. Bulk vitrification has been demonstrated to not meet the "good as glass" criteria for the final waste form. Cast stone as a waste form is greatly inferior to bulk vitrified waste. Steam reforming as a waste form is greatly inferior to bulk vitrified waste and cast stone. Two of the three alternatives also exclude technetium 99 from pre-treatment. All three of these options have complete landfill closure of the single-shell tank farms, which we have already indicated is not protective. DOE has also ruled out treating and sending some waste to the Waste Isolation Pilot Plant, which effectively eliminates these alternatives, as they were presented in the draft EIS, from further consideration.

Alternatives 3A, 3B, and 3C are not protective of the Columbia River; supplemental technologies are not protective because the waste form will not sufficiently hold the waste over time (fails the permanence criteria) and does not meet Tri-Party Agreement requirements for the quality of the final waste form; natural resource injury liabilities are not minimized; and this alternative is not protective of human health and the environment.

Alternative 4 – Existing WTP Vitrification with Supplemental Treatment Technologies; Selective Clean Closure/Landfill Closure. This alternative calls for supplementing the WTP with a combination of cast stone and bulk vitrification, which we indicated above is not a protective form of treatment. This alternative also excludes technetium 99 from pre-treatment. The closure combination of mixing selective clean closure with landfill closure is the most reasonable closure alternative – although it would need to be based on actual conditions in the vadose zone within and beneath the various tank farms. The BX and SX tank farms may or may not be appropriate for clean closure. Certainly other tank farms would need clean or partial clean closure. DOE has also ruled out treating and sending some waste to the Waste Isolation Pilot Plant.

Response side of this page intentionally left blank.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

Alternative 4 is not protective of the Columbia River; supplemental technologies are not acceptable because the waste form will not sufficiently hold the waste over time (fails the permanence criteria) and does not meet Tri-Party Agreement requirements for the quality of the final waste form; natural resource injury liabilities are not minimized; and this alternative is not protective of human health and the environment.

Alternative 5 – Expanded WTP Vitrification with Supplemental Treatment Technologies; Landfill Closure. Tank waste retrieval to only 90 percent would leave an amount of waste within the tanks that would likely eventually cause significant adverse environmental impacts. This alternative also calls for use of cast stone and bulk vitrification, which we have already indicated would not sufficiently immobilize the waste for disposal in Hanford soils. This option also excludes technetium 99 from the pre-treatment process. We do support the idea of further exploring sulfate removal after pre-treatment to reduce the amount of vitrified low-activity waste. This alternative also includes landfill closure of the single-shell tank farms, which we have indicated is not protective. DOE has also ruled out treating and sending some waste to the Waste Isolation Pilot Plant.

Alternative 5 is not protective of the Columbia River; supplemental technologies are not acceptable because the waste form will not sufficiently hold the waste over time (fails the permanence criteria) and does not meet Tri-Party Agreement requirements for the quality of the final waste form; natural resource injury liabilities are not minimized; and this alternative is not protective of human health and the environment.

Alternative 6A – All Vitrification/No Separations; Clean Closure. The WTP is currently being constructed to include pre-treatment and LAW vitrification melters. We support pre-treatment to separate the waste streams and believe it is unnecessary to treat all the waste as high-level waste. It also would unnecessarily prolong the treatment mission to 2163, requiring eventual replacement of the double-shell tanks and construction of two replacement Waste Treatment Plants. We also believe that clean closure of all of the 149 single-shell tanks is probably not necessary.

Alternative 6A may offer the best long-term protectiveness of the Columbia River over any of the other alternatives as all the tank waste is vitrified and disposed off-site. However, the increased time to vitrify all the wastes increases the chances of additional tank leaks during the treatment mission, which could pose an increased threat to the Columbia River and would not be protective of human health and the environment. It also does not comply with Tri-Party Agreement schedules.

Response side of this page intentionally left blank.

Commentor No. 505 (cont'd): Lauren Goldberg, Staff Attorney, Columbia Riverkeeper

Alternative 6B – All Vitrification with Separations; Clean Closure. This alternative may meet all of our criteria. It would depend in large part on the ultimate disposition of the immobilized LAW canisters. Since there would not be pre-treatment to ensure that the technetium 99 ended up in the immobilized high-level glass, if the immobilized LAW were to end up in shallow burial at Hanford, the disposal environment may not sufficiently contain the technetium. This could eventually lead to spread of technetium into Hanford's groundwater. In addition, this alternative presumes landfill barrier of the cribs and trenches, which may not be protective. This alternative also proposes complete clean closure of all of the 149 single-shell tanks, which is probably not necessary.

Alternative 6B may meet all of our criteria, but not if the technetium ends up in shallow burial at Hanford.

Alternative 6C – All Vitrification with Separations; Landfill Closure. This alternative includes landfill closure of the single-shell tank farms, which we have indicated is not protective.

Alternative 6C is not protective of the Columbia River and is not protective of human health and the environment.

Response side of this page intentionally left blank.

Commentor No. 506: Heidi Logosz

From: Heidi Logosz [Heidi.Logosz@skihood.com]
Sent: Monday, May 03, 2010 6:51 PM
To: 'TC&WMEIS@saic.com'
Subject: Clean Up and No New Waste at Hanford!

May 3rd, 2010

Mary Beth Burandt
Document Manager
U.S. Department of Energy
Office of River Protection
P.O. Box 1178
Richland, WA 99352

Dear Ms. Burandt,

My name is Heidi Logosz and I am a resident of the Columbia River Gorge.

I have kept my mouth closed on the issue of nuclear waste at Hanford because I am not an expert on the matter. Not only that, I am not able to argue intelligently to the DOE against the waste being kept now and new waste being sent to Hanford. The DOE knows more than I will ever know of the matter and there are innumerous highly intelligent individuals on the opposition's side that say what needs to be said far better than I ever could.

I am, however, gravely concerned about this matter. I am a mother to a two year old and I cherish him more than anything in this world. His Father spends a lot of time in the Columbia River and this concerns me due to the leaking of nuclear waste from Hanford into the Columbia River. My son will also spend time in the Columbia River as he grows up and I fear what the consequences of this nuclear waste crisis will mean for his health, not to mention the health of other people, wildlife, and vegetation. **506-1**

I know there are many more people like me who are afraid to speak up because we don't know what to say that could convince the DOE to clean up the awful mess and not to consider sending more nuclear waste to Hanford… ever. I am in disbelief that the DOE would even consider not cleaning up the existing disaster or making matters worse by shipping more materials to Hanford.

People whose opinions on this matter I respect have thoroughly studied these issues for decades. From what I am told, this is what needs to happen without exception:

1) **Clean up all 55-million-gallons** of radioactive + hazardous tank waste with over 99% retrieval **506-2**

506-1 DOE notes that data indicate that Hanford operations do not represent a serious health threat for Columbia River users. Monitoring data and potential doses to a variety of receptors are reported annually in the Hanford Site environmental reports (Poston, Duncan, and Dirkes 2011). As presented in Chapter 3, Table 3–13, of this *TC & WM EIS*, the estimated dose from liquid releases from Hanford to the MEI in 2010 was 0.056 millirem. The risk of a fatal cancer from this dose is less than 1 in 10 million.

506-2 The impacts of different levels of tank waste retrieval and of different types of SST system closure are addressed in the *TC & WM EIS* analyses. These include Tank Closure Alternatives 4, 6A, and 6B, which evaluate 99.9 percent retrieval of the tank waste and clean closure of all or part of the SST system. Decisions made by DOE on the proposed actions will be based on a number of factors, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. The decisions on the selected course of action and supporting rationale will be documented in a ROD issued no sooner than 30 days after the EPA Notice of Availability for this *Final TC & WM EIS* is published in the *Federal Register*.

Commentor No. 506 (cont'd): Heidi Logosz

2) Drop the proposal to **ship radioactive wastes from across the nation** to Hanford *506-3*

3) Clean up the millions of gallons of nuclear **waste that has already leaked** + is reaching the Columbia *506-4*

People are counting on you to do what is in the best interest of humanity. Please, drastically change the DOE's position on nuclear waste disposal at Hanford.

Thank you for your time.

Sincerely,

Heidi Logosz
PO Box 304
Hood River OR 97031

506-3 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

506-4 DOE recognizes that groundwater contamination from past leaks is a concern at Hanford and its potential impact on communities downriver from Hanford. One of the purposes of this *TC & WM EIS* is to analyze potential impacts of DOE's proposed actions to retrieve waste from the buried tanks, treat and dispose of this waste, and close the SST farms. This analysis is also intended to aid DOE in making decisions regarding cleanup of the past leaks. The TPA, a legal agreement between DOE, Ecology, and EPA, identifies cleanup actions and schedules, called milestones. The TPA agencies completed negotiations on several Hanford cleanup projects, including the establishment of 29 additional and/or accelerated groundwater and Columbia River protection milestones and target dates.

Commentor No. 507: Douglas and Nancy Milholland

From: Douglas Milholland [douglasmilholland@waypt.com]
Sent: Tuesday, May 04, 2010 12:37 AM
To: tc&wmeis@saic.com
Subject: Hanford as national radioactive waste depository

Douglas & Nancy Milholland
343 35th Street
Port Townsend, Wa 98368
douglasmilholland@waypt.com

Mary Beth Burandt
Document Manager US Department of Energy,
Office of River Protection
PO Box 450, Mail Stop H6-60.
Richland, WA 99353.
TC&WMEIS@saic.com ...

Greetings Ms. Burandt:

We are two of the voters who demanded that Hanford be cleaned up before any additional toxic radioactive waste be allowed into the state. *507-1* I (Douglas) grew up near Hanford and blame the Department of Energy for poisoning my relatives who lived near the Hanford facility - my Uncle's family suffered from radioactive exposure. They had a big garden and were never warned about the radioactive iodine releases that occurred at Hanford. *507-2*

We are deeply upset and insulted to know that the Department of Energy defeated the State of Washington in Court regarding a thorough glassification of all liquid wastes. More than a million gallons of highly toxic waste already has leaked from Hanfords storage tanks, liquid waste that threatens the Columbia river. I understand that the DOE wants to begin bringing more waste into Washington and making it the National Nuclear Waste Depository - a national sacrifice zone. *507-3*

Creating Nuclear Power and all those nuclear bombs was a tragic mistake that in the fullness of time is causing an immense tragedy amongst us mammals - even without a nuclear war.

It seems to us that opening Hanford to receiving radioactive waste from all over the US and probably from overseas as well will open the door to having additional nuclear power plants being built. This is a terrible idea. Humans aren't without options as we move past the peak of fossil fuel availability. Lets invest in wind, tidal

507-1 Comment noted.

507-2 The potential doses to, and health impacts on, the public and workers from past Hanford operations have been the subject of a number of studies. Summaries of these studies are presented in Chapter 3, Section 3.2.10.3, of this EIS. As indicated in that section, the question of whether the population around Hanford has elevated cancer incidence or cancer mortality is unresolved. One past study showed no elevated levels of cancer around nuclear facilities, including Hanford; another study of 16 counties near Hanford determined that cancer incidence in white males and females was below the national average in most counties. The counties in which the incidences of cancer were higher than the national average were not those downwind of Hanford.

The Hanford Dose Reconstruction Project evaluated doses to, but not health effects on, members of the public from releases from 1944 through 1972. Airborne releases of iodine-131 from 1944 through 1957 were responsible for most of the dose from air emissions. The largest organ doses of 24 to 350 rad were to the thyroid. The maximum total effective dose equivalent to an adult from air emissions over the period from 1944 through 1972 was estimated to be 1 rem. The risk of a fatal cancer associated with a dose of 1 rem is about 1 in 1,600. The maximum dose through releases to the Columbia River (from eating nonmigratory fish) was estimated to be 1.4 rem.

507-3 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

As analyzed in this *TC & WM EIS*, 67 of the 149 SSTs at Hanford are known or suspected to have leaked liquid waste to the environment between the 1950s and the present, some of which has reached the groundwater. Estimates of the total leak loss range from less than 2.8 million to as much as 3.9 million liters (750,000 to 1,050,000 gallons). DOE recognizes that groundwater contamination from past leaks is a concern at Hanford and its potential impact on communities downriver from Hanford.

Commentor No. 507 (cont'd): Douglas and Nancy Milholland

and geothermal power. Lets drive our vehicles on fuel derived from algae farms. Nuclear isnt the only option, and it isn't the best option.

Block the cleanup using the courts? Begin bringing more waste here? And YOU want this, your job asks you to help facilitate this???

Well we say no. We suggest you DO NOT help this to occur. WITHDRAW YOUR CONSENT Quit your job if you must. You do not have our permission to bring more nuclear waste to our state. NO NO NO **507-3 cont'd**

FOR ALL LIFE ON EARTH
BREATHING, EATING, DRINKING
MAKING LOVE HAVING BABIES
SAY YES TO LIFE
SAY NO TO
ENLARGING THE TOXIC BURDEN OF NUCLEAR WASTE AT HANFORD

Sincerely

Douglas & Nancy Milholland

Cc
Senator Patty Murray
Senator Maria Cantwell
Representative Norm Dicks
Heart of America NW

One of the purposes of this *TC & WM EIS* is to analyze the potential impacts of DOE's proposed actions to retrieve waste from the SSTs, treat and dispose of this waste, and close the SST farms via landfill closure, selective clean closure, or clean closure. This analysis is also intended to aid DOE in making decisions regarding cleanup of the past leaks, including remediation of the contamination in the vadose zone.

Commentor No. 508 : Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

From: Patti [mailto:pattimc@nezperce.org]
Sent: Monday, May 03, 2010 3:27 PM
To: Burandt, Mary E
Subject: Draft Tank Closure
Attachments: Draft Tank Closure Comments Letter.pdf; Attachment.pdf

Please see attached. Thank you.

Response side of this page intentionally left blank.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Nez Perce
TRIBAL EXECUTIVE COMMITTEE
P.O. BOX 305 • LAPWAI, IDAHO 83540 • (208) 843-2253

May 3, 2010

Ms. Mary Beth Burandt, Document Manager
Office of River Protection
U.S. Department of Energy
Post Office Box 1178
Richland, WA 99352
Attention: *TC & WM EIS*

Re: Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington, DOE/EIS-0391

Dear Ms. Burandt:

The Nez Perce Tribe (Tribe) thanks the Department of Energy for the opportunity to comment on the *Draft Tank Closure and Waste Management Environmental Impact Statement* (TC/WM EIS). The Tribe's Hanford Programs, the Environmental Restoration and Waste Management Division (ERWM) and the Hanford Cultural Resource Program (HCR), monitored this EIS development and made efforts to gain early participation when afforded by the DOE EIS team. The Tribe is aware of the complex issues and decisions to be made through this EIS and applauds the monumental task to produce this document.

The Tribe does not support all of the Preferred Alternatives produced through this EIS based on policy and technical issues identified by our Hanford Programs, as well as not recognizing and incorporating the Tribe's End State Vision Policy (NP Resolution 05-411). The General Comments and Specific Comments produced by our Hanford Staff are attached. *508-1*

In review of this EIS, the Tribe was concerned about the National Environmental Policy Act (NEPA) and how it was utilized through this effort and its affect on Tribal Nations. For example:

- The Department of Energy has associated obligations of the federal fiduciary trustee to the affected Tribes, and to the natural resource Trustees and their constituencies. *508-2*
- Any NEPA documents that evaluate the Hanford Nuclear site needs to describe affected Tribes and the trust responsibilities of DOE and other federal agencies. It needs to include tribal aboriginal rights, treaty rights and describe responsibilities of Executive Orders 12898, 13084 and 13175 [Applicable Relevant and Appropriate Requirements (ARARs)]. *508-3*
- It is essential that tribal input be integrated to help frame the baseline condition, as well as defining the human and natural environment. *508-4*

508-1 DOE has considered the Nez Perce Tribe's comments, along with all other comments submitted by interested parties on the *Draft TC & WM EIS*.

508-2 As stated in the *U.S. Department of Energy American Indian & Alaska Native Tribal Government Policy* (Bodman 2006), DOE recognizes its Federal trust relationship with American Indian and Alaska Native nations. These trust responsibilities to tribes should not be confused with DOE's trustee responsibilities under provisions of CERCLA, as amended. Section 107 of CERCLA authorizes Natural Resource Trustees, who are Federal resource management agencies, states, and American Indian tribes, to act on behalf of the public to assess and recover damages for injuries to natural resources within their respective trusteeship. DOE, the U.S. Department of Interior, the U.S. Department of Defense, the U.S. Department of Agriculture, and the U.S. Department of Commerce are Federal resource management agencies designated by Executive Order 12580 and the National Contingency Plan to act as Natural Resource Trustees on behalf of the public. DOE is the lead Federal Trustee for all natural resources located on DOE property. This complex process is separately governed by CERCLA and the U.S. Department of Interior regulations and is outside the scope of this *TC & WM EIS*. However, DOE will continue to work with the tribes and other Natural Resource Trustees as part of the Hanford Natural Resource Trustee Council.

508-3 As stated in the *U.S. Department of Energy American Indian & Alaska Native Tribal Government Policy* (Bodman 2006), DOE recognizes that some tribes have treaty-protected and other federally recognized rights to resources and resource interests located within reservation boundaries and outside reservation and jurisdictional boundaries. DOE will, to the extent of its authority, protect and promote these treaty and trust resources and resource interests and related concerns in these areas. A number of Executive orders play a central role in guiding DOE's activities, including the Executive orders identified by the commentor.

508-4 For purposes of the NEPA analysis presented in this *TC & WM EIS*, the "baseline conditions" are reflected in Chapter 3, "Affected Environment." The Nez Perce Tribe, along with other Hanford-area tribes, has had extensive opportunities to provide, and has provided, input to the *TC & WM EIS* process and analyses. Appendix C, Section C.3.1, of this EIS identifies the primary occasions for DOE's interactions with the tribes.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

- The following sections of the CEQ regulations allow Tribes to: help define presently unquantified environmental entities and values (Section 1507.2(b)), be a Cooperating Agency (Section 1501.6(a)), be part of the scoping process (Section 1501.7(a)(1)), provide comments as a tribal government (Section 1503.1(a)(2ii)), and provide comments as members of the general public (Section 1506.6(b)(3ii)). *508-5*

Once again, the Tribe appreciates the opportunity to comment on the Draft TC/WM EIS. If you have any questions or comments, please direct them to Gabriel Bohnee, ERWM Program Director.

Sincerely,

Samuel N. Penney

Samuel N. Penney
Chairman

Attachment

508-5 The Nez Perce Tribe, along with other Hanford-area tribes, has had the opportunity to provide, and has provided, extensive input to the *TC & WM EIS* preparation process and analysis. Chapter 8, Section 8.3, and Appendix C, Section C.3, of this *TC & WM EIS* identify the process for tribal interaction and the primary occasions for DOE's interactions with the tribes on the subject of the *TC & WM EIS* preparation process. In addition, Section 8.3 of this *Final TC & WM EIS* includes a description of the outcomes of the meetings with the tribes, and a new appendix, Appendix W, describes the tribal perspective as provided by the Hanford-area tribes.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

General Comments

- Government to Government Consultation: NPT expects to be proactively engaged by DOE during the scoping and alternatives development for Hanford proposals. Tribes are part trustees of Hanford and should be informed and have opportunity to be engaged beyond the NEPA public involvement process. The United States' trust obligation includes a substantive duty to consult with a tribe in decision-making to avoid adverse impacts on treaty resources and a duty to protect tribal treaty-reserved rights "and the resources on which those rights depend." *Klamath Tribes v. U.S.,* 24 Ind. Law Rep. 3017, 3020 (D.Or. 1996). The duty ensures that the United States conduct meaningful consultation "in advance with the decision maker or with intermediaries with clear authority to present tribal views to the … decision maker." *Lower Brule Sioux Tribe v. Deer,* 911 F. Supp 395, 401 (D. S.D. 1995). **508-6**
- The *TC & WM EIS* states, "Under separate treaties signed in 1855, a number of regional American Indian tribes ceded lands that included the present area of Hanford to the United States. Under the treaties, the tribes reserved the right to fish at usual and accustomed places in common with the citizens of the territory. They also retained the privilege of hunting, gathering roots and berries, and pasturing horses and cattle upon open and unclaimed land. However, it is the position of DOE that Hanford, like other ceded lands that were settled or used for specific purposes, is not open and unoccupied land." The underlined selection is absent the specific legal citation for justification of this DOE position. DOE's opinion isn't the law of the land. Currently the EIS only illustrates that tribes have occupied the given area in the past, but does not recognize an ongoing relationship. **508-7**
- The *TC & WM EIS* needs to incorporate an understanding that the Hanford site is located within a geographical area that many tribes recognize as significant. It should not be assumed that because much of the archaeological record does not illustrate use and occupation in areas defined within the *TC & WM EIS,* that those areas were never used or occupied. Additionally, it needs to be recognized that the construction of Hanford facilities and infrastructure pre-dates current laws and regulations for protection and preservation of cultural, historic and archaeological materials. **508-8**
- The Nez Tribe has developed a NEPA narrative for the Greater Than Class C EIS effort by the DOE and will be submitting our narrative separately to the TC/WM EIS team. **508-9**
- The status of Borrow Pit C area as future borrow material for DOE remedial actions causes much anxiety for the NPT, in part because of its location at the foot of Rattlesnake Mountain. The NPT is also attempting to obtain clarification of the current NEPA coverage for Borrow Pit C. However, the NPT recognizes the more encompassing issue that there exist various interpretations of the numbers of anticipated covers, caps and barriers that will be needed and/or employed in the clean-up and remediation of the entire Hanford Site (interpretations of DOE, the regulators, the Tribes, other stakeholders). The look at the entire site includes – but is not limited to – tank farms, solid waste burial grounds, canyons, and the WTP facilities. Borrow source material will be required to construct these anticipated facilities. Regardless of what the final outcome of caps and **508-10**

508-6 The *U.S. Department of Energy American Indian & Alaska Native Tribal Government Policy* (Bodman 2006) outlines seven principles in its decisionmaking and interaction with federally recognized tribal governments. Under the policy, all DOE elements are to ensure tribal participation and interaction regarding pertinent decisions that may affect the environmental and cultural resources of tribes. There is no dispute that the actions proposed in this EIS could affect the interests of American Indian tribes located near Hanford. Hence, DOE has actively engaged in government-to-government consultations with tribes in the vicinity of Hanford, including discussions between tribal representatives and such DOE representatives as the DOE-EM Assistant Secretary, DOE-RL, and ORP. Additionally, DOE consults through its CERCLA and TPA processes, HAB, other NEPA actions at Hanford, the Cultural Resources Program, the Public Safety and Resource Protection Program (which includes ecological resources and habitat protection), and the Hanford Natural Resource Trustee Council, to name some of the primary forums. These consultations offer the opportunity for tribes to engage in meaningful dialogue in advance of DOE decisionmaking. See Chapter 8, Tables 8–3 and 8–4, for a list of organizations contacted during the consultation process; Appendix C, Section C.3.1, for additional tribal communications; and Appendix W for a discussion of American Indian perspectives.

508-7 DOE respectfully disagrees with the Nez Perce Tribe's position regarding tribal rights at Hanford. There is substantial documentation indicating that the tribes understood at the time the treaty was signed that the lands were no longer "unclaimed" when they were claimed for the purposes of the white settlers' activities. Most of Hanford had been so "claimed" at the time it was acquired for Government purposes in 1943. DOE is not aware of any judicially recognized mechanisms that would allow these lands to revert to "unclaimed" status merely through the process of being acquired by the Federal Government. The portion of Hanford that remained in the public domain in 1943 (those lands now having underlying U.S. Bureau of Land Management ownership), as well as all the acquired lands, were closed to all access initially under authority of the War Powers Act and then under the authority of the Atomic Energy Act. It is, therefore, DOE's position that the Hanford lands are neither "open" nor "unclaimed."

508-8 This *Final TC & WM EIS* describes the Hanford Site (see Chapter 3, Section 3.2) and states that it is located in areas that the tribes recognize as significant.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

barriers use, and the final numbers employed (and associated sources of the volumes of borrow material), the NPT recommends that the Tri-Party Agencies sponsor an agency/Tribal/Oregon stakeholder discussion to review the effects of the various anticipated results. The NPT believes there is a stark need for all parties to be able to visualize the various outcomes of such actions, because the lasting effects have the potential to be huge. *508-10 cont'd*

- NEPA documents at Hanford need to include sections describing Viewscape and Soundscape impacts from a tribal perspective that are important to our tribal culture. *508-11*
- Socioeconomic Section of a NEPA EIS should receive more focus and have separate sections for "Social" and "Economics". The future of salmon and treaty-reserved fisheries will likely be determined during the life of the *TC&WMEIS*. Tribal expectations are that these species will be recovered to healthy populations. *508-12*
- If aquatic species were to recover, the regional economy and tribal barter economy would likely increase within the Hanford area. The question is, "How might the TC&WMEIS possibly impact these types of activities, both directly and indirectly?" Fish returns and their associated social and economic potential should be considered within the lifecycle of the proposed action. *508-13*
- Direct production by tribes is part of the economy that needs to be represented, especially considering the Tribe's emphasis on salmon recovery. This type of individual commerce in modern economics is termed and calculated as "direct production". The increase in direct production would be relational to the region's salmon recovery, yet there is no economic measure (within the NEPA process) to account for this robust element of a traditional economy. *508-14*
- In a traditional sense, direct production is a term of self and community reliance on the environment for existence as opposed to employment or modern economies. Direct production is use of salmon and raw plant materials for foods, ceremonial, and medicinal needs and the associated trading or gifting of these foods and materials. Direct production needs to be understood and mentioned in documents like this that have long-time frame clean-up proposals and limit access through institutional controls. *508-15*
- Since the Washington Department of Ecology is a cooperating agency in the preparation of the TC & WM EIS, ERWM expected the hydrogeologic and geologic technical work to be certified, by professionals whom are licensed in the State of Washington, in compliance with the State's laws and regulations. *508-16*
- ERWM supports FFTF Decommissioning, which is a component of Alternative 2. ERWM would support a full remediation if the alternative was offered, which would be consistent with our End State Vision. *508-17*
- ERWM believes that the exclusion of Subsurface Barriers from consideration was ill-advised. Due to the widespread lateral movement of moisture in the subsurface, ERWM *508-18*

508-9 A copy of the Nez Perce Tribe's NEPA narrative for the *Draft GTCC EIS* is included in Appendix W of this *TC & WM EIS*.

508-10 The *Final Hanford Comprehensive Land-Use Plan EIS* (DOE 1999) documents the preservation of the McGee Ranch in exchange for Area C borrow source/ silt materials. DOE has considered environmental and other concerns presented by cooperating agencies, consulting tribal governments, organizations, and individuals and agrees to explain to stakeholders, in future workshops, how DOE intends to implement the decision(s) reached in the ROD.

508-11 Chapter 3, "Affected Environment," includes discussions of the Hanford viewscape (see Section 3.2.1.2) and noise and vibration (see Section 3.2.3). Chapter 4, "Short-Term Environmental Consequences," includes discussions of the impacts of project alternatives on visual resources (see Sections 4.1.1, 4.2.1, and 4.3.1). It also contains an analysis of the impacts of noise and vibration (see Sections 4.1.3, 4.2.3, and 4.3.3). While the visual aspect is addressed from the American Indian perspective, this is not the case for noise.

508-12 The Bonneville Power Administration provides extensive financial support to salmon recovery efforts and planning activities. Under NEPA, this EIS analyzes the potential environmental impacts associated with specific proposed actions and reasonable alternatives for the storage, retrieval, treatment, and disposal of tank waste generated from defense plutonium production activities; closure of SSTs containing HLW; decommissioning of FFTF; and continued management of LLW and MLLW at Hanford. These analyses include impacts on ecological species (including fish) and habitat, as well as environmental justice and socioeconomic considerations, consistent with current CEQ and DOE NEPA guidance. These analyses can be found in Chapter 4, Sections 4.1.9, 4.2.9, 4.3.9, and 4.4.8; Chapter 5, Sections 5.1.3, 5.2.3, 5.3.3, and 5.4.3; and Appendix P, Section P.3, of this *Final TC & WM EIS*.

508-13 See response to comment 508-12.

508-14 DOE realizes salmon recovery relies on local watersheds. However, this is outside the scope of this *TC & WM EIS*. Under NEPA, this EIS analyzes the potential environmental impacts associated with specific proposed actions and reasonable alternatives, realizing that there could be additional factors that could potentially influence the economy of an area. The EIS analyses include impacts on ecological species (including salmon and other fish) and habitat, as well as environmental justice and socioeconomic considerations, consistent with current CEQ and DOE NEPA guidance.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

doesn't believe that surface barriers will prevent the migration of contaminants in the deep vadose zone. **508-18 cont'd**

- ERWM believes that for the EIS to be complete, it should consider the options available for in-situ soil remediation. **508-19**
- ERWM believes that the *TC & WM EIS* assumption that each of the 149 SSTs would leak an average of 15,000 liters (4,000 gallons) to soils during retrieval operations is overly pessimistic. However, both DOE and Ecology should recognize that the EIS risk modeling indicates that potential retrieval leaks pose a significant environmental risk. Thus, both DOE and Ecology should recognize the importance of not reclassifying tanks suspected of leaking based upon incomplete information. **508-20**
- ERWM has identified numerous outstanding issues related to the tank leak reassessment process in general. At the present time, our issues with the aforementioned process are listed below. **508-21**
  1. Inconsistent tank leak criteria
  2. Failure to review drywell monitoring data from the time of the leak
  3. Reduction of documented leak volumes without a technical basis
  4. Multiple leaks from a tank
  5. Misuse of kriging estimates
  6. Lack of external technical review.
- *TC & WM EIS* modeling should have considered modeling non-native soil moisture conditions underneath the tank farms due to Hanford Operations. **508-22**
- DOE's continued inability to explain the current sources of groundwater contamination at Hanford undermines the credibility of the *TC & WM EIS* analyses, which rely on various modeling approaches to predict the consequences of River Protection Project (RPP) mission activities. **508-23**
- In summary, *TC & WM EIS* modeling uses unsupported inputs into the risk assessment and ignores current groundwater conditions. Thus, the outputs of the risk assessments are questionable and are unsuitable for decision making purposes. **508-24**
- An acceptable waste-form for iodine-129 has not been found to date. The DOE should fully and actively evaluate alternative technologies to successfully and economically immobilize iodine-129 in a glass type format with individual iodine-129 waste performance similar to other radionuclides. **508-25**
- ERWM supports the disposal of mixed TRU waste at WIPP. **508-26**
- ERWM supports removal of technetium-99 in WTP pretreatment. Tank Closure Alternatives 2B and 3B include technetium-99 removal within the WTP pretreatment process. **508-27**

508-15 Comment noted.

508-16 NEPA and CEQ implementing regulations do not require an EIS to include hydrogeologic or geologic technical work certified by professionals licensed in the state where the proposed action would take place. Any permits or licenses issued for completion of work covered by this EIS will be done in accordance with all applicable regulations and, as a result, would receive the appropriate approvals or certifications.

508-17 Decommissioning FFTF would take place under both FFTF Decommissioning Alternatives 2 and 3 (see Chapter 2, Section 2.5.3). In the former case, the facility would be decommissioned through entombment, whereas under the latter, it would be removed.

508-18 Tank Closure Alternatives 4, 6A, and 6B are representative of remediation that would result in removal of the source of contamination from the vadose zone (i.e., the contaminated soils beneath the tank farms that are a source of groundwater contamination). This type of remediation could include the use of subsurface barriers. A more complete discussion of potential remediation actions to achieve vadose zone remediation is provided in Chapter 7, Section 7.5.

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

508-19 As discussed in Chapter 2, Section 2.6.1, of this *TC & WM EIS*, in situ technologies were not evaluated in detail because of the difficulties and uncertainties associated with placement of treatment zones; the long periods of time involved in treatment; the questionable uniformity of treatment; and the difficulty in verifying their overall efficacy.

508-20 As discussed in Appendix D, Section D.1.6, of Hanford's 149 SSTs, 67 are listed as "known or suspected" leakers. Although RPP plans to minimize the introduction of liquids into suspected leakers (utilizing VBR), for analysis purposes, all SSTs were assumed to leak during retrieval. The *TWRS EIS* (DOE and Ecology 1996) assumed an average of 15,000 liters (4,000 gallons) would leak during SST retrieval. Due to limitations on currently employed leak detection equipment, this assumption was carried forward in this EIS.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

- The current Enhanced Chemical Cleaning method used in tanks is oxalic acid solution. While this in an improvement over typical sluicing, it is 1940's technology. The DOE should fully and actively evaluate alternative chemical cleaning solutions that use state of the art technology, such as compounds added to sluicing liquid which break chemical bonds in tank heel agglomerates for increased tank retrieval and which exploit control of wetting properties to minimize passage of cleaning fluid though unknown cracks in the steel and/or concrete tank shell. **508-28**
- ERWM supports Tank Closure Alternative 2B with a higher than 99% of tank retrieval and the addition of subsurface barriers to reduce the lateral influx of moisture. **508-29**
- The calculation of tank heel in the *TC & WM EIS* is flawed and under represents uranium and other heavy metals. **508-30**
- ERWM supports the deployment of soil washing capability as outlined in option 6B for the reduction of soil based chemical and radiological risks for the entire Hanford site including the largest tank leaks (A-105, BX-102, SX-108, T-106 …). **508-31**
- In-situ cleaning of <u>intact</u> ancillary equipment should be fully considered and exploited before exhumation is considered. **508-32**
- Retrieval of the associated cribs as outlined in 6A (option case) and 6B (option case) has very limited positive benefit relative to the risk/benefit of the whole site and should not be considered until all sites of greater value have been remediated. **508-33**
- It is imprudent to consider using an SST for staging of waste for processing at the WTP. **508-34**
- DOE has missed an opportunity to estimate groundwater flow rates and lateral transport in the vadose zone based upon the 1951 BX-102 tank leak because DOE has only recently accepted the evidence that this leak has contaminated groundwater (letter from Ms. Stacy Charboneau, Assistant Manager for Tank Farms Project, DOE/ORP to Mr. Gabriel Bohnee, Nez Perce Tribe ERWM, dated March 30, 2009). **508-35**
- Due to its location, no expansion of IDF should be planned. The planned RRPDF should be relocated to 200 West in the proposed IDF west. **508-36**
- Only significant figures should be used when presenting modeling results with superfluous precision. It's doubtful that the modeling results are reliable to five significant figures as reported in many of the tables in the text. **508-37**
- Much of the information related to INL is not necessary for this EIS and does not add any value. In fact ERWM found it confusing at times thinking ERWM was reading about Hanford when in actuality, was INL information. Most of the INL information is not relevant to the Hanford EIS process. ERWM would suggest deleting most of that and just **508-38**

508-21 DOE notes that NEPA analysis is a comparison of the alternatives under consideration; that assumptions used in the analysis must be clearly identified and the uncertainties behind the analysis discussed; and that the assumptions underlying the analysis should not bias one or more alternatives relative to the others. In Appendix D of this *TC & WM EIS*, the derivation of the inventory in the SSTs is discussed. In particular, the identification of the known and suspected tank farm past leaks is based on the *Waste Tank Summary Report for Month Ending December 31, 2002* (Hanlon 2003); the volumes and dates are based on Hanlon (2003) and the field investigation reports; and the inventory is based on field investigation reports or derived from the BBI. DOE disagrees with the supposition that these data sources rely on incorrect statistical analyses, including kriging. In Appendix M of this *TC & WM EIS*, modeling assumptions are discussed, including those related to portrayal of tank farm past leaks. It should be noted that the same modeling assumptions were used to derive environmental consequences under all alternatives. DOE disagrees that uncertainties related to modeled inventories preclude an unbiased comparison of alternatives, and that the analysis suffers from lack of external technical review. Substantial portions of the groundwater and vadose zone analyses were reviewed by the Technical Review Group, the Local Users' Group, and Ecology.

508-22 As reflected in Appendix M, Section M.2, the modeling results of this *TC & WM EIS* are predicated on the presence of nonnative soil moisture conditions at the tank farms.

508-23 The *Draft TC & WM EIS* explicitly compares model results with measured conditions (Appendix U). With two exceptions, these comparisons indicate that the modeling methodology can replicate current conditions within one order of magnitude, the design goal of this EIS. In response to this and similar comments, the discussion in Appendix U of this *Final TC & WM EIS*, specifically with respect to those constituents for which model predictions and actual field conditions show the greatest differences, has been clarified.

508-24 The *Draft TC & WM EIS* explicitly compares model results with measured conditions (Appendix U). Appendix L, Section L.4.3, reveals that field-sampling data from over 5,000 boring logs were used to support lithologic encoding of the regional-scale flow model; Section L.6.1, that field-sampling data from approximately 1,800 groundwater wells were used to calculate the regional-scale flow model; and Appendix N, Section N.1.2, that field-sampling data from approximately 140 vadose zone boreholes were used to calibrate the vadose zone model as well as regional-scale groundwater plume measurements for the

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

provide a brief summary for the reader regarding how some of the alternatives relate to INL. **508-38 cont'd**

- ERWM believes that the reasons that uranium, Tc-99, and nitrate activities/concentrations are currently at higher levels than expected is that the use of a Kd = 0.6 for uranium is inappropriate and the copious amounts of water used during Hanford Operations was not incorporated into the model. *Technical Guidance Document for "Tank Closure Environmental Impact Statement" Vadose Zone and Groundwater Revised Analyses* should be revised to address these issues. **508-39**
- Climate is simply not a snapshot in time. Archeological evidence supports tribal oral history that speaks of a time when the region was volcanic, to a glacial period, including great floods, and to what ERWM knows today. **508-40**
- The Nez Perce Tribe recommends that quiet zones and time periods be identified for known Native American ceremonial locations on and near the Hanford Reservation. Non-natural noise can be offensive during traditional ceremonies. Traditional ceremonies have been held and are expected to continue at the Hanford site. Not all tribal ceremonial sites at Hanford are known to DOE. Hanford facilities may presently create noise interference for ceremonies held at Gable Mountain and Rattlesnake Mountain. Noise generating projects can interrupt the thoughts and focus and thus the spiritual balance and harmony of the community participants of a ceremony. **508-41**
- Hanford in general is composed of sandy soils that do not retain water very well. Consideration must be made for long-term moisture percolation to any underground contamination. Soils have a medicinal purpose for tribal healing. Care should be taken at Hanford sites with soils containing important mineral properties like those in the White Bluffs area. **508-42**
- Water is a centerpiece of the American Indian cultures of the Columbia Plateau, so surface waters at Hanford are a high priority to the Nez Perce. Proposal of any new risk or further contamination of the Columbia River system from Hanford operations will receive strong opposition by the Nez Perce Tribe. As stated before, our culture is closely tied to the survival of salmon in the Columbia River system. **508-43**
- DOE's historical record of protecting groundwater at Hanford is poor. Recent DOE efforts and technological limitations have consistently extended the timeframe of contaminant cleanup. **508-44**
- Contaminant transport to groundwater is still largely unknown in areas. The actual volumes of contamination within the groundwater and the direction of its flow are not fully characterized. This uncertainty and the limited technical ability to remediate the vadose zone and groundwater places the Columbia River at continual risk. **508-45**

BY Cribs, BC Cribs, 216-T-26 Crib, and the REDOX and PUREX waste sites. DOE's view is that the overall level of characterization data for Hanford supports differentiation among the alternatives, which is a key feature of a NEPA analysis. In response to this and similar comments, the discussion in Appendix U in this *Final TC & WM EIS*, specifically with respect to those constituents for which model predictions and actual field conditions show the greatest differences, has been clarified.

508-25 As noted in Appendix E, Section E.1.2.3.1.7, the behavior of iodine-129 in ILAW and other thermally generated waste forms, as well as the fraction that would be captured in the final waste form, are difficult to predict. Further demonstration and testing of the iodine recovery technology should provide the necessary performance data to confirm the assumptions used for this EIS and, possibly, support additional retention of iodine-129 in the thermally generated waste forms. If necessary, design changes may have to be implemented if the actual fractions in the secondary-waste streams are demonstrated to be higher than anticipated. However, such retention information was not available at the time of this EIS's preparation. As discussed in Chapter 7, Section 7.1.6, this is a particular area of focus for DOE, especially with regard to partitioning and capture of iodine-129, a conservative tracer, in secondary-waste forms. Additional sensitivity analyses have been added to this final EIS that evaluate the changes in potential impacts that might result if partitioning or recycling of some contaminants, e.g., iodine-129, could be increased into primary-waste forms and/or if secondary-waste-form performance could be improved. The discussion found in Chapter 7, Section 7.5, was added to summarize these results. The results of these analyses will aid DOE in formulating appropriate performance targets for secondary-waste forms. As discussed in Chapter 7, Section 7.5.2.8, and Appendix E, Section E.1.2.4.5.6, DOE has drafted a roadmap that implements a strategy for development of better-performing secondary-waste forms.

508-26 Comment noted.

508-27 Comment noted.

508-28 As discussed in Appendix E, Section E.1.2.2.4, this *TC & WM EIS* assumes a chemical wash system would be required to supplement the MRS and VBR system to achieve 99.9 percent retrieval. In addition, as stated in Section E.1.2.2.4.4, this EIS assumes that the chosen chemicals would be compatible with safety requirements (e.g., worker health and safety and nuclear safety requirements), as well as the construction materials, wastes to be

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

- ERWM is against adding any additional waste to the Hanford site that adds risk to tribal health. Many tribal members still live a traditional lifestyle, or portions there of, making them more susceptible to contamination than the general public. A CRITFC fish consumption report from 1992 identified that four Columbia River Tribes, including the Nez Perce, consumed over nine times the amount of fish of the general population. Any evaluation needs to include a Tribal Risk Scenario to calculate risk to our members. These scenarios will also consider inadvertent intruder scenarios, as required by DOE Order 435.1. **508-46**
- The USFWS and the 165,000 acre Hanford Reach National Monument (the Monument) on the Hanford site includes rare plant and wildlife species that must be considered during the NEPA evaluation. **508-47**
- DOE needs to review the USFWS Comprehensive Conservation Plan (CCP) that was prepared for managing the Monument. **508-48**
- Columbia River Tribes have created a salmon recovery plan called the Wy-Kan-Ush-Mi Wa-Kish-Wit (Spirit of the Salmon). ERWM would expect that DOE's EIS evaluation would consider the goals and objectives of this Plan and document in the EIS for public review any potential conflicts the repository might have with this salmon recovery plan. **508-49**
- A goal of Columbia River Tribes, the federal, state, and local governments, is to recover Columbia River Salmon runs. Huge monetary and strategic efforts have been made to that end. Any salmon recovery would substantially change the social and economics of the region. For example our tribal subsistence economy would again flourish. The Economics section needs to describe a subsistence economy as part of the overall economic description. This "personal" enterprise is a term used by economists for self and community reliance on the environment for existence as opposed to employment and modern economies. **508-50**
- Tribal employment at Hanford and surrounding area should also be part of the employment description for the region. **508-51**
- DOE needs to develop, with assistance from affected tribes, a definition for Environmental Justice in Indian country. A tribal Environmental Justice definition needs to include sovereign nation-state status, federal trust responsibility, and include treaty and aboriginal rights. **508-52**
- ERWM maintains that aboriginal rights allow for the protection, access to, and use of open and unclaimed lands of the Hanford Reservation when human health and safety are not in jeopardy. **508-53**

treated, and waste-feed-composition requirements for the WTP or supplemental treatment technologies. However, as further discussed in Section E.1.2.2.4, although the chemical-wash-system process has been demonstrated at Hanford, there are uncertainties; thus, the acid wash analyzed (oxalic acid) is considered representative of the wash fluids that could be used. As noted in Section E.1.2.2.4.2, chemical washing is identified for use in conjunction with MRS and VBR system retrieval of 99.9 percent of the waste, and the specific chemicals to be used for this process would be selected to minimize potential environmental, health, and safety impacts, while maximizing the effectiveness of residual waste retrieval. Thus, oxalic acid was chosen to support the analysis in this EIS; however, DOE will review improved solutions as they become available.

508-29 Tank Closure Alternatives 4, 6A, and 6B are representative of retrieval levels greater than 99 percent and remediation that results in removal of the source of contamination from the vadose zone (i.e., contaminated soils between the tank farms and the groundwater). This type of remediation could include the use of subsurface barriers. A more complete discussion on the potential actions to achieve vadose zone remediation is described in Chapter 7, Section 7.5, of this EIS.

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

508-30 With regard to the disproportionate amount of radioactivity in the residues at the bottom of the tanks, DOE currently does not have a technical basis for making more-specific assumptions about the expected compositions of the waste "heels" that would remain in the tanks after retrieval. Retrieval has been completed for only a small number of SSTs, and not much is known about the behavior of, or ability to remove, small volumes of residual waste. For the residual waste remaining within the tank farms in the 200 Areas, closure would require detailed examinations of the tanks and residual waste to support preparation of site-specific radiological performance assessments and closure plans. These examinations would require detailed waste sampling and analyses, assessments of the structural stability of the tanks, and assessments of risk to human health and to the environment. These documents will provide the information and analysis

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

- ERWM proposes that ceremonial sites be placed in co-stewardship with DOE, USFWS and the affected tribes for long-term management and protection. **508-54**
- The Comprehensive Land Use Plan (CLUP) has institutional controls (ICs) that limit present and future uses by Native Americans. These ICs should be described as part of the affected environment. Any new proposals that extend, expand, or create new ICs should be considered cumulative impacts to native people. **508-55**
- The 50-year management time horizon of the CLUP and its land use designations are often incorrectly assumed to be permanent designations. CLUP land use designations and their boundaries can be changed at the discretion of DOE with recommendations by Hanford stakeholders, including affected Tribes. **508-56**
- DOE managers must evaluate as part of NEPA any potential access concerns to ceremonial sites. **508-57**
- According to the *American Indian Religious Freedom Act* (AIRFA), tribal members have a protected right to conduct religious ceremonies at locations on public lands where the ceremonies are known to have been practiced.
- *Executive Order 13007* states that Tribal members have the right to access ceremonial sites. DOE and USFWS must maintain access to known ceremonial sites.
- New culturally significant findings are required to be added to the list of sites and locations with special cultural protections. These protections override any land use designation of the CLUP or other resource documents. **508-58**
- From a tribal perspective, all things of the natural environment are recognized as cultural resources. This is a different perspective from those who think of cultural resources as artifacts or historic structures. The natural environment provides resources for a subsistence lifestyle for tribal people. This daily connection to the land is crucial to Nez Perce culture and has been throughout time. All elements of nature therefore are the connection to tribal religious beliefs. Oral histories confirm this cultural and religious connection.

necessary for DOE and the regulators to make specific decisions on what levels of residual tank waste are acceptable in terms of short- and long-term risks.

DOE has already begun the process of retrieving waste from the tanks, such as those located in Waste Management Area C. Decisions made by DOE on the proposed actions will be based on a number of factors, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. The decisions on the selected course of action and supporting rationale will be documented in a ROD issued no sooner than 30 days after the EPA Notice of Availability for this *Final TC & WM EIS* is published in the *Federal Register*.

508-31 Comment noted.

508-32 Comment noted.

508-33 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

508-34 Appendix E, Section E.1.3.1, of this final EIS provides a discussion on this storage option, which was considered but not evaluated in this EIS. In Appendix E of this *Final TC & WM EIS*, additional discussion is provided on what would be required to implement staging of retrieved waste from SSTs.

508-35 DOE recognizes the commentor's concern about the utility of field data for model design, parameterization, and calibration. In the vadose zone modeling in this *TC & WM EIS*, the degree of lateral migration is a result of competing boundary conditions and material properties, and calibration of the material properties is a challenging problem. The STOMP models in this *TC & WM EIS* were calibrated to groundwater conditions resulting from three reasonably well-characterized sources: the BY Cribs, the BC Cribs, and the 216-T-26 Crib.

508-36 The locations of both the IDF(s) and the RPPDF were selected based on a number of factors, including available room and proximity to associated facilities and processes. As two cells of the IDF currently exist in the 200-East Area, DOE determined it would be logical for expansion to take place on adjacent vacant land to take advantage of existing waste management infrastructure. With respect to relocating the RPPDF, under Disposal Group 2 of Waste Management Alternatives 2 and 3, the land required for the facility far exceeds that set aside in

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Specific EIS Comments

Page S-51

Subsurface Barriers. This option should have been evaluated in detail. **508-59**

In Situ Soil Remediation. A variety of in situ soil remediation technologies should have been evaluated in detail. **508-60**

Page S-56

DOE has favored computer modeling over the collection of characterization data that could have been used to reduce the uncertainty related to lateral transport of contamination in the vadose **508-61**

Page 2-9

The statement that "Sixty-seven of the SSTs are known or suspected to have leaked liquid waste to the vadose zone between the 1950s and the present, although it is likely that some of the tanks have not actually leaked." has been poorly supported. ERWM has asked for an independent review of the DOE's reassessment of past tank leaks. DOE/ORP has not reviewed drywell monitoring data acquired at the time of the reported leak(s) during this reassessment. It is entirely possible more than 67 tanks have leaked. **508-62**

Page 3-9

The Tribes also retained the right to erect temporary structures and contend that these Federal Lands are open and unclaimed. **508-63**

Pages 3-27, 3-39 and 3-58 **508-64**

the 200-West Area for a possible IDF. Thus, relocation of the RPPDF to the area suggested by the commentor is not practical.

508-37 Data presentation in Chapters 5 and 6 and Appendices N and O in this *Final TC & WM EIS* has been revised in response to this and similar comments regarding precision.

508-38 DOE believes that the data presented relative to INL are relevant and necessary. While it is true that information related to INL does not apply to tank closure (a major portion of this EIS), it is relevant to addressing the FFTF Decommissioning alternatives. This EIS has been structured so that information relative to INL is clearly indicated in the section headers and alternative descriptions, as well as in tables and figures, as appropriate.

508-39 As stated in Appendix L of this *TC & WM EIS*, volumes of water were input into the groundwater and vadose zone models according to the estimates provided by the SIM modeling systems and the cumulative impacts inventory database. Although there is some uncertainty in the volume estimates, comparisons with previous studies show general agreement, and water table rises during the operational period are consistent with the modeled anthropogenic recharge. DOE's view is that while there may be some temporal and volumetric uncertainties in anthropogenic recharge, the modeling results suggest that most of the volumetric inventory is accounted for. As shown in Appendix U, modeled groundwater concentrations of uranium-238 and total uranium exceeded observed values by roughly an order of magnitude in calendar year 2005. An analysis of these discrepancies suggests that the overestimation can be attributed to the rather well constrained water and constituent inventories of several sites. DOE agrees that a likely cause of these discrepancies is the K_d (distribution coefficient) used to model uranium migration. This *Final TC & WM EIS* has been revised to present this issue in more detail.

508-40 DOE acknowledges that climate changes occur due to both natural and human-induced causes. Chapter 3, Section 3.2.5.1.1, of the *Draft TC & WM EIS* discusses the physiography and structural geology of the region, including volcanic activity and glacial flooding. DOE acknowledges that the Hanford climate was different during these earlier periods. Potential future changes to climate are discussed by the Intergovernmental Panel on Climate Change in their 2007 report, *A Report of Working Group I of the Intergovernmental Panel on Climate Change, Summary for Policymakers* (IPCC 2007). DOE has reviewed and revised, as necessary, its analyses on the effects of climate change on

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

The "Geology and Soils", "Water Resources" and the "Ecological Resources" sections in the Affected Environment do not contain or reflect the tribal information or values. ERWM maintain that impacts cannot be assessed correctly if this information is lacking from the Affected Environment section. **508-64 cont'd**

Page 3-39

The 82-kilometer (51-mile) Hanford Reach is not free-flowing since its water levels are regulated by the Priest Rapids Dam. **508-65**

Page 3-47

Given that millions of gallons of water are transported to the 200 Areas annually, in certain areas the major source of recharge may not be natural precipitation as stated in the text. **508-66**

Ditches are not synonymous with trenches. At Hanford ditches (unlined canals) were used to transport dilute low activity waste to the ponds. The trenches were operated on a specific retention basis and received "*special intermediate wastes"* (BNWL-1464). After 1950 and depending on the level of radioactivity, liquid wastes were discharged either to surface ponds and ditches or to underground cribs, trenches, and French drains. Liquid wastes were divided into high (more than 100 microcuries [µCi] of beta emitters per milliliter), intermediate (more than 5 X 10-5 µCi and less than 100 µCi of beta emitters per milliliter), and low-level (less than 5 X 10-5 µCi of beta emitters per milliliter) categories (BNWL-1464). The high- level wastes were sent to the tanks for storage. The intermediate level wastes were disposed to cribs. Cribs are underground structures where liquid wastes were released to the soil column with the expectation that contaminant breakthrough to groundwater would occur and releases would be halted once the maximum permissible concentrations (MPC) in groundwater were reached (BNWL-1464). **508-67**

The paragraph on tank leak volumes should be revised. Based on the Historical Leak Model (HLM), much larger leak loss estimates for tanks SX-108 and SX-109 Were proposed in HNF-3233. Based on HNF-3233 and past DOE communications, it appears that the estimated leak volumes for the SX tanks in RPP-23405 and Hanlon are low. On August 27, 1998, DOE issued a press release concerning HNF-3233 and indicated "…the volume of past leaks from four of the Hanford Site's 149 single shell waste tanks is greater than previously estimated." DOE has not issued a press release in support of HNF-4756 that indicates the leaks in SX Tank farm are smaller than previously thought. Since extent of contamination in the vadose zone near these tanks is undefined, it appears that the actual leak volumes in HNF-3233 are plausible for tanks SX-108 and SX-109 and could potentially be an order of magnitude higher than that reported in RPP-23405 and Hanlon. Additionally, there is evidence that tank BX-102 has leaked more than once (Johnson and Washenfelder, Interoffice Memo, dated Sept. 10, 2003, To: S.M. Mackay)

The statement that "Sixty-seven of the SSTs are known or suspected to have leaked liquid waste to the vadose zone between the 1950s and the present, although it is likely that some of the tanks have not actually leaked." has been poorly supported. ERWM has asked for an independent review of the DOE's reassessment of past tank leaks. DOE/ORP has not reviewed drywell monitoring data acquired at the time of the reported leak(s) during this reassessment. It is entirely possible more than 67 tanks have leaked. **508-68**

Page 3-62 **508-69**

various resources at Hanford and the possible effects on environmental impacts of the *TC & WM EIS* alternatives. As described in Chapter 6, Section 6.3.4, DOE has reviewed climate studies that forecast general trends in Hanford regional climate change. However, there are no reliable methodologies for projections of specific future climate changes in the Hanford region, and thus such changes have not been quantified in this EIS. To account for this uncertainty, Appendix O, Section O.6.2, describes the effects of enhanced infiltration such as that which may occur during a wetter climate. In the *Draft TC & WM EIS*, Appendix V focused on the potential impacts of a rising water table from a proposed Black Rock Reservoir. Following the retraction of this proposal, the focus of Appendix V was changed in this final EIS to analysis of potential impacts of infiltration increases resulting from climate change under three different scenarios. Appendix V includes sensitivity analyses of potential impacts at Hanford that could result from climate changes that may increase model boundary recharge parameters and the rise of the groundwater table. Additional qualitative discussion of the potential effects of climate change on human health, erosion, water resources, air quality, ecological resources, and environmental justice has been added to Chapter 6 of this final EIS. Additional discussion of the types of regional climate change that could be expected has also been added to Chapter 6, Section 6.5.2, Global Climate Change. The potential impacts of the alternatives on climate change are addressed in Chapter 6, Section 6.5.2, and Appendix G, Section G.5, of this *TC & WM EIS*.

508-41 DOE has an active commitment to working with the tribes and coordinates all requests for tribal access through its Office of Communications. In consultation with area tribes, DOE also has made commitments in several recent Memorandum of Agreements (MOAs) negotiated under the National Historic Preservation Act requiring that DOE coordinate schedules with the tribes in an effort to avoid or minimize affecting tribal ceremonies. These include the MOA for the Rattlesnake Mountain Combined Community Communication Facility and Infrastructure Cleanup on the Fitzner-Eberhardt Arid Lands Ecology Reserve (executed by DOE and the State Historic Preservation Officer [SHPO] in July 2009) and the MOA for Use of Borrow Source at Area C (executed by DOE, the SHPO, and the Advisory Council on Historic Preservation in April 2009). In addition, a currently pending Amended MOA associated with closure of the Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill, which has been exchanged with area tribes, the SHPO, and Advisory Council on Historic Preservation, includes a similar stipulation to minimize noise and visual effects associated with project activities by coordinating the timing of construction

The western toad was not mentioned as one of the amphibians present. Pacific tree frogs have not been seen for 30 years. The painted turtle was not mentioned. Documentation of these species can be found in a Nez Perce Tribe publication "*I Am of This Land: Wildlife of the Hanford Site, 1996.* Copies of this publication are available upon request from NPT ERWM. **508-69 cont'd**

Page 3-62

ERWM doesn't necessarily support the premise that a correlation or cause and effect have been scientifically established for increased elk mortality due to fires. Many other variables could account for this if indeed mortality has increased significantly. It would be interesting to actually see the mortality figures pre- and post-fire. **508-70**

Pages 3-69 to 3-71

Species were left out of Table 3-8: western toad (state candidate), sage grouse (state threatened), western grebe (candidate), black tailed jackrabbit (candidate). There may be others; please update the table with latest federal and local lists. **508-71**

Page 3-74

The Cultural Resources section only identifies the impacts in relation to archeological and plant resources. These are simply components of cultural resources. The Cultural Resources section should also include a section regarding the connection and association between the indigenous people and their surrounding environment. **508-72**

Page 3-79

The Tribes also retain the right to erect temporary structures and contend the Federal Lands are open and unclaimed. **508-73**

Page 3-87

The *TC & WM EIS* states, "Results of the current assessments and historic studies indicate little risk of enhanced carcinogenesis; exposures to site radionuclide releases tend to be far loERWMr than those to natural background radiation, and chemical exposures are Well within stipulated guidelines." There is a need to clarify that those studies and assessments, noted in the statement above, Were not inclusive of the Native American scenarios, and therefore the results do not reflect the surrounding native community as a whole. Please see *TC & WM EIS* pages U-63 and U-64 for American Indian Residential Farmer peak Hanford Columbia River radiological dose of 131,000 rems per year in 1985 and 100% chance of cancer or death and peak chemical hazard of 305 in 1978 for a 100% chance of chronic or acute chemical exposure. These results would not indicate low levels of carcinogenesis or risk. **508-74**

Page 5-10

Table 5-1 reports spurious digits introduced by calculations carried out to a greater precision than the modeling supports. For example, the results (chemical versus isotopic) for uranium suggest that the modeling has only three significant figures in regards to the calendar year. **508-75**

Page 5-14 **508-76**

activities to minimize disturbance of ceremonies at Rattlesnake Mountain. DOE will continue, through its active Cultural Resources Program and policy of communication and consultations with the tribes, to be sensitive to these concerns.

508-42 Chapter 3, Section 3.2.5, of this *TC & WM EIS* describes the geologic and soil resources at Hanford and in the vicinity with respect to regional physiography and geologic structure; site stratigraphy; rock and mineral resources; geologic hazards; and soil attributes. This description includes the White Bluffs area.

508-43 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

508-44 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

One of the purposes of this *TC & WM EIS* is to analyze potential impacts of DOE's proposed actions to retrieve waste from the buried tanks, treat and dispose of this waste, and close the SST farms. This analysis is also intended to aid DOE in making decisions regarding cleanup of the past leaks.

508-45 DOE's data show that the groundwater model predictions for current conditions presented in the *Draft TC & WM EIS* are within an order of magnitude of recent field measurements. The discussion of the areas of agreement and disagreement has been expanded in Appendix U of this *Final TC & WM EIS*. DOE also believes that the expanded mitigation discussion (Section 7.5) in Chapter 7 addresses some of the questions regarding the near-, mid-, and long-term mitigation actions that could support the decisionmaking process.

508-46 A key purpose of the analyses in this *TC & WM EIS* is to understand the potential impacts of proposed actions on humans so those impacts can be factored into decisionmaking. In analysis of the potential long-term impacts of radioactive materials left at Hanford, a number of different scenarios were developed. These scenarios, described in Appendix Q, "Long-Term Human Health Dose and Risk Analysis," include a groundwater-drinking water user, a resident farmer,

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

According to the text, uranium groundwater concentrations will not exceed 30 ug/L at the core zone boundary until CY 6000. Presently, uranium concentrations in groundwater exceed 30 ug/L at the northern core zone boundary. **508-76 cont'd**

Page 5-32

Figure 5-34 should be corrected to show the presence of a uranium groundwater plume in 200 East. **508-77**

Page 5-41

Table 5-2 reports spurious digits introduced by calculations carried out to a greater precision than the modeling supports. For example, the results (chemical versus isotopic) for uranium suggest that the modeling has only three significant figures in regards to the calendar year. **508-78**

Page D-2

Best Basis Inventory may under represent uranium heel residuals. Review of the DOE uranium documents which talk about total uranium contained in the tanks has an unexplained decrease. The Best Basis Inventory May 1998 gives the Hanford tank uranium inventory of 894,000 Kg. The Best Basis Inventory September 1998 gives the Hanford tank uranium inventory of 878,000 Kg. Most of the references that explain uranium flow at Hanford such as DOE/RL-2000-43 indicate 958,000 Kg of uranium is in Hanford tanks. The Best Basis Inventory 2009 indicates there is an estimated 648,000 Kg of uranium in Hanford tanks. The Best Basis Inventory 2009 also gives standard deviation for total uranium for a total of 47 SSTs and DSTs. The weighted relative standard deviation for these tanks is 30.2%.

Considering the desire for the DOE to minimize the environmental impact of the Hanford site it is very possible the current Best Basis Inventory for uranium is 200,000 Kg low or about 30% low. This would mean 648,000 Kg total uranium is still statistically correct but on the bottom of the distribution. 848,000 Kg total uranium may be a better estimation of actual tank total uranium contents. **508-79**

A possible explanation for the decrease in tank uranium is the decrease in number of tanks thought to have high uranium metal waste. Initially 40 SST Were assumed to have metal waste. This number was deceased to 2 based on sampling 21 of these tanks. HoERWMver even with the large number of samples from tanks there Were a very small number of actual samples of tank heels where the metal waste would be expected (RPP-8847). With very limited data, the amount of metal waste and uranium was adjusted downward for the Best Basis Inventory.

Page D-16

The calculation of tank heel residual after cleaning is flawed. The *TC & WM EIS* basic assumptions for tank heel calculation are found in appendix D-16. The method used (method 1) was selected because of ease of use (DOE statement in tribal consultation) and does not take known tank waste layer composition into consideration. It only treats tanks as a homogenous (fully mixed) waste and computes remaining tank heel waste based on retrieval percentage times total tank inventory. For example, tank X retrieved to 99% would have 1% of the total tank curies or kilograms of an individual component left in the heel. This method fails to take into the consideration all the information in the Best Basis tank inventory that includes individual layer composition for each tank. **508-80**

an American Indian resident farmer, and an American Indian hunter-gatherer. The scenarios reflect recognition of fish as potentially more important in local tribal members' diets than in the diets of the general population. As indicated in Appendix Q, Section Q.2, it was assumed that the American Indian resident farmer and the American Indian hunter-gatherer consume 26 and 226 kilograms of fish per year, respectively. The average adult fish consumption rate in the report cited by the commentor is 58.7 grams per day or about 21.4 kilograms per year.

This EIS also includes analysis of inadvertent intrusion scenarios, the details of which are described in Section Q.2.3. The intruder is assumed to be located on the barrier constructed over a tank farm, a waste disposal facility, or FFTF. The intruder impact model evaluates impacts of construction of a home or drilling of a well at these locations. Residual contamination is brought to the surface, resulting in exposure of construction or drilling workers and subsequent exposure of resident farmers. A detailed description of the intruder model is presented in Section Q.2.3. Results of this analysis, previously included only in Appendix Q, were added to Chapter 5 to make them more available to readers.

508-47 As no action associated with the *TC & WM EIS* alternatives would take place within the Hanford Reach National Monument, no impacts on any rare plants and wildlife species would occur. Accordingly, these species were not specifically addressed in this EIS. As noted in Chapter 3, Section 3.2.7.4, informal consultation was conducted with USFWS, NMFS, Washington State Department of Fish and Wildlife, and the Washington Natural Heritage Program concerning threatened and endangered species that are potentially present within areas to be disturbed by the various alternatives (see Appendix C, Section C.3, for copies of correspondence related to these consultations). Further, as noted in Section 3.2.7.4, special ecological studies were conducted to determine the presence of any rare species within the affected areas. No federally or state threatened or endangered species were identified in these studies. Thus, no such species would be impacted by any of the *TC & WM EIS* alternatives (see appropriate sections of Chapter 4). Rare species at the Hanford Reach National Monument were considered in detail in the *Hanford Reach National Monument Final Comprehensive Conservation Plan and Environmental Impact Statement, Adams, Benton, Grant and Franklin Counties, Washington* (USFWS 2008), to which the commentor is referred.

508-48 DOE did review the *Hanford Reach National Monument Final Comprehensive Conservation Plan and Environmental Impact Statement, Adams, Benton,*

Appendix D-16 gives a more correct method for computing tank heel waste which is method 2. Method 2 takes into consideration that supernatant (liquid) can be easily pumped off the tank and be on top of the waste, salt cake can be readily dissolved or vacuum sluiced which is the next layer and the final bottom sludge layer will be the most difficult to remove. The sludge is heavier and more difficult to dissolve. The remaining heel is calculated based on a proportional volume mix of sludges present in an individual tank and if the heel volumes exceed the total sludge volume a proportional volume mix of the salt cake is used to make up the difference.

The data source for the tank heel estimates is the TWINS Best Basis Inventory (BBI) supported by PNNL. This database is continually updated with new information and radioisotope decay dates to represent the best available knowledge of each tank's contents. The *TC & WM EIS* uses the 2002 BBI. Analysis was done by the Nez Perce Tribe ERWM using the TWINS database updated to November 5, 2009. Compared to the 2009 database the 2002 database under estimates total uranium and PCBs (polychlorinated biphenyls). The 2002 database overestimates iodine-129 and technetium-99. The Nez Perce Tribe analysis uses method 2 of appendix D-16 with the exception that the actual total tank waste volume is used to compute tank heel. This approach is the same method used in the *TC & WM EIS*. It gives a loERWMr estimate than the 99% retrieval of total tank volume or 10 cubic meters for 100-series SST and 0.9 cubic meters for 200-series SST.

The analysis indicates tank heel sludges have a higher content of uranium, plutonium, lead, mercury, chromium, PCBs, strontium-90, and a lower content of carbon-14, technetium-99, iodine-129, cesium-137 and nitrate. The predominate impact is that 6-7 times more total uranium may exist in the tank heel than that used in the EIS.

The following tables list the *TC & WM EIS* SST and DST heels in curies or kilograms for 90, 99 and 99.9% retrieval, the method 2 calculated heels and the numeric ratio of method 2 divided by *TC & WM EIS* values.

SST Heel After 90% Retrieval

Analyte (curies)	*TC & WM EIS 90%*	2009 BBI w/method 2	Ratio method 2/EIS
Hydrogen-3 tritium	8.93E+02	2.25E+02	0.25
Carbon-14	2.59E+02	2.74E+01	0.11
Strontium-90	3.43E+06	5.41E+06	1.58
Technetium-99	1.55E+03	8.32E+02	0.54
Iodine-129	2.99E+00	1.04E+00	0.35
Cesium-137	1.61E+06	1.26E+06	0.78
Uranium-233,234,235,238	8.75E+01	1.71E+02	1.95
Neptumium-237	5.89E+00	4.69E+00	0.80
Plutonium-239,240	6.69E+03	6.60E+03	0.99
Americium-241	NA	8.45E+03	NA

508-80 cont'd

Grant and Franklin Counties, Washington (USFWS 2008) during preparation of this *TC & WM EIS*. DOE also reviewed the *Sport Hunting, Decision Document Package, Wahluke Unit of the Hanford Reach National Monument* (USFWS 2007) and the June 9, 2000, Presidential Proclamation 7319, "Establishment of the Hanford Reach National Monument" (65 FR 37253).

508-49 DOE realizes that salmon recovery relies on local watersheds. However, this is outside the scope of this *TC & WM EIS*. DOE acknowledges the recovery planning that has occurred, including the efforts through the Columbia River Inter-Tribal Fish Commission. The Bonneville Power Administration provides extensive financial support to salmon recovery efforts and planning activities. Under NEPA, this EIS analyzes the potential environmental impacts associated with specific proposed actions and reasonable alternatives for the storage, retrieval, treatment, and disposal of tank waste generated from defense plutonium production activities; closure of SSTs containing HLW; decommissioning of FFTF; and continued management of LLW and MLLW at Hanford. These analyses include impacts on ecological species (including fish) and habitat, as well as environmental justice and socioeconomic considerations, consistent with current CEQ and DOE NEPA guidance. These analyses can be found in Chapter 4; Chapter 5, Sections 5.1.3, 5.2.3, 5.3.3, and 5.4.3; and Appendix P, Section P.3, of this *Final TC & WM EIS*.

508-50 This *TC & WM EIS* acknowledges the role of the agricultural community as one of several driving forces of the economy in the Hanford area since the early 1970s. In addition, Chapter 3, Section 3.2.11, acknowledges that several tribes in the greater Columbia Basin rely on natural resources for subsistence. Additionally, this *TC & WM EIS* analyzes the potential ecological impacts under the various alternatives; this analysis can be found in Chapter 4, Sections 4.1.7, 4.2.7, 4.3.7, and 4.4.6; Chapter 5, Sections 5.1.3, 5.2.3, 5.3.3, and 5.4.3; and Appendix P, Section P.3. Results of this analysis conclude that the alternatives considered in this *TC & WM EIS* would not adversely impact aquatic biota, including salmonids.

508-51 As an Equal Employment Opportunity employer, DOE recognizes the many contributions made by all Hanford employees regardless of race or ethnicity.

508-52 The development of the definition of environmental justice in Indian country is outside the scope of this *Final TC & WM EIS*. The environmental justice analysis presented in this EIS is primarily based on Executive Order 12898 and accompanying CEQ guidance published in 1997. This EIS includes a number

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Analyte (kilograms)	*TC & WM EIS 90%*	2009 BBI w/method 2	Ratio method 2/EIS
Chromium	4.95E+04	4.52E+04	0.91
Mercury	1.68E+02	3.79E+02	2.25
Nitrate	5.18E+06	3.81E+06	0.74
Lead	7.16E+03	1.31E+04	1.83
Uranium	5.42E+04	1.51E+05	2.79
PCB	8.54E+01	2.82E+02	3.30

508-80 cont'd

of analyses of the potential impacts of the various alternatives on the local American Indian population over the short term (see Appendix J) and long term (see Appendix Q). Based on the comments DOE received on the *Draft TC & WM EIS*, DOE has updated language in the discussion of environmental justice presented in Chapter 3, Section 3.3.11, and Appendix J to accurately reflect CEQ and NRC definitions.

508-53 DOE respectfully disagrees with the Nez Perce Tribe's position regarding tribal rights at Hanford. There is substantial documentation indicating that the tribes understood at the time the treaty was signed that the lands were no longer "unclaimed" when they were claimed for the purposes of the white settlers' activities. Most of Hanford had been so "claimed" at the time it was acquired for Government purposes in 1943. DOE is not aware of any judicially recognized mechanisms that would allow these lands to revert to "unclaimed" status merely through the process of being acquired by the Federal Government. The portion of Hanford that remained in the public domain in 1943 (those lands now having underlying U.S. Bureau of Land Management ownership), as well as all the acquired lands, were closed to all access initially under authority of the War Powers Act and then under authority of the Atomic Energy Act. It is, therefore, DOE's position that the Hanford lands are neither "open" nor "unclaimed."

508-54 The Nez Perce Tribe's proposal concerning ceremonial sites is outside the scope of this *TC & WM EIS*.

508-55 Institutional controls at Hanford are derived primarily through the RCRA/CERCLA decisionmaking process under the framework of the TPA. These controls are put in place to protect workers and the public and generally include nonengineered restrictions on activities, access, or exposure to land, groundwater, surface water, waste and waste disposal areas, and other areas or media. While the *Final Hanford Comprehensive Land-Use Plan EIS* (DOE 1999) and the ROD establishing the Hanford Comprehensive Land-Use Plan do use the words "institutional controls," it means that DOE intends to maintain the remediation institutional controls separately derived from (or established by) RCRA/CERCLA decision documents, which take into account the reasonably foreseeable land uses designated by the Hanford Comprehensive Land-Use Plan. If the stated land use will not support the risks encountered after remediation, and remedial institutional controls are deemed necessary (as determined through the RCRA/CERCLA decisionmaking process), then the land use designation may be changed, but only through the NEPA process as defined by the Hanford Comprehensive Land-Use Plan (i.e., as described in Chapter 6

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

DST Heel After 90% Retrieval

Analyte (curies)	*TC & WM EIS 90%*	2009 BBI w/method 2	Ratio method 2/EIS
Hydrogen-3 tritium	3.12E+02	9.36E+01	0.30
Carbon-14	5.29E+01	3.59E+01	0.68
Strontium-90	1.62E+06	1.10E+07	6.78
Technetium-99	1.42E+03	1.79E+03	1.26
Iodine-129	1.83E+00	1.90E+00	1.04
Cesium-137	2.98E+06	2.97E+06	1.00
Uranium-233,234,235,238	6.34E+00	3.22E+01	5.08
Neptumium-237	8.22E+00	2.50E+01	3.04
Plutonium-239,240	1.46E+03	7.53E+03	5.16
Americium-241	NA	5.55E+04	0.30

Analyte (kilograms)	*TC & WM EIS 90%*	2009 BBI w/method 2	Ratio method 2/EIS
Chromium	1.04E+04	3.28E+04	3.16
Mercury	1.44E+01	1.37E+02	9.55
Nitrate	1.90E+06	1.42E+06	0.75
Lead	1.25E+03	6.19E+03	4.95
Uranium	5.45E+03	3.24E+04	5.95
PCB	8.31E+01	5.33E+01	0.64

SST Heel After 99% Retrieval

Analyte (curies)	*TC & WM EIS 99%*	2009 BBI w/method 2	Ratio method 2/EIS
Hydrogen-3 tritium	8.93E+01	2.20E+01	0.25
Carbon-14	2.59E+01	1.98E+00	0.08
Strontium-90	3.43E+05	8.95E+05	2.61
Technetium-99	1.55E+02	6.30E+01	0.41
Iodine-129	2.99E-01	8.26E-02	0.28
Cesium-137	1.61E+05	1.31E+05	0.82
Uranium-233,234,235,238	8.75E+00	3.12E+01	3.56
Neptumium-237	5.89E-01	3.83E-01	0.65
Plutonium-239,240	6.69E+02	9.77E+02	1.46
Americium-241	NA	1.44E+03	NA

Analyte (kilograms)	*TC & WM EIS 99%*	2009 BBI w/method 2	Ratio method 2/EIS
Chromium	4.95E+03	4.14E+03	0.84
Mercury	1.68E+01	6.29E+01	3.74
Nitrate	5.18E+05	3.18E+05	0.61
Lead	7.16E+02	1.77E+03	2.47
Uranium	5.42E+03	3.62E+04	6.67
PCB	8.54E+00	3.28E+01	3.84

508-80 cont'd

of the *Final Hanford Comprehensive Land-Use Plan EIS*). Institutional controls are implemented consistent with DOE's *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions* (Ranade 2009). American Indian access to culturally significant sites or locations at Hanford is provided consistent with the requirements of the American Indian Religious Freedom Act, *U.S. Department of Energy American Indian & Alaska Native Tribal Government Policy* (Bodman 2006), and existing DOE commitments to the tribes.

508-56 DOE agrees that the *Final Hanford Comprehensive Land-Use Plan EIS* (DOE 1999) can change over time. The purpose of that EIS and its implementing policies and procedures is to facilitate decisionmaking about the use of Hanford and its facilities over at least the next 50 years. As stated in Chapter 6, Section 6.6, of that EIS, it is a living document designed to hold a chosen course over an extended period. However, it is recognized that while a fundamentally good plan can do this for a rather short period of time, improvement should be an ongoing program. Thus, the *Final Hanford Comprehensive Land-Use Plan EIS* can be modified as conditions change and, in fact, was reviewed in 2008 through a supplement analysis (DOE 2008c) and clarified in an amended ROD (73 FR 55824).

508-57 DOE has an active commitment to working with the tribes and coordinates all requests for tribal access through its Office of Communications. In consultation with area tribes, DOE also has made commitments in several recent MOAs negotiated under the National Historic Preservation Act requiring that DOE coordinate schedules with the tribes in an effort to avoid or minimize affecting tribal ceremonies. These include the MOA for the Rattlesnake Mountain Combined Community Communication Facility and Infrastructure Cleanup on the Fitzner-Eberhardt Arid Lands Ecology Reserve (executed by DOE and the SHPO in July 2009) and the MOA for Use of Borrow Source at Area C (executed by DOE, the SHPO, and the Advisory Council on Historic Preservation in April 2009). In addition, a currently pending Amended MOA associated with closure of the Nonradioactive Dangerous Waste Landfill and Solid Waste Landfill, which has been exchanged with area tribes, the SHPO, and Advisory Council on Historic Preservation, includes a similar stipulation to minimize noise and visual effects associated with project activities by coordinating the timing of construction activities to minimize disturbance of ceremonies at Rattlesnake Mountain. DOE will continue, through its active Cultural Resources Program and policy of communication and consultations with the tribes, to be sensitive to these concerns.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

DST Heel After 99% Retrieval

Analyte (curies)	*TC & WM EIS 99%*	2009 BBI w/method 2	Ratio method 2/EIS
Hydrogen-3 tritium	3.12E+00	1.01E+00	0.32
Carbon-14	5.29E-01	3.85E-01	0.73
Strontium-90	3.29E+04	1.54E+05	4.69
Technetium-99	1.42E+01	1.72E+01	1.21
Iodine-129	1.83E-02	2.08E-02	1.14
Cesium-137	2.98E+04	2.91E+04	0.98
Uranium-233,234,235,238	6.34E-02	3.93E-01	6.20
Neptumium-237	8.22E-02	3.71E-01	4.51
Plutonium-239,240	1.46E+01	9.36E+01	6.41
Americium-241	NA	7.80E+02	NA

Analyte (kilograms)	*TC & WM EIS 99%*	2009 BBI w/method 2	Ratio method 2/EIS
Chromium	1.04E+03	3.36E+03	3.23
Mercury	1.44E+00	1.39E+01	9.64
Nitrate	1.90E+05	1.37E+05	0.72
Lead	1.25E+02	6.42E+02	5.14
Uranium	5.45E+02	3.98E+03	7.30
PCB	8.31E+00	9.58E+00	1.15

SST Heel After 99.9% Retrieval

Analyte (curies)	*TC & WM EIS 99.9%*	2009 BBI w/method 2	Ratio method 2/EIS
Hydrogen-3 tritium	8.93E+00	2.26E+00	0.25
Carbon-14	2.59E+00	2.54E-01	0.10
Strontium-90	3.43E+04	1.63E+05	4.75
Technetium-99	1.55E+01	1.13E+01	0.73
Iodine-129	2.99E-02	1.16E-02	0.39
Cesium-137	1.61E+04	2.40E+04	1.49
Uranium-233,234,235,238	8.75E-01	3.93E+00	4.49
Neptumium-237	5.89E-02	1.22E-01	2.08
Plutonium-239,240	6.69E+01	1.73E+02	2.58
Americium-241	NA	2.27E+02	NA

Analyte (kilograms)	*TC & WM EIS 99.9%*	2009 BBI w/method 2	Ratio method 2/EIS
Chromium	4.95E+02	5.59E+02	1.13
Mercury	1.68E+00	9.98E+00	5.94
Nitrate	5.18E+04	4.64E+04	0.90
Lead	7.16E+01	2.61E+02	3.65
Uranium	5.42E+02	4.80E+03	8.86
PCB	8.54E-01	6.36E+00	7.45

508-80 cont'd

508-58 DOE recognizes that the Nez Perce and other area tribes feel a strong connection and association with the surrounding environment, including Hanford. Consistent with its responsibilities under the American Indian Religious Freedom Act, Executive Order 13007, and its government-to-government relationship with the tribes, DOE will continue to provide access and coordinate activities to avoid unnecessary interference with tribal ceremonial activities and religious use of the portion of Rattlesnake Mountain under DOE's jurisdiction and other culturally significant areas located on Hanford, where not inconsistent with the law or essential agency functions.

508-59 In response to this and similar comments, DOE performed a sensitivity analysis to evaluate the potential impacts of certain remediation activities (e.g., subsurface barriers to impede lateral subsurface flow) that could be conducted at some of the more prominent waste sites on the Central Plateau and along the river corridor. This analysis is provided in Appendix U of this EIS and is discussed further in Chapter 7, Section 7.5.

508-60 As discussed in Chapter 2, Section 2.6.1, of this *TC & WM EIS*, in situ technologies were not evaluated in detail because of the difficulties and uncertainties associated with placement of treatment zones; the long periods of time involved in treatment; the questionable uniformity of treatment; and the difficulty in verifying their overall efficacy.

508-61 The analyses of this *TC & WM EIS* rely on various modeling approaches to predict the future consequences of RPP mission activities that DOE may undertake. In the *Draft TC & WM EIS*, Appendix L , Section L.4.3, reveals that field-sampling data from over 5,000 boring logs were used to support lithologic encoding of the regional-scale flow model; Section L.6.1, that field-sampling data from approximately 1,800 groundwater wells were used to calculate the regional-scale flow model; and Appendix N, Section N.1.2, that field-sampling data from approximately 140 vadose zone boreholes were used to calibrate the vadose zone model as well as regional-scale groundwater plume measurements for the BY Cribs, BC Cribs, 216-T-26 Crib, and the REDOX and PUREX waste sites. In Appendix U, modeled results of contaminant plumes are compared against field measurements for the COPCs. DOE's view is that the overall level of characterization data for Hanford supports differentiation among the alternatives, which is a key feature of a NEPA analysis. As part of the closure and permitting processes, additional subregional-scale site characterization data will be developed to support smaller-scale, more-detailed modeling assessments.

DST Heel After 99.9% Retrieval

Analyte (curies)	*TC & WM EIS 99.9%*	2009 BBI w/method 2	Ratio method 2/EIS
Hydrogen-3 tritium	3.12E+00	1.01E+00	0.32
Carbon-14	5.29E-01	3.85E-01	0.73
Strontium-90	3.29E+04	1.54E+05	4.69
Technetium-99	1.42E+01	1.72E+01	1.21
Iodine-129	1.83E-02	2.08E-02	1.14
Cesium-137	2.98E+04	2.91E+04	0.98
Uranium-233,234,235,238	6.34E-02	3.93E-01	6.20
Neptumium-237	8.22E-02	3.71E-01	4.51
Plutonium-239,240	1.46E+01	9.36E+01	6.41
Americium-241	NA	7.80E+02	NA

Analyte (kilograms)	*TC & WM EIS 99.9%*	2009 BBI w/method 2	Ratio method 2/EIS
Chromium	1.04E+02	3.36E+02	3.23
Mercury	1.44E-01	1.39E+00	9.64
Nitrate	1.90E+04	1.37E+04	0.72
Lead	1.25E+01	6.42E+01	5.14
Uranium	5.45E+01	3.98E+02	7.30
PCB	8.31E-01	9.58E-01	1.15

Appendix D-16 also lists method 3 for evaluating tank heels which is the Hanford Tank Waste Operations Simulator Model. There is limited public access to method 3 results. Some of the data can be found in DOE/ORP-2005-01 for SSTs. DOE/ORP-2005-01 (Method 3) uses 30 cubic feet residuals and 360 cubic feet residual in the heel calculation. This gives a total heel volume 122% larger than 99% retrieval of actual heels.

SST Tank Heel Comparison of 99% EIS Retrieval Method 3 and Method 1

Analyte (curies)	DOE/ORP-2005-1 Method 3	*TC & WM EIS 99%*	Method 3/ *TC & WM EIS 99%*
Hydrogen-3 tritium	NA	8.93E+01	NA
Carbon-14	1.43E+00	2.59E+01	0.06
Strontium-90	1.43E+06	3.43E+05	4.17
Technetium-99	1.37E+02	1.55E+02	0.88
Iodine-129	1.30E-01	2.99E-01	0.43
Cesium-137	1.14E+05	1.61E+05	0.71
Uranium-233,234,235,238	NA	8.75E+00	NA
Neptumium-237	NA	5.89E-01	NA
Plutonium-239,240	1.97E+03	6.69E+02	2.94
Americium-241	2.84E+03	NA	NA

508-80 cont'd

508-62 DOE is not aware of any additional tanks that have leaked and has implemented a more -sensitive leak-detection-and-monitoring system at the SST farms to ensure any further leaks will be detected and appropriate actions will be taken. As discussed in Appendix D, Section D.1.4, DOE believes the *Waste Tank Summary Report for Month Ending December 31, 2002* (Hanlon 2003) best reflects Hanford's knowledge of known or suspected leaking tanks. Estimates in Hanlon (2003) range from 1.9 million to 4 million liters (0.5 million to 1.05 million gallons). Vadose zone field investigations have not been completed for all of the tank farms, and uncertainties regarding the estimated volumes of past leaks remain; therefore, this EIS uses the higher value of 4 million liters (1.05 million gallons) for analysis purposes.

508-63 See response to comment 508-53 regarding tribal rights at Hanford.

508-64 American Indian interests regarding the affected environment are discussed in the *Draft TC & WM EIS*, Chapter 3, Section 3.2.

508-65 DOE believes that the statement in Chapter 3, Section 3.2.6.1.1, of the *Draft TC & WM EIS* characterizing the Hanford Reach as free-flowing, as cited by the commentor, is accurate and unambiguous. Section 3.2.6.1.1 further states that the Hanford Reach "...extends from the Priest Rapids Dam to the upstream edge of Lake Wallula behind the McNary Dam. Because the flows are regulated, flow rates in the Hanford Reach can vary considerably." Further, DOE believes that the term "free-flowing" is synonymous with the term "unimpounded" and is also consistent with descriptions commonly used for the Hanford Reach, including descriptions of the Hanford Reach National Monument used by USFWS, as presented in Section 3.2.1 of this EIS.

508-66 Sections 3.2.6.1, 3.2.6.2, and 3.2.6.3 of Chapter 3 collectively provide a thorough summary and accounting of surface-water, vadose zone, and groundwater interactions, respectively, across Hanford, including sources of groundwater recharge and discharge, whether natural or induced by humans. These descriptions are based on the best-available science and understanding, with uncertainties discussed where they are known to exist. For example, as presented in Section 3.2.6.1 of this EIS, DOE notes that West Lake, located north of the 200 Areas, has decreased dramatically in size over time due to reductions in wastewater disposal and a corresponding reduction in the water table intersecting the lake. As is already stated in Section 3.2.6.2, DOE believes that substantial artificial recharge to the vadose zone ended in the mid-1990s, except those remaining liquid waste disposal facilities such as the State-Approved Land

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Analyte (kilograms)	DOE/ORP-2005-1 Method 3	*TC & WM EIS 99%*	Methods 3/ *TC & WM EIS 99%*
Chromium	1.45E+04	4.95E+03	2.93
Mercury	NA	1.68E+01	NA
Nitrate	8.18E+04	5.18E+05	0.16
Lead	NA	7.16E+02	NA
Uranium	1.93E+04	5.42E+03	3.56
PCB	NA	8.54E+00	NA

One difference from method 3 over method 1 is method 3 gives higher strontium-90, plutonium-239, 240, chromium and uranium.

Other method 3 data can be found in PNNL-15829 for double shell tank heels. In some cases PNNL-15829 assumes up to 99.999% retrieval for DST which is unlikely. The utility of the Hanford Tank Waste Operations Simulator Model is questioned by the tank waste retrieval contractor. It is likely the best policy to use the most conservative tank residual estimate for individual tank percentage retrieval and refine the actual residual estimate by sampling and characterization. The conservative retrieval estimates should be applied to the source term to estimate environmental impact as Well human and ecological damage.

508-80 cont'd

Page D-24

ERWM has been concerned about the ongoing tank leak assessment process due to its apparent lack of technical rigor. In this process, tank leaks have been estimated primarily by in-tank measurements and to a lesser extent by vadose zone measurements. In-tank measurements are subject to measurement error, boiling wastes, evaporation, sludge collapse, and re-baselining. The minimum detectable leak in a 75 ft tank based on in-tank measurements has been estimated at approximately one-inch or approximately 3,000 gallons. The minimum detectable leak based on drywell measurements has been estimated at 5,000 gallons (RPP-23405, Rev. 0, Appendix A). While the "maximum permissible leak" was estimated at 50,000 gallons, HW-68661 (p. 6) estimated that the "maximum permissible leak" could be detected by one lateral and 4 vertical drywells. It is noteworthy that the drywell moisture logging conducted during the S-102 leak test was unable to detect a 13,150 gallon injection of a sodium thiosulfate and water solution at 40-02-10 (RPP-30121, p. 2-52). These in-tank and vadose zone estimates suggest a minimum detectable leak of 3,000 to 5,000 gallons yet DOE/ORP has supplied a upper bound for some of the tank leaks at 2,000 gallons, which is below DOE expected minimum detection limits based on drywell logging and in-tank measurements.

All tank leak estimates should be reviewed by an independent external expert panel. One of the principles to be used in accomplishing the vadose zone project's goals was: ***"External peer review is important for program success"*** (DOE/RL-98-49, p. 29). By following vadose zone project's guiding principles in this process, DOE/ORP and Ecology would demonstrate an open, resolute and objective process for determining the magnitude of the tank leaks and establishing a tank farm vadose zone project that is credible and defensible.

508-81

Disposal Site, 200 Area Treated Effluent Disposal Facility, and other identified facilities. DOE does not believe that leakage from other sources, such as from export water lines, is a substantial source of artificial recharge across the 200 Areas.

508-67 For analysis purposes in this EIS, the difference between ditches and trenches was deemed unimportant and, for reader ease, these terms were defined consistently throughout this EIS. In the Summary, Section S.9, and Chapter 9 of this EIS, a trench (ditch) is defined as follows: "A depression dug in the ground, open to the atmosphere, and designed for disposal of low-level or intermediate-level radioactive waste. It uses the moisture retention capability of the relatively dry soils above the groundwater." The Summary and Chapter 9 define a crib as follows: "An underground structure designed to distribute liquid waste, usually through a perforated pipe, to the soil directly or to a connected tile field. Cribs use the filtration and ion exchange properties of the soil to contain radionuclides. A crib is operated only if radionuclide contamination observed in the groundwater beneath the crib is below a prescribed limit."

508-68 As discussed in Appendix D, Section D.1.4, DOE believes the *Waste Tank Summary Report for Month Ending December 31, 2002* (Hanlon 2003) best reflects the current knowledge regarding tanks that are known or suspected to have leaked at Hanford. Estimates found in this report range from 0.5 million gallons to 1.05 million gallons. Vadose zone field investigations have not been completed for all of the tank farms, and uncertainties remain regarding the estimated volumes of past leaks; therefore, this EIS uses the higher value of 1.05 million gallons for analysis purposes. A review of *Analysis of SX Farm Leak Histories–Historical Leak Model* (FDH 1998) found that the leak estimates for tanks SX-108 and SX-109 are 203,000 gallons and 44,000 gallons, respectively, and are characterized as follows: "maximum or upper bounds estimates of each leak and are in total volume about six times the previous leak estimates. Minimum leak estimates are about 50 percent of these values, based on judgments about the heat and leak rate uncertainties." For comparison, Hanlon (2003) reports estimates for tanks SX-108 and SX-109 at 2,400-35,000 gallons and less than 10,000 gallons, respectively. Thus, even the minimum leak estimates from Historic Leak Model (HLM) (FDH 1998) exceed the Hanlon (2003) estimates. However, Appendix C of HLM (FDH 1998) also includes replies to comments from the Tank Advisory Chemical Reactions Subpanel, which issued a consensus viewpoint that the "HLM analysis would be of little value without more-detailed uncertainty analyses and the impacts

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Page D-26

A correct reference for the 216-B-38 trench is DOE/RL-2002-42 not Hanlon (2003) as stated in the text. **508-82**

Page D-27

The amount of curies of uranium reported for the B Cribs in Table D-28 is inconsistent with the amount of uranium in kg shown in Table D-29.

The detectable retrieval leak (300 gallons) as estimated in RPP-10413 (Hanson 2003) appears to have been underestimated. The leak injection test at S-102 (RPP-30121) demonstrated that drywell monitoring as conducted by the tank farm contractor was incapable of detecting a 13,150 gallon injection of simulate injected at 40-02-10. Drywell 40-03-03 is located approximately 19 feet to the southwest of the injection drywell 40-02-10. **508-83**

Page E-28

Drywell monitoring as presently conducted by the tank farm contractor isn't a useful method for monitoring for retrieval leaks. The leak injection test at S-102 (RPP-30121) demonstrated that drywell monitoring as conducted by the tank farm contractor was incapable of detecting a 13,150 gallon injection of simulate injected at 40-02-10. Drywell 40-03-03 is located approximately 19 feet to the southwest of the injection drywell 40-02-10.

The EIS indicates that: "The first SSTs known to leak were tanks 241-TY-109 and 241-U-101 in 1959." Since there isn't a Tank TY-109, ERWM assume that the EIS is referring to the confirmed leak in 1959 from tank TY-106. ARH-R-43 lists tank U-104 as the first suspected leaker due to a bulged liner in 1956. Actually, the first recognized tank leak was from tank BX-102 in 1951 (HW-20438). The initial leak estimate of 40,000 gallons (HW-56972) for SX-113 in 1958 is not discussed or included in the leak estimate in Hanlon. During the leak test in 1962 (HW-75714), 15,000 gallons were lost to the subsurface, and this volume is listed in Hanlon. The initial leak estimate of 40,000 gallons is not accounted for. Therefore, a leak estimate for SX-113 should be 55,000 gallons (40K + 15K). It is noteworthy that the Hanford Soil Inventory Model (RPP-26744) lists a leak date of 1958 for SX-113 and that the 1958 leak event triggered the rapid installation of laterals underneath tank SX-113 (HW-60749). **508-84**

Appendix L

It is difficult to evaluate the hydrogeologic basis for the model since there is only one stratigraphic cross-section is shown (found in appendix N, Figure N-3) and only one model layer (the Top of Basalt) is shown (Figure L-7). Maps of the layers above the basalt and additional cross sections should be included in the final version of the EIS. **508-85**

Page L-8

Since the EIS has attempted to attribute groundwater contamination to cribs rather than tank farms, the 200 m cell size (horizontal) has inadequate resolution to separate crib contamination from nearby tank leaks. **508-86**

of uncertainty on HLM conclusions." The author's reply to this comment was, "We agree that uncertainty analyses are very important for the HLM and for any model, but such analyses would be beyond the existing scope of the HLM." In addition, Appendix C of HLM (FDH 1998) further states, "The HLM analysis was meant to demonstrate the viability of this approach, not necessarily to establish the HLM leak estimates as being definitive." Based on the Tank Advisory Chemical Reactions Subpanel comments and the author's replies, DOE continues to believe that Hanlon (2003) best reflects Hanford's knowledge of tanks that are known or suspected to have leaked at the site.

508-69 The western toad has been added to the list of amphibians present on Hanford. The Pacific tree frog is mentioned in Duncan (2007) and Landeen and Crow (1997), and so has been retained. The painted turtle has been added to the list of reptiles present on Hanford.

508-70 The statement that elk mortality due to collisions with motor vehicles occurred after the 24 Command Fire was not intended to imply that there is always a direct relation between fire and such elk mortality. Rather, the statement simply reported USFWS's observation following the fire (DOI 2000).

508-71 The western sage grouse, black-tailed jackrabbit, and western grebe are included in Chapter 3, Table 3–8. The western toad has been added to this table in this final EIS.

508-72 DOE recognizes that the tribes feel a strong connection and association with their surrounding environment. DOE appreciates receiving the Nez Perce Tribe's narrative, which provides its perspectives. DOE included this narrative in this *Final TC & WM EIS* as a new appendix (Appendix W), with references to this appendix added in the main volume of this EIS. DOE acknowledges the importance to the American Indians of cultural resources, including those that predate written records, and of all areas, sites, and materials deemed significant for religious or heritage-related reasons, as well as certain natural resources such as plants, which have many uses (see Chapter 2, Section 2.8.3.8; Chapter 3, Section 3.2.8; and *Hanford Site National Environmental Policy Act (NEPA) Characterization* [Duncan 2007]).

508-73 See response to comment 508-53 regarding tribal rights at Hanford.

508-74 DOE notes that this EIS adequately represents the nature of past assessments and health studies. The past studies of doses and risks are based on populations living near Hanford or other nuclear facilities, on actual releases, or both, and

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Page L-20

The upthrown block of the May Junction fault is mislabeled based upon the orientation of the fault as shown on Figure L-7. None of the faults appear to show any offsets based upon the color contouring. ***508-87***

Page M-15, Table M-3

The dates of the tank leaks referenced to Anderson (1990) are inconsistent with those shown in Anderson (1990, p 23).

The volume (70,000 gal) of the BX-102 tank leak, referenced in Knepp (2002) aka RPP-10098, doesn't agree with the volume of 91,000 gal stated in Knepp (2002) aka RPP-10098. Additionally, there is evidence that tank BX-102 has leaked an additional 33,000 gal in the 1960s (Johnson and Washenfelder, Interoffice Memo, dated Sept. 10, 2003, To: S.M. Mackay). ***508-88***

Page M-20, Table M-10

Release models for uranium are based on Kd which is not a good representation of the mobilization of uranium. The use of Kd is at best an approximation for uranium and other materials moderately retained in soil. PNNL-14022 gives the approximate soil Kd for uranium of very close to zero in water of pH and ionic strength consistent with Hanford vadose zone and groundwater. PNNL-11966 gives a conservative estimate of uranium Kd of 0.5 and a best estimate of 0.6±0.1. PNNL-16531 gives a summary of Kd for uranium of 0.08 to 3.5 for various soil types at Hanford using Hanford groundwater.

The accepted interpretation of and use of Kd is it is at best an approximation for retention in non-homogenous solids. A better explanation of uranium soil mobility can be found in PNNL-15121 and a paper by Jiamin, Wan etal. (Spatially Resolved U(VI) Partitioning and Speciation: Implications for Plume Scale Behavior of Contaminant U in the Hanford Vadose Zone, *Environ. Sci. Technol.*, Publication Date (web): 18 February 2009) where uranium soil mobility is explained by a combination of adsorption, desorption and precipitation factors. Any use of Kd values should be viewed with some suspicion as not being relevant to reality. Alternate modeling should be conducted to accurately predict vadose zone and groundwater transport of contaminates of concern with higher soil retention such as uranium. Uranium should be remodeled in particular because of the large Hanford site inventory and its driver for human risk. ***508-89***

Appendix N

These models appear to underestimate moisture content and the hydraulic conductivity of the vadose zone. ***508-90***

Page N-3

A description of the vertical grid size needs should be added to the text. It appears that the vertical grid size is approximately 2 m based upon Figure N-4. There are thin (less than one meter thick) fine-grained layers in the Hanford that promote lateral transport in the vadose zone. How have the fine-grained layers been incorporated into the STOMP models? ***508-91***

should not be confused with analyses that reflect potential doses to hypothetical receptors. The American Indian hunter-gather receptor is intended to reflect a subsistence lifestyle in which the person consumes wildlife, fish, and plant material taken from the wild and water from the Columbia River for the full year. The source of contamination is assumed to be the groundwater and springs on the Hanford side of the Columbia River, a location where, in 1985, it would not have been possible for a person to be living.

508-75 The groundwater analysis was reported on an annualized basis from calendar year 1940 to calendar year 11,940 (10,000-year period of analysis). The calendar years have four to five significant figures (i.e., are significant to the nearest year). The concentrations reported during each calendar year are more difficult to assess in terms of precision. In a general sense, these concentrations contain only three significant figures. Similarly, in terms of accuracy, as discussed in Appendices O and U, the concentration results are comparable to field data to a close order of magnitude. Data presentation in this *Final TC & WM EIS* has been revised to address issues related to precision raised in this and similar comments.

508-76 The discussion in Chapter 5, Section 5.1.1, of this *TC & WM EIS*, is specific to model results for sources related to Tank Closure Alternative 1. Results in Chapter 5 are intended to demonstrate the impacts of various parts of the alternatives, and are not comparable to current conditions. The appropriate discussion comparing model results with current field measurements is in Appendix U.

508-77 Chapter 5, Figure 5–34, of the *Draft TC & WM EIS* represents a model result for sources related to Tank Closure Alternative 1. Figures in Chapter 5 are not intended to represent current conditions. The commentor is directed to Appendix U for a discussion of the comparison of modeled versus measured groundwater concentrations.

508-78 The groundwater calculations were reported on an annualized basis in these tables, and the date should be interpreted as significant to the nearest year. The concentration data associated with each year probably contain only three significant figures (precision) and are comparable to field measurements to a close order of magnitude (accuracy). Data presentation in this *Final TC & WM EIS* has been revised to address the precision issue raised by this and other commentors.

508-79 To address this specific comment on the draft EIS questioning DOE's use of the 2002 BBI for tank waste inventory data, in 2005, ORP; DOE-RL; DOE Office of Health, Safety, and Security; DOE-EM; DOE Office of the General Counsel;

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Page N-4, Figure N-1
It isn't clear from this figure how the vadose zone transport in the Hanford accounts for the lateral anisotropy of the Hanford due to the presence of fine–grained layers.

Page N-5, Figure N-2
The fine-grained layers in the Hanford aren't being modeled with the STOMP model as shown by the predicted moisture content for Borehole 299-E33-338.

508-91 cont'd

Page N-6
In addition to 200 west, the Cold Creek Unit in 200 East also affects vadose zone transport as shown on Figure N-2, page N-5.

508-92

Pages N-7 and N-8
It doesn't appear to us that the activity level measured and predicted for technetium-99 for the BY Cribs are "in general agreement." In the late 1980s and early 1990s, the predicted activity appears an order of magnitude too high. This comparison suggests that the set of values for the vadose zone hydraulic parameters have underestimated the flux of Tc-99 through the vadose zone from discharges to the BY Cribs.

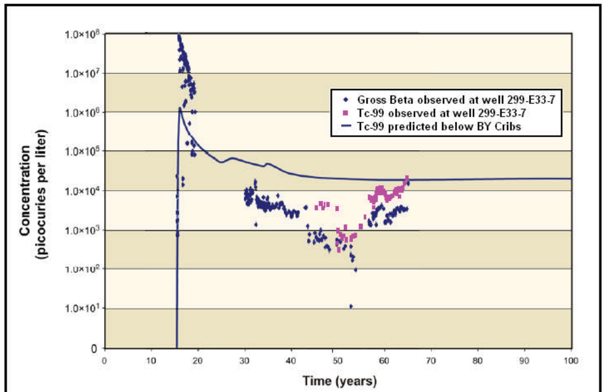


Figure N–5. Time Series of Measured Gross Beta Activity Below the BY Cribs
Figure N–6. Time Series of Predicted Concentration of Technetium-99 Below the BY Cribs

Observed versus predicted Tc-99 activity in groundwater below the BY Cribs as shown in the EIS. Figure N-5 is superimposed on Figure N-6

508-93

and Ecology reviewed the 2002 BBI estimates. The conclusion then, and now, is that the 2002 BBI is appropriate for the analyses in this *TC & WM EIS*. This conclusion is supported in Section 4.0, Assumptions, in the *Technical Guidance Document* (DOE 2005), dated March 25, 2005, which was approved by DOE and Ecology. In summary, DOE and Ecology concluded that the 2002 BBI includes inventory values for both technetium-99 and iodine-129, two risk-driving radionuclides, that are at the higher end of the range of numbers based on the inherent uncertainty in the way the BBI is formulated. This use of some conservatism by using the higher number for two risk drivers is still considered appropriate for this EIS analysis. Regarding the use of the SIM, Revision 1, data for analysis of the cribs and trenches (ditches), dated 2005, as explained in Appendix D, Section D.1.5, DOE reviewed the available data and concluded these data are appropriate for the analysis in this *TC & WM EIS*. For a more comprehensive discussion of this topic, see Section 2.2 of this CRD.

508-80 Regarding the commentor's concerns about the use of the 2002 BBI and the methodology for calculating the tank waste "heels" after waste retrieval, DOE reexamined the inventories used in this *Final TC & WM EIS* and determined that the best-available data were used in the analysis, with the understanding that uncertainty still remains. For a more comprehensive discussion of this topic, see Section 2.2 of this CRD.

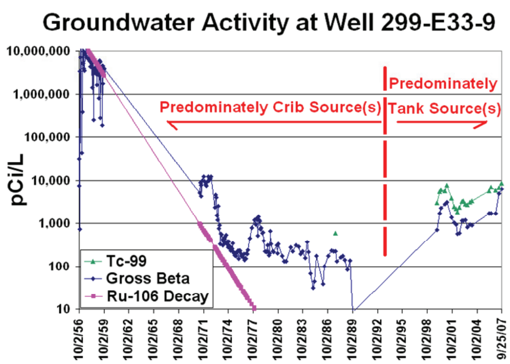
508-81 The leak assessment process serves a primary purpose of engaging DOE, the tank farm contractors, and Ecology in review of the current state of knowledge regarding tank leak estimates. Please review the *Process to Assess Tank Farm Leaks in Support of Retrieval and Closure Planning* (Field, Harris, and Johnson 2007) for a more detailed description of this process. DOE and Ecology have provided updates on this process as requested. DOE publishes reports that summarize findings and recommendations throughout this review process. DOE has received comments and responded to them; both Ecology and DOE consider this an open and transparent process. DOE is not aware of any additional tanks that have leaked and has implemented very sophisticated leak detection and monitoring systems at the SST farms. There are detection systems in place to monitor the tanks for leaks while storing waste; an additional detection system monitors for leaks during retrieval operations. During retrieval, DOE and Ecology have agreed to the use of an electrical resistivity system that has a leak detection capability bounded by 7,571 liters (2,000 gallons). In-tank monitoring of the SSTs storing waste involves many considerations; these monitoring systems and detection limits are described

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

508-93 cont'd

As outlined in our April 16, 2007 presentation to the EIS team, ERWM interpret the gross beta activity in groundwater as follows:

- By 1956, the groundwater was significantly contaminated by discharges to the BY Cribs (HW-42612).
- Discharges to the BY Cribs ceased after ^{137}Cs contamination was detected in groundwater at well 299-E33-3 in 1956 (HW-42612).
- The 1959 gross gamma log (HW-84577) for borehole 299-E33-04 showed the entire soil column was highly contaminated to the bottom of the borehole.
- The contaminant flux for the mobile contaminants from the BY Cribs into the aquifer follows a first order decay pattern.
- Since the mid-1990s, the increase technetium-99 groundwater activities are probably due to tank leaks in BY Tank Farm and BX-102 tank leak.



508-94

Pages N-9 and N-10

It is difficult to compare Figure N-7 (the observed) to Figure N-8 (the predicted) due to the differences in the scales of these figures for Tc-99 groundwater activity in 2005. The Tc-99 plume underneath the 241-C tank farm isn't shown on Figure N-8. Figure N-8 predicts a Tc-99 plume, which isn't shown on groundwater maps of the area in the 2005 annual groundwater monitoring report (PNNL-15670), northeast of the vitrification plant. A map of observed Tc-99 activity in groundwater follows for comparison to the EIS's Figure N-8.

in *Single-Shell Tank System Leak Detection and Monitoring Functions and Requirements Document* (Miller 2008), approved by Ecology.

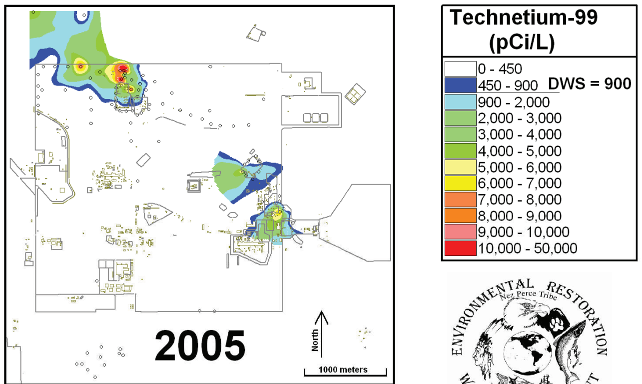
As noted by the commentor and as discussed in Appendix D, Section D.1.4, of this EIS, there is uncertainty regarding the volume of tank waste leaked in the past due to availability of supporting data. For the *TC & WM EIS* analysis, the approach adopted for specification of volumes of past leaks is to use the estimates presented in the *Waste Tank Summary Report for Month Ending December 31, 2002* (Hanlon 2003) and, where leak volume data are missing, to use an estimate of 30,000 liters (8,000 gallons). In addition to those estimates, this *TC & WM EIS* uses a 15,000-liter (4,000-gallon) leak loss volume for each SST for the purpose of modeling impacts of potential retrieval losses or a catastrophic tank failure. This approach was adopted in consultation with Ecology. In addition, tank farm past leaks and associated contamination in the vadose zone are being evaluated under the RCRA Facility Investigation/Corrective Measures Study process. As such, the vadose zone contamination associated with tank farm past leaks is considered an RCRA operable unit rather than a CERCLA operable unit and is assessed in this *TC & WM EIS*.

To provide additional insight, DOE performed a sensitivity analysis to evaluate the potential benefits if certain remediation activities are undertaken at some of the more prominent waste sites on the Central Plateau and along the river corridor. The goal of the sensitivity analysis is to help DOE, EPA, and Ecology prioritize cleanup efforts in the future. This analysis is provided in Appendix U of this EIS and is discussed further in Chapter 7, Section 7.5.

508-82 The reference was corrected in this final EIS. The correct reference is, *Environmental Impact Statement for Retrieval, Treatment, and Disposal of Tank Waste and Closure of Single-Shell Tanks at the Hanford Site, Richland, WA: Inventory and Source Term Data Package,* DOE/ORP-2003-02, Rev. 0, Office of River Protection, Richland, Washington, April 17 (DOE 2003b).

508-83 In response to this and similar comments, DOE conducted a detailed review of available inventory data for consistency between radionuclide and chemical inventories for uranium, and has revised several inventories accordingly for this *Final TC & WM EIS*. With respect to the detectable losses during retrieval, this *TC & WM EIS* used an estimate of 15,000 liters (4,000 gallons) per SST (not the 1,100 liters [300 gallons] referenced by the commentor). It should also be noted that Appendix E discusses a variety of technologies that may be employed during retrieval to monitor potential retrieval losses, and that this estimate does not rely solely on drywell monitoring, as is suggested by the commentor.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee



ENVIRONMENTAL RESTORATION Nez Perce Tribe WASTE MANAGEMENT

508-94 cont'd

Pages N-33 to N-35

508-95

"Clean closure" of cribs and trenches will have a positive effect as indicated for alternatives 6A optional and 6B optional but the effect is so small as to be waste of resources. Digging cribs, trenches, French drains or other liquid waste disposal sites where large amounts of water was flushed through the soil column for remediation is in general not a good use of resources. The clean closure alternatives propose digging associated cribs in what has been termed "plume diving". The *TC & WM EIS* correctly assumes that all mobile contaminates flushed to the cribs and trenches are already or will be in groundwater and are not retrievable. An evaluating of EIS figures N-46 and N-48 which show estimated chemical and radiological release to aquifer from the six associated cribs and trenches areas without and with exhumation shows slight benefit from digging up trenches and cribs. Specifically the graphs show the same release of hydrogen-3, technetium-99, iodine-129, neptunium-237 and uranium-238. The graphs also show slightly larger release for chromium and slightly smaller release for nitrate. Uranium released to aquifer show benefit for exhumation of the cribs and trenches. The following is a list of uranium releases from cribs and trenches according to EIS and total uranium released to cribs and trenches from *TC & WM EIS* and PNNL-15829:

Uranium cribs and trenches, kilograms			
EIS Total	PNNL-15829 Total (calculated from curies)	Released to Aquifer 10,000 yrs. with cap. EIS	Released to Aquifer 10,000 yrs with exhumation EIS
~4000	4660	~66	~3

508-84 Appendix E, Section E.1.2.2.5, discusses the physical condition of the SSTs and monitoring technologies that are currently available to support waste retrieval. Appendix M, Section M.3.1.1, discusses the data and analysis supporting past leak estimates for the SST system. The *Technical Guidance Document* (DOE 2005) documents the agreement between DOE and Ecology to use the Hanlon (2003) estimates of past leak volume as the basis for the impacts analysis of the alternatives. DOE notes that NEPA analysis is a comparison of the alternatives under consideration; that assumptions used in the analysis must be clearly identified and the uncertainties discussed; and that the assumptions underlying the analyses should not bias one or more alternatives relative to the others. It should be noted that the same modeling assumptions were used to derive environmental consequences for all alternatives.

508-85 Appendix L of this *Final TC & WM EIS* has been revised to add more views of model layers and cross sections that represent the hydrogeology encoded into the flow model.

508-86 Although, spatially, the cribs and tanks farms can exist within the same MODFLOW grid cell, which has a dimension of 200 meters by 200 meters, the contaminant inventories processed by STOMP and then by the particle tracking code are assigned as site-specific inventories. In this manner, the contaminant inventories from each of the individual sources remain separate and traceable to that source throughout the vadose zone and particle tracking analysis.

508-87 Appendix L, Figure L–22, has been revised in this *Final TC & WM EIS* to include geologic structure labeling for only those features associated with Gable Mountain, Gable Butte, and Rattlesnake Mountain because these features are discernable in this top-of-basalt contour map. Based on the top-of-basalt surface resolution calculated by the geostatistical interpolation tool and represented in Figure L–22, the top-of-basalt vertical offsets associated with the May Junction Fault (and some of the other faults that exist) are not clearly reflected in the contours.

508-88 The reference to Anderson 1990 was a transcription error that is corrected in this final EIS. The *Field Investigation Report for Waste Management Area B-BX-BY* (Knepp 2002) reports two estimates of volume for the 1951 BX-102 tank leak event. The first estimate of 265,000 liters (70,000 gallons) was based on vadose zone moisture logging, while the second estimate of 343,000 liters (90,600 gallons) was based on process data from a Hanford Works monthly report. The two estimates, which differ by approximately 25 percent, are within

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

508-95 cont'd

Uranium cribs and trenches, curies			
EIS Total	PNNL-15829 Total	Released to Aquifer 10,000 yrs. with cap. EIS	Released to Aquifer 10,000 yrs with exhumation EIS
6.21	6.64	~0.004	~0.004

As can be seem there is a reduction in total uranium released in 10,000 years of about 60 Kg for exhumation. Also noted the radiological uranium inventory does not take this change into account. A more correct representation would be:

Uranium cribs and trenches, curies			
EIS Total	PNNL-15289 Total	Released to Aquifer 10,000 yrs. with cap, EIS	Released to Aquifer 10,000 yrs with exhumation, EIS
6.21	6.64	~0.086	~0.004

Besides removal of uranium from the soil a portion of neptunium-237 and plutonium-239, 240 would probably be removed by digging up the cribs and trenches. From EIS Table 2-52 the estimated cost of digging up the cribs and trenches is $18.1 billion in 2008 dollars. So assuming total removal of 4000 Kg of uranium from the selected cribs and trenches this gives $4.5 million per kilogram of uranium removed. The consideration of crib and trench removal does not make economic or environmental sense. $18.1 billion would be far better served remediating an area that is of higher priority where a larger environmental impact can be made. Potential cribs to remediate would be 216-A-19, 216-U-8 and 216-B-12.

Uranium other cribs, kilograms	
Crib	Total Uranium (calculated from curies from PNNL-15829)
216-A-19	42,500
216-U-8	25,800
216-B-12	15,200

These three cribs represent 83,500 Kg of uranium. Only 216-A-19 has a small discharge volume and physical size making it easier and less costly to dig. So assuming a 90% uranium recovery from digging crib 216-A-19 this would give 38,000 kilograms of uranium for approximately $548 million (1/33 the cost of *TC & WM EIS)*. This would translate into a cost per kilogram of uranium recovered of $14,400. This would be a 310 fold improvement in the use of remediation dollars and 9.5 times more contaminates removed from the soil.

508-96

Page O-8

Since wastes from the vadose zone enter groundwater at the top of the aquifer, it doesn't appear that varying the depth of particle injection into the aquifer should be studied unless the model is unable to describe a fluctuating water table.

reasonable agreement given the uncertainties associated with both estimation methods.

This *TC & WM EIS* evaluates liquid releases from the tank farms as both past leaks and unplanned releases. Events evaluated as past leaks are associated with 67 out of a total of 149 SSTs tanks listed in the *Waste Tank Summary Report for Month Ending December 31, 2002* (Hanlon 2003) as known or suspected leakers. Events evaluated as unplanned releases include non-past leak events documented in WIDS. With respect to leakage events around tank 241-BX-102, the *TC & WM EIS* analysis adopted the recommendation of Knepp (2002) that contamination around tanks 241-BX-101 and 241-BX-102 can be explained by two major events, a 1951 overfill at tank 241-BX-102 and a 1968-to-1970 pump pit leak at tank 241-BX-101. Inventory estimates for these two events are reported in Knepp (2002) and used in the *TC & WM EIS* analysis. The source of the leak volume estimates is Hanlon (2003).

508-89 The distribution coefficient for uranium in contaminated soil, set at 0.6 millimeters per gram, was based on the *Technical Guidance Document* (DOE 2005) for this *TC & WM EIS*.

In general, the parameterization process for the groundwater models continues to be governed by two primary considerations: the requirement to provide an unbiased evaluation of the alternatives in the context of a consideration of cumulative impacts (the essential point of a NEPA analysis); and the requirement to provide a technically defensible analysis relying on documented sources. DOE's view is that a NEPA analysis is essentially comparative, and that the parameter selection process (particularly for heterogeneous and complex media) should be based on the principle of selecting the simplest parameterization that does not conflict with field observations and that allows for an unbiased comparison of the alternatives. More-complex parameterization (spatially varying K_d [distribution coefficient] values, for example) can actually weaken the value of that analysis.

508-90 In the absence of any more context, it is difficult to see how the commentor drew this conclusion. However, in response to this comment and others, further explanation and description have been provided in Appendix N of this *Final TC & WM EIS*. In particular, the discussion of uncertainty in that appendix has been revised.

508-91 In response to this comment and others, further explanation and description have been provided in Appendix N of this *Final TC & WM EIS.*

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Appendix O, Section O.3

With respect to uranium, current groundwater conditions (DOE/RL-2008-01) indicate concentrations of uranium in the B-BX-BY area (B Barrier) that far exceed the maximum predicted results reported in Tables O-6 and O-7. For the no action alternative, the EIS should explain why current concentrations of uranium in the B-BX-BY area are at levels that the modeling predicts won't be reached until after calendar year 11,000.

It appears uranium from the BX-102 tank leak is far more mobile in the subsurface than has been modeled by DOE. DOE's previous modeling exercises (RPP-10098 and DOE/ORP-2005-01) also predicted that uranium in groundwater from BX farm wouldn't exceed drinking water standards for thousands of year. Apparently, it is inappropriate to use a Kd = 0.6 for uranium as suggested in the *Technical Guidance Document for "Tank Closure Environmental Impact Statement" Vadose Zone and Groundwater Revised Analyses*, Final Rev. 0, Department of Energy Office of River Protection, Richland, Washington.

Groundwater activities/concentrations for Tc-99 and nitrate in groundwater near T tank and SX tank farms currently exceed the values listed in Tables O-6, O-7 and O-8. The EIS should explain why the modeling is unable to explain the current activities/concentrations for technetium-99 and nitrate near these tank farms.

ERWM believes that one of the reasons that uranium, Tc-99, and nitrate activities/concentrations are currently at higher levels than expected is that water used during Hanford Operations was not incorporated into the models. For example, high moisture content was observed during the installation of the SX-113 caisson in 1959 (HW-60749, p. 6). The relatively non-native soil moisture was attributed to raw water sprinkled for control of contamination in the previous year. *Technical Guidance Document for "Tank Closure Environmental Impact Statement" Vadose Zone and Groundwater Revised Analyses* doesn't address the use of water for dust suppression, radiation control, and water line breaks and leaks. ***508-97***

Page O-80, Figure O-17
Please refer to the comment for Pages N-9 and N-10. ***508-98***

Section O.6.4, Long Term Analysis of Uranium-238
Since the BX-102 tank leak is the largest single release of uranium in the tank farms, ERWM believe that EIS should have applied the analysis to BX tank farm instead of SX tank farm. The BX-102 tank leak is probably the best characterized of all the tank leaks. This leak has contaminated groundwater (letter from Ms. Stacy Charboneau, Assistant Manager for Tank Farms Project, DOE/ORP to Mr. Gabrial Bohnee, Nez Perce Tribe ERWM, dated March 30, 2009). BX tank farm is located closer to the Columbia River than SX tank farm. Further study of the impacts of the spill of uranium at BX-102 is necessary to address the risks posed to the environment by this event. A model of the BX-102 leak(s) could be validated with actual field results and supported by laboratory studies of soil samples acquired at boreholes 299-E33-45, 299-E33-343, and 299-E33-344. The BX-102 tank leak offers a unique opportunity to actually ***508-99***

508-92 For purposes of developing the groundwater flow model for this *TC & WM EIS*, detailed hydrogeologic data were compiled in part from a review of approximately 5,000 Hanford boring logs. This review, described in Appendix L, Section L.4.3, was conducted to discern textural differences between layers of mud, silt, sand, and gravel and associated differences in hydraulic characteristics for development of the geologic layers for the groundwater model flow field. In this scheme, the Plio-Pleistocene Unit was retained as a separate unit, and individual layers within it and the Hanford and Ringold Formations and Cold Creek Unit were further assigned to 1 of 13 material types. The names assigned to these material types are subsequently used throughout the discussion of the vadose zone analysis presented in Appendices M and N and the groundwater transport analysis in Appendix O of this EIS.

508-93 In response to this comment, DOE has rescaled Figure N–13 to make it more consistent with Figure N–14 in this final EIS. There are two key points in comparing these two figures (i.e., the measured results and the reproduced model results): (1) both show peak concentrations of the BY Cribs nearing 10,000 picocuries per liter; and (2) both show the location of the plume along the eastern side of Gable Gap. This comparison is based on a qualitative agreement; a point-by-point or line-by-line agreement would be unrealistic. In response to this comment and others, further explanation and description have been provided in Appendix N of this *Final TC & WM EIS*.

508-94 See response to comment 508-93.

508-95 The clean closure alternatives considered for the SST system are represented by the Base and Option Cases of Tank Closure Alternatives 6A and 6B. For both Base Cases, the assumption is that the SST system would be cleaned to levels that would allow for unrestricted use, which would involve removal of the tanks, ancillary equipment, and soils beneath the tanks (contaminated as a result of past leaks) down to the water table. The two Option Cases represent this type of clean closure along with removal of soils beneath the tank farms (contaminated as a result of infiltration from the contiguous cribs and trenches [ditches]). As pointed out by the commentor, the analysis shows that removal of the contaminants from the vadose zone would not capture the contaminants from past practices—i.e., past leaks and infiltration from the contiguous cribs and trenches (ditches)—that have already reached the water table.

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

validate a risk model with field results, while the SX study in the EIS is just another uncertain projection into the future.

Furthermore, uranium is modeled for 10,000 years in the EIS but actual peak groundwater concentration at Columbia River edge is estimated to occur at 22,000 years. This modeling was done with releases from SX tank farm only and indicated a 3 fold increase in uranium groundwater concentration. The uranium long term modeling does not take into consideration the entire site EIS and non-EIS uranium inventory. Just because the modeling indicates peak groundwater concentration is in 22,000 years there is no firm evidence that peak concentration would not occur before 10,000 years. Sensitivity analysis for uranium transport was not done as it was for technetium-99 and iodine-129 in Appendix N. A change in water recharge rate or a decrease in Kd used in the programs could easily produce results that would show increased and sooner uranium mobilization. Such observations are consistent with actual field results of uranium plumes. ***508-99 cont'd***

Page O-112, Section O.7, Summary
The text claims that "…the model could produce results that compared reasonably Well to measured concentrations in groundwater from sources significant to the *TC & WM EIS* alternatives and cumulative impacts analysis." ERWM believe that our comments on Appendix O indicate that the modeling has failed to adequately describe the movement of uranium in the subsurface and that the modeling of Tc-99 and nitrate is problematic. As stated previously, the prescribed parameters for moisture flux and the Kd for uranium from *Technical Guidance Document for "Tank Closure Environmental Impact Statement" Vadose Zone and Groundwater Revised Analyses* should be revised. ***508-100***

Page R-5

The Tribes also retained the right to erect temporary structures and contend the Federal Lands are open and unclaimed. ***508-101***

Page S-9 Independent Review and Verification (Quality Assurance) Process
This discussion should be expanded to discuss who performed the review. ***508-102***

Page S-10 Emerging Data
Since the SIM is a computer model, it is misleading to label model results as data. This section should be labeled "Emerging Estimates." ***508-103***

Pages S-68 to S-163 non-EIS Radiological and Chemical Inventory

A major concern is the inadequate representation of the radiological and chemical inventory of non-EIS sites in Appendix S. The most obvious of these is the lack of listing 96% of the total uranium on site. Appendix S list total uranium as "Total Uranium (soluble salt)" this does not take into the consideration the dissolution over 10,000 to 30,000 years that could occur from "insoluble" uranium sources. Below is a table of some of the major non-EIS sources of uranium from PNNL-15829 and *TC & WM EIS* and total for all non-EIS sites listed in Appendix S. The PNNL-15829 data is taken from the report's 2070 estimates which include retrieval of TRU waste. Among these large chemical sources of uranium not listed in the *TC & WM EIS* are sources from US Ecology and the solid waste burial grounds. ***508-104***

the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

508-96 The commentor assumes that the only reason for studying particle injection depth would be due to the model's inability to describe a fluctuating water table. This assumption is false. The *TC & WM EIS* groundwater transport model includes a three-dimensional representation of the water table that changes with time based on changing boundary conditions. For example, during the operational period, significant amounts of liquid were discharged onto the ground surface at Hanford waste sites. This liquid migrated through the vadose zone and created local fluctuations, or mounding, in the water table. The *TC & WM EIS* flow model and particle tracking transport model represent these fluctuations. Likewise, because these significant liquid discharges have ceased in the recent past, the water table, which was rising during times of high discharge, is now relaxing and the local water mounds are dissipating. The *TC & WM EIS* models represent these fluctuations as well. Studying the effects of varying particle injection depths is important because *TC & WM EIS* concentrations are calculated based on the mass of contaminant present and the volume of liquid present at any given time and location of analysis. Near-field calculations of contaminant concentrations are particularly sensitive to the particle injection depth because this calculation is made near the source of the contaminant release (i.e., near the location where the particles are injected). If particle injection depth is not studied and selected based on a clear rationale, it is possible that contaminant concentration calculation results, particularly near the source of the release, could be significantly overstated (e.g., if particle injection depth is too low) or significantly understated (e.g., if particle injection depth is too high).

508-97 In response to this and similar comments, the discussion in Appendix O, Section O.6, of this *Final TC & WM EIS* has been expanded to include a more detailed analysis of the comparison of modeled versus measured conditions at the five tank farm barriers.

508-98 DOE assumes the comment is suggesting that the model result shown in Appendix O, Figure O–39, should be compared with a figure similar to Figure N–8, in Appendix N of the draft EIS, which includes concentration contours based on field observations. The discussion in Appendix O, Section O.6.1 (which includes Figure O–39), is intended to describe a comparison between the Base Case and Alternate Case flow models, and draws the conclusion that the results from both flow models are similar during the operational period.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Site	PNNL-15829				EIS Curies U	Calculated Kg U PNNL	Kg U EIS
	U 233	U 235	U 234/238	Total U Ci			
US Ecology	0	30.58	1789.10	1819.68	1820.00	4242898	0
218-W-5	0.32	18.41	657.34	676.07	654.00	1001214	0.055
218-W-4A	0	6.97	329.19	336.16	132.00	500359	0
218-W-3AE	0.20	4.01	246.92	251.13	185.00	374747	0
218-W-4C	3.02E-06	0.79	77.50	78.29	72.80	117402	83.5
ERDF	0	0	0	0	54.00	0	0
218-W-3	0	0.98	46.12	47.09	23.50	70093	0
218-W-3A	0	0.82	38.95	39.77	0.00	59197	0
618-11	0	0.74	34.94	35.68	0.00	53110	0
221-U	0	0.63	29.55	30.18	0.00	44917	0
216-A-19	2.19E-05	0.63	28.70	29.33	29.30	42493	43400
316-1	68.57	0.40	19.26	88.23	84.50	29278	26200
216-U-8	1.17E-05	0.37	16.95	17.32	17.20	25765	25500
316-2	49.74	0.30	14.29	64.33	61.60	21727	19400
216-B-12	6.52E-06	0.22	10.03	10.24	10.20	15241	15100
216-A-25	5.69E-04	0.21	9.01	9.22	9.23	13705	12200
618-9	0	0.12	5.90	6.02	0.00	8968	0
Site Total	142.63	67.19	3400.62	3610.43	3220.00	6.69E+06	2.73E+05

As noted in the table above the *TC & WM EIS* lists the largest site of uranium at Hanford as having 1,820 Curie uranium inventory but zero "Total Uranium". These are actually mutual exclusive since to have a radiological exposure from uranium mobilized by waster or air at the Hanford site there must also be a possibility of topical or internal chemical exposure. The non-EIS inventory for sites 218-W-3, 618-11, 221-U etc. are not listed for radiological or chemical uranium. It is likely there are other omissions. The cumulative radiological inventory in Appendix S is approximately 89% of the current estimated inventory and the total chemical uranium is only 4% of estimated chemical inventory for the sites listed in the *TC & WM EIS.* The omission potentially multiples the uranium chemical risk by a factor of 24.5. Considering there has been minimal characterization of the majority of the solid waste burials grounds and the waste uranium leaching characteristics are unknown, it is inadvisable to consider the vast majority of the uranium chemical source term as nonexistent. ERWM consider the uranium buried in unlined trenches as being equivalent to high level waste that should be processed through the Waste Treatment Plant and shipped to an offsite repository. The lack of inclusion of chemical uranium source term seriously compromises the *TC & WM EIS* analysis of cumulative risk.

508-104 cont'd

This comparison is completed using the Base and Alternate Case model results shown in Figures O–35 through O–42. This section in Appendix O is not intended to compare modeled results to field observations. See Appendix O, Section O.2.6, for this comparison. The discussion in Appendix N (Figures N–7 and N–8 in the draft EIS) referred to in this comment describes the methodology used to evaluate and select vadose zone hydraulic properties to be used in STOMP for vadose zone modeling.

508-99 This *Final TC & WM EIS* has been revised to present the result of the long-term analysis of uranium-238 for the BX tank farm in addition to the SX tank farm.

508-100 DOE disagrees with the commentor's assertion that the difficulties in matching uranium predictions with field observations are related to issues involving moisture flux and distribution coefficients. DOE's view is that, for the regional-scale modeling conducted for this EIS, the major uncertainties in the analysis are in the source term. As stated in Appendix U, the issues with the uranium plumes (comparison of field measurements to model predictions) are isolated to three sites in the cumulative impacts analysis, and the inventories and release histories for these sites are characterized in the reference document SIM as moderately uncertain. The overall agreement with the tritium, iodine, and technetium plumes, which sample a much larger portion of the aquifer, and the overall agreement of predicted head versus water table elevation across the site suggest that the models are suitable for a long-term regional-scale comparison of the alternatives, and that the predicted flow field and transport properties do not bias one alternative relative to others.

508-101 Please see response to comment 508-53 regarding tribal rights at Hanford.

508-102 This section of the *TC & WM EIS* Summary is intended to highlight, in a brief bulleted format, a timeline of the management of Hanford's waste inventories. The Summary states that a team of experts in quality assurance, groundwater analysis, transportation, and human health and safety impacts was convened by DOE to conduct the quality assurance review. Detailed information about the review can be found in the team's *Report of the Review of the "Hanford Solid Waste Environmental Impact Statement (EIS)" Data Quality, Control and Management Issues* (DOE 2006b). This report is referenced in this EIS and is available in DOE reading rooms.

508-103 DOE believes that the phrase "Emerging Data" is appropriate and accurate when referring to the data/information for the SIM computer modeling results.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

The non-EIS chemical inventory totally ignores the US Ecology chemical inventory. DOH Publication 320-31 indicates there is 17,000 cubic feet on non-radioactive hazardous waste placed in the site from 1965 to 1985. This includes 9 drums of beryllium/copper metal shaving, 56 drums of unknown waste, several thousand drums of phenolic waste and some toluene, benzene and xylene wastes. It is likely there are many other waste sources not included in the *TC & WM EIS*, which leaves us to question the data and quality review procedures used in the *TC & WM EIS*. ***508-105***

There is major disconnect in the method of treatment of past, present and future solid waste burial at Hanford and the environmental goals of the *TC & WM EIS*. Early practice of solid waste (late 1940s) burial had almost no restrictions in what could be put in the ground, later there Were some rules such as retrieval of Post 1970 TRU and regulations for low level waste, mixed low level wastes, greater than class C waste and remote handle waste. The majority of the waste in solid waste burial grounds was placed there in the earlier years with minimal records and little regulations. Estimates for the waste are typically understated by starting the burial ground inventory time in the late 1980s instead of when waste was first placed in the ground (Solid Waste EIS waste inventory start time was September 26, 1988). Inventory is incomplete because of lack of records or characterization. Lack of characterization data is not evidence lack of contamination.

The *TC & WM EIS* categorizes solid waste burial as a non-EIS issue but there is a large amount of solid waste generated by the Waste Treatment Plant and tank closure. This waste is not solid waste such as ILAW glass or HLW glass but waste that is to be placed in boxes or drums and buried in the ground as part of tank waste retrieval. The tabulation of generated waste from the SWIFT (Solid Waste Integrated Forecast Technical Report 2008) site shows that *TC & WM EIS* generates 73% of the volume of solid waste from 2009 to 2035. Approximately 75% of the volume is low level waste and will remain onsite. ***508-106***

508-104 DOE conducted a detailed review of available inventory data and believes the inventory estimates analyzed in this EIS represent the best-available data at the time of its publication. None of the reviewed documents included a total uranium inventory estimate for these burial grounds. However, due to a number of comments, DOE again reviewed the data and revised the burial ground inventories to include a calculated total uranium inventory for those that had not been reported in the referenced documents, as appropriate. This inventory was included in this *Final TC & WM EIS* and analyzed appropriately. As an example of the increase in total uranium inventory resulting from this analysis, the total uranium inventory for LLBG 218-W-3A increased from 0 kilograms in the draft EIS to 3.70×10^5 kilograms in this final EIS.

508-105 Appendix S of this *TC & WM EIS* explains the process used to develop the inventory data set for the cumulative impacts analysis. All disposal sites for which an inventory was identified and considered a potential contributor to cumulative impacts on groundwater are included in the inventory listing provided in Appendix S and, therefore, were modeled. The inventories listed in Appendix S represent the radionuclide inventories (measured in curies) and chemical inventories (measured in kilograms) that were identified for those sites and for those constituents that were screened (described in Section S.3.6 as COPCs, i.e., those constituents that control groundwater impacts). The source cited in this final EIS for the information listed in the Appendix S tables is SAIC 2011, which is a more extensive database of the inventory information used by DOE to accomplish the screening and identify the COPCs. For US Ecology, the *Final Environmental Impact Statement, Commercial Low-Level Radioactive Waste Disposal Site, Richland, Washington* (Ecology and WSDOH 2004) was the primary source for the inventories presented in Appendix S. Other constituents not included in Appendix S, i.e., those determined not to be COPCs, particularly other volatile organic chemicals, were screened out. Additionally, as explained in Appendix S, the inventories for the cumulative impacts sites were identified using the most recent information available. DOE conducted a detailed review of available inventory data and believes the inventory estimates analyzed in this EIS represent the best-available data at the time of its publication.

508-106 As discussed in Appendix S, "Waste Inventories for Cumulative Impact Analyses," DOE conducted a detailed review of available inventory data and believes the inventory estimates analyzed in this EIS represent the best-available data at the time of its publication. Section S.3.5, Analysis of Sites with Missing Inventory, describes from a macro perspective the availability and uncertainties

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

508-106 cont'd

FY2008.0 Forecast Ranked by Waste Generator Volume (m3)

Functional Group	Generator	Total	% of Total	LLW I	LLW III	LLW GTCIII	CH MLLW	RH MLLW	CH TRUM	RH TRUM	End of Life Cycle
Forecast Total		**40,677**	1	12,659	633	6	12,114	946	7,572	6,747	2046
Bechtel-Washington Group	Waste Treatment Plant - Operations	**16,169**	39.7%	7,375			7,636	759		399	2035
CH2M Hill Hanford Group, Inc.	Tank Closure	**13,604**	33.4%	2,637	180		3,419	180	2,210	4,979	2033
Fluor Hanford	Plutonium Finishing Plant, 234-5 Z	**4,739**	11.7%						4,739		2016
Washington Closure Hanford	618-10/11 Burial Grounds	**1,202**	3.0%						249	953	2017
Pacific Northwest National	Pacific Northwest National Laboratory	**961**	2.4%	467	214		191		52	38	2028
Fluor Hanford	T Plant Operations, 221-T/2706-T	**822**	2.0%	661			43		118		2035
Fluor Hanford	Waste Encapsulation & Storage Facility	**682**	1.7%	635	26	6	8	6			2026
Fluor Hanford	RH and Oversized MLLW/TRU(M) Facilities (M-91)	**636**	1.6%	174			423		13	27	2029
Fluor Hanford	Waste Sampling & Characterization Facility, 6266	**422**	1.0%	110			313				2035
Fluor Hanford	Balance of Sludge	**347**	<1							347	2015
Fluor Hanford	Waste Receiving and Processing Facility, 2336-W	**340**	<1	192	52		6		90		2032
Offsite	Knolls Atomic Power-Shipyards	**208**	<1	171	38						2029
Fluor Hanford	Fast Flux Test Facility	**128**	<1	31	97						2010
Fluor Hanford	Canister Storage Building	**111**	<1	111							2035
Fluor Hanford	Ground Water Monitoring	**80**	<1	20			33		27		2035
Fluor Hanford	231-Z Materials Engineering Laboratory	**61**	<1	4					57		2008
Fluor Hanford	K-Basins and Cold Vacuum Drying Facility	**48**	<1		26				18	4	2008
Fluor Hanford	Liquid Waste Processing Facilities, 200 Area	**36**	<1				36				2034
Fluor Hanford	Low Level Burial Grounds, 218 E/W	**28**	<1	28							2035
Fluor Hanford	Hanford Site Operations (Infrastructure)	**20**	<1	18			2				2035
Fluor Hanford	B Plant	**11**	<1	11							2008
Fluor Hanford	REDOX	**5**	<1	4			1				2008
Fluor Hanford	209-E Critical Mass Laboratory	**4**	<1	4							2008
Fluor Hanford	PUREX	**4**	<1	4							2008
Fluor Hanford	224-T Transuranic Storage and Assay Facility	**4**	<1	4							2008
Fluor Hanford	Central Waste Complex	**2**	<1				2				2034
Fluor Hanford	U Plant	**2**	<1	1			1				2008
Washington Closure Hanford	River Corridor Closure Contract		<1								2008
Offsite	Bettis Atomic Power-Shipyards		<1								2018
Offsite	Stanford Linear Accelerator Center		<1								2035
Offsite	Princeton Plasma Physics Lab		<1								2035
Offsite	Lawrence Berkeley Laboratory		<1								2011
Offsite	Brookhaven National Laboratory		<1								2035
Offsite	Argonne National Laboratory-East		<1								2035
Offsite	Ames Laboratory-Ames, Iowa		<1								2033
Offsite	Idaho National Laboratory		<1								2035

508-107

Review of the onsite waste content indicates contact handle and remote handle mix low level waste have a high technetium-99 and iodine-129 content. Consideration should be given for better immobilization of these waste fractions (such as soil or waste washing) with eventual disposal in ILAW glass, HLAW glass or a yet to be developed iodine-129 suitable waste form.

508-108

Based on *TC & WM EIS* Chapter 6 Cumulative Impact Alternative Combination 2 or 3 the vast majority of human health impact is from non-*TC & WM EIS* sources. A large discrepancy for uranium source term has already been noted. Overview of groundwater core zone boundary and Columbia River near shore maximum contaminate level indicate excessive technetium-99, iodine-129, uranium isotopes, uranium metal, plutonium, chromium, lead, mercury nickel and nitrate. Total risk is at 1.0 for Core Zone boundary and Columbia River nearshore.

The highest value non-*TC & WM EIS* components available for remediation are solid waste burial grounds and US Ecology. These burial grounds have not been subjected to intentional liquid discharges such as cribs or trenches and most of the more mobile contaminants are expected to remain in the upper vadose zone. The proposed plan for the vast majority of the solid waste burial grounds in the 200 area is to cap to prevent water infiltration. These caps will fail in 500-1,000 years, and the problem remains. Digging up areas of the solid waste burial grounds with high iodine-129, technetium-99 and uranium would reduce site risk. US Ecology will likely need to be mined for uranium. It is a relatively small area with very high inventory. Another

of the cumulative impacts analysis data, including the data for the burial grounds. DOE agrees there is minimal characterization of the burial grounds waste, but has provided this insight to give the reader a sense of the uncertainties in the cumulative impacts analysis inventory estimates.

This EIS does not categorize the disposal of solid waste as a "non-EIS issue." For example, this EIS analyzes solid waste at IDF-East and/or IDF-West, including ILAW, solid waste generated from supplemental treatment technologies (e.g., bulk vitrification glass and sulfate removal waste product), as well as secondary solid waste from these treatment technologies. The Summary, Section S.5.5, and Chapter 2, Section 2.10, Key Environmental Findings, provide some insight into the issues regarding the secondary waste and state that the EIS analysis suggests additional treatment or waste form development may be needed for secondary waste. DOE is currently evaluating potential secondary-waste form R&D efforts, including ceramic and other waste forms. It is anticipated that these R&D efforts will continue to address treatment of the liquid secondary waste, as this stream would not be generated until the WTP is operational. Measures could also be pursued regarding the increased capture of iodine-129, technetium-99, or other target constituents in ILAW glass. Additionally, DOE analyzed several potential mitigation measures such as recycling secondary-waste streams into the primary-waste-stream feeds within the WTP to increase iodine-129 capture in ILAW and bulk vitrification. These potential measures are discussed in Chapter 7, Section 7.5, of this EIS.

508-107 As discussed in Chapter 7, Section 7.1.6, onsite waste-form performance is a particular area of focus for DOE, especially with regard to partitioning and capture of iodine-129, a conservative tracer, in waste forms. Additional sensitivity analyses have been added to this final EIS that evaluate the changes in potential impacts that might result if partitioning or recycling of some contaminants, e.g., iodine-129, could be increased into primary-waste forms and/or if secondary-waste-form performance could be improved. The discussion found in Chapter 7, Section 7.5, was added to summarize these results. The results of these analyses will aid DOE in formulating appropriate performance targets for secondary-waste forms. As discussed in Chapter 7, Section 7.5.2.8, and Appendix E, Section E.1.2.4.5.6, DOE has drafted a roadmap that implements a strategy for development of better-performing waste forms.

508-108 In general, the scope of this *TC & WM EIS* does not include remediation of groundwater, the LLBGs, or US Ecology as part of the proposed actions evaluated. DOE is implementing an extensive, ongoing cleanup program at

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

notable burial ground is the submarine reactor burial grounds 218-E-12B which has 1.06 million kilograms of lead shielding.

The use of soil washing would be very beneficial in such remediation and likely could be justified in context of whole site remediation.

Digging up the solid waste burial grounds does pose a greater worker health hazard but the environmental/cost rewards ratio is better. A list of the hottest solid waste burial grounds or solid waste containing sites is:

Solid Waste Sites/Storage Sites, curies or metric tons which are not scheduled for RTD							
Iodine-129		Technetium-99		Uranium-curies		Total Uranium-metric tons	
US Ecology	5.6	218-W-5	141	US Ecology	1820	US Ecology	4243
218-W-4B	0.50	US Ecology	50	218-W-5	676	218-W-5	1001
218-W-5	0.038	218-W-3AE	37	218-W-4A	336	218-W-4A	500
218-W-4C	0.035	218-W-4C	17	218-W-3AE	251	218-W-3AE	375
218-W-3AE	0.035	221-B	14	218-W-4C	78	218-W-4C	117
221-B	0.028	218-W-3A	4.6	ERDF	54	218-W-3	70
218-W-3A	0.024	218-E-12B	4.0	218-W-3	47	218-W-3A	59
218-E-12B	0.012	218-W-4B	2.00	218-W-3A	40	ERDF	40
218-E-15	0.003	218-E-15	1.60	218-W-4B	2.6	218-W-4B	4
218-W-2A	0.002	218-W-2A	0.80	218-W-2A	1.8	218-W-2A	3
218-E-14	0.001	218-E-14	0.30	218-W-2	0.9	218-W-2	1
218-W-1A	0.0003	218-W-1A	0.15	218-E-12A	0.7	218-E-12A	1

508-108 cont'd

Appendix U

The explanation of why the uranium-238 and total uranium simulation results show higher impacts than actually observed found on page U-10 should be expanded. It appears that it is unlikely that the release of approximately 2,800 kg at the 216-B-3 pond could result in the extensive uranium groundwater plumes in 200 East. As shown in Table 6-25 from RPP-26744, much larger releases of uranium occurred in 200 East (e.g. 216-A-19, 216-B-12, and 241-BX-102).

508-109

Hanford as required under RCRA, CERCLA, and/or the TPA, a legal agreement between DOE, Ecology, and EPA. The TPA identifies cleanup actions and schedules, called milestones, and is governed by the requirements of CERCLA. CERCLA and the implementing EPA regulations require that the substantive requirements of all applicable or relevant and appropriate Federal and state laws and regulations be met for each cleanup action taking place at Hanford. CERCLA also requires consideration of detailed decision criteria for each cleanup alternative as part of determining cleanup levels for each operable unit or waste management area. NEPA's purpose is different; its focus is to ensure agencies take a "hard look" at the potential environmental impacts associated with a proposed action and the reasonable alternatives to that proposed action. Agencies must conduct a comparative analysis of the alternatives and present the results; consider the cumulative impacts of the alternatives when added to other ongoing actions; and identify potential mitigations that could be used to offset the impacts identified by the NEPA analysis. The goal is to consider the best-available information at the time of the agency's decisionmaking process. However, NEPA does not require that an agency ultimately choose the most environmentally preferred alternative based on a "ranking" process.

As shown in Chapter 6, Table 6–19, for Alternative Combination 2, many of the Core Zone Boundary and Columbia River nearshore maximum concentrations for the COPCs occurred in the past. In recognition of concerns about the potential effects of future remedial actions, DOE added sensitivity analyses to Appendix U of this *Final TC & WM EIS* to provide information concerning the effects of reasonably foreseeable remedial actions on contaminant concentrations in groundwater. The results of these sensitivity analyses are discussed in Chapter 7, Section 7.5. A potential mitigation measure that could be taken by DOE is elimination of specific offsite waste streams containing significant inventories of iodine-129 or technetium-99. This mitigation measure is discussed in Section 7.5.2.2. The results of this sensitivity analysis illustrate the difference this mitigation measure would make in relation to potential groundwater impacts and are included in Appendix U.

508-109 It should be noted that many of the contaminant plumes modeled in the *Draft TC & WM EIS* have generally good agreement with field observations. However, reviews of the EIS groundwater modeling results found some disagreement between certain modeling results and field observations for the historical period (1940 through 2006). Several of the modeled contaminant plumes have been found to overestimate the size of observed plumes. As a result, the

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Table 6-25. Distribution of U-Total Inventory by Specific Site

Operable Unit	Site	U-Total Mean Inventory (kg)	Percent of Total Inventory Lost
200-E PONDS ZONE	216-A-19	4.34E+04	21.08%
UNASSIGNED 300 AREA	316-1	2.62E+04	12.70%
U PLANT ZONE	216-U-8	2.55E+04	12.38%
UNASSIGNED 300 AREA	316-2	1.94E+04	9.41%
B PLANT ZONE	216-B-12	1.51E+04	7.33%
200-E PONDS ZONE	216-A-25	1.22E+04	5.92%
B FARM ZONE	241-BX-102	1.01E+04	4.88%
U PLANT ZONE	216-U-12	6.46E+03	3.13%
PUREX ZONE	216-A-4	5.39E+03	2.61%
U PLANT ZONE	216-U-1%2	3.96E+03	1.92%
Top 10 Total Inv. (kg)		1.68E+05	81.36%

The explanation should consider the possibility of the following:

1. The TC&WM modeling of uranium is unrealistic and unreliable.
2. The uranium plume southeast of 200 East may have gone undetected by the current groundwater monitoring network because it is deeper than the screened interval of the monitoring wells. The groundwater model assumed a screened interval of 40 m.
3. The uranium plume in 200 East underneath the BY Cribs has been attributed to the 241-BX-102 tank leak (letter from Ms. Stacy Charboneau, Assistant Manager for Tank Farms Project, DOE/ORP to Mr. Gabrial Bohnee, Nez Perce Tribe ERWM, dated March 30, 2009).
4. Uranium should be modeled with more mobility in the subsurface. The release of uranium at the 216-B-12 should be considered.

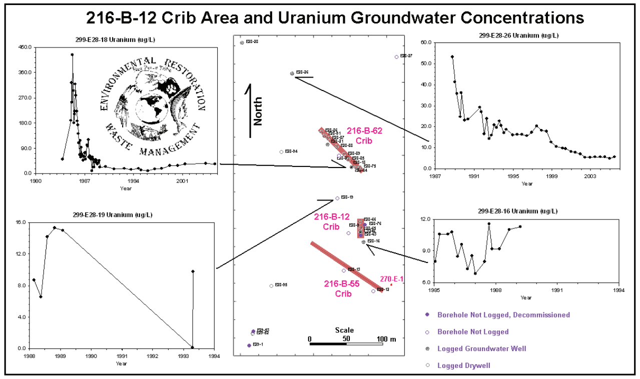
The occurrence of a uranium groundwater plume (Figure 1) near the 216-B-62 crib is problematic. Its origin is the 216-B-12 crib, which is located approximately 150 m (500 ft) to the south (Figure 1). According to the Hanford Soil Inventory Model (RPP-26744), discharges of uranium at the 216-B-12 crib are estimated at 15,100 kg, which ranks as the fifth largest release of uranium at Hanford. The discharges to the crib occurred between 1952 and 1957 as Well as 1967 to 1973. The 216-B-62 crib is estimated to have received 1.04 kg of uranium (RPP-26744) and releases occurred in the November 1973 through September 1991 time period. Uranium (treated essentially as being immobile by DOE) from the 216-B-12 crib has travelled more than 300 ft vertically to reach groundwater and 500 ft horizontally.

508-109 cont'd

TC & WM EIS modeling team determined that certain model parameters should be reevaluated between the draft and final EISs. DOE has compared model behavior at both general and specific levels. Both comparisons serve important purposes: The general comparisons, as well as many of the specific ones, provide confidence that model behavior is largely as it should be and that the analysis and results provide an unbiased comparison of impacts of the alternatives within the context of the cumulative impact analyses.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Figure 1. Index map of the 216-B-12 area and uranium groundwater concentrations.



Based on the publically released version of HEIS (Data Viewer and Evaluator), a uranium groundwater plume was present in the area at the end of 1980 (Figures 1 and 2). The gross alpha activities in groundwater are assumed to be primarily due to the present of uranium in groundwater (Figure 2). Groundwater monitoring data prior to 1980 may not exist as only data after 1980 are available to the public. Thus, the status of prior uranium groundwater concentrations in the area is not known. Maximum observed uranium concentrations occurred in 1985 at Well 299-E28-18 near the 216-B-62 crib (Figure 1) while maximum observed alpha activities Were observed in 1982 (Figure 2). Due to the lack of groundwater monitoring data, it is not possible to ascertain the initial breakthrough of uranium to groundwater in this area or the actual maximum uranium concentrations. The plume appears to have travelled to the north where uranium concentrations Were detected above the drinking water standard (30 ug/L for uranium and 15 pCi/L for alpha activity) by at least 1988 at Well 299-E28-26 (Figures 1 and 2). North of the 216-B-62 crib, groundwater monitoring data are only available from the late 1980's onward, and uranium concentrations have been increasing at Well 299-E28-27 while decreasing at Well 299-E28-28. Uranium groundwater concentrations have been below drinking water standards at both locations. The plume appears to have either dispersed or the higher concentrations of the plume have gone undetected below the screened interval of the nearby groundwater monitoring Wells. A residual uranium groundwater plume is still being detected in the area.

508-109 cont'd

Response side of this page intentionally left blank.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Figure 2. Map of the 216-B-12 area and gross alpha activities in groundwater.

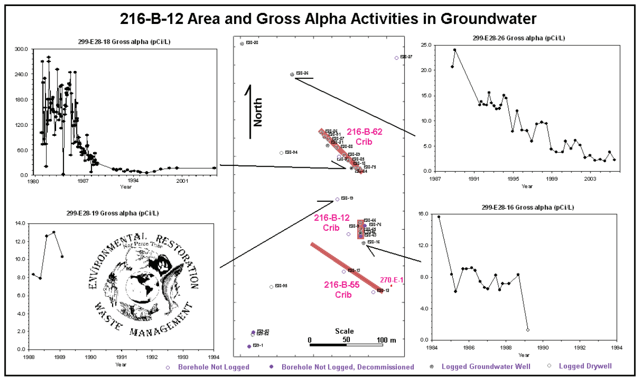
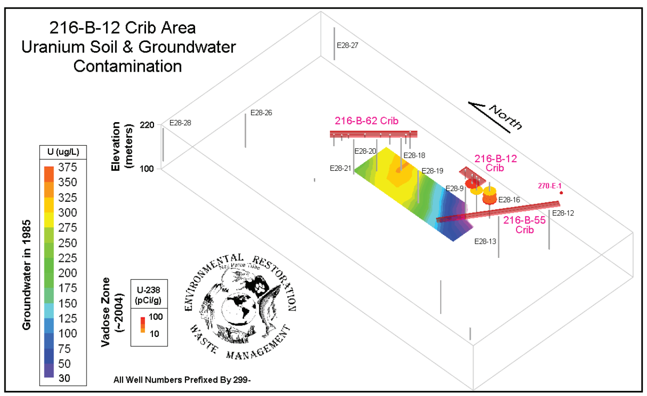


Figure 4. Visualization of the B-12 crib area showing current uranium vadose zone contamination and uranium groundwater contamination in 1985.



508-109 cont'd

Response side of this page intentionally left blank.

Commentor No. 508 (cont'd): Samuel N. Penney, Chairman, Nez Perce Tribal Executive Committee

Pages U-10

The *TC & WM EIS* states, "Therefore, the prediction of the uranium-238 and total uranium contaminant plumes for the non-*TC & WM EIS* sources should be considered an overestimate of the actual impacts by about an order of magnitude." This statement is likely not valid considering the *TC & WM EIS* missed 96% of the chemical uranium inventory. Samplings at some missed sites like US Ecology are showing initial signs of uranium mobilization in the vadose zone and plutonium in the groundwater. It is likely the *TC & WM EIS* understates the future uranium groundwater contamination of the Hanford site. ***508-110***

508-110 Regarding the commentor's concern as to the accuracy of data, DOE reexamined the inventories used in this *Final TC & WM EIS* and determined that the best-available data were used in the analysis, with the understanding that uncertainty still remains. For a more comprehensive discussion of this topic, see Section 2.2 of this CRD.

Commentor No. 509: Richard B. Parkin, Acting Director, U.S. Environmental Protection Agency, Region 10

From: Mbabaliye.Theogene@epamail.epa.gov [mailto:Mbabaliye.Theogene@epamail.epa.gov]
Sent: Monday, May 03, 2010 5:30 PM
To: Olinger, Shirley J
Subject: FW: EPA Comments on the Draft Tank Closure and Waste Management EIS for the Hanford Site, Richland, WA
Attachments: Project number 06-004-DOE 5-3-10.pdf

Dear Ms. Olinger:

Attached, please find EPA Comments on the DEIS for your proposed Tank Closure and Waste Management (TC&WM) Project (CEQ#20090362) at the Hanford Site in Benton County, Washington State. A hard copy of the same comments is also being mailed out to your Office in Richland under separate cover using the US Postal Service.

If you have questions about our comments, please contact me for assistance.

Thank you,

(See attached file: Project number 06-004-DOE 5-3-10.pdf)

Theo Mbabaliye, Ph.D.
US EPA Region 10
1200 6th Ave., Suite 900
Seattle, WA 98101-3140
Phone: (xxx) xxx-xxxx
Fax: (xxx) xxx-xxxx

Response side of this page intentionally left blank.

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

REGIONAL ADMINISTRATOR

May 3, 2010

Shirley J. Olinger, Manager
U.S. Department of Energy
Office of River Protection
P.O. Box 550
Richland, Washington 99352

Re: Comments on the Draft Tank Closure and Waste Management EIS for the Hanford Site, Richland, WA
EPA Region 10 Project Number: 06-004-DOE

Dear Ms. Olinger:

The U.S. Environmental Protection Agency (EPA) has reviewed the Department of Energy (DOE) Draft Environmental Impact Statement (DEIS) for the proposed **Tank Closure and Waste Management (TC&WM) Project** (CEQ#20090362) at the Hanford Site in Benton County, Washington State. This review is in accordance with our authorities under Section 102(2)(C) of the National Environmental Policy Act (NEPA), 42 U.S.C. Section 4332(2)(C) and Section 309 of the Clean Air Act, 42 U.S.C. Section 7609. DOE has gathered valuable information into this DEIS that will inform a series of decisions to be made under DOE Orders and through permits under the Washington State Department of Ecology's Dangerous Waste Regulations, a delegated Resource Conservation and Recovery Act (RCRA) program.

The DEIS analyzes potential environmental impacts associated with three sets of proposed actions: *a) Tank Closure* that would store, retrieve, treat, and dispose of nearly 53 million gallons of radioactive and chemical waste from 149 single-shell tanks (SSTs) and 28 double-shell tanks (DSTs), and closure of the SST system; *b) Decommissioning of the Fast Flux Test Facility* (FFTF); and *c) Waste Management* that would include disposal of Hanford's and potentially other DOE sites' low-level and mixed low-level wastes. Preferred Alternatives have been selected for the FFTF decommissioning and Waste Management actions (Alternatives 2 and 2, respectively). Of 11 potential Tank Closure actions, Alternatives 2A, 2B, 3A, 3B, 3C, 4, and 5 would capture DOE's preferred options for tank waste retrieval, treatment, and closure of the SST system. The DEIS does not identify a specific Tank Closure Alternative.

EPA's primary interest is a clear indication that combined cleanup actions at Hanford will result in conditions that are protective of human health and the environment. The DEIS should show how preferred alternatives fit firmly into that trajectory. The document as written does not clearly show the mechanisms and requirements that will assure that proposed actions will achieve a protective outcome. The analyses must be effectively presented to make closure *509-1*

Printed on Recycled Paper

509-1 Throughout this EIS, DOE identifies the legal requirements that it would need to comply with concerning the specific activities that are part of the proposed action and alternatives. For example, Chapter 1, Section 1.2.1, discusses Hanford regulatory compliance requirements; Section 1.2.7 discusses the WAC regulations DOE must meet for the proposed closure of the SSTs. Section 1.9, which describes the alternatives evaluated in this EIS, refers to the RCRA, WAC, and DOE Order requirements that must be met for DOE to implement the Tank Closure alternatives. The very nature of "environmental impacts analysis" requires DOE to analyze and describe in this EIS how proposed processes and technologies would operate; what results they are expected to achieve; what end products or byproducts might result; and how these measure up against the legal requirements that apply.

Statutory, regulatory, Executive order, and DOE requirements are discussed in the context of each chapter and are listed in the references at the end of each chapter. Chapter 8 identifies and discusses the laws and legal requirements that are potentially applicable to the proposed actions and alternatives, as well as the permits and approvals DOE must obtain from Federal, state, and local agencies.

While DOE's Preferred Alternative for waste management in this *TC & WM EIS* may not be the most environmentally preferred alternative, the ROD issued by DOE will identify any additional mitigation and monitoring commitments adopted by DOE and specify other factors considered by DOE in reaching its decision, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. In announcing its decision in the ROD based on the EIS analyses, DOE will be obligated to carry out the decision consistent with the requirements identified in this EIS. These requirements will be interpreted and applied by Federal, state, and local regulatory agencies through their independent authorities. These agencies may also impose additional mitigation measures through future permitting processes or remedial actions under the scope of the TPA, which include additional opportunities for public comment.

In response to comments on the *Draft TC & WM EIS* concerning the potential long-term impacts on groundwater resources, DOE performed a sensitivity analysis to evaluate the potential impacts if certain remediation activities were conducted at some of the more prominent waste sites on the Central Plateau and along the river corridor. Additional sensitivity analyses were performed to evaluate improvements in both IDF performance (e.g., infiltration rates) and in

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

2

decisions, yet the document does not describe closure requirements that will be necessary in order to obtain permits related to these decisions. 509-1 cont'd

The DEIS shows that all tank closure alternatives would leave contaminants such as Technetium-99 (Tc-99) and Iodine 129 (I-129) in the vadose zone soils leading to groundwater contamination well above drinking water standards for thousands of years at the core zone boundary. For example, under Alternative 2B, according to analyses in this DEIS, concentrations of Tc-99 in groundwater at the core zone boundary would exceed standards by factors of 2 – 100 for about the next 3,000 years, over an area up to 5.3 square kilometers. The DEIS also shows that standards for Tc-99, I-129, uranium isotopes, total uranium, chromium and nitrate would be exceeded at the core zone boundary for all alternatives. We recognize that contaminants in the vadose zone have come from multiple activities at the site and that multiple cleanup programs are responsible for addressing the contamination. However, we believe that significant, additional mitigation is necessary for the actions that are informed by this DEIS. Clean closure techniques may be warranted to meet permit requirements and/or to prevent further contamination of the deep vadose zone and groundwater. While we understand that technologies are not yet fully developed, commitments should be made to fully develop viable, effective methods to remove contaminants from the vadose zone for use within the cleanup timeframe and as part of actions proposed in this DEIS. 509-2

Under the Preferred Waste Management Alternative, there would also be Tc-99 and I-129 releases to the groundwater from the Integrated Disposal Facility (IDF) in 200 Area East, with concentrations 25 and 15 times higher than the standards for Tc-99 and I-129 at the IDF, core zone boundary, and Columbia River, respectively (Tables 5-77 through 88). We also have concerns about stability of radionuclides in secondary waste that will be disposed in landfills and assumptions about the tribal exposure used in radiological risk assessments. 509-3

The DEIS analyses do not take credit for ongoing Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) actions, nor do the analyses acknowledge that future CERCLA actions are intended to remediate contaminants in a manner protective of human health and the environment. Descriptions and analyses in the EIS should account for CERCLA remediation actions where applicable in order to fully account for present and future resource conditions. 509-4

We are concerned about the models as presented in the DEIS. The presentation of information was not easy to follow, critical assumptions were presented with very little justification, and too little information regarding specifics of most model applications was provided. In addition, we have concerns regarding the way uncertainties in many aspects of the flow and transport modeling were recognized and analyzed. Because there was a limited attempt to aggregate the uncertainties resulting from all of the modeling components, the conclusion in the DEIS was that there is *"a lot"* of uncertainty in the simulated groundwater contamination results. Thus, we cannot currently ascertain with a high degree of confidence the modeling predictions of impacts. Also, we cannot know how omitted CERCLA cleanup data would influence the extent of predicted impacts in the DEIS. We believe that additional analyses are necessary to characterize the proposed actions' impacts correctly. 509-5

We acknowledge progress made in addressing some of our concerns at a meeting held among EPA, Department of Energy, and State of Washington Department of Ecology on April

secondary-waste-form performance (e.g., release rates). The discussion found in Chapter 7, Section 7.5, was added to summarize these results. The results of these analyses will aid DOE in formulating an appropriate mitigation action plan subsequent to this EIS and its associated ROD and in prioritizing future Hanford remedial actions that would be protective of human health and the environment and reduce long-term impacts on groundwater resources.

For further discussion on compliance with regulatory requirements, see Section 2.7 of this CRD.

509-2 In response to comments received on the *Draft TC & WM EIS* concerning the potential impacts on groundwater resources, additional sensitivity analyses have been added to this EIS that evaluate remediation of both RCRA and CERCLA sites. Consequently, the discussion found in Chapter 7, Section 7.5, was added to summarize these results and appropriate mitigation measures. The sensitivity analyses and mitigation discussion recognize that an appropriate mitigation action plan would involve different strategies for mitigating short-, mid-, and long-term impacts. It should be noted that the process analyzed in the EIS for technetium-99 removal in the WTP for LAW and HLW glass is not related to and cannot be applied as a technetium-99 soil remediation technology. Additional information on potential soil remediation options and technological challenges has been included in Appendix U, Section U.1.3.4.1; Chapter 7, Section 7.5; and Chapter 2, Section 2.10.

509-3 DOE recognizes the potential negative impacts on Hanford groundwater posed by offsite waste and secondary-waste streams generated from WTP operations under Waste Management Alternatives 2 and 3. The *TC & WM EIS* analysis shows that receipt of offsite waste streams that contain specific amounts of certain isotopes, specifically, iodine-129 and technetium-99, could cause an adverse impact on the environment. Therefore, one means of mitigating the impacts of the offsite waste inventory would be for DOE to limit disposal of offsite waste streams at Hanford. Other mitigation measures, such as recycling secondary-waste streams into the primary-waste-stream feeds within the WTP to increase iodine-129 capture in ILAW and bulk vitrification, are discussed in Chapter 7, Section 7.5, of this final EIS.

In response to the commentor's concern regarding the assumptions used for the tribal exposure scenarios, the Hanford-area tribes have had the opportunity to provide, and have provided, extensive input to the *TC & WM EIS* preparation process and analysis. Chapter 8, Section 8.3, and Appendix C, Section C.3,

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

3

5th and 6th, 2010 in Richland, WA. At that meeting, all agencies agreed that the TC&WM EIS would include the following:

- Analysis of a range of secondary waste performance at IDF. This will include how that range would perform when combined with primary waste forms.
- A write up related to the goals of the CERCLA cleanup program, annotation of graphics in the cumulative sensitivity analysis, and support for discussion in cumulative impacts.
- Analysis of a certain set of sites which have resulted in contamination in the vadose zone, assuming, in a sensitivity analysis, a certain level of cleanup which could be achieved and projection of the results.
- Sensitivity analyses that include both off-site waste mitigation and off-site waste not coming to the site (done for IDF East at a 3.5 mm background rate).

Because of serious concerns about potential impacts to groundwater that will require substantial changes to the suite of preferred alternatives, concerns about stability of radionuclides in secondary waste, and concerns about some of the modeling and presentation of the results, we have assigned an EO-2 (Environmental Objections – Insufficient Information) rating to the DEIS. A detailed discussion of our concerns is included in the enclosed comments (Enclosure 1). *509-6*

We recognize that significant progress has been made and look forward to continuing collaboration as work on this EIS continues.

Sincerely,

Richard B. Parkin

Richard B. Parkin
Acting Director
Office of Ecosystems, Tribal, and Public Affairs

Enclosures
1. EPA Detailed Comments
2. EPA criteria for rating draft EISs

of this *TC & WM EIS* identify the process for tribal interaction and the primary occasions for DOE's interactions with the tribes on the subject of the *TC & WM EIS* preparation process. In addition, Chapter 8 of this *Final TC & WM EIS* includes a description of the outcomes of the meetings with the tribes, and a new appendix, Appendix W, describes the tribal perspective as provided by the Hanford-area tribes.

509-4 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

509-5 Regarding quantification of the uncertainties in the groundwater modeling system, DOE's view is that, for a comparative analysis (as required under NEPA), predictions of long-term impacts that are differentiated by one or more orders of magnitude in concentration should be considered significant by stakeholders and decisionmakers. The discussions in the Summary and Chapters 2 and 5 of this *TC & WM EIS* are all consistent with this view. In Appendix U, comparisons are made between model predictions of current concentrations and measurements of current concentrations. In response to this and similar comments, the discussion in Appendix U has been amplified in this *Final TC & WM EIS* to assist the reader in evaluating the precision and accuracy of the groundwater modeling system.

509-6 As discussed during the meetings with EPA and Ecology on April 5 and 6, 2010, regarding EPA's comments on and rating of this *TC & WM EIS*, and in response to other comments on the potential impacts of future remediation activities that are in various stages of planning (which, given the inherent uncertainty, were not included in the cumulative impacts analysis), DOE performed a sensitivity analysis to evaluate the potential impacts if certain remediation activities were conducted at some of the more prominent waste sites on the Central Plateau and along the river corridor. The goal of the sensitivity analysis is to help DOE, EPA, and Ecology prioritize cleanup efforts in the future. This analysis is provided in Appendix U of this EIS and is discussed further in Chapter 7, Section 7.5.

As discussed in Chapter 7, Section 7.1.6, of this EIS, this is a particular area of focus for DOE, especially with regard to partitioning and capture of iodine-129, a conservative tracer, in secondary-waste forms. Additional sensitivity analyses have been added to this *Final TC & WM EIS*. These additional analyses evaluate what changes in potential impacts might occur if partitioning of contaminants

4

EPA Detailed Comments on the Draft Tank Closure and Waste Management EIS for the Hanford Site, Richland, WA

Contaminants in the Vadose Zone

Radionuclide and chemical contamination levels in the vadose zone are currently very high and would remain higher than the standards for Constituents of Potential Concern (COPCs). The DEIS shows that all tank closure alternatives would leave contaminants such as Tc-99 and I-129 in the vadose zone soils leading to groundwater contamination well above drinking water standards for thousands of years at the core zone boundary. For example, under Alternative 2B, concentrations of Tc-99 in groundwater at the core zone boundary would exceed standards by factors of 2 – 100 for about the next 3,000 years, over an area up to 5.3 square kilometers. The DEIS also shows that standards for Tc-99, I-129, uranium isotopes, total uranium, chromium and nitrate would be exceeded at the core zone boundary for all alternatives. Under the Preferred Waste Management Alternative, there would also be additional Tc-99 and I-129 releases to the vadose zone in concentrations that would exceed standards for each of these two COPCs by as much as 15 and 25 times (Tables 5-77 through 88). We believe that the EIS should address vadose zone contamination and structure tank closure decisions such that actions will be taken to reduce existing contamination in the vadose zone and prevent worsening contamination problems in groundwater (Table 2-17) that would require more cleanup activity. *509-7*

Contamination in the vadose zone would be mostly due to past leaks from multiple sources (tanks, cribs, trenches and ditches), and continued leakage from these areas, including tank leaks that may occur during waste removal, and leaks from residual waste remaining in the tanks as the tanks deteriorate over time. The DEIS is not clear about vadose contamination levels present or expected from each source, nor about requirements that must be met for tank closure. *509-8*

Section 2.2.2.4.2 discusses clean closure. Unlike RCRA, clean closure is defined in the DEIS as removal of the SST, waste receiving facilities, ancillary equipment, and soil within the tank farms to a depth 10 feet below the bottom of the tanks. The 10-foot depth is an estimate of the depth necessary to capture leakage from the tanks during the retrieval process. Clean closure, as defined in the DEIS, may also include deep soil excavation of 65 to 225 feet below the land surface to remediate contaminant plumes (page S-95). We acknowledge the technical challenges that deep removal would entail. *509-9* However, we believe that the DEIS should clearly state that drinking water Maximum Contaminant Levels (MCLs) are the overall target for cleanup. Further, the EIS should clearly describe tank closure requirements that will cover responsibilities under the RCRA actions. *509-10*

Section S.2.1.2 does state that options include retrieving waste to the maximum extent that is both technically practical and required to support closure of the SST system. Chapter 8 also discusses potentially applicable laws, regulations, and other requirements. However, the DEIS does not clearly document meeting the limits of technical practicability. It is not clear how the 90%, 99%, and 99.9% retrieval levels selected for the various SST retrieval/closure options relate to the closure performance standards of WAC 173-303-640(8)(a) applicable to dangerous/mixed waste tank systems, which require tank systems to close by removal or *509-11*

could be increased in primary-waste forms and/or if secondary-waste-form performance could be improved. The discussion found in Chapter 7, Section 7.5, was added to summarize these results. The results of these analyses will aid DOE in formulating appropriate performance targets for secondary-waste forms. As referenced in the Section 7.5.2.8 discussion, DOE has drafted a roadmap that implements a strategy for development of better-performing secondary-waste forms. DOE's response to EPA's specific issues or concerns regarding the modeling and presentation of the results is addressed in the following comment responses.

509-7 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

The clean closure alternatives considered for the SST system, which take into account the contamination in the vadose zone resulting from past leaks, are represented by the Base and Option Cases of Tank Closure Alternatives 6A and 6B. For both Base Cases, the assumption is that the SST system would be cleaned to levels that would allow for unrestricted use, which would involve removal of the tanks, ancillary equipment, and soils beneath the tanks (contaminated as a result of past leaks) down to the water table. The two Option Cases represent this type of clean closure along with removal of soils beneath the tank farms (contaminated as a result of infiltration from the contiguous cribs and trenches [ditches]). The analysis shows that removal of the contaminants from the vadose zone would not capture those contaminants that may have already reached the groundwater table due to past practices (i.e., past leaks and contiguous cribs and trenches [ditches]).

The *TC & WM EIS* analysis shows that receipt of offsite waste streams that contain specific amounts of certain isotopes, specifically, iodine-129 and technetium-99, could cause an adverse impact on the environment. Therefore, one means of mitigating the impacts of the offsite waste inventory would be for DOE to limit disposal of offsite waste streams at Hanford. Other mitigation measures, such as recycling secondary-waste streams into the primary-waste-stream feeds within the WTP to increase iodine-129 capture in ILAW and bulk vitrification, are discussed in Chapter 7, Section 7.5, of this EIS.

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

5

decontamination ("clean" closure). Further, it is not clear how the retrieval levels, or the corresponding analysis of them, relate to the provisions of WAC 173-303-640(8)(b), which requires closure of tank systems as a landfill if it is not practicable to remove or decontaminate contaminated soils (and presumably other tank system components) associated with tank systems. EPA notes that the choice between clean closure and landfill closure under RCRA is not discretionary, but is explicitly contingent on a demonstration by the owner or operator that it is not practical to remove or decontaminate soils. The DEIS, with critical regulatory input from Ecology as the lead decision-maker, should ensure that alternatives and analyses of them explicitly address these points. **509-11 cont'd**

Recommendation:

- *The final EIS should consolidate and briefly discuss requirements that pertain to tank closure actions, especially for removal of contaminants from soils, and measures that will be taken to meet the requirements. That information could clarify (1) the degree of waste retrieval from tanks that should be required, given the amount of radionuclides in the immediately surrounding environment, and (2) the application of removal to the "maximum extent practical" to leaked radionuclides.* **509-12**
- *The final EIS should discuss in sufficient detail ongoing CERCLA remediation actions, their effectiveness in removing contamination, and future cleanup goals of the program to protect human health and the environment.* **509-13**
- *The final EIS should include a Preferred Alternative for tank closure that would prevent additional contaminant releases to surface soils and the vadose zone in the project area and/or develop effective technologies to remove or immobilize the appropriate amount of existing contamination beneath tank farms.* **509-14**

Most of the vadose zone in the project area (200-, 400-, and Borrow-C Areas) is made up of unconsolidated sands and gravels of the Hanford formation, which are highly permeable, with depths ranging from 164-328 ft. Groundwater generally flows eastward across the site from recharge areas and discharges to the Columbia River. The Yakima River is also considered a source of recharge. Over the years and with wastewater disposals, the water table has risen about 30 ft. - 89 ft. within the project site. Some contaminants move with groundwater (e.g., tritium and nitrate), while movement of the others (e.g., strontium and cesium) is slower due to their interaction with minerals within the hydrologic system. In this "suprabasalt" aquifer system of the project site, hydraulic head data have indicated that groundwater flows toward the Columbia River, with travel time ranging from 10-50 years. This time could be shortened, however, by other proposed projects and natural events (floods, climate change, and other events) with the potential to affect groundwater flow speeds.

The EIS assumes that most of the 200 Area waste sites are capped in place (landfill closure) (Tables in Appendix S). The EIS, as summarized on page 6-169, shows that such a general remedial strategy would not be protective of groundwater. The first threshold criterion for all CERCLA remedial actions is to be protective of human health and the environment. The second threshold criterion is to comply with (or waive) applicable or relevant and appropriate requirements. One such requirement would be groundwater drinking water standards. The

509-8 For the waste remaining within the 200 Area tank farms, closure would require examinations of the tanks and residual waste to support the preparation of site-specific radiological performance assessments and closure plans. These examinations would require extensive waste sampling and sample analyses, assessments of the structural stability of the tanks, and assessments of risk to human health and the environment. These documents will provide the information necessary for DOE and regulators to make sound decisions on what levels of residual tank waste are acceptable in terms of short-term and long-term risks. Tank farm past leaks and associated contamination in the vadose zone are being evaluated under the RCRA Facility Investigation/Corrective Measures Study process. As such, the vadose zone contamination associated with tank farm past leaks is considered an RCRA operable unit rather than a CERCLA operable unit and is assessed in this *TC & WM EIS*.

509-9 The scope of this *TC & WM EIS* includes decisions on storage, retrieval, treatment, and disposal of tank waste and closure of the SST system, including the tank system and the vadose zone impacted by the tank farms (i.e., by past leaks). The *TC & WM EIS* closure alternatives for the tank farms include no action, landfill closure, selective clean closure, and clean closure (which would involve actions to remove the source of contamination). This EIS does not include proposed actions to address potential groundwater impacts resulting from the tank farms (i.e., past leaks), as such actions will be addressed as part of CERCLA remedial action for the non-tank-farm areas within the 200 Areas, including consideration of all applicable, relevant, and/or appropriate requirements under Federal and state laws and regulations.

DOE would like to point out to the commentor that the initial removal of the 10 feet of soil below the bottom of the tanks is the assumption used to determine the extent to which the soils would be removed and managed as HLW. The remaining contaminated soil beneath this 10-foot depth would be removed and treated; however, it would not be managed as HLW and would be disposed of on site in the proposed RPPDF after appropriate treatment. This has been further clarified in the Summary and is explained in more detail in Appendix E of this EIS.

509-10 DOE's Preferred Alternatives for tank closure, FFTF decommissioning, and waste management in this EIS may not necessarily represent the most environmentally preferred alternatives, but this is not required by NEPA or CEQ regulations. Potential conflicts with laws and regulations also do not necessarily cause an alternative to be unreasonable, but additional mitigation commitments may be

6

numerous Hanford 100 Area and 300 Area records of decision and the one 200 Area record of decision for groundwater have been at least as stringent as the drinking water standard. Therefore, it is not appropriate for the EIS to assume that the remedial action end state for the 200 Area waste sites is landfill closure which is not protective of groundwater. The EPA understands that these waste site cleanup actions are outside the scope of the EIS. However, this non-EIS cleanup scope is included in the EIS cumulative analysis and the EIS makes comparative conclusions such as the following: "Estimated impacts from groundwater releases that are not associated with the *TC & WM EIS* alternatives, e.g., past leaks, are greater than estimated impacts from releases associated with the *TC & WM EIS* alternatives" (page 6-169). This approach under-represents the relative groundwater consequences of DOE's alternatives.

Recommendation:

- *EPA recommends that DOE change the assumed end state for the CERCLA vadose zone and groundwater cleanup actions such that groundwater contamination meets Washington State Model Toxics Control Act (MTCA) and drinking water standards throughout the 200 Area, plus surface water quality standards immediately adjacent to the Columbia River, as this is the logical extrapolation from all existing CERCLA Record Of Decisions (RODs).*

509-15

Table D-37, which is for tank closure alternative 2B (in-place closure of tanks, cribs, and trenches), states, "For analysis purposes, waste inventories from tank waste retrieval leaks and ancillary equipment were assumed to be treated in the Waste Treatment Plant." However, this appears to be a faulty assumption, as under this alternative, those wastes would be left in place, not retrieved and sent to the waste treatment plant. Leaks during retrieval contribute additional waste inventory that is available for leaching to the soil beneath tanks. Comparing Table D-31 (leaks during retrieval) to Table D-27 (historical leaks) shows that retrieval leaks for most tanks will contribute about as much new waste to the underlying soil as historical leaks. To assume these leaks will be treated via the vitrification plant when, in fact, most alternatives (including DOE's preferred alternatives) leave the leaked waste in the soil, likely significantly underestimates future groundwater impacts. This needs clarification. There are other tables in section D with this same footnote, which is inconsistent with the alternative.

509-16

The DEIS indicates DOE's preferred percent tank waste retrieval is 99%, which would leave 1% of tank waste in place. We believe that level of waste removal from the tanks is an important step forward in dealing with tank waste, especially in leak-prone SSTs that are now twice their original design lifecycle (10-20 years). The remaining waste, however, would more likely be composed of radionuclides of concern, particularly phosphates that contain strontium-90 and transuranic isotopes. Tank waste at Hanford is heterogeneous due to use of different separation processes (p. S-96). Heels therefore left in the tanks may have to be characterized to demonstrate that the waste has been adequately removed from tanks and that the residues can be left in tanks, with minimal risk. DOE Order 435.1 requires that residues remaining in the tank "have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical." If characterized, then it would be easier for DOE to identify an appropriate immobilization technology tailored to the type of chemical and concentration in residual waste.

Recommendation:

509-17

required if it is selected for implementation. This *TC & WM EIS* addresses the potential laws and requirements that would apply, depending on the alternative. Issues concerning the ability to meet legal standards or requirements are also discussed, along with the potential mitigation measures that may be needed and are feasible for implementation by DOE. Additional mitigation measures could be required to obtain future permits issued by the State of Washington, or they may be addressed under the scope of the TPA as part of future remedial actions that are subject to CERCLA. In the ROD for this EIS, DOE will identify and discuss the factors it considered in reaching its decisions, such as economic, technical, and national policy considerations, as well as the mitigation and monitoring measures that will be implemented.

The draft EIS indicates that closing the SSTs is better than not closing the SSTs. The issue identified is the contamination that is currently in the soil from both RCRA and CERCLA past practices. The analysis shows that the removal of the contaminants from the vadose zone does not capture the contaminants that may have already reached the groundwater table due to past practices (i.e., past leaks and contiguous cribs and trenches [ditches]).

DOE received comments on the potential impacts of future remediation activities that are in various stages of planning (which, given the inherent uncertainty, were not included in the cumulative impacts analysis). In response, DOE performed a sensitivity analysis to evaluate the potential impacts if certain remediation activities were conducted at some of the more prominent waste sites on the Central Plateau and along the river corridor. This analysis is provided in Appendix U of this EIS and is discussed further in Chapter 7, Section 7.5.

DOE must comply with certain legal requirements to undertake specific activities that are part of the proposed actions and alternatives; these requirements are identified throughout this EIS. For example, Chapter 1, Section 1.2.1, discusses Hanford regulatory compliance requirements; Section 1.2.7 discusses the WAC regulations DOE must meet for the proposed closure of the SSTs. Section 1.9, which describes the alternatives evaluated in this EIS, refers to the RCRA, WAC, and DOE Order requirements that must be met for DOE to implement the Tank Closure alternatives.

DOE acknowledges that, in CERCLA cleanups conducted under the TPA (which is a separate process and is not part of the scope of this *TC & WM EIS*), MCLs are used as goals for cleanup of groundwater operable units aimed at restoring and protecting the beneficial uses of groundwater (e.g., drinking water) and to

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

7

- *EPA recommends that the final EIS include a discussion describing how vadose zone contamination resulting from waste remaining after tank waste retrieval will be remediated, additional contamination from such waste (heels) will be prevented, and plans for long-term stewardship of the site to prevent future contamination.* **509-18**

Modeling

Our review of modeling is based on information presented in Appendices L, N, and O. We found that the document was very difficult to review in a meaningful way. Apparently, there is a body of supporting documentation in the public record, which is not referenced in the EIS or made available to reviewers. We recommend that this material be referenced in the final EIS and included on the web site. The presentation of information was not easy to follow, critical assumptions were presented with very little justification, and too little information regarding specifics of most model applications was provided. **509-19** In addition, we have concerns regarding the way uncertainties in many aspects of the flow and transport modeling were recognized and analyzed. Because there was a limited attempt to aggregate the uncertainties resulting from all of the modeling components, the conclusion in the DEIS was that there is *"a lot"* of uncertainty in the simulated groundwater contamination results. Based on conclusions in summary results, we are particularly concerned with:

a) The conclusion that "*The bulk of the cumulative human health impacts would result from releases of contaminants attributable to past leaks and releases independent of the alternatives evaluated in this TC & WM EIS*" is not supported by the modeling work because past, current, and planned future CERCLA remediation activities were not considered. After our meeting with DOE and Ecology, EPA expects to see more clarifying information in the final EIS. **509-20**

b) Data in Table S-10 show cumulative maximum peak concentrations in groundwater. With the exception of four values that have occurrence dates in the future, this information may be irrelevant to future decision making. The entire period during which COPCs concentrations exceeded the benchmark concentrations at the Columbia River near shore should be shown on the table.

It is, however, likely that the modeling effort as a whole provides results that are useful for comparing the impacts from the different alternatives against each other, but there is little certainty in the actual predicted outcome for any alternative (peak concentrations, arrival times, cumulative risk, etc.)

Groundwater Flow Field Development

In general, we agree that the *Groundwater Flow Field Development* (Appendix L) processes are reasonable and are the best documented approaches to dealing with the subject. We believe the hydrogeologic framework used is consistent with past work at the site, the flow directions look to be reasonable, and the water-level predictive errors were minimized. Our concerns with the process relate to boundary conditions, parameter estimation and Monte Carlo runs, and other issues as indicated below. Despite these issues, it looks like the base case and alternative case models are generally reasonable and perform in the near-term as desired. However, the subjective elements in their construction and calibration add a substantial degree of uncertainty into their utility as predictive models, particularly when the predictions are for the next 10,000 years.

protect the Columbia River from adverse impacts. DOE notes that, under the Safe Drinking Water Act, MCLs apply at the point of delivery to a consumer; thus, for groundwater that is being evaluated using the CERCLA ARARs process, MCLs are considered "relevant and appropriate" standards. The "benchmark standards" used in this *TC & WM EIS* represent dose or concentration levels that correspond to known or established human-health effects. To determine potential groundwater contamination, the benchmark standard used in this *TC & WM EIS* is the MCL, if one is available. This is consistent with the manner in which MCLs are considered and used in the CERCLA process.

509-11 The commentor is referred to Chapter 8, Section 8.1.4 (page 8–13 of the *Draft TC & WM EIS*), for further information regarding the RCRA closures, including landfill and clean closure for tank systems. In addition, page 8–14 of the draft EIS provides details on the TPA, which is the legal mechanism used to address and define cleanup commitments and to establish goals to achieve compliance and remediation with enforceable milestones. Chapter 2, Section 2.2.2.1.1, provides more discussion on how the retrieval benchmarks (0 percent, 90 percent, 99 percent, and 99.9 percent retrieval) coincide with Milestone M-45-00 and Appendix H of the TPA. The tank closure process, which involves detailed examinations of the tanks and residual waste, will include preparation of a performance assessment and a closure plan. These required documents will provide the information and analysis necessary for DOE and the regulators (i.e., Ecology) to make specific decisions on what levels of residual tank waste are acceptable in terms of short- and long-term risks.

509-12 Additional detailed analyses pertaining to tank closure, including removal of contaminants from soils, will occur within the context of future cleanup actions that are governed by the TPA process and will be based on the applicable, relevant, and appropriate requirements of Federal and state laws and regulations. Ecology's issuance of a closure permit will follow prerequisites under Washington State's Hazardous Waste Management Act, which implements RCRA. DOE must comply with certain legal requirements to undertake specific activities that are part of the proposed actions and alternatives; these requirements are identified throughout this EIS. For example, Chapter 1, Section 1.2.1, discusses Hanford regulatory compliance requirements; Section 1.2.7 discusses the WAC regulations DOE must meet for the proposed closure of the SSTs. Section 1.9, which describes the alternatives evaluated in this EIS, refers to the RCRA, WAC, and DOE Order requirements that must be met for DOE to implement the Tank Closure alternatives. The very nature of "environmental

8

c) *Boundary conditions*

i) Groundwater inflow to the model domain from the west was found by the authors to be a very important parameter, but the manual calibration of that parameter appears to have been done prior to the final calibration (Monte Carlo Optimization). The assumption of non-varying recharge along the western boundary is poorly justified. It is likely that irrigated agriculture on the western flanks of Rattlesnake Mountain and other areas bordering and upgradient of the site will increase over the coming decades (as it has over the past decades), thus changing the influx over time. The reader should (at a minimum) be referred to Appendix V where the analysis of potential effects of the proposed Black Rock reservoir are presented; that analysis serves as a proxy for increased groundwater inflow to the model domain from the west due to expansion of irrigated lands. **509-21**

ii) Assuming a non-varying recharge of 3.5 mm/year for the next 10,000 years subjectively eliminates a potentially large source of long-term uncertainty in the model. Additional justification of this assumption is warranted. **509-22**

iii) Justification is needed for the assumption that there is negligible water exchange between the unconsolidated sediments and the underlying basalts. This no-exchange assumption is perhaps reasonable for predictive simulations over a few decades, but the implications for that assumption over the 10,000-year predictive window are never mentioned. Because of the no-exchange assumption, on-site effects due to changes in such things as irrigated agriculture may not be realistically simulated over the long term. The Columbia River Basalt Group of the Columbia Plateau Regional Aquifer System is one of the nation's principal aquifers and is a significant source of groundwater for irrigation, domestic, and other uses. A default assumption would therefore be that there is water exchange with the basalts. The EIS should be updated to reflect existence of water exchange between the project area basalts. **509-23**

iv) The DEIS was not clear about whether or not groundwater extraction from past, current, and planned future remediation activities at the site were included in the model. Given that the current 90% design for the pump and treat system for the 200-ZP-1 groundwater operable unit is planned to pump at a rate nearly equivalent to the natural recharge rate over the area, the system will have a substantial impact on the flow field over the next few decades. The system will have an even greater impact on the fate of existing and near-future groundwater contaminants. For the 200 West Area in particular, a substantial amount of carbon tetrachloride has been removed from groundwater to date, and the 90% design for the greatly expanded pump and treat system for the 200-ZP-1 GW operable unit will remove much more, as well as uranium and Tc-99. Because remediation systems are not included in the model, the simulation results that are influenced by contaminants that are already in groundwater (or will drain to groundwater in the next few decades) are not realistic. The final EIS should discuss impacts on the fate of existing and near-future groundwater contaminants, and clarify how past, current, and planned remediation impacts were considered in modeling groundwater flow through established boundaries. **509-24**

d) *Parameter estimation and Monte Carlo runs*

impacts analysis" requires DOE to analyze and describe in this EIS how proposed processes and technologies would operate; what results they are expected to achieve; what end products or byproducts might result; and how these measure up against the legal requirements that apply. Statutory, regulatory, Executive order, and DOE requirements are discussed in the context of each chapter and are listed in the references at the end of each chapter.

Chapter 8 identifies and discusses the laws and legal requirements that are potentially applicable to the proposed actions and alternatives, as well as the permits and approvals DOE must obtain from Federal, state, and local agencies. In Sections 8.1.7 and 8.3, DOE identifies the consultations and coordination that DOE has undertaken with American Indian tribes and would need to continue for the purpose of implementing the proposed actions and alternatives.

509-13 As stated in Chapter 1, Section 1.4.2, of this EIS, groundwater contamination in the non-tank-farm areas of the 200 Areas (which include cribs, trenches [ditches], and tile fields) is being addressed under CERCLA, which will also satisfy substantive RCRA and Washington State Hazardous Waste Management Act corrective action requirements. Contamination in the vadose zone resulting from tank farm past leaks would be addressed during the SST closure process. The cumulative impacts analysis for this *TC & WM EIS* (see Chapter 6 and Appendix U) includes the vadose zone of the 200 Areas, in addition to other areas of Hanford.

The commentor brings up the issue of integration and cleanup activities for CERCLA and RCRA units that could influence each other. DOE received comments on the potential impacts of future remediation activities that are in various stages of planning (which, given the inherent uncertainty, were not included in the cumulative impacts analysis). In response, DOE performed a sensitivity analysis to evaluate the potential impacts if certain remediation activities were conducted at some of the more prominent waste sites on the Central Plateau and along the river corridor. The goal of the sensitivity analysis is to help DOE, EPA, and Ecology prioritize cleanup efforts in the future. This analysis is provided in Appendix U of this EIS and is discussed further in Chapter 7, Section 7.5.

509-14 Tank Closure Alternatives 4, 6A, and 6B are representative of remediation that results in removal of the source of contamination from the vadose zone (i.e., contaminated soils between the tank farms and the groundwater). This type

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

9

i) The parameter estimation of the flow model would have been more informative if the estimation included contaminant concentrations predicted by a transport model, and/or the flux into the groundwater system from natural recharge, mountain-front recharge, and water exchange with basalts were allowed to vary within certain ranges. A flow-field calibration that only considers water level data will be highly uncertain. Are there sections of other appendices where the flow model results are verified by transport simulation results? **509-25**

ii) Overall, the calibration approach was a mix of quantitative and subjectively prescribed conditions. It is unclear why the Monte Carlo analysis was done because 1) it doesn't look like the uncertainty analysis was carried through to the transport modeling and risk assessment, so quantified uncertainty in the flow field is only marginally relevant, and 2) selection of the Base Case relied on the prescription that "The Technical Guidance Document …directed that the Base Case flow model would flow predominantly eastward from the 200 Areas of Hanford," and the alternate case relied on the prescription that "The majority of the particles released to the water table within the core zone boundary (200 Area Central Plateau of Hanford) move to the north through Gable Gap rather than to the east toward the Columbia River." Following those prescriptions essentially negated any objective parameter estimation. And although the base case and alternate case hydraulic conductivity parameter values are different, they are essentially equivalent for the predominant material types at the site. **509-26**

iii)The assumption of invariant hydraulic characteristics for each "material type" (unit) is unnecessary and unlikely. Results showed how specifying different characteristics for the "highly conductive Hanford gravel" improved the water level matching. Were the hydraulic parameter values for other material types allowed to vary in particular zones? With parameter estimation, it is reasonable to let characteristics for a unit vary within a certain range. **509-27**

e) *Other specific Comments on Appendix L:*

(1) Page L-3, Section L.2 - "Relatively impermeable" has no hydrogeologic meaning. The basalt can be assumed impermeable, but in reality, it just has relatively low permeability when compared to the overlying sediments. **509-28**

(2) Page L-6, Section L.3.1—A list of all MODFLOW packages used should be included. Additional discussion on selection of some packages is warranted. For example, it seems as though the HUF rather than the LPF package was used; why? There are implications for using either package that should be discussed. **509-29**

(3) Figure L-1—The model domain is not shown in the figure. Use a topographic or similar map that shows Rattlesnake Ridge and the western boundary of the domain. **509-30**

(4) Page L-9, final paragraph—The statement "This finding justifies a uniform 200- by 200-meter (656- by 656-foot) grid across the entire model domain" is not true. The simulation of many surface features, such as source areas and recharge **509-31**

of remediation could include the use of technologies to remove or immobilize the appropriate amount of existing contamination.

See response to comment 509-13 regarding future remediation activities.

509-15 See response to comment 509-13 regarding future remediation activities.

509-16 The cited statement, which is found in Note b in Appendix D, Table D–39, in this EIS, as well as following tables, was included to advise the reader that these waste inventories (tank waste retrieval leaks and ancillary equipment) were assumed to be both treated in the WTP and present in the soil and were included in the groundwater analysis. DOE does not believe this is a faulty assumption; analyzing this waste stream from all perspectives, including air emissions, treatment, and groundwater impacts, is representative of the conservatism of analysis in this EIS.

509-17 With regard to the disproportionate amount of radioactivity in the residues at the bottom of the tanks, DOE currently does not have a technical basis for making more-specific assumptions about the expected compositions of the waste "heels" that would remain in the tanks after retrieval. Retrieval has been completed for only a small number of SSTs, and not much is known about the behavior of, or ability to remove, small volumes of residual waste. However, the tank closure process, which includes detailed examinations of the tanks, residual waste, and surrounding waste in the soil, requires preparation of detailed performance assessments and a closure plan per DOE Order 435.1. These documents will provide the information and analysis necessary for DOE and the regulators to make specific RCRA and permitting decisions on what levels of residual tank waste and contaminated soil are acceptable for closure in terms of short- and long-term risks. DOE disagrees with EPA that, in analyzing 15 feet of soil removal, which was done to represent removal of surface spills and ancillary equipment and piping, we are precluding additional soil removal or treatment as each waste management area is closed. Text has been added to this EIS to describe how soil could be addressed, as well as information on the permitting process related to closure of the tanks and associated soil.

509-18 Chapter 7, Sections 7.1 and 7.5, of this *TC & WM EIS* discuss mitigation measures that could be used to avoid or reduce potential impacts on all resource areas. Many of the mitigation measures discussed would apply across all alternatives because of the similar nature of some of the activities analyzed in this EIS (e.g., construction of facilities). However, the resource subsections of Section 7.1 do acknowledge specific alternatives where only certain mitigation

10

basins, also depends on cell size. The 200x200 cells are likely not a problem, but the issue of the TOB in Gable Gap is just one consideration. The final EIS should expand this discussion to address the other factors considered in selecting cell size. Additional information on cell size in groundwater modeling can be found online at http://pubs.usgs.gov/sir/2004/5038/ (see p. 5-10). **_509-31 cont'd_**

(5) Page L-14, Section L.4.2.4—Are the stated "natural area" recharge rates applied throughout the entire 10,000-year period? **_509-32_**

(6) *Page L-24*:

(a) It is stated that "If more than one geologic layer is contained within one MODFLOW cell, the cell is assigned the properties of the hydrostratigraphic type with the largest total thickness over the range of elevations represented by the MODFLOW layer." Why was this done rather than using effective parameter values for cells with heterogeneous sediments? If you want to have uniform materials in cells, perhaps the LPF package approach would be a better choice. **_509-33_**

(b) Page L-24, final bullet: Were there any stratigraphic data from borehole logs to support this high conductivity channel? Given that flow through the gap was a primary modeling question, this assumption is more than "fine-tuning" and would benefit from additional justification. **_509-34_**

(c) Page L-26, Section L.5.2—The preconditioning period was really 503 years long as described in L.5.4. **_509-35_**

(7) Page L-31, L.7.2.2—What was the resulting flux of water into the model domain? Was it large relative to natural or anthropogenic recharge? **_509-36_**

(8) Page L-37; Section L.9—It is unclear why the Monte Carlo analysis was needed. PEST gave reasonable parameter values. It doesn't look like the uncertainty analysis was carried through to the transport modeling and rick assessment, so why focus on it for the flow field? **_509-37_** **_509-38_**

(9) Page L-72 through L-81, Sections L.10.1.3.1 and 2—The tritium plume particle tracking exercise was non-conclusive, and as stated, many of the runs could be considered acceptable. The Central Plateau Pathline Analysis was based on the subjective criterion that flow should predominantly be to the east. Neither of those exercises lends objective credibility to selecting the preferred Base Case over the other runs. These same comments apply to the path line analyses for the alternate case. **_509-39_**

Vadose Zone Flow and Transport

A flow diagram illustrating the procedure for selection of values of vadose zone hydraulic parameters is given in Fig. N-1. The first step in this process is "determine hydraulic parameters for 16 soil types by matching predicted moisture profiles to moisture profiles observed in undisturbed bore holes." An example fit to measured moisture content profiles is given in Fig. N-2. This is an extremely insensitive method for determining hydraulic parameters. A "good fit" to a moisture content profile such as that shown in Fig. N-2 can be obtained for virtually any set of soil hydraulic parameters by adjusting the assumed recharge rate, which is generally unknown. If the recharge rate is assumed to be known and constant, then what a **_509-40_**

measures would apply or where additional mitigation consideration may be warranted. Text has been added to this EIS to describe how soil could be addressed, as well as information on the permitting process related to closure of the tanks and associated soil.

509-19 All sources of data used in the EIS modeling efforts have been referenced in Appendices L, N, and O; references are provided at the end of each appendix. In response to this and similar comments, Appendices L, N, and O have been revised in this final EIS to include a more complete discussion of the modeling approach with a focus on clarifying the reasons for making certain assumptions; presenting data that provide more comparison among the alternatives; and clarifying uncertainties associated with the analysis.

509-20 Appendices L, M, N, and O show numerous parameter variation exercises, and the overall uncertainty in the models versus field measurements is discussed in Appendix U. DOE's view is that, for a comparative analysis (as required under NEPA), predictions of long-term impacts that are differentiated by one or more orders of magnitude in concentration should be considered significant by stakeholders and decisionmakers. The discussions in the Summary and Chapters 2 and 5 of this *TC & WM EIS* are all consistent with this view. In response to this and similar comments, the discussion in Appendix U has been amplified in this *Final TC & WM EIS* to assist the reader in evaluating the precision and accuracy of the groundwater modeling system. In addition, Appendix U has been revised in this final EIS to expand on the potential impacts of planned future CERCLA remediation activities.

509-21 DOE agrees with the comment regarding time-varying fluxes into the model. In response to this and similar comments, Appendix V of this *Final TC & WM EIS* has been updated to include analysis of future increased water flux into the flow model from its western boundary. DOE agrees with the comment regarding the Black Rock Reservoir scenario and related analysis being a proxy for increased groundwater inflow to the model domain from the west. In addition to the reanalysis related to time-varying water fluxes per the first part of this comment response, Appendix L of this *Final TC & WM EIS* has been revised to include a pointer to Appendix V as an additional analysis representing increased water influx to the western boundary of the model domain.

509-22 The primary justification for this assumption is explained in the *Technical Guidance Document* (DOE 2005). This document codifies modeling assumptions and agreements between ORP, RL, DOE Headquarters, and Ecology. The

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

11

moisture content profile such as is shown in Fig. N-2 tells you is the moisture content at which the unsaturated hydraulic conductivity is equal to the assumed recharge flux per unit area – and that is all. Van Genuchten parameters cannot be deduced from this information. This proposed method indicates a lack of understanding of basic vadose zone physics. The rest of the flow diagram" (Fig. N-1) appears to make little sense and will not yield reasonable estimates. **509-40 cont'd**

Regarding the *Groundwater Transport Analysis*, the particle-tracking approach adopted for the transport simulations is potentially useful if used correctly and carefully. However, there is little information on the specifics of the application to evaluate the quality of the results. For example, it is unclear what computer program was used for the transport analysis. Is there a citation for the computer program whether it was an existing program or created just for this application? **509-41**

The figures illustrating particle-tracking results have some troubling features that are unexplained and suggest problems with the implementation. For example, figures O-5 through 7 show random concentrations in cells surrounding the main plume. We suspect they are noise in the method, or result from not using enough particles. Figures like O-17 that show the 2005 Tc-99 plume beneath most of the Hanford Site are simply mysterious. **509-42**

The phrase "a close order of magnitude" is used to describe the transport calibration results. If simulation results for the few decades between 1980 and 2003 were within a "close order of magnitude," what is to be expected for the 10,000-year simulation results? Are four orders of magnitude appropriate? Why was so much effort spent on exploring the uncertainty of the flow field, while the transport uncertainty is described in largely qualitative terms? **509-43**

Overall, the transport simulations likely have some value in illustrating differences in relative groundwater contamination that may result from alternative management scenarios. However, the results presented do not indicate that they should be interpreted quantitatively, and even the order of magnitude of likely error in the long-term simulation results is unknown. Specific comments include the following: **509-44**

(1) Tables O-6 through O-59 show maximum COPC concentrations for alternatives—For decision making, it helps to know the duration of the COPC exceedance at a receptor; was there one sharp concentration peak that persisted for a few years, or was there a lower peak concentration that was sustained for many millennia? Consider showing the entire time period during which COPC concentrations exceeded the benchmark concentrations at the locations specified and shown on tables. It appears this has essentially been done with regard to risk (if we understand figures like S-18 correctly), but it would be useful for the concentration data also. **509-45**

(2) Page O-1, final sentence – Flux has the units of mass/time. Curies and grams are not units of flux. **509-46**

(3) Page O-5, Section O.2—Sensitivity of the model to tritium transport is not a robust test of the transport capabilities of the model for analytes that potentially sorb or react because tritium in groundwater does not sorb or react with aquifer sediments. Thus, the sensitivity of the model to changes in parameters related to uranium or carbon tetrachloride transport, for example, are not reflected in the analysis of the tritium transport simulations. **509-47**

value of 3.5 millimeters per year was agreed upon after extensive discussions and technical input from the Local Users' Group. Additionally, the Black Rock Reservoir sensitivity analysis documented in Appendix V of the *Draft TC & WM EIS* considers increased water flux into the model due to the construction of a reservoir just west of Hanford. This analysis serves as a surrogate for increases in water flux that could occur over the period of analysis.

509-23 A simplifying assumption was made that there is no hydraulic connectivity between the unconfined aquifer and any existing confined aquifers. It is likely that some interaction between unconfined and confined aquifers exists. However, the availability of data that describe the locations, sizes, and water flux amounts between the aquifers is not sufficient to encode these features into the model. This simplifying assumption should not bias the EIS analysis, and is, therefore, believed to be reasonable in light of the uncertainty related to this feature.

509-24 The *Draft TC & WM EIS* did not include groundwater extractions from past, current, and future remediation activities in its analysis. These extraction activities were not included in the full Base Case analyses, but are part of this *Final TC & WM EIS* due to the relative duration of these activities when compared with the 10,000-year period of analysis. However, in response to this and similar comments, Appendix U of this *Final TC & WM EIS* has been revised to include an analysis of groundwater contaminant containment and removal activities. More generally, Chapter 7, Sections 7.1 and 7.5, of this *Final TC & WM EIS* have been revised to include a more detailed description of past, current, and planned mitigation activities.

509-25 As described in Appendix L, Section L.7, of the *Draft TC & WM EIS*, river conductance, mountain-front recharge head and conductance, flow storage properties for material types, and hydraulic conductivity properties for material types were considered adjustable calibration parameters. Section L.7 includes a discussion of each of these adjustable calibration parameters. Natural recharge was specified by the *Technical Guidance Document* (DOE 2005) and was, therefore, not considered an adjustable parameter for either the flow model or the transport model calibrations. A simplifying assumption was made that there is no hydraulic connectivity between the unconfined aquifer and any existing confined aquifers. It is likely that some interaction between unconfined and confined aquifers exists. However, the availability of data that describe the locations, sizes, and water flux amounts between the aquifers is not sufficient to encode these features into the model. This simplifying assumption should not bias the EIS analysis and is, therefore, believed to be reasonable in light of the

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

12

(4) Page O-31, Section O-2 Final Conclusions: Due to different map scales and concentration scales, it is extremely difficult to compare the plumes in Fig. O-3 and O-4 to Fig. O-5 and O-10 in a meaningful way. There is also no discussion or comparison of what other parameter set results were like. Tables O-2 and O-3 are not useful and should be replaced with a simplified 1-page table that describes the calibrations ranges. A general discussion of the calibration findings should be added. In addition, the parenthetical phrase at the end of the second bullet highlights the shortcomings of an approach that does not reflect ongoing remediation. This suggests that once the expanded 200 ZP-1 pump and treat system is operational, simulated flow and transport to the north will be entirely unrealistic. **509-48**

(5) Page O-31, Section O-3—The tables of results are sometimes difficult to understand. For example, we compared peak tritium values from Table O-6 to Tables O-12, -15, and -18. All peaks were simulated to occur prior to the year 2000. The peak tritium values for alternative 1 were slightly different than those in all the other tables. Granted the differences were not large, but why were they different at all? Related to this, it is unrealistic to report these peak concentration values using 8 significant digits. Two significant digits would be adequate for comparison to other alternatives. **509-49**

(6) Figures O-11 through O-12—Unless we do not understand these figures correctly, the simulated chromium plume is in no way comparable to the observed plumes shown in Fig. S-6 of "Hanford Site Groundwater Monitoring for Fiscal Year 2005" report. Likewise, for the I-129 and Tc-99 maps. **509-50**

(7) Section O.6.3, K_d sensitivity—It is unrealistic to assume uniform K_d values are applicable to the entire site. It is often the variation in K_d values between different types of sediments that leads to substantially different transport times and peak concentrations. Page U-10 states that a K_d of 0.6 was used for uranium. Uranium has been studied extensively at Hanford, especially in the past few years regarding the mobility, and the conclusion is consistent with non-Hanford studies. The conclusion is that uranium does not behave with a single K_d. The fact that this value of 0.6 was set forth in the DOE 2005 Technical Guidance Document for this EIS does not mean that it is the correct number. There are other modeling results presented in this EIS which are different than the collective conclusion of many other specific technical studies done at Hanford, such as future plutonium concentrations in groundwater at the Columbia River. When faced with the decision to use the modeling parameters in the DOE 2005 Guidance Document vs. the best available technical and scientific information, DOE should use the latter and explain use of alternative sources of information. As discussed in our April meeting, the final EIS should include more clarifying information on selection of model parameters, such as K_d and infiltration rates, and associated uncertainties. **509-51**

(8) Page U-10 states "Uranium-238 and total uranium simulation results show higher impacts resulting from large discharge facilities in the 200-East Area (e.g., B Pond) than actually observed." This page also states "the prediction of the uranium-238 and total uranium contaminant plumes for large non–*TC & WM EIS* sources should be considered an overestimate of the actual impacts by about an order of magnitude." This paragraph, which discusses the model results, should provide a specific reference to the model calibration discussion wherein should reside an explanation for why this order of **509-52**

uncertainty related to this feature. Therefore, this feature was not considered an adjustable parameter for either the flow model or the transport model calibrations. DOE acknowledges the question regarding whether there are other appendices where the flow model results are verified by transport simulation results. The groundwater transport model (particle tracking) parameter estimation and sensitivity analysis is described in Appendix O, Section O.2.

509-26 The Monte Carlo optimization as described in Appendix L, Section L.9, of the *Draft TC & WM EIS*, was performed because the hydraulic conductivity value uncertainties were not well estimated in the gradient-based calibration. Section L.9 of the Draft EIS further states: "To further understand the behavior of the flow model to changes in the hydraulic conductivity parameters, a Monte Carlo optimization and uncertainty analysis was conducted on the groundwater flow model."

Extensive tests were run to check the sensitivity of the particle tracking code to parameter changes. See Appendix O, Section O.2.6, for a description of this analysis. Regarding the basis for selecting the final Base Case and Alternate Case flow models, the technical approach to down-selecting from thousands of flow model run cases to a single Base Case and a single Alternate Case applied the *Technical Guidance Document* (DOE 2005) guidance regarding easterly versus northerly flow direction and included an objective Monte Carlo analysis of the root mean square error resulting from changes to hydraulic conductivity values; it also included an objective evaluation of the MODPATH particle pathlines representing a tritium release. DOE agrees with the comment that, although the Base Case and Alternate Case hydraulic conductivity parameter values are different, they are essentially equivalent for the predominant material types at the site.

509-27 Although a single Base Case flow model (with a specific set of hydraulic conductivity values for the 13 material types) was selected for use in the *Draft TC & WM EIS* analysis, thousands of model runs were evaluated prior to selecting the Base Case. The Monte Carlo optimization and uncertainty analysis, as described in Appendix L, Section L.9, evaluated over 6,000 Base Case model runs, with each model run having a different set (within a reasonable range) of hydraulic conductivity values for each of the 13 material zones. The Monte Carlo analysis results were used to narrow the field of model runs down to a smaller set of 26 Base Case model runs, which had the lowest amount of error when model-simulated heads were compared with historical field-observed heads across the

13

magnitude error in the model was deemed acceptable rather than refining the model to better match actual data. The final EIS should include more clarifying information on uranium simulation, calibration, and predicted impacts to reflect on site experiences with uranium contamination and related impacts. **509-52 cont'd**

(9) Page O-112, third paragraph—Although uncertainty in many aspects of the flow and transport modeling was recognized and analyzed with various degrees of quantification, an "accurate assessment of uncertainty in the model" results for even the short-term was not quantified. All that can be said is that there is "a lot" of uncertainty. **509-53**

Models used in the DEIS analysis are complex and associated with large degrees of uncertainties, particularly about how waste moves in the vadose zone and interact with groundwater (p. S-96). For example, Fig. 2-91 shows human health risk from drinking groundwater under Alternative 6B (Option Cases), but it is not clear how much of the future risk presented in the figure is the result of contamination already in the groundwater vs. how much risk would be expected from continued contaminant loading to the vadose zone by the proposed actions. Impacts resulting from residual waste left in place are also not considered in Fig. 2-91. That process is seen throughout the EIS volumes. Pages R-22 to R-23 state that cleanup and protection of groundwater are among current and future DOE activities at Hanford, but results for all alternatives analyzed in the DEIS (Chapter 5) consistently show a failure to protect groundwater. **509-54**

Secondary Waste

The DEIS indicates that secondary waste would be waste that is generated from other activities, e.g., waste retrieval or waste treatment, that is not further treated by the WTP or supplemental treatment facilities, and includes liquid and solid wastes (p. S-89). Secondary waste can also be characterized as low-level radioactive waste, mixed low-level radioactive waste, transuranic waste, or hazardous waste.

Under the Preferred Waste Management Alternative, secondary waste from proposed actions would be disposed of in IDF-East only, supplemented by disposal at the River Protection Project Disposal Facility (RPPDF) (Table 5-75). As a result, the waste disposed of in these two facilities would become available for release to the environment. Groundwater transport results show that waste disposals that include secondary waste would cause significant exceedances of groundwater quality standards for I-129 (1 pCi/L) and Tc-99 (900 pCi/L) at the core zone boundary and Columbia River nearshore (Table O-36 through 47). Exceedances for I-129 would range from 7.4-14.5 pCi/L at the core zone boundary and 4.6-7.2 pCi/L at the Columbia River nearshore. Those for Tc-99 would range from 238-23,882 pCi/L at the core zone boundary and 786-6,708 pCi/L at the Columbia River nearshore. **509-55**

We are also concerned that while release of radionuclides from an immobilized low activity waste (ILAW) glass disposed in landfills would be relatively low, the major release impact of the ILAW treatment would be associated with secondary wastes, including the release of I-129 (S-90). It is also possible that secondary waste from supplemental technologies, such as

model domain. This set of 26 of the "best" model runs was further evaluated using particle pathlines analyses.

509-28 In Appendix L of this *Final TC & WM EIS*, the reference to "relatively impermeable" has been removed from the text.

509-29 DOE agrees with the comment regarding the need for a more detailed discussion of the MODFLOW 2000 packages used to develop the groundwater flow model. In response to this and similar comments, Appendix L of this *Final TC & WM EIS* has been revised to include this additional discussion.

509-30 Figure L–16 in Appendix L of this *Final TC & WM EIS* is intended to represent the Columbia and Yakima River reaches and river-head control points. Figure L–16 has been revised to show the western/southwestern boundary of the model domain.

509-31 Appendix L of this *Final TC & WM EIS* has been revised to expand the groundwater flow model gridding discussion to include factors (other than top of basalt in Gable Gap) that were considered as part of selecting model cell size. It should be noted that, for groundwater transport analysis purposes, source areas are modeled at their actual locations and at their actual sizes. The *TC & WM EIS* groundwater modeling methodology retains the utility to model sources at their actual locations and sizes although the flow model only models flow conditions (heads and velocities) to a resolution of 200 meters by 200 meters in the horizontal plane.

509-32 Yes, natural area recharge is applied in the flow model throughout the 10,000-year period of analysis.

509-33 A reasonable approach to assigning hydraulic properties across the model domain could be to use effective parameter values as noted in this comment. Another reasonable approach to assigning these properties is the method used in the *Draft TC & WM EIS*, which assigns hydraulic properties to each material type consistently across the model domain no matter where that material type occurs. Either of these approaches represent only approximations of the real world due to the uncertainty of the available data and their interpretation. DOE believes that assigning Hanford sand the same name with the same hydraulic properties no matter where it occurs in the model is the simplest and most straightforward approach to encoding the model with these data, and also the easiest approach to communicate to the EIS audience. Therefore, because the *TC & WM EIS*

14

steam reforming and cast stone, would contribute substantial releases of I-129 and Tc-99 to the environment. Modeling results presented in Tables 5-77 through 88 indicate that because of steam reforming supplemental technology, for example, maximum COPC concentrations in the peak year would exceed the standards for Tc-99 by as much as 30,100 pCi/L at the IDF, 24,800 pCi/L at the core zone boundary, and 7,610 pCi/L at the Columbia River nearshore. For I-129, corresponding exceedances would be 24 pCi/L at the IDF, 16 pCi/L at the core zone boundary, and 8 pCi/L at the Columbia River nearshore.

509-55 cont'd

Recommendation:

- *We recommend that the final EIS include a discussion of treatment methods to reduce the amount of COPCs, especially Tc-99 and I-129, in secondary waste and to stabilize the remaining waste such that contaminants would be resistant to leaching.*

Tribes

Information in the DEIS indicates that conditions on the Hanford Site affect resources important to the Wanapum Tribe, Confederated Tribes and Bands of the Yakama Nation (or YN), Nez Perce Tribe, Confederated Tribes of Umatilla Indian Reservation (or CTUIR), and to some extent the Confederated Tribes of the Colville Reservation upstream, particularly groundwater and surface water quality, fisheries, and on-site cumulative risks. While we note that DOE communicated with the Tribes, it is not clear, how the issues raised by the tribes were resolved. Of great concern to most affected tribes is the radiological exposure scenario used in analyzing tribal health risk assessment and DOE's assumption of Hanford site ownership that affected tribes consider too long for their restricted site use.

Some of the Tribes, such as the Yakama Nation and CTUIR have developed exposure scenarios for risk assessments for use at Hanford that DOE agreed to use. Their scenarios reflect tribal natural resource usage patterns, including fish consumption as well as on-site traditional activities. Because DOE's current land use plan is a flexible short-term plan, and longer-term use is unpredictable, the risk assessment in the DEIS should use an appropriate tribal exposure scenario as one of the reasonably foreseeable land uses and analysis scenarios. Even if future site land uses remain unclear, tribal scenarios could provide information that the tribes need. The CTUIR, for example, believes that the scenario that DOE developed underestimates tribal risks roughly 10-fold because the scenario does not reflect actual tribal site usage patterns.

509-56

The DEIS indicates that because of proposed actions, serious long-term impacts to aquatic biota/salmonids would occur due to potential contaminant releases to groundwater on aquatic and riparian resources at the Columbia River (Table 5-172). That impact would be about 21-22 times above the standards for, for example, chromium. During the year of peak dose, this receptor would receive a radiological dose of 3.4 rem and a Hazard Index greater than 1, all of which would be in excess of regulatory limits and chemical exposures. Tribes believe that the radiological risk evaluation by DOE underestimates tribal exposure to radionuclides. For example, the CTUIR consider estimated risks to be about 10 times less than they would be if the tribe's exposure scenario was used. Their scenario can be found online at www.hhs.oregonstate.edu/ph/tribal-grant-main-page.

Consistent with the National Defense Authorization Act that required DOE to develop a future land use plan for at least the next 50 years, DOE completed the Hanford Comprehensive

groundwater flow model achieves a reasonable head calibration when model-simulated heads are compared with field-observed head values, and the *TC & WM EIS* transport model achieves a reasonable transport calibration when the model-simulated tritium plume is compared with the field-observed tritium plume in terms of extents, concentrations, and timing for reaching the Columbia River, DOE prefers this more-simple and straightforward approach to assigning hydraulic properties.

509-34 The highly conductive material is generally not called out in the stratigraphic data from borehole logs. Information is available regarding hydraulic conductivity values determined from aquifer pumping tests. These results are shown in the *Draft TC & WM EIS*, Appendix L, Figure L–53, and related text in Section L.10.1. Additionally, it is known from head observation data that the water table is essentially flat through Gable Gap and across the eastern parts of, and to the east and southeast of, the 200-East Area. Finally, it is generally agreed that cataclysmic flooding in the region created a paleochannel where older material was removed and new high-energy material deposits were made in these areas of the site. These data and information, along with input from the Technical Review Group, the Local Users' Group, and professional judgment from the modeling team, led to the conclusion that there must be a zone of highly conductive material at or near those locations where the *TC & WM EIS* model has this material type encoded. Appendix L of this *Final TC & WM EIS* has been revised to expand the discussion of the technical approach to identifying and encoding the highly conductive Hanford gravel into the model.

509-35 Appendix L, Section L.5.2, is intended to describe how the time-stepping/stress periods are divided up during the model simulation. The initial stress period of 4 years (1940–1943) is intended to transition the model from the initial condition as described in Section L.5.4 to the transient part of the model simulation, where time-varying anthropogenic water fluxes are applied to the model. This is a point that has been clarified in this *Final TC & WM EIS* by revising the second sentence of Section L.5.2 as follows: "In addition to the model preconditioning described in Section L.5.4, Initial Head Distribution, the model is further preconditioned by simulating the years 1940 through 1943..."

509-36 For the Base Case model, total flux of water in and out of the model domain over time is shown in Appendix L, Figure L–55, of the *Draft TC & WM EIS*. Natural and anthropogenic recharge water flux into the model domain is on the order of a few times 10^7 during the Hanford operational period and settling to about

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

15

Land Use Plan EIS in 1999 (p. 3-7). With proposed actions, however, tribes are concerned that DOE would extend that initial site control period of 50 years to 10,000 years i.e., through year 11940 (pages 5-3, 5-2, S-57) or indefinitely (p. Q-31). Tribes want the Site use restriction lifted sooner rather than late after cleanup is complete and assurance of safe use.

Recommendations:

- *We recommend that the final EIS should include a discussion on how issues raised by the Tribes during consultations with DOE were addressed, especially regarding impacts to water resources – quantity and quality, land use and radiological exposure. Please note that some of the affected Tribes have developed plans for their own water quality standards and radiological exposure risk scenarios that may be relevant when addressing impacts to their water resources and subsequent human health impacts. As an example, EPA recently approved new water quality standards for the CTUIR that changed their fish consumption rate of 6.5 grams/day to 389 grams/day. The tribal radiological exposure scenario used in the DEIS should therefore be revised to reflect the new 389 grams/day fish consumption rate. Under separate correspondence, we are sending you a copy of these EPA-approved water quality standards.*

509-56 cont'd

Land Use

Section R.3 discusses historical use of the Hanford site. Notable are tribal residential and seasonal use and non-tribal uses, including residential, agricultural, commercial, industrial, and wildlife protection areas. In contrast to the reality of historical actual land uses at Hanford site and uses the site has and can successfully support, section R.4 discusses future land use at Hanford site as constrained by DOE's current Comprehensive Land-Use Plan (CLUP), which does not consider reasonably anticipated future land uses.

Recommendation:

- *The final EIS should revise wording in the document (e.g. on page Q-31) so that it does not assume that DOE will retain long term or permanent control of the site.*
- *Because the DEIS states that implementation of proposed actions would comply with both CERCLA and RCRA requirements (Appendix R, p. 6), we recommend that the final EIS discuss future land uses at Hanford site using EPA Guidance on Land Use in the CERCLA Remedy Selection Process and Reuse Assessments: A Tool to Implement the Superfund Land Use Directive (http://www.epa.gov/superfund/policy/remedy/sfremedy/landuse.htm). Unlike the CLUP, CERCLA cleanup and subsequent land use decisions consider both past and reasonably anticipated future land uses the Hanford site could support. We believe that such uses should be consistent under both programs – CERCLA and CLUP. One important difference between the two programs is that the DEIS currently assumes that DOE would control the site indefinitely, whereas the CERCLA program would not.*

509-57

Human Health Risk Analysis

(1) Radiological exposure risk analysis

1×10^7 after the Hanford operational period. Due to this and other comments received regarding water flux values in and out of the flow model, this *Final TC & WM EIS* includes three new tables in Appendix L (L–17, L–20, L–24) that discuss water flux from sources in the west and volumes that pass through Umtanum Gap, Gable Gap, and east to the Columbia River.

509-37 See the *Draft TC & WM EIS*, Appendix L, Section L.8, for a complete discussion of the results of the parameter estimation module calibration and the shortcomings identified with that analysis. In summary, the parameter estimation module-defined upper and lower confidence limits for the hydraulic conductivity values were considered unreasonably narrow for a primary purpose of this *TC & WM EIS*, which is to adequately describe the uncertainty of the groundwater flow model with respect to the parameters. Therefore, after it was demonstrated with calculations that the objective function does not vary smoothly with parameter variations as described in Section L.8, the Monte Carlo optimization and uncertainty analysis was performed as described in Section L.9.

509-38 DOE disagrees with the comment that there is no uncertainty analysis completed for the transport model. An extensive evaluation of the sensitivity of the transport model to varying transport parameters is included in Appendix O, Section O.2.6. This analysis represents DOE's acknowledgement that there is uncertainty associated with the selection of contaminant transport parameters and, thus, the selected parameters should produce results that best fit the field-observed conditions.

509-39 DOE agrees with the commentor's observation that many of the flow fields developed for the *Draft TC & WM EIS* analysis could be considered acceptable. The flow field that was selected for the Base Case met the following criteria (in sequential order of application): (1) the flow field was in the lowest 2 percent of root mean square error (i.e., among those most in agreement with historic water levels); (2) the flow field produced a tritium plume originating from the 200-East Area (PUREX plume) whose first arrival time at the Columbia River was within 10 years of the measured value, whose peak values were within an order of magnitude of the measured peak values, and whose aspect ratio (length versus width of the plume) was within 25 percent of the measured aspect ratios; (3) the flow field produced a tritium plume originating from the 200-West Area (REDOX plume) whose peak values were within an order of magnitude of the measured peak values, and whose aspect ratio was within 25 percent of the measured aspect ratios. The process was repeated for the Alternate Case (with the higher top of basalt). For both the Base and Alternate Cases, approximately 20 of the flow

16

Figure 2-91 presents human risk from drinking groundwater under alternative 6B (Option Case), wherein all SSTs are clean closed as defined by the DEIS, as are the six sets of cribs and trenches. It might be assumed that under these actions, groundwater loading from residual contamination in the soil left behind would be minimal (i.e. "protective of human health"). It would be informative to the DEIS reader to add a risk reduction curve for existing groundwater inventory with no future vadose loading. This new figure would provide perspective of how the alternatives impact groundwater over time vs. residual risk in the groundwater not resulting from the EIS scope alternatives. Otherwise, the reader cannot tell how much of the future risk presented in Figure 2-91 (and other future risk figures) is the result of contamination already in the groundwater vs. how much risk is the result of continued loading from the vadose zone because of different EIS alternative actions. **509-58**

Section K.1.1.1.4 discusses radiation protection guides. Most of what is presented, however, is non-enforceable (guidance, recommendations). Only a few of the regulations are mentioned, and none of the laws. This section should be expanded to be consistent with Table 8.1 that lists potentially applicable legal and other requirements. Please note that the CERCLA cancer risk range of 1 in 10,000 to 1 in 1,000,000 would be more stringent than the 100 mrem/year standard used in this DEIS, which is missing from Table K-1. The 100 mrem/year dose limit used in this EIS for the 70-year exposure scenarios would be a lifetime cancer incidence risk of nearly 7 in 1,000, which is much worse than the acceptable CERCLA risk range. EPA has recommended not using dose based recommendations for CERCLA cleanup levels because of the inconsistency with risk based cleanups (see "Radiation Risk Assessment at CERCLA Sites: Q&A" at http://www.epa.gov/superfund/health/contaminants/radiation/pdfs/riskqa.pdf). *EPA therefore recommends DOE use the CERCLA cancer risk range and update the discussion in the final EIS accordingly.* **509-59**

Section 6.4.2 describes one of the receptor scenarios as a resident farmer. The DEIS explains that the scenario assumes that the garden and crops provide about 25% of the resident farmer's crop and animal product needs. That scenario is different from scenarios used in CERCLA decision documents for the river corridor. The Washington State Model Toxics Control Act (MTCA) B (residential) cleanup regulations do not have any consumption of produce from the site, but do have an exposure duration of 6 years (WAC 173-340-740 equations 740-4 and 740-5). The CERCLA cleanup process considers other applicable or relevant and appropriate requirements including those from the state and thus MTCA provided residential cleanup standards for chemicals have been used for the non-radionuclide cleanup levels in Hanford CERCLA documents. For radionuclides, which aren't covered by MTCA, the CERCLA cleanups have used a rural residential farmer / unrestricted exposure scenario in which 100% of the resident's food is grown on-site and the exposure duration is 70 years ("Remedial Design Report / Remedial Action Work Plan for the 100 Area", DOE/RL-96-17, Revision 6, dated October 2009, table B-8; and Remedial Design Report / Remedial Action Work Plan for the 300 Area", DOE/RL-2001-47, Revision 3, dated December 2009, table B-8b). *EPA recommends DOE consult these and other documents and compare the resident farmer scenario used in the DEIS to the rural residential farmer and the MTCA residential cleanup scenarios found in Hanford CERCLA RODs; note differences between scenarios; highlight the scenario with lowest cancer risk; and update the final EIS with any new information reflecting the scenario that would be more protective of human health.* **509-60**

fields (among the roughly 15,000 examined) met these criteria, and, in DOE's view, satisfactorily matched both water level and concentration measurements taken in the field.

Examining these flow fields in terms of flux through Gable Gap revealed two ranges of fluxes for both the Base and Alternate Cases, and indeed these ranges had a significant overlap. This result strongly suggests that, within the set of calibrated models that were examined, some uncertainty remained regarding the percentage of flow north through Gable Gap relative to the percentage of flow to the east. One of the purposes of this *TC & WM EIS* was to compare long-term impacts among the alternatives, and to demonstrate, to the degree feasible, how the comparison might be affected by uncertainties in the modeling. The amount of flow north through Gable Gap relative to the amount of flow east was a significant uncertainty, even among the well-calibrated models. To bracket the uncertainty, DOE chose two cases from among the roughly 40 well-calibrated models: one with the largest percentage of flow to the east (the Base Case) and one with the largest percentage of flow to the north (the Alternate Case). In comparing among the alternatives, Appendix L demonstrates that, for releases in critical areas, key metrics are not strongly affected by the difference between the Base and Alternate Cases. These include general shapes and locations of plumes predicted in 2005 versus field measurements; peak concentrations of plumes; concentrations versus time at the barriers, Core Zone Boundary, and Columbia River nearshore; and areas of plumes above the MCL. DOE agrees with the commentor's observation that, for the purposes of comparing among the alternatives, there is little objective preference for the chosen Base Case flow field or Alternate Case flow field. DOE's view is that the analysis of the differences among the long-term impacts can be elucidated even in light of the uncertainty regarding the relative amount of flow to the north versus flow to the east.

509-40 The commentor has correctly identified a key difficulty with the determination of soil hydraulic parameters. Additional assumptions, which were thought to be obvious assumptions, were required to arrive at a set of usable parameters consistent with observations at the site. An enhanced discussion of the soil parameterizations appears in this *Final TC & WM EIS*. The infiltration is indeed prescribed by the *Technical Guidance Document* (DOE 2005), thus the unsaturated hydraulic conductivity was set to the recharge flux as indicated by the commentor. The saturated hydraulic conductivity and saturated moisture content were set consistent with the saturated zone parameterizations. The remaining

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

17

Under Section 6.4.2.1, the DEIS discusses potential human health impacts. The dose to risk calculation should be checked for accuracy, and explained. The DEIS states that for the period prior to CY 2000, lifetime radiological risks for the year of peak risk at the core zone boundary and Columbia River locations were high, approaching unity. For the period after calendar year 2000, risks remain high, with values between 1×10^{-3} and 1×10^{-2}. The estimated off-site population dose of 215 person-rem per year for the year of peak dose is about 0.01 percent of the average background dose for the population. The EIS doesn't state what the risk numbers 1×10^{-3} and 1×10^{-2} refer to. The reader may guess these refer to lifetime incremental cancer risk, which is a common expression of the principal risk from radionuclides, namely the probability of cancer. The EIS provides a comparison to background, but doesn't explain what background value is used. At the time the DEIS was started, average background radiation dose for the population was generally considered to be about 0.360 rem/year. Converting background radiation to risk, 0.360 rem/year, for a 70 year exposure scenario, times 0.0008 cancer incidence per rem, equals 2×10^{-2} (two in 100) lifetime incremental cancer risk due to background radiation for the 70 year exposure scenarios in this EIS. The figure from the DEIS, 0.01 percent of the background (which was just calculated to be about 2 in 100), would give an incremental cancer risk increase of 2×10^{-6} which clearly is not between 1×10^{-3} and 1×10^{-2} as stated in the DEIS. Please note that, due to due to increased medical exposures, the new National Council on Radiation Protection (NCRP) and Measurements Report 160 (http://www.ncrponline.org/Publications/160press.html) has updated the background radiation dose to be 0.62 rem/year. *The final EIS risk calculations should therefore be checked for accuracy and be update with the new NCRP background dose.*

Under section 6.4.2.1, the DEIS states that for the period after calendar year 2000, risks remain high, with values between 1×10^{-3} and 1×10^{-2} and that the estimated offsite population dose of 215 person-rem per year for the year of peak dose is approximately 0.01 percent of the average background dose for the population. It was not clear how the risk range was determined, and the peak year dose gives a false estimate that the high risks are only 0.01 percent of the average background dose for the population. *The final EIS should explain how the risk range and related peak dose were obtained.*

Incremental health risk is the increased risk that a receptor (normally a human being living nearby) will face from (the lack of) a remediation project. The use of incremental health risk is based on carcinogenic and other effects and often involves value judgments about the acceptable projected rate of increase in cancer. In some jurisdictions, this is 1 in 1,000,000 but in others, the acceptable projected rate of increase is 1 in 100,000. A relatively small incremental health risk from a single project is not of much comfort if the area already has a relatively high health risk from other operations like incinerators or other emissions, or if other projects exist at the same time causing a greater cumulative risk or an unacceptably high total risk.

509-61

When explaining MEI, it is said "this person is assumed to be exposed to radionuclides in the air and on the ground from Hanford emissions, ingest locally grown food irrigated with water from the Columbia River downstream from Hanford, ingest fish from the Columbia River, and use the river for recreation." This statement is true, but excludes consumption of dairy products (p. 3-88, 89). *Because of their influence on risk of exposure to Iodine isotopes, we recommend that dairy products be included in exposure risk calculations.*

509-62

two parameters, shape parameters, were estimated by observing moisture profile behaviors in the vicinity of material interfaces or, in some cases, by adapting parameters for texturally similar materials on site. This need for the assumptions, relating to the uniqueness of parameter sets, is a primary motivation in additional calibration relative to plume concentration matching. The practical goal of the parameterization was consistency with observations at the site.

509-41 The development and application of the particle tracking method to evaluate contaminant transport for this *TC & WM EIS* is discussed in Appendix O, Section O.2, of the *Draft TC & WM EIS*. This discussion includes references to numerous open literature publications and to information regarding any modifications or additions made to the particle tracking code, as applicable, to this *TC & WM EIS*.

509-42 In response to this and similar comments, Appendix O has been revised in this *Final TC & WM EIS* to include presentation of the spatial and temporal fluctuations in the predicted concentration field. In addition, the data presentation in figures in Chapters 5 and 6 and Appendix O has been revised to more clearly represent the range in predicted concentrations.

509-43 In response to this and similar comments, Appendix U of this *Final TC & WM EIS* has been expanded to clarify the purpose and results of the comparison of modeled results to measured results for the current timeframe, as well as the relevance of this comparison to the comparative analysis required under NEPA. Finally, Appendix O has been revised to more clearly present uncertainties in the groundwater modeling and the response of the models to those uncertainties.

509-44 Regarding quantification of the uncertainties in the groundwater modeling system, DOE's view is that, for a comparative analysis (required under NEPA), predictions of long-term impacts that are differentiated by one or more orders of magnitude in concentration should be considered significant by stakeholders and decisionmakers. The discussions in the *TC & WM EIS* Summary and Chapters 2 and 5 of this *TC & WM EIS* are all consistent with this view. In Appendix U, comparisons are made between model predictions of current concentrations and measurements of current concentrations. In response to this and similar comments, this discussion has been amplified in this *Final TC & WM EIS* to assist the reader in evaluating the precision and accuracy of the groundwater modeling system.

18

At what temperature will the waste be when retrieved from tanks? If the temperature of the waste will be above 100° C, then all radionuclides in tank waste should be considered gases in accordance with the Clean Air Act (see 40 CFR 61, Subpart H-Appendix D). If that was overlooked, *we recommend that the final EIS verify whether air emissions resulting from radionuclide gases would generate doses that could exceed regulatory limits.* **509-63**

Over the life of the project, there will be an annual average dose of 0.13 mrem (p. 4-132). If all of it were air emissions from 200 Area activities and vented with one stack, this would be considered a major stack for rad emission and will be subject to continuous monitoring. *We recommend that the final EIS include a brief description of sampling and monitoring plans for air emission units that could be present on site during implementation of proposed actions.* **509-64**

Some dose assessment data presented in Section 5.1 show expected doses that are much higher than the average annual dose (360 mrem/year) for a regular citizen. *The final EIS needs to clarify whether calculated doses are ALARA (as low as reasonably achievable) or not, and measures that will be taken to lower higher doses for the receptors.* **509-65**

Tables 5-10 through 5-15 show that expected doses at peak year are generally three or four times higher for Native Americans compared to another individual near the site. *The final EIS should include the rationale used in developing the module for Native Americans and reasons for high doses in their dose assessment. Also, please note that cumulative doses are missing for all members and they should be included in the final EIS.* **509-66**

Iodine-129 is a gas when emitted from the tanks. DOE claimed in p. K-25 that "a second screening analysis was done that assumed that the air treatment system removed 99% of the I-129." For purposes of estimating air emissions, all gaseous radionuclides are released in their entirety or 100%. By assuming 99% removal rate, DOE may have significantly under-estimated doses from I-129. *The final EIS needs to review the list of radionuclides considered to be gaseous under the Clean Air Act and ensure that assumptions used are accurate, and explain which air treatment systems would be used to achieve such high I-129 removal efficiency.* **509-67**

Section K.2.1.1.4 describes the approach used in determining annual emissions i.e., using an annual average and indicates that the method can result in the peak impact spanning a number of years rather than occurring in a single year. We are concerned that that approach may not be realistic since it would not give the worst case scenario for resultant doses. It is also not possible to know whether doses would exceed regulatory limits or not. *The final EIS should address these issues and demonstrate that the doses would not exceed acceptable limits because of proposed actions.* **509-68**

Table Q-9 listed an indoor dust filtration factor of 1. Since normal HEPA filter efficiencies range from 99 - 99.5%, *the final EIS should indicate which filters were used and how they were able to filter all contaminants from the air.* **509-69**

Much of the risk discussion in Chapter 5 and Appendix U is provided as unitless measures of risk. Other than the Hazard Index, which is unitless, but has meaning relative to a value of 1, the remaining risk numbers appear meaningless to the EIS reader and cleanup decision-makers. *The final EIS should include appropriate risk measure units; risk calculations that are a "lifetime incremental cancer risk" should be so marked, and other risk numbers should be appropriately labeled.* **509-70**

(2) Air quality impacts

509-45 Graphs of concentration as a function of time are provided for all of the alternatives in Chapter 5 of this *TC & WM EIS*.

509-46 DOE agrees with the commentor that, as used in the context of Appendix O, the units of flux should be expressed in units of mass (or quantity of radioactivity) per time. Appendix O and its figures have been revised to refer to the integrated flux released from STOMP in terms of curies per year or grams per year.

509-47 It should be noted that among the primary human health and ecological risk drivers driven by the groundwater pathway, risks from technetium-99 and iodine-129 are dominant during the majority of the period of analysis, and that both are conservative species. It should also be noted that, to first order, the primary differentiating factor between conservative species (e.g., iodine-129 and technetium-99) and non-conservative species (e.g., uranium-238, the third-most dominant risk driver that is important in the later time period of analysis [roughly after calendar year 7500]) is the retardation factor. The net effect of retardation is that non-conservative species follow the same transport pathways, but at a slower rate than the pore water velocity. This makes these species relatively unsuitable for calibrating a regional-scale transport model with data spanning a 60-year period. The reason the tritium, iodine, and technetium plumes are useful for calibration of the regional-scale transport model is simply that these plumes have sampled a large portion of the unconfined aquifer, from the 200-East Area southeast to the Columbia River; from the northern part of the 200-East Area into Gable Gap, and across the majority of the 200-West Area. A secondary reason is that the source terms (inventories and release histories) of these constituents are relatively well constrained.

509-48 The data presentation in Chapter 5 and Appendix O has been revised to provide greater clarity. The discussion in Chapter 7, Section 7.5, has been added to highlight the importance of groundwater containment and contaminant removal as a short-term mitigation strategy.

509-49 The data presentation in Chapters 5 and 6 and Appendices N and O has been revised to remove rounding artifacts, reflect the actual precision of the calculation, and address this comment.

509-50 The discussion in Appendix O, Section O.6.1 (which includes Figures O–35 through O–42), is intended to describe a comparison between the Base Case and Alternate Case flow models, and draws the conclusion that the results from both flow models are similar during the operational period. This section in

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

19

For better protection of public health from air pollution exposure, EPA has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants or criteria pollutants (see http://www.epa.gov/air/criteria.html) that should be used to determine if emissions from a project would exceed daily and annual standards. Any projects that would generate emissions exceeding the standards would have to include measures to demonstrate that, if implemented, the project would comply with both state and federal air quality regulations.

Even though background concentrations of criteria pollutants at Hanford are currently below the standards (Table 3-3), it is likely that emissions within the project area could exceed the standards because of proposed actions. As the DEIS noted, particulate matter (PM) concentrations in eastern Washington can change suddenly and reach higher levels due to extreme natural events such as dust storms and large brush fires. On a windy day in 2005, for example, monitoring values for PM_{10} exceeded the 24-hour standard (p. 3-26). Air quality may also be impacted due to management of radioactive waste, dust from road construction and site operations, quarrying, regular traffic on dirt roads, emissions from vehicles, and cumulative impacts from surrounding activities such as agriculture and fire. Of particular concern is the consistent detection of some radionuclides (strontium-90, I-129, cesium-137, plutonium (238, 239, 240, and 241), americium-241, and uranium-235) in air samples collected from the project area in 2006 (Table 3-5). Since data for other radionuclide emissions are missing from the table, it is not possible to determine the level of impacts that would be associated with their emissions. ***509-71***

Results of air quality modeling for the proposed actions indicate potential exceedances of NAAQS for the PM_{10} (24-hour) and carbon monoxide (1-hour) under most Tank Closure and Waste Management alternatives as shown in Tables 4-3 and 4-129, respectively. Under Tank Closure, Alternatives 2A, 3A-C, and 5 would result in incremental criteria pollution concentrations for carbon monoxide ranging from 600-17,700 $\mu g/m^3$ above the standard (40,000 $\mu g/m^3$), and these exceedances could occur over as many as 7 years under each of the alternatives. All Tank Closure Alternatives would result in exceedances of the 24-hour PM_{10} standard, with emissions over the standard (150 $\mu g/m^3$) ranging from 396 (No Action) to 4,960 $\mu g/m^3$ (Alternative 6B). These exceedances could occur over 3 years (No Action) to as many as 192 years under Alternative 6A. Although concentrations of $PM_{2.5}$ were not included in the DEIS, they could also occur at levels higher than the standards during the project life. ***509-72***

Under the Preferred Alternative for Waste Management action, incremental criteria pollution concentrations for carbon monoxide (1-hour) would exceed the standard by as much as 49,800-257,000 $\mu g/m^3$ and for 8-hour carbon monoxide by as much as 41,200 $\mu g/m^3$ (Table 4-129). Similarly, activities under Alternative 3 would also generate emissions of CO with concentrations exceeding the standards for CO (8-hour) by 41,000 $\mu g/m^3$ (disposal group 2 and 3) and for CO (1-hour) by 51,200 (disposal group 1) to 256,000 $\mu g/m^3$ (disposal groups 2 and 3), respectively. These exceedances would also last a very long time covered by the project. Although not provided in the DEIS, concentrations of $PM_{2.5}$ could also occur at levels significantly higher than the standard during the project life. ***509-73***

Mitigation measures, such as construction of a tent-like building over a portion of a tank farm during tank retrieval could provide protection to make closure less environmentally risky. Enclosures provide multiple benefits, such as containment of air releases (protection to adjacent workers, the public, and the environment to reduce short-term impacts) and environmentally sheltered work space for workers (which supports year-round work to reduce inclement weather ***509-74***

Appendix O is not intended to compare modeled results to field observations; the commentor is directed to Appendix U for that comparison. Appendix U draws the conclusion that, with the exception of several sites involving uranium and carbon tetrachloride, the modeling results predicted for calendar year 2005 are in agreement with the corresponding field measurements to within an order of magnitude. In response to this and similar comments, the discussion in Appendix U has been expanded to facilitate comparison between model predictions and field observations and provide further detail regarding those comparisons.

509-51 In general, the parameterization process for the groundwater models continues to be governed by two primary considerations: the requirement to provide an unbiased evaluation of the alternatives in the context of the cumulative impact sources (the essential point of a NEPA analysis), and the requirement to provide a technically defensible analysis that relies on documented sources. DOE's view is that a NEPA analysis is essentially comparative, and that the parameter selection process (particularly in heterogeneous and complex media) should be based on the principle of selecting the simplest parameterization that, to first order, does not conflict with field observation and allows an unbiased comparison of the alternatives. More-complex parameterization (spatially varying distribution coefficient values, for example) can actually weaken the comparative value of the analysis.

509-52 The discussion in Appendix U has been revised in this *Final TC & WM EIS* to address this and similar comments.

509-53 DOE disagrees with the commentor's assertion that "all that can be said is that there is 'a lot' of uncertainty." Appendices L, M, N, and O show numerous parameter variation exercises, and the overall uncertainty in the models versus field measurements is discussed in Appendix U. DOE's view is that, for a comparative analysis (as required under NEPA), predictions of long-term impacts that are differentiated by one or more orders of magnitude in concentration should be considered significant by stakeholders and decisionmakers. The discussions in the Summary and Chapters 2 and 5 of this *TC & WM EIS* are all consistent with this view. In response to this and similar comments, the discussion in Appendix U has been amplified in this *Final TC & WM EIS* to assist the reader in evaluating the precision and accuracy of the groundwater modeling system.

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

20

shutdowns which saves on costs and schedule). The DEIS states that containment structures are impractical due to "a large degree of uncertainty concerning the feasibility" (page S-56). However, we note that containment buildings are commercially available and being used successfully elsewhere, including by DOE at other sites. As a specific example, the so-called ARP IV enclosure over pit 5 at the Idaho National Lab is operational and is 235 x 270 ft. Section 7.1.4 also lists additional mitigation measures to reduce air quality impacts. The mitigation measures are, however, not quantified and discussed in a manner that clarifies the extent to which predicted air quality impacts and associated exceedances of applicable standards, as discussed above and further explained on p. S-103, would be minimized to meet the standards. **509-74 cont'd**

Recommendations:

- *Since the project area and surrounding areas may include sensitive populations such as the elderly and children, the final EIS should quantify and describe in sufficient detail measures that will be taken to reduce predicted emissions to assure NAAQS, particularly for PM and carbon monoxide, will be met by the proposed project. It will also be important to monitor air quality and take corrective action if air quality standards are not met. Monitoring strategies should be tailored to local conditions because localized air quality impacts can be substantial, even though area-wide and/or long term monitoring may show compliance with air quality standards.* **509-75**
- *The DEIS document should include separate concentrations for PM_{10} and $PM_{2.5}$ because each measure may exceed the standards, while the other might not. As of December 18, 2006, EPA promulgated the revised $PM_{2.5}$ NAAQS to protect the public from short-term fine particle exposure. Thus, the revised NAAQS for $PM_{2.5}$ should be used to help determine the significance of proposed actions' air quality impacts pursuant to 40 CFR 1508.27(b)(2) and (10), as well as when considering the need for and extent of mitigation, for all proposed actions for which NEPA decision documents, i.e., Record Of Decision (ROD) in this case, have not yet been issued. The final EIS therefore needs to evaluate potential $PM_{2.5}$ emissions that would result from the proposed actions for public review and comment; indicate whether the NAAQS for $PM_{2.5}$ would be exceeded or not; and discuss measures that would be taken to assure NAAQS for $PM_{2.5}$ would be met during implementation of proposed actions.* **509-76**
- *Because the DEIS does not include refined analysis of emissions utilizing reasonable control technologies and more-detailed construction activities (p. 2-144, 4-34, and 7-10), the final EIS should include that information so accurate air quality impacts and mitigation measures and their effectiveness can be determined.* **509-77**

509-54 The clean closure alternatives considered for the SST system are represented by the Base and Option Cases of Tank Closure Alternatives 6A and 6B. For both Base Cases, the assumption is that the SST system would be cleaned to levels that would allow for unrestricted use, which would involve removal of the tanks, ancillary equipment, and soils beneath the tanks (contaminated as a result of past leaks) down to the water table. The two Option Cases represent this type of clean closure along with removal of soils beneath the tank farms (contaminated as a result of infiltration from the contiguous cribs and trenches [ditches]). The analysis shows that removal of the contaminants from the vadose zone would not capture those contaminants that may have already reached the groundwater table due to past practices (i.e., past leaks and contiguous cribs and trenches [ditches]).

In response to comments received concerning the reader's ability to distinguish the impacts of the different tank farm sources, the figures under Tank Closure Alternative 2B in Chapter 5 were revised to split out the sources resulting from past leaks, cribs and trenches (ditches), ancillary equipment, tank residuals, and retrieval leaks.

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

509-55 As discussed in Chapter 7, Section 7.1.6, secondary-waste-form performance is a particular area of focus for DOE, especially with regard to partitioning and capture of iodine-129 and technetium-99, both conservative tracers, in secondary-waste forms. Additional sensitivity analyses have been added to this final EIS that evaluate the changes in potential impacts that might result if partitioning or recycling of some contaminants, e.g., iodine-129, could be increased into primary-waste forms and/or if secondary-waste-form performance were improved. The discussion found in Chapter 7, Section 7.5, was added to summarize these results. The results of these analyses will aid DOE in formulating appropriate performance targets for secondary-waste forms. As discussed in Chapter 7, Section 7.5.2.8, and Appendix E, Section E.1.2.4.5.6, DOE has drafted a roadmap that implements a strategy for development of better-performing secondary-waste forms.

509-56 Early stakeholder participation in the EIS planning and development process is important to DOE, and DOE has provided numerous opportunities for such

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director U.S. Environmental Protection Agency, Region 10

U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action*

Environmental Impact of the Action

LO – Lack of Objections
The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC – Environmental Concerns
EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO – Environmental Objections
EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU – Environmentally Unsatisfactory
EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 – Adequate
EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 – Insufficient Information
The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 – Inadequate
EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

interaction. Hanford-area tribes have had the opportunity to provide, and have provided, extensive input to the *TC & WM EIS* preparation process and analysis, which is outlined in Chapter 8 and Appendix C. In addition, Chapter 8 of this EIS includes a description of the outcomes of the meetings with the tribes, and a new appendix, Appendix W, describes the tribal perspective as provided by the Hanford-area tribes. DOE disagrees with EPA's recommendation to use fish consumption rates specific to the CTUIR reservation, because it conflicts with the information the tribes submitted to DOE that was used in Appendix W.

Clarification has been added to this EIS to explain the difference between land assumptions related to administrative control and the groundwater period of analysis.

509-57 The language referred to by the commentor in Appendix Q on page Q–31 of the *Draft TC & WM EIS* has been revised to clarify that DOE does not anticipate near-term loss of institutional controls of the site. DOE disagrees that use of *EPA Guidance on Land Use in the CERCLA Remedy Selection Process and Reuse Assessments: A Tool to Implement the Superfund Land Use Directive* is appropriate for the cumulative impacts analysis completed for this EIS. That guidance is used within the context of the CERCLA remedial actions being conducted under the TPA, which are not part of the scope of the proposed actions evaluated in this EIS. Appendix R, Section R.4, of this *TC & WM EIS* describes the purpose of the TPA, which is an agreement for achieving compliance with the remedial action provisions of CERCLA and corrective action provisions of RCRA. The EPA guidance takes into account reasonably foreseeable land uses that have been established for a site.

In 1999, after an extended NEPA process involving EPA and numerous other agencies as cooperating agencies, DOE issued the *Final Hanford Comprehensive Land-Use Plan EIS* (DOE 1999). Based on that EIS, DOE issued a ROD establishing the Hanford Comprehensive Land-Use Plan, which designates the various land uses for Hanford. In the same timeframe, the Hanford Reach National Monument was established by President Clinton (65 FR 37253; Presidential Proclamation 7319), which applies to portions of Hanford. In 2008, DOE issued the *Supplement Analysis, Hanford Comprehensive Land-Use Plan EIS* (DOE 2008c); this analysis was performed to determine whether there were any significant changes in circumstances or substantial new information that would affect the basis for DOE's original land use designation decisions. DOE issued an amended ROD in 2008 to clarify how DOE will continue to implement the Hanford Comprehensive Land-Use Plan, including the use of other regulatory processes such as the TPA to ensure consistency with the land-use plan. However, no significant changes in circumstances or new information substantial enough to merit preparing a supplemental EIS were identified.

This *TC & WM EIS* discusses several different types of end-state management in Chapter 2, the Glossary, and the Summary. These include administrative controls, active institutional controls, and postclosure care, as appropriate. Each of these end-state management options would take place at the completion of an action. For analysis purposes, this EIS assumed that administrative controls or postclosure care and monitoring would continue for 100 years beyond the construction, operations, and deactivation phases of an alternative. As discussed in Appendix M, closure features were assumed to fail after a period of time (e.g., RCRA landfill barriers at 500 years; Hanford landfill barriers at 1,000 years; grouted secondary-waste forms at 500 years). The failure of these systems is reflected in the impacts analysis presented in this EIS. The 10,000-year time period described in this *TC & WM EIS* represents the period of analysis used for the long-term impact analyses for groundwater, human health, and ecological risk. It does not represent the assumed period of institutional controls. For clarity, a definition of "10,000-year period of analysis" has been included in the *Final TC & WM EIS* Glossary.

It should be noted that it is DOE policy (DOE Policy 454.1, April 9, 2003) to use institutional controls as essential components of a defense-in-depth strategy that uses multiple, relatively independent layers of safety to protect human health and the environment (including natural and cultural resources). DOE would implement institutional controls, along with other mitigating or preventive measures as necessary, to provide a reasonable expectation that, if one control temporarily fails, other controls will be in place, or other actions will be taken, to mitigate significant consequences. Chapter 7, Sections 7.1 and 7.5, discuss potential mitigation measures that include developing better-engineered landfill barriers and waste-form performance, among other potential measures.

509-58 The commentor observes that risk reduction in the groundwater system as a whole has two components: reduction resulting from a decrease in loading from the vadose zone, and reduction resulting from processes in the groundwater system itself (i.e., advection, dispersion, retardation, and radioactive decay). DOE agrees with the commentor's suggestion that clear presentation of both of these components of risk reduction is of importance to decisionmakers, stakeholders, and the public. To address this comment, DOE has added analyses to this *Final TC & WM EIS* that show risk reduction curves resulting from several different degrees of reduction in the vadose zone for selected sites. The results of these analyses are presented in Chapter 7, Section 7.5, of this *Final TC & WM EIS*.

509-59 Appendix K, Section, K.1.1.4, Radiation Protection Guides, presents the documents prepared by national and international bodies on which the United States has based its radiation protection policies and standards. Section K.1.1.5, Radiological Exposure Limits, explains how these guides are used in establishing EPA standards for the public and DOE standards for workers. As the commentor notes, Chapter 8, Table 8–1, provides a broad-ranging list of laws and regulations that are potentially applicable to the implementation of an alternative evaluated in this EIS and would include permitting actions for air and liquid releases. The intent of Section K.1 is to present the criteria that are used in NEPA (not CERCLA) impact analyses.

509-60 In the NEPA process, multi-pathway exposure scenarios are needed for comparison of impacts of the EIS alternatives. The individual scenarios used in this capacity are intended to be representative of a location and lifestyle, while collectively spanning a range of plausible exposures. Both the activities and parameters used in the scenarios are based on existing reports and compilations. DOE does not agree that comparison of the NEPA scenarios to the CERCLA scenarios in other documents would provide additional value. Chapter 5 and Appendix Q present information on risk ranges for different scenarios for the alternatives. Chapter 6 presents information on risk ranges for the cumulative impacts.

509-61 Dose-to-risk calculations were reviewed as part of the quality assurance program implemented during preparation of this *TC & WM EIS*. The introductory paragraphs of Chapter 6, Section 6.4.2, state that (1) long-term human health impacts were estimated as lifetime risk of incidence of cancer, (2) background dose to an average individual is 365 millirem per year, and (3) approximately 5 million individuals live downstream of Hanford. The word "excess" has been added to the definition of risk, and identification of background dose has been clarified to not include the contribution of large doses to a small portion of the population, which would increase the estimate of background dose to 620 millirem per year. The ranges of total risk reported in Section 6.4.2 are derived from detailed results presented in Appendix Q. A sentence has been added to the introductory paragraph of Section 6.4.2 directing the reader to

Appendix Q for a detailed description of methods and results of estimation of long-term human health impacts.

509-62 This representation of doses from current Hanford operations comprises doses from all pathways, including potential doses from dairy products. This discussion was updated to reflect data from the *Hanford Site Environmental Report for Calendar Year 2010* (Poston, Duncan, and Dirkes 2011) and to indicate that ingested food was also assumed to be from locations downwind of Hanford. Note that the 2010 environmental report states that concentrations in "dairies downwind of the site are now similar to levels measured in samples obtained from the dairy generally upwind of the site."

509-63 The cited appendix of 40 CFR 61 applies to evaluations in support of applications to construct or modify facilities or notifications of startup, and not necessarily to evaluations performed under NEPA. Nonetheless, DOE has confirmed that the temperature of waste during retrieval will not exceed 100 degrees Celsius.

509-64 DOE acknowledges that if the potential for releases in excess of regulatory triggers were anticipated when facilities were built and operated, the appropriate sampling and monitoring programs would have to be implemented. This is a NEPA document, not a permitting document, so details regarding permitting are not necessary. However, the section has been modified to indicate that the site would comply with the applicable regulations and, if projected emissions so indicated, sampling equipment would be installed and monitoring performed.

509-65 Two aspects have bearing on calculated doses. First, there is some conservatism in the predicted doses presented in the draft EIS. While refinements in the approach used in this *Final TC & WM EIS* lessened the predicted doses, modeled exceedances of standards are still predicted. This is why the second aspect—the regulatory context—remains important. This EIS addresses those laws and requirements that would apply to the proposed actions, depending on the alternative. Issues concerning the ability to meet legal standards or requirements are also discussed, as are the potential mitigation measures that may be needed and are feasible for implementation by DOE. The legal standards include, in particular, ALARA, a process used instead of a specific dose limit to minimize doses to workers and the public to as far below limits as is practicable.

509-66 The higher doses for the American Indian scenario reflect the differences in the exposure parameters, as indicated in Appendix Q on pages Q–6 and Q–27 of the *Draft TC & WM EIS*. The basis for these parameters reflects higher consumption rates and participation in religious ceremonies that do not apply to non–American

Commentor No. 509 (cont'd): Richard B. Parkin, Acting Director
U.S. Environmental Protection Agency, Region 10

Indian scenarios. Cumulative impacts on the American Indian receptors are presented in Appendix U of this EIS.

509-67 DOE recognizes that iodine is one of the principal radionuclides that will require attention when implementing a selected alternative. When engineering the systems to process waste and treat the effluent, the performance assumed in this EIS will be one of the factors considered, thus silver reactors or other technology capable of capturing iodine will have to be included in the air treatment train. The second screening referred to was to determine if removal of iodine-129 changed the dominant nuclides, which it did not. A sensitivity analysis was performed to evaluate the impacts of a failure to remove iodine to the level indicated. This sensitivity analysis showed that the estimated dose in the year of maximum impact could increase by about 15 percent. Given this increase, the dose to the MEI would remain below the 10-millirem-per-year regulatory limit.

509-68 DOE acknowledges that there are limitations in the approach used to estimate annual doses from facilities' emissions. To enable the analysis, assumptions were made regarding the average emissions and the time that various activities would occur. In practice, the emissions from facilities and the schedule for performing the various activities may be different from those assumed in the analysis. Regardless, DOE will comply with the regulatory requirement to maintain doses to an MEI below 10 millirem per year and will ensure compliance with conditions that are included in permits for the emission points at Hanford.

509-69 The indoor dust filtration factor in RESRAD is not the same as a high-efficiency particulate air filtration efficiency. Instead, the RESRAD factor is a simple multiplier used to account for any attenuation of the indoor dust concentration relative to the outdoor concentration. The default value for RESRAD is 0.4, adjusting the indoor dust to 40 percent of the outdoor value, but for this EIS, this factor is set equal to 1.0, thus conservatively allowing for no attenuation.

509-70 The discussion of the units of risk has been clarified, as necessary, and consistent usage has been applied throughout this final EIS.

509-71 DOE generally agrees with commentor's summary of information on criteria air pollutants, which was presented in the *Draft TC & WM EIS*, Chapter 3, Section 3.2.4.1. Information on natural events and wildfires that would result in exceedance of the particulate matter standards, such as the event in 2005, is normally reported in the annual site environmental report. Data on radionuclide emissions in Chapter 3, Section 3.2.4.1, were updated (2010 data) in this final EIS. Table 3–5 represents emissions for the entire Hanford Site. The Hanford

Site environmental report (Poston, Duncan, and Dirkes 2011) referenced in the table is the most recent yearly report available and is representative of all recent years of impacts at the site.

509-72 DOE generally agrees with the commentor's summary of the nonradiological modeling results for the Tank Closure alternatives presented in Chapter 4 of the *Draft TC & WM EIS*. The draft EIS assumed for analysis purposes that emissions of particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$) were the same as PM_{10} emissions. More-detailed emissions were not developed. A more detailed independent $PM_{2.5}$ analysis would require estimates of $PM_{2.5}$ emissions, which are not currently available; perhaps estimates of emissions of secondary components of $PM_{2.5}$ (sulfates and nitrates); and modeling of $PM_{2.5}$. For this final EIS, based on the assumption stated above, concentration values for $PM_{2.5}$ were added to Tables 4–3 (Tank Closure alternatives), 4–100 (FFTF Decommissioning alternatives), and 4–130 (Waste Management alternatives) in Chapter 4 in addition to the PM_{10} values presented.

The discussion found in Chapter 7, Section 7.1, summarizes potential mitigation measures that could be used to control air pollutant emissions under the alternatives. Following issuance of this *Final TC & WM EIS* and its associated ROD, DOE is required to prepare a mitigation action plan that addresses mitigation commitments expressed in the ROD. This plan would be prepared before DOE would implement any action that is the subject of a mitigation commitment. During the design process and permitting, more-precise estimates of air emissions and the control of these emissions would be determined as necessary to meet the ambient standards; this level of detail is not necessary for NEPA analysis.

509-73 The incremental criteria pollutant concentrations under Waste Management Alternative 2 for carbon monoxide (1-hour averaging period) would exceed the standard by 9,800 to 217,000 micrograms per cubic meter and, for the 8-hour averaging period, by as much as 31,200 micrograms per cubic meter, based on the modeling results presented in Chapter 4, Table 4–130, of this *Final TC & WM EIS*. Under Waste Management Alternative 3, carbon monoxide concentrations would exceed the 1-hour standard by 10,300 (Disposal Group 1) to 216,000 (Disposal Groups 2 and 3) micrograms per cubic meter and the 8-hour standard by 31,000 micrograms per cubic meter (Disposal Groups 2 and 3). Please see response to comment 509-72 regarding analysis of $PM_{2.5}$ emissions.

The discussion found in Chapter 7, Section 7.1, summarizes potential mitigation measures that could be used to control air pollutant emissions under the alternatives. Following issuance of this *Final TC & WM EIS* and its associated ROD, DOE is required to prepare a mitigation action plan that addresses mitigation commitments expressed in the ROD. This plan would be prepared before DOE would implement any action that is the subject of a mitigation commitment. During the design process and permitting, more-precise estimates of air emissions and the control of these emissions would be determined as necessary to meet the ambient standards; this level of detail is not necessary for NEPA analysis.

509-74 As stated, containment structures are commercially available and have been successfully used at other sites. However, the containment structures that would be needed to cover excavations of tank farms in this EIS would have to be much larger than those that have been demonstrated elsewhere. For example, the commentor cites an example of a 235- by 270-foot containment structure used over Pit 5 at INL, whereas containment structures that would be required for tank closure would be significantly larger. For example, the tank farm excavations would range from 200 by 200 feet to 1,000 by 800 feet. DOE is assuming the use of containment structures for tank closure sized at 500 by 550 feet, based on scaled-up data. In stating "a large degree of uncertainty concerning the feasibility," DOE recognizes that construction of such large structures may have its limitations. Appendix E, Section E.1.2.5.3, describes the containment structures proposed for tank and soil removal activities.

509-75 Ambient air quality standards are set to protect human health, including those of the elderly and children. Activities resulting from decisions made to meet the purpose and need of this EIS would be designed and implemented to meet the ambient air quality standards. Chapter 4, Section 4.1.4, of the *Draft TC & WM EIS* discusses some of the conservatism included in the EIS analysis, stating, "For the purpose of this analysis, emissions of PM_{10} and $PM_{2.5}$ from general construction activities were assumed to be the same as the total suspended particulate emissions. This results in a substantial overestimate of PM_{10} and $PM_{2.5}$ emissions. Further, the analysis did not consider emission controls that could be applied in the construction areas, as discussed in Chapter 7, Section 7.1. A refined analysis of emissions, based on more-detailed engineering of the construction activities and application of appropriate control technologies, is expected to result in substantially lower estimates of emissions and ambient concentrations from the major construction activities under any of the Tank Closure alternatives." Section 7.1.4 discusses the need for additional control measures, other types of controls that could be applied to construction-type sources, and some of the control measures included in the WTP design. Detailed design of the facilities and control measures has not been performed, and more-detailed information on an air pollution control program is not available. Identification of the need for a monitoring program and development of the program would be part of the permitting process.

509-76 The *Draft TC & WM EIS* assumed for analysis purposes that $PM_{2.5}$ emissions were the same as PM_{10} emissions (see Chapter 4, Table 4–3, note "c"). More-detailed emissions data do not currently exist for $PM_{2.5}$ for the activities analyzed. A more detailed independent $PM_{2.5}$ analysis would require estimates of $PM_{2.5}$ emissions, perhaps estimates of emissions of secondary components of $PM_{2.5}$ (sulfates and nitrates), and modeling of $PM_{2.5}$. A more refined analysis of emissions, based on more-detailed engineering of the construction activities and application of appropriate control technologies, is expected to result in substantially lower estimates of emissions and ambient concentrations from the major construction activities under any of the alternatives. The analysis for $PM_{2.5}$ is considered to be conservative because it is based on emission factors for total suspended particulates or PM_{10}; the fact that detailed control technologies were not applied in the analysis; and other assumptions as described in Appendix G of the draft EIS. DOE considers the current level of engineering and emission estimates to be adequate for the comparative analysis performed for this EIS. Additional analysis would be performed as needed when more-detailed engineering is performed and as required for permitting of the various facilities.

509-77 Consistent with CEQ requirements, DOE has used the best-available information to address emission controls and the technologies that may be used when the selected alternative is implemented. Since NEPA is done early in the process, more-detailed information about construction activities is not available for reanalysis for this *Final TC & WM EIS*; nor is an analysis of reasonable control technology application for these activities and the operational sources. A more refined analysis of emissions, based on more-detailed engineering of the construction activities and application of appropriate control technologies, is expected to result in substantially lower estimates of emissions and ambient concentrations from the major construction activities under any of the alternatives because conservative assumptions were made in the analysis in estimating emissions and emission control. DOE considers the current level of engineering and emissions estimates to be adequate for the comparative analysis performed for this EIS. Additional analysis would be performed as needed when more-detailed engineering is performed and as required for permitting of the various facilities.

The discussion found in Chapter 7, Section 7.1.4, summarizes potential mitigation measures that could be used to control air pollutant emissions under the alternatives. During the design process and permitting process, more-precise estimates of air emissions and the control of these emissions would be required to meet the ambient standards; this level of detail is not necessary for NEPA analysis.

Commentor No. 510: Denny Palmer

April 6, 2010

Mary Beth Burandy, Document Manager
Office of River Protection
Department of Energy
PO Box 1178
Richland, WA 99352
Attention: TC & WM EIS

To whom it may concern,

I would like to initially state that I am writing as a concerned citizen who lives and works in the City of Spokane, Washington. It has come to my attention that the Department of Energy's (DOE) preferred alternatives for tank closure and waste management at Hanford will likely affect myself and others in the City of Spokane.

First, the DOE owes to the citizens of Washington implementation of the best and most widespread cleanup option technologically available. Unacceptable and less extensive alternatives the DOE is considering would allow for additional groundwater contamination and potential contamination of the Columbia River. Previous leaks from just a section of Hanford's tanks is a major factor adding to long-term ground and surface water impacts. Under DOE's current plan, none of these leaked materials would be retrieved, and would thus eventually lead to the groundwater and the Columbia River. It is unacceptable for the DOE to save money when the health and wellbeing of the citizens of Washington are at stake. ***510-1***

The DOE recognizes that risks of cancer from drinking water miles away from the tank farms will be approximately 50 times that State's cancer risk cleanup standard in the year 3600. As a citizen who enjoys the recreational aspects of the Columbia River corridor, I understand the grave impact such a decision would have on local economies and lives in that region. ***510-2***

The DOE's proposal to ship radioactive waste from across the nation to Hanford once the Waste Treatment Plant is operational is completely unacceptable. This preferred alternative by the DOE poses short and long-term environmental and public health risks that must be avoided. The DOE's choice for landfill closure of cribs and trenches adjacent to the tank farms would result increased amounts of contamination reaching the groundwater and the river. I have been informed that the proposed influx of off-site waste from across the nation would likely add an additional 15 curies of iodine, which under current plans, would not be immobilized in glass and would be highly prone to leach into the groundwater and the Columbia River. ***510-3***

With 90% of the radioactive iodine and 74% of the radioactive technetium releases would be imported from other areas of the country, as a citizen I have to question the DOE's decision to transport such waste through my city. I live and work close to I-90 and the DOE's decision to transport such waste along this corridor poses an enormous health risk not only to myself, but to the thousands of others who also live along this path. Unjust exposure to these materials is unconscionable. The Spokane River which flows adjacent to I-90 also poses risk to contamination due to this transportation influx. ***510-4***

It is entirely inequitable to force Washington residents to bear a disproportionate burden of housing much of the nation's most hazardous substances given the fact that the citizens of Washington State have clearly and unequivocally voiced their opposition to becoming the ***510-5***

510-1 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

510-2 Two aspects have bearing on predicted cancer risk in the Columbia River corridor. First, there is some conservatism in the predicted risks presented in the draft EIS. While refinements in the approach used to prepare this *Final TC & WM EIS* lessened the predicted risks, modeled exceedances of standards are still predicted. This is why the second aspect—the regulatory context—remains important. This *TC & WM EIS* addresses those laws and requirements that would apply to the proposed actions, depending on the alternative. Issues concerning the ability to meet legal standards or requirements are also discussed, as are the potential mitigation measures that may be needed and are feasible for implementation by DOE. In particular, additional mitigation measures could be required to obtain future permits issued by the State of Washington, or they may be addressed under the scope of the TPA as part of future remedial actions that are subject to CERCLA. In the ROD for this EIS, DOE will identify and discuss the factors it considered in reaching its decisions, such as economic, technical, and national policy considerations and the mitigation and monitoring measures that will be implemented. In all cases, DOE will select a set of activities designed to protect public health and safety.

510-3 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

The impacts of the offsite waste in terms of radiological risk are presented in the Summary, Section S.5.5.3, and Chapter 2, Section 2.10, Key Environmental Findings. These sections discuss the radiological risk differences between including and not including offsite waste disposal at IDF-East.

The *TC & WM EIS* analysis shows that receipt of offsite waste streams that contain specific amounts of certain isotopes, specifically, iodine-129 and technetium-99, could cause an adverse impact on the environment. Therefore, one means of mitigating this impact would be for DOE to limit disposal of

Commentor No. 510 (cont'd): Denny Palmer

nation's radioactive dumping ground. DOE's plan calls upon Washington residents to shoulder the entire burden of transporting and storing the nation's nuclear waste while, through the passage of Initiative 2004, the people of Washington overwhelmingly expressed their reluctance to allow additional shipments of radioactive waste to Hanford until existing waste is cleaned up. Delaying the addition of more hazardous wastes until the WTP becomes operational in 2022 does absolutely nothing to protect the Columbia River and the health of our children for generations to come. ***510-5 cont'd***

I respectfully request that the DOE clean up the millions of gallons of nuclear waste that has already leaked from the leaky single-shell tanks and reaching the Columbia River; and also to entirely drop the proposal to ship radioactive waste from across the nation to Hanford. Under absolutely no circumstance whatsoever, should DOE transport hazardous radioactive waste along I-90 directly above the sole source Spokane-Valley/Rathdrum-Prairie Aquifer. ***510-6***

Sincerely,

Denny Palmer
438 W. Shoshone
Spokane, WA 99203

offsite waste streams at Hanford. Other mitigation measures, such as recycling secondary-waste streams into the primary-waste-stream feeds within the WTP to increase iodine-129 capture in ILAW and bulk vitrification glass, are discussed in Chapter 7, Section 7.5, of this final EIS.

Closure of past-practice units, e.g., cribs and trenches (ditches), is not part of the proposed actions analyzed in this EIS. Closure of these units would be addressed at a later date subject to appropriate NEPA and/or CERCLA review.

510-4 DOE disagrees with the assertion that 90 percent of the total (both onsite and offsite) inventory of iodine-129 and 74 percent of the total inventory of technetium-99 would be transported to Hanford from offsite DOE facilities. Appendix D shows that onsite inventories of iodine-129 and technetium-99 are much larger than inventories assumed to be present in offsite waste. The *Draft TC & WM EIS* analyzes the transportation of RH-LLW from INL to Hanford for disposal. Based on the public's input and concerns about offsite waste disposal at Hanford, DOE has included in this *Final TC & WM EIS* an example of a potential mitigation measure that could be taken by DOE. Specifically, an offsite waste stream containing a significant inventory of iodine-129 (i.e., RH-LLW resins from INL) was eliminated from the analysis. This mitigation measure has been incorporated into the Waste Management alternatives. In addition, a sensitivity analysis is included that shows the impacts of limiting offsite waste streams containing iodine-129 and technetium-99. The results of this sensitivity analysis illustrate the difference this would make in potential groundwater impacts and are included in Appendix M. Other mitigation measures, such as recycling secondary-waste streams into the primary-waste-stream feeds within the WTP to increase iodine-129 capture in ILAW and bulk vitrification, are discussed in Chapter 7, Section 7.5, of this EIS. As shown in the Summary of this *TC & WM EIS*, Section S.5.3; Chapter 2, Section 2.8.3.10; and Chapter 4, Section 4.3.12, it is unlikely that the estimated total public radiation exposures from transporting radioactive waste to Hanford for disposal would result in any additional LCFs.

510-5 See response to comment 510-3 for a discussion on the transport and disposal of offsite waste.

510-6 See response to comment 510-1 regarding groundwater contamination and remediation.

One of the purposes of this *TC & WM EIS* is to analyze potential impacts of DOE's proposed actions to retrieve waste from the buried tanks, treat and dispose of this waste, and close the SST farms. This analysis is also intended to aid DOE in making decisions regarding cleanup of the past leaks.

See response to comment 510-3 for a discussion on the transport and disposal of offsite waste.

Decisions made by DOE on the proposed actions will be based on a number of factors, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. The decisions on the selected course of action and supporting rationale will be documented in a ROD issued no sooner than 30 days after the EPA Notice of Availability for this *Final TC & WM EIS* is published in the *Federal Register*.

Commentor No. 511: Arthur Babitz, Mayor, City of Hood River, Oregon

Mary Beth Burandt, Document Manager
Office of River Protection
U.S. Department of Energy
PO Box 1178
Richland, WA 99352

Dear Ms. Burandt,

We are elected officials who represent many of the cities along the Columbia River downstream from the Hanford Site. We have diverse economies of farmlands, fisheries, forestry, and recreation-based tourism. Many of our high-tech and light industries are located close to or on the banks of the river. The health of our communities is inextricably linked to the health of the Columbia River.

We are concerned that the cumulative analysis in the U.S. Department of Energy's Draft Tank Closure and Waste Management Environmental Impact Statement predicts a wide-spread and persistent environmental contamination of the Columbia River that could affect our cities for thousands of years (Chapter 6 and Appendix U). The DOE's EIS also concludes accepting offsite waste to the Hanford Site would have long-term negative impacts on the river (Chapter 6). *511-1*

The Columbia River is the life blood of our communities. We will not accept this vision of our future.

We expect the DOE to implement the highest level of cleanup possible and to continually research new technologies that will allow the removal of contaminants deep in the soil. We expect the DOE to make decisions to guarantee the highest level of protection of human health and the environment. We endorse the Oregon Department of Energy's proposed Alternative 7 and urge the DOE to analyze each of the proposed actions individually and collectively. *511-2* We also ask you to rescind your February 2000 record of decision that opened up Hanford to off site waste.

We understand the desire to complete cleanup as quickly and cheaply as possible. Unfortunately, the extent of the contamination and the complexity of the cleanup means there are no acceptable shortcuts. *511-3*

Our communities cannot tolerate the long-term contamination of the Columbia River as foreseen in this EIS. We are counting on the Department of Energy to take the requested actions to preserve our collective health, safety, and security.

Sincerely,

Arthur Babitz, Mayor
City of Hood River

cc: Senator Ron Wyden, Senator Jeff Merkley, Congressman Greg Walden, County Commission Chair Ron Rivers

301 OAK STREET • P.O. BOX 27 • HOOD RIVER, OREGON 97031 • (541) 386-1488

511-1 As described in Chapter 6, Section 6.4.2, the cumulative risk to downstream users of the Columbia River would be low under all alternative combinations (i.e., a Hazard Index lower than 1.25×10^{-3} and a total risk lower than 1.0×10^{-6}), and would be dominated by non–*TC & WM EIS* sources. The estimated offsite population dose of 215 person-rem per year for the year of peak dose is approximately 0.01 percent of the average background dose for the population. In addition, the estimates of cumulative risk presented in the *Draft TC & WM EIS* do not take into account all ongoing and future cleanup actions. Therefore, actual cumulative risk is expected to be even lower.

In recognition of concerns about the effects of remedial actions, DOE has added sensitivity analyses to Appendix U of this *Final TC & WM EIS* to provide information on the potential effects of reasonably foreseeable remedial actions on the concentrations of contaminants in groundwater. The results of these sensitivity analyses are discussed in Chapter 7, Section 7.5. Reducing contaminant concentrations in groundwater would reduce the discharge of contaminants to the Columbia River, further reducing the already-low risks to downstream water users.

511-2 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

Chapter 2, Section 2.6.4, of this *Final TC & WM EIS* has been revised to include a discussion of the Oregon Department of Energy's proposal and how DOE has addressed the range of reasonable alternatives for tank waste storage, retrieval, and treatment and remediation of the existing tank farms in its original Tank Closure alternatives. DOE has carefully considered the Oregon proposal and, as explained in Section 2.6.4, has determined that it is not reasonable.

511-3 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

In general, the scope of this *TC & WM EIS* does not include groundwater remediation activity as part of the proposed actions evaluated. DOE is

Commentor No. 511 (cont'd): Arthur Babitz, Mayor, City of Hood River, Oregon

implementing an extensive, ongoing cleanup program at Hanford, as required under RCRA, CERCLA, and/or the TPA, a legal agreement between DOE, Ecology, and EPA. The TPA identifies cleanup actions and schedules, called milestones. The TPA agencies completed negotiations on several Hanford cleanup projects, including the establishment of 29 additional and/or accelerated groundwater and Columbia River protection milestones and target dates.

Commentor No. 512: Andrea Rogers, Mayor, City of Mosier, Oregon

Mayor Andrea Rogers
Council President Allan Rodrick
Peny Wallace
Kathy Fitzpatrick
David Princehouse
Tim Mortenson
Rae Jackson

City of Mosier
P.O. Box 456 Mosier, OR 97040
541-478-3505 541-478-3810 (fax)
mosiercityhall@mosierwinet.com

Mary Beth Burandt, Document Manager
Office of River Protection
U.S. Department of Energy
P.O. Box 1178
Richland, WA 99352

Dear Ms. Burandt,

We are elected officials who represent many of the cities along the Columbia River downstream from the Hanford Site. We have diverse economies of farmlands, fisheries, forestry, and recreation-based tourism. Many of our high-tech and light industries are located close to or on the banks of the river. The health of our communities is inextricably linked to the health of the Columbia River.

We are concerned that the cumulative analysis in the U.S. Department of Energy's Draft Tank Closure and Waste Management Environmental Impact Statement predicts a wide-spread and persistent environmental contamination of the Columbia River that could affect our cities for thousands of years (Chapter 6 and Appendix U). The DOE's EIS also concludes accepting offsite waste to the Hanford Site would have long-term negative impacts on the river (Chapter 6).

The Columbia River is the life blood of our communities. We will not accept this vision of our future. **512-1**

We expect the DOE to implement the highest level of cleanup possible and to continually research new technologies that will allow the removal of contaminants deep in the soil. We expect the DOE to make decisions to guarantee the highest level of protection of human health and the environment. We endorse the Oregon Department of Energy's proposed Alternative 7 and urge the DOE to analyze each of the proposed actions individually and collectively. We also ask you to rescind your February 2000 record of decision that opened up Hanford to off site waste. **512-2**

We understand the desire to complete cleanup as quickly and cheaply as possible. Unfortunately, the extent of the contamination and the complexity of the cleanup means there are no acceptable shortcuts.

Our communities cannot tolerate the long-term contamination of the Columbia River as foreseen in this EIS. We are counting on the Department of Energy to take the requested actions to preserve our collective health, safety, and security. **512-3**

Sincerely,

Andrea Rogers

Andrea Rogers, Mayor
City of Mosier

cc: Senator Ron Wyden, Senator Jeff Merkley, Congressman Greg Walden, County Commissioner Bill Lennox

512-1 As described in Chapter 6, Section 6.4.2, the cumulative risk to downstream users of the Columbia River would be low under all alternative combinations (i.e., a Hazard Index lower than 1.25×10^{-3} and a total risk lower than 1.0×10^{-6}), and would be dominated by non–*TC & WM EIS* sources. The estimated offsite population dose of 215 person-rem per year for the year of peak dose is approximately 0.01 percent of the average background dose for the population. In addition, the estimates of cumulative risk presented in the *Draft TC & WM EIS* do not take into account all ongoing and future cleanup actions. Therefore, actual cumulative risk is expected to be even lower.

In recognition of concerns about the effects of remedial actions, DOE has added sensitivity analyses to Appendix U of this *Final TC & WM EIS* to provide information on the potential effects of reasonably foreseeable remedial actions on the concentrations of contaminants in groundwater. The results of these sensitivity analyses are discussed in Chapter 7, Section 7.5. Reducing contaminant concentrations in groundwater would reduce the discharge of contaminants to the Columbia River, further reducing the already-low risks to downstream water users.

512-2 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

Chapter 2, Section 2.6.4, of this *Final TC & WM EIS* has been revised to include a discussion of the Oregon Department of Energy's proposal and how DOE has addressed the range of reasonable alternatives for tank waste storage, retrieval, and treatment and remediation of the existing tank farms in its original Tank Closure alternatives. DOE has carefully considered the Oregon proposal and, as explained in Section 2.6.4, has determined that it is not reasonable.

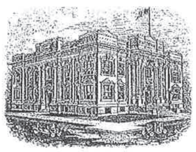
512-3 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

In general, the scope of this *TC & WM EIS* does not include groundwater remediation activity as part of the proposed actions evaluated. DOE is

Commentor No. 512 (cont'd): Andrea Rogers, Mayor, City of Mosier, Oregon

implementing an extensive, ongoing cleanup program at Hanford, as required under RCRA, CERCLA, and/or the TPA, a legal agreement between DOE, Ecology, and EPA. The TPA identifies cleanup actions and schedules, called milestones. The TPA agencies completed negotiations on several Hanford cleanup projects, including the establishment of 29 additional and/or accelerated groundwater and Columbia River protection milestones and target dates.

Commentor No. 513: Bill Lennox, County Commissioner, Wasco County Board of Commissioners



WASCO COUNTY

Board of County Commissioners
511 Washington Street, Suite 302
The Dalles, Oregon 97058-2237
(541) 506-2520
Fax: (541) 506-2521

Dan Ericksen, *Chair of the Board*
Sherry Holliday, *County Commissioner*
Bill Lennox, *County Commissioner*

March 18, 2010

Mary Beth Burandt, Document Manager
Office of River Protection
U.S. Department of Energy
PO Box 1178
Richland, WA 99352

Dear Ms. Burandt:

We are elected officials who represent many of the communities along the Columbia River downstream from the Hanford Site. We have diverse economies of farmlands, fisheries, forestry, and recreation-based tourism. Many of our high-tech and light industries are located close to or on the banks of the river. The health of our communities is inextricably linked to the health of the Columbia River.

We are concerned that the cumulative analysis in the U.S. Department of Energy's Draft Tank Closure and Waste Management Environmental Impact Statement predicts a wide-spread and persistent environmental contamination of the Columbia River that could affect our communities for thousands of years (Chapter 6 and Appendix U). The DOE's EIS also concludes accepting offsite waste to the Hanford Site would have long-term negative impacts on the river (Chapter 6).

The Columbia River is the life blood of our communities. We will not accept this vision of our future. *513-1*

We expect the DOE to implement the highest level of cleanup possible and to continually research new technologies that will allow the removal of contaminants deep in the soil. We expect the DOE to make decisions to guarantee the highest level of protection of human health and the environment. We endorse the Oregon Department of Energy's proposed Alternative 7 and urge the DOE to analyze each of the proposed actions individually and collectively. *513-2* We also ask you to rescind your February 2000 record of decision that opened up Hanford to offsite waste.

We understand the desire to complete cleanup as quickly and cheaply as possible. *513-3* Unfortunately, the extent of the contamination and the complexity of the cleanup means there are no acceptable shortcuts.

513-1 As described in Chapter 6, Section 6.4.2, the cumulative risk to downstream users of the Columbia River would be low under all alternative combinations (i.e., a Hazard Index lower than 1.25×10^{-3} and a total risk less than 1.0×10^{-6}) and would be dominated by non–*TC & WM EIS* sources. The estimated offsite population dose of 215 person-rem per year for the year of peak dose is approximately 0.01 percent of the average background dose for the population.

In recognition of concerns about the effects of remedial actions, DOE has added sensitivity analyses to Appendix U of this *Final TC & WM EIS* to provide information on the potential effects of reasonably foreseeable remedial actions on the concentrations of contaminants in groundwater. The results of these sensitivity analyses are discussed in Chapter 7, Section 7.5. Reducing contaminant concentrations in groundwater would reduce the discharge of contaminants to the Columbia River, further reducing the already-low risks to downstream water users.

513-2 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

Chapter 2, Section 2.6.4, of this *Final TC & WM EIS* has been revised to include a discussion of the Oregon Department of Energy's proposal and how DOE has addressed the range of reasonable alternatives for tank waste storage, retrieval, and treatment and remediation of the existing tank farms in its original Tank Closure alternatives. DOE has carefully considered the Oregon proposal and, as explained in Section 2.6.4, has determined that it is not reasonable.

513-3 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

In general, the scope of this *TC & WM EIS* does not include groundwater remediation activity as part of the proposed actions evaluated. DOE is implementing an extensive, ongoing cleanup program at Hanford, as required under RCRA, CERCLA, and/or the TPA, a legal agreement between DOE, Ecology, and EPA. The TPA identifies cleanup actions and schedules, called

Commentor No. 513 (cont'd): Bill Lennox, County Commissioner, Wasco County Board of Commissioners

MARY BETH BURANDT
March 18, 2010
Page 2

Our communities cannot tolerate the long-term contamination of the Columbia River as foreseen in this EIS. We are counting on the Department of Energy to take the requested actions to preserve our collective health, safety, and security. **513-3 cont'd**

Sincerely,

WASCO COUNTY BOARD OF
COUNTY COMMISSIONERS

Bill Lennox

Bill Lennox,
WASCO COUNTY COMMISSIONER

milestones. The TPA agencies completed negotiations on several Hanford cleanup projects, including the establishment of 29 additional and/or accelerated groundwater and Columbia River protection milestones and target dates.

Commentor No. 514: Betty J. Barnes, Mayor, City of Bingen, Washington

CITY OF BINGEN

March 18, 2010

Mary Beth Burandt, Document Manager
Office of River Protection
U.S. Department of Energy
PO Box 1178
Richland, WA 99352

Subject: Draft Tank Closure and Waste Management Environmental Impact Statement (TC&WM EIS)

Dear Ms. Burandt:

The City of Bingen is one of many cities along the Columbia River downstream from the Hanford site. We have a diverse economy of agriculture, fisheries, forestry and recreation-based tourism. Many of our high-tech and light industries are located close to or on the banks of the river. The health of Bingen and other cities is linked to the health of the Columbia River.

The City of Bingen is concerned that the cumulative analysis in the U.S. Department of Energy's Daft Tank Closure and Waste Management Environmental Impact Statement (EIS) predicts a wide-spread and persistent environmental contamination of the Columbia River that could affect Bingen and other cities for thousands of years (Chapter 6 and Appendix U). The EIS also concludes that accepting offsite waste at the Hanford site would have long-term negative impacts on the river (Chapter 6).

The Columbia River is the life blood of communities adjacent to it. The City of Bingen does not accept the vision portrayed in the EIS as the vision of our future. *514-1*

We ask the Department of Energy to implement the highest level of cleanup possible and to continually research new technologies that will allow the removal of contaminants deep in the soil. The Department of Energy should make decisions to guarantee the highest level of protection for human health and the environment.

The City of Bingen endorses Oregon Department of Energy's proposed Alternative 7 and urges the U.S. Department of Energy to analyze each of the proposed actions individually and collectively. We also ask you to rescind your February 2000 record of decision that opened up Hanford for storage of off-site waste.

The City understands the desire to complete cleanup of Hanford as efficiently and effectively as possible. However, due to the extent of the contamination and the complexity of the cleanup there are no acceptable shortcuts. *514-2*

112 N Ash Street PO Box 607 Bingen, Washington 98605
Telephone: 509.493.2122 Fax: 509.493.1391 E-mail: bingen@gorge.net

514-1 As described in Chapter 6, Section 6.4.2, the cumulative risk to downstream users of the Columbia River would be low under all alternative combinations (i.e., a Hazard Index lower than 1.25×10^{-3} and a total risk lower than 1.0×10^{-6}) and would be dominated by non–*TC & WM EIS* sources. The estimated offsite population dose of 215 person-rem per year for the year of peak dose is approximately 0.01 percent of the average background dose for the population.

In recognition of concerns about the effects of remedial actions, DOE has added sensitivity analyses to Appendix U of this *Final TC & WM EIS* to provide information on the potential effects of reasonably foreseeable remedial actions on the concentrations of contaminants in groundwater. The results of these sensitivity analyses are discussed in Chapter 7, Section 7.5. Reducing contaminant concentrations in groundwater would reduce the discharge of contaminants to the Columbia River, further reducing the already-low risks to downstream water users.

514-2 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

Chapter 2, Section 2.6.4, of this *Final TC & WM EIS* has been revised to include a discussion of the Oregon Department of Energy's proposal and how DOE has addressed the range of reasonable alternatives for tank waste storage, retrieval, and treatment and remediation of the existing tank farms in its original Tank Closure alternatives. DOE has carefully considered the Oregon proposal and, as explained in Section 2.6.4, has determined that it is not reasonable.

Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

In general, the scope of this *TC & WM EIS* does not include groundwater remediation activity as part of the proposed actions evaluated. DOE is implementing an extensive, ongoing cleanup program at Hanford, as required under RCRA, CERCLA, and/or the TPA, a legal agreement between DOE, Ecology, and EPA. The TPA identifies cleanup actions and schedules, called

Commentor No. 514 (cont'd): Betty J. Barnes, Mayor, City of Bingen, Washington

The communities along the Columbia River cannot tolerate the long-term contamination of the Columbia River as foreseen in the EIS. We urge the Department of Energy to take the requested actions to preserve our collective health, safety and security.

514-2 cont'd

Sincerely,

Betty J. Barnes
Mayor

112 N Ash Street PO Box 607 Bingen, Washington 98605
Telephone: 509.493.2122 Fax: 509.493.1391 E-mail: bingen@gorge.net

milestones. The TPA agencies completed negotiations on several Hanford cleanup projects, including the establishment of 29 additional and/or accelerated groundwater and Columbia River protection milestones and target dates.

Commentor Number 515 is not included in this Comment-Response Document because it is a duplicate of Commentor Number 514.

Commentor No. 516: Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Washington Fish and Wildlife Office
Eastern Washington Field Office
11103 East Montgomery Drive
Spokane Valley, WA 99206

April 19, 2010

Ms. Mary Beth Burandt
EIS Document Manager
Department of Energy
Office of River Protection
P.O. Box 1178
Richland, WA 99352

Dear Ms. Burandt:

Thank you for the opportunity to comment on the "Draft Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, WA." Detailed comments are attached. The Department of the Interior, U.S. Fish and Wildlife Service (Service) is providing these comments as part of our continuing effort to support DOE's cleanup activities and Natural Resource Damage Assessment and Restoration (NRDAR), and to help assure that cleanup and NRDAR activities are efficient and well coordinated with other Tribal, State, and Federal activities at the Hanford Facility.

The Service appreciates the significant effort made by DOE to produce a detailed and relatively transparent evaluation of various cleanup approaches. In general, we prefer alternatives that reduce long-term habitat disturbance and provide for mitigation of lost habitats when disturbance footprints cannot be avoided. We are concerned that capping wastes in place may not be the best long-term solution to waste management except in certain limited circumstances, especially given the history of problems with cap effectiveness at sites throughout the United States.

The smaller the footprint of waste sites, and smaller the total capped area, the more manageable cap maintenance will be over the long term. Moreover, protection of groundwater is of utmost importance, as movement of contaminated groundwater can adversely impact biota at springs, seeps, wetlands, and the Columbia River. Alternatives that limit migration of contaminated groundwater, and remediate already contaminated groundwater to the maximum extent practicable, are preferred by the Service.

516-1

TAKE PRIDE IN AMERICA

516-1 A discussion of impacts on habitat, especially sagebrush habitat, is presented in Chapter 4, Sections 4.1.7, 4.2.7, and 4.3.7. These sections, as well as Chapter 7, Section 7.1.7, also address mitigation of sagebrush habitat loss, as well as other actions that can mitigate impacts on habitat and wildlife. The commentor mentions that there is a "history of problems with cap effectiveness at sites throughout the United States." Further clarification indicated that the issue is the potential footprint of a disposal facility and to reduce the overall footprint of the site by removing the waste and relocating it to one disposal area would be more desirable. DOE understands the commentors desire to reduce the waste disposal footprint at Hanford. A discussion on the closure requirements for a RCRA facility, including the closure of a tank system, is provided in Chapter 8, Section 8.1.4. Before implementing any closure actions, DOE will develop a tank farm system closure plan that will be implemented for each of the waste management areas. The State of Washington "Dangerous Waste Regulations" (WAC 173-303) implement the Hazardous Waste Management Act of 1976, as amended. These regulations provide the requirements for decisionmaking regarding the cleanup and permitting of dangerous wastes. The regulations define the state closure standards for the owners and operators of all dangerous waste facilities (WAC 173-303-610(2)) and include references to requirements for tank systems (WAC 173-303-640). The regulations describe specific requirements for closure of the tank system (WAC 173-303-640(8)(a) and (b)). This part of the regulations provides a requirement for DOE to "remove or decontaminate all wastes residues, contaminated soils, and structures and equipment contaminated with waste" for the tank system. If DOE "demonstrates that not all contaminated soils can be practically removed or decontaminated," then landfill closure is required (WAC 173-303-640(7)). DOE must close the tank system and perform postclosure care in accordance with closure and postclosure care requirements that apply to a dangerous waste landfill (WAC 173-303-640(8)(b)). Closure of a landfill requires the placement of a barrier that meets specified requirements.

Table 4–1 summarizes major new facilities needed under the Tank Closure alternatives, including barriers. A full description of both the modified RCRA Subtitle C and Hanford barriers is provided in Appendix E, Section E.1.2.5.4.1. It is noted in that section that the modified RCRA Subtitle C Barrier is designed to provide long-term containment and hydrologic protection for a performance period of 500 years, while the Hanford barrier is designed for 1,000 years. Following closure, DOE would implement postclosure care (which is assumed in this EIS to be 100 years).

Commentor No. 516 (cont'd): Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

If you have any questions, please contact Dr. Joe Bartoszek at (509) 546-8338 or Russell MacRae at (509) 893-8021.

Sincerely,

for Ken S. Berg, Manager
Washington Fish and Wildlife Office

Cc:
Kate Benkert, U.S. Fish and Wildlife Service, Lacey, WA
Joe Bartoszek, U.S. Fish and Wildlife Service, Burbank, WA
Don Steffeck, U.S. Fish and Wildlife Service, Portland, OR
Dave Brockman, U.S. Department of Energy, Richland, WA
Dennis Faulk, U.S. Environmental Protection Agency
Jane Hedges, Washington Department of Ecology
Stuart Harris, Confederated Tribes of the Umatilla Indian Reservation
Gabriel Bohnee, Nez Perce Tribe
Russell Jim, Yakama Indian Nation

While the scope of this *TC & WM EIS* does not include groundwater remediation activity as part of the proposed actions evaluated, DOE is implementing an extensive, ongoing cleanup program at Hanford, as required under RCRA, CERCLA, and/or the TPA, a legal agreement between DOE, Ecology, and EPA. The TPA identifies cleanup actions and schedules, called milestones. The TPA agencies completed negotiations on several Hanford cleanup projects, including the establishment of 29 additional and/or accelerated groundwater, and Columbia River protection milestones and target dates.

Decisions made by DOE on the proposed actions will be based on a number of factors, including health and safety; environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. The decisions on the selected course of action and supporting rationale will be documented in a ROD issued no sooner than 30 days after the EPA Notice of Availability for this *Final TC & WM EIS* is published in the *Federal Register*.

Commentor No. 516 (cont'd): Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

DRAFT TANK CLOSURE AND WASTE MANAGEMENT ENVIRONMENTAL IMPACT STATEMENT FOR THE HANFORD SITE

Volume 1

Commenting Organization: USFWS Commenter: JEB/RKM
Section #: General Pg #: NA Line #: NA Code: C
Comment: We are interested in reducing exposure and potential exposure of wildlife to hazardous materials below any known effect threshold and to the maximum extent practicable. As such we are not in favor of capping waste in place but prefer removal, treatment, and consolidation in centralized disposal areas. Capping in place is not preferred for long-term protection of wildlife. Any cost/benefit analyses must also consider the long-term impacts to natural resources and their services due to residual contamination. Not only is leaving contamination in place problematic from a basic resource protection standpoint, it may also result in additional costs associated with compensating the public for continued natural resource "injuries" as defined in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Natural Resource Damage Assessment and Restoration (NRDAR) provisions. *516-2*

Commenting Organization: USFWS Commenter: JEB
Section #: General Pg #: NA Line #: NA Code: C
Comment: There are some contaminant issues that appear to be absent from this document. For example, PCB oils had been used in this (and other) area(s) of the site on the roads as dust control, yet no mention is made of this in this EIS. How does DOE intend to handle issues such as this? More assessment of this issue seems warranted. *516-3*

Commenting Organization: USFWS Commenter: JEB
Section #: General Pg #: NA Line #: NA Code: C
Comment: Lacking from the scenarios or analyses is any planning for disaster. For example, how would a breach of the Grand Coulee Dam affect what occurs on site? This type of planning is required of local emergency planning agencies by the federal government; it makes sense that the federal government should consider these same scenarios in their planning for remedial actions. *516-4*

Commenting Organization: USFWS Commenter: JEB
Section #: 2.5.4.3 Pg #: 2-120 Line #: NA Code: C
Comment: The DOE (and the Service) have trust responsibilities for the natural resources on the Hanford site. This alternative proposes an additional disposal facility in the 200 west area. Creation of this disposal facility would remove trust resources from use for the public in perpetuity. While we generally prefer removal and disposal rather than capping wastes in place, we prefer alternatives and recommend actions that will reduce the final footprint to the smallest area practicable and mitigate for those areas that are lost. *516-5*

Commenting Organization: USFWS Commenter: JEB
Section #: 2.8.1.7 Pg #: 2-146 Line #: NA Code: C

3

516-2 The clean closure alternatives considered for the SST system are represented by the Base and Option Cases of Tank Closure Alternatives 6A and 6B. For both Base Cases, the assumption is that the SST system would be cleaned to levels that would allow for unrestricted use, which would involve removal of the tanks, ancillary equipment, and soils beneath the tanks (contaminated as a result of past leaks) down to the water table. The two Option Cases represent this type of clean closure along with removal of soils beneath the tank farms (contaminated as a result of infiltration from the contiguous cribs and trenches [ditches]). The analysis shows that removal of the contaminants from the vadose zone would not capture those contaminants that may have already reached the groundwater table due to past practices (i.e., past leaks and contiguous cribs and trenches [ditches]).

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

Although a formal cost-benefit analysis is not required for EISs prepared under the CEQ's regulations implementing NEPA (40 CFR 502.23), or under the State of Washington's SEPA rules (WAC Chapter 197-11-450), DOE did prepare an analysis of the total costs of each alternative to better understand their relative relationship and to support the EIS's evaluation of potential environmental impacts. Compensation for potential natural resource injuries is addressed under a separate process consistent with CERCLA, as amended (42 U.S.C. 601, 9607) through regulations issued by the Department of Interior (43 CFR Part 11). These regulations establish an administrative process for conducting assessments that includes technical criteria for determining whether releases have caused injury, and if so, what actions and funds are needed to implement restoration. As a Trustee for natural resources at Hanford, DOE will continue to meet its responsibilities under CERCLA, as spelled out in the TPA, which includes addressing natural resource injuries. DOE's policy is to integrate natural resource concerns and restoration through the CERCLA cleanup process. Both DOE and the Department of the Interior are participating, along with other trustees, in ongoing injury assessment planning and related Natural Resource Damage Assessment and Restoration activities.

516-3 DOE discontinued the previous use of oils containing polychlorinated biphenyls (PCBs) as a method of dust control at Hanford in 1978, after which time the use of PCBs was restricted to contained systems. Areas previously contaminated

Commentor No. 516 (cont'd): Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

Comment: The DOE (and the Service) have trust responsibilities for the natural resources on the Hanford site. Reducing disturbance to the least amount practicable is preferred, in particular reducing impacts to the existing sagebrush habitat should be minimized for both the short- and long-term. **516-6**

Commenting Organization: USFWS Commenter: JEB
Section #: 2.8.3.7 Pg #: 2-190 Line #: NA Code: C
Comment: The DOE (and the FWS) have trust responsibilities for the natural resources on the Hanford site. Reducing disturbance to the least amount practicable is preferred; in particular reducing impacts to the existing sagebrush habitat should be minimized for both the short- and long-term. **516-7**
Commenting Organization: USFWS Commenter: JEB
Section #: 2.9.1.2 Pg #: 2-215 Line #: NA Code: C
Comment: This section states that "Impacts on other types of receptors vary in proportion to the impacts on the drinking-water well user and do not provide additional information to discriminate among alternatives." There is no additional information on which alternative is the most conservative, what is the proportional relationship of the other alternatives to the drinking-water well user, or other information which would aid the reader in evaluating the relative risk to other receptors/scenarios. Some information to guide the reader in this regard needs to be provided in this section. **516-8**

Commenting Organization: USFWS Commenter: JEB
Section #: 2.9.1.3 Pg #: 2-225 Line #: NA Code: C
Comment: The exposure scenario and calculation does not adequately characterize the potential risk to ecological receptors. These HQs are derived without considering the potential additive effects of chemicals, inputs of contaminants from ground water, aerial deposition on plants, etc. Missing are impacts from contaminated soil left in place, transport from disposal cells over time (generally through ground water), direct contact from air deposition and rain splash (on plants), and surface water pools (fed by surface water runoff and ground water). **516-9**

Commenting Organization: USFWS Commenter: RKM
Section #: 3.2.7.4 Pg #: 3-73 Line #: NA Code: C
Comment: Critical habitat for the federally threatened bull trout has recently been revised, and the current proposal includes the Hanford Reach of the Columbia. The EIS should be updated to reflect potential effects of Hanford activities on this critical habitat. We would also recommend additional conversations with the Service and the National Marine Fisheries Service (NMFS) regarding Endangered Species Act (Act) consultation regarding possible effects to federally listed species and their critical habitat. The current effects analysis in the EIS should be expanded. **516-10**

Commenting Organization: USFWS Commenter: RKM
Section #: 4.1.7 Pg #: 4-436 Line #: NA Code: C
Comment: This and other sections that discuss potential effects to threatened and endangered species should be expanded. The scope of your analysis should explicitly include any interrelated or interdependent project activities, (e.g., equipment staging areas, offsite borrow **516-11**

by this past practice are being addressed as part of the Hanford Site cleanup program and will be addressed in accordance with the requirements and timing of that program. Note that this *TC & WM EIS* does not address the cleanup of PCB-contaminated soils such as those referred to by the commentor; it does, however, include an analysis of the potential environmental impacts associated with a number of nonradioactive contaminants, including PCBs. Some of the waste in the Hanford SSTs and DSTs is known to contain PCBs. Appendix D, Section D.1.1.3, of this EIS explains how sample data were used to derive an estimated inventory for the tank farms. As indicated by that analysis, because the tank farms are high above the water table and remote from the river, PCBs have a negligible impact. Appendix M shows the projected PCBs released to the vadose zone from the tank farms (see, for example, Figures M–20, M–21, and M–22). Appendix N presents figures on the projected PCBs that travel through the vadose zone and reach the groundwater. As reflected in Figures N–16, N–17, and N–18 of the draft EIS, PCBs would not reach the groundwater in any significant quantity in the 10,000-year period of analysis.

516-4 As discussed in Chapter 3, Section 3.2.10.5, Emergency Preparedness, of this *TC & WM EIS*, DOE contractors are responsible for maintaining emergency plans and response procedures for all facilities, operations, and activities under their jurisdiction. The Hanford Site Emergency Plan, established in compliance with DOE Order 151.1C, *Comprehensive Emergency Management System*, provides for hazard-specific planning of, preparedness for, and response to a wide range of facility emergencies and natural phenomena, including flooding. Appendix K, Section K.3, covers the range of accidents considered and evaluated in this EIS. The accidents include facility accidents as well as natural events (e.g., an earthquake) deemed capable of affecting project facilities. A dam failure, as noted in the comment, was not included, as it is not deemed to have that capability. Chapter 3, Section 3.2.6.1, has been revised to include information from a study by the U.S. Army Corps of Engineers indicating that a hypothetical 50 percent instantaneous breach of Grand Coulee Dam would not inundate the 200 Areas or the 400 Area, where the activities addressed in this EIS are concentrated.

516-5 As noted in Chapter 2, Section 2.12, DOE's Preferred Alternative for waste management is Alternative 2, which would utilize less land, including less sagebrush habitat, than Alternative 3 but more than Alternative 1, No Action. With respect to mitigation, DOE would mitigate the loss of sagebrush habitat as stipulated in the *Hanford Site Biological Resources*

Commentor No. 516 (cont'd): Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

material areas, or utility relocations) and any indirect or cumulative effects. The current draft EIS does not contain a Biological Assessment that comprehensively summarizes effects in one place. Please coordinate with the Service and NMFS. ***516-11 cont'd***

Commenting Organization: USFWS Commenter: JEB
Section #: 5.1.3 Pg #: 3-362 Line #: NA Code: C
Comment: Long-term ground water impacts are only considered for the Columbia River, not resources that may be impacted on the travel route from the source to the Columbia River. The ponds near Gable Mountain provide evidence that the ground water contamination at the site is capable of impacting biota other than those only found in the Columbia River. Scenarios in which contaminated ground water impacts biota as it travels to the Columbia River need to be considered. ***516-12***

Commenting Organization: USFWS Commenter: JEB
Section #: 5.3.3 Pg #: 5-1162 Line #: NA Code: C
Comment: Long-term ground water impacts are only considered for the Columbia River, not resources that may be impacted on the travel route from the source to the Columbia River. Air deposition alone is not sufficient to characterize potential impacts to biota along the contaminated ground water pathway. The ponds near Gable Mountain provide evidence that the ground water contamination at the site is capable of impacting biota other than those only found in the Columbia River. Scenarios in which contaminated ground water impacts biota as it travels to the Columbia River need to be considered. ***516-13***

Commenting Organization: USFWS Commenter: JEB
Section #: 5.4.3 Pg #: 5-1269 Line #: NA Code: C
Comment: Long-term ground water impacts are only considered for the Columbia River, not resources that may be impacted on the travel route from the source to the Columbia River. The ponds near Gable Mountain provide evidence that the ground water contamination at the site is capable of impacting biota other than those only found in the Columbia River. Scenarios in which contaminated ground water impacts biota as it travels to the Columbia River need to be considered. ***516-14***

Commenting Organization: USFWS Commenter: JEB
Section #: 6.3.7 Pg #: 6-19 Line #: NA Code: C
Comment: Wetland creation incidental to construction, remediation, and treatment may occur. Any surface waters created should not adversely impact wildlife which may utilize them. ***516-15***

Commenting Organization: USFWS Commenter: JEB
Section #: 6.3.7.1 Pg #: 6-21 Line #: NA Code: C
Comment: Impacts to mature shrub-steppe should be minimized. ***516-16***

Commenting Organization: USFWS Commenter: JEB
Section #: 6.4.3 Pg #: 6-164 Line #: NA Code: C
Comment: Long-term ground water impacts are only considered for the Columbia River, not resources that may be impacted on the travel route from the source to the Columbia River. The ponds near Gable Mountain provide evidence that the ground water contamination at the site is ***516-17***

Management Plan (DOE 2001) and the *Hanford Site Biological Resources Mitigation Strategy* (DOE 2003c) (see appropriate ecological resources sections of Chapter 4 and Chapter 7, Section 7.1.7).

516-6 DOE is cognizant of its trust responsibilities. As noted in Chapter 7, Section 7.1.7, where impacts would occur, mitigation would be implemented as stipulated in the *Hanford Site Biological Resources Management Plan* (DOE 2001) and the *Hanford Site Biological Resources Mitigation Strategy* (DOE 2003c).

516-7 See response to comment 516-5 regarding sagebrush habitat.

516-8 As indicated in Chapter 2, Section 2.9, of this *TC & WM EIS*, detailed analysis and discussion of the long-term human health impacts for the drinking-water well user and the other receptors are provided in Appendix Q of this EIS. The purpose of Section 2.9 is to provide a summary of the results. Therefore, the drinking-water well user was used as a representative for the four types of receptors. The statement is trying to explain that the results from the other three types of receptors (i.e., the resident farmer, the American Indian resident farmer, and the American Indian hunter-gatherer) are proportional to the impacts on the drinking-water well user, so are not needed in this section in order for the reader to compare the alternatives. However, Chapter 5 and Appendix Q of this *TC & WM EIS* provide the results from the analyses for all four types of receptors and how they compare to each other and across the alternatives.

516-9 As stated in Appendix P, Section P.2.1, comparing alternatives is the primary purpose of the ecological risk analysis in this *TC & WM EIS*. The risk analysis is not intended to fully characterize the risk, as might occur in an ecological risk assessment under laws such as CERCLA; therefore, every exposure pathway (e.g., rain splash on plants) and its incremental contribution to a potential impact is not quantified. The most important pathways from sources to receptors (air emission and the subsequent deposition on soil, releases to groundwater) that are evaluated in this EIS are common to all of the alternatives, but vary in magnitude under different alternatives. The amounts released via these pathways and the resulting concentrations in the different media to which receptors are directly or indirectly exposed also vary under the different alternatives, but the extent to which receptors are exposed to the different media does not vary. Therefore, the risk to receptors under the different alternatives does not change if common but minor exposure routes are not included in the risk estimates for the receptors as long as the risk estimates for all alternatives are calculated in the same way for potentially capable of impacting biota other than those only found in the Columbia River. Scenarios in which contaminated ground water impacts biota as it travels to the Columbia River need to be considered.

Scenarios also appear to assume no changes in geomorphology of the Columbia River. It is assumed that in the timeframe considered (10,000 years) the flow path of the Columbia River will change. A recent article (2/1/2010) in the Tri-City Herald interviewing Alan Rohay, a seismologist at Pacific Northwest National Laboratory, stated that about 2,000 earthquakes occurred during 2009 in a small area beside the Columbia River on the Hanford site. There was an uplift of about an inch in this area. This would seem to support the concept that the river may indeed change course within 10,000 years. The most likely change in this area is to the south, first through the Hanford Ditch area, then possibly further south to the southwest of Gable Mountain. This would change exposure scenarios particularly with respect to inputs to the Columbia River. Geomorphological changes need to be considered for the various scenarios. ***516-17 cont'd***

Commenting Organization: USFWS Commenter: JEB
Section #: 7.2.7 Pg #: 7-26 Line #: NA Code: C
Comment: This section states that "Furthermore, under all TC & WM EIS alternatives, some COPCs would eventually migrate to and seep into the Columbia River. However, as discussed in Chapter 5, most of these impacts for all TC & WM EIS alternatives are not projected to be a risk to ecological receptors." Although we concur that COPCs will eventually migrate to the Columbia River, there was not adequate characterization to state that they are not projected to be a risk to ecological receptors and it appears as though there will be potential risk to ecological receptors that may be significant. ***516-18***

6

the same set of exposures and receptors. The additive effects of chemicals can be evaluated by calculating the Hazard Indices as the sum of the Hazard Quotients of individual chemicals.

516-10 The paragraph that discusses critical habitat in Chapter 3, Section 3.2.7.4, has been revised to include designation of the main stem upper Columbia River and Yakima River critical habitat units for the bull trout. Appropriate sections of Chapters 3 and 4 have been expanded accordingly.

Communications have occurred with DOE and with USFWS, NMFS, and the state concerning listed species that are potentially present on Hanford (see Appendix C). Potential impacts on special status species at Hanford are addressed in Chapter 4, Section 4.1, and there is no impact (that is, "no effect") on any federally or state-listed threatened or endangered species. If circumstances change, DOE will evaluate the need and undertake additional informal consultation with the appropriate agencies to ensure protection of listed species.

516-11 As noted in the response to comment 516-10, appropriate sections of Chapters 3 and 4 dealing with threatened and endangered species have been expanded to address the designation of critical habitat for the bull trout. DOE has considered the land needed for construction laydown in its land use estimates. Nearly all geologic material would be derived from Borrow Area C, although small amounts of material, such as cement, would be purchased from licensed offsite commercial facilities (see Chapter 4, Section 4.1.5). The small land area that could be needed to supply utilities to individual construction sites has not been included in the land use estimates provided in Chapter 4 because the extensive existing utility network in the 200 and 400 Areas would likely require little expansion. Nevertheless, DOE would consult with USFWS and the State of Washington prior to constructing utility corridors through undeveloped portions of the 200 and 400 Areas. Further, these areas would be surveyed for threatened and endangered species. It should be noted that a road has already been constructed off of Route 240 to access Borrow Area C. As no threatened or endangered species occur in the immediate vicinity of areas affected by project activities, indirect impacts would be minimal or nonexistent.

A general discussion of indirect impacts on biota is presented in Section 4.1.7.2.1 and other appropriate sections of Chapter 4. Potential cumulative impacts on threatened and endangered species are addressed in Chapter 6, Section 6.3.7. The format chosen for this *TC & WM EIS* is to present a discussion of each resource

Commentor No. 516 (cont'd): Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

Appendix P

Commenting Organization: USFWS Commenter: JEB
Section #: General Pg #: NA Line #: NA Code: E
Comment: The Service has limited its review of this document due in part to its large size, and in part due to the focus on sub-surface and engineering-related issues. Nonetheless, even our review was made difficult by errors in cross referencing within the document. *516-19*

Commenting Organization: USFWS Commenter: JEB
Section #: General Pg #: NA Line #: NA Code: C
Comment: Scenarios appear to assume no changes in geomorphology of the Columbia River. Based on historical changes in the geomorphology of the Columbia Basin, and continuing earthquakes and uplift in the Hanford Reach area, it can be assumed that in the time frame considered (10,000 years) the flow path of the Columbia River will continue to change. A recent article (2/1/2010) in the Tri-City Herald interviewing Alan Rohay, a seismologist at Pacific Northwest National Laboratory, stated that about 2,000 earthquakes occurred during 2009 in a small area beside the Columbia River on the Hanford site. There was an uplift of about an inch in this area. This would seem to support the concept that the river may indeed change course within 10,000 years. The most likely change in this area is to the south, first through the Hanford Ditch area, then possibly further south to the southwest of Gable Mountain. This would change exposure scenarios particularly with respect to inputs to the Columbia River. Geomorphological changes need to be considered for the various scenarios. *516-20*

Commenting Organization: USFWS Commenter: JEB
Section #: General Pg #: NA Line #: NA Code: C
Comment: There is a general sense that the goal of the risk analysis was to demonstrate there is an acceptable risk under the various alternatives. For example when Hazard Quotients exceed 1, it is stated that this doesn't mean there is unacceptable risk (e.g. "The chromium Hazard Quotients above 1.0 did not necessarily indicate high risk to aquatic biota"). Arguments are made to support these statements (e.g., given the magnitude of the Hazard Quotients and the conservative exposure assumptions… aquatic biota and sediment-dwelling biota… would be unlikely to be at unacceptable risk), rather than suggesting further analysis may be needed. Although the document considers the exposure assumptions conservative, we believe that these HQs are derived without considering the potential additive effects of chemicals, inputs of contaminants from ground water, aerial deposition on plants, etc. Thus we do not agree that these results are "conservative" or "overestimated" as stated in the text. Additionally some exposure factors have been dropped from the calculations (e.g., in the exposure model for plants, the exposure from direct deposition (P_d) is missing). We disagree with the conclusion that the analyses indicate acceptable risk (page P-51 "Conservative exposure assumptions and TRVs mitigated these uncertainties and allow for confidence in "no risk" conclusions"). *516-21*

Commenting Organization: USFWS Commenter: JEB
Section #: General Pg #: NA Line #: NA Code: C
Comment: There are several shortcomings with the current ecological risk assessment and we are concerned about the adequacy for predicting current and future risk. *516-22*

7

area (e.g., land use, infrastructure, ecological resources) under each Tank Closure alternative, followed by similar discussions under the FFTF Decommissioning and Waste Management alternatives. Thus, it is not possible to present all information for threatened and endangered species within one section. The format used in this EIS attempts to present the material in a logical manner that permits the reader to readily review the potential impacts.

516-12 Potential impacts on terrestrial ecological resources were evaluated for multiple exposure pathways and sources (air emissions and subsequent deposition on soil, releases to groundwater). Impacts on terrestrial receptors were evaluated at the maximum onsite location (air deposition only) and offsite/Columbia River location (air deposition and groundwater discharge). For consistency with other *TC & WM EIS* assessments of long-term impacts, the line of analysis for the maximum terrestrial exposure location was the Core Zone Boundary in the predominant downwind direction, and exposure to groundwater upwelling/discharging was only evaluated at the Columbia River. Based on DOE's review of the site descriptions, the conceptual model for Hanford does not include locations (such as Gable Mountain ponds) along the pathways from potential contamination sources to the Columbia River. This is consistent with the conceptual site model for long-term future groundwater levels. This EIS does not state or assume that terrestrial receptors are never exposed to groundwater in upland habitats; however, discharge of contaminated groundwater beneath the Core Zone to upland habitats is considered a minor pathway because if it occurs, it only occurs in a few places, infrequently, and only at small volumes, and the extent and magnitude of the ecological exposure is accordingly small. The most important pathways from sources to receptors that are evaluated in this EIS are common to all of the alternatives, but vary in magnitude under different alternatives. Therefore, the risk to receptors under the different alternatives does not change if common but minor exposure routes are not included in the risk estimates for the receptors as long as the risk estimates for all alternatives are calculated in the same way for the same set of exposures and receptors.

516-13 See response to comment 516-12 for a discussion of long-term groundwater impacts.

516-14 See response to comment 516-12 for a discussion of long-term groundwater impacts.

516-15 DOE agrees with the commentor that any surface waters created as a result of activities associated with any of the Tank Closure, FFTF Decommissioning,

Commentor No. 516 (cont'd): Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

Commenting Organization: USFWS Commenter: JEB
Section #: P.1 Pg #: P-1 Line #: NA Code: E
Comment: Review was made difficult by errors in cross referencing within the document. For example Appendix P, section P1 refers to Chapter 3, Figure 3-13 for habitat information whereas this information appears to be in Figure 3-16 and the reader is referred to sections 3.9.4.1 and 3.9.4.2 for threatened and endangered species however these sections do not exist. **516-23**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2 Pg #: P-5 Line #: NA Code: C
Comment: What appears to be missing from the analysis is upland waters that would be ground water fed. These types of water bodies have been found historically on site (e.g. Gable Mountain ponds) and could appear again through erosion of ground surface and/or changes in ground water elevation or other geomorphological changes over the next 10,000 years. This scenario indeed may be likely. Analyses of impacts to wildlife under the different scenarios when these conditions appear need to be conducted. **516-24**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2 Pg #: P-5 Line #: NA Code: C
Comment: Impacts to terrestrial ecological receptors were evaluated by using values from air and soil concentrations resulting from air deposition. Missing are impacts from contaminated soil left in place, transport from disposal cells over time (generally through ground water), direct contact from air deposition and rain splash (on plants), and surface water pools (fed by surface water runoff and ground water). These impacts need to be included. **516-25**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2 Pg #: P-5 Line #: NA Code: C
Comment: It is stated that immediately following operations soil concentrations are expected to be at their maximum, attenuating thereafter. However predicted failure of disposal containment shows increases in ground water levels long after operations have ceased. These releases will likely impact surface water through migration to the Columbia River as well as providing a source for more upland surface water bodies; analyses of impacts to wildlife under these conditions needs to be conducted. **516-26**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1 Pg #: P-6 Line #: NA Code: C
Comment: It appears as though the exposure scenarios were run during remedial operations only although it is stated that predicted releases were used "…to evaluate the impacts…in the distant future following operations." These analyses were not evident. We are concerned about the potential long-term impacts to wildlife that may occur after remedial activities have ceased. What are the exposure scenarios and potential impacts for the different alternatives in Calendar Year 2050 and beyond? **516-27**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1 Pg #: P-6 Line #: NA Code: C
Comment: Exposure was not evaluated using the newer ICRP Publication 108 (October, 2008). What would the result be using the newer guidance? **516-28**

8

or Waste Management alternatives should not adversely impact wildlife. Such surface waters would most likely be associated with runoff/sedimentation ponds put in place during construction and would be temporary in nature. Because water captured in these ponds would be unlikely to be contaminated and would readily infiltrate or evaporate, adverse impacts on wildlife would also be unlikely. Nevertheless, appropriate precautions to eliminate or minimize adverse impacts on wildlife would be implemented as part of such projects at the time they occur.

516-16 During the process of siting facilities for the various alternatives addressed in this *TC & WM EIS*, DOE selected locations that were within disturbed areas to the greatest extent possible. Nevertheless, some undisturbed areas containing sagebrush habitat would be needed for locating a few facilities. If sagebrush habitat would be disturbed under alternatives selected in the ROD, its loss would be mitigated as stipulated in the *Hanford Site Biological Resources Management Plan* (DOE 2001) and the *Hanford Site Biological Resources Mitigation Strategy* (DOE 2003c) (see the appropriate ecological resources sections of Chapter 4 and Chapter 7, Section 7.1.7).

516-17 In general, the features and processes (e.g., geomorphology) included in the groundwater model were governed primarily by two considerations: the requirement to inform decisionmaking by providing an unbiased evaluation of the impacts of the alternatives and the requirement to provide a technically defensible analysis of the impacts using documented data and methodologies. Many important features or processes can be thought to occur, but are not essential to a comparative analysis, which would be weakened or clouded by modeling features and processes that are speculative or may occur, but that lack essential characterization data. Due to the uncertainty of occurrences 10,000 years in the future, any assumption made would have to be applied consistently to all alternatives, which would not affect their relative ranking. This *TC & WM EIS* is designed to evaluate impacts to support decisions regarding retrieval of waste from the SST system, closure of that system, and processing and disposal of the waste streams resulting from those activities. Those evaluations are best supported by analyses that model future conditions similar to current conditions in the absence of data that strongly demonstrate the degree and nature of change.

516-18 As stated in Appendix P of this *TC & WM EIS*, comparing alternatives is the primary purpose of the ecological risk analysis in this EIS. Based on the conservative nature of the exposure assumptions and on the estimated Hazard Indices and Hazard Quotients for the representative receptors, no adverse effects

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1 Pg #: P-6 Line #: NA Code: C
Comment: Comparing alternatives is the primary purpose of the ecological risk analysis however without including impacts from contaminated soil left in place, transport from disposal cells over time (generally through ground water), and surface water pools (fed by surface water runoff and ground water) comparison of the long term potential impacts to wildlife are inadequate. As written, the analysis is primarily for releases during remedial treatment and does not consider impacts after closure. **516-29**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1 Pg #: P-6 Line #: NA Code: C
Comment: Benchmarks from the newer ICRP Publication 108 (October, 2008) should also be considered. **516-30**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1 Pg #: P-8 Line #: NA Code: C
Comment: Since hazards from exposures to multiple chemicals can be and usually are additive (although they can be antagonistic or synergistic) evaluating impacts from chemicals individually is generally not acceptable. Several acceptable methods are available for such analyses (see e.g. "Methods and Guidance for Health Risk Assessment of Chemical Mixtures," L. K. Teuschler, M. Mumtaz, R. C. Hertzberg, and G. E. Rice, 2003). **516-31**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1 Pg #: P-8 Line #: NA Code: C
Comment: Use of partial dose because further information is not available is not appropriate without explicitly showing where only partial dose was used and indicating why no acceptable method of estimating total dose was available. **516-32**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1 Pg #: P-8 Line #: NA Code: C
Comment: Using bird toxicity test data for lizards and particularly amphibians is not appropriate. There should be no shortage of chemical toxicity data that could be used for amphibians and reptiles so that there is no need to use any other class of animal. **516-33**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1.1 Pg #: P-9 Line #: NA Code: C
Comment: Exposure pathways to plants should include aerial deposition (e.g., foliar adsorption), rain splash, and ground water uptake. **516-34**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1.4 Pg #: P-10 Line #: NA Code: C
Comment: In the exposure model for plants, the exposure from direct deposition (P_d) is missing (USEPA, 1999, Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Vol. 3, Appendix F, Peer Review Draft, EPA530-D-99-001C, Office of Solid Waste and Emergency Response, Washington, D.C., August.) **516-35**

9

of chemical or radioactive COPCs in air or groundwater releases to the Columbia River are expected to result under the various alternatives evaluated.

516-19 For those who may not want to read through this entire EIS, DOE published a Summary. The Summary is intended to provide a brief overview of the material contained in the *Draft TC & WM EIS*. For those interested in reading this entire EIS, DOE has also issued a Reader's Guide to assist the public in navigating through the information presented. This guide serves as an introduction and guide to the contents of this EIS, highlights the key features of the reasonable alternatives, and provides references to specific sections of the document to assist the reader in reviewing the technical analyses presented. Recognizing that many people may not read beyond the EIS Summary, the information presented in both the Summary and the Reader's Guide attempts to strike a balance between those readers interested in the technical details regarding DOE's proposed actions and alternatives and readers seeking a simple overview.

DOE also held a 1-hour open house prior to each public hearing on the draft EIS to allow the public to meet informally with members of the *TC & WM EIS* team, ask questions, and learn more about the draft EIS. Informative factsheets also were provided at these open houses. In response to the commentor's concern regarding any cross-referencing errors that may have occurred during production of the draft EIS, DOE has done an extensive review to ensure that the cross-references of this *Final TC & WM EIS* are improved. In addition, DOE has conducted thorough reviews of this EIS, including technical editing and proofing, as well as reviews by subject matter experts and DOE staff to ensure the accuracy of cross-references within this document.

516-20 See response to comment 516-17 regarding groundwater model features.

516-21 As stated in Appendix P, Section P.2.1, comparing alternatives is the primary purpose of the ecological risk analysis in this *TC & WM EIS*. The risk analysis is not intended to fully characterize the risk, as might occur in an ecological risk assessment under laws such as CERCLA; therefore, every exposure pathway (e.g., rain splash on plants) and its incremental contribution to a potential impact is not quantified. Nevertheless, the magnitude of exposures over the important pathways is overestimated, as described in Appendix P, Section P.2, by using maximum average annual air concentrations and cumulative soil concentrations resulting from air deposition over the entire operations period and ignoring all loss mechanisms. These hypothetical maximum exposures for the evaluated pathways are compared with benchmarks associated with no impact, resulting in

Commentor No. 516 (cont'd): Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1.4 Pg #: P-11 Line #: NA Code: C
Comment: In the exposure model for soil-dwelling invertebrates, the exposure from ingested water (P_w) is missing (USEPA, 1999, Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Vol. 3, Appendix F, Peer Review Draft, EPA530-D-99-001C, Office of Solid Waste and Emergency Response, Washington, D.C., August). This may be significant in the long-term due to failure of disposal cells and movement of contaminated ground water. **516-36**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1.4 Pg #: P-11 Line #: NA Code: C
Comment: The soil organic carbon content referenced as 0.01 in DOE 1998 (DOE (U.S. Department of Energy), 1998, Screening Assessment and Requirements for a Comprehensive Assessment, Columbia River Comprehensive Impact Assessment, DOE/RL-96-16, Rev. 1, Pacific Northwest National Laboratory and CRCIA Management Team, March) could not be found within that reference. Please provide more detail of the source of this value. **516-37**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1.4.1 Pg #: P-11 Line #: NA Code: C
Comment: The ECF for mule deer is 1, taken from Sample et al (1997). However Sample states that "For relatively small mammals (e.g., mice, voles, and shrews) that are effectively much closer than 1 m to the source, an elevation correction factor (ECF) of 2 should be applied to account for the increased dose expected at ground level relative to the effective height of a standard human used to derive the dose coefficients. For large animals the ECF may be set at 1. If desired, more complex modeling may be conducted to arrive at ECFs for organisms of any given effective height above the ground." In the case of deer, an ECF of 1 does not seem appropriate since, unlike humans, adult deer sleep on the ground and fawns, a physiologically more sensitive life stage, spend even more time lying on the ground. **516-38**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1.4.1 and P.2.1.4.2 Pg #: P-11 to P-18 Line #: NA Code: C
Comment: Exposure was not evaluated using the newer ICRP Publication 108 (October, 2008). Why wasn't the newer guidance used and what would the result be using the newer guidance? **516-39**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.1.5 Pg #: P-20 Line #: NA Code: C
Comment: The toxicological benchmarks used for vertebrates (0.1 rad per day) and plants/invertebrates (1 rad per day) were derived from IAEA (1992). Are these at least as protective as the no effect level values for reference plants and animals in Environmental Protection: the Concept and Use of Reference Animals and Plants, ICRP Publication 108 Approved by the Commission in October 2008 using the appropriate dose calculations? We would like the most protective values to be used. **516-40**

Commenting Organization: USFWS Commenter: JEB
Section #: P.2.2.1 Pg #: P-25 Line #: NA Code: C

conservative Hazard Quotients. Statements addressing Hazard Quotients greater than 1 acknowledge the deliberate conservatism of some of the parameters used in the risk analysis and the uncertainty associated with interpreting Hazard Quotients that are greater than 1, which are indicative of likely adverse impacts. This EIS does not unequivocally state that there are no risks to ecological receptors under the various alternatives. As stated in Appendix P, a more precise evaluation would be required to resolve the uncertainties in the risk characterization. A risk assessment precise enough to support risk characterization with acceptable uncertainty, however defined, such as might be required to support a decision under CERCLA, would typically require field studies quantifying actual exposure of, and adverse impacts on, ecological receptors, i.e., a baseline ecological risk assessment. A baseline ecological risk assessment is unnecessary, because such an assessment is not required to provide an unbiased comparison or to differentiate the impacts among the alternatives evaluated in this *TC & WM EIS*. As suggested in Appendix P, a more precise evaluation is not possible for this *TC & WM EIS* because of incomplete and unavailable information.

516-22 As stated in Appendix P, Section P.2.1, comparing alternatives is the primary purpose of the ecological risk analysis in this *TC & WM EIS*. The risk analysis is not intended to fully characterize the risk, as might occur in an ecological risk assessment under laws such as CERCLA; therefore, every exposure pathway (e.g., rain splash on plants) and its incremental contribution to a potential impact is not quantified. The most important pathways from sources to receptors (air emission and the subsequent deposition on soil, releases to groundwater) that are evaluated in this EIS are common to all of the alternatives, but vary in magnitude under different alternatives. The amounts released via these pathways and the resulting concentrations in the different media to which receptors are directly or indirectly exposed also vary under the different alternatives, but the extent to which receptors are exposed to the different media does not vary. Therefore, the risk to receptors under the different alternatives does not change if common but minor exposure routes are not included in the risk estimates for the receptors as long as the risk estimates for all alternatives are calculated in the same way for the same set of exposures and receptors.

516-23 The text has been corrected in Appendix P, Section P.1, of this *Final TC & WM EIS*.

Commentor No. 516 (cont'd): Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

Comment: Here reference is made to using the soil-dwelling invertebrate BAF-S that might have been overestimated. The BAF-S was based on a Daphnia BCF as described in section P.2.1.4 page P-11. Since using the Daphnia raised uncertainty for the soil dwelling invertebrate, why wasn't the earthworm used instead? For example, the following approach to calculate a soil-earthworm BAF is from SADA (2000):

Kow-based soil-to-invertebrate BAFs generated using
the following equation from EPA (2000):
BAFworm = soil to earthworm bioaccumulation factor
(mg/kg dry invertebrate / mg/kg soil)
foc = fraction organic carbon in soil. Default is set to 1%.
Kow = octanol-water partitioning coefficient.

516-41

11

516-24 Ecological risk information used to assess and compare the alternatives is presented in this EIS. Potential impacts on terrestrial ecological resources were evaluated for multiple exposure pathways and sources (air emissions and subsequent deposition on soil, releases to groundwater). Impacts on terrestrial receptors were evaluated at the maximum onsite location (air deposition only) and offsite/Columbia River location (air deposition and groundwater discharge). For consistency with other *TC & WM EIS* assessments of long-term impacts, the line of analysis for the maximum terrestrial exposure location was the Core Zone Boundary in the predominant downwind direction. This EIS does not state or assume that terrestrial receptors are never exposed to groundwater in upland habitats; however, discharge of contaminated groundwater beneath the Core Zone to upland habitats is considered a minor pathway. The most important pathways from sources to receptors that are evaluated in this EIS are common to all of the alternatives, but vary in magnitude under different alternatives. The amounts released via these pathways and the resulting concentrations in the different media to which receptors are directly or indirectly exposed also vary under the different alternatives, but the extent to which receptors are exposed to the different media does not vary. Therefore, the risk to receptors under the different alternatives does not change if common but minor exposure routes are not included in the risk estimates for the receptors as long as the risk estimates for all alternatives are calculated in the same way for the same set of exposures and receptors.

516-25 As stated in Appendix P, Section P.2.1, comparing the alternatives is the primary purpose of the ecological risk analysis in this *TC & WM EIS*. The risk analysis is not intended to fully characterize the risk, as might occur in an ecological risk assessment under laws such as CERCLA; therefore, every exposure pathway (e.g., rain splash on plants) and its incremental contribution to a potential impact is not quantified. The most important pathways from sources to receptors (air emission and the subsequent deposition on soil, releases to groundwater) that are evaluated in this EIS are common to all of the alternatives, but vary in magnitude under different alternatives. The amounts released via these pathways and the resulting concentrations in the different media to which receptors are directly or indirectly exposed also vary under the different alternatives, but the extent to which receptors are exposed to the different media does not vary. Therefore, the risk to receptors under the different alternatives does not change if common but minor exposure routes are not included in the risk estimates for the receptors as long as the risk estimates for all alternatives are calculated in the same way for the same set of exposures and receptors.

Commentor No. 516 (cont'd): Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

Appendix R

Commenting Organization: USFWS Commenter: JEB
Section #: R.4 Pg #: R-10 Line #: NA Code: C
Comment: The following two bullets are presented on this page:

• Contaminated materials and soils will be left in place, unless removal and disposal are more cost-effective.
• Removing, treating, and disposing of contaminated materials, especially soil.

Contaminated materials and soils should be removed, treated, and disposed of unless doing so is cost prohibitive and leaving those materials in place will not present an unacceptable risk. ***516-42***

Commenting Organization: USFWS Commenter: JEB
Section #: Table R-3 Pg #: R-20 Line #: NA Code: C
Comment: Long-term ground water impacts are only considered for the Columbia River, not resources that may be impacted on the travel route from the source to the Columbia River. The ponds near Gable Mountain provide evidence that the ground water contamination at the site is capable of impacting biota other than those only found in the Columbia River. Scenarios in which contaminated ground water impacts biota as it travels to the Columbia River need to be considered.

The analyses appear to assume no changes in geomorphology of the Columbia River. It is assumed that in the time frame considered (10,000 years) the flow path of the Columbia River will change. A recent article (2/1/2010) in the Tri-City Herald interviewing Alan Rohay, a seismologist at Pacific Northwest National Laboratory, stated that about 2,000 earthquakes occurred during 2009 in a small area beside the Columbia River on the Hanford site. There was an uplift of about an inch in this area. This would seem to support the concept that the river may indeed change course within 10,000 years. The most likely change in this area is to the south, first through the Hanford Ditch area, then possibly further south to the southwest of Gable Mountain. This would change exposure scenarios particularly with respect to inputs to the Columbia River. Geomorphological changes need to be considered. ***516-43***

Commenting Organization: USFWS Commenter: JEB
Section #: Table R-12 Pg #: R-23 Line #: NA Code: C
Comment: The listed activity "Management of the Hanford Reach of the Columbia River as a national monument and a national wildlife refuge" should include as a wild and scenic river in accordance with Public Law 100-605 as amended by Public Law 104-333, Section 404 in this and other relevant sections of the document (e.g. Section 6.2). ***516-44***

12

516-26 See response to comment 516-24 regarding ecological receptors.

516-27 Long-term impacts of releases to air throughout the remedial period were evaluated at the end of that period, when the concentrations would be at their theoretical maximum due to accumulation of contaminants released throughout the period, assuming no decay or other entropic processes following deposition. At the end of the remedial period, concentrations would begin to be reduced by decay and other entropic processes. Direct exposure of wildlife to wastes in burial grounds after the end of the period was not evaluated in this EIS, except to the extent that wildlife would be exposed to releases of contaminants to groundwater. Long-term impacts on wildlife exposed to maximum concentrations in discharging groundwater over 10,000 years were evaluated.

516-28 This *TC & WM EIS* used the guidance of Valentin (2007) [ICRP Publication 103]. DOE believes the benchmarks in that guidance are adequate for the purposes of this EIS (Hanford-specific receptors). The primary purpose of the ecological risk analysis for this *TC & WM EIS* is to provide an unbiased comparison of alternatives, and that comparison is independent of the benchmark used for any given receptor and COPC. The secondary purpose is a screening-level assessment of risk, and DOE believes the benchmarks used in the ecological risk analysis for this *TC & WM EIS* are conservative benchmarks that are appropriate for that purpose. ICRP Publication 108 "introduces the concept of Reference Animals and Plants, and defines a small set. It discusses their pathways of exposure, and collates and discusses the adequacy of the best-available data relating to their dosimetry at different stages of their life cycles. In addition, this publication further develops and uses this information to derive sets of tabulated data (dose conversion factors, in terms of (µGy/day)/(Bq/kg)) that allow the dose to be calculated for 75 radionuclides that may be within, or external to, each organism" and "…derives a set of derived consideration reference levels for each biotic type in order to help optimise the level of effort that might be expended on its environmental protection, or that of similar types of organisms." ICRP Publication 108 does not claim to have any new data for calculating rad dose; rather it applies existing data to calculating dose and "reference levels" to generic "reference" receptors.

516-29 DOE agrees with the commentor's assertion that impacts after closure are a key component to distinguishing among the alternatives considered in this *TC & WM EIS*. DOE disagrees with the commentor's assertion that the analysis in the *Draft TC & WM EIS* is primarily for releases during remedial treatment. In both the alternatives impacts analysis (Chapter 5) and the cumulative impacts analysis (Chapter 6), impacts are explicitly included from past releases, contaminated soils and other materials left in place following closure, and potential future waste disposal activities. In addition, connectivity from the source locations through the groundwater system to the locations of ecological receptors is considered through the long-term impacts analysis (Chapters 5 and 6 and Appendix P).

516-30 See response to comment 516-28 regarding the use of data resources.

516-31 Calculated risk indices, Hazard Quotients for individual chemical COPCs, and Hazard Indices for all radioactive COPCs combined were used to compare *TC & WM EIS* alternatives (see Chapter 5). Additive effects of chemicals can be evaluated by calculating Hazard Indices as the sum of Hazard Quotients of individual chemicals. Doing so assumes that effects are additive. This assumption is not necessary for the purpose of comparing risks of *TC & WM EIS* alternatives.

516-32 Appendix P documents where information was not available to calculate total dose. Using partial dose is acceptable because, as stated in Appendix P, comparing alternatives is the primary purpose of the ecological risk analysis in this *TC & WM EIS*, and the same information is available across alternatives for a given receptor or pathway.

516-33 Regarding the use of bird toxicity data for reptiles and amphibians, commonly accepted screening-level toxicity benchmarks for reptiles and amphibians were not available for the chemical COPCs. The lack of toxicity reference values for reptiles and amphibians does not thwart the primary purpose of this *TC & WM EIS*, i.e., to compare alternatives. Rather than exclude these receptors for lack of toxicity reference values, the risk analysis estimates the exposure of reptiles and amphibians, which likely differ from that of birds because of differences in receptor parameters such as body weight and ingestion rate, resulting in potential differences in risk estimates even when calculated using the same toxicity reference values. This approach provides a broader range of risk estimates with which to compare alternatives and screen the risk of alternatives.

516-34 See response to comment 516-25 regarding the ecological risk analysis.

516-35 Long-term impacts of releases to air were evaluated at the end of the remedial period, when the concentrations in soil would be at their theoretical maximum due to accumulation of contaminants released throughout the remedial period, assuming no decay and other entropic processes following deposition. After

Commentor No. 516 (cont'd): Ken S. Berg, Manager, U.S. Department of the Interior, Washington Fish and Wildlife Office

the remedial period, there would be no direct deposition on plants from releases to air, only from resuspended soil. Uptake of chemicals and radionuclides into plants from soil is included in the dose for herbivores, in addition to soil ingestion, as well as in the internal radiation dose for plants, as shown in equations in Appendix P, Sections P.2.1.4 and P.2.1.4.2. The risk to plants is estimated from the soil concentration of chemicals because the toxicological benchmarks for plants are soil concentrations, as discussed in Section P.2.1.5.

516-36 Benchmarks for soil-dwelling invertebrates cover all pathways from soil to invertebrate. The risk to ecological receptors from ingestion of groundwater for the *TC & WM EIS* alternatives is estimated for a variety of vertebrate receptors for which there are commonly accepted estimates of water ingestion rates and ingestion-based toxicity reference values. There is no commonly accepted method for estimating risk to soil-dwelling invertebrates from ingestion of water specifically because there are no commonly accepted estimates of water ingestion by soil-dwelling invertebrates nor ingestion-based toxicity reference values. Rather, risk to soil-dwelling invertebrates is estimated using the concentration of COPC in soil and concentration-based toxicity reference values (benchmarks) that are commonly assumed to include all exposure pathways from soil to soil-dwelling invertebrates, including ingestion of and direct uptake from soil pore water.

516-37 Regarding the commentor's request for additional information concerning the DOE 1998 reference, the value and source are listed in Appendix P, Section P.2.1.4, of this *TC & WM EIS*. The value of 0.01 is found on page I-D.2 of DOE 1998 in Appendix I-D of the referenced document.

516-38 The purpose of the risk analysis was not to assess the risk to every species and every life stage. Comparing alternatives is the primary purpose of the ecological risk analysis in this *TC & WM EIS*.

516-39 See response to comment 516-28 regarding the use of data resources.

516-40 See response to comment 516-28 regarding the use of data resources.

516-41 The decision was made not to use the earthworm due to the aridity of the site, because earthworms are not a major component of the soil-dwelling invertebrate fauna in arid lands. Applying bioaccumulation factors derived from octanol-water partitioning coefficients to other classes of soil-dwelling invertebrates at Hanford, as suggested in the comment, would not reduce uncertainties. Uncertainty about values of parameters in exposure models does not reduce their utility given the primary purpose of the ecological risk analysis for this *TC & WM EIS*, namely the unbiased comparison of alternatives. Furthermore, not every species is required to be used in the analysis of alternatives for this *TC & WM EIS*.

516-42 The statements in question are from the *Plan for Central Plateau Closure*, which presents a strategic approach to closing the Central Plateau area of Hanford (Fluor Hanford 2004). As stated in Appendix R, page R–10, of the *Draft TC & WM EIS*, the first bullet was an overall assumption from the plan, and the second bullet was the closure approach for the Waste Site Closure Element. There are 12 operable units on the Central Plateau. An interim decision has been made for one of them and others are planned. An assumption was made about the potential remediation choice for other units on the Central Plateau. Actual cleanup actions under RCRA and CERCLA will be governed by site-specific analyses and decisions made in consultation with state and Federal regulators, as appropriate. Central Plateau closure is not the subject of a decision in this *TC & WM EIS* but is included because of the potential contribution to cumulative impacts.

516-43 See response to comment 516-17 regarding groundwater model features.

516-44 Management of the Hanford Reach as a Wild and Scenic River by USFWS has been added to Chapter 6, Section 6.2, of this *TC & WM EIS*. The status of the Hanford Reach relative to the laws noted by the commentor is addressed in Chapter 3, Section 3.2.6.

Commentor No. 517: Dee Tvedt

From: dee@dtvedt.com
Sent: Tuesday, May 04, 2010 1:36 AM
To: ^DOE
Cc: Gamache, Lori M
Subject: Hanford Clean up comments

Thank you for the opportunity to comment on the Hanford Clean-up. Following is my feedback:

THERE SHOULD BE NO MORE WASTE ADDED TO HANFORD! I am completely opposed to Hanford being a national radioactive and radioactive-hazardous waste dump. The USDOE must do all it can to protect the Columbia River and the health of children and adults living on and around it for thousands of years.

Limit wastes in Hanford landfills to amounts and types of Hanford clean-up wastes which won't cause future leakage & violate cancer risk and other standards. This means using off-site landfills that are not next to major rivers or above drinkable groundwater, and not importing off-site waste to Hanford. *517-1*

Dig up Plutonium and other "Transuranic" wastes in unlined soil disposal ditches and tank leaks, treat the wastes and dispose of them in deep geologic repositories. Dig up other wastes from unlined soil ditches and tank leaks, treat them, and dispose of them in a regulated commercial radioactive waste facility which is not above drinkable groundwater or next to a river. *517-2*

USDOE must remove the tanks ("clean closure") and investigate and remediate the soil contamination from
tank leaks. Washington State's hazardous waste law says that landfill closure can only be used after practical efforts to cleanup contamination have been attempted.

The USDOE must remove 99.9% of the tank wastes, or remove to the limits of technical capabilities. *517-3*

The Washington State standard for decommissioning nuclear reactors requires removal and site restoration. Oregon did this for the Trojan reactor. Do not put more radioactive waste on the road unnecessarily – treat the waste at Hanford. *517-4*

The USDOE should plan to start up the LAW vitrification portion of WTP prior to 2019 and start funding a second LAW facility in 2012 in order to have it ready to operate by 2022. The "supplemental treatment" options should be discarded as they are less effective and less protective of the environment. *517-5*

USDOE should drop completely their proposed trucking of nearly 3 million cubic feet of radioactive and "mixed" radioactive wastes to Hanford under its "preferred *517-1 cont'd*

517-1 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

517-2 Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

DOE policy and the *WM PEIS* specify disposal of LLW and MLLW within the DOE complex. However, for MLLW, DOE may continue to use commercial disposal facilities, consistent with DOE Order 435.1 and current DOE policy. Any LLW generated by the tank closure or FFTF decommissioning activities would be disposed of in the LLBGs, in one of the two active trenches (31 and 34); an IDF; and/or the RPPDF, all of which would have liners.

517-3 The impacts of different levels of tank waste retrieval and of different types of SST system closure are addressed in the *TC & WM EIS* analyses. These include Tank Closure Alternatives 4, 6A, and 6B, which evaluate 99.9 percent retrieval of the tank waste and clean closure of all or part of the SST system. This closure includes the tank system, along with the vadose zone as impacted by the tank farms (i.e., past leaks). However, as discussed in the Summary and Chapter 1 of this *TC & WM EIS*, DOE will not make decisions based on this EIS on groundwater remediation, including the remediation of groundwater contamination resulting from non-tank-farm areas in the 200 Areas, because that is being addressed under the CERCLA (42 U.S.C. 9601 et seq.) process as implemented under the TPA. Decisions made by DOE on the proposed actions will be based on a number of factors, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. The decisions on the selected course of action and supporting rationale will be documented in a ROD issued no sooner than 30 days after the EPA Notice of Availability for this *Final TC & WM EIS* is published in the *Federal Register*.

517-4 Under NEPA, agencies identify the laws, regulations, and requirements that may apply to the proposed action and alternatives and identify where standards may alternatives" in the Tank Closure & Waste Management Environmental Impact Statement. This plan is a huge danger to the people of Oregon and Washington and future generations. 517-1 cont'd

Do not endanger any more living beings with these hazardous radioactive wastes. Clean up Hanford now – future generations need to not suffer for the stupid decisions of this generation.

Sincerely,

Dee Tvedt
801 Lynn Lane
Eugene, OR 97404
Phone: xxx-xxx-xxxx

be exceeded. Chapter 8 of this *TC & WM EIS* provides both a listing and short description of the laws, regulations, and requirements that may apply to the proposed actions, including decommissioning of FFTF.

Radioactive waste is transported in DOT-certified containers that meet strenuous technical standards established by NRC.

517-5 As discussed in the *TC & WM EIS* Summary, Chapter 1, and Chapter 2, this EIS analyzes additional waste treatment capability that includes expanding the vitrification process capability currently being constructed in the WTP or supplementing the WTP's capability with supplemental treatment technologies. Thus, decisions to be made by DOE regarding whether to treat all waste in the WTP, as is or expanded, or to supplement its capacity by adding new treatment capability depend on demonstrating the feasibility of supplemental treatment technologies, including supplemental treatment waste-form performance (durability) for long-term groundwater protection.

Appendix E, Section E.1.3.3.1, discusses the DOE Technology Readiness Assessment that included Business Case No. 7 (LAW First and Bulk Vitrification with Tank Farm Pretreatment), i.e., early startup of the LAW treatment process. However, at the time of the *Draft TC & WM EIS* preparation, DOE had not made a decision on whether to support implementation of this business case. Since then, DOE has commissioned an external technical review of the system planning for alternative supplemental treatment of LAW at Hanford (Kosson et al. 2008). The report (Kosson et al. 2008) from this review concluded that, although the current schedule for completion of the WTP LAW Vitrification Facility and supporting facilities could support early treatment of LAW in 2014, such early startup would require an interim pretreatment capability and the means for disposition of secondary waste. Since 2008, DOE has been evaluating the transition of the WTP from construction to commissioning and has issued a startup strategy, the *2020 Vision* (WRPS and BNI 2011). Information on this strategy is provided in Appendix E, Section E.1.3.3.2, of this *Final TC & WM EIS*. The *2020 Vision* evaluates some of the elements identified in earlier DOE reports but focuses on commissioning of the WTP project and activities essential to starting up the LAW Vitrification Facility, the Analytical Laboratory, the BOF, as well as the Pretreatment Facility and the HLW Vitrification Facility.

Commentor No. 518: Dave Tvedt

From: David Tvedt [david@dtvedt.com]
Sent: Tuesday, May 04, 2010 1:03 AM
To: DOE
Cc: Gamache, Lori M
Subject: Hanford draft

I am writing regarding your Hanford draft Tank Closure and Waste Management EIS. I am totally opposed to Hanford being used as a national radioactive waste dump. It's already one of the most polluted and toxic places in the United States and it is in no way an appropriate place for storing more radioactive waste. *518-1*

I urge you to do a "clean closure" of the High-Level Nuclear Waste Tanks and not just a partial cleanup. The millions of gallons of radioactive waste leaked from these tanks is appalling. The long term ramifications of the over 40 miles of unlined soil trenches of radioactive and chemical wastes needs to be taken seriously and cleaned up as best it can. A "complete and thorough" cleanup of this contamination is very important. Please do the responsible thing and not just do an inadequate quick fix solution to the huge toxic entity that is Hanford. Future generations will curse you if you don't. *518-2*

Dave Tvedt
801 Lynn Lane
Eugene, Oregon
xxx-xxx-xxxx
David@dtvedt.com

518-1 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

518-2 The impacts of different levels of tank waste retrieval and of different types of SST system closure are addressed in the *TC & WM EIS* analyses. These include Tank Closure Alternatives 4, 6A, and 6B, which evaluate 99.9 percent retrieval of the tank waste and clean closure of all or part of the SST system. This closure includes the tank system, along with the vadose zone as impacted by the tank farms (i.e., past leaks). However, as discussed in the Summary, Section S.1.3.2, and Chapter 1, Section 1.4.2, of this *TC & WM EIS*, DOE will not make decisions on groundwater remediation, including the remediation of groundwater contamination resulting from non-tank-farm areas in the 200 Areas, because that is being addressed under the CERCLA (42 U.S.C. 9601 et seq.) process. Decisions made by DOE on the proposed actions will be based on a number of factors, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. The decisions on the selected course of action and supporting rationale will be documented in a ROD issued no sooner than 30 days after the EPA Notice of Availability for this *Final TC & WM EIS* is published in the *Federal Register*.

Commentor No. 519: Craig McDonald

From: webmaster@RL.gov [mailto:webmaster@RL.gov]
Sent: Tuesday, May 04, 2010 10:34 AM
To: ^Webmaster
Subject: HANFORD.GOV Feedback

Forward To:	Webmaster
SUBJECT:	HANFORD.GOV Feedback
EASY TO USE:	yes
FOUND EVERYTHING:	yes
COMMENT:	My concern as citizen down stream of the Hanford site is the clean up must continue and no further material come to Hanford. Nuclear waste must be contained and our lands, streams and groundwater be kept free of contamination. *519-1*
URL:	http://www.hanford.gov/orp/?page=146&parent=0
NAME:	craig mcdonald
PHONE:	xxx-xxx-xxxx
EMAIL:	zeek@hughes.net

519-1 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

Commentor No. 520: Nancy Lou Tracy

Fax: 1-848.785.2865

TC & WM EIS
P.O. Box 1178
Richland, WA 99352

Dear Heart of America,

520-1 As the outrage mounts regarding more dumping of radioactive wastes at a site which has failed for decades to provide containment – or even care – I find myself coming at this from a different angle.

520-2 Have just finished reading James Hansen's book, "Storms of My Grandchildren, The truth about the Coming Climate Catastrophe and Our Last Chance to save humanity." At first his support of nuclear power dismayed me – until I read on about the possibility of a so-called 4th generation nuclear power, and wonder why we're now even considering so-called 3rd generation which – like all previous light-water reactors will burn about 1% of the uranium mined, leaving civilizations to continue to "baby sit" the 10,000 years-active wastes. Fourth generation power plants sound almost too good to be true. "Auther" of 4 was Enrico Ferme.

Fourth generation, the fast breeder, uses about 99% of energy from mined uranium. Further, the fast breeder also produces energy from transuranic actinides, fertile materials now dumped as radioactive waste. Nuclear waste from nuclear weapons development alone (some 600,000 tons) of uranium hexafluoride by-products, now in "storage" can fuel these fast-breeder reactors. Wastes from a generation 4 plant have a life of several hundred, not 10,000 years, and they can't be used for weapons production.

If all these claims are so – these accumulated wastes of decades past that now threaten all of life – would become valuable commodities. Uranium mining could be at an end, destructive as it is, for generation 4 power plants can extract uranium from sea water. The catch is that a first plant needs to be built. Wouldn't the Hanford reservation (I can't believe I'm saying this!) be the best site, with such a ready fuel supply? Three Mile Island's disaster stopped construction that was ready to go during the Clinton/Gore Administration.

Sincerely, and with hope this may proof out

Nancy Lou Tracy
7310 SW Pine St
Portland OR 97223

520-1 Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

520-2 Advanced nuclear power development is beyond the scope of this *TC & WM EIS*.

Commentor Number 521 is not included in this Comment-Response Document because it is a duplicate of Commentor Number 467.

Commentor Number 522 is not included in this Comment-Response Document because it is a duplicate of Commentor Number 488.

Commentor No. 523: Harry Smiskin, Chairman, Tribal Council, Confederated Tribes and Bands of the Yakama Nation

Confederated Tribes and Bands of the Yakama Nation

Established by the Treaty of June 9, 1855

May 3, 2010

David A. Brockman, Manager
Richland Operations Office
U.S. Department of Energy
P.O. Box 550
Richland, Washington 99352

Mary Beth Burandt, Document Manager
Office of River Protection
U.S. Department of Energy
Post Office Box 1178
Richland, WA 99352
TC&WMEIS@saic.com

RE: SUPPLEMENTAL COMMENTS ON DOE DRAFT TANK CLOSURE AND WASTE MANAGEMENT EIS FOR THE HANFORD SITE (DOE/EIS-0391-D)

Dear Mr. Brockman and Ms. Burandt:

Thank you again for the opportunity to comment on the Draft Tank Closure and Waste Management Environmental Impact Statement (Draft EIS) for the Hanford Site, Richland, Washington (DOE/EIS-0391-D) prepared by the U.S. Department of Energy (USDOE). This letter supplements the extensive comments previously submitted by the Yakama Nation dated March 12, 2010.

1. Institutional Controls:

   a. The Draft EIS states that "long-term cumulative impacts are assessed for approximately 10,000 years into the future" (Appendix R, Section R.10, page R-21). It is not a reasonable alternative to assume that any federal agency will exist and maintain control of the site for 10,000 years. The range of alternatives in a revised Draft EIS should include those that can achieve cleanup levels that allow for safe, unrestricted subsistence use of all Treaty resources within a realistic timeframe. This includes full access to cultural resources by the Yakama Nation and its members within its ceded land and aboriginal territory, including on the Hanford Site and the Columbia River adjacent to the site. *523-1*

Post Office Box 151, Fort Road, Toppenish, WA 98948 (509) 865-5121

523-1 This *TC & WM EIS* assumes several different types of end-state management, as described in Chapter 2, the Glossary, and the Summary. These include administrative controls, institutional controls, and postclosure care, as appropriate. Each of these end-state management options would take place at the completion of an action and is assumed to occur for 100 years following the end of the action (e.g., active institutional controls would be maintained for 100 years following final placement of waste in a storage facility). The 10,000-year time period described in this *TC & WM EIS* represents the period of analysis used for the long-term impact analyses for groundwater, human health, and ecological risk; it does not represent the assumed period of institutional controls. For clarity, the definition of "10,000-year period of analysis" is included in this final EIS in Chapter 2, the Glossary, and the Summary, as appropriate.

DOE respectfully disagrees with the tribes' position regarding tribal rights at Hanford. There is substantial documentation indicating that the tribes understood at the time the treaty was signed that the lands were no longer "unclaimed" when they were claimed for the purposes of the white settlers' activities. Most of Hanford had been so "claimed" at the time it was acquired for Government purposes in 1943. DOE is not aware of any judicially recognized mechanisms that would allow these lands to revert to "unclaimed" status merely through the process of being acquired by the Federal Government. The portion of Hanford that remained in the public domain in 1943 (those lands now having underlying U.S. Bureau of Land Management ownership), as well as all the acquired lands, were closed to all access initially under authority of the War Powers Act and then under authority of the Atomic Energy Act. It is, therefore, DOE's position that the Hanford lands are neither "open" nor "unclaimed." DOE included the tribes' positions and views in Appendix W of this *Final TC & WM EIS*.

Commentor No. 523 (cont'd): Harry Smiskin, Chairman, Tribal Council, Confederated Tribes and Bands of the Yakama Nation

b. DOE's speculative reliance on institutional controls essentially abrogates Yakama rights reserved under Article III of the Treaty without congressional authority by potentially restricting the Tribe's ability to safely access and use trust resources through hunting, fishing and gathering. *523-2*

2. NEPA deficiencies:

a. Article III of the Treaty should be treated as equivalent to a statutory requirement so far as human health and development of an alternative that meets the Yakama Nation's rights and needs. The Yakama Nation should be able to examine the EIS and evaluate how it is going to affect their rights and their culture without reliance on institutional controls. It would be unreasonable under NEPA if such an alternative were to be excluded. *523-3*

b. The Draft EIS lacks sufficient detailed analysis – for example, it makes arbitrary and speculative assumptions about offsite waste characteristics. *523-4*

c. DOE must comply with NEPA regulations regarding incomplete or unavailable information, i.e., it must either explicitly state that such information is lacking, or obtain the information and include it in a revised EIS. *523-5*

d. There is inadequate analysis and evaluation of mitigation measures, and what DOE will do if such measures cannot be accomplished. NEPA regulations require that alternatives either avoid or minimize adverse impacts, or provide means to mitigate adverse impacts. *523-6*

e. On February 18, 2010, the Council on Environmental Quality (CEQ) released draft NEPA guidance on consideration of the effects of climate change and greenhouse gas (GHG) emissions. The draft guidance indicates that climate change effects should be considered in the analysis of projects that are designed for long-term utility and located in areas that are considered vulnerable to specific effects of climate change within the project's timeframe. The Yakama Nation encourages DOE to use CEQ's draft guidance to evaluate impacts from climate change in the revised EIS, particularly in consideration of the sensitivity, location, and timeframe of the proposed actions. *523-7*

3. Land disposal of mixed transuranic and/or mixed low-level waste violates the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. § 6924(b)-(m). See Opinion, *Washington v. Chu,* 9th Circuit No. 06-35227 (March 10, 2009). Any alternative that provides for importation of such waste into the Hanford Site for shallow land burial is therefore unlawful, is not a reasonable action, and must not be considered by DOE in the revised EIS. *523-8*

2

523-2 DOE recognizes that some tribes have treaty-protected and other federally recognized rights to resources and resource interests located within reservation boundaries and outside reservation and jurisdictional boundaries. DOE will, to the extent of its authority, protect and promote these treaty and trust resources and resource interests and related concerns in these areas.

523-3 Chapter 8 identifies and discusses the laws and legal requirements that are potentially applicable to the proposed actions and alternatives, as well as the permits and approvals DOE must obtain from Federal, state, and local agencies. In Sections 8.1.7 and 8.3, DOE identifies the consultations and coordination that DOE has undertaken with American Indian tribes and would need to continue for the purpose of implementing the proposed actions and alternatives. The Yakama Tribe and other Hanford-area tribes have had the opportunity to provide, and have provided, extensive input to the *TC & WM EIS* preparation process and analysis. Chapter 8, Section 8.3, and Appendix C, Section C.3, of this *TC & WM EIS* identify the process for tribal interaction and the primary occasions for DOE's interactions with the tribes on the subject of the *TC & WM EIS* preparation process. In addition, Chapter 8 of this *Final TC & WM EIS* includes a description of the outcomes of the meetings with the tribes, and a new appendix, Appendix W, describes the tribal perspective as provided by the Hanford-area tribes, as well as copies of the treaties. The alternatives presented in this *TC & WM EIS* were developed under NEPA (42 U.S.C. 4321 et seq.) to address the essential components of DOE's three sets of proposed actions (tank closure, FFTF decommissioning, and waste management) and to provide an understanding of the differences among the potential environmental impacts of the range of reasonable alternatives. Consistent with CEQ guidance, this EIS analyzes the range of reasonable alternatives that covers the full spectrum of potential combinations. The alternatives considered by DOE in this EIS are "reasonable" in the sense that they are practical or feasible from a technical and economic standpoint and meet the agency's purposes and needs. Potential conflicts with laws and regulations do not necessarily cause an alternative to be unreasonable; however, to implement an alternative (if it is selected), additional mitigation commitments may be required.

523-4 DOE believes that the offsite waste inventory and waste characterization estimates analyzed represent the best-available data to support this EIS. As noted in Appendix D, conservative assumptions were employed to support the EIS analyses. The impacts of the offsite waste in terms of radiological risk are

Commentor No. 523 (cont'd): Harry Smiskin, Chairman, Tribal Council, Confederated Tribes and Bands of the Yakama Nation

To adequately address the comments submitted by Yakama Nation and others, the revisions to the Draft EIS will be extensive. Therefore, we respectfully request that DOE prepares a Revised Draft EIS and issue it for public comment. A Revised Draft EIS which satisfies NEPA requirements is needed to support informed decision making regarding the proposed actions. *523-9*

Sincerely,

Harry Smiskin

Harry Smiskin, Chairman,
Yakama Tribal Council

cc/enc: Moses Squeochs, General Council Chairman
Donald Isadore, Jr., Yakama Tribal Council
Warren Spencer, Jr., Yakama Tribal Council
Lavina Washines, Yakama Tribal Council
Sam Jim, Sr., Yakama Tribal Council
Phil Rigdon, Director, Department of Natural Resources
Russell Jim, ERWM Manager
Tom Zeilman, Attorney

presented in the Summary, Section S.5.5.3, and Chapter 2, Section 2.10, Key Environmental Findings. These sections discuss the radiological risk differences between including and not including offsite waste disposal at IDF-East. Ecology's foreword to the draft EIS included its views and positions concerning DOE's analysis in the document and has been updated in this final EIS.

523-5 Throughout this EIS, DOE identified where information was lacking or inadequate. DOE also explicitly stated the assumptions that were made in conducting the *TC & WM EIS* analyses, as well as the uncertainties associated with both these assumptions and the analysis results. DOE's analyses conservatively account for the reasonably foreseeable range of potential impacts and uncertainties are discussed in accordance with NEPA requirements (incomplete and unavailable information requirements in CEQ NEPA regulations – 40 CFR 1502.22).

523-6 The NEPA evaluation process is conducted early in agency planning, when details of the proposed project are not yet well enough defined for specific mitigation measures to be developed. Chapter 7, Sections 7.1 and 7.5, discuss potential mitigation measures that could be used to avoid or reduce adverse environmental impacts associated with implementation of the alternatives. DOE has incorporated several mitigation measures into the alternatives proposed in this *TC & WM EIS* to prevent or reduce the short- and long-term environmental impacts. Some mitigation measures were incorporated into all of the alternatives, and some represent variations in one or more of the elements or technologies used to construct the alternatives (e.g., various tank waste retrieval benchmarks, sulfate removal, technetium removal, treatment of all tank waste as HLW, clean closure options).

In response to comments received on the *Draft TC & WM EIS* concerning potential long-term impacts on groundwater resources, additional sensitivity analyses were performed and are included in this final EIS. The additional analyses evaluate potential impacts if certain remediation activities are conducted at some of the more prominent waste sites on the Central Plateau and along the river corridor. Furthermore, sensitivity analyses that evaluate improvements in IDF performance (e.g., infiltration rates) and in secondary- and supplemental-waste-form performance (e.g., release rates) were performed and are included in this final EIS. Chapter 7, Section 7.5, was added to discuss and summarize these results. Following completion of this *Final TC & WM EIS* and its associated ROD, DOE would be required to prepare a mitigation action plan that explains mitigation commitments expressed in the ROD. This mitigation action plan would be prepared before DOE would implement any *TC & WM EIS* alternative actions that are the subject of a mitigation commitment expressed in the ROD.

523-7 DOE is aware of the draft CEQ guidance on climate change (Sutley 2010) and has taken it into consideration in this EIS. DOE has reviewed and revised, as necessary, its analyses on the effects of climate change on various resources at Hanford and the possible effects on environmental impacts of the *TC & WM EIS* alternatives. As described in Chapter 6, Section 6.3.4, DOE has reviewed climate studies that forecast general trends in Hanford regional climate change. However, there are no reliable methodologies for projections of specific future climate changes in the Hanford region, and thus such changes have not been quantified in this EIS. To account for this uncertainty, Appendix O, Section O.6.2, describes the effects of enhanced infiltration such as that which may occur during a wetter climate. In the *Draft TC & WM EIS*, Appendix V focused on the potential impacts of a rising water table from a proposed Black Rock Reservoir. Following the retraction of this proposal, the focus of Appendix V was changed in this final EIS to analysis of potential impacts of infiltration increases resulting from climate change under three different scenarios. Appendix V includes sensitivity analyses of potential impacts at Hanford that could result from climate changes that may increase model boundary recharge parameters and the rise of the groundwater table. Additional qualitative discussion of the potential effects of climate change on human health, erosion, water resources, air quality, ecological resources, and environmental justice has been added to Chapter 6 of this final EIS. Additional discussion of the types of regional climate change that could be expected has also been added to Chapter 6, Section 6.5.2, Global Climate Change. The potential impacts of the alternatives on climate change are addressed in Chapter 6, Section 6.5.2, and Appendix G, Section G.5, of this *TC & WM EIS*.

523-8 On March 10, 2009, the U.S. Court of Appeals for the Ninth Circuit affirmed a lower court ruling that a Federal hazardous waste exemption does not apply to mixed TRU waste stored at Hanford (*State of Washington v. Chu*, 558 F.3d 1036 (9th Cir. 2009)). DOE had argued that amendments made in 1996 to the WIPP Land Withdrawal Act of 1992 exempted mixed TRU waste from RCRA storage requirements and land disposal restrictions, if the waste had been designated by DOE for disposal at WIPP, regardless of where it is located in the United States. The appeals court disagreed, finding that "Congress has clearly required that the designation exemption be applied only to wastes at WIPP." As a result, Hanford mixed TRU waste is subject to storage and land disposal prohibitions under

Washington's state law, which acts in lieu of the Federal RCRA regulations. Although this ruling did not apply to MLLW, which is not disposed of at WIPP, appropriate treatment to meet applicable Land Disposal Restriction treatment standards is (or would be) performed before disposal at Hanford. The purpose of this *TC & WM EIS* is to analyze the potential impacts of DOE's proposed actions to retrieve and treat the Hanford tank waste; close the Hanford SST system; store and/or dispose of the waste generated from these tank waste activities; decommission FFTF; and expand or upgrade waste management capabilities to support ongoing and planned waste management activities for on- and offsite waste to facilitate cleanup at Hanford and other DOE sites. The proposed disposal includes LLW and MLLW, not mixed TRU waste.

523-9 DOE has satisfied NEPA requirements by responding to public comments on the draft EIS in this CRD and by making changes to the draft EIS where appropriate and necessary. Subsequent to the issuance of the *Draft TC & WM EIS*, DOE prepared an SA to analyze 14 topics it identified where it is unclear whether updated, modified, or expanded information warrants preparation of a supplemental or new draft EIS. DOE concluded, based on analyses in the SA, that the updated, modified, or expanded information developed subsequent to the publication of the *Draft TC & WM EIS* does not constitute significant new circumstances or information relevant to environmental concerns and bearing on the proposed action(s) in the *Draft TC & WM EIS* or their impacts. Further, DOE has not made substantial changes in the proposed action(s) that are relevant to environmental concerns. Therefore, in accordance with CEQ regulations (40 CFR 1502.9(c)) and DOE regulations (10 CFR 1021.314(c)), DOE determined that a supplemental or new *Draft TC & WM EIS* is not required. See Chapter 1, Section 1.8.2, for more information. The Yakama Nation, along with other Hanford-area tribes, has had the opportunity to provide, and has provided, extensive input to the *TC & WM EIS* preparation process and analysis. Chapter 8 and Appendix C of this *TC & WM EIS* identify the process for tribal interaction and the primary occasions for DOE's interactions with the tribes on the subject of the *TC & WM EIS* preparation process. In addition, Chapter 8 of this *Final TC & WM EIS* includes a description of the outcomes of the meetings with the tribes; a new appendix, Appendix W, describes the tribal perspective as provided by the Hanford-area tribes.

Commentor No. 524: Lois Irwin and Ward Irwin

2969 74th Ave. Southeast
Mercer Island, WA 98040
April 30, 2010

Mary Beth Burandt
Office of River Protection
PO Box 1178
Richland, WA 99352

Attention DOE Draft

Dear Ms. Burandt,

In regard to the Hanford nuclear facility on the Columbia River, please note the following points in regard to cleanup of the hazardous waste on its site.

1. Send no more waste to Hanford – especially greater than Class C until the waste treatment plant is fully functioning. **524-1**

2. Please clean up the single closed tanks to 99.9% **524-2**

3. Have the single hole tanks cleaned up before 2030.

Respectfully submitted,

Lois J. Irwin
Ward J. Irwin

524-1 Regarding the commentor's concern about the inclusion of GTCC LLW in this *TC & WM EIS*, DOE has included information from the *Draft GTCC EIS* in the *Final TC & WM EIS* cumulative impacts analysis. For a more comprehensive discussion on GTCC LLW, see Sections 2.1 and 2.12 of this CRD.

524-2 The impacts of different levels of tank waste retrieval and of different types of SST system closure are addressed in the *TC & WM EIS* analyses. Tank Closure Alternatives 4, 6A, and 6B evaluate 99.9 percent retrieval of the tank waste and clean closure of all or part of the SST system. Decisions made by DOE on the proposed actions will be based on a number of factors, including health and safety, environmental, economic, and technical considerations; agency statutory missions; and national policy considerations. The decisions on the selected course of action and supporting rationale will be documented in a ROD issued no sooner than 30 days after the EPA Notice of Availability for this *Final TC & WM EIS* is published in the *Federal Register*.

Commentor Number 525 is not included in this Comment-Response Document because it is a duplicate of Commentor Number 508.

Commentor Number 526 is not included in this Comment-Response Document because it is a duplicate of Commentor Number 498.

Commentor Number 527 is not included in this Comment-Response Document because it is a duplicate of Commentor Number 523.

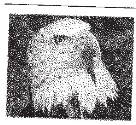
Commentor Number 528 is not included in this Comment-Response Document because it is a duplicate of Commentor Number 480.

Commentor Number 529 is not included in this Comment-Response Document because it is a duplicate of Commentor Number 467.

Commentor Number 530 is not included in this Comment-Response Document because it is a duplicate of Commentor Number 503.

Commentor No. 531: Diane Janes

U. S. DOE
must remove the
tanks & clean the
soil. 531-1



Diane Janes
6834 SW Burlingame Ave
Portland OR 97219

531-1 Comment noted.

Commentor No. 532: Robert Alvarez, Institute for Policy Studies

PLUTONIUM WASTES FROM THE U.S. NUCLEAR WEAPONS COMPLEX

by

Robert Alvarez*

May 25, 2010

Summary

A preliminary estimate based on waste characterization data indicates that from 1944 to 2009 approximately 11,655 kg of plutonium-239 were discarded at U.S. nuclear weapon production facilities. This is nearly three times more than the U.S. Department of Energy's (DOE) last official estimate of waste losses (3,919 kg) made in 1996.

- There are about 2,624 kg in high-level radioactive waste tanks and bins.
- About 7,431 kg of plutonium are in solid waste, which DOE plans to dispose at the Waste Isolation Pilot Project (WIPP) a geological repository in New Mexico for transuranic wastes. About half is emplaced.
- About 1,610 kg of plutonium were buried prior to 1970 at several DOE sites and are not planned for disposal in WIPP.

This dramatic increase is due to disposal of process residues originally set aside for weapons, understatement of production losses, and improvements in waste characterization data.

The Hanford site in Washington State is responsible for about one third of DOE's plutonium-contaminated wastes (3,796 kg), – more than any site in the U.S. nuclear weapons complex. DOE considers hundreds of kilograms of plutonium buried before 1970 to be permanently disposed at Hanford, despite evidence of significant deep subsurface migration and contamination of ground water that enters the Columbia River. Moreover, DOE researchers recently indicated that plutonium could migrate in groundwater and potentially render the near shore of the Columbia uninhabitable in less than 1,000 years. DOE should remove as much buried plutonium as possible at Hanford for geologic disposal, as it is doing at the Idaho National Laboratory. *532-1*

*Senior Scholar, Institute for Policy Studies, Washington, D.C.

532-1 Appendix S of this *TC & WM EIS* explains the process used to develop the inventory data set for the cumulative impact analyses completed for this EIS. All disposal sites for which an inventory was identified and considered a potential contributor to cumulative impacts on groundwater are included in the inventory listing provided in Appendix S and, therefore, were modeled—including the sites noted in the commentor's paper. The inventories listed in Appendix S represent the radionuclide inventories (measured in curies) and chemical inventories (measured in kilograms), including total uranium, that were identified for those sites and for those constituents that were screened (described in Section S.3.6 as COPCs, i.e., those constituents that control groundwater impacts). The source cited in this final EIS for the information listed in the Appendix S tables is SAIC 2011, which is a more extensive database of the inventory information used by DOE to accomplish the screening and identify the COPCs. These COPCs, as well as other constituents determined not to be COPCs, particularly other volatile organic chemicals, can be found in this source documentation for the sites noted. As explained in Appendix S, the inventories for the sites were identified using the most recent information available. As stated in Table S–5, the liquid inventories were obtained from (1) SIM, Rev. 1 (Corbin et al. 2005); (2) *Radionuclide Inventories of Liquid Waste Disposal Sites on the Hanford Site* (Diediker 1999); (3) the *Hanford Site Waste Management Units Report* (DOE 1987); (4) technical baseline reports; (5) the latest version of WIDS; or (6) other sources.

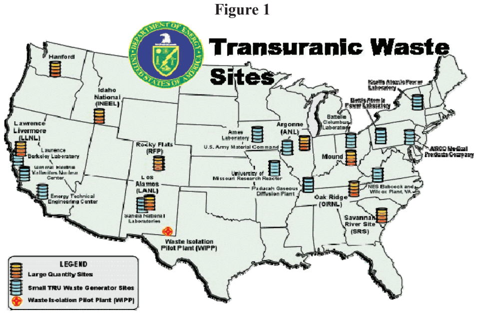
DOE notes that one of the sources identified in this screening process is a large contributor to plutonium contamination in the groundwater. This source, a reverse well, resulted in direct injection of waste streams into the aquifer. Information regarding this reverse well and the potential behaviors of the contaminants (i.e., plutonium) is discussed in Appendix U of this *Final TC & WM EIS*.

Regarding the status of groundwater contamination and remediation at Hanford, groundwater remediation activities, as required under RCRA, CERCLA, and/or the TPA, are in various stages of assessment, risk-based end-state development, corrective action, and/or active remediation. For a more comprehensive discussion of remediation at Hanford, see Section 2.3 of this CRD.

Introduction

The production and fabrication of plutonium primarily for nuclear weapons generated a class of wastes known as transuranics that are contaminated with radioactive elements heavier than uranium on the periodic chart (i.e. plutonium, americium, curium and neptunium). Transuranic Waste (TRU) waste is defined by the U.S. Environmental Protection Agency (40 CFR 91) as having a concentration greater than 100 nanocuries of alpha-emitting transuranic isotopes per gram, with half-lives greater than twenty years. Prior to the early 1970's TRU wastes were disposed as low-level radioactive wastes directly into the ground. However, due to the hazards of plutonium in particular, the Atomic Energy Commission (DOE's predecessor) concluded in 1970 that disposal of these wastes in a geologic repository designed to contain wastes for at least 10,000 years was necessary to protect the human environment. There are 21 DOE sites that generated TRU wastes. (See figure1.)

Figure 1



Plutonium-239 is of greatest concern because of its high concentration and long half life of 24,100 years. With a specific activity about 200,000 times greater than uranium, plutonium-239 emits alpha particles as its principal form of radiation. Over time, americium-241 a decay product, builds up and gives off hazardous external penetrating radiation.

If a large amount is inhaled, it can cause lung damage, fibrosis and even death. Alpha particles travel a very short distance within living tissue and repeatedly strike nearby cells creating potential damage. Tens of micrograms if inhaled can lead to cancer.[1] Particles less than a few microns in diameter can penetrate deep in the lungs and lymph nodes, and can also be deposited from the bloodstream in the liver, bone surface and other organs. Over the past several years, a significantly higher incidence of cancer has been reported among workers following exposure to plutonium. [2]

The behavior of plutonium in the environment is far from certain and has been found to migrate at greater distances than assumed. [3] As noted by S.S. Hecker, former Director of Los Alamos

532-1 cont'd

Response side of this page intentionally left blank.

National Laboratory, it is "one of the most challenging applications of modern chemistry because of the inherent complexity of plutonium and the corresponding complexity of the natural environment."[4]

Since 1970, TRU wastes were placed in retrievable containers to allow for deep disposal. The U.S. Congress authorized the design and construction of the Waste Isolation Pilot Project (WIPP) in near Carlsbad, New Mexico in 1980 (P.L. 96-164) to dispose of TRU waste generated for military purposes. The bedded salt formations at WIPP were chosen because of their long-term stability and self-sealing properties. The WIPP facility is located 2,160 feet underground and has an authorized disposal capacity of 175,000 cubic meters. According to recent waste characterization data DOE estimates that 83,050 cubic meters of TRU wastes containing 7,431kg of plutonium 239 are anticipated for disposal at WIPP.[5] About half has already been emplaced. [6]

Accounting for Plutonium*

Between 1944 and 1994, the U.S. produced and acquired a total of 111,400 kg of plutonium-239. About 93 percent came from government production reactors and the rest from foreign sources and U.S. commercial reactors. [7] DOE accounts for plutonium by reconciling the amount in the "actual" inventory set aside for government requirements and "removals" including material expended in war, weapons testing, transmutation, inventory discrepancies, and waste losses. In its last official estimate in 1996, DOE reported total amount of plutonium "removed" and no longer available for use was 12, 000 kg, including 3,919 kg lost to waste. [8]

532-1 cont'd

Based on more recent waste characterization data[9 10 11 12 13 14 15 16 17 18 19], approximately 11,519 kg, about 10 percent of the total amount of Pu-239 produced at U.S. sites has gone into waste streams (See Table 1). Five DOE sites are responsible for about ninety-nine percent of these wastes. (See Table 1) This large increase appears to be due to disposal of production residues, understatement of production losses, and better waste characterization.

During the Cold War residual plutonium from production processes were stored and recovered, if this proved less costly than making new supplies in production reactors. With the end of nuclear weapons production, DOE no longer needed these residues and discarded them as waste. At DOE's Rocky Flats plant some 3,000 kg of plutonium in residues are disposed at WIPP. [20]

Environmental compliance agreements led to more rigorous characterization of waste streams, which found understated waste losses. For instance, because of refinements in waste characterization, the inventory of plutonium in Hanford high-level radioactive waste tanks is more than twice than declared in 1996. [21]

*This paper does not address about 6,130 kg of plutonium-239 contained in DOE spent reactor fuel, [22] and 61,500 kg of plutonium removed from weapons stocks,[23] mostly from dismantled weapons and weapons components (~80 percent) and other production processes. About 41.8 metric tons is expected to be processed so it can be mixed with uranium for fabrication into mixed oxide fuel for use in commercial nuclear power plants and subsequently disposed. Disposition plans for 5 tons of "non-pit" plutonium include mixing with defense high-level wastes to be vitrified or direct disposal in WIPP. There are several thousand more kilograms, which may be declared excess from retired weapons [24] and from the recent arms reduction agreement between the U.S. and Russia. [25]

Response side of this page intentionally left blank.

Table 1 Plutonium in Waste Inventory

Site	Description	DOE/Plutonium: The First 50 Years 1996(a) Kg Pu-239	DOE/ Waste Data (1981-2009) Kg Pu-239
Rocky Flats	Solid waste packaged in containers (now emplaced in WIPP)	47	3,597(b)
Hanford	High-level waste in tanks farms,	455	1,109 (c)
Hanford	Solid wastes	875	2,282 (b) (d) (e)
Hanford	Liquid wastes	192	405(e) (f)
Los Alamos National Laboratory	Solid waste (post 1970)	610	750 (b)
LANL (Pre-1970)[26]			450 (g)
Idaho National Engineering Laboratory (INEL)	Solid wastes	1,106	1,299 (b) (h)
INL	Calcined HLW in bins	72	774 (i)
INL	Solutions stored in Tanks farms	8	8 (a)
Savannah River Site (SRS)	Liquids in high-level waste tanks,	575	733 (j)
SRS	solid waste	193	182 (b)
Other DOE Sites	Solid wastes	59	76 (b)
TOTAL		**3,919**	**11, 665**

(a).DOE/DP-0137(1996),(b) DOE/TRU-09-3425 (2009),(c) TWINS (2003), (d) WHC-SD-WM-ES-325 (1995), (d).PNNL-11800 (1998), (e) RHO-LD-114 (1981) (f) DOE-RL-2007-27,(g) DOE/EM-00-0384 (2000) (h) IC P/EXT-04-00253 (2004),(i) DOE/EIS-0287(2002), (j) SRS HLW 2005,

532-1 cont'd

Response side of this page intentionally left blank.

This revised estimate of discarded plutonium adds about 8,300 kilograms more to the total inventory in DOE's 1996 declaration. This may be due to errors in the estimates of plutonium in wastes, which may not yet be formally incorporated into DOE's material control and accountancy system. It could also be due to accounting for inventory differences, which according to DOE, " is the difference between the quantity of nuclear material held according to accounting books and the quantity measured by a physical inventory." Prior to the late 1960's, DOE did not have a well-established mass balance system, based on predictive reactor codes allowing for more accurate estimates of production. Also, the agency's material measurement technologies "were less accurate than today." [27]

Discarded Plutonium at Hanford

The Hanford Engineering Works was one of the world's largest plutonium production centers. Uranium metal fuel, using either natural (0.71wt% U-235) or low enriched uranium (primarily 0.95 or 1.25wt % U-235), was clad into uranium fuel elements sent to the Hanford 100-Area for irradiation in nine production reactors. Spent reactor fuel was discharged into basins of water to allow for reduction in heat and decay of short-lived radionuclides before being sent for chemical separation of nuclear materials. Irradiated fuel ruptures and corrosion led to residual plutonium in storage basins and contamination of the nearby environment.[28] [29]

Plutonium was extracted from 98,892 MTU (metric tons uranium) of spent fuel[30] using four chemical separations plants.[31] [32] Additional amounts of plutonium came from offsite sources from other processing facilities and foreign providers. [33] About 70 percent of the irradiated fuel was processed at the PUREX facility, which operated from 1956 to 1972 and 1981 to 1989. [34] After chemical separation, liquid reprocessing waste containing residual amounts of plutonium and other actinides were primarily transferred to high-level radioactive waste tanks. [35] Plutonium was also discharged to cribs trenches and ponds. [36]

532-1 cont'd

Beginning in 1949, separated plutonium nitrate from the reprocessing plants was sent to the Plutonium Finishing Plant (PFP) where plutonium was purified into metal and oxides.[37] PFP had several waste streams including gaseous effluents that were filtered and exhausted. Liquid wastes were discharged into unlined soil disposal sites until 1973, when they were sent via a transfer line to high-level waste tanks. (See Figures 2 and 3) [38]

According to DOE's 1996 official estimate, about 2 percent of the total plutonium produced at Hanford went into waste streams (approximately 1,348 kg). [39] Since then waste characterization data indicates that more than five percent of the plutonium produced at Hanford went into waste streams. Moreover, Hanford is responsible for about one third of plutonium wastes (3,796 kg), more than any DOE site. (See Table 1)

Of this amount about 2,687 kg of plutonium in liquid and solid wastes were discharged, stored or buried in soil. Lesser amounts were deposited in reactor basin residues. An additional 1,109 kg of residual plutonium mostly from reprocessing plants were discharged into high-level radioactive waste tanks.[40] The department plans to remove and convert most of the plutonium mixed with high-level radioactive wastes into glass logs for geological disposal.

Response side of this page intentionally left blank.

About 1,811 kg of buried plutonium are planned for disposal in WIPP and 876 kg of plutonium was discharged or buried into the ground prior to 1970. [41] Approximately 405 kg were discharged as liquids into soil and an underground settling tank. [42 43]

Figure 2. Plutonium Production At Hanford

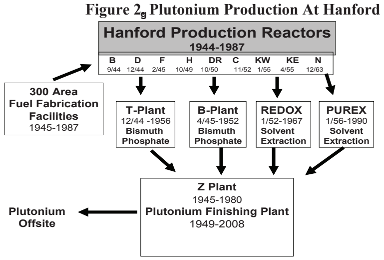
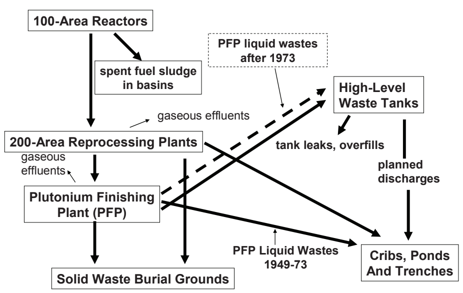


Figure 3. Plutonium Waste Streams At Hanford



532-1 cont'd

Response side of this page intentionally left blank.

7

Prior to 1970, approximately, 371 kilograms of plutonium in solid wastes were dumped in containers such as cardboard boxes to unlined trenches mostly associated with the PFP.[44] Between the mid 1960's and 1980, 100 kg plutonium was disposed in a similar fashion in a commercial radioactive waste landfill located in the Hanford 200-East area.[45] More than 60 percent of the total estimated volume (138,000 cubic meters) of pre-1970 TRU wastes at DOE sites is buried at Hanford.[46]

As a result of processing large amounts of plutonium, normal operating losses at PFP are the highest at Hanford. Recent data suggests that transuranic waste discharges to soil in the PFP zone were comparable if not greater than similar discharges from the reprocessing plants into Hanford's high-level waste tanks.[47] One reason is that production records understated plutonium losses. In 2001, researchers at Hanford concluded, "the ability to measure the plutonium content of waste streams was vastly inferior compared to the ability to measure plutonium in the primary feed and product streams."[48]

A case in point is 216-Z-9 Crib. This soil disposal site, roughly the size of a volleyball court (30'x60') operated from July 1955 to June 1962 and received approximately one million gallons (4.6E+06 L) of organic and aqueous plutonium discharges from the Hanford RECUPLEX facility -- a scrap recovery operation in the PFP zone. During its operation this facility processed about 8,700 kilograms of plutonium. [49] (The plant was closed after a criticality accident in April, 1962 that resulted in high exposures to workers.[50]) Although processing records indicated that approximately 27 kilograms were discarded into the crib, samples taken in the years following its closure indicated that the site may have contained as much as 150 kg of plutonium, with a soil concentration as high as 34.5 grams per liter. [51] This was enough to possibly set off a nuclear criticality event prompted by water intrusion that could have resulted in near lethal doses to workers.[52] By the late 1970s, 58 kilograms of plutonium were removed from the top 30 centimeters of soil using remote equipment. [53]

Leaving Buried Plutonium Behind

According to the Government Accountability Office, "DOE has long considered pre-1970s buried wastes permanently disposed." [54] At Hanford DOE plans to complete cleanup of about 4 percent of the total acreage containing buried plutonium by 2025 at an estimated cost of $320 million.[55] This cleanup will result in the shallow land disposal of hundreds of kilograms of plutonium wastes generated prior to 1970. DOE officials view the long-term stewardship efforts, which are likely to rely heavily on land control, site surveillance, monitoring, maintenance, record keeping, and related activities, as inherently low cost. Federal institutional controls require that disposal of radioactive wastes at DOE sites must pose less than a 1 in 10,000 chance of exceeding EPA drinking water standards over a 10,000 year time frame.[56]

In 2000, the National Academy of Science challenged this assumption and concluded that: "**Institutional controls will fail** [emphasis added]. Past experience with such measures suggests, however, that failures are likely to occur, possibly in the near term, and that humans and environmental resources will be put at risk as a result. "[57]

532-1 cont'd

Response side of this page intentionally left blank.

A recent estimate by the DOE underscores the Academy's concern and indicates that plutonium in groundwater from dump sites at Hanford could reach the near shore of the Columbia River in less than 1,000 years at concentrations 283 times greater than the federal drinking water standard. [58] This suggests that buried plutonium at Hanford could render the site's near shore line uninhabitable.

Currently, plutonium vadose zone contamination at Hanford is relatively uniform and exceeds the 100 nCi/g level set for geological disposal at depths greater than 100 feet. Deep vadose zone contamination at Hanford appears to be orders of magnitude greater than at DOE's Idaho site, which has a greater concentration of buried TRU wastes. [59] [60](See figure 3) Migration beneath Hanford disposal sites has been enhanced by solvents, acids and concentrated salts.[61] Moreover, plutonium has migrated to groundwater beneath the Hanford site. [62]These borehole measurements raise questions about DOE's site model that assumes strict vertical migration and does not account for preferential movement of contaminants, as has been documented at Hanford plutonium waste disposal sites. [63] (See Figure 3)

Because of environmental compliance requirements at the Idaho National Laboratory, DOE is beginning to remove pre-1970 TRU wastes for geologic disposal. Beginning in the 1950's plutonium-contaminated wastes was shipped from the DOE's Rocky Flats plant, which made plutonium weapons components, for burial at INL. After a major fire in August 1969 at Rocky Flats resulted in burial of an unprecedented amount of plutonium-239[64], the state of Idaho resisted further disposal and demanded removal of these wastes from the site. Idaho's opposition contributed to DOE's decision to establish the WIPP repository and to require TRU wastes generated after 1970 to be retrievably stored. In 1995, Idaho entered into an agreement with DOE, and the Environmental Protection Agency which required the removal of high-level radioactive wastes, spent reactor fuel and transuranic wastes from the state by 2035. DOE refused to remove transuranic wastes buried at INL prior to 1970 until the Federal District Court in Idaho ruled in favor of the state July 2008.[65] Currently, it appears that DOE plans to remove about 871 kg[66] of an estimated 1,155 kg buried prior to 1970.[67]

532-1 cont'd

No such regulatory requirement has been incorporated in the environmental compliance agreement at Hanford. [68] DOE should be required to remove and process buried plutonium disposed prior to 1970 for geological disposal at WIPP, as is the case at the Idaho National Laboratory. While it may not be possible to remove deep subsurface concentrations, the technology to remove the major preponderance of these wastes from near surface soil was successfully demonstrated at Hanford thirty years ago. To meet waste acceptance criteria, the amount of pre-1970 buried plutonium that would have to be processed (~876 kg Pu-239) would result in about 5,000 to 10,000 drums containing approximately 1,000-2000 cubic meters to be emplaced in WIPP.[69] If the estimated life-cycle cost of $10,000 per 55-gallon drum of TRU waste at the DOE's Idaho site [70] is used at Hanford, this would result in an expense of approximately $50 to $100 million. There are likely to be larger costs at Hanford, because of requirements to protect workers, remote equipment and deep migration of plutonium.

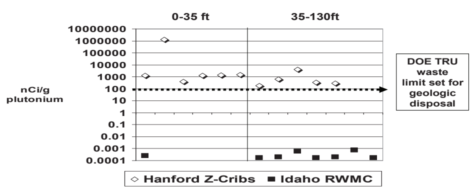
As DOE embarks on its effort to cleanup up its most contaminated area in the Central Plateau at Hanford, it is becoming clear that plutonium-contaminated waste poses one of the most serious risks to the human environment for years to come. Even though the costs of removal and

Response side of this page intentionally left blank.

disposal of buried plutonium at WIPP are high, the costs of leaving it behind at Hanford are incalculable.

532-1 cont'd

Figure 4. Subsurface Contamination at the DgOEs Hganford andyIdaho Sites



ources: EGG-ER-10456 Rev. 03
tp://www.hanford.gov/cp/gpp/data/gpl.cfm

---

[1] National Research Council, Management and Disposition of Excess Plutonium, P. 333, National Academy Press, 1995. http://www.nap.edu/catalog.php?record_id=2345#toc

[2] Agency for Toxic Disease Registry, Department of Health and Human Services, Toxicological Profile for Plutonium, September 2007. http://www.atsdr.cdc.gov/tfacts143.pdf

[3] A. B. Kerstin, D. W. Feud, D. L. Finnegan, D. J. Rook, D. K. Smith & J. L. Thompson, Migration of plutonium in ground water at the Nevada Test Site, *Nature* **397**, 56-59 (7 January 1999) http://www.nature.com/nature/journal/v397/n6714/abs/397056a0.html

[4] S.S. Hecker, Plutonium Science Challenges Future Researchers, Actinide Research Quarterly, 2n/3rd Quarter, 2000. http://www.lanl.gov/source/orgs/nmt/nmtdo/AQarchive/00fall/editorial.html

[5] U.S. Department of Energy, Annual Transuranic Waste Inventory Report-2009, DOE/TRU-09-3425 Rev. 0. http://www.wipp.energy.gov/library/Baseline2004/FY2009/Annual_TRU_Waste_Inventory_Report-2009_DOE_TRU-2009-3425.pdf

[6] Ibid.

[7] U.S. Department of Energy, Plutonium: The First 50 years, DOE/DP-0137, February 1996. http://www.doeal.gov/SWEIS/DOEDocuments/004%20DOE-DP-0137%20Plutonium%2050%20Years.pdf

[8] Ibid.

[9] Department of Energy, Savannah River Site, High-Level Waste Tank Data, Rev. 1 2005,

Response side of this page intentionally left blank.

[10] U.S. Department of Energy, Tank Waste Inventory Network System, Best- Basis Summary Report, (TWINS-2003) September 2003.

[11] W.O. Greenhalgh, Pre-1970 Transuranic Solid Waste at Hanford, Westinghouse Hanford Company, WHC-SD-WM-ES-325, Rev.0, 1995.
[12] C.T. Kincaid et al, Composite Analysis of Low-Level Waste in the 200-Area Plateau of the Hanford Site, PNNL-11800, March 1998. http://www.pnl.gov/main/publications/external/technical_reports/pnnl-11800-adden-1.pdf
[13] U.S. Department of Energy, PFP Project Managers Meeting, Meeting Minutes and Presentation, August 21, 2002
[14] K.W. Owens, Existing Data on the on the 216 Z Liquid Waste Sites, RHO-LD-114, 1981. http://www5.hanford.gov/arpir/?content=findpage&AKey=D196055124
17 DOE/TRU-2009-3245.

[16] DOE-DP-0137.
[17] T.A. Batcheller, G.D. Redden, Colloidal Plutonium at the OU 7-13/14 Subsurface Disposal Area: Estimate of Inventory and Transport Properties, Bechtel BWTX Idaho LLC, IC P/EXT-04-00253, May 2004, http://ar.inel.gov/images/pdf/200405/2004051900569GSJ.pdf
[18] U.S. Department of Energy, Idaho High-Level Waste and Facilities Disposition, Final Environmental Impact Statement, DOE/EIS-0287, Appendix C-7, Table C.7-3, September 2002. http://nepa.energy.gov/finalEIS-0287.htm
[19] U.S. Department of Energy, Plutonium/Organic-Rich Process Condensate/Process Waste Group Operable Unit RI/FS Work Plan: Includes the 200-PW-1, 200-PW-3, and 200-PW-6 Operable Units, DOE/RL-2001-01, Rev.0 April 2004. http://www2.hanford.gov/ARPIR/?content=findpage&AKey=D4573392
[20] U.S. Department of Energy, Record of Decision on Management of Certain Plutonium Residues and Scrub Alloy Stored at the Rocky Flats Environmental Technology Site, Federal Register / Vol. 63, No. 230, December 1, 1998.
[21] TWINS-2003
[22] U.S. Department of Energy, Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada, DOE/EIS-0250 February 2002, Appendix A, Table A-2.
[23] U.S. Department of Energy, National Nuclear Security Agency, U.S. Commitment to Disarmament, May 2010. http://www.state.gov/documents/organization/141772.pdf
[24] H. Kristensen, United States Discloses Size of Nuclear Weapons Stockpile, Federation of American Scientists, http://www.fas.org/blog/ssp/2010/05/stockpilenumber.php
[25] Treaty Between the United States of America and the Russian Federation on Measures For The Further Reduction And Limitation Of Strategic Nuclear Arms, April 8, 2010. http://www.state.gov/documents/organization/140035.pdf

25. U.S. Department of Energy, Buried Transuranic-Contaminated Waste Information for U.S. Department of Energy Facilities, DOE/EM-00-0384, 2000.
[27] DOE/DP-0137,p.53.
[28] G. B. Mellinger C. H. Delegard, M. A. Gerber, B. N. Naft, A. J. Schmidt T. L. Walton, Disposition Options for Hanford Site K-Basin Spent Nuclear Fuel Sludge, PNNL-14729, January 2004. http://www.pnl.gov/main/publications/external/technical_reports/PNNL-14729.pdf
[29] P.C. Jerman, W.N. Koop, F,E Owen, Release of Radioactivity to the Columbia River from Irradiated Fuel Element Rruptures, Hanford Atomics Production IOperation, RL-REA-2160, May 1965. http://www5.hanford.gov/ddrs/common/findpage.cfm?AKey=D9042989
[30] U.S. Department of Energy, "Nuclear Material Mass Flow and accountability on the Hanford Site, HNF-8069, October 2001. http://www5.hanford.gov/pdwdocs/fsd0001/osti/2001/I0035319.pdf
[31] They include: the T-Plant and B Plant using Bismuth Phosphate (BiP04) Process (1944–1956), the REDOX facility (1952–1967); and (3) the PUREX plant (1956–1972, 1983–1990
[32] Lesser amounts of nuclear materials such as tritium, neptunium-237, plutonium-238, americium-241 and uranium-233 were also produced at Hanford.

[33] DOE/DP-0137
[34] Separation of plutonium at PUREX was halted in 1972, restarted in 1982, and permanently ended in 1989.
[35] HNF-8069.

Response side of this page intentionally left blank.

Commentor No. 532 (cont'd): Robert Alvarez, Institute for Policy Studies

11

[36] Ibid.
[37] HNF-8069, P. 4-5 "The primary chemicals were nitric acid, sodium hydroxide, carbon tetrachloride, aluminum nitrate, tri-butyl phosphate, and calcium, and a number of lesser chemicals also were used."
[38] R.A.Corbin, B.C. Simpson, M.J. Anderson, W.F Danielson III, , J.G. Field,, T.E. Jones, C.T. Kinkaid, Hanford Soil Inventory Model, Rev. 0, PNNL-15367 September 2005
[39] DOE/DP-0137
[40] TWINS 2003
[41] RHO-LD-114, PNNL-11800
[42] RHO-LD-114
[43] K.R. Ridgeway, M.D. Veatch, D.T. Crawley, Victor I. Sviridov 216-Z-9 History and Safety Analysis, ARH-2207, November 1971. http://www5.hanford.gov/ddrs/common/findpage.cfm?AKey=D8639356

[44] WHC-SD-WM-ES-325.
[45] PNNL-11800.
[46] U.S. Department of Energy, Office of Environmental Management, Summary Data on the Radioactive Waste, Spent Nuclear Fuel, and Contaminated Media Managed by the U.S. Department of Energy, 2000, Chapter 7.

[47] CH2MHILL, Soil Inventory Model Data, PFP Zone, 2005.
[48] HNF-8069, p. 4-6.
[49] ARH-2207
[50] T P. McLaughlin, S. P. Monahan, N.L. Pruvost, V. V. Frolov, B. G. Ryazanov, A Review of Criticality Accidents, Los Alamos National Laboratory, LA-13638, May 2000. http://www.orau.org/ptp/Library/accidents/la-13638.pdf

[51] ARH-2207, p. 27. "During the seven years of operation, the Recuplex process had an overall Material Unaccounted For (MUF) of 174 kg (about a 2 percent waste loss) and 80 kg across the solvent extraction system. Therefore, it might be assumed the other half of the overall MUF went to solid waste burial."
[52] Ibid
[53] S.L. Charboneau, JA,Teal, A.M. Hopkins, C.S. Sutter, Flour Hanford Co., Decommissioning the 216-Z-(Crib Plutonium Mining At the Plutonium Finishing Plant: Issues Characterization, HNF-34075, Rev. 0, June 2007. http://www.osti.gov/bridge/purl.cover.jsp;jsessionid=ABE18752ADC293B33CDE1204A22AD8E3?purl=/908812-OJpjiK/
[54] United States Government Accountability Office, Report to the Subcommittee on Energy and Water Development, Committee on Appropriations, House of Representatives, Nuclear Waste, Plans for Addressing Most Buried Transuranic Wastes Are Not Final, and Preliminary Cost Estimates Will Likely Increase, GAO-07-761, June 2007. http://www.gao.gov/new.items/d07761.pdf
[55] Ibid.
[56] U.S. Department of Energy, Nuclear Regulatory Commission and Environmental Protection Agency, The Interagency Steering Committee on Radiation Standards Federal Institutional Control Requirements for Radioactive Waste and Restricted Release of Property Containing Radioactive Material, http://www.hss.energy.gov/nuclearsafety/env/guidance/aea/radtabls.pdf
[57] Committee on Remediation of Buried and Tanks Wastes, Board on Radioactive Waste Management, National Research Council, Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites, National Academy Press, (2000). http://www.nap.edu/catalog.php?record_id=9949#toc
[58] DOE/EIS-0391, Appendix U, Table U-2. http://www.hanford.gov/orp/uploadfiles/EIS-0391_D-AppendixU.pdf

[59] U.S. Department of Energy, Idaho National Engineering Laboratory, Dames and Moore, Compilation and Summarization of the Subsurface Disposal Area Radionuclide Transport Data at the Radioactive Waste Management Complex, EGG-ER-10546, Rev. 3, March 1994. http://ar.inel.gov/owa/getgif_2?F_DOC=EGG-ER-10546&F_REV=03&F_PAGE=1&F_GOTO=1
[60] U.S. Department of Energy, Office of Environmental Management, Stoller Hanford Co, Borehole logging reports, DOE-EM/GJ922-2005, 2005.

[61] Ibid.

Response side of this page intentionally left blank.

Commentor No. 532 (cont'd): Robert Alvarez, Institute for Policy Studies

12

[62] U.S. Department of Energy, Remedial Investigation Report for the Plutonium/Organic Rich Process Waste Condensate/ Process Waste Group,DOE-RL-2007-27, October 2007. http://www5.hanford.gov/arpir/?content=findpage&AKey=DA05808255

[63] DOE-EM/GJ922-2005.
[64] IC P/EXT-04-00253
[65] U.S. District Court for the District of Idaho, Agreement to Implement U.S. District Court Order Dated May, 25, 2006, July 1, 2008.
[66] DOE/TRU-09-3425
[67] IC P/EXT-04-00253
[68] The Agreement, Hanford Facility Agreement Consent Order by Washington State Department of Ecology, United States Environmental Protection Agency, and the U.S. Department of Energy, As Amended through April 22, 2010. http://www.hanford.gov/?page=81
[69] Each 55 gallon container would contain 87.5 to 175 grams of Pu-239 in a volume of 0.2123763495 m3. To dilute 876 kilograms of plutonium to meet the WIPP Waste Acceptance Criteria, this would result in ~5,000- 10,000 55-gallon containers or 1,000m3 to 2,000 m3 in volume.

[70] B. J. Orchard, L. A. Harvego, T. L. Carlson, R. P., Grant, Complications Associated with Long- Term Disposition of Newly-Generated Transuranic Waste: A National Laboratory Perspective. http://www.inl.gov/technicalpublications/Documents/4215162.pdf

Response side of this page intentionally left blank.

Commentor No. 533: Madeline Smith

From: madeline marie smith [mailto:msmith28@uoregon.edu]
Sent: Monday, June 28, 2010 5:01 PM
To: TPA Change Packages
Subject: Re: Hanford

Paula Call, USDOE
P.O. Box 550, A7-75
Richland, WA 99352
June 28,2019

To those concerned for nuclear safety:

I leave it to other concerned citizens to point out the inadequacies of the current plans which fail to completely clean up the nuclear waste stored at Hanford.

On May 1,2010, I wrote Mary Beth Burandy, Document Manager, an e-mail commenting on Draft TC and WM EIS. (see attachment.)

533-1 In it, I recommended a climate change EIS; dry casking, at each nuclear facility in the United States; and no vitrification at Hanford until all nuclear waste was removed from the ground and safely stored.

This e-mail concerns transportation of all nuclear waste to Hanford and factors in the amount of human error that continues to plague existing nuclear facilities.

Human error has been in the news due to the one mile beneath the sea oil rig disaster which has been extensively reported in the news since oil has been spouting from the hole it made.

On PBS Newshour on May 31, 2010, Bill Nye, former host of "The Science Guy" made the following comments, "there's almost a million oil wells around the world. There's a few thousand oil rigs. And this is the kind of disaster that could happen anywhere."

He adds," And there are backup systems, but the backup systems weren't inspected. The backup systems were not regulated."

"And, when things go wrong, it's potentially troublesome. Now there's one more thing. We have tens of thousands of coal -fired power plants around the world. We have thousands and thousands of oil and gas-fired power plants. We have about 400,434 nuclear power plants." (Emphasis is mine.)

533-1 Carbon dioxide control and global and regional climate change are not within the scope of this EIS. This *TC & WM EIS* addresses proposed actions to retrieve and treat the Hanford tank waste; close the Hanford SST system; store and/or dispose of the waste generated from these tank waste activities; decommission FFTF; and expand or upgrade waste management capabilities to support ongoing and planned waste management activities for on- and offsite waste to facilitate cleanup at Hanford and other DOE sites. This EIS does address impacts of the alternatives on global climate change and the potential impacts of regional climate change on activities at Hanford (see Chapter 6, Section 6.5.2, Global Climate Change).

BP is included in," the industry had no blowout technology" and "they didn't have a backup plan".

The absolute lack of a backup plan is a major reason to cancel plans to transport nuclear waste from facilities all over the United States to Hanford.

That Hanford also has no backup plan for the likely disaster of a highway accident is made clear from the National Highway Traffic Administration 2002 report, Traffic Safety Facts 2001: A Compilation of Motor Vehicle Crash Data from the Fatality Analysis Reporting System and the General Estimate System.

I searched for risk factor statistics regarding the types of vehicles, specifically trucks, which were involved in accidents, but couldn't find them. But risk factors were listed for drivers operating a motor vehicle: 1.alcohol, 2.cell phones, 3.gender, 4.young drivers, 5. senior drivers, 6.speed, 7.location. From this list, it's clear that potentially, any type vehicle can collide with any other type vehicle. *533-2*

This is a potentially dangerous situation for which the Highway Traffic Safety Administration has no recommended backup plan. Accidents are handled locally with whatever resources a local government has. It's not likely that they have the funds to purchase the special equipment to handle a nuclear spill.

Therefore, for safety's sake, the best immediate plan is for each nuclear site to dry cask it's own nuclear waste, and delay building any new nuclear facilities until all the old nuclear wastes are safely stored.

We must always factor in human error. In Walking a Nuclear Tightrope: Unlearned Lessons of Year-plus Reactor Outages by David Lochbaum published by the Union of Concerned Scientists in 2006, are graphs of average lengths of outages and their costs, (pages 5,15,17, 20) and also three pages of specific information about each outage in columns which are headed: name of reactor, owner, location, day commercial operation began, outage dates, reactor age at the start of outage, outage length, NRC region, reactor type, and outage category. (pages 8,9,10) *533-3*

From the study of all the specific cases listed on those three pages, Lochbaum made the following observations: problems are not spotted soon enough, the public is being ignored, corrective action programs are not adequately assessed, problems are allowed to recur, perception (not reality) guide safety decisions, owners are not made aware of non-hardwire problems, programmatic breakdowns are not confined to

533-2 As discussed in this *Final TC & WM EIS*, Chapter 3, Section 3.2.10.5, Emergency Preparedness, DOE uses DOE Order 151.1C, *Comprehensive Emergency Management System*, as a basis to establish a comprehensive emergency management program that provides detailed, hazard-specific planning and preparedness measures to minimize the health impacts of accidents involving loss of control over radioactive material or toxic chemicals. DOE contractors are responsible for maintaining emergency plans and response procedures for all facilities, operations, and activities under their jurisdiction and for implementing those plans and procedures during emergencies. Plans and procedures are reviewed and approved by DOE in accordance with DOE Order 151.1C. The Transportation Emergency Preparedness Program was established by DOE to ensure its operating contractors and state, tribal, and local emergency responders are prepared to respond promptly, efficiently, and effectively to accidents involving DOE shipments of radioactive material. The following assistance is provided: emergency planning and guidance; training material development and delivery; emergency drills and exercises; centralized emergency notification; support to emergency responders (radiological surveys, technical assistance, and public information); and post-incident assessment (along with other agencies).

Another resource for emergency responders is the National Council of Radiation Protection Report Number 161, *Management of Persons Contaminated with Radionuclides*. This report provides guidance to those who may be called to respond to radionuclide contamination incidents to provide medical care and those who perform radiation-safety functions. For radioactive material shipments that exceed highway route controlled-quantity limits, the carrier must operate vehicles only over preferred routes and notify affected states and tribes regarding when these shipments will occur. For DOE shipments, DOE uses a satellite tracking and communications system to track shipments during transport; this system would be used to immediately report an incident. In addition, for all accidents, the U.S. Department of Homeland Security is responsible for establishing policies for and coordinating civil emergency management, planning, and interaction with Federal Executive agencies that have emergency response functions in the event of a transportation incident.

Guidelines for response actions are outlined in the *National Response Framework* (FEMA 2008a) in the event a transportation incident involving nuclear material occurs. The U.S. Department of Homeland Security would use the Federal Emergency Management Agency, an organization within the U.S. Department of Homeland Security, to coordinate Federal and state

Commentor No. 533 (cont'd): Madeline Smith

one plant, better communication is needed inside the NRC, not all poor performers have had a year-plus outage. (pages 21 to 26).

It is the failure to look reality in the face that worries me the most. "The public health risks and financial stakes of a 'surprise' nuclear disaster are too high to allow false perceptions to continue guiding nuclear safety decisions." (page 25) ***533-3 cont'd***

It is time to stop ignoring the concerns of clear thinking citizens and do what is best for the continued survival of us and our planet. We must learn how to keep human error minimal, stop taking risks that bring irreversible climate change ever closer. ***533-1 cont'd***

Madeline Smith
594 West 11 Ave.
Eugene, OR. 97401
or: e-mail: msmith28@uoregon.edu
or:xxx-xxx-xxxx

participation in developing emergency response plans and to be responsible for development and maintenance of the *Nuclear/Radiological Incident Annex* (FEMA 2008b) to the *National Response Framework*. The *Nuclear/Radiological Incident Annex* and *National Response Framework* describe the policies, situations, concepts of operations, and responsibilities of the Federal departments and agencies governing the immediate response to and short-term recovery activities for incidents involving release of radioactive materials to address the consequences of the event. In addition, truck drivers who transport radioactive or hazardous materials are required by Federal (49 CFR 383) and state regulations to be technically qualified and experienced and to have completed training in hazardous and radioactive materials transportation. This training, awareness of the cargo risk, and strict compliance with transportation regulations have reduced the likelihood of accidents to well below the national accident rates for all commercial trucks.

Regarding the commentor's concern about the transport of LLW and MLLW from other DOE sites to Hanford for disposal, DOE will be deferring the decision on sending LLW or MLLW from other DOE sites to Hanford for disposal (with some limited specific exceptions), at least until the WTP is operational, subject to appropriate NEPA review. For a more comprehensive discussion on the transport and disposal of offsite waste, see Section 2.1 of this CRD.

533-3 DOE notes that the report cited in the comment deals with lessons learned from operations at nuclear power reactors regulated by NRC. As indicated in Chapter 8 of this *TC & WM EIS*, DOE has an extensive system of standards and requirements to ensure safe operation of DOE facilities. "Nuclear Safety Management" (10 CFR 830) specifically requires that DOE safety programs be designed to detect and prevent safety and quality problems, identify the root causes, prevent recurrence of the problems, and provide timely information to the rest of the DOE community on lessons that were learned.

Commentor No. 534: Stuart Harris, Director, Department of Science and Engineering, Confederated Tribes of the Umatilla Indian Reservation

Confederated Tribes of the
Umatilla Indian Reservation
Department of Science & Engineering

46411 Timine Way • Pendleton, OR 97801
(541) 429-7040 • fax (541) 429-7040
info@ctuir.com • www.umatilla.nsn.us

April 30, 2010

Mr. Dave Brockman, Manager
Richland Operations Office
U.S. Department of Energy
P.O. Box 550-A7-75
Richland, WA 99352

Re: Proposed Tri-Party Agreement changes to Hanford Central Plateau Waste Sites, Facilities and Groundwater cleanup

Dave

Dear Mr. Brockman:

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) appreciate the opportunity to comment on the Tri-Party Agreement changes. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have a vital interest in the current and future condition of Hanford, the Hanford Reach, and Hanford-affected lands and resources. The USDOE's Hanford site was developed on land ceded by the CTUIR under the 1855 Treaty with the United States. The CTUIR reserved rights to this land and retained and reserved the perpetual rights to hunt, fish, gather, pasture livestock, and pursue other activities throughout the region, including the area in and around Hanford. The Hanford site contains critical and unique shrub steppe habitat, and the Hanford Reach is the last free-flowing segment of the Columbia River and is home of the last remaining naturally spawning fall Chinook.

Through nuclear weapons production activities, it has taken less than one lifetime to contaminate and thereby permanently affect the ability of CTUIR to safely use the Hanford Nuclear Reservation Area and its resources. The Hanford cleanup is the largest cleanup effort in the world. Yet according to the Central Plateau Cleanup Completion Strategy; "Currently no feasible technology exists to cleanup some of the contamination in the deep vadose zone that might threaten the groundwater." CTUIR assumes that the current proposed changes represent the best current thinking about how to proceed with cleanup. Since the Tri-Parties have already reached agreement, the CTUIR is only providing a few comments.

1. The CTUIR notes that DOE/RL expects the groundwater to reach drinking water standards with a century, more or less, while the TC&WM EIS shows that this will essentially never occur. The reality, therefore, lies somewhere between 'safe to drink' and 'lethal forever.' The TC&WM EIS was charged with developing the newest and best Hanford GW/VZ model, with peer review **534-1**

Treaty June 9, 1855 - Cayuse, Umatilla and Walla Walla Tribes

534-1 The *Draft TC & WM EIS* results suggest that complete removal of flux from the vadose zone over approximately the next 100 years would result in continued exceedances of benchmark standards in groundwater at the Core Zone Boundary for key COPCs from tank farm sources for several hundred years into the future (cf. Alternative 6A, Option Case, Clean Closure with Removal of Cribs and Trenches). In other words, concentrations at the Core Zone Boundary retain a signature of the operational (high discharge) period for a significant length of time into the future. The *Draft TC & WM EIS* also suggests that, under foreseeable combinations of waste-form performance, infiltration, and inventories, exceedances of benchmark standards for key COPCs from the IDF(s) may be expected over a period ranging from several thousand to 10,000 years into the future. Both of these results are for situations where no mitigation measures were included in the modeling. DOE is of the view that mitigation measures may be necessary to address groundwater contamination issues at the site, both for tank-farm-related and non-tank-farm-related sources. Such mitigation measures could include, but are not limited to, reduction of flux from the deep vadose zone into the aquifer, groundwater pump-and-treat systems, and development and deployment of improved waste forms.

Under NEPA, this *TC & WM EIS* is required to present decisionmakers with an estimate of impacts that allows for informed judgment regarding the tradeoffs among the alternatives. For example, the *TWRS EIS* (DOE and Ecology 1996) demonstrated that retrieving and treating waste from the SST system was preferable in terms of NEPA values to leaving that waste in place. It is also clear under NEPA that even the most preferable alternative may benefit from additional mitigation measures. In response to this and similar comments, Chapter 7, Section 7.5, of this *Final TC & WM EIS* contains additional analyses regarding potential mitigation measures. DOE's expectation is that these mitigation measures will be further developed during the assessment and permitting process as individual tank farms are closed.

Commentor No. 534 (cont'd): Stuart Harris, Director, Department of Science and Engineering, Confederated Tribes of the Umatilla Indian Reservation

and configuration control, so the CTUIR have to conclude that reality is closer to the 'lethal forever' condition. We urge the Tri-Parties to sort this out, because no more final decisions can be reached until this uncertainty is reduced to tolerable levels. **534-1 cont'd**

2. The CTUIR want to reiterate the importance of cleanup of the groundwater and the protection of the Columbia River. Therefore, it is important to continue developing the technology and a strategy to cleanup the deep vadose zone contamination.

3. The CTUIR would like to see the outline of the Lifecycle Report as soon as it is available. The lifecycle report could become a very important guidance document that contains cost projections, schedules, endstate descriptions, and a variety of restoration, stewardship, and environmental justice goals. Or, it could be bland and uninformative.

4. In the TPA changes, the language that states, "reaching mutually agreeable alternatives and end states" seems to have been removed. Instead, the language simply offers to discuss issues with Tribal Nations. The CTUIR want to maintain an active role in decision-making according to the DOE Indian Policy and Framework. Therefore, the language should acknowledge that Government to Government protocols exist and will be followed.

5. The CTUIR are concerned about the Modification P-07-09-02. The language shifts the responsibility of writing RODs from EPA and Ecology to DOE. While the regulatory agencies retain a concurrence role, it leaves the selection of final remedies and the establishment of remedial goals up to DOE. Because DOE steadfastly refuses to acknowledge on-site Treaty rights, refuses to use the CTUIR exposure scenario as a baseline scenario, and refuses to set cleanup goals to protect Tribal health, this will become a significant focus of the NRDA process.

If you have any questions, please feel free to contact myself or Dr. Barbara Harper of my staff.

Sincerely,

Stuart Harris, Director
Department of Science & Engineering

cc:
Shirley Olinger, Manager, DOE/ORP
Dave Brockman, Manager, DOE/RL
Jane Hedges, Washington State Department of Ecology
Dennis Faulk, U.S. Environmental Protection Agency
Gabriel Bohnee, Nez Perce Tribe
Russell Jim, Yakama Nation
Ken Niles, ODOE
file

RECEIVED
MAY 04 2010
DOE-RLCC

Response side of this page intentionally left blank.