

Confederated Tribes and Bands  
of the Yakama Nation

Established by the  
Treaty of June 9, 1855



August 3, 2012

Mr. Dennis McLerran, Regional Administrator  
Environmental Protection Agency Region 10  
1200 Sixth Ave, Suite 900  
Seattle, WA 98101

Re: Proposed Cleanup Actions for the 100-K, 200-UP-1, and 300 Areas of the Hanford Site

Dear Mr. McLerran,

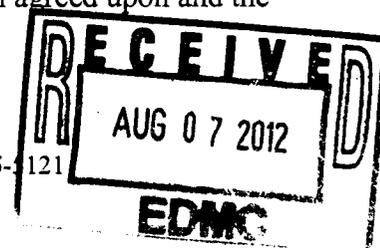
The U.S. Environmental Protection Agency (EPA) anticipates issuing three Records of Decision (RODs) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for the Hanford Site 100-K Reactor Area, 300 Area, and 200-UP-1 Operable Unit this year. The Confederated Tribes and Bands of the Yakama Nation submitted to the National Remedy Review Board written comments voicing our concerns about Hanford cleanup. At the Board's request, we subsequently submitted to the Board a letter specifically calling for our Cultural Resources concerns. These included a summary of technical issues and recommendations that are pertinent to the cleanup decisions being made for the three sites. The documents are attached as references.

Our issues and concerns as outlined in these documents remain outstanding and validated as reflected in the Boards' memorandum documenting their recommendations [June 26, 2012].

We note the Board's statements regarding *Recommendations Common to All Three Areas* reflect our own concerns regarding human health risk assessment, lack of characterization data in the development the PRGs, and the elimination of COPCs as well as the identification of full remediation cost factors.

We also note the Board's area-specific recommendations reflect and validate our concerns regarding the following:

- The RI/FS/PP documents do not address cultural resource adequately. It does not address how DOE will comply with cultural laws. The K and 300 areas are culturally sensitive with multiple archaeological sites as well as burials. These sensitive areas have not had complete characterization of contaminants; therefore remedial actions cannot yet be determined to establish what will be necessary to ensure protectiveness to human health, the environment, and the archaeological sites themselves. Currently, there is a lack of necessary data to develop the necessary protocol to proceed in these areas. Yakama Nation ER/WM believes it is impossible for EPA to issue a final decision document until these protocols have been agreed upon and the necessary data has been collected.

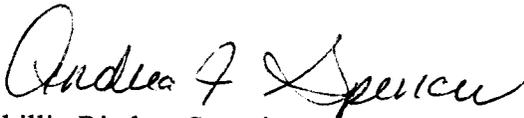


- Our over-arching concern regards contaminant impacts to the Columbia River.
- Institutional controls: Institutional controls as part of proposed remedial alternatives do not comply with unrestricted access to the site or Yakama Nation Treaty Rights. DOE's use of institutional controls as a means of preventing, *without fail*, exposure to residual contamination in the subsurface and groundwater remains both troubling and ultimately unproven.
- Risk Scenarios: Supplemental risk evaluations conducted as part of the 100-K RI/FS Report and Proposed Plan do not fully consider a Tribal Exposure Scenario, do not recognize the Hanford Site as "open and unclaimed," and does not include provisions to evaluate exposure to contamination through tribal subsistence and cultural activities. Even the non-Tribal Exposure Scenarios presented in the RI/FS Report are limited and unrealistic.
- Applicable or Relevant and Appropriate Requirements (ARARs): the 300 Area contaminant concentrations were not evaluated against the most restrictive ARARs or were compared against incorrect risk values. There were also discrepancies in the application of Drinking Water Standards (DWS) or Maximum Concentration Levels (MCLs) to identify exceedances or non-exceedances using MTCA Method B.
- Ecological Risk: The preferred alternative for the 100-K Area only proposes to treat a single radionuclide (Carbon-14) in groundwater. The remaining radionuclides in groundwater at the site seemingly are passed through the pump-and-treat system and re-injected into the unconfined aquifer, thus effectively spreading and diluting the constituents in groundwater to meet regulatory standards. In the 300 Area, a proper ecological risk assessment was not performed. For example, terrestrial biota and other ecological receptors will likely be impacted if groundwater contaminants migrate to the Columbia River or contaminants are transported to the surface via irrigation.
- Remedy Performance:
  - 100-K: The reactor cores and the contaminated orchard lands should be addressed in the proposed remedy. As stated in EPA (comment 4 on the RI/FS), "if this RI/FS and PP are for a final ROD, the reactor path and decision should be evaluated. ...The FS/PP needs to develop and evaluate alternatives for the waste sites near the reactor as some of them appear to be impacting groundwater.
  - 300 Area: The preferred alternative relies on an unproven technology. The preferred alternative relies on polyphosphate uranium sequestration, which has not been demonstrated to be effective, has numerous technical problems, and has previously not worked in the 300 Area under similar circumstances.
  - UP-1: DOE did not address certain zones of groundwater contamination or sources remaining in the 200 West Area vadose zone for purposes of mitigating future impacts. As Ecology noted in their comments, there is not a plan as to how these remaining sources, which will continue to contaminate the groundwater, will be remediated. Far-field well area contamination (Chromium in the south & Nitrate to the North) will not have a complete remedy.
- Vadose Zone: Groundwater modeling performed in support of remedial alternative evaluation is deficient. The preferred alternative includes a provision for no remedial

action to be taken to remediate the deep vadose zone. DOE did not address certain zones of groundwater contamination or sources remaining in the 200 West Area vadose zone for purposes of mitigating future impacts. As Ecology noted in their comments, there is not a plan as to how these remaining sources, which will continue to contaminate the groundwater, will be remediated. Far-field well area contamination (Chromium in the south & Nitrate to the North) will not have a complete remedy.

The Yakama Nation ERWM Program looks forward to dialog on these concerns and comments. Unless these recommendations are acted upon the Yakama Nation will not be in a position to endorse the Record of Decisions. If you have any questions, please contact Russell Jim at (509) 945-6741, or at Wade Riggsbee (509) 967-5375 or Rose Ferri (509) 452-2502.

Sincerely,



Phillip Rigdon, Superintendent, Department of Natural Resources  
Yakama Nation

Enclosures:

Cc/enc:

Warren Spencer, Chairman RHCW  
Vivian Babs George, RHCW  
Sam Jim Sr., RHCW  
Stella M. Washines, RHCW  
Russell Jim, Program Manager, ERWM  
Dennis Faulk, U.S. Environmental Protection Agency  
Jane Hedges, Washington Department of Ecology  
Susan Leckband, HAB  
Ken Niles, Oregon Department of Energy  
Gabriel Bohnee, NPT  
Stuart Harris, CTUIR  
Rex Buck, Wanapum  
Tom Zeilman  
Administrative Record July 24, 2012



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April 9, 2012

Dennis Faulk, Hanford Project Manager  
U. S. Environmental Protection Agency  
309 Bradley Blvd., Suite 115  
Richland, WA, 99352

Re: ER/WM Cultural Resource concerns on the draft Remedial Investigation/Feasibility Study (RI/FS)

Dear Mr. Faulk,

Yakama Nation Environmental Restoration/Waste Management (YN ER/EM) would like to submit our concerns with regards to cultural resources in the 100-K area. As stated during the Environmental Protection Agency (EPA) National Remedy Review Board meeting, March 27-29, 2012, the RI/FS and associated plan does not identify how the Department of Energy will comply with the National Historic Preservation Act, Native American Grave Protection and Repatriation Act, Archaeological and Historic Preservation Act, Archaeological Resources Protection Act, Executive order 13175, American Antiquities Act, and Proclamation 7319.

After expressing these concerns at the Remedy Review Board meeting, Board members requested YN ER/WM staff to detail out the concerns and submit them formally. The attached concerns are being submitted per this request. Please accept them as an addendum to YN ER/WM's original 10 page comment submitted to yourself and Remedy Review Board members. A copy of these concerns has been submitted to Amy Legare, Chairwoman, EPA National Remedy Review Board for distribution to Remedy Review Board members, also per Board member request.

If you have any questions or concerns please contact myself or a member of YN ER/WM cultural resource staff, Rose Ferri or Dana Miller at 509-452-2502. We look forward to continued consultation to resolve these sensitive cultural issues.

Sincerely,

Russell Jim  
Yakama Nation-ER/WM Projects Manager

Vera Hernandez, RHWC  
Sam Jim Sr., RHWC  
Philip Rigdon, YN DNR  
Rob Whitlam, DAHP  
Kate Valdez, YN THPO

Warren Spencer, RHWC  
Raymond Smartlowit, RHWC  
Amy Legare, EPA, Review Board Chairwoman  
Administrative Record  
Dan Opalski, EPA, Region 10

100-K and 300 Area RIFS EPA Advisory Remedy Review Board Statement

RE: Follow up comments concerning cultural resources

The 100-K and 300 Areas RI/FS have not addressed cultural resources. Although the cultural resource section acknowledges the abundance of cultural sites and culturally significant areas throughout the Hanford site, the remedy does not address how cultural resources will be protected or how effects to cultural resources will be addressed, as mandated by the NHPA and implementing CFRs. The RI/FS states "Tribal Nations leaders review the locations and potential impacts to these resources before site activities begin." However DOE has not been compliant with the NHPA and implementing CFRs since 2003. Approximately 1,200 projects (roughly 90% of all projects) were implemented since 2003 without a full Section 106 review and without any Tribal consultation. To date YN does not know the location and the nature of most of these projects.

Currently there are ongoing discussions with regards to the discovery of contaminated artifact, funerary objects and /or human remains. This topic was originally brought to DOE's attention in the late 1980s. To date there is still no plan as to how these resources will be cared for. Under the NHPA it is DOE's responsibility to properly care for these cultural materials. Tribal discussions with DOE revealed there is a lack of data to determine the level, type and depth of contamination in culturally sensitive areas, known archaeological sites and burial areas. Although DOE has invited Tribal input on a plan of action, until more characterization and testing is completed it is impossible to move forward with a treatment plan, or remedy selection, as it is unknown if cultural material will need to be removed, or can be left in place based on the level of contamination.

The final RODs are expected to be written by September 30, 2012, yet DOE has yet to meet with Affected Tribes to develop a sampling plan for the culturally sensitive areas, known archaeological sites and burial grounds. Once a sampling plan is developed samples will need to be collected and analyzed. The site specific results will need to be reported to Tribal Policy Makers, at which time each site will need to be reviewed. In consultation with DOE, EPA, and WA Ecology the Tribal Policy makers will need to decide what can be left in place and what will have to be removed based on levels of contamination. A plan detailing removal methods and proper curation/reburial of cultural materials must be developed and included in the ROD. The removal of cultural material will add time and expense, which has not been addressed in the alternative remedy selection and cost analysis process. To leave cultural material in place may affect clean up levels as well.

Final RODs need to account for the additional time, expense, clean up levels, and/or mitigation measures to comply with National Historic Preservation Act, Native American Grave Protection and Repatriation Act, Archaeological and Historic Preservation Act, Archaeological Resources Protection Act and Executive order 13175. With regards to HRNM land DOE will also need to ensure compliance with American Antiquities Act and Proclamation 7319. Compliance with laws and regulations needs to be written into the ROD, not merely written into an implementation/work plan post ROD..

It is unclear if DOE has consulted with Department of Interior on remedy and clean up levels as directed in Proclamation 7319 for the HRNM and adjacent lands that could affect the Monument lands. Any outcome of this consultation may affect clean up levels on the River corridor, which in turn may affect remedy selection for the 100-K and 300 Area proposed plans.



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March 27, 2012

Amy Legare, Chair  
National Remedy Review Board (NRRB)  
U.S. Environmental Protection Agency (EPA)  
1200 Pennsylvania Avenue, NW  
Mail Code 5204P  
Washington, DC 20460

Dear Ms. Legare:

Thank you for the opportunity to submit comments on the current cleanup plans for the 100-K Reactor Area, 300 Area, and 200-UP-1 Operable Unit of the Hanford Site in anticipation of the three Records of Decision (RODs) expected to be issued this year under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The Yakama Nation's compliance objectives for the cleanup and closure of the Hanford Site include the following:

1. Compliance with Yakama Nation Treaty Rights, including full access to cultural resources by the Yakama Nation and its members within its ceded land and aboriginal territory, including on the Hanford Site.
2. Protection of the health of Yakama Nation tribal members and the environment so that the Hanford Site and all its resources (including the Columbia River, its islands, other surface waters, geologic resources, groundwater, air, and biological resources such as plants, fish, and wildlife) are safe for all exposure scenarios and tribal uses.
3. Cleanup decisions that follow the CERCLA RI/FS process and requirements through finalization and approval of documents (including risk assessments and supporting secondary documents) prior to development of Proposed Plans for final RODs.
4. Cleanup decisions based on adequate site-specific characterization information, including the vadose zone and groundwater. There are areas of uncertainty within the groundwater modeling approach (STOMP-ID), and its application is inappropriate until the issues are resolved.
5. Cleanup actions that comply with all applicable or relevant and appropriate federal and state regulatory requirements.
6. Cleanup actions that are compatible with clean closure, including the high-level waste tanks. Cleanup actions that would preclude clean closure should not be implemented.

7. Cleanup actions that are complete, permanent, are based on proven technology for application at Hanford, and do not rely on long-term stewardship and institutional controls to address long-lived radionuclide and dangerous waste contamination at the Hanford site. Long-term stewardship and institutional controls will not be effective for wastes that remain dangerous for hundreds or thousands of years.
8. Official recognition that Native Americans living near the Hanford site are the most vulnerable people to environmental contaminants, as underscored by EPA's Columbia River Fish Contaminant Survey.

Attached is a summary of technical issues related to the Hanford cleanup, which is limited to 10 pages as dictated by the letter dated February 13, 2012 from Dennis Faulk, EPA Region 10, to Harry Smiskin, Yakama Nation Chairman. Aside from the technical concerns presented in the attached issue paper, the Yakama Nation believes there are serious deficiencies in the Remedial Investigation/Feasibility Study (RI/FS) cleanup process that are documented by the EPA, Washington State Department of Ecology, and the Hanford Natural Resource Trustee Council.

Thank you for your consideration. I look forward to discussing the Yakama Nation's concerns and recommendations regarding Hanford cleanup with the NRRB.

Sincerely,



Russell Jim  
Yakama Nation ERWM Program Manager

Attachment

cc: Yakama Nation Tribal Council Radioactive/Hazardous Waste Committee  
Philip Rigdon, Deputy Director, Yakama Nation Department of Natural Resources  
Dennis McLerran, Regional Administrator, EPA Region 10  
Ted Sturdevant, Director, Washington State Department of Ecology

**Yakama Nation Technical Issues for Hanford Cleanup Decisions**  
EPA National Remedy Review Board Meeting  
March 27-29, 2012

The U.S. Environmental Protection Agency (EPA) anticipates issuing three Records of Decision (RODs) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for the Hanford Site 100-K Reactor Area, 300 Area, and 200-UP-1 Operable Unit this year. The Confederated Tribes and Bands of the Yakama Nation appreciates the opportunity to discuss concerns about Hanford cleanup with the EPA National Remedy Review Board, including this summary of technical issues and recommendations that are pertinent to the cleanup decisions being made for the three sites.

**General Concerns**

The Yakama Nation does not believe that current plans for Hanford cleanup are adequately protective of Tribal people or Treaty resources. Superfund cleanups must be protective of the environment and human health, including tribal people. The assessment of risk for the River Corridor (DOE, 2011a), for example, is incomplete and does not adequately assess either baseline risks or cumulative risks that a Yakama member would encounter on the Hanford Site, nor does it adequately assess potential risks to ecological receptors on which our people depend to sustain our health, livelihood, and culture. Critical issues related to the River Corridor, including the 100-K and 300 Areas, and Hanford in general are presented below:

1. **The proposed remedies do not fully comply with the Treaty of 1855 between the Yakama Nation and the United States of America.** The Treaty, which reserves specific rights and resources for the Yakama Nation, should be acknowledged as an ARAR or a "must comply" standard for cleanup decisions. This includes the right to practice in full subsistence activities in Yakama usual and accustomed use areas.
2. **DOE is short-cutting the CERCLA cleanup process at Hanford in order to meet TPA milestones and save money.** The proposed plans deal with radiological and chemical contaminants that potentially pose risks for very long periods of time. The proposals are to leave much of the toxic wastes at the site, with the potential for long-term impacts to the environment and human health. The EPA as a regulator should ensure that DOE follows the CERCLA process and adequately completes the risk assessments that support cleanup decisions for the Hanford Site.
3. **The cleanup and restoration of the River Corridor 100 Areas within the Hanford Reach National Monument (HRNM) remains DOE's obligation.** Under the Antiquities Act of 1906, the Hanford Reach National Monument (HRNM) was created by Proclamation 7319 in 2000. The Proclamation lists the resources that are to be protected including: riparian, aquatic and upland shrub stepped habitats, native plant and animal species as well as archaeological, historic and sacred sites throughout the monument. While the majority of the HRNM is managed by USFWS, the river corridor lands underlying the Hanford reactors and operational areas are managed by DOE, the current land owner. The DOE-managed portions of the HRNM include the 100-K and 300 Areas addressed in the cleanup proposals. These lands contain high levels of contamination and significant cultural resources. It is recognized in the Proclamation that DOE has the responsibility to clean up hazardous substances and the restoration of natural resources. The Proclamation further states, "As Department of Energy and US Fish and Wildlife Service determine that lands within the monument managed by the Department of Energy become suitable for management by the US Fish and Wildlife Service, the US Fish and Wildlife Service will assume management by agreement with the Department of Energy." Clearly it was the intent of the President that the HRNM land would be cleaned, restored and then managed by the USFWS. The entire HRNM would then be managed according to the mission of the USFWS guided by the HRNM Comprehensive Conservation Plan (CCP), which states a primary purpose of, "Protect and restore biological, cultural, geological and paleontological resources." Areas in the River Corridor 100 Areas are some of the most contaminated, and it remains the obligation of DOE to clean and restore these areas within the HRNM and areas that could affect the HRNM in consultation with the Department of Interior. Anything other than complete cleanup and restoration of the HRNM would be in direct conflict with the Antiquities Act, Proclamation 7319, and the HRNM CCP.

4. **Cleanup decisions are based on insufficient characterization data.** DOE has not conducted adequate site characterization with sufficient sample coverage of geographic areas, potential sources, media types, and transport mechanisms to ensure data of sufficient quality before estimating risk and making cleanup decisions. To support coherent and protective cleanup decisions, Superfund calls for fully characterizing the nature and extent of contamination. For Hanford, this should include characterizing all waste sites (regardless of remedial stage), the areas in between these sites, and the vadose zone. More complete characterization of environmental conditions is required to allow a more spatially robust evaluation and to reduce the current level of uncertainty.
5. **There are areas of uncertainty within the groundwater modeling approach (STOMP-1D), and its application is inappropriate until issues are resolved.** The graded approach to evaluating groundwater protection and STOMP-1D modeling has many uncertainties (e.g., what criteria will be used to assess the validity of the Preliminary Remediation Goals [PRGs] as they apply to site conditions). We believe *The Technical Guidance Document for "Tank Closure Environmental Impact Statement" Vadose Zone and Groundwater Revised Analyses* should be revised and corrected before it is used to define initial values for model parameterization (e.g., revising the incorrect Kd value of 0.6 used for uranium). Application of this model for making cleanup decisions is inappropriate until these issues are resolved.
6. **River Corridor cleanup does not consider potential contaminant migration from the Central Plateau.** Contamination in the Central Plateau is currently migrating to groundwater through the highly complex vadose zone. In the 200-UP-1 Remedial Action Objective (RAO) #3, DOE acknowledges the need to *protect the Columbia River and its ecological resources from degradation and unacceptable impact caused by contaminants migrating from 200-UP-1*. This contaminated groundwater from the Central Plateau is being transported to the River Corridor and has already reached the Columbia River; this will continue far into the future, as shown by DOE's own modeling. DOE should consider contaminant migration in groundwater over time from the Central Plateau to the River Corridor and ultimately the Columbia River, including groundwater flow rates, plume mixing, and exposure pathways, and incorporate this information into the decision documents for the River Corridor.
7. **Restricted land use and institutional controls (risk management actions) inappropriately form the basis for the risk assessment.** DOE's own guidance acknowledges the EPA directive that institutional controls cannot be factored into a baseline risk assessment. By definition, baseline risks are risks that would exist if no remediation or institutional controls are applied at a site; this information then provides a foundation for determining the most appropriate remedial options. DOE should not assume restrictions and controls when assessing risk on which cleanup decisions are made.
8. **The total risks to tribal residents have not been assessed.** DOE fails to accurately and completely identify all sources of contamination, transport mechanisms through all environmental media, and potential risks to tribal members based on a traditional subsistence lifestyle. Inadequate data are used to characterize exposure from groundwater and fish ingestion, for example, both of which are critical exposure pathways. A cumulative risk assessment should be conducted for a Yakama tribal residential scenario, and the results should be applied to cleanup decisions.
9. **Linkages, access, and exposure to the Columbia River in conjunction with the River Corridor are not considered.** DOE's definition of the geographic scope of the River Corridor extends only to the near shore of the Columbia River and does not include the river itself. Arbitrarily segregating the riparian shoreline of a river from the river itself, which are connected hydraulically, does not make sense for assessing potential risk. It is most likely that a person living, using, or recreating at Hanford would encounter the river in addition to the riparian and upland habitats. DOE must conduct the clean up based upon use scenarios that include access to the Columbia River from the River Corridor, and consider all exposure pathways related to river water, sediments, and aquatic organisms.
10. **Important sample locations, contaminants, and concentration data are excluded without adequate justification.** Characterization efforts and risk assessments that drive cleanup decisions have excluded data results, contaminants, waste sites, and non-operational areas without adequate justification and based upon generalizations (e.g., contaminants found in less one-third of waste sites are not retained as contaminants of

concern). DOE should not exclude any contaminants or locations based upon generalized assumptions without adequate evaluation of the data and clear justification.

11. **Site data are compared to background (reference) samples that were also collected on the Hanford Site and potentially impacted by Hanford contaminants.** DOE considers samples collected either onsite or proximal to Hanford as background and reference samples; yet, these locations cannot confidently be deemed uninfluenced by releases from Hanford because of airborne contamination and/or movement through the environment and food web. These locations are not appropriate as background for comparison to site data. Appropriate locations should be selected that are not on the Hanford site and assuredly not influenced by Hanford contaminants.
12. **Only incremental risks above background levels were considered in assessing baseline risk.** All contaminant exposures at the site contribute to baseline risk and should be included in a risk assessment. However, DOE is making risk management decisions prior to assessing risk by excluding certain "background" exposures. DOE should consider all contaminants contributing to risk at the site, including natural and background concentrations, as part of total baseline risk.
13. **CERCLA and MTCA limits are not always applied when assessing risk.** The radiation dose limit of 15 millirem per year (mrem/yr) equates to a lifetime cancer risk that is 3 times above the maximum allowable value (1 in 10,000) under the federal Superfund program (and even more when other EPA risk coefficients are considered in the conversion). Although Washington State's Model Toxics Control Act (MTCA) applies to all hazardous substances, DOE interprets MTCA to only regulate chemicals, excluding Hanford's extensive radionuclide contamination. Superfund and MTCA risk thresholds should be adopted for chemicals and radionuclides combined, and for radiation should equate to a more protective level of 5 mrem/yr or less radiation dose limit.
14. **Toxic wastes being excavated as part of cleanup are being disposed of on-site.** Disposal of the much of the contaminated wastes excavated from the Hanford facilities is at the mixed-low-level radioactive burial grounds in the Central Plateau known as Environmental Restoration Disposal Facility (ERDF). An issue is how some of these wastes currently or proposed for disposal meet the waste acceptance limits for ERDF. It is our understanding that some of the wastes from the River Corridor are diluted by mixing contaminated waste with less contaminated soils prior to disposal at ERDF. Another issue is the total inventory of transuranic elements in the ERDF, as the facility has a design life that is far shorter than the half-lives of transuranic elements. This poses a concern about the amount of transuranics that may be released into the soil from the facility in the future. An evaluation should be performed on the total waste inventory in the ERDF (to date), focusing on long-lived radionuclides. Such an evaluation should support a determination of future impacts and whether disposal at ERDF is exceeding risk criteria.

#### 100-K Reactor Area

Overall, the Proposed Plan for cleanup of the 100-K Reactor Area and the associated Remedial Investigation / Feasibility Study (RI/FS) Report (DOE, 2011b,c) do not comprise an adequate cleanup of the 100-K Area. DOE developed Preliminary Remediation Goals (PRGs) that are generally very high, and which would allow significant concentrations of contaminants to remain in place. These cleanup goals are based on land use scenarios identified for uses over a limited period of time in DOE's Comprehensive Land Use Plan Environmental Impact Statement (DOE, 1999), which assume that there are no complete exposure pathways to residual contamination in the deep vadose zone or groundwater plumes. The preferred alternative for treating contaminated groundwater in the 100-K Area focuses on hexavalent chromium and carbon-14. The proposal is to continue to operate an existing pump-and-treat system at the 100-K Area and augmenting it with additional bioremediation or air stripping technology. These technologies have not been demonstrated to be effective in treating the types of contamination present in the 100-K groundwater, nor in the 100-D Area. DOE theorized that the 100-D Area system did not work because continuing sources of hexavalent chromium contamination in the vadose zone were introducing new contamination to groundwater; DOE assumed that no continuing sources exist in the 100-K Area. This assumption is not adequately justified with site data to be considered the base case for modeling purposes. The Yakama Nation concerns with the cleanup proposal for the 100-K Reactor Area are supported by agency comments (EPA, 2011b and Ecology, 2011b) and include, but are not limited to, the following:

1. **The nature and extent of contamination in the 100-K Reactor Area has not been adequately characterized and documented.** EPA and Ecology each submitted numerous comments expressing serious concern regarding DOE's methodology for characterizing contamination in the 100-K Reactor Area (Ecology, 2011b and EPA, 2011b). The Yakama Nation agrees that DOE has not adequately, or realistically, evaluated the nature and extent of contamination at 100-K. For example, only 16 out of 165 waste sites were evaluated. Insufficient data exist to fully characterize the extent of soil and vadose zone contamination that has resulted from disposal of very large volumes of wastewater contaminated with hexavalent chromium and radionuclides. As stated in Ecology comments (page 3), the RI/FS "does not provide adequate information on how the vast extent of soil/deep vadose zone contamination created by billions of gallons of contaminated effluent discharges creating a mound of ~33 ft high and the overland flows covering a vast area around the K Reactors discharging both mobile (e.g. chromium) and highly adsorptive contaminants like Sr-90 was characterized."
2. **Contaminants of potential concern (COPC) are being eliminated from consideration prematurely.** The decision to focus on only a selected list of contaminants (identified in Chapter 4 of the RI/FS) in soil and groundwater significantly reduces the cumulative risk estimated for the 100-K Area. Ecology and EPA comments also reflect the concern that several analytes were being removed from the DOE-approved list of COPCs either prematurely, or based on criteria that were not appropriate. For example, radionuclide contaminants associated with the KE fuel storage basin (such as cesium, plutonium, uranium, and technetium) were not identified as COPCs, and non-radionuclide contaminants associated with the area (such as tetrachloroethylene) were not always included. Also, screening of contaminants may have resulted in underestimating total risk since each contaminant contributes to the cumulative risk even if the individual contaminants do not exceed screening levels used.
3. **The modeling approach used by DOE to evaluate remedy performance contains serious flaws and unrealistic or unduly favorable assumptions.** EPA and Ecology each submitted comments identifying deficiencies in the modeling performed by DOE to support the Proposed Plan's preferred alternative for the 100-K Reactor Area. The Yakama Nation agrees that partition coefficients used in the model were frequently not appropriate, not correct, or not justified; partition coefficients were not consistent between sections of the RI/FS Report, and contaminants were sometimes identified as both highly mobile and relatively immobile; stating that contaminant partition coefficients are "constant in time and space" is known to be inaccurate; recharge rates used in the vadose transport modeling were not justified or were not appropriate; hydraulic transport parameters were not well justified or supported with field or lab data; assuming contamination to be uniform in the subsurface is not supported by site data; modeling did not meet Washington State requirements stated in WAC 173-340-747 for deriving soil concentrations for groundwater protection; and modeling parameters were not consistent between programs (RESRAD, STOMP).
4. **Modeling to support PRG development was only performed for a limited time period.** Modeling used to help develop PRGs was only performed for a period of 3,000 years, which is not adequate considering the long half-lives of some Hanford radionuclide contaminants. The limitation on the calculated time interval was arbitrarily made to save time and "resource constraints." Because many contaminants did not reach peak concentrations within the modeled time period, many of the contaminants with higher partition coefficients had their peak concentrations "scaled" off of other contaminants. This approach introduces significant uncertainty into the calculation of the groundwater and surface water concentrations used to set PRGs.
5. **Groundwater and surface water modeling to support PRG development unrealistically assumes completely clean backfill.** DOE acknowledged that backfill sediments are "known to have been contacted by contaminated fluids" in some locations (DOE, 2011b). Given the extensive history of contamination at the Hanford Site, this assumption should be supported with *in-situ* sampling of backfill. Otherwise, using the blanket assumption that all backfill is completely clean may constitute an arbitrary reduction in the contamination source term.
6. **Recharge and infiltration scenarios used in developing soil screening levels (SSLs) and PRGs for the River Corridor are not consistent.** SSLs were calculated using the irrigation recharge scenario, which is a conservative approach based on the greatest volume of water passing through the contaminated soil; however, it is unclear how the SSLs were applied. PRGs were actually applied in the 100-K RI/FS Report, and these were calculated using a "base case" (less) recharge scenario. The PRGs are significantly higher (less protective) than

those calculated using the irrigation recharge scenario since much less water passes through the contaminated soil interval. EPA and Ecology each criticized the infiltration rates used to develop PRGs, referring to them as unrealistic. They also criticized DOE's assumption of mature shrub steppe habitat becoming quickly established (effectively reducing total infiltration) over remediated waste sites and in the 100-K Operational Area. Both agencies submitted additional comments suggesting that DOE has underestimated how much water will infiltrate from the surface through remediated waste sites and contaminated soil in the vadose zone, resulting in perpetuation of the groundwater plumes that exceed drinking water standards.

7. **DOE maintains that there are no complete exposure pathways to the deep vadose zone or groundwater.** The preferred alternative identified in the Proposed Plan meets remedial action objectives set by the DOE that are based on land uses identified in the Comprehensive Land Use Plan EIS, which include conservation and mining for government purposes (DOE, 1999). Based on these land use scenarios, DOE maintains that there are no complete exposure pathways to residual contamination in the 100-K Area or the River Corridor. EPA commented that the DOE's proposed land uses do not comply with the unrestricted use and casual use scenarios that were agreed upon by the Tri-Parties. It is also important to note that traditional cultural activities and other land uses that are not acknowledged by DOE would result in exposures that significantly exceed those the DOE has elected to estimate. Also, DOE has not resolved the contradiction between its stated land use that includes mining and the presumption that no exposure pathways exist to contamination in the deep vadose zone or groundwater. Ecology notes in their comment (page 10) "that exposure to groundwater rads occurs through multiple pathways (not limited to drinking water) which should be evaluated against the NCP range."
8. **The use of institutional controls as part of proposed remedial alternatives does not comply with unrestricted access to the site or Yakama Nation Treaty Rights.** DOE's use of institutional controls as a means of preventing, *without fail*, exposure to residual contamination in the subsurface and groundwater remains both troubling and ultimately unproven. Regarding the use of institutional controls at DOE waste sites, the National Research Council pointed out: "While there is typically a tacit recognition that engineered barriers and waste stabilization approaches have limited periods of effectiveness, these technologies are frequently employed with inadequate understanding of, or attention to, the factors that are critical to their success. These include the need for well-conceived plans for performance monitoring that identify and correct potential failures and plans for maintenance and repair, including possible total system replacement." (NRC, 2000). This level of planning, both technical and financial, does not appear to have been included in the cleanup planning. Aside from a general statement that waste sites near the reactor structures would be covered with surface barriers, no detailed information is provided regarding the types of institutional controls that would be implemented, such as fencing, regulatory controls, surface barriers, and supporting funding.
9. **Assessment of potential risk to human health and cultural resources are not considered for Tribal members at 100-K.** Supplemental risk evaluations conducted as part of the 100-K RI/FS Report and Proposed Plan do not consider a Tribal Exposure Scenario, do not recognize the Hanford Site as "open and unclaimed," and do not include provisions to evaluate exposure to contamination through tribal subsistence and cultural activities. Even the non-Tribal Exposure Scenarios presented in the RI/FS Report are limited and unrealistic. As noted by Ecology, the resident Ranger, for example, is assumed to be "unaccompanied," implying no family (i.e., no child would be allowed at the residence), which is impractical for hiring purposes by the U.S. Fish and Wildlife Service. Additionally, there is very little discussion of cultural resources and the impacts remediation may have on these important tribal resources. The RI/FS Report notes that archaeological sites have been identified that are associated with villages, ceremonial sites, harvesting areas, sacred areas, and other traditional activities. However, there is no discussion of how remedial activities will impact these sites or what measures will be taken to ensure adequate protection of culturally sensitive locations.
10. **The preferred alternative does not treat several radionuclides known to exceed groundwater screening levels.** The preferred alternative for the 100-K Area only proposes to treat a single radionuclide (carbon-14) in groundwater. The remaining radionuclides in groundwater at the site are passed through the pump-and-treat system and re-injected into the unconfined aquifer, thus effectively spreading and diluting the constituents in groundwater to meet regulatory standards. While adequate dilution may ultimately reduce concentrations of strontium-90 and tritium to below drinking water standards, this is a poor primary approach to employ in an area with the potential for significant additional subsurface contamination by these same radionuclides as yet unidentified.

11. The preferred alternative relies on remedial technologies that are either unproven, or have been shown not to perform well. The Proposed Plan indicates that "design testing will be required for biological treatment" that will be employed to treat groundwater in addition to the existing pump-and-treat system (DOE, 2011c). The DOE goes on to acknowledge that "although biological treatment of hexavalent chromium has been proven, implementation at the Hanford Site would likely require at least laboratory scale treatability testing." A similar supporting statement for the proposed carbon-14 treatment states that "while air stripping is a routinely used treatment technology, using it for carbon-14 is not routine" and that deployment of such a system would also require laboratory scale testing before any (possible) treatment could be pursued. These statements acknowledge that evaluation of the remedial technologies that make up the preferred alternative have not been evaluated according to many of the CERCLA Evaluation Criteria, such as compliance with ARARs; long and short term effectiveness; reduction of toxicity, mobility, and volume; implementability, and cost. DOE also does not include in a discussion of handling the various difficulties and failures that have been previously encountered with the technologies identified in the preferred alternative, such as failures associated with the 100-N permeable reaction barrier and pump-and-treat system, *in-situ* apatite treatment of uranium in the 300 Area vadose zone and groundwater, and the ineffective pump-and-treat system at 100-D "because of continuing sources in the vadose zone or aquifer" (DOE, 2009). Data gaps in the nature and extent of contamination at the 100-K Area and the relatively high probability that ongoing sources to groundwater remain unidentified in the vadose zone indicate that pump-and-treat is an inappropriate technology, and likely ineffective for long-term groundwater cleanup.
12. The selection of remedy in the Proposed Plan (PP) does not appear to be supported by a complete analysis of feasible alternatives. We agree with EPA's comment (number 1) that the proposal "seems to fall short of the purpose and intent of a PP under the NCP and does not follow EPA guidance... the proposed plan must describe an analysis of the feasible alternatives and clearly state why the proposed remedy is the most appropriate for the operable unit, based on written EPA guidance and criteria."
13. The reactor cores and the contaminated orchard lands should be addressed in the proposed remedy. As stated in EPA (comment 4 on the RI/FS), "if this RI/FS and PP are for a final ROD, the reactor path and decision should be evaluated. ... The FS/PP needs to develop and evaluate alternatives for the waste sites near the reactor as some of them appear to be impacting groundwater. Deferring cleanup of these wastes until the reactor is removed is not acceptable."

### 300 Area

Overall, the Proposed Plan for cleanup of the 300 Area and the associated RI/FS Report (DOE, 2011d,e) do not support an adequate cleanup of the 300 Area. The preferred remedial alternative for the protection of groundwater relies on the application of polyphosphate solution to deeper zones of uranium contamination. Polyphosphate remediation has been previously attempted in the 300 Area and has proven to be both problematic and ineffective. In the event that the polyphosphate application does not reduce the mobility of uranium in the deep subsurface, the proposed alternative specifies that no additional treatment will be applied. Based on modeling, DOE believes that monitored natural attenuation of the groundwater plume will achieve regulatory compliance within 38 years. The proposal is that the entire site be restricted with institutional controls to limit exposure to residual contamination. Key comments related to the 300 Area cleanup plan include:

1. Additional characterization of the Operable Units is needed. Eleven new wells were drilled as part of the characterization effort performed for the 300 Area RI/FS. However, characterization efforts were focused on only 5 identified waste sites (North Process Pond, South Process Pond, Process Trenches, 307 Disposal Trenches, and 307 Retention Basins). Of the 11 wells drilled, 7 were focused on further refining already-identified groundwater contamination. Multiple instances of previously unidentified contamination being discovered in the 300 Area indicate that full characterization of the nature and extent of contamination in the 300 Area is far from complete.<sup>1</sup> As a result, it is not possible to identify the remedial actions that will be necessary to completely remediate the site.

<sup>1</sup> For example, the discovery of cesium-137 and strontium-90 contamination below the 324 building and recent addition of the uranium plume from the 613-7 burial ground.

2. **Several COPCs have been inappropriately eliminated from consideration for remedial actions.** Groundwater contamination constituents in the 300 Area include gross alpha activity, nitrate, trichloroethene (TCE), cis-1,2-dichloroethene (DCE), and hexavalent chromium. All of these contaminants have been detected at concentrations that exceed groundwater regulatory standards. The Proposed Plan has eliminated all of these constituents from the final list of contaminants of concern based on criteria that they are associated with other sources, which is not logical. The rationale, for example, does not demonstrate that the contaminants are not toxic, do not constitute a risk to exposed receptors, or are not in violation of regulatory standards. Removal of contaminants of potential concern on the basis that the source of the contamination has not been located, or is not in the decision unit addressed by the Proposed Plan, is contrary to the purpose of the plan, which is to present options for cleaning up soil and groundwater.
3. **No PRGs to protect groundwater and surface water have been set for uranium in the vadose zone.** The PRGs in the Proposed Plan are used to "assess the effectiveness of the selected remedial alternatives to meet the remedial action objectives during the Feasibility Study process" (DOE, 2011e). By not providing a PRG value for uranium in the vadose zone, DOE has effectively eliminated an important standard by which remediation activities can be judged. The inability to evaluate the remedial action's performance following implementation is not acceptable. Where PRGs were calculated, infiltration scenarios used in PRG development are not acceptable (similar to 100-K).
4. **The preferred alternative relies on an unproven technology.** The preferred alternative relies on polyphosphate uranium sequestration, which has not been demonstrated to be effective, has numerous technical problems, and has previously not worked in the 300 Area under similar circumstances. Several problems associated with this technology have been previously identified during field trials in the 300 Area, including problems placing the reactive solution in contact with contaminated aquifer sediments due to high groundwater velocities; dispersion of reactive agents in groundwater rendering them ineffective to treat contamination in aquifer sediments; incompatibility with 300 Area aquifer geochemistry; and insufficient fine grained material in the Hanford Formation to retain and initiate precipitation of uranyl-phosphate mineral phases. PNNL has stated that "the ability to maintain low uranium concentration in the 300 Area unconfined aquifer over long periods of time using phosphate treatment of the saturated zone [appears] to be limited" (Vermeul et al., 2009). It is critical that the treatment identified in the preferred alternative be demonstrated to work, or include provisions to verify treatment has occurred as planned.
5. **Evaluation of remedial alternatives against balancing criteria is not reasonable, credible, or acceptable.** The problems previously identified with the preferred alternative treatment to protect groundwater are generally dismissed by the Proposed Plan with the statement "previous tests performed in the vadose zone and [periodically rewetted zone] were promising, but did not positively demonstrate the viability of this technology for large area application" (DOE, 2011e, page 45). This statement implicitly confirms that the polyphosphate treatment identified has not been evaluated according to the applicable CERCLA balancing criteria, which require the selected treatment's *performance at the site* be compared against other alternative's performance at the site. The rating of remedial alternatives against balancing criteria that has been performed does not reflect an honest and unbiased evaluation. The final proposal should include a complete analysis of feasible alternatives.
6. **The preferred alternative incorporates treatments rated by DOE to perform poorly against balancing criteria.** The preferred alternative includes a provision to implement the treatments identified in Alternative 2 in case the identified polyphosphate treatment is unsuccessful. The remediation to protect groundwater specified in Alternative 2 is to *take no action*. The performance of Alternative 2 evaluated against the balancing criteria includes "poor" ratings in both reduction of toxicity, mobility, or volume and short-term effectiveness, and is rated to perform only "moderately" for long term performance. Finally, the reliance on monitored natural attenuation to remediate groundwater in the 300 Area is the same remedial action selected as that selected in the 1992 interim ROD for the 300-FF-5 Operable Unit, which has failed to perform as intended (EPA, 1996).
7. **Groundwater modeling performed in support of remedial alternative evaluation is deficient.** The preferred alternative includes a provision for no remedial action to be taken to remediate the deep vadose zone. This is considered acceptable by the DOE based on groundwater fate and transport modeling results calculated to support evaluation of the remedial actions. Several significant deficiencies have been identified in the model

and in DOE's reporting of model results (DOE, 2011d). Deficiencies include: 1) model hydrogeologic parameters were set so that the effective porosity of the Hanford Formation is lower than that in the Ringold Formation, which contradicts DOE's previous description, 2) modeled flow paths do not reflect actual flow paths taken by hyporheic water in response to changes in river stage, 3) the modeled outcome of the equilibrium sorption model achieves a steady-state concentration in a different time frame than the kinetic sorption model; furthermore the DOE does not address the results for the other 3 wells modeled, none of which follow the behavior of the first well.<sup>2</sup>

8. **Many additional simplifying assumptions have been incorporated into the model that introduce uncertainty.** Simplified model assumptions include: 1) significant simplification of local geology that does not account for local preferential flow paths, changes in hydraulic conductivity, changes in fine grained fraction, and other lithologic heterogeneity; 2) assumed hydrologic boundary conditions in the past and future; 3) simplified calculation of partition coefficients that may not reflect actual uranium behavior, simplified hydrologic regimes<sup>3</sup> in the Columbia River and restricted flow paths for hyporheic water and groundwater, simplified, and assumed initial distributions of uranium (e.g., assigning values derived from data at one of two depths, and extrapolating between data points); and 4) assumed sorption/desorption behavior of uranium under dynamic flow conditions. Furthermore, the modeled attenuation of the groundwater plume overlooks the problem that the treated contamination remains in place, and may become remobilized in the future due to changes in environmental conditions that include groundwater chemistry, groundwater elevations, or other factors<sup>4</sup>. DOE does not address this problem in the discussion of *in situ* remediation, but it should be incorporated into the evaluation of CERCLA balancing criteria. The most definitive and prudent approach to permanently remediating the 300 Area vadose zone is to *remove the source material*.
9. **Exposure pathways to contaminated media have been documented to be complete.** Both the Proposed Plan and the RLFS assert that there are "no complete exposure pathways for risk to human populations" based on the formally designated land use and existing institutional controls. However, this statement is contradicted by DOE's own description of the 300 Area as the "site of potential exposure of contaminants carried by groundwater include the riverbed substrate, and riverbank springs that appear during periods of low stage." The seeps are monitored by the DOE's Public Safety and Resource Protection Program.
10. **The selection of remedy seems to be focused on future industrial use of the lands and least cost rather than a complete analysis of feasible alternatives.** A complete analysis of feasible alternatives must be conducted.

#### 200-UP-1 Operable Unit

The Yakama Nation has significant concerns regarding the Proposed Plan and associated RLFS for cleanup of the 200-UP-1 Groundwater Operable Unit (OU), which is located beneath the 200 West Area in the Central Plateau. The groundwater contamination associated with the OU has resulted largely from operations and process liquid waste disposal practices associated with U Plant, S Plant (Reduction-Oxidation [REDOX] Plant), the 241-S-SX Single-Shell Tank Farms, and 241-U Tank Farm. Liquid wastes generated in the U Plant and S Plant were routinely discharged to the ground through engineered discharge structures and surface impoundments including cribs, French drains, reverse wells, ditches, and ponds. A number of the tanks in the S, SX and U Tank Farms have leaked and are suspected or known contributors to vadose zone contamination. The Yakama Nation concerns with the cleanup proposal for the 200-UP-1 OU are supported by agency comments (EPA, 2011a and Ecology, 2011a) and include, but are not limited to, the following:

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<sup>2</sup> Well 399-1-17A does not drop below the federal maximum contaminant level for as long as 160 years from the present. Two other wells (399-1-7, 399-2-2), also had at least one model run that did not achieve compliance within the DOE's stated 38 years from present.

<sup>3</sup> The hydrologic regime used for the entire model domain consists of a 2-year data cycle repeated multiple times.

<sup>4</sup> Because the DOE has not proposed a verification program for the vadose treatment there is no way of knowing how resilient the treated strata are to changes in environmental variables.

1. **Key receptor groups and exposure pathways were not evaluated.** Potential risks to many important human receptors groups, such as those represented in the Tribal scenarios, were not properly assessed to make cleanup decisions. Groundwater irrigation and certain consumption pathways were not evaluated, and adequate rationale was not provided. For example, child and adult external exposure to radionuclides in groundwater (steam and condensate), as well as dermal contact, should be evaluated. In addition, a proper ecological risk assessment was not performed. For example, terrestrial biota and other ecological receptors will likely be impacted if groundwater contaminants migrate to the Columbia River or contaminants are transported to the surface via irrigation. Ecology requested these potential receptors and pathways be addressed.
2. **Calculations of future groundwater concentrations were estimated assuming a pre-selected remedy.** Estimating future groundwater concentrations should include modeling of a larger list of contaminants, and should evaluate more than the pre-selected pump-and-treat remedy.
3. **DOE did not address certain zones of groundwater contamination or sources remaining in the 200 West Area vadose zone for purposes of mitigating future impacts.** As Ecology noted in their comments, there is not a plan as to how these remaining sources, which will continue to contaminate the groundwater, will be remediated. Far-field well area contamination (e.g., chromium to the south and nitrate to the north) will not have a complete remedy. How will the remedy for groundwater meet the goal without addressing future impacts from sources in the vadose zone?
4. **Contaminant concentrations were not evaluated against the most restrictive ARARs or were compared against incorrect risk values.** Concentrations should be evaluated against the most restrictive ARARs and correct risk values.
5. **The cleanup does not address all of the contaminants of concern.** Screening for COPCs should have considered the contaminants in the source units, used appropriate screening levels, relied on adequate sample sizes, and retained contaminants that pose more than 1% of the risk. For example, that 21 contaminants were eliminated based on less than 10 samples is considered unacceptable. Ecology acknowledged these shortcomings in their comments. For example, as EPA also commented that hexavalent chromium and tetrachloroethene should be added to the COC list as concentrations are greater than the state groundwater cleanup level.
6. **The percentage of risk contribution or hazard index values for all COPCs were not provided.** DOE needs to retain all contaminants that contributed greater than 1% of the risk or hazard. Additionally, the the 95% Upper Confidence Level (UCL) should be reported, as additional contaminants may be added on the basis of the 95% UCL as a line of evidence for selecting COPCs (refer to EPA comments).
7. **DOE did not estimate risk from potential exposure to all COPCs.** DOE stated that "a risk evaluation is not conducted for final COPCs that are radionuclides." This results in an incomplete assessment. DOE needs to apply all data to accurate risk equations, providing all of the parameters such as slope factors, reference doses, and consumption rates. DOE should not use MTCA Equation 720-2 for radionuclides. There were also discrepancies in the application of Drinking Water Standards (DWS) or Maximum Concentration Levels (MCLs) to identify exceedances or non-exceedances using MTCA Method B.
8. **The remedy for the groundwater must be comprehensive in order to meet drinking water standards (DWS) and to protect future impacts to the Columbia River.** However, the proposed cleanup fails to commit resources (e.g., funding) to develop a treatment technology for I-129 (see EPA comment) and provides no timeframe for the remediation of I-129 in the groundwater (see Ecology comment). Performance standards that the pump-and-treat system should reach prior to termination of the treatment are not specified (for technetium-99 and uranium, for example), and details on the contaminant treatment methods are not provided (see Ecology comments). Monitored natural attenuation (MNA) has not been demonstrated as a remedy for nitrate (Ecology comment), not enough information is provided to support the proposed remedial action for nitrate (EPA comment), for which the cleanup level should be the DWS 10,000 ug/L (see EPA comments).

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