Confederated Tribes and Bands
of the Yakama Nation ERWM

Established by the
Treaty of June 9, 1855

September 10, 2013

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Subject: Review of the Proposed Plan and Remedial Investigation/Feasibility Study for the 300-FF-1, 300-FF-2, and 300-FF-5 Operable units (DOE/RL-2010-99, REV 0; DOE/RL-2010-99-ADD1, REV 0, AND DOE/RL-2011-47, Rev 0).

Dear Ms. Ballinger and Mr. Gadbois:

The U.S. Environmental Protection Agency (EPA) anticipates issuing the Record of Decision (ROD) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for the 300-FF-1, 300-FF-2, and 300-FF-5 Operable Units this year. The Confederated Tribes and Bands of the Yakama Nation appreciate the opportunity to review and provide comments on these documents.

The Hanford Reach is one of the most culturally resource-rich areas in the western Columbia Plateau with a well preserved cultural landscape. Pre-Hanford uses of the area included agriculture and use by Native American tribes. Archaeological evidence demonstrates the importance of this area to the Yakama Nation, whose presence can be traced since time immemorial. The near-shore area of the Columbia and Yakima Rivers contained many village sites, fishing and fish processing sites, hunting areas, plant-gathering areas, ceremonial and religious sites. Upland areas were used for hunting, plant gathering, religious practices, and overland transportation. Of the fish community, anadromous and resident fish species use the river as a migration route to and from upstream spawning areas and are of cultural and economic importance. The Treaty of 1855 provide for the people of the Yakama Nation to "live along" and fish the River Corridor.

The Yakama Nation's vision for the cleanup and closure of the Hanford Site includes meeting the following objectives:

1. Compliance with Yakama Nation Treaty Rights, including full access to cultural (and natural) resources by the Yakama Nation and its members within its ceded land and aboriginal territory, which includes the Hanford Site.

300-FF-1 300-FF-5
300-FF-2

2. 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.
3. 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.
4. 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.
5. 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.
6. 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-1D), and its application is inappropriate until the issues are resolved.
7. Cleanup actions that comply with all applicable or relevant and appropriate federal and state regulatory requirements.
8. Cleanup actions that are compatible with clean closure, including the waste tanks. Cleanup actions that would preclude clean closure should not be implemented.

We look forward to discussing our vision of cleanup and our concerns regarding current cleanup plans for Hanford with you further.

Sincerely,

Marlene George

Russell Jim
Yakama Nation ERWM Program Manager

cc:
Jane Hedges, Washington State Department of Ecology
Matt McCormick, RL Manager, US Department of Energy
Ken Niles, Oregon Department of Energy
Stuart Harris, CTUIR
Marlene George, YN ERWM
Gab Bohnee, Nez Perce
Administrative Record

Attachment 1:
Note these comments do not reflex a detailed description of all our concerns.

Attachment #1: YN ERWM comments on the 300 Area Proposed Plan & RI/FS:

1. **Protection of Yakama Nation treaty rights, including full access to cultural resources on the Hanford Site by the Yakama Nation:** Ensuring Treaty compliance is a critical intergovernmental concern. By and through this document, USDOE supports the participation of Yakama Nation in activities related to remediation and restoration of resources affected by Hanford and implements its trust responsibility and enforceable obligations to the Yakama Nation.

   - 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. All future Interim and Final Record(s) of Decision(s) should be in harmony with treaty rights of the Yakama Nation under the Treaty of 1855 including upland treaty rights.

   The YN ERWM program believes Preferred Alternative is not protective does not meet ARARs; is inconsistent with anticipated (*and feasible*) future land and groundwater use; and does not represent the maximum extent possible a permanent solution in a cost effective manner.

2. **Land Use:** Language in the Proposed Plan and selected Preferred Alternative indicates that DOE is not considering cleanup to unrestricted use and is striving toward a less stringent cleanup based on the Comprehensive Land-Use Plan (i.e. use of Method A-Industrial Standards vs. Method B-Unrestricted). While cleanup decisions may ultimately be defined by management boundaries, the risk assessment should be based upon actual human behaviors. The YN ERWM Program believes that all 300 Area cleanups should be to unrestricted use.

   - The final CLUP did not include any suggestions, or address any concerns provided by the Yakama Nation.[1]

   All potential impacts to treaty-reserved rights and resources should be thoroughly evaluated and considered in a revised RI/FS and Proposed Plan and supporting documents, including use of the Yakama Risk Scenario as the basis for setting cleanup levels.

   The Preferred Alternative should be consistent with the USDOE's American Indian Policy, with the federal trust responsibility, and with the terms of the Treaty of 1855.

   - The CLUP was a Federal undertaking that determined what type of activities could occur within the Hanford landscape, yet traditional cultural properties (TCP) were never addressed. Areas designated for industrial use, research and development, and conservation mining could have significant impacts on the landscape, and adversely affect a TCP should one be present.

[1] Yakama Nation letter to John Wagoner, Manager, Department of Energy, Richland Operations Office, June 30, 1998.

- As stated within the Proposed Plan, future land use as "Industrial" extends only *at least* (emphasis added) fourteen years into the future. This is inconsistent with the preferred remedy as the technology employed requires a longer period and there is acknowledged uncertainty in its success on the Hanford site.

The 618-11 Burial Ground is adjacent to the Energy Northwest parking lot areas where there is frequent "non-worker" public use. It is inappropriate to identify this site as continued "Industrial Use". *Unrestricted Use* should be the designation for this area.

Text throughout the Proposed Plan indicated a much longer span of time needed to insure remediation than discusses under each alternative particularly in the case of the long-lived radionuclides.

- Any additional remediation costs of the facilities currently in use should be included in an amendment to the ROD.
- All future and anticipated remediation costs should be included in the Alternatives' analysis.

3. **Cultural Resources & Institutional Controls**: There is the assumption of and over-reliance on use of Institutional Controls to ensure protectiveness rather the primary objective which is protectiveness of the environment and human health through preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, or contaminants as a principal element.

The philosophy underlying the cleanup of Hanford should be guided explicitly by the goal of allowing Native Peoples to safely live the lifestyle to which they are entitled. This way of thinking will be particularly important when considering how to incorporate non-quantitative elements into the Preferred Alternative such as the spiritual or cultural value of a site. The Yakama Nation has previously expressed deep concern in leaving in place large quantities of hazardous radiological and chemical wastes on the site with the long-term use of institutional controls as protective measures. This is specifically applicable to long-lived radionuclides such as uranium. DOE has acknowledged uranium is present throughout large sections of the vadose zone in the 300 Area, which will continue to impact groundwater quality. Within the timeframes that are realistically applicable (hundreds of millions of years for some radiological contaminants) institutional controls will inevitably fail, allowing fixture exposure to human health and the environment.

The YN expects a discussion of the culturally sensitive areas with reference to both historic and pre-contact Native American use within the Proposed Plan. Implied agreement with implementation of a ROD change rather than an MOA or outlining actions within the ROD is misleading to the public. The YN ERWM program request consultation with DOE on this issue. Use of institutional controls must be addressed in light of, and with appropriate deference to, Yakama Nation treaty and cultural rights which guarantee use of the land for specific purposes which are considered inseparable from the Yakama way of life.

- 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 (i.e., costs, does not appear to have been included in the analysis of alternatives).

- Currently, there are several projects and major decisions that will be made that effect the entire Hanford site, yet still a comprehensive TCP study has not been performed. Site wide undertakings and decisions such as clean up levels, restoration, vegetation management, land use plans, the use of barriers and institutional controls need to take into consideration the effects on TCPs.

- It is the obligation of DOE under the National Historic Preservation Act (NHPA), Section 106 to determine if their actions will adversely affect cultural resources. Any action that would limit access to a TCP, be ground disturbing, effect the viewshed, or in any way compromise the character defining features that make it eligible for listing on the National Register would be an adverse effect. According to the 36CFR 800 any adverse effect to a cultural site must be mitigated, usually through an MOA.

- Between the years, 2003-2011 approximately 1200 projects (85% of all projects) were completed under the classification of "no potential to cause effect". This classification allowed DOE to complete these projects without a full Section 106 cultural review and without any consultation with YN. These projects have yet to be evaluated to determine if there is damage to significant cultural resources/TCPs. The small percentage of these projects YN has reviewed indicates a high percentage of projects had ground disturbance and some within already designated culturally sensitive areas. These remediation projects were out of compliance with NHPA. These projects should be mapped and evaluated to determine the overall impact. This information can then be used when evaluating Alternatives and what additional cultural evaluations will need to be performed.

- DOE is also obligated under NHPA, Section 110, to inventory and evaluate properties to determine eligibility under the agency's jurisdiction. DOE has not been holding up to their Section 110 obligation of identifying cultural properties on the Hanford site. The Hanford Cultural Resource Management Plan (HCRMP) was finalized in 2003. In Chapter 3, Section 4.2.6 under purposed surveys it states "One TCP each year", to date only two TCPs have been fully evaluated. It further states the need to continue to work with Tribal elders to identify TCPs. There are known TCP that have not been evaluated such as, White Bluffs, Coyote Rapids, the Columbia River, Wahluke Slope, as well as other potentially unknown TCPs in the Hanford area. Cultural properties are only being addressed through the Section 106 process, on a project by project basis, which is entirely ineffective.

- The HCRMP identifies the need for Tribal elder participation in identifying

TCPs and lays out a comprehensive method, separate from the Section 106 process. This piecemeal method through Section 106 does not allow for a comprehensive landscape study and does not allow for proper consultation with YN. None of the Alternatives were evaluated against the nine balancing criteria based on effects on TCP. A TCP study of the area must be completed to identify cultural properties so that the Alternatives can be properly evaluated to determine effects of the actions on the TCP. If it is determined any actions will adversely affect a TCP, the adverse effect must be mitigated in compliance with 36 CFR 800 and in compliance with NHP an ARAR of CERCLA. The MOA would need to be attached to the Record of Decision to show how DOE's action under the ROD will be in compliance.

- It is unclear what actions will be taken to ensure compliance with the Antiquities Act of 1906. 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. 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.

- Full compliance with government-to-government requirements are not fulfilled by the vague statements found in the Proposed Plan (pages 12/58): "*EPA also invited the Tribal Nations to participate in EPA's National Remedy Review Board review of this proposed cleanup action. In addition to these formal activities, DOE and EPA have worked with Tribal staff during the RI/FS process*" or "*The National Historic Preservation Act of 1966 is identified as a potential ARAR for remedial actions*

where cultural resources are present. The statement is made that remediation may have the potential to impact cultural resources, and that an analysis of cultural resource impacts will be taken before any remedial action occurs in the 300 Area."

- The Proposed Plan and decision documents do not adequately resolve the concerns presented to the National Remedy Review Board regarding cultural resources and other areas of concern for the Yakama Nation.

- There is the assumption of and over-reliance on use of Institutional Controls to ensure protectiveness rather the primary objective which is protectiveness of the environment and human health through preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, or contaminants as a principal element.
  - The Preferred Alternative for groundwater with ICs for extended time periods is inconsistent with the CLUP (It is stated that cleanup actions will support reasonably anticipated future land uses consistent with the Hanford Reach National Monument and "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (the "CLUP') (HCP EIS) (64 FR 61615). CLUP is designated for 50 years operational and 100 years for institutional controls. Beyond that time period, the site could be used for any and all types of land use; including irrigation. It is know that there will be continued (occasional) but none the less, releases above cleanup levels for over 100 years; there will be a continued need for ICs.
  - It is unclear if ICs are in place only for the extent of the remedy or does the remedy include the ICs needed for areas of future RTD sites (e.g., the pipelines associated with current use facilities).

- The YN expects a discussion of the culturally sensitive areas with reference to both historic and precontact Native American use within the Proposed Plan. Implied agreement with implementation of a ROD change rather than an MOA or outlining actions within the ROD is misleading to the public. The YN requests consultation with DOE on this issue. Use of institutional controls must be addressed in light of, and with appropriate deference to, Yakama Nation treaty rights which guarantee use of the land for specific purposes which are considered inseparable from the Yakama way of life and with respect to unlimited/unrestricted access to TCPs and sacred sites.

4. **Evaluation of the Proposed Plan and Preferred Alternative (3a): Key Concerns/Comments:**
   - The Proposed Plan for cleanup of the 300 Area and the associated RI/FS Report does not support an adequate cleanup of the 300 Area. While identified waste sites were/are no doubt heavily contaminated, the fact remains that significant quantities of uranium will remain unaddressed under the current Preferred Alternative (3a). DOE's approach intended to immobilize persistent high concentrations of uranium in the 300 Area vadose zone will not provide long term protection of groundwater since the contamination will remain in place. In order to achieve long-term protection of the Columbia River, contaminants will need to be removed from the vadose zone in the 300 Area. The described approach (polyphosphate treatment) has been demonstrated to be easily reversible, and does not remove the potential for future

remobilization or migration which is likely with changes in climate and/or river behavior.

- Selection of feasible alternatives for consideration did not consider RTD (to unrestricted use cleanup levels) of uranium in the deep vadose zone and PRZ where 80% of the uranium contamination resides (approximately 1ha (3ac) at the 316-5/300 APT , the SW quadrant of the North Process Pond's (316-2) effluent inlet, and 307 Disposal Trenches (316-3) waste sites). Along with the remedial components identified in the "Common Elements" section of the Proposed Plan, this remedy would score higher than the proposed Preferred Alternative in all of the Threshold & Balancing Criteria analysis factors, and it would be under the cost of Alternative #4 with the public assurance that the great majority of the Uranium (and possibly Cis-1,2- dichloroethene) contamination has been removed, and very high degree of certainty in performance and meeting and maintaining the RAOs. **At the very minimum, the YN ERWM program recommends this approach as the Preferred Alternative.**

- Alternative #3a's relies on the application of polyphosphate solution to deeper zones of uranium contamination for protection of groundwater. Polyphosphate remediation has been previously attempted in the 300 Area and has proven to be both problematic and ineffective (only approximately a 50% reduction in leaching). Although initial post-treatment uranium concentrations decreased to below the drinking water standard of 30 ug/L, a significant rebound in uranium concentration was observed approximately 2 months after treatment. In general, uranium performance monitoring results support the hypothesis that limited long-term treatment capacity (i.e., apatite formation) was established during the injection test.[2] The statement "*The efficacy of uranium sequestration by apatite assumes that the adsorbed uranium would subsequently convert to autunite, or other stable uranium phases. Because this appears to not be the case in the 300 Area aquifer, even in locations near the river, apatite may have limited efficacy for the retention and long-term immobilization of uranium at the 300 Area site*" further testifies to the inappropriateness of application of polyphosphate solution as a remedy. [3]
    - 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. The RI/FS should include a complete and credible

[2] PNNL-18529, 2009, 300 Area Uranium Stabilization Through Polyphosphate Injection: Final Report, Pacific Northwest National Laboratory, Richland, Washington. Available at: http://www.pnl.gov/main/publications/external/technical_reports/PNNL-18529.pdf.
[3] (PNNL-18529)

evaluation of polyphosphate treatment, including a discussion of the published failures and limitations that were identified by PNNL (2009).

- The Proposed Plan does not include explanations of how a 50 percent success rate is consistent with the statutory and NCP provisions regarding treatment (i.e. the preference for treatment to the maximum extent practicable; defined under NCP guidelines for *effective treatment as a 90 to 99 percent reduction in concentration)* as recommended by the National Remedy Review Board in 2012. Clarify how this Proposed Plan has met the NRRB recommendations regarding this issue.
- As recommended by the National Remedy Review Board in 2012, it is unclear how physical and chemical analysis was performed to determine if enhanced transport of phosphate treated uranium particles (colloids) may reduce the effectiveness of the proposed remedy given the river's flux velocity of 50feet/day in the 300 areas. Clarify how this Proposed Plan has met the NRRB recommendations regarding this issue.

- Alternative 3a incorporates treatments rated by the DOE to perform poorly against balancing criteria. Previous comments have identified the numerous deficiencies associated with the preferred alternative's application of polyphosphate to remediate uranium in the vadose zone in situ (see above). However, selection of Alternative 3 or 3a effectively incorporates Alternative 2 of the Proposed Plan as the de facto treatment, since this approach is to take no action to remediate vadose contamination by uranium. 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. The Alternative 2 treatment is rated to perform only "moderately" for long term performance, and "very well" for implementability. While this Alternative is not explicitly selected as the Preferred Alternative by the Proposed Plan, we are concerned that it may ultimately be implemented after the application of polyphosphate solutions in the 300 Area fails to reduce vadose zone contamination volume, mobility, or toxicity and contingent or additional remedial actions are not applied.

  This reliance on monitored natural attenuation to remediate groundwater in the 300 Area is the same remedial action selected as in the 1992 interim ROD for the 300-FF-5 Operable Unit, which has failed to perform as intended. The RI/FS completed for the 1996 ROD predicted that groundwater standards would be achieved no later than 2002 (EPA, 1996). It is apparent that after more than 20 years, reliance on the Columbia River to essentially flush uranium out of the vadose and periodically rewetted zones has not proven to be effective. Intentionally selecting a remedial alternative (Alternative 3a) that is known to be ineffective as a means to ultimately implement an alternative that requires no additional action be taken (Alternative 2) seems misleading and misguided in terms of protecting human health and the environment, a primary objective of remediation.

- The Preferred Alternative (3a) (and Proposed Plan) lacks required information: The Preferred Alternative (or Proposed Plan) does <u>not</u> include the required description of the contingency measures that will be implemented should the monitoring show that natural attenuation is unable to achieve the cleanup goals. Conditions that would trigger the contingency should also be specified (e.g., continued plume migration or contaminant levels are well above levels predicted for a specified time) (EPA 540-R-

98-031). The Proposed Plan and Preferred Alternative should incorporate remedial actions that will meet these thresholds and state explicitly the contingency measures and additional actions that will be taken should CERCLA monitoring demonstrate the Preferred Alternative has not worked as planned. Provide details in the Proposed Plan for public review including cost of implantation of contingency measures.

- The YN ERWM program request DOE update and provide details in the Proposed Plan for public review including cost of implantation of contingency measures.
- EPA guidance on Monitored Natural Attenuation states a plume should be stable and all mechanisms clearly identified to appropriately consider as a MNA remedy. Explanations in the Proposed Plan clearly indicate the plumes for all COCs for which MNA is applied are not stable and could easily be affected by unanticipated yet potential changes in river levels or as the result of application of unproven technologies (Cis-1, 2-dichlorethene contamination appears to be moving towards the river at levels exceeding DWS). Clarify how this Proposed Plan has met the NRRB recommendations regarding this issue.

- There is no description/clarification of likely requests for waivers as required by CERCLA within the Proposed Plan.
  - In a letter dated August 3, 2012 the DOE Richland Office replied to a letter of recommendations provided by the Hanford Advisory Board regarding the 300 Area RI/FS and Proposed Plan remedial alternatives. Text included in the August 3, 2012 letter stating that the DOE is already pursuing the application of the National Contingency Plan to wave "applicable or relevant and appropriate requirements," which appears to indicate that the DOE does not anticipate the Preferred Alternative will be effective in meeting the ARARs for the cleanup.
  - USDOE correspondence (12-AMCP-0085, March 26, 2013) with the National Remedy Review Board discusses the technical challenges in the development and implementation of a strategy to protect and restore the aquifer impacted by the residual uranium and definitively states DOE/RL will not support a deep RTD option despite both Ecology and stakeholders position that 'Remove-Treat-Dispose (RTD) options are preferred. The correspondence continues to state that while DOE/RL has not sought an applicable or relevant and appropriate requirement wavier for the uranium plume in portions of the 300 Area, *it is their view that the basis for such a wavier is clearly presented in the 300 Area Feasibility Study.*(emphasis added)
  - RL identified the requirement for clear performance benchmarks to be agreed to and identified in the Proposed Plan and ROD that provides for a natural attenuation remedy if these are not achieved. These benchmarks are not within the 300 Area Proposed Plan.

- 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. The Proposed Plan and Preferred Alternative should incorporate remedial actions that will meet these thresholds and state explicitly the contingency measures and additional actions that will be taken should CERCLA monitoring demonstrate the Preferred Alternative has not worked as planned.

- Reliance on monitored natural attenuation to remediate groundwater in the 300 Area is the same remedial action selected as in the 1992 interim ROD for the 300-FF-5 Operable Unit, which has failed to perform as intended. The RI/FS completed for the 1996 ROD predicted that groundwater standards would be achieved no later than 2002 (EPA, 1996). It is apparent that after more than 20 years, reliance on the Columbia River to essentially flush uranium out of the vadose and periodically rewetted zones has not proven to be effective. Intentionally selecting a remedial alternative (Alternative 3a) that is known to be ineffective as a means to ultimately implement an alternative that requires no additional action be taken (Alternative 2) seems misleading and misguided in terms of protecting human health and the environment, a primary objective of remediation.

- The Preferred Alternative does not include quality assurance measures. Application of polyphosphate solution to soils in the 300 Area has been demonstrated by PNNL not to be effective or consistent in reducing toxicity, mobility, and volume of contamination (PNNL, 2008; PNNL, 2009). Previous field tests using polyphosphate solution in an attempt to remediate subsurface remediation have experienced significant problems achieving appropriate contact time between contaminated media and the reactive agent due to the high hydraulic conductivity of the unconfined aquifer, and similarly high groundwater velocities. These problems notwithstanding, the preferred remedial alternative's application of phosphate solution to the 300 Area subsurface does not include a program of drilling and chemical testing in the infiltration and injection areas to verify reagent placement. The preferred remedial alternative therefore has no quality assurance measures to ensure the remedial action has been implemented as planned, and no standard against which to judge its performance. The Proposed Plan should include a detailed description of quality assurance measures that will be implemented as part of the preferred alternative's use of polyphosphate sequestration. The description should include a program of subsurface testing to ensure placement of reagents, as well as identify performance standards which the alternative must achieve before the reagents are applied in the field.

- Alternative #3 *design details* will be identified in the RDR/RAWP to be prepared after the ROD is issued. EPA guidance (EPA 540-R-98-031) states this information should be included in both the Preferred Alternative Section of the Proposed Plan and the Selected Remedy Section of the ROD, not in the workplan. The YN ERWM program request DOE update and provide details in the Proposed Plan for public review.

- Table 3: Summary *of Comparative* Analysis of Alternatives: We believe the weight applied to ranking of the effectiveness of the alternatives to be incorrect. There is obvious discrepancy in the rating of Alternative #4 as having less *Long-term effectiveness and permanence* and less *Reduction of toxicity, mobility, or volume through treatment* or *Short-term effectiveness and time to achieve RAOs* in comparison with Alternative 3a. While cost for waste sites is less under Alternatives #s 3or 3a (with considerable uncertainty as this is an unproven technology for the

Hanford site), Alternative 4 admittedly and assuredly takes less time, removes a great portion of the source waste, and has equal reduction of mobility of a specific areas as both 3 & 3a.

- Use of Remedial Action Objectives (RAOs): The purpose of RAOs is to explain and address site risks and to include an action (and specifics/details) to be taken achieve the objective. RAOs are the measurement tools for evaluating the success of the ROD remedy during the CERCLA 5 year review process. Without a specific action, the metrics for measurement are filled with subjectivity and uncertainty.

- None of the seven (7) RAOs have a definitive task or standard to be met. An Example of a specific action to include using RAO#2: Prevent COCs migrating and/or leaching to surface water *by treatment of the contaminated soils or RTD.*

- Clarify all RAOs with specific action(s) to be performed and/or standard(s) to be met.

- Alternative #3a: It is uncertain that 'enhanced uranium attenuation' is a sustainable technology. Granted it does reduce mobility but it does nothing to reduce toxicity, concentration, or volumes. Clarify how this technology will demonstrate it is a sustainable technology that will last until no longer required.
  - Clarify how many years it will be before deep excavation (below 15ft) in uranium sequestration areas could be possible without risk to human health and the environment (i.e., exceedence of cleanup standards).
  - Include a discussion of the rationale for the placement of injection wells. Clarify why there are no interiorly located wells.
  - Clarify if short-term effectiveness evaluations for all alternatives were based on only the time to build/implement the remedy or if it includes the time to achieve all remedial action PRGs.
  - Clarify what is meant by 'a sufficient time to produce a stable uranium mineral' as used in the evaluation of the short-term effectiveness of Alternatives # 3 & 3a (top of pg 62).
- Clarify how #3 & 3a have the highest short-term effectiveness as they do not extend the remediation time frame beyond the time required for the waste sites. Both #4 & 5 take less time to achieve PRGs for uranium in the GW than #3 or 3a.

- Exposure pathways to contaminated media have been documented to be complete. Both the Proposed Plan and the RI/FS 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. The Preferred Alternative does not address remediation of this complete pathway. Nor does it provide documentation on how DOE's Public Safety and Resource Protection Program is capable of taking the necessary actions to ensure remediation if necessary. This information should be included in the Proposed Plan for public review.

General Comments on the Analysis of the Alternatives:

- Evaluation of alternatives in the Proposed Plan is not realistic or credible. The performance problems associated with Alternatives 3 and 3a are not realistically and accurately evaluated according to CERCLA criteria when compared against Alternatives 4 and 5, which feature more extensive excavation of contaminated areas to permanently remove, treat, and dispose of uranium contaminated soils. Specifically, Alternatives 3 and 3a, both of which feature polyphosphate treatment as a primary form of remediation for the subsurface beyond 15 feet in depth, are rated to be more effective in short-term effectiveness, reduction of toxicity, mobility, and volume, and implementability than Alternatives 4 and 5. In Table 3 (p. 56) of the Proposed Plan both Alternatives 4 and 5 are identified as achieving RAOs for uranium in groundwater before Alternatives 3 and 3a by a margin that ranges from 5 to 11 years. The analysis to assign such ratings should be revised.

- DOE implicitly acknowledges on page 45 of the Proposed Plan, stating "phosphate will be injected into the upper portion of the groundwater to attempt to sequester uranium potentially mobilized by the surface infiltration and [periodically rewetted zone] injection." Given the already well documented deficiencies of polyphosphate to permanently sequester uranium in the 300 Area under both unsaturated and saturated conditions, this double standard applied in favor of polyphosphate treatment is particularly inappropriate. There are several additional examples that suggest the evaluation of alternatives was biased including:
    - Assertion that Alternatives 3 and 3a are more effective than Alternatives 4 and 5 on the basis that they will result in the direct formation of autunite; a result that has specifically been identified as not occurring and not proving to be an effective remedial alternative by PNNL (2009).
    - Explicit discussion of Alternatives 3 and 3a "reducing mobility" of uranium in the treated area even though both RTD alternatives also permanently reduce mobility of uranium by taking it out of the periodically rewetted zone and vadose zone.
    - Discounting of the uncertainties associated with delivering phosphate solution to the zones of uranium contamination in the deep vadose zone and periodically rewetted zone. These problems are well documented, and have also been linked with relative increases in hydraulic conductivity of contaminated sediments following application of polyphosphate solution (PNNL, 2009).
    - Rating polyphosphate alternatives above monitored natural attenuation (Alternative 2) while failing to acknowledge that polyphosphate-solution treatments have proven to be ineffective in the past; have not been demonstrated to be successful on a field scale in the 300 Area; and that monitored natural attenuation may be de facto implemented after the phosphate treatments are applied.

  The DOE should perform credible evaluation of alternatives for the Proposed Plan, include all relevant information regarding pilot study performance results, complications, known limitations, and commonalities as part of the evaluation of alternatives, and should identify common elements such as the reduction of mobility in the vadose zone that results from removing contaminants to provide for a complete evaluation.

- Presentation of polyphosphate remedial actions is misleading and inaccurate. The Proposed Plan states that phosphate injection that will be performed to remediate the

vadose zone has been tested in a pilot study and that "uranium concentrations within 23 [meters] of the pilot study injection well decreased below the drinking water standard from autunite formation." However, review of the full report that was referenced by the DOE, 300 Area Uranium Stabilization through Polyphosphate Injection: Final Report (PNNL-18529, 2009) found that the full conclusion stated:

- Although initial post-treatment uranium concentrations decreased to below the drinking water standard of 30 ug/L, a significant rebound in uranium concentration was observed approximately two months after treatment. In general, uranium performance monitoring results support the hypothesis that limited long-term treatment capacity (i.e. apatite formation) was established during the injection test. (Emphasis added).

- The text in the Proposed Plan is misleading and incomplete in its assessment of the polyphosphate treatment identified for Alternatives 3 and 3a. These deficiencies are further compounded by several additional factors that include inaccurate evaluation of short-term effectiveness, reduction of toxicity, mobility, and volume, and implementability. The RI/FS should include a complete and credible evaluation of polyphosphate treatment, including a discussion of the published failures and limitations that were identified by PNNL (2009).

- The Preferred Alternative incorporates treatments rated by the DOE to perform poorly against balancing criteria. Previous comments have identified the numerous deficiencies associated with the preferred alternative's application of polyphosphate to remediate uranium in the vadose zone in situ (see above). However, selection of Alternative 3 or 3a effectively incorporates Alternative 2 of the Proposed Plan as the de facto treatment, since this approach is to take no action to remediate vadose contamination by uranium. 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. The Alternative 2 treatment is rated to perform only "moderately" for long term performance, and "very well" for implementability. While this Alternative is not explicitly selected as the Preferred Alternative by the Proposed Plan, we are concerned that it may ultimately be implemented after the application of polyphosphate solutions in the 300 Area fails to reduce vadose zone contamination volume, mobility, or toxicity and contingent or additional remedial actions are not applied.

- Design elements for Alternatives selection should be described in sufficient detail in the Proposed Plan so that the public can evaluate and comment on the proposal (EPA 540-R-98-031). The Proposed Plan provides the foundation for the ROD to defer the final technology selection to the remedial design phase. (See Table 3 Note: Although the remedial alternatives developed for evaluation do not have specific provisions for sustainable elements, those values can be incorporated during the remedial design phase.)

- Clarify in the discussion of the Alternatives 2, 3, 3a, 4, and 5 how treatment for identified long-lived TRU radionuclides of plutonium and americium and cesium-137 and strontium-90 is included as stated elsewhere in the Proposed Plan.

- Clarify if any of the Alternatives were evaluated against the nine balancing criteria based on what happens with transition to Long-term Stewardship prior to completion of remediation under the Record of Decision (e.g., Clarify if a cost benefit analysis of

remedy costs including long-term stewardship costs was done.) The environmental consequences of doing this action or not doing it have not been evaluated. Clarify how any of the Alternatives can ensure compliance with the balancing criteria with transition into Long-term Stewardship. These analyses should be done as this action will clearly need to be reflected and integrated into the final ROD. The YN ERWM program request DOE update and provide details in the Proposed Plan for public review.

- Soil contamination should be documented in both vertical and horizontal directions from all potential sources *(EPA/540/G-89/004-Guidance for Conduction Remedial Investigations and Feasibility Studies Under CERCLA).* Clarify how the discovery of cesium-137 and strontium-90 contamination below the 324 and the recent addition of the uranium plume from the 618-7 burial ground were included in the characterization efforts. Clarification is need. The YN ERWM program request DOE update and provide details in the Proposed Plan for public review including cost of implantation of any contingency measures.

- 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 statements similar to "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.

- Discussion of the 'unintended consequences', etc, of deep RTD should be included in the description of the appropriate Alternatives, not within the evaluation of short-term effectiveness. Quantified data has not been incorporated into the Alternatives #4 & 5 to support the assumption that deep excavation to remove the majority of Uranium (~80%) will release significant contamination to the groundwater or the Columbia River.

- Discussions of significant funding and building of ERDF infrastructure is an associated element of the 300 Area RI/FS/PP processes, however DOE has not provided related cost estimates or how ERDF costs are managed (e.g., clarify whether ERFD costs are projected under a separate decision).

- Identify the three waste sites needing additional remedial actions under the 300-FF-1 OU ROD. Clarify the amendment process to the original ROD; clarify how this action is to be capture under the final ROD for the 300 –FF-1. 300-FF-2, and 300-FF-5 OUs. (pg4/PP)

5. **Groundwater:** Data collected in the Columbia River shows pore water uranium concentrations that exceed regulatory criteria (more than four times the Federal drinking water standard).

We remain concerned the health of Yakama Nation tribal members with the needed extensive remediation of the groundwater as there will be continued effects and potential new COCs from the 200 Area which are not considered in this Proposed Plan. CERCLA asks that all *primary sources* of contamination be included in RI/FS evaluations. Groundwater is not generally considered a primary source, yet as upland plumes enter the river, the YN ERWM Program are concerned that any remedy reviews will not include actual sampling actions or technological systems review to confirm performance or to consider these missing source area contaminants.

- Regardless of the source of groundwater contamination, all COCs should be evaluated. Consideration of all sources of contamination is a requirement of the Dangerous Waste Regulations which is an ARAR to the 300-FF-1, 2, & 5 ROD.

- The YN ERWM Program request EPA use of the new RfD value (0.0006) for Uranium by EPA's Office of Drinking Water as the basis of the Maximum Contaminant Level for drinking water is noted in the Tri-Party approved comment resolution document attached to DOE letter (13-AMRP-0041) to EPA and Ecology, 11/21/2012.

- The Preferred Alternative appears to jeopardize the successful completion of several TPA milestones: M-016-00: 09/30/2024: (Complete remedial actions for all non-tank farm and non-canyon operable units. This includes groundwater remediation.); M-016-00A: 03/31/2017: M-016-110-T04: 2/31/2016.

- Table 1 list the Principal Risk Driver COCs for the Vadose Zone for the 300-FF-1 & 2 OU yet Uranium is seemingly the only COC that will be addressed by the Preferred Alternative. Clarify how these principal risk drivers to the groundwater are being remediated and demonstrate (using travel times, etc) that contamination from these COCs will be prevented downstream and/or from reaching the river in exceedence of the DWS, MCLs, AWQS.
    - The YNERWM Program disagrees with the application of several footnotes identified in Table A-1 & A-2:
        i. Table A-1 states highly mobile contaminants (Kd<2) the model assumes the entire vadose zone is contaminated (100%) for Kd>2, the ratio is 70/30%. Contaminants with a Kd of 2 are still highly mobile. The YN ERWM program request justification and data from the vadose zone to support modeling assumptions.
        ii. The YN ERWM Program question the values for Uranium, Nitrate, and Toluene listed in Table A-1 and request additional clarification on how these were attained.
        iii. The *Note* on Table A-1 states additional COCs for the 618-10 & 618-11 burial grounds will be identified in the remedial design report/remedial action work plan. CERCLA requires all sources and their contaminants be identified within the alternatives section. Additional information is requested (including additional characterization as necessary).
        iv. Table A-1, footnote (j) indicates the hexavalent chromium PRG is based on IROD cleanup levels (DOE/RL-96-17).
        v. Table A-2, footnote (b) cites use of values from the IRIS database. However Table 4-1 of the Addendum to the 300 Area RI/FS reflects the revisions associated with updates to toxicity values and elimination of secondary maximum contaminant level (MCLs) as a

chemical-specific ARAR. The Groundwater Method B Unrestricted Land Use values stated for both COCs are listed as 16 & 0.95 ug/L respectively. Table A-2 of the Proposed Plan needs to reflect these more stringent values. Edit Proposed Remediation Goals (PRGs) to reflect these values.[4]

vi. Table A-1 list 30ug/L as the Drinking Water Standard and the proposed PRG. However, MEMO (EPA –Region 10, August 7, 2008) recommends use of the Reference Dose (RfD) developed by the Office of Water for the Maximum Contaminant Level (MCL) for uranium in the human health risk assessment for the Hanford Nuclear Reservation NPL site in place of the RfD developed by the Integrated Risk Information System (IRIS) for soluble salts of uranium (2000; U.S. Environmental Protection Agency & U.S. Geological Survey, 2000). After calculations, this equates to a groundwater cleanup level of ~10ug/L.

vii. The YN ERWM program request the PRG cleanup level be changed to reflect use of the new RfD value as promulgated by EPA and the cleanup level under MTCA of 10ug/L for Uranium in the groundwater.

- The YN ERWM program remains concerned the health of Yakama Nation tribal members with the needed extensive remediation of the groundwater as there will be continued effects and potential new COCs from the 200 Area which are not considered in this Proposed Plan. CERCLA asks that all *primary sources* of contamination be included in RI/FS evaluations. Groundwater is not generally considered a primary source, yet as upland plumes enter the river, the YN ERWM Program are concerned that any remedy reviews will not include actual sampling actions or technological systems review to confirm performance or to consider these missing source area contaminants.
- Uranium migration from the Central Plateau into the River Corridor groundwater is expected to continue and to remain in excess of the present drinking water limit of 30 micrograms per liter for about 2,000 years.[5]

- 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(DOE, 2010b)*. 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.

- Remediation of contaminants from the 200-PO-1 OU will be years in the future. (M-015-21A 06/30/2015 is the due date to submit initial documents for approval, <u>not</u> to

[4] "First Sulfate Restriction Issued in AZ Mine Permit," pg. 14, *Southwest HYDROLOGY*, Vol. 6/Number 6: November/December 2007.
[5] DOE 2009, Vol. 2, Figure U-9, p. U-9.

initiate the actual remediation efforts). The 200-PO-1COCs that exceed Groundwater or River protection standards are within the same aquifer. By their inter-connectedness, the lack of current remediation of these contaminants, and to ensure continuity of the Hanford site groundwater remediation efforts, these COCs should be included in the 300-FF-5 ROD GW remediation plan. Discussion is needed to demonstrate (using travel times, etc) that the contamination reportedly originating from the 200-PO-1 is prevented from exceeding the DWS, MCLs, AWQS downstream and/or reaching the river. Otherwise, the ROD must include a remedy for all these constituents: COC Example: I-129 (e.g., Remedy: resins to treat the I-129).

- Include discussion of the levels of Tech-99 & I-129 in the 300-FF-5 groundwater operable unit.
- Table 1 list the Principal Risk Driver COCs for the Vadose Zone for the 300-FF-1 & 2 OU yet Uranium is seemingly the only COC that will be addressed by the Preferred Alternative. Clarify how these principal risk drivers to the groundwater are being remediated and demonstrate (using travel times, etc) that contamination from these COCs will be prevented downstream and/or from reaching the river in exceedence of the DWS, MCLs, AWQS.

- The Proposed Plan lacks treatment for Cis-1, 2-dichlorethene and TCE (DNAPL) contaminants. Both which exceed DWS. Cis-1, 2-dichlorethene contamination appears to be moving towards the river at levels exceeding DWS.
  - Table 4-1 of the Addendum to the 300 Area RI/FS reflects the revisions associated with updates to toxicity values and elimination of secondary maximum contaminant level (MCLs) as a chemical-specific ARAR. The Groundwater Method B Unrestricted Land Use values stated for both COCs are listed as 16 & 0.95 ug/L respectively. Table A-2 of the Proposed Plan needs to reflect these more stringent values. Edit Proposed Remediation Goals (PRGs) to reflect these values.
  - Clarify why DOE is justified in not providing a remedy to include remediation of these contaminations. TCE (considered a DNAPL) maybe viewed as a source material (USEPA, 1991b; OSWER Directive # 9200.4-17p). Remediation for TCE and cis-1, 2-dichloroethene should be included in the Preferred Alternative. There are several different employable techniques for separating the organic chemicals which been successful employed in other groundwater cleanups and could be applied at Hanford. The technologies that may ultimately be selected and the timing and criteria for the future technology selection should be described in sufficient detail in the Proposed Plan so that the public can evaluate and comment on the proposal (EPA 540-R-98-031).
  - The Preferred Alternative (or Proposed Plan) does not include the required description of the contingency measures that will be implemented should the monitoring show that natural attenuation is unable to achieve the cleanup goals. Conditions that would trigger the contingency should also be specified (e.g., continued plume migration or contaminant levels are well above levels predicted for a specified time) (EPA 540-R-98-031). Update and provide details in the Proposed Plan for public review including cost of implantation of contingency measures.
  - Uranium was detected at a maximum concentration of 70ug/L in a 300 Area seep (DOE/RL-2011-01, Rev.0). The river shoreline and hyporheic zone cleanup levels should ensure the more stringent values of either the DWS or

ambient water quality standards. More clarification is needed in the Proposed Plan, how Uranium contaminants in the 300 Area seeps do not exceed ecological protection federal or state standards (i.e. provide reference in RI/FS where this is demonstrated).

- Clarify if the oxidation of uranium to form autunite will affect the natural attenuation /biodegradation process of TCE and/or cis-1,2-dichloroethene. Include discussion in Proposed Plan/Preferred Alternative.
- As Tribal members, YN looks at groundwater as a cultural resource and in a more holistic way as all water is the sacred lifeblood of the people. We disagree with the removal of secondary maximum contaminant levels as a chemical-specific ARAR for the specific purpose of maintaining not only the groundwater's quality but also aesthetic qualities. Include these secondary maximum contaminant levels as a chemical-specific ARAR and all previously eliminated COCs.

- The Preferred Alternative lacks a remedy for Nitrates. Exclusion of any Nitrate remediation of the groundwater is unfounded. Final comment disposition/resolution of Ecology's general comment #6 regarding the Columbia River Component Risk Assessment, Volume II, Parts 1 and 2, Baseline Human Health Risk Assessment, DOE/RL-2010-117, Rev. 0, (13-AMRP-0041; 11/21/2012) indicate agreement that the large concentrations of nitrate in the surface water and the high concentration of phosphorous in the sediment at the outfall are from a Hanford source (specifically the 331 Life Sciences Laboratory). Additionally, Nitrate concentrations not only exceed DWS (45mg/L) in the southern portion of the OU, but also down gradient from the 618-11 burial ground. Furthermore, several unplanned releases of Uranium-bearing nitric acids combined with either sulfuric acid or copper or other compounds have been identified.[6]
    - Caution is appropriate if young children might be exposed, such as in the Nonresident Tribal scenario, because they are particularly at risk for methemoglobinemia, the critical effect for nitrate exposure (IRIS 2009).

The statement that there is not a good environment for biodegradation in the 300 Area to warrant the use of an Apatite barrier to capture the 300 Area Sr-90 plume is inconsistent to it application in the 100-N area. This technique should have been a part of the 'Common Elements" of the Alternatives. Include this in the evaluation of all Alternatives.

- YN ERWM program questions the rationale that dust suppressant applications are prohibitive or would drive excessive amounts of Uranium into the groundwater/river above DWS to the exclusion of selection of the most viable Alternative. Quantify the amount of increase in Uranium concentration in wells downstream of the 618-10 & 316-4 waste sites due solely to dust suppressant water.

- Clarify the need for an additional evaluation of HH ELCR and hazards were performed when MTCA Method B would suffice.

- Exposure Point Concentrations (EPCs) were used to calculate the ELCRS and noncancer hazards. Clarify the "thresholds" established by EPA & Ecology. Frequently these EPCs resulted in deletion of COPCs when used to compare COCs against the applicable standard or risk-based concentration.

[6] BHI-01164, 300 Area Process Trenches Verification Package, Appendix A.

- Clarify what was the process used to validate the results from which the EPCs were derived.
- Please refer to our prior discussions of EPCs in response letter to Hanford Risk Assessments, etc.

- Calculation of radionuclide PRGs based on use of a risk ELCRs of a 1 in 10,000 risk or radionuclide dose (15 mrem/year) is in opposition the EPA guidance which states the point of departure for risk is 1 in a million. The allowable target risk range is $1x10^{-4}$ to $1x10^{-6}$ but DOE continues to drive cleanup with the lowest level rather than initially striving to meet the highest standard of 1 in a million (1x10-6). $1x10^{-6}$ is consistent with MTCA (WA States regulations) and it should be DOE's cleanup goal.[7] As MTCA explicitly defines radionuclides as hazardous substances, the combined limit for radionuclides and chemicals should correspond to a lifetime cancer risk of $1x\ 10^{-5}$ or less at the very least.

- Years to attain mature plant revegatation is more correctly identified as a range of 80 to 100 years Recalculate infiltration rates using this more appropriate range of years. Adjust Alternatives to incorporate these values to reflect a more accurate timeline in achieving remediation goals.

- Cleanup levels (i.e., PRGs) should reflect the current MTCA Method B standards and in cases where they are less stringent than before, there should be no back-sliding from previous cleanup commitments in the PP.

- More clarification is needed on how cleanup levels will be adjusted to account for waste site-specific residual contaminations and for sites with multiple residual contaminants. The same is needed for evaluation of groundwater exceedances.

6. Contaminant Fate and Transport Modeling:

- Federal DWS/MCL is currently listed as 30ug/L for Uranium. However, MEMO (EPA –Region 10, August 7, 2008) recommends use of the Reference Dose (RfD) developed by the Office of Water for the Maximum Contaminant Level (MCL) for uranium in the human health risk assessment for the Hanford Nuclear Reservation NPL site in place of the RfD developed by the Integrated Risk Information System (IRIS) for soluble salts of uranium (2000; U.S. Environmental Protection Agency & U.S. Geological Survey, 2000). This equates to a groundwater cleanup level of ~10ug/L. The YN ERWM Program request 10ug/L to be use as the cleanup level.

- Include a figure depicting all COCs groundwater plumes. Create a figure for the 300-FF-5 OU plumes similar to Figure 5. (Figure 11 does not demonstrate the entire groundwater plumes of the 300-FF-5 OU.)

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[7] The 15 millirem per year (mrem/yr) dose limit used by DOE in the past is not protective enough; this dose equates to a lifetime cancer risk of 3×10^{-4}, which is three times the maximum allowable value under CERCLA. Note: If the EPA's own risk coefficients for radiation are used, it equates to a fatal cancer risk of more than 5×10^{-4} and a cancer incidence risk of 1×10^{-3}, which is well outside the CERCLA target range of 10^{-4} to 10^{-6}.)

- Table 2-1. Data Needs and Sampling Program for the 300 Area Remedial Investigation indicate the treatability tests to date have not demonstrated a successful delivery mechanism for polyphosphate.

- Clarify in the Proposed Plan what is meant by "continued discharge of relatively low uranium concentrations to the river" (pg 14/PP). The YN ERWM Program believes these low concentrations are the result of dilution rather than appropriate treatment.

- Clarify in the Proposed Plan how the *lateral extent of the PRZ limits the effectiveness of deep excavation* as a remedy other than cost considerations.

- Section on Waste Site Contamination is confusing to the reader. References to burial grounds are repeated with different intent to the explanations. Include a figure with all sites under discussion. Figures 9 & 10 do not suffice; rather they add confusion.

General Fate and Transport Modeling, PRG Development comments:

- Many simplifying assumptions have been incorporated into the uranium transport modeling that makes the results highly uncertain. Uranium transport modeling in the 300 Area has been performed to support remedial alternative evaluation as part of the RI/FS Report and Proposed Plan. There are several overly simplifying assumptions that are incorporated into the transport model. Some of these assumptions include:

    - Significant simplification of local geology.
    - Assumed hydrologic boundary conditions in the past and future (10-, 50-, and 100- year events have been eliminated, resulting in a restricted set of river stages applied repeatedly).
    - Simplified calculation of partition coefficients that may not reflect actual uranium behavior.
    - Simplified hydrologic regimes in the Columbia River and restricted flow paths for hyporheic water and groundwater.
    - Simplified initial distributions of uranium, which included assigning values derived from cleanup verification package data to one of two depths, and extrapolating between data points.
    - Assumed sorption/desorption behavior of uranium under dynamic flow conditions.

- While model runs can be compared against observed values for a portion of the domain, ultimately the results must be viewed as only one possible outcome that may occur in the future depending on environmental variables and remedial actions. The DOE should incorporate the uncertainty and consider the associated reductions in alternative performance that may result from changes in environmental variables into the evaluation of CERCLA balancing criteria. Where sensitivity analysis has not been performed, performance uncertainty should count against the long term effectiveness of remedial alternatives that leave uranium in the vadose and periodically rewetted zones.

- Uranium transport modeling boundary conditions are not realistic for the remedial alternative performance time period. Hydrologic boundary conditions for the uranium transport model specified in Appendix F were constructed using data from relatively short periods of time (e.g., 1 year for the river side lateral boundary) that are then repeated over the performance period of the model (3,000 years). This

approach does not capture the impact of 10-, 50-, 100-, or 1,000-year events which include unusually high discharges, heavy rainfall, and other infrequent events. Such events are likely to inundate higher portions of the vadose zone than flows during a typical year. The hydrologic boundary conditions should include a greater range of groundwater and river stages that ensure unusual and infrequent events are considered as part of remedial alternative performance evaluations.

- Uranium transport modeling transects do not characterize areas of highest contamination. Modeling of uranium transport in the subsurface as part of PRG development should be performed at locations where maximum contamination is expected to occur. The current 2-dimensional transect alignments are located orthogonal to inferred flow paths down gradient from waste sites known to have residual contamination that is more than 10 times the identified background concentration. Dilution of labile constituents is known to occur with transport, making the transect positioning used sub-optimal for determining the concentrations of uranium in groundwater following remedial actions. Additional transect results should be added to the RI/FS Report that include areas of greatest soil contamination for each of the proposed remedial alternatives to provide appropriate evaluation of their performance.

- Uranium transport modeling assumptions are biased to favor polyphosphate treatment. Modeled attenuation of the groundwater plume evaluates the preferred alternative's performance by removing portions of the uranium source from the vadose and periodically rewetted zones; this would not occur as part of the polyphosphate treatment. Additionally PNNL (2009) has indicated that sequestered uranium may easily be remobilized. Removing portions of the source term would be appropriate for Alternatives 4 or 5, but should not be used for Alternatives 3 or 3a. Using this approach to evaluate the efficacy of the polyphosphate treatments is not appropriate or realistic in light of the previous field tests and published results. Using such an assumption constitutes a deficient analysis that is biased and creates the impression that the Preferred Alternative will perform better than is realistically expected, requiring lower capital expenditures and fewer environmental impacts. The uranium transport modeling should evaluate remedial alternative performance that realistically leaves the source term uranium in place as is contemplated by DOE for polyphosphate treatment, and removes uranium for RTD alternatives. Polyphosphate modeling should incorporate the observed remobilization of uranium following the treatments as was described in PNNL-18529 and the findings of these analyses should be incorporated into the evaluation.

- Infiltration scenarios used in PRG development are not appropriate. Infiltration scenarios used for the post closure period are not well justified, and do not represent a realistic set of site conditions under which the selected remedial alternative will perform. PRG infiltration scenarios are based on very low rates of infiltration identified under the industrial or conservation land use scenarios. These infiltration rates are not well justified or appropriately conservative to establish PRG values. The DOE should develop PRG values that are protective of groundwater and surface water for infiltration rates such as those identified under the irrigation scenario or volcanic damming of the Columbia River, which may dramatically increase saturation and transport conditions in the current vadose zone.

- No preliminary remediation goals to protect groundwater and surface water have been set for uranium in the vadose zone. The Proposed Plan states "[Preliminary Remediation Goals] provide the basis for cleanup levels in the ROD." No PRG values have been provided for uranium in the vadose zone under any exposure scenario. Because PRG values are used to measure and evaluate compliance of remedial actions, the absence of PRG values for uranium in the vadose zone means there is no performance standard for the selected remedial alternative. Based on the text of the Proposed Plan, this omission indicates that the final Record of Decision (ROD) will not include cleanup levels for vadose zone uranium. Failure to include PRG values for known contaminants of concern makes the Proposed Plan in its existing form deficient and constitutes an unacceptable regulatory arrangement for remediating the 300 Area. The Proposed Plan should include PRG values for uranium isotopes and total uranium in the vadose zone.

- PRG calculations rely on environmental stasis. Page 5-88 indicates that the high partitioning coefficient of uranium means that it will not move through the vadose zone quickly enough to contaminate groundwater; stated in the RI/FS "it takes longer for the vadose zone contamination to enter the groundwater than the groundwater to decline below the DWS." This assumption does not allow for any significant environmental change which may introduce larger volumes of water to parts of the vadose zone (e.g., irrigation or mining). Such changes may result in severely compromising future performance of remedial alternatives that leave the uranium source term in the subsurface. Reasonable assumptions regarding changes in land use at the 300 Area or the possibility of significant changes should be incorporated in the infiltration rate or groundwater elevation as part of the evaluation of remedial alternatives.

7. **Human Health Soil Risks: Tribal Risks:** Again identified as higher than the risk for the residential scenario.

Accumulated scientific evidence demonstrates that Native Americans are, as a statistical cohort, subject to the highest risk of disease and cancer from exposure to environmental contaminants. The Columbia River Basin Fish Contaminant Survey is a technical report that assesses the amount of chemical pollution in certain species of fish, and the potential health risks from eating fish those fish. The study is based on fish samples collected between 1996 and 1998 from tribal fishing waters in Washington, Oregon and Idaho. EPA funded the study which was coordinated by the four member tribes of the Columbia River Intertribal Fish Commission (CRITFC).

The YN ERWM Program request official DOE recognition that Native Americans living near the Hanford site are the most vulnerable people to environmental contaminants due to higher exposure levels, as underscored by EPA's Columbia River Fish Contaminant Survey. Adults in CRITFC's member tribes who eat fish frequently (48 meals per month) over a period of 70 years may have cancer risks that are up to 50 times higher than those in the general public who consume fish about once a month.

The Preferred Alternative (3a) lacks discussion of how it results in *minimal (if any) impacts to environmental justice*. The philosophy underlying the cleanup of Hanford should be guided explicitly by the goal of allowing Native Peoples to safely live the lifestyle to which they are entitled and prevent YN from suffering disproportionate impacts. This way of thinking will be particularly important when considering how to incorporate non-

quantitative elements into the Preferred Alternative such as the spiritual or cultural value of a site.

- The total ELCR estimates from use of Groundwater as a Potential Drinking Water source is 5.2×10^{-4} for nonradiological COPCs and 4.9×10^{-4} for radiological COPCs (total cumulative ELCR is 1.0×10^{-3}), which are greater than the EPA upper target risk threshold of 1×10^{-4}. The HI is 6.9, which is greater than the EPA target HI of 1.0. The Total Cumulative ELCR for radionuclide analytes is 1.0×10^{-3}. The total ELCR estimates from groundwater as a source of steam in a sweat lodge is 1.6×10^{-3} for nonradiological COPCs and 2.4×10^{-2} for radiological COPCs, which are both greater than the EPA upper target risk threshold of 1×10^{-4}. The HI is 119, which is greater than the EPA target HI of 1.0 (excerpts from G1.2.1.1 300 Area Subregion).

- There remains unacceptable risk disproportionate impacts to the YN tribal members from both chemical and radiological contaminants. Much of the risk assessments are based on the RCBRA and other supporting documents (unapproved or has unresolved comments by the Tri-Party Agencies).

The YN has outstanding issues with the use of River Corridor Baseline Risk Assessment and its 'sub-documents'[i.e. Tier 1 document for wildlife or the Tier 2 document for plants and invertebrates] as a major supporting document in cleanup decisions for the River Corridor Areas. These documents are not finalized or approved nor have our comments and concerns been addressed. [8]

- RCBRA (River Corridor Baseline Risk Assessment Volume II, Part 1: Human Health Risk Assessment August 2011): Volume II, Part 1: Human Health Risk Assessment August 2011pg 7-34: For the Nonresident Tribal scenarios, the total cancer risk estimates exceed 10^{-4} and HIs exceed 1.0 for all ROD areas.

- Risks to the YN Tribal members should be calculated and included in the Alternative selection decision-making process using the YN risk scenario post ~22-28 years of remedy selection.[9] As evaluated and explained in the RCBRA, by the year 2075, subsistence farmer RME cancer risks above 1×10^{-4} are related overwhelmingly to arsenic exposure from produce ingestion. Because the CTUIR resident and Yakama resident scenarios use very high (subsistence level) site-raised food ingestion rates, strontium-90 still plays a significant role in food-related exposures at year 2075 for these scenarios. (pg 6-22, DOE/RL-2010,Rev 0).

- Statement is made that radionuclides associated with historical waste disposal continue to contribute the majority of risk and will take more than 28 years (see page 29/PP) to reach concentrations less than the residential PRGs. This seems to be a conflicting statement. Clarify if dissolved uranium something separate. Clarify the time for all radionuclides (identify each separately) to decay to below residential PRGs.

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[8] See our February 28, 2011 letter to the Tri-Party Agencies (DOE-Matt McCormick, EPA-Dennis Faulk, and Ecology- Jane Hedges

[9] See our review comments on the Proposed Plan for Remediation of the 100-FR-1, 100-FR-1, 100-IU-2, 100-FR-3, and 100-IU-6 DOE/RL-2012-41 Draft A and the Remedial Investigation/Feasibility Study for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units, DOE/RL-2010-98, DRAFT A December 2012.

- Conservation/mining land use is as a part of the basis for the preliminary remediation goals (PRGs). YN disagrees with this land use designation to develop PRGs. Our Treaty rights guarantee (among other rights) use of groundwater for sweat lodge activities. Groundwater is to be restored to its most beneficial use, which is drinking water standards (i.e. Method B, unrestricted land-use values). All PRGs should be calculated based on unrestricted land-use (at the very minimum.) See our previous comments on modeling and PRGs.

- Many PRGs have been inappropriately developed and uncertainties remain as these documents still require revision. Our concerns remain regarding the methodology used to calculate the EPCs. EPA's ProUCL methods were identified yet in some instances a 95UCL was not calculated (a maximum value used instead). Use of the max ignores most of the information in the data set.
    - When the number of measurements is small (e.g., n<5) or the detection frequency is low (<5%), ProUCL ultimately recommends collection of more samples to compute defensible statistics.[10] Collection of additional samples was not done. Some unremediated waste sites may have exceedances of PRGs, which would provide the basis for remedial action or further evaluation. EPA review of YN comments on these issues in our earlier correspondence on the RCBRA, etc would provide further clarification.

- A review of CVP documents (most dating 2001-2008) for a number of waste sites raised concerns. Several indicate the use of outdated standards or as of yet agreed to (by the Tri-Parties) values (i.e. the 100 Area Analogous Sites RESRAD Calculations (BHI 2005a) to calculate non-radiological COCs, [e.g. copper, lead, selenium, TPH; Aroclor-1254]. Many state use of MTCA 1996 values or soil RAGs based on "100 time groundwater cleanup rules and 100 times dilution attenuation factor times surface water quality criteria. Provide a more detailed explanation of the review of all CVPs including the comparison process and whether additional characterization and/or sampling was performed for those CVPs where filtered sampling results, etc where utilized. Adjust the need for addition site-specific remediation as warranted.

- Text (and Table A-1) within the document identifying 20mg/kg for arsenic as an unrestricted land use clean up value is misleading. It implies Washington State

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[10] quotes from EPA sources, supporting use of the 95% UCL:1) Dec 2002 OSWER 9285.6-10 (http://www.hanford.gov/dqo/training/ucl.pdf) "It is important to note that defaulting to the maximum observed concentration may not be protective when sample sizes are small, because the observed maximum may be smaller than the population mean..... The use of the maximum as the default EPC is reasonable only when data samples have been collected at random from the exposure unit and sample size is large" (p. 20). 2) ProUCL Ver. 3.0 (Singh et al, 2004) (http://www.epa.gov/nerlesd1/tsc/images/prouc13apr04.pdf)

"It is recommended that the maximum observed value NOT be used as an estimate of EPC....It should be noted that for highly skewed data sets, the sample mean indeed can even exceed the upper percentiles (e.g., 90%, 95%), and consequently, a 95% UCL of the mean can exceed the maximum. This is especially true when dealing with log normally distributed data sets of small sizes" (p. 55).

Department of Ecology concurrence with use of this value on the Hanford site as background. The 20mg/kg cleanup level is the WAC 173-340 (1996) Method A value.

- The YN ERWM Program believes it is incorrect to apply Method A on the complex Hanford site as it is used for sites which contain a small number of hazardous substances.

Its application has resulted in residual levels for arsenic which do not reflect the Unrestricted Land Use Soil Cleanup Standards WAC 173-340-740(3)]) 2007 Method B value (0.67 mg/kg) and the MTCA ("Deriving Soil Concentrations for Groundwater Protection" [WAC 173-340-747(3)(a)]), groundwater protection value (0.00737 mg/kg) cleanup values (which would default to site background levels of 6.5mg/kg). The proposed 20 mg/kg value for arsenic exceeds the 1×10^{-6} individual cancer risk based on the MTCA.

- In simple terms, the risk analysis showed that casual users of the River Corridor as it is have low enough risk to be safe. However, all of the residential user scenarios have unacceptably high risk. Some of the risk was associated with uranium, mercury, chromium, cadmium, and radiological contaminates. But a major part of the high risk levels found in the residential scenarios is from consumption of arsenic contaminated plants, animals and water. A large proportion of Nonresident Tribal cancer risk and HI is related to arsenic soil concentrations that are approximately equivalent to levels in areas unaffected by Hanford Site activities. When cancer risk estimates are calculated without the contribution of arsenic, the total cancer risk estimates still exceed 10^{-4} for all six ROD areas.
- While much of the arsenic is assumed to be from pre-Hanford agricultural practices, there was a portion that could be attributed to Hanford operations. That amount of the Hanford process arsenic load should be determined, and the cleanup of that arsenic should be a part of the Hanford cleanup plan.

- The Proposed Soil cleanup levels for Hexavalent Chromium to ensure protection of groundwater should be set at 0.2 mg/kg. This value is found using a Kd value of 0 mL/g and more accurately depicts movement of this contaminant through soils. Fate and transport simulations presented in DOE/RL-2010-98 should be recalculated using 0.0 Kd value. All concentrations in the groundwater and along the shoreline and the subsequent timeline for decline in concentration should be re-evaluated using a 0.0 Kd.

8. **Costs**: Clarification and inclusion of information is needed in the Proposed Plan and analysis of the appropriate alternatives in several areas:
   - Clearly the Proposed Plan and decision documents do not adequately explain how cleanup meets the National Historic Preservation Act consultation process, including, for example, the specific and concrete steps for how cleanup in the cultural areas will proceed in a manner that prevents damage/disturbance (e.g., specific soil sampling designs to protect artifacts), including associated costs or served to resolve the concerns presented to the National Remedy Review Board (NRRB MEMO, June 26, 2012) regarding cultural resources and other areas of concern for the Yakama Nation.

Cost analysis for required well-conceived plans for performance monitoring that identify and correct potential failures and plans for maintenance and repair, including possible total system replacement is missing (NRC, 2000). This level of planning, both technical

and financial (i.e., costs, does not appear to have been included in the Proposed Plan or the analysis of alternatives).

- It appears that incremental costs have escalated (~doubled) for basically same remedies as proposed in the previous 300 Area Proposed Plan without explanation.

The Preferred Alternative (or Proposed Plan) does not include the required description of the contingency measures that will be implemented should the monitoring show that natural attenuation is unable to achieve the cleanup goals. Conditions that would trigger the contingency should also be specified (e.g., continued plume migration or contaminant levels are well above levels predicted for a specified time) (EPA 540-R-98-031). Update and provide details in the Proposed Plan for public review including cost of implantation of contingency measures.

- Clarify if remediation costs for waste sites whose remediation expected to begin under the Interim ROD for the 300-FF-2 are fixed and will not increase. Clarify what would be an estimate of increase in costs should these identified sites not have remediation under the Interim ROD. (e.g., The Proposed Plan does not clearly explain how the 300-FF-2 OU will incorporate remediation of the 324 Building nor does the Preferred Alternative consider remediation its contaminants of concern or the associated costs). Although there will be an amendment to the 300-FF-2 OU Interim ROD, all changes will be incorporated in one final ROD for the 300 Areas. Clarification is need for better public understanding of the whole process.

- Clarify what is the cost estimate for currently inaccessible pipelines which are to be RTD (a comment element to all Alternatives). Removal/disposition of currently inaccessible pipelines (due to their close proximity to long-term facilities) is not included in the RDT discussion.

- Discussions of significant funding and building of ERDF infrastructure is an associated element of the 300 Area RI/FS/PP process, however DOE has not provided related cost estimates or how ERDF costs are managed or related uncertainties. Clarification of how operation and maintenance costs are allocated is needed. Without this discussion, the public maybe mislead.

- Clarify what is the cost for treatment/remediation of identified long-lived TRU radionuclides of plutonium and americium and cesium-137 and strontium-90 (the 618-10/618-11 burial grounds).

- With separate ROD decisions in place, it is difficult to understand costs related specifically to the Preferred Alternative actions. Use of figures only in the Proposed Plan doesn't provide enough clarity. Suggest use of separate Tables in addition to figures.

- Design elements for Alternatives selection should be described in sufficient detail in the Proposed Plan so that the public can evaluate and comment on the proposal (EPA 540-R-98-031). The Proposed Plan provides the foundation for the ROD to defer the final technology selection to the remedial design phase. Any associated costs should be included in the Proposed Plan.

- It is unclear if any of the Alternatives were evaluated against the nine balancing criteria based on what happens with transition to Long-term Stewardship prior to completion of remediation under the Record of Decision (e.g., Clarify if a cost benefit analysis of remedy costs including long-term stewardship costs done. The environmental consequences of doing this action or not doing it have not been evaluated. It is unclear how any of the Alternatives can ensure compliance with the balancing criteria with transition into Long-term Stewardship. These analyses should be done as this action will clearly need to be reflected and integrated into the final ROD.

9. **General Comments on NEPA**: The relationship of NEPA and NEPA values to related information is not clearly presented.
   - Rewrite for clarity and include discussion that some of the required assessments supporting NEPA values that are not yet made until after the RI/FS is approved. The statement, "NEPA values were incorporated into the assessment conducted as part of the FS" gives the impression that NEPA values were done in the FS, and that is the end of NEPA values. Many of NEPA values are incorporated and enforce implementation of applicable laws and regulations into later phases of the CERCLA documentation process, including the ROD and RD/RAWP. Correct text and provide reference in RI/FS.

10. **General Comments on Future Interim ROD changes:**
    - Statements like "There will be a period of time between when the final action ROD is approved and the required RD/RAWP is prepared and issued. During this period, DOE-RL plans to continue remedial activities, such as waste site RTD. In order for these actions to be consistent with the final action remedy selection, the current interim action RD/RAWPs will be modified using the TPA (Ecology et al., 1989a) change notice process to include the final cleanup levels specified in the final action ROD when it is issued" do not comply with CERCLA regulations.

      The CERCLA process for changes in cleanup values in a ROD requires, at a minimum, an Explanation of Significant Difference (ESD) and maybe a ROD amendment. The TPA cannot circumvent the required CERCLA process. The YNERWM program expects review opportunities.

11. **General Comments on sections within the Proposed Plan:**

1. Principal Threat Wastes & Current and Future Exposure Scenarios:

Identify reference to the health and safety program managing worker exposure concerns.

- Clarify the reason for the ratios used under the industrial worker scenario (6 hours indoors and 2 hours outdoors) and over a 25 year period rather than a 30 year period.

- It is misleading to the public to state only three sites in the 300-FF-2 OU contain principal threat waste; it seems if only three sites were ever contaminated. Clarification is requested.

- Clarify if the 618-2 Burial ground was a disposal site similar to the 618-10 & 11.

- It is unclear in the discussion of the Alternatives 2, 3, 3a, 4, and 5 how treatment for long-lived the identified TRU radionuclides of plutonium and americium and

cesium-137 and strontium-90 is included. Clarify in this section and also in the Alternatives discussions.

2. Principal Threat Waste Approach: Delete text referencing $1x10^{-3}$. This is very misleading to the public. EPA guidance states point of departure is $1x10^{-6}$.

3. Scope and Role:
   - See previous comments on exclusion of contaminants emanating from the 200 Areas/200-PO-1 OU. Proposed Plan does not clearly explain how the 300-FF-2 OU will incorporate remediation of the 324 Building nor does the Preferred Alternative consider remediation its contaminants of concern. Piece-mealing of sub-areas makes for inconsistent cleanups and ignoring the remediation of groundwater contaminants.

   - Table 1 list the Principal Risk Driver COCs for the Vadose Zone for the 300-FF-1 & 2 OU yet Uranium is seemingly the only COC that will be addressed by the Preferred Alternative.
     - Clarify how these principal risk drivers to the groundwater are being remediated and demonstrate (using travel times, etc) that contamination from these COCs will be prevented downstream and/or from reaching the river in exceedence of the DWS, MCLs, AWQS.

   - Table 1 lists the Principal risk driver COCs but excludes the following COCs which are included in Table A-1: Include these as contaminants to be remediated and monitored or provide a discussion of the relationship of Table 1 to Table A-1 for reader clarification: Copper, zinc, vanadium, silver, pyrene, lead, arsenic, antimony, boron, molybdenum, mercury, hexavalent chromium, and selenium.

4. General Comment on the Remedial Action Objectives:
   - The purpose of Remedial Action Objectives (RAOs) is to explain and address site risks and to include an action (and specifics/details) to be taken achieve the objective. RAOs are the measurement tools for evaluating the success of the ROD remedy during the CERCLA 5 year review process. Without a specific action, the metrics for measurement are filled with subjectivity and uncertainty.

     - None of the seven (7) RAOs have a definitive task or standard to be met. An Example of a specific action to include using RAO#2: Prevent COCs migrating and/or leaching to surface water *by treatment of the contaminated soils or RTD.*

Clarify all RAOs with specific action(s) to be performed and/or standard(s) to be met.

5. General Comment on Removal, Treatment, and Disposal at Waste Sites:
   - Clarify in this section's discussion that currently inaccessible pipelines are to be RTD as this is a comment element to all Alternatives. Include any RCRA pipelines if relevant. Clarify if there are pipelines at deeper depths which will not be removed.

   - Clarify how the determination was made that the 324 Building Cells C & D have the capacity and the structural integrity to howl the highly contaminated soils of the 324 building.

- Provide reference to the CERCLA Action Memorandum #2 under which removal of the 324 Building will be performed; it is currently unavailable for public review.
- Clarify how the highly contaminated soil will be immobilized prior to placement in Cells C & D of the 324 Building.

- General: Reader has difficulty understanding where there are 37 or more waste sites yet to be remediated under the existing Interim ROD for the 300-FF-2 OU. Clarify and identify these waste sites in the Proposed Plan. Clarify the "re-evaluation process" for the 90 sites previously remediated under the Interim ROD in the Proposed Plan.

6. General Comments on Temporary Surface Barriers and Pipeline Void Filling:
   - Design of surface barriers and discussion of pipeline void fillings should be included in the ROD per EPA guidance and the RCRA permit not within the RDR/RAWP. Correct this statement in the Proposed Plan.

   - Removal/disposition of currently inaccessible pipelines (due to their close proximity to long-term facilities) is not included in the RDT discussion. More clarification is needed. Clarify what is the cost estimate for their removal. Include this in the Proposed Plan and the Alternatives evaluation and analysis.

   - Clarify if the 300 Retired Radioactive Liquid Waste Sewer will be remediated in the 300-FF-2 OU remediation. Clarification and costs analysis is needed. Include this information in the Proposed Plan and the Alternatives evaluation and analysis.

   - Clarify if there are pipelines at deeper depths which will not be removed. Include this information in the Proposed Plan.

12. Human Health Risk Assessment Additional Comments:

- The human health risk assessment for the RI/FS and Proposed Plan is based primarily on results of the River Corridor Baseline Risk Assessment (RCBRA), on which the Yakama Nation has provided substantial comments previously, supplemented with a limited risk evaluation for the 300 Area. The Proposed Plan (p. 6-5) and RI/FS (p. 6-5) state that the RCBRA and RI/FS found few waste sites exceeding EPA target risk and hazard limits for a residential exposure scenario and no waste sites exceeding these limits for the industrial/commercial scenario. The approach and assumptions made in the risk assessments, however, do not adequately assess the cumulative risks that a Yakama member would encounter on the Hanford Site. The 300 Area RI/FS did not apply the Yakama Nation Exposure Scenario to estimate cumulative risks for all media combined or to develop cleanup levels protective of tribal members who will use the river, nearshore, and upland areas of the site. Key issues with the RCBRA that were never addressed and continue to limit its application to the 300 Area include:

- The RCBRA was not a cumulative baseline risk assessment, as it excluded certain contaminants, waste sites, non-operational areas, and the Columbia River itself from the assessment. Similar to the RCBRA, the RI/FS failed to consider all sources of contamination, describe transport mechanisms through all environmental media, and evaluate cumulative risk to tribal members based on a traditional subsistence

lifestyle. For example, insufficient data were used to characterize exposure from groundwater and fish ingestion, which are both very important exposure pathways.

- The RCBRA was not a "baseline" risk assessment and was biased in that it assumed institutional controls to limit exposures. CERCLA guidance directs that institutional controls *may not* be factored into a baseline risk assessment, and this directive is acknowledged by DOE's guidance. Assuming that long-lived radioactive and hazardous contaminants remain in place also implies that long-term stewardship must be implemented that will remain effective longer than any human institution has ever existed.

- The RCBRA did not consider contaminants migrating from the Central Plateau. Contaminated groundwater from the Central Plateau has already reached the Columbia River and will continue to affect the 300 Area and River Corridor far into the future. Risks were assessed under the unlikely assumption of institutional controls and/or remediation of the Central Plateau, including the vadose zone and groundwater.

- The RCBRA compared site data to background or reference contaminant concentrations found in samples collected from sites inappropriately located onsite or proximal to Hanford; these locations have most likely been influenced by releases from Hanford in the form of airborne contamination and/or movement through the environment and food web. Additionally, risk management decisions were prematurely made during the baseline risk assessment process by excluding certain "background" concentrations from the estimates, when in actuality; these stressors contribute to baseline risks regardless of their source.

- The RCBRA only provided screening-level risk assessments for groundwater and fish ingestion. While additional risk calculations for exposure to groundwater were conducted for the 300 Area RI/FS, including risks to Native Americans, no additional risk calculations were made for the riparian, nearshore, or river areas of the 300 Area. The RCBRA did not consider a Tribal resident who also uses the river for fish and other subsistence uses. This is particularly important since the Columbia River Component (CRC) risk assessment found fish ingestion to be the largest contribution to Tribal human health risks from the river, exceeding EPA target risk limits.

- The Yakama Nation does not support an industrial use scenario for the anticipated land use for the 300 Area. This scenario allows for a less stringent cleanup based on the expectation of restricted use and institutional controls remaining in place for very long time periods. The Yakama Nation supports unrestricted use of the Hanford Site, including the 300 Area, and the site should be cleaned up to protect for unrestricted Tribal uses.

- The CERCLA limit for managing hazardous waste cleanup is referred to in the NCP and EPA's directive 9355.0-30 as a target risk range of 10^{-4} to 10^{-6} and it is important to consider this *range* when arriving at "acceptable" risk limits for all peoples who may reside on or live near the Hanford site. The upper-bound (least protective) risk level of 1×10^{-4} may not be adequate as a "threshold" for calculating risk-based screening levels, as used in the Proposed Plan, particularly considering the degree of site-specific uncertainties and the multitude of contaminants found in the 300 Area.

- Methods used to develop radionuclide preliminary remedial goals (PRGs) in the RCBRA and 300 Area RI/FS only assumed a target cancer risk level of 1×10^{-4}. Using this risk level for a *baseline* risk assessment is inconsistent with EPA Risk Assessment Guidance for Superfund Part B, Chapter 4, titled "Risk-Based PRGs for Radioactive Contaminants," which states to "calculate risk-based PRGs for each carcinogen corresponding to a pre-specified target cancer risk level of 10^{-6}." It is misleading to present the risk assessment results as being "similar between the RCBRA and the RI/FS for the residential scenario" when the RCBRA did not use the most appropriate and protective threshold target risk level.

- Additionally, interim cleanup actions were based on the radiation dose limit of 15 mrem/year, which equates to a lifetime cancer risk that is 3 times above the maximum allowable value (1×10^{-4}) under the federal Superfund program (and even more when other EPA risk coefficients are considered in the conversion).

- The 300 Area RI/FS assessment of groundwater risk, which was intended to provide the *baseline* risk assessment that was lacking in the RCBRA, found that risks to Native Americans using groundwater were 4- to 5-times greater than the EPA tap water scenario for drinking water ingestion presented in the RI/FS and were above risk and hazard target levels (p. 6-223). Exposure assumptions associated with the Native American scenarios should be used to develop cleanup levels for the 300 Area protective of such uses.

- The 300 Area RI/FS did not include cumulative risks summed across soil and groundwater because, according to DOE, the RME for a resident scenario does not include combined exposure to both media (p. 231). This segregation does not show the total risks to an individual, particularly a Tribal member living in the 300 Area who may be using groundwater and is exposed to soil as well.

13. Ecological Risk Assessment Comments:

- Ecological risks were calculated by individual waste site as though they were isolated from any other site when considering exposure to biological organisms. The cumulative potential exposure from all waste sites within a species-specific use area needs to be considered, particularly for species with a large home range that may be exposed to multiple waste sites.

- Biological populations were defined too broadly. While it is reasonable to consider area-use-factors in estimating risks, populations were defined such that even individuals visiting a waste site with elevated risk would not result in a substantial impact on the overall population of that species (effectively diluting the risk across a large population).

14. Data Used in Risk Assessments.

- The human health and ecological risk assessments in the RI/FS form the basis for development of the risk-reduction cleanup levels. However, these risk assessments are based primarily on the River Corridor Baseline Risk Assessment (RCBRA) and the Columbia River Component (CRC) risk assessment. The YN has commented on these previously, but the issues raised have yet to be addressed. These include:

- Inadequate numbers and locations of chemical and biological samples were used to characterize the site.

- Inappropriate reference and background data were used to evaluate site data.
- Numerous issues exist with data quality.
- Contaminants migrating from other portions of the Hanford site or from offsite were excluded.

15. Fate and Transport Modeling, PRG Development Additional Comments:

- Many simplifying assumptions have been incorporated into the uranium transport modeling that makes the results highly uncertain. Uranium transport modeling in the 300 Area has been performed to support remedial alternative evaluation as part of the RI/FS Report and Proposed Plan. There are several overly simplifying assumptions that are incorporated into the transport model. Some of these assumptions include:
  - Significant simplification of local geology.
  - Assumed hydrologic boundary conditions in the past and future (10-, 50-, and 100- year events have been eliminated, resulting in a restricted set of river stages applied repeatedly).
  - Simplified calculation of partition coefficients that may not reflect actual uranium behavior.
  - Simplified hydrologic regimes in the Columbia River and restricted flow paths for hyporheic water and groundwater.
  - Simplified initial distributions of uranium, which included assigning values derived from cleanup verification package data to one of two depths, and extrapolating between data points.
  - Assumed sorption/desorption behavior of uranium under dynamic flow conditions.

- While model runs can be compared against observed values for a portion of the domain, ultimately the results must be viewed as only one possible outcome that may occur in the future depending on environmental variables and remedial actions. The DOE should incorporate the uncertainty and consider the associated reductions in alternative performance that may result from changes in environmental variables into the evaluation of CERCLA balancing criteria. Where sensitivity analysis has not been performed, performance uncertainty should count against the long term effectiveness of remedial alternatives that leave uranium in the vadose and periodically rewetted zones.

- Uranium transport modeling boundary conditions are not realistic for the remedial alternative performance time period. Hydrologic boundary conditions for the uranium transport model specified in Appendix F were constructed using data from relatively short periods of time (e.g., 1 year for the river side lateral boundary) that are then repeated over the performance period of the model (3,000 years). This approach does not capture the impact of 10-, 50-, 100-, or 1,000-year events which include unusually high discharges, heavy rainfall, and other infrequent events. Such events are likely to inundate higher portions of the vadose zone than flows during a typical year. The hydrologic boundary conditions should include a greater range of groundwater and river stages that ensure unusual and infrequent events are considered as part of remedial alternative performance evaluations.

- Uranium transport modeling transects do not characterize areas of highest contamination. Modeling of uranium transport in the subsurface as part of PRG development should be performed at locations where maximum contamination is expected to occur. The current 2-dimensional transect alignments are located

orthogonal to inferred flow paths down gradient from waste sites known to have residual contamination that is more than 10 times the identified background concentration. Dilution of labile constituents is known to occur with transport, making the transect positioning used sub-optimal for determining the concentrations of uranium in groundwater following remedial actions. Additional transect results should be added to the RI/FS Report that include areas of greatest soil contamination for each of the proposed remedial alternatives to provide appropriate evaluation of their performance.

- Uranium transport modeling assumptions are biased to favor polyphosphate treatment. Modeled attenuation of the groundwater plume evaluates the preferred alternative's performance by removing portions of the uranium source from the vadose and periodically rewetted zones; this would not occur as part of the polyphosphate treatment. Additionally PNNL (2009) has indicated that sequestered uranium may easily be remobilized. Removing portions of the source term would be appropriate for Alternatives 4 or 5, but should not be used for Alternatives 3 or 3a. Using this approach to evaluate the efficacy of the polyphosphate treatments is not appropriate or realistic in light of the previous field tests and published results. Using such an assumption constitutes a deficient analysis that is biased and creates the impression that the Preferred Alternative will perform better than is realistically expected, requiring lower capital expenditures and fewer environmental impacts. The uranium transport modeling should evaluate remedial alternative performance that realistically leaves the source term uranium in place as is contemplated by DOE for polyphosphate treatment, and removes uranium for RTD alternatives. Polyphosphate modeling should incorporate the observed remobilization of uranium following the treatments as was described in PNNL-18529 and the findings of these analyses should be incorporated into the evaluation.

- Infiltration scenarios used in PRG development are not appropriate. Infiltration scenarios used for the post closure period are not well justified, and do not represent a realistic set of site conditions under which the selected remedial alternative will perform. PRG infiltration scenarios are based on very low rates of infiltration identified under the industrial or conservation land use scenarios. These infiltration rates are not well justified or appropriately conservative to establish PRG values. The DOE should develop PRG values that are protective of groundwater and surface water for infiltration rates such as those identified under the irrigation scenario or volcanic damming of the Columbia River, which may dramatically increase saturation and transport conditions in the current vadose zone.

- No preliminary remediation goals to protect groundwater and surface water have been set for uranium in the vadose zone. The Proposed Plan states "[Preliminary Remediation Goals] provide the basis for cleanup levels in the ROD." No PRG values have been provided for uranium in the vadose zone under any exposure scenario. Because PRG values are used to measure and evaluate compliance of remedial actions, the absence of PRG values for uranium in the vadose zone means there is no performance standard for the selected remedial alternative. Based on the text of the Proposed Plan, this omission indicates that the final Record of Decision (ROD) will not include cleanup levels for vadose zone uranium. Failure to include PRG values for known contaminants of concern makes the Proposed Plan in its existing form deficient and constitutes an unacceptable regulatory arrangement for

remediating the 300 Area. The Proposed Plan should include PRG values for uranium isotopes and total uranium in the vadose zone.

- PRG calculations rely on environmental stasis. Page 5-88 indicates that the high partitioning coefficient of uranium means that it will not move through the vadose zone quickly enough to contaminate groundwater; stated in the RI/FS "it takes longer for the vadose zone contamination to enter the groundwater than the groundwater to decline below the DWS." This assumption does not allow for any significant environmental change which may introduce larger volumes of water to parts of the vadose zone (e.g., irrigation or mining). Such changes may result in severely compromising future performance of remedial alternatives that leave the uranium source term in the subsurface. Reasonable assumptions regarding changes in land use at the 300 Area or the possibility of significant changes should be incorporated in the infiltration rate or groundwater elevation as part of the evaluation of remedial alternatives.

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