Consortium Universities: **Vanderbilt University**, Georgia Tech, Howard University, New York University, Oregon State University, Rutgers University, University of Arizona, University of Wisconsin - Madison

OVERVIEW OF REVISIONS MADE TO

"METHODOLOGY FOR THE HANFORD SITE-WIDE RISK REVIEW PROJECT

Revision A

September 4, 2014"

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Vanderbilt University
Department of Civil & Environmental Engineering
VU Station B#351831
Nashville, TN 37235-1831

TABLE OF CONTENTS

INTRODUCTION

Since January 2014, the Consortium for Risk Evaluation with Stakeholder Participation (CRESP) has led an effort initiated by the Department of Energy (DOE) to execute a Hanford Site-wide evaluation of risks to human health, the environment (groundwater, Columbia River, and ecological resources), and cultural resources. The primary goal of this Risk Review Project is to carry out a screening process for risks and impacts to human health and resources[1]. The results of the Risk Review Project are intended to provide the DOE, regulators, Tribal Nations, and the public with a more comprehensive understanding of the remaining cleanup at the Hanford Site to help inform (1) decisions on sequencing of future cleanup activities, and (2) selection, planning and execution of specific cleanup actions, including which areas at the Hanford Site should be addressed earlier for additional characterization, analysis, and remediation.[2] This includes mitigation measures that offset or reduce risk associated with cleanup.

To accomplish the Project's goal, the most recent, available information is gathered, described, and analyzed about hazards (i.e., contaminant inventories, physical chemical forms) and existing environmental contamination within each of the units being evaluated for the Project.

Approximately 60 units composed of geographically co-located sites to the extent possible are identified to be evaluated and rated during the execution of the Project. These units consist of remaining cleanup sites as of October 1, 2015. For each unit evaluated, potential risks to the public, workers, groundwater and the Columbia River, ecological and cultural resources[3] (collectively referred to as" receptors") at the Hanford Site are considered.

The Risk Review Project is being carried out in multiple stages. They are:

- development of a **Methodology** for completion of the risk ratings to receptors;
- submission of an **Interim Progress Report** that provides the results of the first set of 25 units evaluated as well as preliminary observations made from the evaluations completed and ratings of risks to receptors; and
- submission of a **Final Report** that provides both the results of all units evaluated (approximately 60) and recommendations and observations that would help inform sequencing of cleanup.

Since the Project's inception, a Core Team comprised of senior managers from DOE, the Environmental Protection Agency, and State of Washington Departments of Ecology and Health has provided advice to CRESP on the Risk Review Project's development and execution. Subject matter experts from the Pacific Northwest National Laboratory (PNNL) also have provided research, analytical, and other assistance to CRESP.

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[1] In this Risk Review Project, human health and resources evaluated include groundwater and the Columbia River, facility workers, co-located people, the public, and ecological and cultural resources. Collectively, humans and these resources also are referred to as "receptors".

[2] Additionally, while earlier studies have evaluated portions of the Hanford Site, there has never been a comprehensive, site-wide review of the risks to human health and resources from contamination, waste management, and cleanup activities.

[3] Cultural resources are described but not rated.

For the first several months, the primary focus was the development and testing of the methodology to be used to execute the Risk Review Project. The resulting methodology is adapted from prior risk characterization approaches used at Hanford Site and elsewhere and tailored to fit Hanford Site's unique cleanup and waste management activities, diversity of information, and also the goal and specific objectives of the Risk Review Project.

In August 2014, CRESP briefed Core Team members and their staff in detail on the draft methodology document. These briefings took place in Washington, DC and in Richland so that both field and headquarters staff could participate. Comments and feedback were encouraged and all comments received by September 4, 2014 were seriously considered with the vast majority of them being incorporated into a second iteration of the methodology titled "Methodology for the Hanford Site-Wide Risk Review Project Revision A". This is the version that was released for broader public input.

In addition to briefing Core Team members and staff, CRESP made individual presentations on the draft methodology or components of the methodology in late August and early September to the Hanford Advisory Board, Hanford Communities, Tri-Cities Development Corporation, tribal staff (Nez Perce, Umatilla, Wanapum, and Yakama), State of Oregon, and Defense Nuclear Facilities Safety Board. At each of these presentations, CRESP encouraged participants to review the methodology and make comments and/or forward the methodology to others in their organization for review and comment.

The draft methodology was posted on CRESP's website on September 4 for public comment. The comment period ended Friday, October 3, 2014. More than 300 written comments were received from individuals, Tribes, organizations, and governmental entities. This overview document provides a list of the comments received (See Appendix) along with a brief summary of the revisions that have been made to the September 4, 2014 version of the methodology that was made available for public comment.

CRESP also asked two independent experts to review the September 4, 2014 version of the methodology during the comment period. The experts were requested to advise CRESP on whether they consider the methodology's approach to be appropriate for achieving the stated risk review goal and objectives. Both agreed that (1) the approach meets the stated risk review goal and objectives, and (2) their overall impression of the Methodology was very favorable. In addition, they submitted written suggestions for improving the document during the public review period.

CRESP and PNNL spent several weeks reviewing the merits of each comment received to determine whether and, if so, to what extent, it should be incorporated into the methodology that would be used to execute the Risk Review. General comments ranged from questions about the objectives and purpose of the Risk Review Project, to concerns raised about the lack of clarity regarding the risk review approach as articulated in the methodology compared to the regulatory approach being implemented, to suggestions about the need for more discussion about risk assessment, risk characterization, and risk management. Specific comments also were made on various chapters of the methodology. Finally, comments were submitted on the Appendices to the draft methodology (e.g., templates for three of the pilot cases, which were completed (without ratings) and used to test the methodology). They are not addressed as part

of this overview document because of the many revisions made to the relevant sections of the methodology. However, each comment was reviewed and considered.

After the review was completed and the results of the pilot study testing the methodology were studied, the September 4, 2014 version of the methodology was again revised. The Core Team was briefed on the changes made and members offered several suggestions and comments for CRESP's further consideration; representatives from Tribal Nations and the State of Oregon also participated in the briefing. Core Team suggestions led to additional changes to the methodology, as did factual accuracy review comments received from agency staff. Finally, the methodology was revised once again after completion of a technical edit (hereinafter referred to as "final methodology").

The final methodology has been used to evaluate the set of 25 units (total is approximately 60) that are characterized for the first phase of the Risk Review Project. Results of the first set of evaluations are included in the interim progress report together with the completed evaluation templates and observations made on work completed under the Risk Review Project to date.

Written input received on the interim progress report is expected to inform the Risk Review Project's final report. Both the final methodology and interim progress report may be found on CRESP's website (www.CRESP.org/hanford).

This document provides a brief overview of the revisions made to each of the Chapters of the September 4, 2014 version of the methodology. Also included as an Appendix is a list of all written comments (without attribution) received during the public comment period[4]. A response to each comment is not provided. This is because revisions to the methodology are based on many factors and not exclusively on those comments received during the public comment period. Other factors include: lessons learned from the pilot case studies, additional information gathered and analyzed as evaluations have been completed, stakeholder meetings, and Core Team suggestions. So, while individualized responses are not provided, this *Overview of the Revisions Made to the Hanford Site-Wide Risk Review Project Methodology, Rev A, September 4, 2014* document is to summarize key revisions to the Methodology. All comments received were carefully considered, which should be obvious by comparison of the draft Methodology (Sept. 2014) with the Methodology released in August, 2015.[5]

[4] Page numbers referred to in Stakeholder comments are from the document entitled *Methodology For The Hanford Site-Wide Risk Review Project Revision A, September 4, 2014.*

[5]This document should be viewed in tandem with the final methodology posted on CRESP's website.

METHODOLOGY REVISIONS FROM COMMENTS RECEIVED DURING COMMENT PERIOD

METHODOLOGY REVISIONS: EXECUTIVE SUMMARY AND CHAPTER 1. RISK REVIEW PROJECT SCOPE AND EXECUTION

1. Goal stated in Executive Summary clarified to read: The overarching goal of the Risk Review Project is to carry out a screening process for risks and impacts to human health and resources.
2. Specific Objectives stated in Chapter 1 clarified to read:
    a. To review hazards and existing environmental contamination Site-wide and determine the potential for contaminants and cleanup actions to cause risks to receptors, and identify key uncertainties and data gaps;
    b. To provide relative ratings of risks to receptors from hazards and existing environmental contamination, and identify the most urgent risks to be addressed, in order to better enable the Tri-Parties (DOE, EPA, State of Washington) to make decisions on the sequencing of Hanford cleanup activities.
    c. To provide context for understanding how the hazards, existing environmental contamination, current risks and risks posed by cleanup at the Hanford Site compare to existing risks and impacts posed by similar cleanup activities conducted at non-DOE sites located either on-site or nearby, as well as at other non-DOE, large-scale regional sites.
3. Clarified that the risks to receptors will change as cleanup decisions are made (e.g., Risks to people potentially exposed and groundwater resources are important to the urgency and sequencing of specific cleanup, whereas risks and impacts to ecological and cultural resource are important to the selection and execution of cleanup approaches.).
4. Clarified distinctions between inventories of stored waste, including radionuclides and chemicals, contamination within formerly used facilities, and existing environmental contaminants. Distinction made between hazards and risks.
5. Emphasized that Risk Review Project focuses on hazard and risk characterization not on risk management decisions (e.g., Project will not analyze which cleanup option should be selected or the timing of cleanup (for they are management decisions).
6. Emphasized that the Risk Review Project is not a CERCLA risk assessment or a Natural Resources Damage Assessment and is not intended to interpret treaty rights.
7. Updated External Review Process to include information on comments received to September 4, 2014 version of the methodology.
8. Clarified that an overall risk rating is not to be applied to cultural resources; instead information on each evaluation unit (EU) to be gathered, described, and analyzed as a planning tool for future activities.
9. Emphasized that the focus of the "*Methodology for the Hanford Site-Wide Risk Review Project, Rev A September 4, 2014*" is on the elements of the methodology itself, rather than on outcomes of the ratings or binning of risks to receptors.
10. Clarified that the Risk Review Project is not focused on establishing cleanup endpoints, but rather is using existing thresholds as the basis for the evaluation process.
11. Addressed all factual suggestions and added references and qualifications where noted.

METHODOLOGY REVISIONS: CHAPTER 2. AN OVERVIEW OF THE RISK CHARACTERIZATION METHODOLOGY

1. Summarized steps of methodology to ensure consistency with corresponding chapters in Methodology.
2. Removed references to groundwater infiltration and recharge rates; that information to be provided as described in 14 below.
3. Slightly revised Methodology Overview figure for consistency.
4. Expanded list of radionuclides and other contaminants and included their symbols.
5. Added a section entitled "Durability of Institutional Controls" to clarify that the length of time in which institutional controls would be effective is 100 years after the transfer land from federal to non-federal control and that some areas at Hanford Site likely would be under federal control for "very long periods of time".
6. Clarified that where cleanup decisions had not been determined, potential cleanup approaches would be identified for each EU and included as an Appendix.
7. Added that during the Active Cleanup (to 2064) evaluation period, the nuclear safety analysis, which is embodied in the documented safety analysis (DSA) process, including hazards analysis (HA), preliminary DSA, and final DSA, provides (a) a detailed evaluation of external and operational initiating events and scenarios that can result in risks to human health from existing hazards and (b) prevailing conditions, including infiltration and subsurface contaminant transport with groundwater flow.
8. Clarified rationale for including risks and impacts to groundwater stating that groundwater is a protected resource under Washington State and federal regulations.
9. Clarified that land use designations will be realized when the near-term post-cleanup period begins in 2064, so land use will be a factor for consideration in the Risk Review during two evaluation periods: near-term post-cleanup (to 2164) and long-term post-cleanup (to 3064).
10. Clarified that descriptions of land use would refer to environmental impact statement and record of decision rather than CLUP.
11. Clarified that risks to Columbia River include those through contaminant exposure in the riparian zone (through seeps) and benthic zone (through groundwater upwellings).
12. Clarified that to provide a clearer picture of risks associated with a geographical area, certain EUs have multiple sources.
13. Clarified Land Use section to add language that future land use is not a direct factor in the sequencing of cleanup activities, although future land use is important for determining the extent of cleanup (Reference to Environmental Impact Statement rather than CLUP)).
14. Restated and clarified that "unrestricted land use" designation does not apply to areas within the Central Plateau.
15. Restated EPA's land use designations following completion of remedial action as unrestricted uses, restricted uses, and use for long-term waste management.
16. Revised Evaluation Unit Templates section to reflect changes made to the organization of the Templates completed for the Risk Review Project.
17. Addressed all factual suggestions and added references and qualifications where noted.
18. Revised list of primary contaminants (in Section 2.2 entitled "Radionuclides and Other Contaminants Considered") to include additional contaminants (e.g., Cl-36) based on comments and a complete review of all Interim Report EUs.

19. Added Section 2.14 describing the consideration of uncertainty in the Review.
20. Added conceptual site models for each of the five EU source groupings (e.g., Tank Waste and Farms, Legacy Source Sites, and Groundwater).

METHODOLOGY REVISIONS: CHAPTER 3. METHODOLOGY FOR GROUPING CONTAMINANT SOURCES FOR EVALUATION

1. Updated figures, definitions, and references.
2. Clarified to insure that only one possible disposition option under evaluation.
3. Assumed that the cleanup of K Area sites outside the fence will have been completed by the end of FY15 because Risk Review Project is focused on the "to-go" cleanup actions starting in FY16.
4. Used standard DOE terminology when possible. However, this Risk Review Project is not a formal performance assessment and as a result, a formal FEPS analysis has not been for all facilities or activities.
5. Addressed all factual suggestions and added references and qualifications where noted.
6. Updated list of EUs.
7. Added section (3.10) describing Primary Sources.

METHODOLOGY REVISIONS: CHAPTER 4. METHODOLOGY FOR CONSIDERING INITIATING EVENTS USED IN EVALUATIONS

1. Modified title of chapter for consistency throughout Methodology document (see above).
2. Provided explicit instruction to use Initiating Event frequencies and dose consequences from Documented Safety Analysis or Hazards Analysis where they exist (or from other inventory documentation)
3. Combined guidance from the EU specific Initiating Events and Consequences tables into a single generic table.
4. Added additional discussion relative to Severe Natural Hazard Phenomena (NHP) and External Events. Included discussion of site-wide impacts and impacts to regional infrastructure which can result from these events.
5. Provided discussion on Intentional Destructive Acts (IDA).
6. Clarified use of the Initiating Event Frequency to determine a relative risk versus the determination of an absolute risk:
    a. Use of Initiating Events (frequency) for determination of Relative Risk (Point Estimate = I.E. / yr * Consequence)
    b. Use of Initiating Events for determination of Absolute Risk (Probability Density Function = I.E. /yr * Exposure Time (yrs) * Consequence).
7. Added additional discussion on response to severe NPH events with respect to capability and capacity to respond.
8. Added specific discussion on Geomagnetic Disturbance (GMD) events.
9. Revised to clarify to protection actions or repair of barriers is assumed.
10. Added specific callout for Human Intrusion within loss of Institutional Controls.
11. Clarified/added Definition of Co-located Person.

12. Clarified discussion that IE frequencies are for use in a relative risk comparison not for the determination of an absolute risk value.
13. Addressed all factual suggestions and added references and qualifications where noted.

METHODOLOGY REVISIONS: CHAPTER 5. RISKS TO PUBLIC HEALTH ON THE HANFORD SITE AND CHAPTER 6. WORKER SAFETY

Renumbered in Current Methodology and Now Entitled: Chapter 5. Evaluating Risks to Human Health

1. Renumbered Chapter (to 6) to reflect that Chapters 5 and 6 had been combined.
2. Addressed all factual suggestions and added references and qualifications where noted.
3. Clarified categories of human receptors (people present on or adjacent to the Hanford Site), who are defined for evaluation purposes. Those categories include: facility worker; co-located person, controlled access person, and public.
4. Clarified when the categories defined for evaluation purposes are consistent with the Safety Analysis and Risk Assessment Handbook (SARAH and DOE–STD-3009-2014).
5. Used DOE standards where applicable.
6. Revised Table (now 5-2) to better explain dose limits, standards, guidelines, benchmarks and recommendations used.
7. Revised Table (now 5-5) to describe the public risk rating basis for unmitigated design basis events.
8. Revised description of radiation doses and thresholds used relative to human health.

METHODOLOGY REVISIONS: CHAPTER 7. EVALUATING RISKS TO THE COLUMBIA RIVER AND GROUNDWATER

Renumbered in Current Methodology to Chapter 6

1. Renumbered Chapter (to 6) to reflect that Chapters 5 and 6 had been combined.
2. Addressed all factual suggestions and added references and qualifications where noted.
3. Revised text to reflect that groundwater has “multiple personalities” (both as a protected resource and pathway)
4. Grouped EUs and their evaluations based on ability to impact the Columbia River, including River Corridor (RC), Central Plateau (CP) 200-West and CP 200-East. The CP evaluation takes into account recent well data. Our evaluation of potential benthic and riparian zone impacts is consistent with the TC&WM EIS.
5. Revised PC evaluation (including Table 6-1) based on all Interim Report EUs. Noted that *toxicity is implicitly considered in the use of drinking water standards or similar threshold values (BCGs or AWQC).* Note that we used the most mobile form of the PC in the evaluation.
6. Revised and added two figures (Figure 6-5 and 6-6).
7. Used 2013 Hanford Annual Report and TC&WM EIS to evaluate current and future extents of VZ and SZ contamination (based on region – 200-W versus 200-E versus RC); added consideration of discharge types(because drives current extent of contamination and remedial effectiveness where ponds (very high) >> cribs (high) >> trenches (mod) >> tank leaks (low)); added concept of tying source to plume in GW impact framework for evaluation of impacts and revised framework diagrams (Figure 6-8 through Figure 6-11 accordingly). Steps were added to the framework diagrams (Figure 6-9 through Figure 6-11) and used to better describe the framework evaluation.

8. Clarified that Risk Review Project is using a rough-order-of-magnitude basis for evaluating impacts.
9. Revised framework to use BCGs (radionuclides) and AWQC (chemicals) for the evaluation of the riparian and benthic ecology. Also indicated that differences among impacts to the free-flowing river receptors would be insignificant (dilution).
10. Added concept of treatment.
11. Added consideration of higher infiltration rates, where appropriate (gravel covers).
12. Added explanation of Group C contaminants evaluation.
13. Added detailed explanations of how the TC&EIS results were used in the analysis of potential GW and CR impacts. These predictions and current and recent well data are used instead of other modeling assumptions (e.g., ellipsoids)
14. Added consideration of losses of carbon tetrachloride to the atmosphere.
15. Revised demonstration (200-UP-1 OU).
16. Replaced summary tables to be consistent with EU template tables.
17. Added Attachment 6-4 to describe use of Photoshop to estimate relative plume areas, which are used to estimate relative plume volumes.

METHODOLOGY REVISIONS: CHAPTER 8. EVALUATING RISKS TO ECOLOGICAL RESOURCES

Renumbered in Current Methodology to Chapter 7

1. Renumbered Chapter (to 7) to reflect that Chapters 5 and 6 had been combined.
2. Simplified method for evaluation.
3. Included clearer definition of objectives, and what Methodology is not (.e.g., a risk assessment).
4. Included evaluation of risk from contaminants (current status, during cleanup, post-cleanup).
5. Modified field protocol for 2014- 2015 conditions.
6. Modified rationale and methods to be consistent with remediation options for EUs, including physical disruptions and contamination left in place.
7. Incorporated rationale for the evaluation rating.
8. Collected on-site ecological information (Field Data), and conducted Field survey of EU (walk-through where possible) in 2014-15.
9. Added analysis of percent of each ecological resource level in EU, using field data and GIS information.
10. Included data on sensitive species, and sensitive ecological system types.
11. Revised methodology for Ecological Binning for each EU.
12. Expanded consideration of role of contaminants and multiple remediation options.
13. Included and enhanced effects of contaminants during cleanup and “left in place” within the potential remediation options for each EU.
14. Binned potential risks from remediation actions (after field visits for current, during active cleanup and near-term post-cleanup).
15. Did not include a list of species important to the tribes, although any provided by the Tribes would be included. However, a comment was added on the importance of knowing and protecting these species.
16. Added language about the importance and risk to receptors from current contamination.

17. Addressed all factual suggestions and added references and qualifications where noted.

METHODOLOGY REVISIONS: CHAPTER 9. EVALUATING CULTURAL RESOURCES

(Renumbered in Current Methodology to Chapter 8)

1. Renumbered Chapter (to 8) to reflect that Chapters 5 and 6 had been combined.
2. Revised entire Chapter to reflect that an overall risk or impact rating is not to be provided to cultural resources; instead impacts to cultural resources will be described from information gathered on EU in terms of known (documentation reveals resource is present), unknown (uncertainty about presence of resource in documentation); or none (no resource present).
3. Emphasized that federal law requires that a cultural resources review be completed before any project activity may begin, including those associated with remediation, regardless of any rating that may be provided (16 U.S.C. 470 et. seq.; 36 CFR Part 800 2004
4. Restated impacts (expressed as known, unknown, or none) for each of three overlapping cultural resources landscapes: Native American; Pre-Hanford Era (1805 to 1943); and Manhattan Project/Cold War Era (1943-1990).
5. Recognized importance of indirect impacts by showing both direct and indirect impacts (expressed as known, unknown, or none) for each of the three landscapes.
6. Deleted all references to specific locations of cultural resources.
7. Updated provisions regarding the establishment of the Manhattan Project National Historical Park to reflect enactment of legislation in December 2014.
8. Provided more detail on the provisions of the Manhattan Project National Historical Park Act.
9. Clarified and expanded discussion of the steps that comprise the DOE Cultural Resources Review Process that DOE has implemented for all undertakings (projects/activities) at Hanford Site (process is consistent with federal law).
10. Emphasized that required cultural resources reviews for undertakings are carried out consistent with federal statutory requirements.
11. Emphasized that cultural resources may be adversely impacted by the release of contaminants or be further exposed after cleanup has ended.
12. Provided more detail on the literature review conducted for each EU (and within 500 meters of the EU) regarding whether existing DOE and Washington State records reveal the presence of cultural resources, including traditional cultural places.
13. Added a definitions of “direct” and “indirect’ impacts from regulations prescribed under the National Historic Preservation Act 36 CFR 800.5 (2004)).
14. Inserted a reference to the List of Remediation Options document (and where found in Appendix), which identifies what is known about the type of cleanup planned for each EU.
15. Clarified how land use may impact cultural resources after the active cleanup evaluation period ends in 2064.
16. Included as a Table (8-5) the methodology template that details the cultural resources literature review that is to be followed and completed for each EU (See Appendices to Reports for Risk Review Project for the literature review completed for each EU).
17. Addressed all factual suggestions and added references and qualifications where noted.

APPENDIX: LIST OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD (SEPTEMBER 4, 2014 – OCTOBER 3, 2014)

GENERAL COMMENTS

1. The document is well written and each chapter clearly focuses on the title subject. However, it is difficult to achieve a coordinated view of how the chapters relate and come together to accomplish the stated purpose of identifying and characterizing risk.
2. Since "methodology" is stated to be the subject of the document, it would seem that each chapter should have the word methodology in the title and the content of the chapter would be centered on the risk characterization methodology for the stated receptor.
3. Consistent terminology is important for helping the reader capture the flow of the contents. Some terms are not consistently used, e.g., the five contamination sources are referred to as: sources, groupings, and categories in the chapter and elsewhere in the document. Please select one term to use. The entire document should be reviewed for consistent terminology.
4. The methodology is extremely ambitious and an attempt to comprehensively and systematically provide a qualitative assessment of the risks at the Hanford site.
5. The major challenge is getting high resolution of the intended risk measures, given the very broad scope of acute and sub-acute chemical and radiological consequences and the impact of so-called "industrial accidents." The top down approach is sound, but the amount of material being considered in the review is so enormous that it is very difficult to process into clearly understood risk metrics; metrics suitable for cross comparing and prioritizing impacts. For example, it is not clear how the methodology integrates the site-wide impact of the selected 60+ evaluation units to facilitate risk management decision making at the site level.
6. It is suspected that because of the long history at the Hanford areas much is already known about the risks at the individual units. So the task at hand is to a considerable extent a matter of processing results that already exist than applying risk assessment techniques. Thus, the methodology should be strong on information processing capability. Such ordering and organization of risk results should enable efficient focusing on the sources that really drive the risk.
7. While the risk review approach is expansive in terms of metrics, processes, and sources, it is not quantitative in terms of metrics that make it easy to make across the board comparisons. The methodology would be enhanced by a phased approach with each additional phase being more detailed in scope to facilitate screening and exposing the sites warranting more detailed analysis. With each phase and iteration the emphasis on information processing decreases and the emphasis on risk assessment increases. In general, the idea of a phased approach is to expose the sources that are most important to the risk. It enhances the efficiency of the risk assessment. Once at this level, the analysis should be more rigorous than implied by the methodology to account for among other things the uncertainties involved as uncertainty is often the major contributor to risk. Such uncertainties need quantification to enhance the resolution between different options for making a decision on cleanup or remediation actions. The strategy is to put more emphasis on risk assessment of the units and sources within the units representing the greatest contribution to overall site risk.
8. The idea of an interim report on a selected set of evaluation units is a very good approach and should provide guidance on how to proceed with the remaining evaluations.

9. It is believed that the methodology would benefit by giving more emphasis to the scenario approach to risk assessment. Scenarios are an effective way of linking hazards such as radioactive material and toxic chemicals to a desired set of end states.
10. The risk review methodology is vague on both the definition of a consistent set of endstates that facilitate comparing risks and the process of linking the hazards to the endstates. Such endstates are necessary as a basis for making comparisons and the resolution of priorities. The endstates together with initial conditions and initiating events provide the basis for well-defined scenarios representing the risks involved.
11. It is also necessary to have a systematic means of assembling and integrating the individual unit evaluations into area evaluations and then into site-wide evaluations. The material in the slides indicate flow diagrams for processing the risk information, but is lacking in details on assembling the information into forms that facilitate decision making. The fall-out of the individual unit evaluations should be the importance ranking of the contributors to undesired endpoints. The rank order of contributors is the key output of a risk assessment that facilitates the allocation of resources to take corrective actions.
12. On the matter of endpoints and technology requirements for remediation and cleanup, a study was performed by the National Research Council addressing this issue in 1999. The title of the report on this study is, "An End State Methodology for Identifying Technology Needs for Environmental Management, with an Example from the Hanford Site Tanks." The recommended methodology in the NAS study while focusing on the waste tanks was described as having general application on other Hanford sources of radioactive material and waste. It is interesting to note that three members of the NAS committee that performed the study have strong ties with Vanderbilt: Allen Croff, Ray Wymer, and the author of these comments, John Garrick, who served as Chairman.
13. How will the composite risk posed by multiple sites be analyzed on single receptors (including residual risk from sites deemed cleaned up)?
14. Is there a composite analysis of the aggregate impact to receptors based on sequence of clean-up?
15. It is not clear what the project can accomplish. The analyses rely predominantly on existing data provided by the U.S. Department of Energy (DOE) and Pacific Northwest National Laboratory for the Hanford Site. Because Hanford staff are already intimately familiar with this information and have years of experience working on the site, it seems unlikely there will be any significant new insights about identification or relative significance of risks associated with Hanford contaminants and cleanup. Moreover, because the project relies so heavily on Hanford data and on a long-time Hanford contractor, the approach arguably jeopardizes the independence of analyses and results, and makes it less likely that different perceptions of relative risk can emerge. We are also concerned that we have been told Hanford regulators were not in favor of doing this study, as it is unlikely to provide new insights, and is something of a distraction from ongoing work.
16. The concept of "risk" embodied in the plan is very different from the approach to CERCLA risk assessment which has typically been used at Hanford. We and others would benefit from a clear definition of what CRESP means by risk in the context of this project. To a large extent, the focus of analyses seem to be not on the nature and significance of extant risks (i.e., from presence of contaminants), but on the potential negative consequences of cleanup actions. This is especially true for ecological and cultural resources, where there is no evaluation (as far as we can ascertain) of risks from contaminants on the site. The analyses instead seem limited to cleanup

consequences. One potential interpretation of the findings from this approach may be the irrational conclusion that cleanup of the largest, worst waste problems pose the largest risks to the environment, so therefore cleanup of the worst sites should be discouraged. With the exception of groundwater analyses, there seems to be little consideration of risk resulting from the inventory and (potential) migration of contaminants already released to the environment at Hanford.

17. The discussion on page 9 mentions "distinctions amongst different cleanup approaches . . ." If a major goal of this project was to compare different cleanup approaches on some (or all) evaluation units, for the purpose of recommending cleanup approaches that would limit ancillary adverse effects, this would be laudable. Unfortunately, no such evaluation seems to be included in the plan.
18. In conference calls, CRESP staff have stated that although risks are being scored for several receptor categories at each evaluation unit (EU), there appears to be no intent to combine scores for risk categories to assess an overall risk for any evaluation unit. Regardless of how this is stated or caveated in this plan or in products of the assessment, it is probably inevitable that such merging of scores will be done. Consequently, by having several categories that limit consideration to effects of cleanup actions, the aggregate determination of "risk" for any EU will be heavily slanted toward effects of cleanup actions, not on the actual risk posed by materials and conditions of that EU.
19. The assignment of risk ratings across evaluation periods significantly downplays future risk. In the case of the Long-term Post Cleanup period, risk ratings will not even be assigned, ostensibly because of high uncertainty. In our conference call with CRESP staff on September 22, you indicated that the intent was not to downplay future risk, but rather to connote the time frame in which effects would materialize, and to express the urgency of addressing the risk. This is not at all clear in the document. Section 2.6, which describes the evaluation template, does not address this issue at all, nor do any of the display items (figures and tables) that summarize analyses. The final paragraph on page 17 suggests that stated severity of risk is conflated with timing, but this issue is not emphasized. The end result is that risk ranking, relative to time frame, is almost certain to be misinterpreted. On that same call, we proposed that risk should be ranked without regard to time frame, and that "urgency" for action should be addressed separately. This could be done using the evaluation periods already embodied in the plan – a risk that does not materialize until say, 100 years in the future would be ranked low during active cleanup, but would have a higher risk rank during near-term post cleanup.
20. The approach used in the plan often confuses risk with risk management. At sites where DOE intends to leave a substantial inventory of contaminants (radioisotope and/or chemical), land use designations will be industrial or industrial exclusive, and institutional controls will be used to limit human access to and use of such areas. Exposure will be limited, but risk will remain.
21. Risk analyses appear to be predicated on an assumption that planned remedies – pump and treat, in-situ chemical barriers, caps, etc. - will work as planned. In estimating risk, what consideration is given to the fact that these remedies might not be as effective as planned, or that in some cases they might completely fail?
22. The assessment is silent on risks from actions not being taken. As one example, at Hanford, DOE has a responsibility to manage invasive weeds, but that responsibility is not being carried out. The result is an ongoing degradation of ecological (and cultural) resources that will only worsen with time.

23. The plan relies heavily on land uses defined in the Hanford Comprehensive Land Use Plan (CLUP), but that creates a number of concerns. First, the CLUP is a DOE plan – not agreed to by other parties at Hanford, including Benton County. The lack of buy-in from stakeholders reflects a widespread perception that land uses were defined (at least in part) in the CLUP not on the basis of reasonably expected (or appropriate) future lands uses, but as a tool to justify the limited amount of cleanup at many of the most contaminated areas. Second, adherence to the plan will have a finite lifetime (stated as 50 years in the CLUP, but perhaps extending until the 150 year end of active management by DOE) so effective long term risk management based on the CLUP cannot be assumed. In addition, the basis for assessing risk to humans in this plan seems based on land use restrictions and institutional controls, not on inherent risk related to waste inventory/mobility.
24. There does not seem to be any consideration in the plan for risk associated with presence of multiple contaminants, or of aggregate risk from sources in multiple EUs. In addition, CRESP assumes that a second contaminant added to a persistent contaminant plume presents a low risk. This reasoning seems to devalue the added toxic effects of the second contaminant (persistent or not).
25. On page 11, the plan states that "the same end-states associated with the end of the active cleanup period are assumed to be applicable until the year 3064, where reasonable." Uncertainty, for almost every aspect of future conditions encompassed in this assumption, is massive and makes application of this assumption a pointless exercise.
26. Institutional controls are not assumed after 150 years (Table 4.3). Accordingly, it should be assumed that for all locations where analyses assume limited access/exposure based on ICs, risk will increase significantly in the Long-Term Post-cleanup period.
27. The Methodology Overview Presentation contains tables and diagrams which are too small to read. The readable diagrams raise numerous questions (because they are extremely confusing).
28. The Methodology file of 46 MB is too large to download. As a result, it is impossible to make comments on the material you have presented. Perhaps the material should be available on a CD format. I get the impression that CRESP did not want anybody commenting on their material.
29. Last thought: Long term risk will be difficult to ascertain with detailed performance assessments (which have not yet been performed).
30. 1) The direction memorandum states that the purpose of the project is to review existing information and develop a summary level catalogues of risks and impacts (exact language below). It is not clear how developing entirely new analysis fits into a review of existing information:
31. 2) There is not a clear picture of how the CRESP team is going to evaluate the risks and what is different than what has been evaluated in our NEPA and CERCLA analysis. In the summary they talk about how they will bin the risks, but later in the document it appears that they intend to perform significant analysis. Binning risks is akin to what is done in the nuclear safety world in early hazard analysis by qualitatively using professional engineering judgment on applying concepts of low-medium-high consequences and probability of occurrence to various accident scenarios. This is not what is being done here.
32. How will DOE use the results from the CRESP analysis? What if it differs significantly or appreciably from the EIS analysis upon which we based the Tank Closure and Waste Management (TC&WM) Environmental Impact Statement (EIS) Record of Decision (ROD) - Has DOE-EM management thought through this? What protocols or checkpoints are being put into

place by DOE to ensure that the new analysis proposed by CRESP meets DOE's policies, and quality standards?

33. The basis of the review seems to be the statement made that "a comprehensive site-wide review… has never occurred" (excerpt below.) This statement is not entirely correct and we disagree based on the fact that the TC&WM EIS, as part of the settlement agreement to resolve the litigation over the Hanford Site Solid Waste EIS, looked comprehensively at cumulative impacts from the cleanup of Hanford (including those decisions being made in the EIS as well as the impact of the CERCLA cleanups in progress, interim RODs and final ROD, and the TC&WM EIS purpose and need.) It is not clear what the relationship of CRESP's analysis is to the TC&WM EIS cumulative analysis. By EM direction, the EIS cumulative analysis will serve as the basis for the composite analysis for the site under 435.1 and that analysis will be updated after the Integrated Disposal Facility (IDF) and Waste Management Area (WMA) C PA's are done to reflect site specific performance assessment decisions. It seems we are opening up ourselves to having multiple analyses with varying assumptions and likely resulting in multiple results.
34. The plan subdivides or assigns risk to bin their Evaluation Units, i.e. very high, high, medium, low etc. This binning occurs prior to any independently verified analysis, and must rely on a compilation of the preparers' historical Hanford knowledge of risk at Hanford. It seems as though a systematic approach to binning, or perhaps binning them after credible analysis has been run might be a better approach. This methodology plan also coins the term "iconic" for: cesium-137, ioding-129, plutonium, strontium 90, technetium-99, tritium, and carbon tetrachloride, trichloroethylene, chromium, total uranium and nitrate. They also list cyanide as a risk driver, yet not "iconic". Is there a difference between iconic contaminants and all others?
35. Item 2 states that the goal is "to provide relative ranking of risks to receptors from sources in order to provide the Tri-Party agencies to make decisions on a sequence of cleanup activities." Using the example of tanks farms, the report uses T Tank Farm as an example. Decisions have already been made on the end state of the single shell tank (SST) farms (retrieval of waste from SSTs (1997 TWRS ROD), treatment of waste through the Waste Treatment Plant (WTP) (1997 TWRS ROD) and landfill closure (TC&WM EIS ROD). These NEPA decisions are reflected in the TPA both in 1997 as well as in the current TPA and consent decree milestones. From a programmatic perspective many of these decisions and sequence have already been made and the department is in the process of implementing those programmatic decisions.
36. Page 7, Items like SST and DST closure FFTF decisions, LLW and MLLW disposal decisions, use of existing facilities and infrastructure (CWC, Wrap, T plant, 242 evaporator etc.) should be eliminated from evaluation under the flow diagram based on the statement of what the scope of this review is not.
37. Page 31, Section 3.6. FFTF should not be included in the analysis based on the report's statements regarding the scope of the review. A decision was made in the TC&WM EIS ROD to entomb the facility and therefore these activities fall in the not to be reviewed category scope description since decisions have been made through the appropriate NEPA analysis.
38. Table 3-1 Listing of Evaluation Units, Tank Farm units CP TF-1 through CP-TF 9, CP-00-3, CP-OP-10-15 should be eliminated since decisions have been made on the facilities (TC&WM EIS ROD) and these activities fall in the not to be reviewed category scope description since decisions have been made through the appropriate NEPA analysis.
39. The purpose and end use of the CRESP report becomes less clear as the reader gets further into the methodology. The work appears to be mostly an analysis of the impacts that could occur during the remaining cleanup activities. Since these activities are already required under

enforceable milestones, even if not all of the technical details of the final engineering designs have been determined, it is not clear what decisions the report will support.

40. According to CRESP's definitions there is no, and will never be, any public or tribal health risk from accessing contaminated lands or through the use of on-site or off site contaminated natural resources because exposure will always be prevented even after institutional controls fail. Thus, according to the CRESP methodology, human health risk is not a driver of the Hanford cleanup.
41. There may be some ecological impact (this is not the same as risk) during remediation, which is why USDOE is required to revegetate. CRESP says there is no ecological risk from contamination, so ecological risk not a risk driver of the Hanford cleanup.
42. Comment: The use of this document seems aimed at finding reasons not to clean up (e.g., because remediation would impact the ecological or cultural/historic resources.). According to CRESP, there is no present or future human health risk, no ecological risk, and no worker risk other than as a result of accidents, and therefore USDOE cannot use human, ecological, or worker risk to justify cleanup dollars. According to this logic, there is no reason to clean up groundwater because USDOE can simply block access to it, thus preventing exposure. All of these assumptions and conclusions violate the basic principles of CERCLA. Confusion on the Meaning of Risk
43. CRESP is confusing hazard with risk. This confusion is why the prior risk-based budgeting effort failed. Each project first claimed to be very risky and deserving of funding, but the pubic rose up in alarm when they heard project leaders say how risky their projects were. Project leaders quickly recanted and said they were highly hazardous but not risky. CRESP has fallen into the same trap.
44. The risk-based endstates effort also failed because the underlying assumption was that a restrictive land use provided an excuse to avoid setting remedial goals based on the residential farmer. This was unacceptable to the public and to regulators. It set up a condition where perpetual federal ownership and maintenance of institutional controls would be required in order to prevent human contact with natural resources any more intense than recreational visits. CRESP has fallen into the same trap.
45. CRESP has also confused risk with impact. The term "risk" has different meanings for each receptor and these need to be more clearly defined in the document. For example, groundwater "risk" is actually a representation the mechanics of groundwater contamination (i.e. how soon, how much, mobility of PC ,current water quality, and the like) while public health "risk" represents the potential for human exposure to contaminants as a result of defined initiating events. Ecological "risk" in this analysis represents the potential for various remediation actions at current waste sites to impact high-value habitat.
46. The methodology violates basic CERCLA baseline risk assessment guidance. According to CRESP, no exposure is the same as no risk. By this assumption, there is no human health risk from Hanford because all exposure pathways are blocked at present. There will never be future risk because institutional controls will prevent excessive exposure. CRESP will therefore likely conclude that Hanford poses no human health risk.
47. True risk analysis looks at a series of probabilities: the probability of a release, the probability of migration, the probability of exposure, the probability of an adverse health impact, and so on. CRESP arbitrarily sets some of these probabilities at zero, in particular that no exposure = no risk. This would mean that a receptor is a zero risk as a groundwater plumes moves closer and closer, and is not actually at risk until the day that the plume arrives, even if the arrival is

inevitable. The public would be at zero risk the day before the nuclear accident, and dead the next day, no matter what the probability of the nuclear event might have been in the interim. This is simply bad risk practice. Risk is risk. Maybe the event has not occurred, or the impact has not occurred, but the risk still exists as long as the chain of probabilities is intact. Maybe there will be a risk management decision to enact institutional controls to break the chain of probabilities, but that is risk management, not risk assessment. Maybe there will an engineering fix to the facility problem, but that is also risk management, not risk assessment.

48. Despite DOE Order 435. 1which limits evaluation to 1000 years, the contamination at Hanford will remain intrinsically hazardous for tens of thousands of years. The TC&WM EIS showed that some risks do not peak until after 3064; CRESP will ignore these.
49. Reasonably foreseeable land use beyond 50 years includes residential farming and tribal scenarios because this establishes an environmental quality that would support the broadest set of future use options even if actual land use is conservation. The level of risk and cleanliness should support the full range of future land use options; this is not the same as actually allowing residential development. Further, the CRESP assumptions set up a condition where a restrictive land use (e.g., industrial or conservation) could lead to decisions that cleanup is not necessary because the public is largely excluded.
50. Miscellaneous Comments: Different sections were written by different authors with different assumptions, causing inconsistencies. Several of the tables need better explanations of abbreviations and some footnotes are missing. For example, while this reviewer probably agrees with at least part, but probably not all, of Tables 4-3 to 4-7, but I am not sure what all the abbreviations mean.Some of the methodology cannot be evaluated until we see results. For example, all landfills must be assumed to leak or be breached, but we won't know this until we see the report.
51. Cumulative assessment, geographic scope. The report is actually only looking at the impacts from future remediation activities; yet the YN risks remain unacceptably high as a result of current decisions. The stated focus of the project is on risk characterization, which is technically the final step in a risk assessment (not including subsequent risk management decisions). This project, however, is designating separate "evaluation units" within Hanford and falls short of a complete site-wide risk assessment; it should be a cumulative assessment that evaluates all sources, contaminants, and exposure pathways, even including impacts from other stressors (e.g., socio-economic) that may increase (or decrease) risk to the various receptor groups. While risks may not be integrated among receptors, they can be integrated among all areas of the site. For example, exposure to contaminants in groundwater and the Columbia River are additive to (not separate from) upland risks. The Risk Review Project will necessarily focus on where characterization data are available; however, to represent a holistic view, it should be acknowledged that data gaps exist (e.g., some areas with historical airborne contamination have never been investigated).
    a. Risk and impacts to the environment is 'rated or binned according to the magnitude of the potential risk to members of the public, workers and the environment. Risk (aka ELCR) must be calculated or modeled, based on site-specific sampling and characterization. Risk estimates based on ranking of site areas with supposed contaminants or prospective land use hundreds of years into the future, etc are nothing more than guesses.
    b. The Project seems to have equated risk management and risk evaluation as the same process. They are not. To state "An overriding theme of this chapter is that if a person or

a population is not exposed to a hazard, then it is not at risk. " Simply keeping people from using the resource or the area so they are not exposed to a hazard negates the purpose of evaluating public health risks. Again you can't use an IC to assume no risk.

c. There is no evaluation of risks of failure of IC post cleanup in either the 'near-term' (100 years past active cleanup year 2164) or 'long-term' (100-1OOOyears).

d. To have a reliable risk evaluation, the Project should include reviews of the risk assessments for the Hanford site. The Project should also model all scenarios including residential farmer and tribal scenarios. The YN has its own health exposure scenario which should be included in all risk analyses and utilized to set cleanup levels.

52. Institutional controls, temporal scope. The project states that the work will not focus on risk management decisions; however, the premise behind the entire assessment is that risk management decisions are being made and implemented (i.e., considers a "plausible range of cleanup actions"); this includes the assumption of institutional controls into the future, which is counter to the purpose of a baseline risk assessment. Also, it is unclear why public health is only being evaluated for two of three time periods identified for this project; specifically, evaluating risks only until 2164. Evaluating human health for 150 years is insufficient considering that radionuclide contamination, if left at Hanford, will remain active and hazardous for thousands of years, with the potential for human (and ecological) exposure.

53. It is not clear how cumulative impact will be assessed when you try to make analysis of risk and impact assessment on an operable unit/site specific basis.

54. The document does not appear to indicate which data sources will be used for the evaluation. The stakeholders who review this methodology document would be able to point out

55. The document refers to separating human health risks associated with land use of surface soils and near-surface exposure from those resulting from the use of groundwater. This separation is not consistent with regulations that require all pathways be evaluated simultaneously, because receptors are potentially exposed to risks from multiple pathways simultaneously. Also, regulations require that media not cross- contaminate one another. The challenges of evaluating all media simultaneously are experienced by all practitioners, but are not grounds for disparate risk assessments. Please consider that surface soil cleanup may need to be adjusted considering contamination below in groundwater, as the two pathways are additive from the perspective of a human receptor. Some groundwater plumes may persist over hundreds of years, when additional contamination from surface sites reaches groundwater. Additionally, remedial actions for groundwater may need to be adjusted considering contamination arriving from the vadose zone. Complete separation of these pathways may lead to quite questionable results.//The document also does not include tribal land use in the evaluation, and does not consider tribal or subsistence exposure scenarios. Local tribes have been active participants in Hanford risk assessment planning and are highly motivated to see cleanup that is protective of their treaty rights. It is an oversight to disregard their needs for ranking risks. It is very possible that they will be somewhat concerned about this...

56. Page 8, Identification of both Rad and hazardous COPCs: It is unclear why the rationale for picking COPCs is that they are “iconic”. That does not seem like a particularly good rationale in terms of it doesn’t seem focus on COPCs that are more important to a resource area. In addition from a GW perspective the task indicates that it is focusing on timeframes associated with years 2014-2064, 2064-2164, and 2164-3064 the analysis has structured its results so the impacts from tritium, plutonium and Ur will essentially be irrelevant. It is unclear if that is by design or not. Typically NRC and DOE require 10,000 year analysis since long lived less mobile COPCs don’t

peak until much later in the analysis period. Also note that the analysis continues to attach CCl4 with tanks farms activities (Appendix E T tank farm). Carbon tetrachloride is not a COPC associated with the Office of River Protection activities.

57. This repeats a pattern that the Agency for Toxic Substances and Disease Registry (ATSDR) used as a cookie cutter conclusion stating since the public is not allowed on site, there is no public health risk. The CRESP methodology guides the reader to conclude that the most urgent actions to address are acute-event accidents (such as PFP demolition, K-Basin sludge, Cs capsules) and they are already being taken. Therefore, an unknowledgeable reader would be led to assume that Hanford cleanup will be done once a few high hazards are addressed. Then the USDOE could simply put up a fence and walk away, and CRESP's methodology would show little or no risk within the 1000 year timeframe, even if all the tanks leaked.
58. As stated on page iii, ""Rather, the Risk Review Project is limited to considering a plausible range of cleanup actions for different types of contaminant sources to provide a better understanding of the range of potential risks and impacts that may be caused by future cleanup actions.
59. Comment: The overall title of the activity should not be called a site-wide risk assessment; it should be called something more specific, such as ""Risks and Impacts that May Be Caused by Future Cleanup Actions."" With this change a reader would not expect an actual risk evaluation in the CERCLA style, but simply a description of the impacts of remediation activities. Most of our comments are directed at the failure to follow CERCLA guidance, not at the apparent narrower purpose of evaluating remediation-cause impacts.
60. Page ii. ""Yet, while earlier studies have evaluated portions of the Hanford Site, a comprehensive, site-wide review of the risks to human health and resources from contamination, waste management and cleanup activities has never occurred.
61. a. Comment: This statement is not true. Several risk assessments have already been completed for Hanford to address these same issues (c.f. Hanford Remedial Action Environmental Impact Statement, the Tank Waste Remedial System Environmental Impact Statement, and the Tank Closure Environmental Impact Statement). This work is repeating various site-wide risk efforts that have occurred over the past 20 years:
    a. Several EISs (HRA-EIS, TWRS EIS, TC&WM EIS) as well as several PNNL efforts (risk-based budgeting, risk-based endstates). The methodology applied in the previous efforts is directly applicable to the current work and should be revisiting by the CRESP team.
    b. The CRESP team should review the previous Hanford risk assessments and incorporate the methodologies used in those efforts into the current work. Specifically, evaluate the use of the Modular Risk Assessment approach as the basis for determining exposure and risk.
    c. A sentence should be added to the Executive Summary to acknowledge the other risk assessments that have been done for Hanford and explain how this assessment is different or what value it adds to what is already known and already incorporated into milestones.
62. Page 16-17 says ""However, risks to receptors will not be integrated across different receptor types. A final listing of the risk ratings for each of the receptor groups will be provided with the final Risk Review Project Report. For example, a final set of tables will provide the risk rating for each of the 60+ EUs for of the 6 receptors. However, there is no scientifically-accepted method of integrating and normalizing ratings between and among receptors. That is, high risk may mean different things for human health, ecological health, groundwater, and cultural resources.

63. This statement is not true. See Harper, B.L. and Harris, S.G. ""Measuring Risks to Community Health and Quality of Life."" Presented at the 9th ASTM Symposium on Environmental Toxicology and Risk Assessment, Seattle, April 21, 1999 (Paper #6034, Committee E47), published in ""Environmental Toxicology and risk Assessment"" (F Price, K Brix and N Lane, eds.), 2000, pages 195-211."
64. Page 10. Using two recharge rates for the active cleanup period implies a great deal of new modeling, yet the result will be only a H-M-L binning. Which approach is correct? Note that USEPA requires baseline risk assessments with the residential farmer and irrigation for the Records of Decision.
65. Page 10-11. "The presence of residual contaminants in remediated areas and engineered disposal facilities typically is evaluated through performance assessments. As discussed earlier, critical initiating events for the transport of remaining contaminants from closed facilities, the vadose zone, and groundwater is the rate of infiltration or recharge."
    a. Comment: Performance assessments are done for tanks and facilities, but not during the Rl/FS, although methods are comparable.

CHAPTER 1 COMMENTS

1. Vague scope and direction from USDOE lends itself to a subjective risk rating approach. No statistical inference. The Direction Memorandum App. A states “identify and characterize potential risks to the public, workers and environment….inform the efficient use of USDOE EM resources.
2. The primary goal of the Risk Review Project is “to identify and characterize potential risks and impacts to the public, workers, and the environment from current contaminant sources and potential future cleanup efforts at the Hanford Site”. It seems it is a duplication earlier effort made to get qualitative assessments on the impact of human health and the environment from the available data. There are a number of analyses made on the risk assessment to meet the regulatory needs (CERCLA/RCRA) to make decision on clean up at the Hanford Site. We not sure how this qualitative approach is going to help in making decisions where the cleanup is already progressing with a full scale and now at mature state- especially in those areas/sites/OUs where cleanup is moving forward with the final RODs, expanded interim RODS, etc. Please note that almost all the soil sites along the river corridor are virtually cleaned up to an acceptable level through various interim RODS, etc. taking into consideration of its impact to the Human Health and the environment. The objectives of Risk Review project needs to be clearly defined how the qualitative assessments is going to be beneficial in making future decision to clean up the soil and the groundwater in the following two major situations:
3. In areas with huge uncertainty in the nature and extent of contamination (e.g. in the central plateau deep vadose zone)
4. In areas where active remediation has already taken place and progressing with remediation time frame to meet the remedial objectives based on detailed analysis of risk assessment with adequate/(near adequate data) Not sure how conclusions will be defended scientifically. Only basis for credibility of this study is experience of CRESP and PNNL. It is not clear how cumulative impact will be assessed when you try to make analysis of risk and impact assessment on an operable. The authors of this document should consider how the final ratings and potential conclusions will be defended scientifically. Also how does this document fit in and what is its intended use in relation to all the other Hanford risk documentation. One of the goals as stated is to provide the regulators with a common understanding of the risks and impacts cleanup

options may have. Maybe the focus of this document is too broad and a more defensible document comparing cleanup options based on cost and damage assessments. This appears to be a very high level evaluation which applies qualitative methods based on grouping and aggregation (i.e., relative binning of risks), as opposed to quantitative risk assessment methods. As such, the resulting uncertainty is large, limiting the utility of such an evaluation. The document does not appear to indicate which data sources will be used for the evaluation. The stakeholders who review this additional data to consider, but without a list of databases and references it is not possible to suggest additional sources.

5. The primary goal of the Risk Review Project is "to identify and characterize potential risks and impacts to the public, workers, and the environment from current contaminant sources and potential future cleanup efforts at the Hanford Site". It seems it is a duplication earlier effort made to get qualitative assessments on the impact of human health and the environment from the available data. There are a number of analyses made on the risk assessment to meet the regulatory needs (CERCLA/RCRA) to make decision on clean up at the Hanford Site. We not sure how this qualitative approach is going to help in making decisions where the cleanup is already progressing with a full scale and now at mature state- especially in those areas/sites/OUs where cleanup is moving forward with the final RODs, expanded interim RODS, etc. Please note that almost all the soil sites along the river corridor are virtually cleaned up to an acceptable level through various interim RODS, etc. taking into consideration of its impact to the Human Health and the environment. The objectives of Risk Review project needs to be clearly defined how the qualitative assessments is going to be beneficial in making future decision to clean up the soil and the groundwater in the following two major situations:
6. In areas with huge uncertainty in the nature and extent of contamination (e.g. in the central plateau deep vadose zone)
7. In areas where active remediation has already taken place and progressing with remediation time frame to meet the remedial objectives based on detailed analysis of risk assessment with adequate/(near adequate data)
8. Section 1.1,top of page, Bulleted Item 2, text stating: ""To provide relative ratings of risks to receptors from sources, in order to better enable the Tri-Parties {DOE, U.S. Environmental Protection Agency (EPA), and Washington Department of Ecology) to make decisions on the sequencing of Hanford cleanup activities.""
9. Comment: It is difficult to imagine that this qualitative, simplified analysis will provide the Tri-Parties with any new and useful insights into the relative risks associated with the various waste sites and facility at Hanford. It is apparent that the Tri-Parties did not ask for this report and do not need assistance with understanding risks or sequencing activities. However, USDOE-HQ might want a systematic but qualitative overview for its own use, such as to justify budget requests.
10. Comment: The entire analysis has the appearance of being systematic and complete, but it is really a subjective and qualitative analysis with underlying flawed assumptions. The methodology document implies precision and new modeling (especially the vadose and groundwater sections), but it does not appear that there will be any solid risk numbers, just H-M-L judgments.
11. Comment: The CTUIR staff has developed a sound risk assessment methodology for complex sites such as Hanford that has been applied at several risk assessment such as HRA-EIS, TWRS-EIS, Composite Analysis, and recent Tank Closure EIS. The methodology is called Modular Risk Assessment (MRA) and in it each module such as Source, Transport, and Exposure are evaluated

separately then interacted to give risk results that are presented in the form of isopleths (contours) over the entire effected area. For more information on the MRA risk assessment methodology, please contact Department of Science and Engineering at the CTUIR for more information."

12. Section 1.1,Bulleted Item 3, text stating: ""To place the risks posed by the contamination and the cleanup at the Hanford site into context with the risks, remediation, and land uses at other places and sites in the region and the significance of Hanford's unique geography.""
13. Comment: It is not clear how the authors intend to achieve this stated objective since the totality of this analysis is focused on the Hanford site. From Section 2.9 it appears that the document may simply provide a qualitative discussion of Hanford risks within the context of other local and regional sources of contamination and risk. The utility of such a discussion in the context of legally-mandated clean-up is limited and will likely be viewed by the public as an attempt to lay a foundation to later support arguments for not completing clean-up. This latter assertion is also supported by some of the ranking methodologies found in the document. For example, in Table 7-5 the ratings for the impact of a plume to surface water diminish if the Hanford contribution is less than 1% of the total load to the Columbia River. This distinction demonstrates an assumption by the authors that the USDOE can minimize their responsibility for releases if the collective populations upriver are contributing more of the pollutant than Hanford. Again, this has the appearance of an excuse to not complete clean-up. It should also be noted that the distinction that a small contributing fraction means lower risk to the river may not be supported by quantitative risk analysis. Many other factors such as pore water concentrations, contaminant toxicity, the mode of action, and the specific exposure pathways must also be considered in determining the risk to human health and the environment."

CHAPTER 2 COMMENTS

1. Methodology consideration of a post-clean up period of a 1000 years (2064-2164) would seem to have no practical value for informing decision making. I understand that this time horizon is included because of the long half-life of some of the radioactive contaminants.
2. The Evaluation Template appears to be a creation of this project. The template will likely be a major management tool for presenting data and information from this and other projects in a useful format. Its value should perhaps be discussed in more detail here, including consideration of creating a searchable electronic version.
3. The template approach is a good one as long as it is used as a screening tool to enable more detailed analyses to be performed on the greatest sources of risk, which are expected to be but a fraction of the sources that exists at a given unit.
4. Please add another evaluation time (very long-term post closure: beyond 1,000 years). Because of the deep vadose zone and the very low moisture infiltration, travel times through the vadose zone for ”dry” disposal will exceed 1,000 years and will approximate 10,000 years. Calculations published in the 2001 ILAW PA, the groundwater impacts at 10,000 years were ~1,000 times that at 1,000 years (for an infilitration rate of 4.2 mm/yr – now considered to be quite conservative). Latter calculations with an infilitration rate of 0.9 mm/yr (based on a series of measurements at the site of the Integrated Disposal Facility site)show that the expected impact at 1,000 years is over 10 orders of magnitude less than that predicted to occur during the first 10,000 years. By restricting itself to 1,000 years, the methodology is likely to underestimate Hanford impacts.
5. Use of the term “iconic” to describe contaminants seems inappropriate. We appreciate the goal of defining a shorthand term to describe the contaminants of primary concern at Hanford, but iconic does not fit – especially in light of the dictionary definition of an icon as “an object of uncritical devotion.”
6. “all reasonably available land uses at Hanford will have been realized. . .” (p 13). What does this mean?
7. There are pros and cons of aggregating individual waste sites (sources) into evaluation units (EUs). For example, a more streamlined approach may be gained, but specificity and potentially important detail are lost (especially since an individual EU may contain multiple source types)./ Clarify the distinction between risk ratings vs. risk rankings (the figure specifies risk ratings)./
8. It is stated that one of the main reasons (the no.1 item under “why is the review conducted now”) to carry out this task is that “cleanup has proven to be a much more lengthy, complex, technically challenging and expensive undertaking than was envisaged in 1989 when Hanford’s mission shifted from production of weapons material to waste management and cleanup” In this context, I would like to mention that since signing of the TPA in 1989, tri-parties have continuous work on the complexities of the issues by involving nation labs, other federal agencies (USGS, EPA Remedy Review Board, etc.), state agencies, a number of independent expert panels with members of national and international reputes, academia, industries, etc. In this regard, it would be great if this project provides a path forward in the following areas:
    a. Make suggestions for better approach in areas where decision are already made in areas of soil and groundwater clean up to meet any gap of understanding to move further or make better decisions b. Make suggestions/recommendation in those areas where technological gap of understanding exits and need better understanding through

investment in science and technology (waste retrieval/treatment, etc.). Please note that we do agree that we don't have all the information/technology needs to address some of emerging issues.//
List specific Pu isotopes (e.g., Pu-239, 240) and uranium isotopes (e.g., U-233, 234, 235, 238). Also, all U isotopes are radioactive, so U should be listed under radionuclides. The distinction between "primary contaminants" (risk drivers or iconic contaminants) vs. "chemicals of potential concern" (COPCs) is unclear.

b. Per the River Corridor Baseline Risk Assessment (RCBRA) (DOE/RL-2007-21), additional Hanford radionuclides are C-14, Co-60, Eu 152, and Eu-154, while additional Hanford nonrads are Cr+6, Pb, Hg, PCE, and tributyl phosphate. PCBs should also be included (Hermann, 2007), preferably as congeners rather than Aroclors. In addition, decay products (rads) and degradation products (nonrads) might be considered.Hermann, RM. 2007. Polychlorinated biphenyl presence in the Columbia River Corridor. WCH-208, Rev 0, Washington Closure Hanford, Prepared for USDOE, Richland Operations Office. "

9. I don't think it is a realistic expectation to assume 99% removal of waste in every tank. Furthermore, does this refer to 99% of the waste volume in the tanks or 99% of the main constituents that drive the risk in each tank? This can lead to quite different evaluations.
10. Proactive inclusion of a Native American exposure (e.g., CTUIR, Yakama) may be less inflammatory than initial exclusion or…
11. Is this correctly written, or should it say "residential use"? "Unrestricted use" is the default in the state of Washington for cleanup standards for soil. WAC 173-340-740.
12. This should say 221-T which is the T Plant canyon building
13. Tables in this figure will be populated with risk ratings (ranging from "not discernible" to "very high"), as a function of receptor type (i.e., worker, public, ecological, groundwater, Columbia River, cultural), receptor "level" (e.g., for ecological receptors: non-native plants/animals=0, endangered species=5), evaluation unit (i.e., legacy source sites, tank waste/farms, groundwater plumes, D&D of inactive facilities, operating facilities), remedial action (ranging from natural attenuation to excavation), and evaluation time period (active cleanup, near term post-cleanup, long-term post-cleanup).However, it is unclear how these broad risk ratings are ultimately linked to underlying exposure and toxicity of contaminants.
14. Please clarify why economic assets are not evaluated (no separate chapter in Table of Contents), given that other non- biotic resources are assessed (e.g., groundwater, Columbia River, cultural resources). On the other hand, it could be argued that protection of human assets (e.g., cultural and economic resources) requires a different set of methods than are typically applied in risk assessment to protect "humans and the environment."
15. The US Ecology site is in the 200 Area.
16. Explain in greater detail the rationale for evaluating Hanford site risk in relation to the larger geographic and economic region.
17. Typo: "they reach"
18. The report states that the risk review "will not analyze which the cleanup option should be selected or the timing of the cleanup but instead the risk review project will consider a plausible range of cleanup actions for different types of contamination sources to better understand the range of risk that may be caused by future clean up actions". Later in the report there is discussion about use of disposal facilities, tank farm cleanup (or closure), and use of existing storage facilities. Many of these overlap with the scope of the TC&WM EIS which evaluated the

range of cleanup actions the uncertainty associated with those decisions and issued a Record of Decision. Based on the scope of this review as defined by the project objectives , closure of the tank farms, treatment of tank waste, use of existing facilities (CWC, WRAP, and T-plant), disposalof waste at IDF, and FFTF demolition should all be excluded from the report because they are not future decisions (the decisions were made by DOE in the TC&WM EIS ROD published on December 13, 2013) and the range of cleanup actions were already evaluated in the TC&WM EIS alternatives. NEPA requires evaluation of cultural, biological, socioeconomic, transportation, worker health, public health, safety, groundwater etc. so this evaluation seems very repetitive of work already done.

19. Page 9, based on the previous statement of the scope of what this review is and what the review is not; barrier evaluation associated with closure of SSTs, IDF including retrieval of waste and grouting of tanks and ancillary equipment, and FFTF should be eliminated from part of the scope. Evaluation of operations and closure of those facilities included evaluation of differentbarrier options (no barrier, RCRA barrier, Hanford barrier) and barrier degradation timeframes in the TC&WM EIS, and a decision was made and therefore the range of options has already been addressed. ‘
20. Page 10, the report addresses two infiltration rate assumptions of 5 mm/yr and 50 mm/yr for disturbed soil. It is unclear what the rationales for those numbers are.
21. Page 13 Section 2.5, It is unclear what the document is trying to say in paragraph 2 of this section. It appears to imply that since State of Washington Model Toxics Control Act regulations recognize unrestricted and industrial use and the Hanford Comprehensive Land Use EIS recognizes categories other than just those two (industrial, industrial exclusive, R&D, conservation) that somehow this is an area that is an area of risk for the Tri-Parties and needs to be addressed. However other than that statement there is no evidence presented to support more than the implication of a potential issue."
22. Page 19 Section 2.8 Economic Assets. This section implies that this topic has not been evaluated however it was evaluated under the socioeconomic sections of the documents listed in Section2.10 references (page 20) Note the reference section appears to be incomplete; the TWRS EIS, 2008 CLUP SA, State of Washington’s SEPA EIS on US Ecology, Energy Northwest data related to the license renewal, and PNSO’s EAs on their facilities are not listed. Since these are the items listed in the Section to be considered and they were in the TC&WM EIS cumulative impact analysis, as well as having their own NEPA reviews done and associated decisions made on a path forward, the purpose of this section does meet the definition under the CRESP scope about what is to be reviewed. These activities fall in the not to be reviewed category since decisions have been made through the appropriate NEPA/SEPA or NRC licensing process.
23. Page 19, the heading on the row “Excavation”, this use is misleading because excavation could just mean bury in another location on the site, and thus have equal yet delayed environmental consequences. Suggest openly displaying the end state associated with excavation.
24. Page 21—23, Attachment 2.1 Summary of Recommended recharge rates at Hanford, This section represents some technical concerns. Other than a 1999 report on barrier prototypes, it appears to focus on work solely done by PNNL on recharge. Some of the documents listed are ones that due to technical concerns DOE has identified t should not be used, in other cases the list is incomplete in terms of available information on the topic. The CRESP scope should not address infiltration rate uncertainty for SST and DST residuals, ancillary equipment, grout for tanks, closure of SSTs, or IDF. These areas were evaluated and uncertainty in long term recharge rates and infiltration were addressed in the TC&WM EIS Chapter 7 Mitigation and factored into

DOE's decision process when the TC&WM EIS ROD was written. Therefore these activities fall in the not to be reviewed category scope description since decisions have been made through the appropriate NEPA analysis.

25. Page 8, Section 2.3. "Rather, each source (or EU) is evaluated as if cleanup were not to occur for 50 years to provide insights into the risks that may be incurred through delay." a. This statement is not an accurate description of what is evaluated by the CRESP methodology. According to CRESP assumptions, there is no human exposure and no risk during any of the time period other than some potential for accidents as infrastructure degrades. The only exception might be the groundwater section, which considers how new groundwater contamination might affect either clean or contaminated groundwater. However, with the low recharge rates that CRESP assumes, there will likely be no groundwater impacts during any of the evaluation periods.
26. CRESP equates land use (a risk management and resource management decision) with risk assessment. This is incorrect. The CLUP does not trump CERCLA guidance, which is why USEPA ignores the CLUP and why PRGs are based on the reasonably foreseeable residential farmer (although they should actually be based on a tribal RME since this represents the highest reasonably foreseeable exposure) even though residential farming is not a CLUP land use.
27. The CLUP is not a forever document. It is only good for the period of active cleanup, whenever that is, or 50 years after its issuance.
28. Page 10. ""Thenear-term post-cleanup period is for 100 years after cleanup is completed (untilthe year 2164). This period was selected because it is the interval over which institutional controls are assumed to be in effect for land areas no longer maintained underfederal control.""In 2164, but probably before, receptors will be moving across the entire site because the land would not be under federal control and the CLUP would no longer be in effect. Actually, in areas where there are no institutional controls, receptors will have already moved in. Exposure scenarios must be applied everywhere across the entire site using post-remediation inventories and cumulative multi-media exposure pathways.The CLUP is irrelevant once the land is not under federal control. "
29. Unrestricted use refers to UU/UE as the CERCLA requirement, not just to surface use (there is no such thing as unrestricted surface use in regulatory guidance for risk assessment). UU/UE in CERCLA includes groundwater. CRESP must model all scenarios including the residential farmer and the Tribal scenarios.
30. Page 13, Section 2.5. ""For the purposes of the Risk Review Project, it is assumed that allreasonably available land uses at Hanford will have been realized when the near-term post-cleanup period begins or by 2064. This means that land use will be a factor to be considered as part of the evaluation for each EUfor two time periods: near-term post cleanup (until 2164) and long-term post cleanup (until 3064). ""
31. We understand the logic, but it is wrong. Elsewhere there is an assumption that federal ownership stops in 2064 and that institutional controls fail after 2164. This means that land use controls also fail, most likely in 2064 (in fact, they are already failing because public and tribal access is increasing). Therefore, the tribal and residential farmer scenarios should be applied all across the site, including groundwater. You can't have it both ways - either the federal government retains ownership for as long as the COCs remain intrinsically hazardous and can maintain ICs, or ownership goes out of federal hands and ICs fail, land use changes, and all scenarios must be applied. Future communities will not remember where all the hazards are and

maintain the current CLUP map. We know that local counties already want the land for development."

32. Page 13. However, specific exposure scenarios that correspond with the CLUP land use. Categories have not been developed through past Tri-party efforts. The State of Washington currently recognizes only “unrestricted use" and "industrial use" as standard land use designations with established exposure scenarios.
    a. Again, CRESP pays far too much attention to land use, when it is really irrelevant. The reason that the Tri-Party Agencies have not developed a scenario for each prospective CLUP land use is because this would not comply with federal risk assessment guidance. The underlying CRESP assumption seems to be that USDOE HQ does not want to cleanup any more than absolutely necessary based on the faulty assumption that it can keep the Tribes from exercising their treaty rights and keep the public out for the next several thousand years. The probability of this happening is zero."
33. We recommend that CRESP read the CERCLA 5-year review criteria for a proper definition of unrestricted use.
34. Page 13, Section 2.5, text stating: ""The primary land use selected as the basis for assessment of each EU is the EU's land use as defined in the preferred land use alternative under the Comprehensive Land Use Plan {CLUP) {DOE/EIS-0222-F 1999}." Comment: The CLUP clearly states an intended purpose to document the best combination of land uses over a 50-year period. The evaluation currently being conducted extends far beyond 50 years. Political will and social values change with time and the current barriers to certain land uses may not exist in the future. For these reasons, the CRESP evaluation should include the other potential land uses proposed by the collaborating parties that developed the CLUP. These land uses include grazing, farming, and Tribal subsistence use. "
35. Comment: Please find and quote DOE goals relevant to endstate quality of environmental resources. Environmental quality goals are not the same as a generic resource management statements such "DOE will manage land for conservation and mining." There is no actual environmental quality goal in this statement, just an indication of what human activity will not be allowed.
36. Tribal health risk needs a separate section. Page 14 says ""Alimited set of additional alternativeland use scenarios may be considered in response to input received from Tribes and/or the broader set of stakeholders.
    a. ""Comment: Please consider this as that input. If CRESP expects this input, why make the Tribes beg for it?
    b. The CTUIR continues to assert that it maintains treaty rights on Hanford lands and intends to practice hunting and gathering and encampment activities on lands as they are released by the USDOE. For this reason the CTUIR Tribal subsistence exposure scenario should be included in all risk analyses completed for Hanford.
    c. Comment: How will CRESP implement the tribal scenarios? Will new site-wide risk assessment be run? We assume not, since this is a qualitative exercise."
37. Page 11. Risks from Contaminated Near-Surface Soils - the primary pathways are (i} directhuman exposure through land use, (ii) transport to the subsurface and groundwater through infiltration, (iii) contaminant transport through erosion, biotic processes or atmospheric dispersion, (iv) biota exposure and biotic transport, and (v) exposure to cultural resources.

a. This statement implies that groundwater is an exposure pathway, contrary to other sections.

38. Exposure to cultural resources is nonsensical. If CRESP means tribal health risk, then tribal health risk needs to be a section along with public health risk.
39. Receptors, Page 12. "soils or consumption of food grown or harvested from contaminated soils. Potential exposure due to routine excavation or other activities is considered to a depth of 5 m. Groundwater contamination is evaluated separately from other pathways. "a. No; groundwater has to be evaluated wherever there are relevant receptors, not separately. Risk assessments can't simply eliminate one medium using a presumed post-hoc risk management decision based on an assumed continuance of effective ICs.
40. Harvested food requires irrigation. Irrigation means higher recharge rates than assumed in this analysis.
41. Thematic Comments - Grouping of Sources103. Section 2.1. Post-remediation residual inventories are ignored, other than (perhaps) landfill inventories, although the latter are largely unknown. It is not clear how those legacy source sites will be evaluated.
42. How CRESP handle remediation that has not yet occurred, but which will be accomplished in the near term in the River Corridor? This is already required and enforceable, and any impacts to ecological or cultural resources will have to be mitigated and/or partially restored. Thus the ""risk"" from remediation is already being addressed. In cases where there are known human burial sites near remedial sites, Tribes are consulted and a path forward is negotiated.105. On Page 9, different remedial options are mentioned, as if USDOE is trying to reopen past decisions.106. Why use a new subdivision of sites; there are already regulatory Operable Units (OU) that are defined. How are the EUs related to OUs?107. The methodology used in the HRA-EIS and TWRS-EIS mapped the waste and risk to several receptors on the entire Hanford site in the same scale (very high, medium, low, or not discernible). Revisiting those risk assessments would cost less and be more trustworthy.Hanford Site Baseline Risk Assessment Methodology (HSBRAM), DOE/RL-91-45, has a complete categories of scenarios for each type of receptor with well-determined specific methodology. Prior to presenting new grouping or binning categories, please review the HSBRAM.108. Vadose zone inventory is not known but can be estimated. It is the source of much of the risk identified in the TC&WM EIS.109. Section 5.8 describes the steps for evaluating an EU, but is missing a step: a complete EU-specific inventory including VA and GW, for various time periods, including post-remediation residuals.
43. Contaminants of Concern
    a. Section 2.2. Not all COCs are included, but there is no explanation of which ones are not included or what percentage of total risk is accounted for by the subjective selection ofa subset of COCs. This source of uncertainty and an estimate of its impact on the results need to be included in the CRESP analysis.
    b. How will risk drivers and iconic COCs actually be selected?"
44. Groundwater113. Public and tribal health risk must include groundwater according to CERCLA guidance. Without groundwater, the evaluation is deceptive.
45. Page 13, Section 2.5, first paragraph,text stating: ""human health risk... is separate from use of groundwater. This separate consideration is important because (i) cleanup of facilities, surface and near-surface contamination is most frequently a separate effort fromgroundwater remediation, and (ii) treatment or alternate forms of water supply can be provided tofacilitate desired land use when the groundwater within the unit being evaluated is not suitable.""

a. This reviewer understands the logic presented in this statement, but it is not in compliance with regulatory guidance. By CRESP's logic, there is no reason to clean up the groundwater because USDOE could simply block access. However, this ignores the right to drill wells which would clearly start in 2064 when federal control ends, and ignores the permitting process for river withdrawal. It also ignores basic CERCLA risk assessment guidance, which requires a multi-media approach.

CHAPTER 3 COMMENTS

1. The concept seems reasonable in dividing the site into 60 evaluation units with a further division into five source elements that have many common features. This division structure should be followed in the methodology presentation in each chapter.
2. It should be noted that Figures 3-1 and 3-2 are not very legible. Also, the words canyon and vitrification should be added to the list of Terminology and Definitions.
3. Disposal of contaminants, structures and facilities that have no methodology proposals should be grouped into an appendix. It would be helpful to the reader to have the major uncertainties relative to the purpose of this document in a single location for transparency purposes. Note comment in section 2 on page 32: "…the final disposition pathway, schedule and location for off-site disposal is uncertain….".
4. I did not find the Attachment E-1 referred to in section 3.10 Listing of Evaluation Units (see page 38).
5. It seems awkward and confusing to combine risk analysis for source units with associated contamination in soils and the deep vadose zone. Exposure and risk issues are totally different, as are cleanup decisions. It would be much better to separate these areas into different evaluation units.
6. The plan states that once emptied, tanks and ancillary equipment will be grouted and tank farms will be capped. The presumption of this action is premature - final decisions on tank farm closure have not been made and are controversial.
7. On page 36, some tank waste is described as "properly classified as TRU." The accuracy of this assertion is debatable. Regardless, the ability to dispose of this waste at WIPP cannot be assumed, even if the waste is ultimately classified as TRU.
8. The map of the 100-K EU (Figure 3.6) does not include all waste areas at 100-K. How will areas outside the shaded area on Figure 3.6, and wastes/risks associated with those areas be accounted for in the risk assessment?
9. Figure 3-8 needs a legend (colors are different from related figures).
10. The figure says on the top that "11 of the 149 SSTs may contain CH-TRU". I think this information comes from the "white paper" that is referenced on p. E-27. But where is the information to support the information that this is CH rather than RH waste? Based on information in Table E-14 on p. E- 53, one of those tanks, T-104, has about 200 Ci of Cs-137 and 2850 Ci of Sr-90. Those two radionuclides are the constituents for exposure to the workers, and these are high amounts of radionuclides.
11. In this document it would be better to defer the whole issue of CH and RH and only discuss it as potential TRU waste. The discussion about of RH and CH shall be dealt with in the permit modification where the process to retrieve and process this waste is evaluated and in DOE's determinations.
12. The grout vaults are located on the West side of WTP.

13. Page 28, Tank Waste and Farms. This section should not be included in the review based on the report's statements regarding the scope of the review. The factors here were considered, along with the treatment and closure decisions associated with the tank farms in the context of the cumulative impacts at both the Hanford site, surrounding activities (PNNL, US Ecology, Energy Northwest), and management plans for the area. These activities and uncertainty fall in the not to be reviewed category scope description for this review since decisions have been made through the appropriate NEPA analysis. (Discussed in TC&WM EIS Chapter 5, 7, Appendices D, S, Q and U)."
14. Page 31-36, It is unclear the purpose of 3.7 since most of the facilities listed here have a RCRA permit associated with them and the RCRA rules identify how you have to close a TSD. On page 32, paragraph 3 should include in the discussion that ERDF is primarily for CERCLA and IDF is for disposal of RCRA wastes.
15. Page 36, It is unclear why the Direct Feed LAW proposal is mentioned here.
16. This chapter seems rather superficial considering that detailed FEPS reports are produced for all facilities and most activities. FEPS refers to Features, Events, and Processes evaluations done during performance assessments. For a USDOE document, CRESP should use USDOE terminology.
17. Page 45, Section 3.4: What will be assumed for the Tanks inventory (source) and releases (source term). What fraction of source will be processed at the WTP and what fraction will be released into the environment?
18. Page 48, Section 3.6. Does this risk assessment estimate the risk associated with the residual contaminations in each of these facilities? Many contaminates were left in U Canyon cells, the air tunnel,and sand filters after D&D and there will be more added when the final D&D takes place. The residual risk will be significant and should be evaluated.

CHAPTER 4COMMENTS

1. A brief discussion should be added on the source of the assumptions noted in Tables 4-1, 4-2 and 4-3. Are these values unique for the Hanford Site and how were they derived?
2. The methodology seems appropriate, but the ratings could be debated.
3. How does this information factor into the methodology presentation in the receptor chapters?
4. Was terrorism considered in any of the event/likelihood categories in Table 4-3?
5. Likelihood for some events (Table 4.1) should be reconsidered.
6. Occurrence of a 100 year flood is well above 50 percent in a 100 year period. These events should be classed as "anticipated."
7. Likewise, one can (statistically speaking) expect ten 1,000 year floods in a 10,000 year period. The probable occurrence of events greater than the 100 year flood event should be recognized and considered.
8. Occurrence of a Cascadia earthquake is also likely higher than indicated in the plan – given time since the most recent quake and historic recurrence interval, there is probably at least a 50 percent likelihood occurrence in the next 100 years (i.e., shift from "unlikely" to "anticipated.") A Cascadia quake might also trigger dam failure and is likely to trigger extensive and prolonged failures of regional infrastructure and of Hanford facilities. The effects of those events should be factored into risk analysis.

9. Dam failure is listed as extremely unlikely for years 1-150, then unlikely. Actual likelihood is probably much higher – it could be triggered by a Cascadia quake, as noted above. Also, note recent problems with major cracks at Wanapum Dam and the subsequent discovery of serious design problems on dams upstream from Hanford.
10. Oregon Department of Geology and Mineral Industries worked with other State agencies to prepare a series of excellent reports and assessments on the impacts of a rupture of Cascadia. This will occur in the next several centuries and is possibly overdue – now. The impacts are enormous. More than this, the seismic shaking of the subduction zone appears highly likely to couple to the Olympia-Wallowa Lineament which crosses the Hanford site, and which led to the formation of the fold structures and mountains across that part of eastern Washington State. (Poster attached) The key problem with a Cascadia event is the consumption of the entire capability of the nation to respond to it, with the vast majority of response being west of the Cascade Mountains to the Pacific. Little response will be available for areas to the east. Additionally, if as expected the Olympia-Wallowa Lineament couples to the subduction zone fault, there may be large direct impacts at Hanford simultaneously.
11. Carrington events have the potential to be even larger and more damaging at Hanford than a rupture of the Cascadia subduction zone faults. They have the potential to directly destroy most electronic and electrical infrastructure – requiring months to years to replace with no alternate sources available in the interim. [See full comment on Carrington Events submitted by D. Dunning]
12. Footnote “a” should specify “1-100%” (rather than “1%”), if associated with a likelihood between 0.01 and 1.
13. The description of the Long-Term Post-Cleanup time period does not acknowledge that loss of ICs will result in an end to barrier repairs, and efforts to prevent human construction activities will also end. Human construction activities could be the single-most likely and harmful event in the long term.
14. Tables 4.3 through 4.7 indicate that human errors are not applicable in the long term. The long term is the most likely period during which humans will make errors at the site, as a result of a lack of knowledge.
15. Also, the references that were used for the specific assignments in Tables 4.3 through Table 4.7, in the likelihood/impact columns, are not provided though they are needed."
16. Although the likelihood of occurrence and severity of consequence can combine to estimate risk, underlying assumptions of increased contaminant mobility and exposure (as a result of initiating events) need to be described in greater detail in order to more fully characterize risk.
17. Page 60, last topic Ash Fall, with Mt. Saint Helens rumbling, the likelihood might not be extremely unlikely.
18. Page 52. There have been many discussions of what a "facility" is. For safety analysis, the building is the facility, so anyone outside the front door may be exposed. For regulatory purposes the public must be assumed to be anywhere on site with respect to point of exposure. It is incorrect to assume that the public and Tribes are restricted since DOE and the Tribes are working on access mechanisms now.
19. Initiating events. Consideration for ""initiating events"" such as fire, volcanic eruptions, and plane crashes, may be a useful exercise (since risks to receptors would certainly increase from such events); however, presenting the ""likelihood"" of the event seems insufficient compared with a quantitative assessment of the added risk (e.g., what are the risks to receptors without the barriers in place that DOE currently anticipates?).There is no routine worker risk because

worker dose limits will never be exceeded. The only real risk is from a facility accident (explosion, plane crash, earthquake, etc.) before a facility is demolished. Since the public is not allowed on site, there is no public health risk. CRESP's methodology would indicate little or no risk within the 1000 year timeframe; these faulty assumptions could be used to attempt to dismiss tribal treaty rights."

20. This is the time period after ICs have failed and the land is not under federal control, so irrigation must be assumed.
21. Page 52, text stating: ""Liquid waste handling events (Large leaks, miss-transfers) resulting in the release of a hundreds gallons of material. High pressure sprays leaks of high activity waste material.""
    a. a. Comment: Given the structure of the preceding bullet list on Page 52 it would seem that these two sentences are actually two different initiating events.
22. Page 56, Table 4-3: Comment: The consequence of an initiation event has a precise meaning in this analysis and interchanging the words ""consequence"" and ""impact"" in the text creates needless complexity for the reader. Please maintain consistency in the use of the term to describe the variable representing the result of an initiating event.
23. Page 56-57, Table 4-3, Entries for: Explosions, Loss of Institutional Controls, Loss of Engineered Systems, Significant Dam Failure, and Structural Decay.
    a. Comment: All the above are listed with a ""Low"" consequence, yet each has the potential to create offsite impacts. Offsite impacts are listed on Page 52 as having a ""High"" consequence. Please provide the logic behind the individual consequence levels listed in the table. Local stakeholders should be included in the development of Tables 4-3 through 4-7.
24. Page 59-60, Table 4-4, Entries for: Explosions, Loss of Institutional Controls, Plane Crash, and Structural Decay.
    a. Comment: Same comment as above.
25. Page 62-64, Table 4-5, Entries for: Loss of Institutional Controls, Significant Dam Failure, and Sever drought/precipitation.
    a. Comment: Same comment as above.
26. Page 65-67, Table 4-6, Entries for: Fires, Explosions, Loss of Institutional Controls, Loss of Engineered Systems, Significant Dam Failure, Plane Crash, Structural Decay, Winds, Flood, and River Flood.
    a. Comment: Same comment as above.
27. Page 68-70, Table 4-7 Entries for: Explosions, Loss of Institutional Controls, Plane Crash, and Structural Decay.
    a. a. Comment: Same comment as above.

CHAPTER 5 COMMENTS

1. Ground water is not considered as a pathway of exposure in this evaluation. The discussion here needs to be clear regarding whether potential groundwater exposure scenarios mentioned on page 79 are fully discussed in Chapter 7. It is noted that on page 83 of this chapter, the statement is made that "tribal risk assessments are driven by the groundwater consumption pathway".
2. The document makes an assumption that uncontaminated soil to a depth of 15 feet would be protective from direct exposure scenarios. This is a reasonable assumption, however, the methodology for evaluating the vapor intrusion pathway of exposure to volatile substances below 15 feet should be included.
3. This Chapter adequately discusses pathways and routes of exposure that include chronic exposures and "worst case" exposure assumptions. The presentation is consistent with EPA risk assessment methodology for evaluating contaminated air, soil and surface water.
    a. Analyses described in Chapter 5 (risks to public health) raises several serious concerns:
        i. Exposure to groundwater is excluded from analyses
        ii. Text speaks of the "low probability for potential failure of Institutional Controls," even though Chapter 4 assumes no control of ICs after 150 years.
        iii. The section confuses risk assessment/analysis with risk management. It pretty much ignores actual risk and relies on presumed success of risk management (exclusion of the public using land use controls and ICs) to limit exposure. The section accepts the flawed logic that there are not risks to human health because there are ICs when the inverse is actually the case – there are ICs because there are unacceptable risks to human and environmental health.
        iv. The section fails to meaningfully consider risks to the health and lifeways of tribal members.
        v. The section also accepts as fact the DOE determination that there are no Hazard Category 1 nuclear risks at Hanford. Yet there are significant potential risks due to concrete degradation from the cesium and strontium capsules in the Waste Encapsulation Storage Facility. The fact that such a potentially catastrophic risk is not identified reflects badly on the thoroughness of information provided for the risk analysis.
        vi. There is no mention of dietary factors (fish consumption) for tribal members.
4. Page 83 – "Native Tribes expect to use the Hanford Site. . . "(emphasis added). Tribal members have treaty rights to access; perhaps something like "Native Tribes have treaty rights guaranteeing access to the Hanford Site . . ." would be more accurate and respectful.
5. The document describes a 'rough order-of-magnitude rating or binning of potential risks to the public' as a product from the Risk Review Project. However, an accurate ranking will require a systematic approach that is at least semi-quantitative, rather than simply based on the hypotheses of individuals or small guided groups of individuals. A goal should be true objectivity to provide new insight.
6. The intruder scenarios do not represent significant possibilities in the next several hundred years. Humans build roads and structures for businesses, transportation and homes on a regular basis, and these normal activities are not considered as likely intrusion scenarios. Rather, the intruders are seen as renegade well drillers and families climbing fences to get into restricted areas. Within a few centuries it is unlikely that it will be necessary to climb fences to get onto

the site. The vision for intrusion should be in line with common human activities, recognizing uncertainty by looking back a few hundred years at the changes that can occur over that time period.

7. Label first column, “Consequence.”
8. Rather than “residential”, it should say “unrestricted”.
9. However, with MTCA cleanups, the soil to groundwater leaching pathway is typically more restrictive. Also, decoupling groundwater from exposure scenarios (i.e., evaluating groundwater separately in Chapter 7) decreases transparency of this report, since groundwater is generally a common drinking water source for human receptors.
10. Page 73, “Use of groundwater is not included in the risk evaluation because (i) there exists potential for provision of alternate or treated water supply commensurate with the anticipated uses when groundwater quality is inadequate to meet relevant water quality standards, and (ii) risks and impacts to groundwater resources are considered independently of designated land uses because it is considered a protected natural resource by the State of Washington.” The reasons for not using groundwater in this scenario are not self-evident and this type of analysis is inconsistent with analysis typically done in NEPA analysis and DOE O 435.1 analysis.; It appears a strange rationale that the major source of contamination is not being used in the risk evaluation because it is an important resource in the State of Washington. Wells are very typical in this area. This typically is not the way in which risk analysis is approached.
11. Page 78, It is unclear the value of introducing a suburban residential scenario which relies solely on surface water for drinking and what value that is going to provide to the analysis.
12. Page 83, Tribal Scenarios – It is unclear how the Tribal Scenario is going to be used and it is suggested that it be eliminated. As requested by the different tribes, the two mentioned Tribal scenarios have been run to inform the decision maker for CERCLA and NEPA documents on site since about 2006.
13. Page 78. ""use of groundwater for drinking will be restricted until all contaminant levels meetdrinking water standards.""
    a. This statement implies that groundwater is impacted but does not, and never will, pose any human health risk. If this is a valid assumption, why is USDOE spending money to retrieve tanks and treat groundwater that won't reach the Columbia River for centuries?
    b. Access to all groundwater should be assumed for time periods when institutional controls are no longer maintained (post-cleanup). As noted in the document on page 83, the Tribal exposure scenarios are highly sensitive to groundwater use."
14. Page 86, Table 5-7: Entries for ""Consequences"" under the table entry for ""Industrial Exclusive"" land use. a. Table 5-7 presents the near-term post-cleanup public risk ratings for the various land uses designated in the CLUP. Industrial exclusive lands in the CLUP correspond to the central plateau area where long-term storage of waste is planned in perpetuity. Has CRESP considered possible terrorist actions when assigning a ""Moderate"" consequence level? "
15. CRESP further uses the CLUP to claim that all public health receptors are off-site or downriver; again, this is a basic violation of CERCLA methodology for baseline human health risk assessment.
16. Page 73. "There is a direct linkage between future land use options and cleanup levels.""Comment: This is not true statement. The only reasonably foreseeable land use after the federal agencies no longer own Hanford is unrestricted. This land use must include

unrestricted access to the groundwater. The CLUP is a 50 year planning document and does not define all possible future uses in perpetuity."

17. The section should be termed Human Health Risk with subsections for the general public, tribes, and workers.
18. Chapter 5 needs tribal scenarios. Tribes are people, too, and should not be relegated to cultural risks. They have health risks. To arbitrarily eliminate exposure scenarios reflects a basic misunderstanding of risk assessment. Please refer to CERCLA baseline human health risk assessment methodology.
19. Page 73. ""EPA'sRisk Assessment Guideline documents (EPA 2000, 2003) describe the methodsthat agencies and companies should use to evaluate risk and inform decisions about remediation and allowable land uses. In the case of most hazardous waste sites, risk assessments are performed for populations currently living on or adjacent to the contaminated site.
    a. This statement is not true. EPA guidance says that a baseline human health risk assessment evaluates risk from using on-site contaminated resources assuming no institutional controls. It is not limited to current residential locations (i.e., not onHanford)."
20. Page 74. '7here is a reflexive relationship between land use and cleanup. ""Again, this reflects a misunderstanding of EPA baseline risk assessment methods and purpose. CRESP is mixing up baseline risk assessments with risk management which has a more direct relationship with land use controls. However, the 5-year review criterion is UU/UE."
21. Page 74. ""Anoverriding theme of this chapter is that if a person or a population is not exposedto a hazard, then it is not at risk.""This statement is not correct and invalidates the entire underlying premise of evaluating public health risks. If the hazard or contamination exists, then people are precluded from using the resource or area because they are at risk. Precluding people is the same as a health or risk-based IC. Fences do not reduce baseline risk, just exposure."
22. The definition of stealth farming family is rather laughable. Page 75 says ""A stealth intruder might include a thrill-seeker, an anti-anything demonstrator, a saboteur or a hypothetical stealth farmer family (Antonio et al. 2002). A stealth farmer as used by EPA is a family of four that climbs a fence or by-passes access controls, sets up a residence, farms and consumes crops, and potentially spends 365 days a year on the restricted site.""
    a. He also has his children picked up by the school bus, has his mail delivered to his house, votes, and pays his utility bills. This is hardly stealthy.
    b. Also, avoid disparaging terms like anti-anything demonstrator."
23. Page 84, Table 5-6Numerous exposure pathways are missing from this table. Missing pathways include but are not limited to incidental soil ingestion by adults, dust inhalation, bathing, direct dermal contact to soil, consumption of game that has been raised in the contaminated lands, and consumption of Columbia River fish."
24. Table S-1. Add tribal risk.
25. Table S-2. This table is inappropriate for human health risks. The federal risk limit is lE-4, with all COCs and all pathways included. Anything higher requires remedial action. No exception. If CRESP means that the numbers in the table are not actual risk levels, but only an event probability, then the units need to be changed."

26. SO. Table S-3 and Exposure Scenarios (Page 78 and following).CRESP gives example of pathways and routes of exposure but the list is not complete.
    a. Sl. The entire section discussing EPA land use scenarios is irrelevant and should be omitted. EPA has no exposure scenarios that are dependent on a pre-determination of land use. Land use is ephemeral and can change at any moment.
    b. S2. Page 78. There are also no access zones, sometimes disparagingly referred to as sacrificezones.Please don't use the judgmental term 'disparagingly.' These are sacrifice zones in reality.
    c. S3. Section S.6 is irrelevant and should be eliminated.
    d. S4. Section S.7. This section summarizes the 300 Area Rl/FS. It says that tribal risks were evaluated but there is no summary of tribal risks as there is for the other scenarios. This is a rather blatant omission. Please add a summary of tribal risk.
    e. SS. If Table S-S refers to the 300 Area Rl/FS, it disagrees with the CRESP statement that groundwater is not used and therefore poses no risk. Table S-S does include groundwater usage. Why?
    f. S6. Tribal scenarios are described, then dismissed. This is unacceptable and incorrect.
    g. S7. Unrestricted use is considered to be equivalent to the residential farmer. Again, this is CRESPS's assertion, but it ignores tribal risk as the true RME.
    h. S8. Table S-6 (tribal exposure pathways) is on the one hand incomplete, but on the other hand includes groundwater which CRESP says is not considered.
    i. S9. Page 8S. ""Although access to the 200 Area is well-controlled, an authorized visitor once inside the gate, might wander away from or elude escorts to enter a high hazard area; this likelihood is ""unlikely.
        i. The concept of using proximity to roads as the only measure of likelihood of land use is wrong. Risks exists wherever contamination is or may be present, regardless of whether there happens to be a road nearby at present. Roads can go anywhere or new roads can be built. Complete access must be assumed when remediation is complete."
27. Table 5-1: missing tribal risk.
28. Table 5-2: clarify intent of use of table; to assign this same likelihood to the public would be incorrect application. Are these actual risk levels? If so, the federal risk range isl X l0-4 to lX l0-6 and RCRA risk ranges are lX l0-6 for individual contaminant or l X l0-5 for multiple contaminants. Once these ranges are exceeded, qualification by impacts disappears and remediation is required.
29. Table 5-3: Incomplete. Note: EPA does not have land use scenarios but some human scenarios. Also, long-term disposal sites or on-site permanent disposal sites are in reality sacrifice zones. Suggest deletion of this sentence or proper identification as sacrifice zones.
30. Table 5-6: missing numerous pathways: incidental soil ingestion by adults, dust inhalation, bathing, direct dermal contact to soil, consumption of game that has been raised in the contaminated lands, and consumption of Columbia River fish.
    a. No discussion of tribal risks in summary of 300 Area RI/FS. Please include. The Project ignores tribal risk as the true RME (see EPA's Columbia River Fish Contaminant Survey).
31. This is a subjective categorization of existing workscope for the Hanford site (aka-legacy source sites, tank wastes & tank farms, groundwater plumes, D-4 of facilities, Operating Units). Some

examples of areas not included as evaluation units which pose risk PFP, K- basin sludge, Cesium capsules, IDF and interim HWL storage facilities, USEcology, and the Reactor removals and their groundwater plumes.

32. Land use assumptions. It is not appropriate to assess risks based on land use designations implied in a document with which the Yakama Nation does not agree (the CLUP). As noted in Section 5.6, the CLUP neglects tribal uses in any areas of the Hanford Site. Also, some land use designations include institutional controls, which is a risk management action that should not be assumed at this point in the assessment. DOE's land use assumptions must be updated and include tribal uses. The Yakama Nation does not want to continue to visit cultural sites ""with DOE approval,"" as stated in Section 5.3, into the future.
    a. Based on currently designated land uses for the Hanford site and nearby lands without consideration of Treaty Rights or the reasonable foreseeable use of the resources. The only reasonably foreseeable land use after the federal agencies no longer own Hanford is unrestricted (multi-media including groundwater) use, not the CLUP designations.
    b. While stating that the Project does not focus on risk management decisions and recommendations should be prospective in nature,it does consider ""a plausible range of cleanup actions. This statement is contradictory to the established legal Superfund/RCRA process. Cleanup actions are the result of decisions. These decisions are based on legal obligations, regulations/laws. It is unclear what decisions the report will support.
33. The only human health risk that remains is that arising from a facility accident (explosion, plane crash, earthquake, etc.) before, during, and after remediation (Sections 5 and 6).
34. Tribal human health risk is ignored in this methodology, even though CTUIR asserts that it is one of the Reasonable Maximum Exposure (RME) scenarios that are relevant and applicable at Hanford. It is insulting to lump tribal health into a cultural resource section and then dismiss all tribal health risks. Tribes are people, and their human health needs a separate section following the public health section and before the worker health section.

CHAPTER 6 COMMENTS (RENUMBERED IN CURRENT METHODOLOGY TO CHAPTER 5)

1. This chapter presents a methodology for linking the assessment of worker risk and information in the Evaluation Templates. This is a good example of coordination of information within the document as mentioned above. The rating of the three types of risk to remedial activity offers a thoughtful matrix. However, the assigned risk level assumptions may be worthy of further evaluation.
2. There is no mention of occupational exposure to beryllium, or of asbestos exposure as a concern for worker health and safety in Section 6.
3. The reference by Applegate and Wesloh (1998) does not seem to appear in the text. A relevant article on the transfer of risk from hypothetical populations to real workers is the following: Church, BW. 2000. The unacknowledged transfer of risk. ESPR 2:79-84.
4. Since USDOE will not let any worker approach his or her occupational radiation dose limit, how can workers ever be at risk other than due to accidents?
5. CRESP indicates that cleanup is complete by the end of 2064 and that institutional controls (ICs) will be maintained until 2164. The CTUIR DOSE staff does not believe that institutional controls (ICs) will last until 2164, or even much beyond 2064.

6. Comments on Chapter 6 (Worker Safety). This section is more straightforward and less contorted than the human health section. No comment."

CHAPTER 7 COMMENTS (RENUMBERED IN CURRENT METHODOLOGY TO CHAPTER 6)

1. The geology and hydrogeology at the Hanford site is extremely complex. Boreholes, well data, subsurface zone estimates and mathematical modeling have and are being used to obtain reasonable estimates of contaminant movement toward the Columbia River. These methodologies provide data for developing mathematical models to predict extent and rate of movement of contaminants present on the site. This chapter evaluates groundwater movement at the Evaluation Unit level and focuses on primary contaminants. A 24-step framework methodology is presented for characterizing groundwater in an Evaluation Unit. The framework provides a rather comprehensive list of the steps involved. Many steps by the nature of this complex environment include estimates of factors and uncertainties. Therefore, predictions of time, concentration and contaminant type for impacts on the Columbia River are highly uncertain. The methodology presented is reasonable and does acknowledge the uncertainties.
2. A demonstration usage of the framework is presented for two radioactive contaminants for the B Complex location. The demonstration information and data are rather complex. A presentation of a summary of the benefit and conclusions derived from this demonstration would be helpful.
3. The source of drinking water for the City of Pasco is the Columbia River. Threats to the quality of the water in the Columbia are paramount for prioritization of cleanup efforts and resources.
4. The assumption that barriers will be effective in isolating contaminants in soil is based on a presumption that water in the vadose zone moves predominantly (entirely) in a vertical, downward direction. In the complex heterogeneous soils of Hanford, this is not realistic. Accordingly, assumptions of the long-term effectiveness of barriers, and associated risk of contaminant mobility, are optimistic.
5. The plan assumes caps/barriers on waste sites will function as planned for at least 50 years, and that infiltration into caps will be very low (e.g., page 10). There is not long-term data to support this optimistic view. To the contrary, the history of caps has suggested physical degradation and vegetation penetration into caps is common. Moreover, continuing success of caps at Hanford is predicated on continuing application of herbicides (or mechanical removal) to prevent penetration of caps by deep-rooted shrubs. Long-term success of such caps is unlikely; projected infiltration rates should be increased in recognition of the likely failure.
6. The groundwater section seems to dismiss potential risks to biota in the substrate of the Columbia River (page 103), based on a single citation that predates documentation of significant contaminant upwelling from Hanford sources.
7. Section 7.2 states that “lower risk ratings are given if the load from the EU source is less than 1 percent of the total load to the Columbia River from all sources.” This approach is technically unsound for two reasons. First, it fails to consider aggregate loading from all Hanford EUs. Second and more important, it ignores the widely documented impacts of Hanford releases that cause localized contamination in groundwater plumes and in water (and sometimes biota) in the Columbia River at Hanford. There is chromium at several reactors, strontium 90 at 100-N, and uranium at the 300 Area. DOE has used this argument in the past (Hanford releases are a small portion of total loadings for some contaminants and are therefore unimportant), but the occurrence of other sources to the river does not exonerate DOE of responsibility for its releases

and their effects. Decisions about cleanup (and risk) at Hanford need to be driven by whether contaminant concentrations exceed standards defined in laws and regulations.

8. Use of Kd's for modeling uranium mobility is inappropriate, as discussed on our September 22 conference call. Kd is treated as a constant, but DOE and PNNL documents report "Kds" for uranium that vary by orders of magnitude in Hanford soils, and that vary as a function of things like pH and carbonate concentration. Absent better characterization of controls on concentration, Kd can be a reasonable and useful approximation, but for uranium at Hanford, it is clearly not the case. Saturation with respect to a mineral phase is a much better predictor.
9. CRESP assumes that the Hanford groundwater will not be available for drinking until all contaminant levels meet drinking water standards – therefore it assumes no risk from groundwater. Following federal control of the site, it seems reasonable to assume that the groundwater will be used. In addition, the draft methodology states that "treatment or alternate forms of water supply can be provided to facilitate desired land use when groundwater…is not suitable." All water – both groundwater (outside of Hanford) and surface water of the Columbia River Basin, is currently allocated. It seems unlikely that in 75 or more years that there wouldn't be even more demands on this limited resource and the Hanford groundwater would be much sought after as a resource.
10. The CRESP draft methodology states that infiltration below the planned barriers at Hanford would have an averaged value of 5mm per year. The measured infiltration below the Hanford Barrier, a multi-layer complex component barrier, exceeded this number by 2 or 3 times. However, the planned barrier that is being considered now at Hanford is the standard Evapotranspiration Barrier, which is basically a thicker mono-layer of graded soil. This barrier is designed to absorb water and slowly release it back to the environment. In the Barrier Workshop held in the Tri-Cities in 2012, many experts from around the country gathered for this meeting admitted that these barriers passed much more water (5-10 inches of infiltration) under semi-arid, episodic conditions (like Hanford) because of their limited storage. The risk evaluation for facilities and waste sites using barriers for closure should present a higher risk value due to this fact.
11. Uranium exhibits a broad chemistry dependent variation in apparent distribution coefficients which is a highly variable function of pE, pH, carbonate (and other oxo species), and other factors. The reported kd's vary across five orders of magnitude. This appears confusing until the solubility of various species and the chemistry is considered. Uranium (as well as all of the elements from Thorium to Plutonium) form actinyl cores (UO_2) that tend to associate with oxo species wrapped in a plain around the central atom (e.g. $UO_2(CO_3)_3$ tetra-anon). Carbonate, hydroxide and water are the most common species to fill the equatorial positions. However, nitrate, nitrite, sulfate, phosphate, silicate and many others will as well. Large moieties (like sulfate) are sterically hindered and tend to fill four or five oxygen positions. ... [See full comment on U Chemistry submitted by D. Dunning]
12. Text specifies EPA drinking water standards for contaminants in groundwater but does not mention MTCA Method B groundwater standards. Similarly, text specifies state water quality standards for surface water (WAC 173-201A) for contaminants in surface water but does not include federal criteria from the Clean Water Act (CWA) and National Toxics Rule (NTR). Also, USDOE Biota Concentration Guides (BCGs) are not specified for rads in water and sediment for eco receptors.
13. Figure 7-11 contains a "benthic threshold" decision diamond but no "free-flowing concentration threshold" decision diamond. Since text specifies both types of thresholds (abstract of Chapter 7

and Section 7.2) as evaluation metrics for the Columbia River, please clarify why the "free-flowing concentration threshold" is absent in the figure (given that risk to the Columbia River can presumably occur in both benthic and free-flowing components of the river and trophic relationships often include receptors in both of these components). //I don't think it is correct to say that Tc-99 originate only from Hanford EU sources. Tc-99 is a common decay product from nuclear medicine procedures with millions of procedures performed every year. As Tc-99 has a short biological half-life (60 hours) and high mobility in aqueous solutions, it is released into many public water ways such as the Columbia River. The latest Hanford Environmental Report (DOE/RL- 2013-18, Rev 0) does show that Tc-99 is detectable in the river water even above the Hanford Site, and the data seems to indicate some addition of Tc-99 from the site at least some years.// Although entitled "Evaluating Risks to Ecological Resources," this chapter appears to be more of a primer on landscape ecology (e.g., patch and connectivity features), a summary of ecological resources at the Hanford Site (e.g., habitats, species of concern), and a description of a field assessment (but with no contaminant data analysis) than an evaluation of eco risk.// When risk is evaluated, the emphasis is more on risk from remedial action, rather than on risk from site contaminants. While risk from remedial action is noteworthy, risk from site contaminants should be the major focus when evaluating ecorisk at the Hanford Site.//Re ecological resources, comparison of the Hanford Site vs. Columbia Basin Ecoregion may not be particularly useful, given that off-site development has diminished ecological resources in the larger ecoregion. That is, both areas have unique perturbations (e.g., Hanford contamination vs. ecoregion development) that may confound comparison.//section 8.6-table 8-9 Re "Conservation (mining)" land use, risk is rated as "Moderate to high" (Table 8-9), but text describes risk as low for conservation areas. Please //Table 8-6, 8-8 No references have been cited for the ecological effects that are listed in the table. The basis for the effects is not clear. // Table 8-8. The impact of drought on ecological resources may be underestimated. Drought may select for drought-tolerant species, but may still result in loss of important species (such as shrubs) on evapotranspiration barriers and revegetated waste sites. The outcome may be increased wind erosion and sand migration, and more fires, which may also result in increased wind erosion and sand migration. If droughts develop mainly during the growing seasons (the summers) and destroy shrubs on covers, winter precipitation may be more effective at percolating below the rooting zone toward buried waste.

14. Page 100 Chapter 7 – It is unclear the purpose of Chapter 7. The evaluation metrics are to discuss what has impacted GW over the three time periods (50 years, 100 years and 1000 years). It is not clear what is being added to the existing evaluations. The past discharges from the site are already reflected in the current groundwater contamination. Impacts from decisions being made today generally show up in the later timeframes than what is being evaluated here. Once the scope of Chapter 7 is determined (if it is not deleted), a detailed review of the information presented needs to be done since it is unclear how the study metrics on pages 113-123 will further inform DOE, based on what we have already evaluated."
15. Page 128-129, The report appears to take a sensitivity analysis done in Appendix N, which was only performed to demonstrate the influence of travel time and recharge rate, and therefore contains some simplified assumptions (recharge rate was constant, uniform across the study area, and soil layers and uniform and of constant thickness). The author of this section appears to take this simplified analysis and applies this to the B complex and the T tank farms and is going to draw conclusions, however the simplified assumptions are not valid for the study area. Chapter 7 of the TC&WM EIS draws some conclusions about mitigation of tank farms and other

sites but does it with the calibrated EIS GW models to draw the conclusions, not extrapolations from one analysis.

16. Footnote 21, It is unclear what footnote 21 refers to.
17. There is no routine worker risk because worker dose limits will never be exceeded.
18. The probability of adding new risk to groundwater is minimized in this analysis because of the assumptions being applied. In particular, the recharge rate is on the low end of previous estimates, no irrigation is assumed, and adding more contamination to existing plumes does not add much "risk" (See Tables 7-2 to 7-4).
19. The goal of the project as stated in the 16 January 2014 Hanford Site-Wide Risk Review Project Direction Memorandum was to identify and characterize potential risks and impacts to the public, workers, and the environmental at the Hanford Site and to inform the efficient use of Department of Energy (DOE) environmental Management {EM) resources.""Comment: In other words, the analysis would identify risks with sufficient clarity to allow decisions to prioritize clean-up activities (even though these decisions have already been made and incorporated into enforceable milestones). The methodology, however, relies on so many simplifying assumptions and subjective value judgments that the final result will be difficult to support and defend. The following is a partial list of simplifying assumptions and value judgments that are ingrained in this assessment methodology:
    a. Human health risks do not include the cumulative impacts of all sources of exposure. Specifically, groundwater is not included as source of contamination to the public receptor (Page 12, 4th paragraph).
    b. Several statements imply a great deal of new risk modeling (e.g., tribal scenarios will be run, recharge rates will be modeled, vadose zone transport will be evaluated). But the overall methodology is a subjective H-M-L ranking.
    c. The impact to the groundwater receptor is evaluated independently for each evaluation unit (EU), and cumulative impacts of multiple EUs are ignored (Figure 7-8).
    d. Movement of contaminants in the vadose zone and the groundwater plumes are going to be modeled using a highly simplified approach that relies on assumptions such as a constant linear velocity for the MCL front of the plume (Page 142-143) and a static plume geometry (Page 141). Note that key risk decisions are based on the size of the plume and time contaminants reach certain locations, not on toxicity.
    e. A single worst case source and contaminant is selected to reflect the impact of an EU on groundwater and the Columbia River. Thus, an EU with multiple ""medium"" risk contaminants (only one of which will be selected to represent the EU) will be ranked lower than an EU with one ""high"" risk contaminant (Page 119, 1st paragraph).
    f. Our impression is that the potential impact ranking of initiating events are biased low (c.f. Table 4-3 and related comments presented below).
    g. CRESP's value judgments are applied to create decision points that unnecessarily force priority rankings (Pages 119-121).
    h. CRESP asserts that there is no risk to the groundwater and Columbia River receptors until a contaminant reaches its regulatory threshold. Low concentration discharges and cumulative risks are ignored.
20. Groundwater is sometimes considered an exposure pathway and in other sections it doesn't appear to have any given risk as it is assumed that DOE will always prevent it (i.e. use of ICs).

Where there are potential receptors (harvested foods), groundwater evaluation must be done concurrently. Recharge rates must likewise be adjusted.

a. The Columbia River is not the only receptor location. Risks to people from groundwater use need to be mapped across the entire site, not just along the river or in the river.
b. Flow diagram for evaluating risks to groundwater and the Columbia River appears to be based on the Primary Contaminant Groups matrix table. Some primary contaminants are given higher ratings as other primary contaminants have natural or offsite sources. It is irrelevant whether a contaminant is already in the river (Cr or U). Consideration of the fraction of contaminant load into the Columbia River against other contaminate source within the risk evaluation is unwarranted. DOE EM is legally obligated to remediate the Hanford site regardless of the surrounding site contributions to the Columbia River. Risk load from Hanford should be considered independently first and then the total load in the river considered to see if the Hanford addition pushes any contaminant or multiple contaminant risks over any threshold.
c. Primary Contaminant Groups table is not representative of all contaminants on the Site and category of mobility does not reflect site-specific differences of Kd values which contribute to risk in varying degrees. True risk impacts (and the combination of impacts of other units) will not be identified as these other COCs are ignored.
d. Remediation of groundwater plumes should be wholelistic with consideration of all upgradient and associate Reactor plumes, and the Columbia River. Risks to the river are inherently linked with Hanford site. Groundwater is separated from the soils. Groundwater risk must always be considered in conjunction with any soiVvadose zone cleanup response and associated risks. No action response for soil/vadose zone may disproportionately increase risk in the groundwater.
e. No defined benthic thresholds.
f. There is nothing indicating consideration of reduction of site risks through preventative or enhanced treatment.
g. Why are groundwater COCs evaluated for mobility and persistence and not toxicity? How was persistence determined?

21. The amount of detail provided in this section implies that a great deal of new modeling will be done.
22. We should note that the plume maps only show concentrations down to individual MCLs. Drawing plumes based on risk levels, both singly and in combination with other contaminants, would indicate a much larger area of excess risk.
23. Page 118, second paragraph, text stating: ""In this review, groundwater or the Columbia River is considered impacted when a primary contaminant concentration exceeds a given threshold value.""
    a. The true risk impacts of an EU, as well as the combined impacts of multiple EUs, will not be captured with this approach since the cumulative impacts of multiple low-concentration contaminants are ignored.
    b. This methodology should be revised to assign an impact to any contaminant that reaches the groundwater or the Columbia River even if the concentrations are below the regulatory limits. Furthermore, the aggregate impacts of multiple contaminants should be included in the analysis.

24. Page 121. ""If the primary contaminant does not impact the Columbia River during the Long-term Post-Cleanup evaluation period, the not-discernible (ND) rating will be assigned.11
    a. The Columbia River is not the only receptor location. Risks to people from groundwater use needs to be mapped across the entire site, including the shoreline, not just in [a boat on] the river.
25. The Hanford Natural Resource Trustee Council is working on benthic thresholds, but is only partway through that exercise. Figure 7-1 is dependent on knowing benthic thresholds, but CRESP does not have them. How does CRESP propose to estimate benthic thresholds?
26. Page 118. Groundwater COCs (actually, a subset of COCs) are evaluated for mobility and persistence, but not toxicity. Why?
27. The text does not really define how persistence was determined.
28. CRESP should acknowledge that the Kd values for the soils at Hanford are a controversial issue.
29. Page 118. ""For the purposes of this Hanford Site-Wide Review, the primary contaminants Cs-137,Sr-90, Tc-99, 1-129 are given the highest ratings because they originate only from Hanford EU sources. For the other primary contaminants, which have other natural or offsite sources, lower risk ratings are given if the load from the EU source is less than 1% of the total load to the Columbia River from all sources.""
    a. It is irrelevant whether a contaminant (such as Cr or U) is already in the river from other sources. The total risk as load from Hanford must be considered independently first, and then the total load within the river must be considered to see if the Hanford addition pushes single or multi-contaminant risks over a threshold.
30. Tables 7-2, 7-3, 7-4, Case 1. If the groundwater has not been impacted, there cannot be an existing plume, so there should be N/A in each table.
31. Tables 7-2, 7-3, 7-4. We disagree with the assumption that if a plume is already persistent, it is a low risk to add more contamination to it. Where is the total toxicity considered?
32. Page 127. ""Contaminants that were deemed not to lead to groundwater concentrations above the MCL within 12,000 years were not listed.11
    a. a. CRESP is only evaluating impacts for 1000 years (incorrectly), so why is a 12,000 time frame mentioned? Where is CRESP getting its information about MCLs in 12,000 years?
33. Table 7-6. Is the DWS factor a multiple of a drinking water standard? What is the source of the recent plume data that is indicated as red text?
34. Table 7-7. Most of these contaminants are not on CRESP's list of iconic contaminants or risk drivers, so why include them in the table?
35. Page 131. The default-attenuation factor of 20 should be revisited for Hanford, given the large plumes that do not show dilution over many square miles.
36. Page 119, second paragraph, text stating: '7he steps for determining a risk rating basis forimpact to groundwater are outlined in the flowchart in Figure 7-10.""
    a. a. Figure 7-10 details a hierarchy for evaluating the relative risk of a contaminant to groundwater that is based on the project team's value judgment on what constitutes a ""risk"". The figure highlights a fundamental flaw in this analysis. Namely, that the value set of the authors, which is imbedded in the analysis, is subjective and is not necessarily representative of the values of the people who are going to be impacted by Hanford contamination. For example, the authors assume that contamination of previously uncontaminated groundwater represents a higher ""risk"" than adding contamination to

already contaminated groundwater. What is the basis for this assertion? It is not driven by the total toxicity associated with the contamination nor is it a reflection of the probability of exposure of human or ecological receptors. Rather, the assertion is a value judgment that assumes already contaminated water has a lower value than uncontaminated waters. The distinction establishes the false premise that we make a choice between the two cases. There is no choice, however, for future users of the water. Both are equally unacceptable.

b. Similar statements about the presence of subject value judgments can be made concerning the assumed reduction in risk associated with the time for the primary contaminant to reach groundwater (Figure 7-10 and 7-11), the length of the impacted shoreline (Table 7-5), and the percent loading to the Columbia River (Table 7-5).

c. c. If the USDOE intends to continue with this analysis then a series of working meetings are needed with the public stakeholders to refine the analysis process to more accurately describe the values of the people who will be impacted by long-term cleanup decisions at Hanford. At a minimum these meeting should include the Hanford Natural Resources Trustee Council.

37. Tables 7-2 through 7-4.This reviewer does not agree with the arbitrary and subjective distinctions being applied in this analysis. Regardless of whether contaminant A is added to contaminant B, or contaminant B is added to contaminant A, the result is the same; a plume of A+B. Case Ill of Table 7-2 represents a plume of a Group B contaminant into which a Group A contaminant is added (B+A). Case II of Table 7-3 represents a plume of a Group A contaminant into which a Group B contaminant is added (A+B). Yet, their ""risks"" are perceived by the authors as different. Why? The answer to this question is rooted in the author's subjectively imposed value set. In the opinion of CRESP Group B contaminants (Cs-137, Sr-90,TCE, Cyanide, U,Cr) are not as ""bad"" as Group A contaminants (Tc-99, 1-129, CCl4). Therefore, any new Group A contamination has a higher "risk" than any new Group B contamination. Yet, in both situations the end result is a plume of A+B that has a certain level of toxicity along with a future probability of being contacted by human and ecological receptors. This methodology does not define or distinguish or either property in a manner adequate to rank the relative ""risk"" between the two conditions. Relative risk should be calculated as the probability to cause a well-defined standard of harm to a well- defined set of receptors under a well-defined set of conditions.

    a. If the USDOE intends to continue with this analysis then a series of working meetings are needed with the public stakeholders to refine the analysis process to more accurately describe the values of the people who will be impacted by long-term cleanup decisions at Hanford. At a minimum these meeting should include the entities that comprise the Hanford Natural Resources Trustee Council

38. Table 7-11 and 7-12. Entries for Metric a. Metric Sa (discharge concentration at the Columbia River) is listed in both tables as the regulatory limit for Tc-99 (Table 7-11) and Uranium (Table 7-12) in ground water. These entries highlight another flaw in the analysis process. Risk is assumed to only exist when a contaminant reached the regulatory limit. This methodology ignores the true human health and ecological risks associated with Hanford contamination. Under this scenario plume that reaches the Columbia River at 90% of the regulatory limit and continues in perpetuity has no risk. However, regulatory limits are often not a health-based value and exposures to concentrations below these limits can cause detrimental impacts to human and ecological receptors. Even when regulatory limits are health-based the values are set using a presumed exposure scenario which might not be reflective of what will likely take place along

the Hanford shoreline. b. Evaluation end-points for this analysis need to reflect human health and ecological risk to the Columbia River and to the local communities that will be using the resources on and near Hanford."

39. There appears to be missing narrative at the end of the Metric 6 topic on page 144.

CHAPTER 8 COMMENTS (RENUMBERED IN CURRENT METHODOLOGY TO CHAPTER 7)

1. This chapter presents a rather detailed discussion of habitat features and the factors that degrade habitat for wildlife species. It more or less makes a case for restoring and minimizing degradation of habitat by remediation procedures. A five-level classification (methodology) for rating habitat importance is presented. Habitat for a number of animal and fish are presented. A matrix (methodology) of remediation methods versus impact on the five levels of habitat is presented. A table is also presented for the immediate effects of a list of Initiating Events. Also, a schematic (methodology) is presented of an approach for ecological risk evaluation. The Summary Template states that ecological information in the Summary will be in context with information in this chapter—a very appropriate cross linkage within the document.
2. The approach described in Chapter 8 (Ecological Resources) is a profound disappointment. As noted above, consideration of ecological risks seems limited to the potential adverse effects of cleanup actions. Extant risks are totally ignored. This feels like trying to do a natural resource damage assessment that ignores the injuries caused by a release, and looks only at the downside effects of cleanup on the environment. This approach is unsound, and is contrary to the intent of CERCLA regarding risk assessment and cleanup.
3. In the context of ecological (and cultural) resources, we urge CRESP to emphasize to DOE the risks of doing limited (and slow) cleanup and restoration. In taking an approach of limited cleanup, DOE might limit cleanup costs, but it does so at the expense of establishing liability for natural resource damages, including service losses.
4. In the list of risk issues (Section 8.2,), we suggest modifying item 6 discussing edge effects. While small edge to surface area ratios are good for some habitats and species, some species prefer to live “on the edge.” Patchiness is also important for some species.
5. Areas of sagebrush listed in Table 8.1 for the Hanford Site are misleading, as fires have destroyed much of the sagebrush habitat on the site. We suggest CRESP update this table to reflect the current condition.
6. It would be good if evaluation of risks for ecological resources incorporated a discussion of the risks of poor project design. At some Hanford sites, the area used for support areas (e.g., laydown areas, spoil piles, etc.) for response projects is unnecessarily large, and causes extensive, needless habitat destruction. At NRDWL/SWL, for instance, the 30 ha site is surrounded by Level 5 habitat. DOE’s closure plan calls for destroying habitat on more than 40 ha of that Level 5 habitat – far more than is necessary.
7. The map in Figure 8.3 (Level 1 habitat) is incorrect; the map does not include any of the industrialized areas on the Hanford Site. I suspect this map actually shows land disturbed (mostly for agriculture) prior to the start of the Manhattan project.
8. Should say “Olive-sided Flycatcher”
9. Pages 168-176, Section 8.6, It is unclear what the purpose of the Ecological evaluation is. NEPA documents are required to look at Ecological resources as part of the evaluation. Site activities are required to have ecological surveys done in areas that are not previously disturbed before actions can be taken so it is unclear with value this review is doing that DOE does not already do

from an implementation point of review. It also seems to ignore the procedures in place to protect Ecological species when making the assertion on whether there will be an impact from certain activities in the future, especially in the 50 and 100 year timeframes.

10. Page 168. Where is the list of species important to tribes?
11. The overall premise, that there is little or no risk from contamination and that only the future potential physical impacts from additional remediation are risky, is arguable. If this is true, then no remedial goals would include ecological endpoints.
12. Page 17. "whilefor ecosystems the important level is the population of a given species (except in the case of federally or state-listed species)."
    a. This may be CRESP's assumption, but it is not necessarily held by Hanford Natural Resource Trustees. It is also not necessarily the proper way to do ecological risk assessment.
13. Chapter 8 Abstract. The entire premise of this chapter is that the baseline is current ecological condition. This means that habitat which has already been degraded is at lower risk from further impacts (i.e., it is not as serious to cause further degradation). While this might be a valid argument, it undervalues the restoration that is already required. Risks and impacts seem to be confused. Only 3 sites were field-checked. There are a lot of metrics mentioned in the text, but it would entail a great deal of work to actually evaluate all of them for every EU. It seems that expectations for a detailed analysis have been raised by the level of detail proposed in the methodology.
14. Table 8-1 caption says "Historical data were based on potential vegetation predicted to be at the end of the plant succession in the absence of human induced change"
    a. Where is CRESP getting historical data and maps, how are they going to be quantified, and is the potential natural vegetation a reference to Omernick Level IV habitat?
    b. How is this information going to be used?
15. Table 8-9 indicates that only Level IV and V resources are deemed important enough to be evaluated for impacts. The CTUIR DOSE technical staff strongly disagrees with this decision. Levels II and II are also very important.
16. Worksheet 8.1.Why is the buffer area size only 3X? Needs a citation to support this choice.
17. Page 205, 618-10 example.
    a. If 10-20% of the species were Russian thistle, this means there is little or no noxious weed control,which is a risk in itself.
    b. The 10-12% seems to disagree with the cover percentages in Table 8-15.
18. Page 206, last paragraph. This paragraph seems internally inconsistent - If half of the site and buffer is Level Ill or higher, why would removal of all the vegetation result in no net change? 87.
19. Page 208, BC Cribs and Trenches. If this site was remediated, the absence of plants means that no restoration was ever done. Is this true? Calling an area Level 0 and no risk just because USDOE did not revegetate as required suggests that there is no incentive for restoration. A barren site is at risk for noxious weeds, which is an actual risk.
20. According to CRESP, there is no present ecological risk; ecological risk occurs only as a result of remediation. If this is true, then why do records of decision include ecologically-based remedial goals?

CHAPTER 9 COMMENTS (RENUMBERED IN CURRENT METHODOLOGY TO CHAPTER 7)

1. DOE has made a major effort over time in identifying locations and artifacts of cultural and religious significance to historical and current Native Americans. The methodology used included document searches, architectural excavations, photographs and direct consultation with Tribal members. The chapter presents a method for prioritizing the value of cultural resources most worthy of protection and preservation. Four levels were established. A matrix was also established to rate the risk to cultural resources by various remedial options and the type of disturbance produced by the remediation.
2. DOE appears to have been transparent with Native American Tribes relative to Hanford site activities and their impact on the environment. DOE seeks to implement methods and procedures, including clean up procedures that will prevent or minimize effects on cultural and religious aspects of the Hanford Site.
3. The inclusion of a statement in this chapter from the four local Native American Tribes confirming that an open relationship exists with DOE and that their views and concerns are seriously taken into consideration in resolution of site issues would be helpful.
4. The effort and legal requirements to preserve the Manhattan Project artifacts and structures is ongoing and is relatively straight forward relative to the complexity of locating and identifying the dispersed cultural and religious sites of importance to Native Americans.
5. As is true for Section 8, the planned approach for assessing risk to cultural resources, as defined in Section 9, is very disappointing. Adverse effects of historic releases and extant waste inventory seems to be ignored, and consideration of risk is limited to adverse effects of response activities.
6. Table 9.3 general location of the White Bluffs Bank is incorrect.
7. The White Bluffs bank building is not West of the 100-B/C area. It is close to the 100-F area, and I that is still considered to be part of the 600 Area
8. The "cultural risk" section is misnamed. It only deals with impacts to cultural and historic resources as a consequence of remediation. It should be retitled "Impacts to Cultural and Historic Resources Due to Remediation Activities."
9. Page 12. ""Risks to Cultural Resources -from physical disruption, destruction, exposure, impaired access or precluded access resulting from contaminant releases or cleanup activities, from contaminated food, water, medicinal plants, orfibers, orfrom destruction of the religious/cultural and aesthetic values (e.g., viewshed). ""
    a. This is not the proper definition of cultural resources for a risk assessment. The food, water, plants and fibers are part of human health exposure pathway within the tribal scenario. CRESP needs to separate harm to those resources from harm to people exposed by those pathways. It is unacceptable to lump everything tribal (and recreational and economic) under the heading of cultural resources.
10. Page 17 refers to ""cultural receptors"" (i.e.,tribes). While the general public may not have much 'culture,' CRESP needs to change this wording and stop disparaging tribal people as simply 'cultural receptors.'
11. What is the distinction between what is ""cultural"" and what is not? The embedded stereotype is that everything a tribal member does is ""cultural,"" but nothing that anyone else does is.
12. Plants and animals of tribal interest should be evaluated under the ecological chapter and added to the Threatened and Endangered list. It is unacceptable to relegate them to this chapter and then not provide a list. Likewise, all exposure pathways need to be addressed in a tribal health

risk section along with the other receptors (residential farmer in particular). Where is the list of plants and animals that are important to Tribes; conversely, what plants and animals are not important to tribes?

13. Where in this chapter are risks to tribal health from contamination evaluated?
14. Section 9.2. While it is true that biota are sometimes included in a definition of cultural resources, it is not acceptable to treat them separately from a risk assessment perspective. Risks to biota belong in the ecological chapter, not in the cultural resource chapter. 94. Page 219. ""As such, it is important to understand the influence that preservation of Level 5(and many Level 4) ecological resources has on cultural resources. (See Chapter 8 on Ecological Resources for definitions of Level 4 and Level 5 ecological resources)""
15. Exactly what is this influence?
16. Level IV and V resources are not the only important levels of habitat; this belongs in the ecological chapter.
17. Page 219. Seventy five (75) percent of the entire Hanford Site had not been surveyed for the existence of cultural resources. How will CRESP evaluate this large, unknown area?
18. Page 219. ""The Key to levels of Cultural Resources (listed from highest to lowest within the EU) is below and is followed by a more detailed definition for each level""
19. The CTUIR Cultural Resources Protection Program reviewed Chapter 9 of the methodology document. There are several significant problems with Chapter 9. Many of the foundational elements are flawed and the entire chapter lacks cultural sensitivity and understanding. Below these concerns are explained in detail.
20. Throughout Chapter 9, references are made to the NHPA and Section 106 process; however, the language used is not consistent with federal law. This entire chapter needs to be rewritten so that all references to NHPA are accurate and consistent. For example, footnote 27 on page 218 is wrong. The outcomes listed are not the possible outcomes as defined by Section 106. Additionally, DOE does consult on all undertakings including projects that have no potential to cause effect and the Tribes do have the opportunity to consult on that determination. Further, mitigation does not dictate an MOA; it's the other way around. As a result of an adverse effect determination, an MOA is written to outline the appropriate mitigation. It's obvious that whoever wrote this chapter was not fully familiar with the Section 106 process and NHPA terminology.
21. The evaluation methodology asks the Tribes to valuate their cultural resources individually. This is extremely problematic because the CTUIR's belief system is holistic and inclusive and does not compartmentalize our people or our resources from one another. Thus we manage our cultural resources as a landscape because each component contributes to the value of the other. Separating and individually enumerating their value is extremely problematic. For example, valuing a root gathering area as a Level 2 resource when that root gathering area is located on a Level 4 sacred site which is near a Level 3 archaeological resource doesn't work because this assumes that the sacred site is more valuable than the root gathering area and the archaeological site which is not the case. The very act of gathering food is a spiritual expression of our culture and religion. The location of the archaeological site is directly tied to resource availability in the area including access to the sacred site and each component contributes to the value of the other. Thus each resource is integrally tied to one another.
22. Chapter 9 does not address potentially contaminated cultural resources at all. On page 212, the authors state "the primary risk factors associated with cultural resources will emerge during active remediation or during the time period referred to as active cleanup". This isn't true. For

example, if a site is cleaned up but there is residual contamination that is simply going to be allowed to naturally attenuate thus requiring institutional controls that constrain access and use of the resources within that area, then our cultural resources continue to be adversely effected until those resources can be accessed and utilized by our tribal people in an unrestricted manner. And given natural attenuation could take several hundred years, the cumulative effects of contamination have to be taken into consideration thus this risk review. CTUIR strongly disagrees with this classification. Levels 2, 3, and 4 are equally important. However, they must have good definitions, including species lists, since CRESP wants to rank sites based on species of tribal importance. Again, where is this list?

23. Cultural Resources. Upon reviewing the chapter on cultural resources it is clear there is a lack of understanding of Tribal cultural resources. The issues with this chapter are too numerous to list. YN cannot concur with any part of this methodology as being an effective means to assess risk to cultural resources.
24. Table 9-1. Add GPS coordinates. Otherwise we can't evaluate whether the methods were applied correctly, and will have to assume that locations are unknown.
25. Page 220. Levels 2 and 3 are supposed to be based on maps or lists of known cultural resource or other sites of tribal or recreational importance. Where are the maps and lists? Without seeing them, we have to assume that they are unknown. It is not acceptable for CRESP to do this behind closed doors.
26. Table 9-4. The logic of this table is arguable. For existing facilities, cribs and trenches, existing borrow pits, and so on, any damage to cultural/historic resources has already been done, and there are no more cultural resources, so there should be no further risk from remediation.
27. Page 227. CRESP gives the official definitions of adverse effect, but needs to provide more explanation about why disturbance is not an adverse effect, particularly since CRESP says that an ""adverse effect does not include the potential to eradicate, obliterate, demolish, or otherwise destroy part or all of the resource within the unit being evaluated."" Obliteration is not an adverse effect?
28. Page 227. Does ""denied consumptive use"" include both due to contamination and due to simple denial of access? If so, where is the tribal health evaluation?
29. Page 227. The language of ""adverse effect"" duplicates the language of ""disturbed but no adverse effect."" Which one is correct?"

METHODOLOGY REVISIONS: APPENDIX B, APPENDIX C, APPENDIX D, APPENDIX E

Revisions to pilot case templates are not discussed as part of this overview document.

APPENDIX B STAKEHOLDER COMMENTS

1. B-4 I think this is supposed to say “WA MTCA” which is the abbreviation for Model Toxic Control Act./B-5 This classification mixes “apples” and “oranges”. The default classification for all Hanford SST and DST tank waste is HLW. (There are other tanks at Hanford that are not HLW.) The classifications of waste under DOE Order 435.1 are HLW, LLW and TRU. CH and RH is a totally different classification based on the surface activity of the waste. Waste with activity below 200 mR/h is contact handled (CH) and above 200 mR/h is considered remote handled (RH). So CH and RH is all about safe management of the waste.
2. Part Ill, current land use, is not relevant to a proper definition of ""risk.""

3. Part 5, Inventory. This is a huge task since inventories are hard to find and do not exist for post-remediation residuals. How detailed is the inventory going to be?
4. Page B-1, Primary Contaminants. Why repeat past risk assessments (RA) at a more superficial level? If this is just an overview for HQ, and is not intended to be a sitewide RA detailed enough to meet regulatory requirements and make decisions, then this should be made clear in the purpose statement. The CRESP report will be a systematic overview but not a complete picture of sitewide risks.
5. Page B-2, Summary Risk table. According to CRESP's definitions, there is no, and will never be, any public health risk because exposure will always be prevented.
6. There may be some ecological impact (this is not the same as risk) during remediation, which is why USDOE is required to revegetate.
7. There may be some impact to cultural/historic resources (if there are any remaining resources in the Reactor areas), but they will be mitigated by standard means, so there is no ""risk.""
8. The only real risk is worker risk during accidents during remediation.

APPENDIX C STAKEHOLDER COMMENTS

9. C-1. Missing reference where the cited information is on page 30. It should read (DOE/RL-2011-47, p. 30) based on information on page C-3.// C-20 I agree with this statement. The primary inventories are Sr-90 and Cs-137, both with half-lives of around 30 years. They were disposed almost 2 half-lives ago which can drastically change the listed numbers.//
10. CRESP is summarizing existing information, but it seems that some of the information is missing. For example, modeling has already been done, but CRESP indicates that it is unknown.
11. Maybe this overview is what USDOE-HQ needs to know. But the work is being planned now, so what is the point of re-evaluating actions that are already planned?
12. Worker risk during active remediation is rated as high, along with potential releases associated with remedial activity; is worker a reason to delay remediation?
13. CRESP says that public/tribal health risk is N/A; so there is no human health risk driver, correct?
14. The risk to inadvertent intruders is extremely high at present, but delaying remediation for several decades would reduce tritium levels and retrieval mechanisms may leave materials that are ""more prone to migration."" It is not clear what this means; it sounds like a reason to leave the site alone
15. There is a declining tritium plume, but CRESP says that there is no public health or ecological risk from it now or in the future, and the Columbia River is not threatened, so risk to the river is not a driver, correct?
16. CRESP says there is no risk to ecological or cultural resources at present or due to remediation, so these risks are not drivers, correct?
17. If Comments 4, 6, and 7 (above) are correct the only real risk in CRESP's opinion is worker risk during remediation accidents, or if facilities have an accident before they are demolished. However, worker dose limits will never be exceeded, so worker risk from planned activities will be minimal and the only real risk at Hanford, according to CRESP's definitions, is accidental release (explosion, plane crash, earthquake, etc.).
18. After reading the CRESP evaluation, the reader would conclude that there is no reason to remediate 618-11 since there are no short-term or long-term risk drivers. The conclusion from the CRESP evaluation would most logically be to pave it over and walk away. Yet, this site is so

radioactive that it is a top-priority site. The CRESP methodology appears to be fundamentally flawed since it will reach the wrong conclusion for this very dangerous waste site.

19. "Receptor scenarios. The stated goal of the project is to characterize risks to ""the public, workers, groundwater and the Columbia River, and ecological and cultural resources."" This list of human and ecological entities that are identified as receptors for this risk review should also identify Tribal members, specifically the Yakama Nation, who have distinctly different exposure patterns than the general public. Traditional and subsistence uses of natural resources equate to a much higher exposure potential for tribal members. Section 5.5 (Public Health Exposure Scenarios) notes that, at Hanford ""tribal scenarios are sometimes considered"" (p. 78). Since the Yakama Nation has been on this land since time immemorial and they have reserved treaty rights to continue using the land and its resources, which are so vital to the perpetuation of its culture, tribal uses should always be considered at Hanford. While Section 5.7 acknowledges the use of tribal scenarios in risk assessments for one operable unit (300 Area) at Hanford, the Yakama Nation has continually requested that a site-wide, baseline, cumulative risk assessment be conducted for tribal members, versus the area-by-area assessments that only consider limited waste sites and exposure assumptions. It should be noted that the Yakama Nation was never ""allowed"" (funded) by DOE to perform ""independent risk assessments"" as stated on p. 83. Also, while ""public"" is defined in Section 5.1 as including tribal members, Table 5-1 listing the categories of ""public"" does not include tribal members.
20. Statements that risk to receptors is negated by use of alternate water such that groundwater does not constrain land use (which is a violation of Tribal Treaty Rights) underestimates tribal member risks (as well as stakeholder risk). Statement that precluded or impaired land use should not be confused with health risk clearly implies a lack of understanding of Treaty Rights and Cultural Resources.
21. Receptor scenarios. The stated goal of the project is to characterize risks to ""the public, workers, groundwater and the Columbia River, and ecological and cultural resources."" This list of human and ecological entities that are identified as receptors for this risk review should also identify Tribal members, specifically the Yakama Nation, who have distinctly different exposure patterns than the general public. Traditional and subsistence uses of natural resources equate to a much higher exposure potential for tribal members. Section 5.5 (Public Health Exposure Scenarios) notes that, at Hanford ""tribal scenarios are sometimes considered"" (p. 78). Since the Yakama Nation has been on this land since time immemorial and they have reserved treaty rights to continue using the land and its resources, which are so vital to the perpetuation of its culture, tribal uses should always be considered at Hanford. While Section 5.7 acknowledges the use of tribal scenarios in risk assessments for one operable unit (300 Area) at Hanford, the Yakama Nation has continually requested that a site-wide, baseline, cumulative risk assessment be conducted for tribal members, versus the area-by-area assessments that only consider limited waste sites and exposure assumptions. It should be noted that the Yakama Nation was never ""allowed"" (funded) by DOE to perform ""independent risk assessments"" as stated on p. 83. Also, while ""public"" is defined in Section 5.1 as including tribal members, Table 5-1 listing the categories of ""public"" does not include tribal members.
    a. Statements that risk to receptors is negated by use of alternate water such that groundwater does not constrain land use (which is a violation of Tribal Treaty Rights) underestimates tribal member risks (as well as stakeholder risk). Statement that precluded or impaired land use should not be confused with health risk clearly implies a lack of understanding of Treaty Rights

APPENDIX D STAKEHOLDER COMMENTS

1. D-1 It is actually classified as TRU or TRUM (Transuranic mixed waste). There is more TRUM waste than TRU waste at CWC. Only the TRUM is regulated through the RCRA permit.//D-4 This is not totally correct. Hanford has a final status RCRA permit, but all operating units in the permit do not have final status conditions for operations. CWC is one of those units and operate under interim status requirements. D-4 All the information in this footnote is derived from the Part B Application for CWC. It should be noted that WA Department of Ecology has not finalized this permit. Specially, a number of treatment methods mentioned in the application have not been approved. D-5 MTRU makes sense but it normally named TRUM//D-10 SWOC stands for Solid Waste Operations Complex// D-19 The reference list contains all these references from the permit application. It should be noted, as in previous comment, that the permit application has not been finalized into a final permit. Much of the permit application represents wishful thinking from USDOE about how they will be able to manage waste at CWC. However, the information in the application material is sufficient to make this risk evaluation.//

APPENDIX E STAKEHOLDER COMMENTS

1. E-27 The A and AX farm in the 200-E area are SSTs and not DSTs.
2. Appendix E, E-i, The T Tank Farm is proposed as a site-wide, risk review project EU template. DOE requests that the Tank Farms be removed from evaluation. This template takes most of the data from the TC&WM EIS and then asks questions related to impacts to workers, public, GW surface water, Ecological resources, cultural resources and socioeconomic resources, and what are the impacts in the next 50, 100, and 1000 years. These are the same resource areas analyzed in the short term impact analysis under the TC&WM EIS for 11 alternatives and 2 sub-options in both the draft and final EIS, which include T tank farm, and are included in DOE's record of decision (December 13, 2013). In the areas of GW the EU asks the following questions;
    a. What is the origin and history of contamination (accidental release, intentional discharge and multiple discharges): This repeats much of what is in the TC&WM EIS or has been updated by recent leak reports.
    b. What are the primary contaminants (risk drivers)? The analysis restates much of what is in the TC&WM EIS Appendix D for this area. The analysis then goes on to evaluate the results in Appendix O, P and the GW analysis and draws some general conclusions about what the EIS concluded.
    c. What are the co-contaminants that will affect the mobility of the primary contaminants? No information is provided, which is not surprising based on the complexity of this issue and the level of characterization needed to address this issue.
    d. What is the depth of contamination and soil type/stratigraphy associated with the contamination? Is the soil profile primarily natural of heavily disrupted?
3. The report references a 2008 report from PNNL (Serne) as well as Well data from 2006 to discuss this. It is unclear the value of this discussion. Vadose Zone and GW uncertainty had to be addressed in the context of the TC&WM EIS prior to making a closure decision in the TC&WM EIS ROD (December 13, 2013).
4. The list of questions continues and most areas reflect a summarization of what is already in existing DOE documents whether it is the safety documents, TC&WM EIS, or updates to the Hanlon report. Since we have already evaluated this and made a decision in the TC&WM EIS ROD, it isn't clear what conducting the additional risk review provides to DOE."

5. The chapters appear to have been written by separate authors and lack sufficient linkage. More linkage and flow among the chapters relative to the stated goal and purpose would be helpful. Also, the Executive Summary would be more useful by linking specific statements to chapters and page numbers where that topic is explained and discussed in greater detail. Also, the Summary's main objective is less clear with diverse statements being made using the terms goal, purpose, focus and subject relative to the purpose of the project.
6. The Risk Review Project focuses on risk characterization, which is a necessary predecessor torisk management, but does not focus on risk management decisions."" page iii.
    a. Comment: The entire CRESP approach is predicated on assuming that risk management decisions will be preventing exposure. This is the most basic flaw of the overall approach. The assumption violates CERCLA guidance."
7. E-27 The A and AX farm in the 200-E area are SSTs and not DSTs.
8. Appendix E, E-i, The T Tank Farm is proposed as a site-wide, risk review project EU template. DOE requests that the Tank Farms be removed from evaluation. This template takes most of the data from the TC&WM EIS and then asks questions related to impacts to workers, public, GW surface water, Ecological resources, cultural resources and socioeconomic resources, and what are the impacts in the next 50, 100, and 1000 years. These are the same resource areas analyzed in the short term impact analysis under the TC&WM EIS for 11 alternatives and 2 sub-options in both the draft and final EIS, which include T tank farm, and are included in DOE's record of decision (December 13, 2013). In the areas of GW the EU asks the following questions;
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    c. What are the co-contaminants that will affect the mobility of the primary contaminants? No information is provided, which is not surprising based on the complexity of this issue and the level of characterization needed to address this issue.
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