Oregon
John A. Kitzhaber, MD, Governor

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Dr. David Kosson
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Dear Dr. Kosson:

Oregon appreciates the opportunity to provide comments on the draft methodology for the Hanford Site-Wide Risk Review Project. We especially thank you for your efforts for outreach to Oregon as a stakeholder at Hanford, including a meeting in Salem at the start of the process and several subsequent conference calls to discuss the status of, and planned approach for, the project.

Our attached comments are organized in three groups. First, there are several high-level comments on the project and draft methodology. These are followed by a group of more focused technical questions and comments, and finally some editing notes. If you have questions or wish to discuss any of our comments, please contact me. I will be out of the office until October 10.

Sincerely,

Ken Niles
Administrator, Nuclear Safety Division

Cc Doug Shoop, U.S. Department of Energy, Richland Office
Kevin Smith, U.S. Department of Energy, Office of River Protection
Jane Hedges, Washington Department of Ecology
Dennis Faulk, U.S. Environmental Protection Agency

**High-level comments and concerns**

1. 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.

2. 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.

   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.

3. 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.

4. 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.

5. 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.

6. 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?

**Technical comments**

- 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.

- 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.

- 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.

- 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.

- 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.

- 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).

- 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.

- 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.

- 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.

- 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?

- Likelihood for some events (Table 4.1) should be reconsidered.
    - Occurrence of a 100 year flood is well above 50 percent in a 100 year period. These events should be classed as "anticipated."
    - 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.
    - 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.

- 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.

- 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.

- Analyses described in Chapter 5 (risks to public health) raises several serious concerns:
    - Exposure to groundwater is excluded from analyses
    - Text speaks of the "low probability for potential failure of Institutional Controls," even though Chapter 4 assumes no control of ICs after 150 years.
    - 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.
    - The section fails to meaningfully consider risks to the health and lifeways of tribal members.
    - 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.
    - There is no mention of dietary factors (fish consumption) for tribal members.

- There is no mention of occupational exposure to beryllium, or of asbestos exposure as a concern for worker health and safety in Section 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.

- 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.

- 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.

- 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.

- 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.

- 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.

- 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.

- 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.

- 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.

- 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.

- 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.

**Edits and other non-technical comments**

- 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."
- "all reasonably available land uses at Hanford will have been realized. . ." (p 13). What does this mean?
- Figure 3-8 needs a legend (colors are different from related figures).
- 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.
- 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.
- Table 9.3 general location of the White Bluffs Bank is incorrect.