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December 7, 1993

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Eric D. Goller
100 Area Unit Manager
U.S. Department of Energy
P.O. Box 550, A5-19
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Dear Mr. Goller:

Subject: Review of 100 Areas CERCLA Ecological Investigations, WHC-EP-0620

The Washington Department of Wildlife (WDW) was asked by the Washington Department of Ecology to review the subject document (Landeen et al. 1993) and to provide the U.S. Department of Energy with appropriate comments to consider. I reviewed the document from the standpoint of how it: (1) meets the objectives of the ecological investigations that are proposed in Appendix D-2 of each of the 100 Area groundwater operable unit work plans, (2) relates to the ongoing Site surveillance programs, and (3) meets the data needs for ecological risk assessments. Because the data discussed in Landeen et al. (1993) also partially addresses impacts to the Columbia River (i.e., riparian zone) from contaminants arising from site activities, the WDW's previous comments to the Environmental Protection Agency on the Columbia River Impact Evaluation Plan (CRIEP; DOE-RL 1993) (letter, Clausing to Gadbois, dated August 5, 1993) also have some relevance (4). Paragraph (5) provides some specific comments on the document. I end with some conclusions and recommendations.

(1) Appendix D-2 of the 100 Area groundwater operable unit work plans describes those ecological investigations that are a part of the CERCLA and RCRA past-practice remedial investigations for the 100 Areas. Landeen et al. (1993) and Cushing (1993; for aquatic studies) report the results of these investigations. In regard to the overall scope of sampling reported in Landeen et al. and Cushing it seems that the sampling outlined in the work plan generally was accomplished. Thus, some criticisms of the sampling effort reported in Landeen et al. may be more realistically viewed as criticism of the 100 Area groundwater operable unit work plans, with one possible exception. Appendix D-2 (e.g., from DOE-RL 1992) states that the burrowing of mammals and digging insects into waste disposal cribs and trenches will be evaluated. Section 7.6 (page 34) of Landeen et al. states that soil samples from ant mounds and mammal burrows were collected **adjacent** to waste sites. If samples were indeed collected adjacent to waste sites and not directly above buried waste, it is unlikely that they provide useful information relative to waste site intrusion.

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(2) Pacific Northwest Laboratory (PNL) and Westinghouse Hanford (WHC) conduct extensive sampling of environmental media for the purposes of environmental surveillance ("outside the fence"; PNL) ( e.g., Woodruff et al. 1993) and near-facility environmental monitoring ("inside the fence"; WHC) (e.g., Schmidt et al. 1993). These surveillance programs have until recently concentrated chiefly on radionuclides and emphasized environmental media that could either impact human exposure or indicate a redistribution of contamination to uncontrolled areas. [PNL has expanded its sampling program in 1993 to sample riverbank springs and sediment, and slough sediments, for ICP metals (Bisping 1993).] Thus, these programs tend to evaluate media at locations where potential contamination is most likely to be detected. The sampling effort of Landeen et al. (1993) tended to investigate locations different from the two surveillance programs described above. In itself, the information may have some utility if the intent was to ensure that areas not previously sampled, such as downriver from the operable units (because they were considered less likely to have received contamination), are checked to establish baseline conditions prior to remedial activities. Analytical data that have been generated by the existing surveillance programs may have some value for risk managers (because the programs have sampled atop the waste sites themselves (WHC) and at locations where potentially contaminated groundwater enters the Columbia River (PNL); however, these programs have not to date: (a) sampled specifically to monitor ecological impacts and (b) used sample quality control procedures that are equivalent with those specified for CERCLA/RCRA past-practice data needs (Ted Poston, PNL, pers. comm.), and (c), except for PNL, incorporated nonradionuclide contaminants into their sampling protocol. The foregoing could make the data less useful; unfortunately, the work plans (Appendix D-2) do not address a complete solution to these deficiencies. Thus, there seems to have been a lack of appreciation on the part of Tri-Party participants for how best to integrate existing environmental surveillance programs with CERCLA/RCRA past-practice surveillance needs (note that for nonhuman-based ecological sampling I view sampling for surveillance purposes as different from sampling for risk assessment purposes; see below).

(3) In contrast to sampling for surveillance purposes, sampling can also be used to support the data needs of an ecological risk assessment. Qualitative risk assessments (QRA) for the 100 Areas (source operable units) use effects on the Great Basin pocket mouse (Perognathus parvus) as the measurement endpoint. The data in Landeen et al (1993) do not provide any additional information that can be used to better model the risk to the pocket mouse. Moreover, until receptors and pathways are chosen for the baseline risk assessment for the 100 Areas it is not possible to evaluate whether Landeen et al. or previous sampling efforts will be able to provide data to support this latter type of risk analysis. In regard to establishing additional receptors of concern the document was inconclusive (Section 5.0). The two types of risk assessment both rely on specific pathways of exposure for each receptor. Thus, site- and scenario-specific transfer coefficients are important components of each risk assessment and can only be determined when a sampling protocol is specifically designed to attain these types of information. In an earlier review provided to Ecology that concerned the 200 Area ecological investigation [letter, Hall to Cross, dated October 6, 1993 (Enclosure)], I outlined some considerations that need to be addressed when designing a sampling protocol to determine transfer coefficients.

(4) As mentioned previously in WDW's comment letter to the CRIEP, we are concerned that existing ecological sampling for contaminant uptake on Hanford is heavily biased toward receptors that historically have been selected either because they have a potential impact on human health (i.e., they are part of a biotic pathway for human exposure) or because they have created localized problems by their ability to intrude into waste sites. Landeen et al. (1993) provide some data that improve this situation (also the sample data supplied by Cushing, 1993, for aquatic organisms is certainly a step in the right direction). Moreover, these authors highlight potential contaminant pathways for special status species. Although state and federal, threatened and endangered species deserve consideration, the species in these categories that use the Hanford Reach riparian zones and adjacent uplands for part of their life cycle are insufficient monitors of the functional integrity of these ecosystems. Thus, species that are sensitive to environmental contaminants should be considered as indicators for monitoring the effects of possible contaminant releases on the ecosystem. These are not necessarily species that have received attention in the past but are those that, in addition to their sensitivity, may be amenable to bioassay type studies (e.g., earthworms, frog larvae, etc.).

(5) Specific comments on Landeen et al. (1993) are:

- Biotic sample concentrations are compared to soil threshold values. Because appropriate, site-specific transfer coefficients are unknown, this approach may be invalid.

- Averages of the sample data are presented, but no statistical comparisons are made between controls and the samples used to assess contamination levels.

- Although wildlife surveys did not add any significant observations, the vegetation surveys seem to provide useful information about the riparian plant communities in the 100 Areas.

- Because of the nature of sample locations it is unlikely contamination would be detected; however, sample locations are generally consistent with what is designated in the work plans. Existing surveillance programs seem to sample where contaminants, and their uptake by the biota, are most likely to be detected.

- The locations of coyote scat and raptor pellets do not necessarily correlate with locations at which the animals may have obtained their food (Section 8.6, 2nd paragraph).

Conclusions and Recommendations

Ecological surveillance of contaminant uptake and its effect on the biota, independent of human pathway concerns, is still in its formative stages on Hanford. Moreover, Hanford is breaking new ground in its approaches to ecological risk assessment. Not surprisingly, the ecological sampling plans for the 100 Areas (Appendix D-2 of the groundwater operable unit work plans) may have been conceived and approved before the full range of data needs could be identified. With some exceptions, Landeen et al. (1993) reflects the level of sampling identified in the

work plans. Thus, WDW's major concern is not so much with this document as it is with a plan for filling in the data gaps that are identified in this letter and in our previous correspondence referenced herein. As an aid to filling in these data gaps we make the following recommendations.

- o Whether ecological surveillance is accomplished as a part of ongoing programs or specifically supports CERCLA/RCRA activities, the relevant program needs to critically evaluate whether those species that are potentially most susceptible to contaminant uptake and effect are adequately identified and monitored. The transition from a historically narrow (but understandable) focus on human uptake pathways to a concern for contaminant effects on the biota independent of human concerns demands this evaluation.

- o For risk assessment the Tri-Party participants need to clearly identify the receptors and pathways to be considered for both qualitative and baseline risk assessments (for completely terrestrial, riparian, and aquatic scenarios). To my knowledge this has only been done in part for the source operable unit QRAs. This step is a starting point for identifying what sampling is necessary to quantify appropriate site-specific transfer coefficients, etc. The baseline risk assessments for the 100 Area operable units and elsewhere will need to evaluate the physical effects of remediation on wildlife and habitat as well as the potential effects of contaminants, and then determine whether remediation results in a net benefit. If the ecological risk assessments are overly conservative because of a lack of site-specific data or inadequate pathway modeling, then inappropriate remedial decisions (based on ecological risk) might be made.

- o Tri-Party participants should evaluate how the ongoing surveillance programs of PNL and WHC can best complement the data needs of CERCLA/RCRA past-practice remedial investigations for ecological data.

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Woodruff, R. K., R. W. Hanf, and R. E. Lundgren. 1993. Hanford Site Environmental Report for Calendar Year 1992. PNL-8682. Pacific Northwest Laboratory, Richland, Washington.

I hope you find this information useful. Please call if you have any questions (372-1189).

Sincerely,

John Hall
Habitat Biologist, Hanford Site

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Enclosure

cc: Ted Clausing, WDW
Steve Cross, Ecology
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Enclosure

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October 6, 1993

To: Steve Cross
Washington Department of Ecology, Hanford Project

From: John Hall
Habitat Biologist, Hanford Site

Subject: 200-Area Ecological Investigation (Biological Uptake of Contaminants)

Reference: Description of Work for 200 Areas Ecological Investigations, WHC-SD-EN-AP-127, Rev. 0

This memorandum will serve to provide you with my impressions of the recent ecological sampling effort conducted this summer by Westinghouse Hanford (WHC) as part of the 200-Area Ecological Investigation. Also, I discuss some additional considerations associated with future sampling.

Based on the exchange of letters between DOE-RL and the regulators in regard to the description of work (DOW) for this effort, it is easy to conclude that there was, at least initially, a lack of agreement on the purpose and utility of the sampling and its resultant data. Because the DOW will be revised to reflect the sampling protocol that was actually achieved, I initially assessed the protocol based on what the investigators (WHC) implied were their sampling goals. My understanding was that: (1) waste sites that represented highly contaminated sites were selected and (2) sample locations at those sites were designed to evaluate those areas that potentially contained the highest concentrations of contaminants. The intent was to gain some information about site-specific transfer coefficients under conditions in which the probability of biological uptake was optimal.

On 28 July 1993 I toured the proposed sample locations with WHC personnel. Based on my field observations and subsequent conversations with applicable WHC personnel I made the following recommendations to WHC: (1) move the insect pitfall traps and mammal trapping stations at B Pond to nearer the inlet end where contamination levels are expected to be highest and (2) at the terrestrial sites move the above traplines to inside the boundaries of the waste site. The sampling protocol was not designed to find the "hot" animal by first screening captured animals with radiation detectors. Rather, the intent was

to collect, what are likely to be on average, animals that experienced a relatively high uptake of contamination versus animals off the waste site or in less contaminated areas. Based on Steve Weiss's presentation on this subject at the unit manager's meeting on 29 September 1993, it seems WHC made these suggested adjustments to their sampling protocol.

Contaminant analyses of the collected biological material have yet to be completed. Thus, I cannot comment as to the implications of the direct results of the study. Still, some comments that are independent of the analytical results are appropriate. As part of the agreement to approve the DOW, there seemed to be a general consensus among DOE-RL, WHC, EPA, and Ecology that whatever the ultimate purpose of the 200 Area ecological investigation, the present sampling effort would provide only preliminary results. Based on sample size alone this is probably an appropriate determination. (There are other considerations I mention below that potentially limit the use of the results.) The question is where do we go from here.

Site-specific transfer coefficients are an important component of the ecological risk assessment methodologies for both the qualitative and baseline risk assessments. It can be argued, however, that the data needs for these two assessments may differ. The qualitative risk assessment could be judged as a more conservative analysis compared to the baseline risk assessment as the latter is used as a basis of comparison for final remediation alternatives. Thus, if accurate transfer coefficients are not deemed a necessity for the qualitative risk assessment (for reasons expressed previously by EPA and Ecology), I suggest that they should be considered important for the baseline risk assessment. This information will help to ensure that final remediation alternatives are evaluated in an unbiased manner. Obviously, this concern about transfer coefficients is not restricted to the 200 Areas.

To facilitate the collection of appropriate data the following need to be considered: (1) Plant uptake of contaminants is species- and contaminant-specific. Moreover, there may be changes in the rate of uptake of a particular contaminant over the course of the growing season. Thus, the plant may not always be in equilibrium with the concentration of the contaminant in the surrounding soil. (2) To make an accurate determination of the transfer coefficient from soil to plant the soil from around the root zone of the plant must be sampled. (3) The next step from plant to animal considers a herbivorous receptor. Here it is important to know what plants, and what parts of the plant, are the major constituents of the receptor's diet. Moreover, information also is needed on how contaminants are compartmentalized within a particular plant species. (4) Similarly, the transfer of contaminants from herbivore (primary consumer) to carnivore (secondary and tertiary consumers) needs to consider what portions of the animal are eaten and how the contaminants are compartmentalized within the different tissues. (5) Risk assessments on Hanford assume a lack of institutional control. Thus, the vegetation present on a waste site

today may not be what is available to the receptor after the loss of institutional control. (6) Laboratory-derived transfer coefficients and coefficients obtained from studies in which site conditions are significantly different from Hanford may have only limited utility. Thus, it is best to have site-specific values when they can be reasonably obtained. (7) Maximum values may not be as important as their distribution, both temporally (e.g., seasonal changes in plant uptake) and spatially.

The present sampling may demonstrate that biological uptake and transfer within food chains are occurring. Moreover, it could provide rough indices of Hanford-specific transfer coefficients. Because of the considerations discussed above and the limited amount of sampling, however, the analytical results will not provide sufficient information for direct incorporation into the baseline risk assessment. The conceptual model for the 200 Area baseline risk first needs to be refined and agreed to by Tri-Party Agreement participants. Thus, all receptors of concern and their associated food webs need to be defined, along with the applicable contaminants of concern, before a detailed sampling plan for determining relevant transfer coefficients can be formulated.

I purposely avoided making specific references to the scientific literature to support the above comments. I did peruse a small portion of the literature in order to generate ideas, but my main purpose here was not to make a rigorous argument for my suggestions; instead, I wanted to outline some aspects that need to be considered when formulating a sampling plan with the expressed purpose of determining transfer coefficients. Thus, I view my comments as a point of departure for further discussion.

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