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**Farber, Teri L**

**From:** HUGHS Susan C [Susan.C.Hughs@state.or.us]  
**Sent:** Thursday, December 05, 2002 1:03 PM  
**To:** astrid\_p\_larsen@ri.gov  
**Cc:** cpalmer@yakama.com; danl@nezperce.org; ddteel@bhi-erc.com; gadbois.larry@epa.gov; Helen.Hillman@hazmat.noaa.gov; Jake\_Jakabosky@or.blm.gov; lgo1461@ECY.WA.GOV; preston\_sleeper@ios.doi.gov; stuartharris@ctuir.com; tlezie@bhi-erc.com; tom\_obrien@fws.gov; tzeilman@yakama.com; viguelav@dfw.wa.gov; NILES Ken; HUGHS Susan C  
**Subject:** Oregon comments on chromium/salmon report



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Astrid \* attached are Oregon's comments on the "Evaluation of the Effects of Chromium to Fall Chinook Salmon in the Hanford Reach of the Columbia River: Integration of Recent Toxicity Test Results."

Our signed letter will be mailed on Friday.

Susan

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**EDMC**

December 4, 2002

Astrid Larson,  
U. S. DOE-Richland  
PO Box 550, A2-15  
Richland, WA 99352

Dear Ms. Larsen:

Ref: Oregon's comments on *Evaluation of the Effects of Chromium to Fall Chinook Salmon in the Hanford Reach of the Columbia River: Integration of Recent Toxicity Test Results*

Thank you for the opportunity to comment on the "Evaluation of the Effects of Chromium to Fall Chinook Salmon in the Hanford Reach of the Columbia River: Integration of Recent Toxicity Test Results, 9-2002, PNNL-14008."

This integrated report is a mixture of history, background information, observations and conclusions that make concise commentary difficult. In our opinion, some conclusions are not supported by the data shown. River conditions (water volume and velocity) make acute health effects difficult to measure. However, the data do not rule out indications of injury or the possibility of long-term effects such as impaired fecundity. While these studies were not designed to address long-term effects, we want to guard against any conclusion of "no adverse effects" without the caveat that important information about potential injury is missing.

Our specific comments follow:

- The conclusions of the fertilization study are not supported by the data reported in this study. Aspects of the study design lead to questionable results. Specifically, the low fertilization rates in the control group invalidate the data collected. Also, when the 1% sodium chloride solution was initially added to the fertilized eggs, the eggs were damaged and the experiment had to be redone, apparently still including this step. Neither this event nor its significance are discussed in the study results.
- We disagree with the statement in the Executive Summary that interpretation of parr health results is difficult. In fact, the results show that some concentrations of chromium resulted in measurable adverse effects. A more accurate conclusion would be:

"there is some level of chromium exposure at which measurable adverse health effects occur in juvenile salmon. Further, salmon in water with a hardness of 200 mg/L are

unable to detect and avoid hexavalent chromium in the water, indicating the potential that injury is occurring. Further study is needed."

- The Fish Health Studies were conducted on juvenile salmon (60 days post-hatch at test initiation). However, previous studies ("Acute Toxicity of Chromium to Young King Salmon and Rainbow Trout (Median Tolerance Limits), by P.S. Olson, Battelle-Northwest, 1957) indicate that the eyed-egg to swim-up age group is more vulnerable to the effects of chromium. Any further studies of fish health should include this earlier life stage.
- We understand the Natural Resource Trustees requested a simplified version of the studies with some common conclusions. However, more details are needed to support this report. We recommend that technical details, numerical results, and calculations be included as appendices to allow informed analysis of the report. For instance, there is no data that supports the statement that chromium concentrations in groundwater do not exceed the 20 ug/L. There is no support for the determination that 20 ug/L is protective of aquatic biota. Appendix 1 shows no sampling dates but refers to "recent chromium data." The table shows chromium levels in near-river wells but we don't know the location of those wells and how they relate to the locations of the chromium plume. Also, there is no data that supports the validity of the 1:1 dilution effect where the groundwater upwells into the redds.
- There is a great deal of information in this integrated report that addresses history and whether chromium exposure is likely to occur. We suggest you put this information in appendices or a separate supporting document. Frankly, much of this discussion seems to be laying the groundwork to minimize any conclusion of injury. As an example, in one part of the report (Section 3.2.2, page 26, paragraph 3) you refer to chromium concentrations ~90 to ~200 ug/L as being "slightly" above expected background. Elsewhere in the report you define background as ~16 to ~32 ug/L. It is not clear if you are discussing Cr(total) or Cr(VI). This is particularly striking as background levels of hexavalent chromium or Cr(VI) do not occur in nature. Hexavalent chromium is an indicator of human activity and contamination.
- The amended record of decision lists a requirement of no more than 20 ug/l at each compliance well. This value should be considered one of several remedial action objectives, which when coupled with a 1:1 dilution would yield a 10 ug/l level in the river. The 10 ug/l level is slightly less than the AWQC (Alternate Water Quality Criteria) for aquatic life listed in the 1996 Interim Action ROD. The 1996 Interim Action ROD listed 11 ug/l as the AWQC for chronic exposure for aquatic species. The amended ROD goes on to state "The siting, design, and sampling of the compliance monitoring wells shall be adequate to define the boundaries of the plume, the effectiveness of the treatment zone and shall be capable of assessing if the barrier "breakthrough" occurs. We should interpret this to mean that wells known to be influenced by high river stage (infiltrating groundwater) cannot be used to determine remedial action effectiveness, as the goal is to reduce undiluted groundwater to 20 ug/l prior to beginning to mix with river water and that monitoring should bound the chromium plume to 20 ug/l. Without knowing the specific locations of the test wells, it

cannot be determined whether the ROD requirements are being met. Nonetheless, for wells in the mixing zone, the 10 ug/L level should be the applicable limit.

In conclusion, we support DOE's efforts to seek information about the effects of chromium on salmon in the Columbia. We urge DOE to consider the work done thus far to be a beginning. We recommend further study, preferably by a consortium of Northwest universities, to determine whether the continued presence of hexavalent chromium from Hanford Site groundwater and in the Columbia River is measurably impacting the salmon and other anadromous fish. The study or studies should examine potential exposures through the entire life cycle of the fish, not just one or two life stages as in the existing studies, as well as analyzing potential reproductive effects. The study should use a statistically significant sample of Columbia River salmon and replicate river water conditions.

Further, we will recommend to the U.S. Environmental Protection Agency, and its appropriate state counterpart, that they pursue independent studies to determine whether the hexavalent chromium standard of 20 micrograms per liter is ecologically protective before establishing it as the final cleanup standard for Hanford's chromium groundwater contamination. This includes determining what impact chromium may have on organisms and insects that are food for the Hanford Reach's anadromous fish.

Thank you for the opportunity to comment on this study.

Sincerely,

Ken Niles  
Administrator  
Nuclear Safety Division  
Oregon Office of Energy

Cc: Hanford Natural Resource Trustees (via email)  
Oregon Hanford Waste Board  
Larry Gadbois, EPA (via email)



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November 26, 2002

Ms. Astrid Larsen  
Department of Energy  
P.O. Box 550, A2-15  
Richland, Washington 99352

Dear Ms. Larsen:

The Washington State Department of Ecology has completed its review of the report, "Evaluation of the Effects of Chromium to Fall Chinook Salmon in the Hanford Reach of the Columbia River: Integration of Recent Toxicity Test Results", September 2002, PNNL-14008. The following comments are offered by Ecology in the capacity of state trustee for natural resources at the Hanford Site.

The report provides background information on the subjects of chromium contamination, groundwater-surface water interactions, and the life history of fall chinook salmon as they relate to conditions in the Hanford Reach. The report synthesizes results from several studies conducted from 1998-2000 for the Hanford Natural Resource Trustee Council to evaluate the effects of chromium on chinook salmon.

Aside from some recent data on chromium in groundwater near the Columbia River, the study data are not shown. Details of methods are not shown either. Therefore, it isn't possible to assess the soundness of conclusions drawn from previous studies and discussed in the present report. However, the authors did a good job of using the results of those previous reports, along with information from the literature, to explain the potential risks, or apparent lack of risks to fall chinook spawning and rearing in the Hanford Reach. They looked at all applicable stages of their life cycle along with a variety of relevant exposure scenarios to derive their conclusion that 10 µg chromium/L is adequate to protect fall chinook. Based on the information presented we agree with that conclusion.

Ms. Larsen  
November 27, 2002  
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In the Introduction (last paragraph, page 9), the authors state that the last part of the report "... makes recommendations for additional research to address current uncertainties." However, we couldn't find any recommendations for additional research in the report.

Peer reviewer M.C. Newman, Ph.D. noted in his remarks on the Dauble et al. 2001 report that, "[he] would not draw any conclusions from the DNA work at this time and suggest[s] more extensive studies before making definitive statements about potential effects. Other methods for assessing DNA damage would seem appropriate than flow cytometry." In reviewing the USGS, Potential for Chromium To Adversely Affect Chinook Salmon in the Hanford Reach report he notes that the methods and results in that study are not clear regarding DNA. He concludes that the DNA "data seem ambiguous and any conclusions without further study may simply confuse the issue." Lawrence Curtis in his peer review of the Dauble report also recommended additional work with parr stage fish.

It may be true that the statistics for the Chinook runs in the Hanford Reach suggest no adverse affects due to chromium exposure. However, questions remain regarding potential DNA damage and long-term chronic effects. If the authors revise or append the report they should include recommendations as a separate section.

Ecology supports continued long-term monitoring of chromium concentrations in Columbia River water, including pore water sampling.

Sincerely,

Larry Goldstein, Section Manager  
Nuclear Waste Program

Cc: Hanford Natural Resource Trustee Council  
Larry Gadbois, EPA  
John Price, Ecology  
Lauri Vigue, Washington Department of Fish and Wildlife