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March 11, 2007

Mr. Kevin Rochlin
Superfund Project Manager
U.S. Environmental Protection Agency, Region 10
1200 6th Avenue, ECL-112
Seattle, WA 98101

Subject: Technical Memorandum No. 1 - *Preliminary Ecological Risk Management Based Action Objectives* – Final Draft

Dear Kevin:

Further to your letter dated February 15, 2007 (received on February 20, 2007) and pursuant to Paragraph 13 of the June 2, 2006 Settlement Agreement, please find attached for your review and information the final draft of Technical Memorandum No. 1 – Preliminary Ecological Risk Management-Based Action Objectives.

Should you have any questions or require any additional information, please do not hesitate to contact the undersigned.

Sincerely,
Teck Cominco American Incorporated

Marko E. Adzic, P.E.
Manager, Environmental Engineering

Attachment (1)

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TECHNICAL MEMORANDUM NO. 1
PRELIMINARY ECOLOGICAL RISK MANAGEMENT-BASED ACTION OBJECTIVES

This technical memorandum presents preliminary ecological risk management-based action objectives (RMAOs)[1] for the remedial investigation and feasibility study (RI/FS) of the Upper Columbia River site (Site). Preliminary RMAOs developed for protection of human health will be developed by the U.S. Environmental Protection Agency (EPA) and are not included in this memorandum.

A critical objective of the RI/FS process for the Site is to delineate areas of the Site that may pose an unacceptable risk to ecological receptors (e.g., benthic invertebrates, fish, shellfish, plants, birds, and mammals, including those listed under the Endangered Species Act). Prior investigations conducted by state and federal agencies have identified contaminants of interest (COIs) at the Site, which include cadmium, copper, lead, mercury, zinc, and other metals and metalloids, as well as organic compounds such as dioxins, furans, and polychlorinated biphenyls (USEPA 2004). The RI/FS process will supplement information collected in prior studies to further delineate the nature and extent of contaminants present at the Site, including a comprehensive characterization of COIs; provide an understanding of the sources, fate, and transport of contaminants to and within the Site; and support an ecological risk assessment (ERA).

Preliminary ecological RMAOs for the Site will be defined consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and EPA Guidance documents, in assessing potential ecological risks to better define risk management alternatives that will result in healthy and sustainable ecological populations within the Site ecosystem. At this early stage of the process, preliminary RMAOs for the protection of ecological receptors serve as a framework for the overall site assessment and ERA.

The preliminary ecological RMAOs presented in this memorandum will be refined in later stages of the RI/FS process as potential ecological risks are understood. Together with EPA's preliminary RMAOs for the protection of human health, these preliminary ecological RMAOs will ground the assessment in the overarching goal for the Site: to protect human health and the environment.

[1] As stated in the June 2, 2006, Settlement Agreement (USEPA 2006) between Teck Cominco American Incorporated and EPA, RMAOs developed for this site "shall have the same meaning as remedial action objectives in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and their development shall be consistent with the NCP."

APPROACH USED TO DEVELOP PRELIMINARY ECOLOGICAL RMAOS FOR THE SITE

Table 1 summarizes preliminary ecological RMAOs developed for the Site. These preliminary ecological RMAOs are intended to provide a framework for Site-specific management decisions regarding ecological resources. These preliminary ecological RMAOs will evolve during the RI/FS and may be further refined as the conceptual site model (CSM), problem formulation, and ecological risk assessment proceed[2]. Development of these preliminary RMAOs is central to coordinating and communicating with other participating parties and the public.

Table 1. Preliminary Ecological RMAOs.

Medium	Preliminary Risk Management-Based Action Objective[a]
Soils	Reduce to acceptable levels the risks to plant communities that may be exposed to contaminants of concern (COCs) in soil
	Reduce to acceptable levels the risks to populations[b] of soil invertebrates that may be exposed to COCs in soil
	Reduce to acceptable levels the risks to populations of birds and mammals that feed on plants and/or soil invertebrates containing COCs, or that may directly ingest soils containing COCs
Sediments[c]	Reduce to acceptable levels the risks to populations of fish that may be exposed to sediment-bound COCs
	Reduce to acceptable levels the risks to populations of birds and mammals that feed on aquatic resources
	Reduce to acceptable levels the toxicity to benthic infauna that live in and on surface sediments
	Mitigate or prevent dispersion of sediment COCs through aerial transport to uncontaminated locations where unacceptable resource exposure may occur
Surface water	Reduce to acceptable levels the exposures of ecological receptors to COCs at water concentrations that exceed potential applicable or relevant and appropriate requirements (ARARs) for surface water quality
	Reduce to acceptable levels the risks to populations of birds and mammals that feed on aquatic resources or ingest surface water with elevated levels of COCs
	Reduce to acceptable levels the risks to populations of fish that may be exposed to COCs in surface water

a. The list of medium and relevant pathways to be evaluated during the RI/FS process (e.g., problem formulation) will not be constrained by the preliminary RMAOs presented and discussed herein.
b. "Populations" refer to local groups of individuals common to the Site. Individual level analyses may need to be considered in the ERA.
c. Sediments are broadly defined as particles deposited by wind or water that are transported by water and accumulate in or immediately adjacent to surface water bodies. For this Site, sediment is defined to include particles at the bottom and sides of the Upper Columbia River channels and reservoir, including beaches.

[2] Pursuant to Paragraph 13. f. i. of the June 2, 2006 Settlement Agreement, upon completion of the Baseline Ecological Risk Assessment, the preliminary RMAOs developed and presented herein will be further refined.

EPA guidance (USEPA 1988) specifies that Remedial Action Objectives (RAOs), here termed RMAOs, for protecting environmental receptors typically seek to preserve or restore a resource (e.g., fish) and are thus expressed in terms of a contaminant of concern (COC), medium of interest, and an acceptable contaminant level or range of levels. At this early stage in the RI/FS process, delineation of Site-specific COCs and acceptable contaminant levels have not been completed. When these preliminary RMAOs are refined, in the screening of remedial action alternatives, they will reflect up-to-date Site-specific information on COCs and acceptable contaminant levels or ranges based on the results of the baseline ecological risk assessment. However, for the purposes of this memorandum, COCs referred to in Table 1 and throughout the remainder of this memorandum are used interchangeably with COIs.

The overall goal of the preliminary ecological RMAOs for the Site is to manage ecological risks to levels that will result in the recovery and maintenance of healthy local populations and communities of biota. Accordingly, the phrase "reduce to acceptable levels the risks" used in the preliminary ecological RMAOs summarized in Table 1 refers to decreasing the unacceptable risks associated with the presence of COCs at the Site by means that are appropriate to the circumstances present, and may include but not necessarily be limited to lowering/mitigating their concentrations, mobility, bioavailability, toxicity, and/or exposure to receptors. Similarly, "acceptable levels" refers to risks posed by COCs that are less than unacceptable adverse risk or harm to identified ecological receptors at the Site. Thus, reference to acceptable contaminant levels presented in this memorandum does not reflect Site-specific numeric guidelines or standards (i.e., preliminary remediation goals), which will be developed after the ERA is completed.

In their preliminary form, these ecological RMAOs broadly encompass the primary exposure pathways and receptors of concern at the Site. These preliminary ecological RMAOs will be refined throughout the assessment process, as problem formulation and the conceptual exposure model for the ERA are further developed (e.g., chemicals, receptors, and exposure media may be screened out or screened in as new data become available), as applicable or relevant and appropriate requirements (ARARs) are identified, and as information about the Site is assembled and synthesized.

DEVELOPMENT OF POTENTIAL GENERAL RESPONSE ACTIONS ASSOCIATED WITH PRELIMINARY ECOLOGICAL RMAOS

As described in EPA RI/FS guidance (USEPA 1988), actions that will be used to satisfy the RMAOs are referred to as "general response actions." Initially defined during RI/FS scoping, general response actions are "refined throughout the RI/FS process as a better understanding of site conditions is gained and action-specific ARARs are identified." General response actions may include *in situ* capping, treatment, containment, excavation, dredging, disposal, institutional controls, monitored natural recovery, or some

combination of these actions (USEPA 1988). General response actions, like the RMAOs, are medium-specific.

Potential sediment remedies are provided in EPA's contaminated sediment remediation guidance (USEPA 2005). Based on this guidance, a list of remedial technologies that will be considered in the development of remedial alternatives for areas with unacceptable ecological risks at the Site include:

- No action
- Institutional controls
- Monitored natural recovery (MNR)
- *In situ* containment (e.g., capping)
- *In situ* treatment
- Removal and disposal (e.g., aquatic, nearshore, or upland confined disposal)
- Removal and treatment.

The current condition of the UCR ecosystem reflects the influence of multiple environmental stressors. In view of the multiple environmental stressors in the watershed, it is critical to consider the effects of the full range of chemical, physical and biological factors influencing the biota and habitats. These factors will be important to identifying and assessing effective remedial action alternatives.

As required by the Settlement Agreement (USEPA 2006), during the feasibility study, Teck Cominco American Incorporated will provide EPA with a technical memorandum on refined ecological RMAOs (Agreement Task 6: Development and Screening of Remedial Alternatives). The refined RMAOs will provide more specific objectives for reducing to acceptable levels the risks to ecological receptors based on the results of the baseline ERA and the remedial investigation, and will include more detailed identification and evaluation of potential remedial action alternatives and associated technologies.

REFERENCES

USEPA. 1988. Guidance for conducting remedial investigations and feasibility studies under CERCLA. Interim Final. EPA/540/G-89/004. OSWER Directive 9355.3-01. U.S. Environmental Protection Agency, Washington, DC.

USEPA. 2004. Draft Upper Columbia River Site RI/FS scoping plan. Prepared by CH2M Hill and Ecology and Environment, Inc. (Contract No. 68-S7-04-01). EPA/630/P-04/068B. August 2004. U.S. Environmental Protection Agency, Region 10, Seattle, WA.

USEPA. 2005. Contaminated sediment remediation guidance for hazardous waste sites. EPA-540-R-05-012. OSWER Directive 9355.0-85. December 2005. U.S. Environmental Protection Agency, Washington, DC.

USEPA. 2006. Settlement agreement for implementation of remedial investigation and feasibility study at the Upper Columbia River Site. June 2006. U.S. Environmental Protection Agency, Washington, DC.