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LWG RESPONSES TO EPA COMMENTS ON THE 2002 DRAFT ROUND 1 WORK PLAN, PORTLAND HARBOR SUPERFUND SITE

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LWG RESPONSES TO EPA COMMENTS ON THE 2002 DRAFT ROUND 1 WORK PLAN, PORTLAND HARBOR SUPERFUND SITE

LWG Draft
May 16, 2003

The Lower Willamette Group (LWG) submitted to the US Environmental Protection Agency (EPA) a Draft Round 1 Work Plan and Round 1 Field Sampling Plan (FSP) for the Portland Harbor Remedial Investigation and Feasibility Study (RI/FS) on June 7 and 14, 2002, respectively. After extensive review and discussion, EPA and its partners provided LWG with an 'unofficial' set of comments on the documents in August 2002. EPA committed to consolidating the comments into one 'official' set of comments to be delivered later. At that time, EPA and LWG agreed that a more comprehensive Work Plan would be prepared that addressed more than just the Round 1 phase of the project. Because of this substantial change, EPA also agreed that the LWG would not be required to respond formally to each of the unofficial comments, but that the comments would form the basis for technical discussions and preparation of the Programmatic Work Plan and subsequent FSPs.

EPA and LWG also agreed to focus on resolving comments that related to the Round 1 sampling proposed for the late summer and fall of 2002. Much of the proposed sampling was collection of fish and invertebrate tissue, and was seasonally dependent. LWG and EPA agreed on the importance of collecting these samples in 2002 to help achieve the aggressive project schedule on which the parties had agreed.

Based on the unofficial comments, EPA and LWG also embarked on a series of technical subgroup meetings during late 2002 and early 2003. The purpose of the meetings was to discuss and, where possible, reach consensus on technical issues before submitting the Programmatic Work Plan draft. Where consensus could not be reached in the technical subgroups, the LWG prepared and submitted brief "issue papers" on [date] describing LWG proposals for the unresolved issues and providing technical rationales for those proposals. The LWG hoped that EPA management would either approve these proposals or instruct the LWG to take a different approach favored by EPA and supported by sound science. These EPA management decisions were then to be

incorporated into the revised programmatic work plan. Instead, subsequent to a change in the EPA project management team, EPA orally advised the LWG that it might conditionally approve or not oppose certain of these proposals but would defer review of the unresolved issues to its review of the programmatic work plan. Therefore, the programmatic work plan in some places incorporates the consensus of the technical subgroups and in other places develops the LWG recommend approach to a particular issue.

EPA provided the consolidated set of official comments to the LWG on February 26, 2003. The Programmatic Work Plan was submitted to EPA on March 31, 2003. To be fully responsive to EPA's letter, the LWG is also providing responses to each of EPA's comments. The responses are particularly important for comments (or parts thereof) where:

1. EPA's position was not directly incorporated into the Work Plan due to a lack of resolution between EPA and LWG. Lack of resolution could have been due to disagreement between EPA and LWG on certain matters, or that the topic was not thoroughly addressed in subgroup meetings. In these cases, the Work Plan contains LWG's proposed approach; or

2. There is a potential misunderstanding of how the Work Plan addressed the comment due to the complexity of the issue or, in some cases, because the LWG did not have sufficient time between receiving EPA's comments and submitting the revised Work Plan to address the particular comments. In these cases, additional explanation is provided.

The main purpose of these responses is to provide a guide for the location of relevant information in the Work Plan that addresses the comments. We believe this information will be useful as we move forward with finalization of the Work Plan. It is also important to note that ALL comments from EPA and its partners (including all 'unofficial' comments) were discussed in the technical subgroup meetings held in late 2002 and early 2003. Many of these comments were important in development of the Programmatic Work Plan and the Round 2A FSP.

We have noted one other outstanding issue not addressed in the comments that should be clarified. Section 4.7 of the project Statement of Work (SOW) requires submittal of a CERCLA/WRDA Integration and Coordination Plan following completion of an EPA-Corps agreement. Because no such agreement on WRDA issues has been completed, and the LWG is not currently pursuing integration of CERCLA with WRDA, the LWG has not prepared such a plan.

In addition, a Draft Round 1 Field Sampling Plan (FSP) was submitted at the same time as the Draft Round 1 Work Plan in 2002, and EPA provided comments of this FSP as well. These comments are not responded to here. These comments were addressed in discussions with EPA and resulted in a revised Round 1 sampling approach that was implemented with EPA concurrence in 2002.

Work Plan General Comments

Data Collection

Comment [page 1, 1st paragraph, 1st half]: The sampling scheme currently proposed is not adequate to determine the nature and extent of contamination (horizontal and vertical) or to identify localized in-water sources of contamination within Portland Harbor. Although both the Work Plan and Field Sampling Plan identify nature and extent of contamination as an objective of Round 1 of the remedial investigation (RI), the proposed sampling approach will not achieve the stated objectives. Additional sampling is necessary to characterize potential in-water source areas. This should include a higher sampling density in the vicinity of suspected source areas that have not been well characterized.

Response: We have revised the sampling approach substantially in this version of the Work Plan, and the new approach for the next round of sampling is specifically detailed in the Round 2A Field Sampling Plan. In addition, Work Plan Sections 7.2.1 and 7.2.2 present a revised approach for determining the need for sampling multiple media to evaluate chemical distributions and identify sources. Finally, the FS approach to determining sediment management areas (Section 8.6) details a process for using this information in the overall context of developing cleanup alternatives and how the issue of potential recontamination by ongoing sources will be handled (Section 8.7).

Comment [page 1, 1st paragraph, 2nd half]: In addition, subsurface samples must be collected to provide an understanding of the vertical extent of sediment contamination. By focusing solely on surface sediments, it is possible that only relatively clean, recently deposited sediments will be characterized. Minimal sampling of potential in-water source areas precludes characterization of the nature and extent of sediment contamination. In addition, the lack of toxicity testing through bioassays to evaluate effects on the benthic community precludes characterization of benthic effects.

Response: The overall subsurface sampling approach is described in Work Plan Sections 6.3.3 and 6.3.7. In addition, specific objectives and approach for subsurface sampling are defined in Section 7.2.1. Toxicity testing using bioassays is described in the Ecological Risk Assessment Approach (see Section 6.3.3, Section 7.3.4, and Appendix C).

Comment [page 1, 2nd paragraph]: We are concerned about language regarding the scope and intent of the Round 1 Work Plan and associated sampling and the lack of any data objectives that would be employed to determine whether or not additional rounds of data collection would be necessary or unnecessary. The document (page 13, 68) states that, "Round 1 is anticipated to be the most significant data-gathering event of the RI/FS, with Round 1 data focused on determining the nature and extent of contamination in sediments in the ISA and the concentrations of chemical constituents in the tissues of a variety of fish species." Round 1 is not the, "most significant data gathering event of the RI/FS." Rather, Round 1, as presented, is a limited and initial data gathering effort that will not answer the question of nature and extent, nor will it provide all the tissue data and supporting evidence necessary for conducting the baseline risk assessments. While it is recognized that a Round 2 sampling effort may be needed, it appears that too much emphasis and expectation is placed on the Round 1 data. Page 68 states that, "The Round 2 sampling program will likely focus on obtaining information from areas that were not defined following the Round 1 sampling program." What does this mean? Round 1 focuses entirely on the ISA and does not address harbor-wide nature and extent issues making everything outside the ISA "undefined" after Round 1.

Response: The approach to three full Rounds of Sampling including a Round 2 with at least two sub-components is summarized in Section 6.3. This multi-round approach is detailed throughout Section 7.

Comment [page 1, last paragraph]: The proposed sampling is inadequate to characterize potential effects on ecological and human receptors resulting from surface water exposures. Grab sampling for PCBs and other bioaccumulative contaminants is not appropriate, and may lead to conclusions that these compounds

are not present, when in fact ineffective sampling was used to detect the compounds. Different sampling methodology, such as high volume or diffusion sampling (e.g., lipid bags) with lower detection limits are needed to collect these samples properly and to ensure that the contribution of contaminants present in surface water to fish tissue burdens are quantified appropriately.

Response: Surface water analyses will be conducted in two phases. The first phase consists of grab samples for understanding N&E and direct toxicity and will be included in the Round 2A sampling. The need for other types of sampling to address bioaccumulation potential will be addressed based primarily on tissue analyses from Round 1, and results of the Preliminary Ecological Risk Evaluation. COPCs found to be bioaccumulating to potentially significant levels will be evaluated to determine if accumulation from surface water is likely to be an important contributor. If so, lipid bags, high-volume sampling, or other methods will be employed to help determine whether surface water is an important pathway, and what the likely sources are. Such sampling will then be planned.

Comment [page 2, 1st paragraph]: Round 1 has an emphasis on tissue collection, which is proposed to be used in a "data evaluation" to preliminarily assess risk for the site. Tissue evaluations, while important to assess risk to higher level organisms, are limited in that they concentrate on the potential effects to a limited set of bioaccumulative compounds and receptors. Due to the lack of focused sediment sampling and the absence of toxicity testing as described above, the direct effects of non-bioaccumulating chemicals are not adequately considered during Round 1. The assessment does not include an evaluation of localized effects on the benthic community, nor does the proposed sampling support a rigorous evaluation of these effects in order to provide a focus to round 2 sampling. The tissue sampling will provide an initial look at tissue COPCs, however, given the fact that fish integrate exposure from large areas of sediment, surface water and potential groundwater and seep exposure, this is not a good method for determining areas within the ISA that are contributing to unacceptable effects and levels of contaminants in ecological species. Additional sampling is needed to specifically address effects on the benthic community, which is in direct contact with the sediments. Although evaluation of

effects to the benthic community are largely ignored in this round of sampling, a detailed historical data review combined with the limited sediment sampling proposed in Round 1 could be used (with the appropriate screening criteria) as a tool to direct future rounds of sediment sampling and bioassay testing.

Response: Focused sediment sampling and toxicity testing are now explicitly described in Section 7. Evaluation of localized effects on the benthic community is discussed in detail in Appendix C, Section 5.3.

Comment [page 2, 2nd paragraph]: The Work Plan does not include any methodology for correlating tissue concentrations to surface water and sediment concentrations. Without this step, it is not possible to develop, evaluate and implement response actions to reduce tissue concentrations to acceptable levels. Ultimately, the link between sediment contamination and fish tissue will need to be made if unacceptable chemical concentrations in fish are found. To complete the link, synoptic fish tissue and sediment samples need to be collected.

Response: Section 5.3 of Appendix C details the methods for relating tissue concentrations to water or sediment concentrations.

Groundwater

Comment [page 2, last two paragraphs; page 3, 1st paragraph]: The Work Plan is completely inadequate in addressing groundwater. This presents a major problem since it does not seem to be leading the project to achieving full characterization of the Portland Harbor Site, documenting both the ambient contamination and the specific contamination areas, or to understanding the magnitude of all the major inputs to the system from groundwater and surface water sources.

When there is groundwater sampling incorporated into this, or future plans, there must be a clear understanding that volatiles are not the only contaminant in groundwater or the sediments. In the next revisions it must be made clear that groundwater samples will need to include all, or the majority of the contaminants of concern (VOCs, semi-volatiles, metals, PAHs, etc). While it is possible that some of

the more hydrophobic contaminants will need not be analyzed, that should be a decision based on supportable logic and data, and not as a general rule before any sampling locations or methods are proposed.

The groundwater sample section is so limited that in practicality it simply postpones any groundwater sampling until Round 2 on the best scenario, or never as a worst scenario. While postponing groundwater collection to Round 2 could be useful if additional analysis of the existing sediment data is completed, and only if additional samples are taken in an attempt to more carefully define the areas of concern, it is not clear that either one of these approaches are being considered in the sediment plans for Round 1 or 2, and therefore, not likely to influence any future groundwater sampling. In addition, this lack of sampling or incorporation of known groundwater contaminant discharges into the sediment plan sampling location choices ignores the locations where we should be obtaining sediment quality data based on existing discharges.

Response: The Programmatic Work Plan includes a process for evaluating groundwater using a phased approach in which DEQ extensive information base is reviewed and used to identify data needs for assessing whether groundwater could be a source of unacceptable risk in the river. The types of information, and methods for obtaining it will be location-dependent. LWG's initial review of the DEQ information will be presented in a report to EPA and form the basis for a cooperative process to identify additional information needed to make risk management decisions for the river, and identify potential source control actions for DEQ.

A specific Step by Step methodology for studying the potential effects of contaminated groundwater discharges to the river is described in Section 7.2.3, and this methodology is not limited to just VOCs.

Because the evaluation of groundwater information is linked to the assessment of ecological and human health risks, sampling takes place later in the process (Rounds 2 and/or 3). However, this appears to be the most appropriate way to ensure that large amounts of potentially unnecessary data are not collected, and that the data

collected achieve the goal of understanding the potential risks associated with any groundwater related discharges of chemicals.

Data Analysis

Comment [page 3, 1st paragraph of section]: A major disappointment with the RI/FS Work Plan is that the existing data were not evaluated in the document in such a way that the reviewers could understand how these data were being used in designing Round 1. While there is mention of many of the studies already completed and of the potential sources, an evaluation of these studies/sources was rarely done (except for the QA) nor is there much discussion as to how these studies impacted the sampling design of sediment, fish, and water.

Response: Section 7.2.1 describes how historical data will be used to meet overall data objectives. Section 4 contains detailed discussion of the findings of these historical studies.

Comment [page 3, 2nd paragraph of section]: The analysis of the existing data also needs to consider physical changes to the river (deposition and erosion), including flood events, to determine if the data is still representative of current site conditions. Given that most of the existing data was collected several years ago, it cannot simply be presumed that it all category 1 data is still usable data. The analysis should consider the results of recent bathymetric surveys, sediment profile imaging, and other work to determine data usability.

Response: Section 7.2.1 describes how historical data will be used to meet overall data objectives and Section 7.1.1 describes how the physical system will be evaluated and its relationship to sediment chemistry studies. In addition, Section 4.2 recognizes that all historical data cannot be necessarily assumed to be useful for all Work Plan purposes, and that this is related to sediment stability.

Comment [page 3, 3rd paragraph of section, lines 1-7]: The data analysis provided in the Work Plan is inadequate in that it did not include subsurface or category 2 data. Although data of unknown quality may not be appropriate for use in the risk

assessment, it may be useful for the identification of areas and contaminants of concern. Similarly, it is known that subsurface sediment concentrations are generally higher than surface sediments. What is unknown is the degree to which subsurface sediments may result in exposure to human or ecological receptors. Again, these data may be useful for the identification of areas and contaminants of concern.

Response: Category 2 data is used in the understanding of historical information in Section 4. Subsurface data are discussed and presented in Section 4.2.

Comment [page 3, 3rd paragraph of section, lines 7-11]: In addition, the analysis would be greatly aided by a comparison to sediment screening criteria. Overall, any data analysis must recognize the limitations on use of the data described in the proceeding paragraph. Category 1 data should be used as appropriate, assuming it has been analyzed according to the same criteria to make sure it still represents current site conditions.

Response: Chemical data are presented across categories of concentration ranges in lieu of screening against potentially inappropriate criteria. However, the LWG has provided such screening maps to EPA in project meetings, as requested.

Comment [page 3, bottom paragraph]: In many areas, the plan lacks sufficient detail to allow the government team to understand exactly what has been done to date, what is planned, or how Round 1 data will be used. Throughout the document, the point is made that some type of risk based analyses will be done after Round 1. However, the methodology to be used is not presented clearly or consistently. Meetings with Respondents have failed to clarify this issue. Sometimes the words "risk screening" and "screening levels" are used to describe this process, other times the words "risk assessment" are used. The RI/FS Work Plan must present the methods and data/assumptions that will be used to evaluate the results from Round I.

Response: Significant text has been added to Section 6.3.5, 7.3, and 7.4 of the Work Plan, Appendix D, and Section 1 of Appendix C to explain the structure of the ecological and human health risk assessments, data needs, schedule, and major deliverables.

Comment [page 4, 1st full paragraph]: We disagree with the approach outlined for evaluating effects on the benthic community due to its reliance on Probable Effect Concentrations (PECs) and the lack of toxicity testing. The ecological risk assessment Work Plan states that sediment data will be compared to sediment quality benchmarks such as PECs, to assess the potential for adverse effects on the benthic community. PECs are not conservative screening numbers, and are defined as a benchmark where effects are likely to occur. In Table 5-1 of Appendix C of the Work Plan, the null hypothesis is given for the benthic community as "the adverse effects concentration does not exceed peer-reviewed literature based LOEC for survival, growth, or reproduction." A LOEC may be an appropriate screening tool for the benthic community, but a PEC does not correspond to a LOEC. Rather a PEC is a benchmark where about 85% of the benthic community is showing effects. By definition, a LOEC would be closer to a TEC, where about a 15% effect is seen. By using a PEC for exposure and effects screening, areas where adverse effects on the benthic community are occurring could potentially be missed. Appropriate protection levels are also outlined in Oregon's statute and Rule, which state that "For protection of ecological receptors, if a release of hazardous substances causes or is reasonably likely to cause significant adverse impacts to the health or viability of a species listed as threatened or endangered pursuant to 16 U.S.C. 1531 et seq. or ORS 496.172, or a population of plants or animals in the locality of the facility, the acceptable risk level shall be the point before such significant impacts occur (ORS 465.315)". Perhaps a better approach is to screen using a TEC (threshold effects concentration), where effects are infrequently expected, and a PEC, such that gradients of potential effects could be defined. Areas that exceed a TEC, but are lower than a PEC could be identified for further evaluation, such as toxicity testing through bioassays. Areas above a PEC would identify areas where effects are likely occurring, and should be considered areas needing potential action (i.e., early action candidate areas).

Response: Subsequent to extensive discussion with EPA and its partners, the approach to assessing benthic risks has been revised and is summarized in Section 6.3.5, 7.3, and Appendix C. The approach uses SQVs (TEL, PEL and PEC) in an evaluation of historical data to identify areas for placing sediment samples and conducting toxicity testing. These areas will be sampled during Round 2A and a predictive tool, relating sediment concentration and toxicity, will be developed from these results. A specific approach will be described in a document to be submitted in the near future entitled: "Technical Memorandum: Benthic Analysis Approach for the Portland Harbor Superfund Site".

Comment [page 4, bottom paragraph]: The rationale and objectives for the Round I investigation need to be further developed. Without a presentation of how the entire RI/FS will be conducted (clear investigation objectives and an understanding of the general scope of future phases of investigation) it is difficult to see how Round 1 fits in with subsequent investigation phases and to comment on the proposed sampling locations. The Work Plan must fully describe the anticipated phases of the RI/FS. Clear objectives should be set forth for each known phase of work. The Work Plan should be revised to include:

- Clear objectives for known phases of investigation;
- Identification of known data gaps that must be addressed in subsequent investigation phases (e.g., vertical extent of contamination, characterization of localized sources and/or hot spots (principal threats)); testing adjacent to suspect site or sources;
- The RI schedule should reflect the major tasks associated with data gaps; and
- Recognition that multiple phases may be needed to meet DQOs.

Response: Section 6 has been added for the express purpose of outlining the entire project and how the various phases of field and data analysis work will fit together in a comprehensive approach.

Comment [page 5, 1st paragraph]: It is unclear how the Feasibility Study (FS) will proceed based on Round 1 data. Critical information is lacking to allow the FS to

move forward in a meaningful way. The proposed sampling approach does not clearly describe a process for delineating localized areas of contamination to identify hot spots or principal threats, determining the vertical extent of contamination to estimate potential dredge volumes or evaluating sources and inputs of contamination to determine the contaminant loading from outfalls, groundwater discharge, upstream, and the potential for recontamination be performed.
Page 68, section 6.1.3 generally describes potential sampling rounds but no criteria are provided that would assist in guiding us into Round 2. What media and what contaminant levels in those media will be used to justify a decision to take or not take more samples?

Response: The FS subsection has been greatly expanded to its own full section (Section 8). Approaches to issues such as sediment area delineation, vertical extent, and recontamination are specifically described. The relationship of Round 3 sampling (primarily FS) to previous Rounds of sampling is summarized in Section 6.

Comment [page 5, 2nd paragraph]: Round 1 data will be confounded by the fact that several aspects of the RI/FS Work Plan are undeveloped and in many cases, little or no site-specific data exists to support propositions and assumptions made in the Work Plan. For example, additional criteria for how Round 1 data will be used needs to be provided for Round 1 sampling of target species. We also caution against the use of mixed terminology, such as "risk estimates" and "preliminary assessments." Respondents are required to conduct risk assessments. There is no proposed process to go from a determination of risk to cleanup levels, or even to define areas requiring cleanup. The Work Plan needs this basic framework. It also needs a master list of data needs, with a clear and logical plan for collecting the needed data, in this and subsequent sampling efforts.

Responses: The relationship of Round 1 to later sampling rounds is summarized in Section 6. The risk terminology has been made more precise and the overall approach is described in Section 6.3.5. The relationship between risk levels and determination of cleanup areas and volumes is described in Section 8.6. Data needs

are described on an issue-specific basis in Sections 7 and 8, and are called out in separate subsections in each case.

Comment [page 5, 3rd paragraph]: Subsurface sediment chemistry, sediment bioassays, and additional water column sampling using low detection methods will be needed to define adequately the nature and extent of contamination. More surface sediment chemistry will be needed to define the boundaries of areas requiring cleanup, and to ensure that all hot spots have been identified. These and other data adequacy issues are addressed in our detailed comments.

Response: Subsurface and additional surface sediment chemistry will be collected in Round 2 (see Sections 6.3.3 and 7.2). Bioassays will be collected in Round 2 (see Section 6.3.3 and 7.3). Water sampling will follow a phased approach that may include low level analyses in later rounds as appropriate (see Sections 7.2.2 and 7.3.4). Additional sampling to define SMAs is provided for as needed in Round 3 (see Section 6.3.7).

Comment [page 5, 4th paragraph]: The Work Plan needs some key definitions up front. What is a reference area? What is a background area? What is a comparison area? If any of these are to be used in the plans there should be a non-ambiguous definition up front, and if they are synonymous terms, then only one should be used in the documents.

Response: The Work Plan contains a glossary of terms in Section 11. "Background" is the only term now used in the Work Plan. "Background" is specifically defined in Section 8.2 using CERCLA guidance.

Comment [page 5, beginning 5th paragraph]: We do not disagree with the goal of obtaining as much information as possible from this sampling round, but there is neither sufficient historical Category 1 data nor understanding of the breadth and extent of contamination to support the assumptions in the Work Plan. In addition, the sampling plan, as presented, lacks the breadth to determine the extent of the contamination and proposes insufficient sampling of key receptors.

Response: Three major rounds of sampling are described in the revised Work Plan. The relationship to historical data is described in Section 7. The relationship between sampling and key receptors is defined by the DQO tables supporting Section 7. Per discussions with EPA and EPAs Partners, additional receptors were added to the ERA, and these receptors were collected for tissue analysis during Round 1.

Comment [Page 5, middle of 5th paragraph]: For example, Round 1 focuses on the ISA, and so will not address contamination in the rest of Portland Harbor.

Response: Samples are proposed in Round 2 in areas outside the ISA. Overall, our technical approach as defined by the AOC and as presented in the Work Plan is to start investigation within the ISA and identify boundaries based on contiguous chemical concentrations in sediment posing risk as determined through preliminary risk evaluation (see Section 6).

Comment [page 5, end of 5th paragraph]: Key species life stages, e.g., adult chinook salmon and lamprey, are not included. The emphasis on sediment and tissue samples precludes obtaining contamination data from other sources and receptors. An additional concern is that the document makes many assumptions about critical issues, such as sources of contaminants in fish tissue and sensitivity to contaminants. Generally, little or no site-specific data exist to support those assumptions. The question of what the data needs are to confirm or rebut those assumptions must be answered.

Response: Since the draft Round 1 Work Plan was delivered, LWG completed Round 1 with changes to the ecological receptor list as requested by EPA. Northern pikeminnow and peamouth were added as receptors and sampled. Attempts were made to collect tissue samples of all animal receptors, including juvenile chinook salmon and lamprey ammocoetes, except for amphibian, bird and mammal receptors. The revised Work Plan contains the updated Round 1 sampling objectives and outlines the assessment methods and resulting data needs for each assessment

endpoint (See Section 6.0 of the Work Plan and Section 5.3 of Appendix C). Support has been added to Appendix C where assumptive statements are made in response to the specific comments (See Appendix C responses). The risk assessment approaches have been significantly revised to include more detail on how evaluations will be conducted and where they rely on historical versus collected data from three rounds of sampling (Appendix C and D).

Risk Assessment and Exposure Pathways

Comment [Page 6, 1st paragraph]: The work plan describes a risk assessment that attempts to assess risks to a large section of river, but fails to identify local sources or assess the risks associated with those local sources. For example, bioaccumulative compounds found in fish tissue may describe a general risk in the river but they will not point back to sources areas. Sampling that would determine nature and extent around in-water sources is missing.

Response: Round 1 sampling included co-located tissue and sediment samples and was designed around chemical sources and ecological habitat. Therefore, LWG believes the data can be used to target local sources and assess risk to ecological and human receptors. Round 2 is focused on determining chemical distributions in sediments and on sediment bioassays as well as water column sampling to allow assessment of direct toxicity. Section 6.0 of the Work Plan outlines the sampling activities and Section 5.3 of Appendix C describes the assessment methods and data needs for ecological receptors. In addition, as the site-wide risk assessment process moves forward, areas may be identified for further evaluation in the RD/RA post-ROD to address source-and PRP-specific issues.

Comment [page 6, 2nd paragraph]: The risk assessment may compare sediment values to Probable Effect Concentrations (PECs) and Threshold Effects Concentrations (TECs) to demonstrate the range of potential toxicity, but areas above a TEC must be identified for further evaluation.

Response: The detailed approach for risk assessment endpoints, including benthic invertebrates, is described in Section 5.3 of Appendix C. In addition, a detailed

technical memorandum was prepared and submitted to the EPA ecorisk subgroup in January, 2003. EPA responded with comments and approval of the benthic approach on March 19, 2003 (pending response to comments, including development of a detailed technical memorandum on the subject. This memorandum ("Technical Memorandum: Benthic Analysis Approach for the Portland Harbor Superfund Site") includes an approach that uses SQVs (TEL, PEL and PEC) in an evaluation of historical data to prioritize areas for further investigation. These areas will be sampled for chemistry and bioassay testing, and a predictive tool, relating concentration and toxicity, will be developed from these results.

Comment [page 6, 3rd paragraph]: The analyses of exposure pathways in the document fails to consider, or regards as minor, several pathways that are likely significant. Humans, mammals, and birds all ingest significant amounts of water, and so that is a major pathway of exposure. Also, especially during high water periods, there can be high levels of suspended sediment in the water. Therefore, ingestion of the water will include ingestion of sediments making that a major exposure pathway. Even if these pathways prove to be minor compared to other pathways, they may be important due to cumulative and threshold effects.

Response: Section 5.2.2 presents the pathway analysis for the Portland Harbor Superfund Site. Appendix D for human health indicates that complete and significant pathways, including where relevant to water, will be quantitatively assessed. Appendix C for ecological risk presents the process for determining if water and/or sediment is considered a significant contributor to the risk estimate. Although birds and mammals do ingest water, the LWG disagrees that this is a major pathway compared to the ingestion of biota and sediment. Water concentrations in a system such as the Willamette are not expected to influence (change the estimate one way or another) risk estimates for the food web pathway.

Maps

Comment [page 6, 4th and 5th paragraphs]: The maps and aerial photographs are of very high quality and well done, but should have additional details added to them to have a more complete, and consistent, set of site names, landmarks (river miles, bridge names, selected area features, etc.). These should be labeled consistently in all

the maps and photographs, as much as possible, to allow easy comparison from one type of figure to the next of the same area. In addition, it would be best if more of the maps were at the same scale if easily done to allow more overlapping of maps.

There should be a comprehensive contaminant map which compiles all that is known along the river to help define the area better in a composite manner. It should include the visible or similarly defined contaminant areas (NAPL, seeps, etc.), the potentially major contamination discharge pipes, the previous locations where samples have been taken and a general interpretation of data can be graphically shown, visual observations where there is no "data", etc. This type of a complete map will help to focus the work areas, the types of contamination in each, and the future work that needs to be done.

Response: Substantial work has been done to include additional maps with the information suggested as well as updating maps to include more information. Consistent labeling of features and consistent map scales were used to the extent practicable for the revised maps. In some cases, different maps scales were necessary to more clearly present the information on the map (e.g., Figure 2-15a-k, bathymetric survey differences). Upland facility names and boundaries, seep locations, outfall locations, utility crossing, bathymetric differences, and dredged areas have been added to all of the chemical concentration maps for surface and subsurface sediment (i.e., Figures 4-1 through 4-34).

Comment [Page 6, last paragraph; page 7 first paragraph]: The names of facilities used in the maps needs to be much more descriptive than just "Port of Portland" (or other such), even if they are the present owner. Too many of those are presented in the maps, and they are not descriptive enough to be of any use for characterization. It is suggested that each facility have a parenthesis behind the name which indicates what the most potentially problematic historical industrial use of that site or parcel has been. In addition, at a minimum, the names included in all the maps and tables should include all the ones that are in the ODEQ list, shown in Figure 3-2. All those names which are included in maps should be consistent over all the different maps and photos presented in the Work Plan.

Response: Maps and tables were revised with consistent facility identifiers. Table F-1 contains a comprehensive list of the ECSI sites along Portland Harbor and the industrial uses of, and chemicals present at, each site. Figure 1-3 presents both property ownership and ECSI site identifiers, for further cross-reference. Adding historical uses to maps was not practical at the map scale used. This information is provided in various other forms in the Programmatic Work Plan and in the FSP presentation.

Comment [page 6, 2nd paragraph]: The reports should have a summary in the beginning of each major section (surface water, sediments, fish sampling, groundwater, etc.) which states what that section will cover and what further work will be done, or, alternatively, what limits to future work are being implied by that section. This is a problem, for example, in sections where there are statements which imply that this is the "major field work season", and therefore anything in the future would be expected to be significantly less than what is presented in this plan.

Response: Section 6 has been added to provide an overall approach on the types and extent of sampling in each round and the information each round is intended to provide. The section also provides an overview of how these rounds fit together to meet the overall objectives of the RI/FS.

Conceptual Model

Comment [page 7, 3rd paragraph]: The Work Plan needs an acceptable graphical sediment conceptual model to support the sampling proposals. That model should also be discussed and explained in a related section of the text which describes the assumed model for the ISA or selected subareas (nearshore areas, coves, main channel, deposition areas, etc.). The model should take into consideration the downstream flow patterns and how contaminants have reached the sediments through the near-shore activities. Furthermore, the Work Plan must include this information when making the general statement that transects to mid-channel show decreases in concentrations. Gradients should be defined based on a group of samples, not on one or two samples.

Response: Depicting all of these spatial relationships in one simple graphical format is difficult, if not impossible. However, we have greatly expanded the CSM section (Section 5) and this includes extensive graphical presentations to aid in the understanding of the overall CSM. Specific statements about trends in the data (spatial or temporal) are related to historical data presented in Section 4.

Subsurface Sediment Data

Comment [page 7, 1st paragraph of section]: The subsurface sediment data should be incorporated if available, to document sediment sources or clean areas. While we recognize that the subsurface data is category 2 data, using the existing deeper sediment data, together with other category 2 data would create a more complete picture of the nature and extent of contamination. On a related note, it seems interesting that there is very limited U.S. Geological Survey (USGS) data or references used in the Work Plan. The Work Plan should document what USGS data is available which supports the sediment work and plans.

Response: Subsurface sediment data are discussed in Section 4.2 of the Work Plan. Figures 4-18 through 4-34 present Category 1 and Category 2 subsurface sediment sampling results. Category 1 and Category 2 subsurface sediment data have been and will continue to be used to plan additional site characterization sampling efforts. To our knowledge, relatively few USGS studies have been conducted on the Lower Willamette River; available USGS data have been incorporated into the Work Plan.

Comment [page 7, 2nd paragraph of section]: The sediment sampling should be based on compiling all the available information, and not simply on filling the gaps of the previously sampled locations or on a subset of the data. While only the appropriate category 1 data should be used for compliance or risk assessment type of work, all the available data should be used in the planning since it will provide the best indication of the extent of contaminated areas.

Response: Subsurface and Category 2 data are presented in Section 4.2. These data are used in the determination of Round 2 sampling locations (see Round 2A FSP) and will be used in the determination of the extent of contamination.

Comment [bottom page 7 and to page 8]: Most of the sediment samples planned are from very shallow samples, and may not allow sufficient characterization of the site. If only additional shallow data is obtained, and interpreted with only the existing shallow data to develop a site characterization comprehensive picture of the site, we may bias the nature and extent of contamination, or miss some of the important sediment sources. Different mapping criteria for the contamination should be used, using deep cores data, shallow samples data, groups of data sets, combinations of contaminants, etc., to characterize the ISA with the existing data and to indicate where there are data gaps. In addition, to place an inordinate amount of hope on characterizing and understanding the site based on only shallow sources may be a fatal flaw if a high flow event occurs that smears the sediments down river. The Work Plan should incorporate the deep sediment data; plan to obtain additional deep core data to plan for future remediation; and it should not be limited to sampling for the risk assessment. Previous subsurface sediment sampling should be incorporated into the present characterization and additional deep sediment cores should be used to further define that characterization.

Response: Subsurface and category 2 data are presented in Section 4.2. These data are used in the determination of Round 2A and 2B sampling locations (see Round 2A FSP) and will be used in the determination of the extent of contamination. Round 2B and 3 are anticipated to include additional subsurface coring (see overview Section 6).

Comment [Page 8, 2nd paragraph]: The only deep cores which are proposed are already selected to be for "natural attenuation". This objective seems a bit premature since the river sediments have not been fully characterized and concentrating data collection for a selected "remedy" in a few random area may bias future remedial action alternatives. Numerous deeps cores analyzed for multiple suites of chemicals are necessary to characterize the existing sediment contamination, not just for purposes of "natural attenuation."

Response: The Nature and Extent Work Group verbally agreed on the tiered natural attenuation approach that is reflected in revised Section 8 and Appendix A. The EPA/DEQ-reviewed minutes from the January 21, 2003 Nature and Extent Work Group meeting state: "LWG proposed a 3-step approach to the natural attenuation study: 1) identify general physical system types in the river that could have processes that support NA, 2) estimate capability for NA in each physical system type, 3) estimate NA potential in specific areas for FS. The first step would be completed using existing data and hydrodynamic modeling data (if available), while the second and third steps would use sediment core data and other sampling results. Sediment cores for Step 2 would be most likely collected during Round 2B." An approach for general subsurface chemistry sampling for other purposes is also now described in the Work Plan (see overview Section 6).

Sediment Stakes

Comment [Page 8, 3rd paragraph]: Previously submitted comments on the limitations of sediment stakes have been ignored and the stakes are proposed as the only method to sample the changes of the sediment surface. There are no clear explanations of how those measurements will define the changing sediment surface to support the use of the stakes. It is also not clear who or how the stake readings will be done during a high flow event (which would be the events of interest). Once the high velocities and flows drop, the net change of the sediment caused by moving sediment may not be noticed at the stakes. No backup system is proposed, so that if the stakes do not work, there will be no way to change the method until the next sampling plan is proposed, reviewed, and implemented (probably delaying these measurements an entire year).

Response: This comment was originally made on the Round 1A FSP (not the Work Plan) and the Round 1A FSP was revised based on meeting discussions with EPA about these comments.

Early Actions

Comment [Page 8, 4th paragraph]: The Work Plan does not adequately address the need for early actions. More attention should be given to the identification,

evaluation and implementation of early actions. The Round 1 sampling effort should be adequate to identify potential early action areas through a comparison to sediment screening criteria. At the conclusion of Round 1, data should be evaluated to determine which early action candidate areas warrant further characterization.

Response: The existing Early Action memorandum included as Appendix B of the Work Plan, constituted the initial evaluation required under the AOC and SOW. The Early Action memorandum proposed a process of periodic reevaluation of the site for early actions, including after Round 1 data collection as proposed in the comment. It should also be noted that both the nature and extent sampling (much of which will occur in Round 2A), and particularly, the sampling related to sources conducted both by LWG and directed by DEQ at individual sites is expected to help identify potential ongoing sources, which was one of the major obstacles identified by the Early Action memorandum.

The LWG has expressed concern to EPA outside the Work Plan process that the timing of early actions coincide with sufficient progress toward completion of the RI/FS. LWG views this as necessary so that parties undertaking early actions can be assured that early actions are a cost-effective means of reducing actual risk at the site and that early action areas will not be recontaminated by uncontrolled sources. Dan Opalski's March 28, 2003 letter to the LWG states,

> "...remedial actions taken after completion of an RI/FS and issuance of a ROD provide greater certainty that the remedy will not need to be revisted...Here, prior to completion of an RI/FS, a given removal action may provide little certainty with respect to long-term effectiveness...Given where we are in the process, the main thrust of Respondents' funds, focus, and action are best spent on work with DEQ to investigate and perform cleanups in upland areas to address ongoing sources to contaminants to the river while working with EPA under the AOC to perform a thorough and complete RI/FS to reach in-water cleanup decisions as expeditiously as possible. This is the best strategy for using everyone's resources most efficiently"

Source Areas

Comment [bottom page 8 and top page 9]: The logic of "sources" so far is limited to upland sources, but that is only one of many "source areas" affecting Portland Harbor. Within the ISA there are sources located in the river sediments, which were created by a number of activities and processes which need to be identified and characterized. Some of these were likely discharges directly into the river (solid wastes or liquids -- dissolved or NAPLs); on-going pipe discharges; discharging groundwater and related contaminants flowing into the river; shallow sediment contaminants which may be smeared over a large area; deeper contaminants which may be related to old processes which may be in a fairly thick zone, but now buried by a veneer of cleaner sediments, spills, etc. This logic is not apparent in the Work Plan and deserves more discussion.

Response: Section 3 provides a thorough discussion of the range and types of sources that are likely to be present at the site. How these sources fit into the physical site model are described in Section 5.1.1. The characterization of sources is described in Section 7.2. Finally, an approach for understanding the potential for future recontamination by ongoing sources is discussed in Section 8.7.

Work Plan Specific Comments

Section 1.0, Page 1:

Comment: Second paragraph, "The purpose of the RI/FS is to investigate the nature of sediment chemical distributions ..." Strike the word "sediment." The investigation is not limited to sediment and other media should be included.

Response: Sentence revised to include "in-water portions" of the Site.

Section 1.3.1, Page 9:

Comment: Item #7 in list, "Select Site-specific, Project-specific, and Sediment-specific Risk Management Approaches that will Achieve Risk-based goals." It will be impossible to achieve this without collecting site-specific information on bioavailability and toxicity. Because the plan relies on literature-based BSAFs and national sediment screening levels, the risk-based goals will not be site-specific.

Response: Site-specific information on toxicity testing is presented in Appendix C(see Section 5.3 of Appendix C and Attachment C.3). Site-specific BSAFs will be developed if a predictive relationship exists between tissue chemistry and sediment concentrations.

Page 12:

Comment: It is not clear what methodology will be used for the "risk-based evaluation of available information and assessment of uncertainty associated with risk management decisions."

Response: The risk approach has been updated to include more detail (Sections 6, 7, and Appendices C and D). Uncertainty is specifically addressed in both Section 7 of Appendix C and Section 6 of Appendix D.

Section 1.3.3, Page 13:

Comment: Third paragraph, "Round 1 is anticipated to be the most significant data-gathering event of the RI/FS, with the Round 1 data focused on determining the nature and extent of chemicals in sediments ..." EPA disagrees that the proposed sampling is sufficient to achieve this goal. More samples are needed near suspected source areas to identify and define the extent of hot spots, and subsurface data is needed to define the mass of material that exceeds risk-based concentrations. Although the proposed sampling is a good first step in addressing the area wide concentration in fish, it is inadequate to characterize the nature and extent of in-water contamination. EPA disagrees that Round 1 will comprise the "most significant data gathering event of the RI/FS."

Response: The Round 1 FSP was revised based upon discussions with EPA. Additional rounds of sampling and their purpose are described in Section 6 of the Programmatic Work Plan.

Section 1.3.3, Page 14.

Comment: "Subsurface sampling to determine the depth of contamination may occur in Round 2 ..." The implication here is that subsurface sampling will only occur if the surface sediments are contaminated. The further implication is that

subsurface contaminants do not cause risk and will not be exposed due to chemical diffusion, advection, bioturbation, erosion, dredging, or other forces in the future. Respondents cannot simply assume that subsurface contaminants are not a problem. Respondents should propose appropriate studies to determine whether subsurface contamination causes risk or is likely to do so in the future.

The source and nature and extent from subsurface contamination should be investigated in Round 1 sampling. Subsurface sources may become exposed as the river changes and the potential future risk needs to be assessed.

Response: EPA and the LWG have agreed that subsurface sediment sampling will be conducted during Round 2B, and Round 3 if necessary (see overview Section 6).

Section 1.3.5, Page 15:

Comment: First two paragraphs. The text here also appears on page 12; omit redundancy.

Response: The redundant text has been deleted.

Section 1.4, Page 15:

Comment: Cultural resource issues and legal responsibilities apply to both the uplands and the in-river portion of the site. Because the natural banks of the Lower Willamette River have been altered and flooded over time, cultural sites may exist below the high water mark. Additionally, the Yakama Nation considers natural resources, especially fish and water, cultural resources.

Cultural resource issues must be addressed with the Tribes, and they must agree to approaches to handling cultural sites and objects. In addition, collection of beach sediment samples may uncover cultural sites or objects.

Response: Section 1.4 indicates that the LWG will undertake an evaluation of cultural resources consistent with ARARs. As requird by the AOC, the cultural

resource analysis will begin after the LWG receives a memo from EPA describing the requirements of the analysis.

Section 2.1, Page 20:

Comment: The presentation on the physical setting and geologic history would benefit from the addition of simple figures (e.g., Generalize Geologic History – Figure 3-18 from the Doane Lake RI, Geraghty & Miller, 1991).

Response: We have included a geological cross section (Figure 2-1).

Section 2.1, Page 20:

Comment: First bullet, the statement that "there is no evidence that the CRBG is a significant aquifer along the margins of the ISA" is not supported. CRBG wells are known to be present historically and a limited number of production wells are still in use (e.g., Chevron Asphalt production well). In addition, a pump test at the GASCO facility identified an interflow zone that produced approximately 1,000 gallons per minute.

Response: The section on hydrogeology (2.1) has been greatly expanded including additional information on the CRBG.

Section 2.2, Page 23:

Comment: A figure should be added that shows how river stages vary over time. A figure of this type can illustrate trends in river levels and is essential in the interpretation of data (i.e., with respect to a river stage) in a dynamic setting.

Response: Figure 2-2 depicts river stage data.

Section 2.3, Page 25:

Comment: The Acoustic Doppler Current Profiler data collected to date by David Evans and Associates, Inc. should be summarized in the Work Plan.

Response: Section 2.2.2 describes these data.

Section 2.3, Page 26:

Comment: It is unclear whether all dredging projects have been included in the summary. For example, dredging recently took place adjacent to the Willbridge docks and at Terminal 5. These are not depicted on Figure 2-1.

Response: All dredging for which we have specific location data are depicted on Figures 2-8 and 2-11. The Willbridge location dredging data were not obtained prior to submittal of this Work Plan. However, the general location of the dredging is apparent in the bathymetry difference maps.

Sections 2.5-2.6, Pages 28-30:

Comment: Sediment Transport and Dredging. The historical and projected sediment transport trends are critical to better understanding where ISA contaminants may have become located and what remedial options are feasible in certain river locations. In addition, historical and recent sediment transport as well as dredge/fill activities may greatly influence the outcome of the sampling and analysis effort if sampling locations are not carefully selected. The sediment trend analysis (STA) provided very useful information that needs to be supplemented with additional transport data. To this end, sediment samples below the ISA need to be analyzed to better understand the nature and extent of historical and current contamination on a harbor-wide basis. A lot of bathymetry, sedimentation and historical contaminant data are provided in graphs in the Work Plan. To make sure that this data is considered in a coordinated fashion with species and habitat use, CSOs and other data provided, a river-mile-by-river-mile analysis of potential sampling sites would be beneficial.

Response: A mile-by-mile analysis of sampling locations is provided in the Round 2A FSP. This FSP includes sampling downstream of the ISA.

Section 2.5, Page 29:

Comment: Last paragraph. The text here refers to Table 2-2. There is no Table 2-2.

Response: Typo corrected.

Section 3.1, Page 31:

Comment: Other contaminants that may be present in the ISA include herbicides (Rhone Poulenc), pentachlorophenol (McCormick and Baxter and Time Oil), and perchlorate (ATOFINA).

Response: All chemicals except perchlorate are mentioned on page 42. We have no information confirming the presence of perchlorate.

Section 3.2, Pages 32-34:

Comment: Permitted Discharge, Storm water and CSOs. While the volume of overland flow may be small relative to the amount of discharges from outfalls, the amount and toxicity of contaminants in the runoff that enters the river will add to the severity of the problem.

Response: We agree that the relatively toxicity of discharges is important in addition to the volume of those discharges. Because we do not have direct information regarding the toxicity of most of these discharges, we have not included any additional text regarding this issue.

Section 3.2, Page 32:

Comment: A discussion of TMDLs for the Willamette would be a very helpful addition to this section. Which chemicals have TMDLs, what is the daily load allowed, and how does the current daily load from all of the permitted outfalls compare to the TMDLs?

Response: Discussion of TMDLs is provided on page 49. There are approximately 900 permitted dischargers to the Willamette River, and the LWG did not undertake to compare the current daily load from all permitted outfalls to the TMDLs. OAR 340-045-0035 requires all new or renewed NPDES permits to comply with applicable TMDLs; the LWG therefore assumes that all DEQ-permitted outfalls have been assigned waste load allocations consistent with Willamette River TMDLs.

Section 3.2.1, Page 33:

Comment: Copper, lead and zinc may appear to be the most prevalent heavy metals present in stormwater because they are typically the only metals analyzed for under general stormwater permits. In fact, they are used as indicators of metals contamination in storm water. It is likely that other metals are present in storm water as well.

Response: Text on page 44 describes a variety of metals in addition to copper, lead, and zinc.

Section 3.2.2, Page 34:

Comment: "Since 1997, CSO discharges in the ISA have been reduced to an average of three events per year, discharging about 1 million gallons annually." Is the reduction due to increases in system capacity or the lack of large storm events?

Response: Projects contributing to reduced CSO discharges are described on page 45.

Section 3.3, Page 34:

Comment: Groundwater Discharge. It is unacceptable that the entire discussion of groundwater sources in only two sentences long. The Work Plan should at least summarize the contaminants and levels found in the groundwater at sites where data is available. It is clear from this section that groundwater sources played absolutely no role in determining the location of sediment or surface water samples. See also general comments on groundwater.

Response: The groundwater discharge discussion has been expanded (Section 3.3) and a plan for additional work to understand potential sources of risk in the in-water portion of the Site from the discharge of contaminated groundwater is described in Section 7.2.3.

Page 34, second paragraph.

Comment: Respondents, with help from DEQ, need to identify the areas where contaminated groundwater may be discharging to the river. These need to be investigated (i.e., collection of water and sediment samples) and the risk assessed.

Responses: Section 7.2.3 describes a plan for identifying areas where contaminated groundwater may be discharging.

Section 3.3, Page 34:

Comment: The statement "There are few data documenting the quality of groundwater discharging to river sediments." is misleading. The upland investigations have generated a considerable amount of groundwater data from monitoring wells and direct-push technology grab samples. Most of the available data documents groundwater gradients to the river and the presence of hazardous substances in groundwater. Therefore, it can be concluded that hazardous substances are being discharged to surface water through the river sediments. EPA would agree that few data exist documenting groundwater quality at the point of discharge into the river (i.e., groundwater/surface water interface). However, the Work Plan needs to address how to fill this data gap.

Response: The description of existing groundwater conditions has been revised. Section 7.2.3 contains a plan for evaluating whether contaminated groundwater discharging to the river poses risk.

Section 3.4, Page 34:

Comment: It is unclear whether spills resulting from over-water activities will be evaluated during the RI/FS. More detail should be provided.

Response: Over-water spills as a source are described in Section 3.4. Section 7.2 describes the general approach for understanding chemistry extent and potential sources. The Round 2A FSP provides information on where samples are taken to address this issue.

Section 3.6, page 35:

Comment: It is unclear whether chemical leaching from coated surfaces will be evaluated during the RI/FS. More detail should be provided.

Response: This potential source is described in Section 3.6. The Round 2A FSP provides information on where samples will be taken to address this issue. Analysis for butyltins has been added to several sediment samples to evaluate, in part, this potential source (see Round 2A FSP Table 2-3).

Section 3.8, Page 36: Upstream Sources (and Pages 86-87)

Comment: The description of contaminant sources upriver of the ISA and Lower Willamette River warrants attention. Adequate upriver sampling is needed and these areas should not necessarily be considered "baseline" or "reference" areas until further studies are done. In all likelihood, "reference areas" may need to be selected from areas off the main stem Willamette River.

Response: Sampling to understand inputs to ISA is part of the characterization approach described in Section 7.2. Off main-stem reference areas have not been proposed, because no reference-type sampling is currently proposed.

Sections 3.9-4.1, Pages 37-38:

Comment: Chemical Transport and Distributions (including the July 19th revised section 4.1 on Chemical Distributions in Sediment). The recognition that chemicals may settle out "some distance from the original source" and can be "rapidly transported away from sources" is contrary to the discussion on page 66 which states that, "existing sediment data clearly show elevated concentrations of sediment chemicals in the immediate vicinities of many upland facilities that are actively involved in DEQ-led soil and/or groundwater investigations. This distribution of chemicals demonstrates that sediment contamination is not widespread and that sediments transport processes are not so significant as to distribute sediment chemicals throughout the area." This is a premature conclusion in that sediment transport and bathymetry studies are not complete and Category 1 data in Table 4-2a reflects a very small number of samples taken between RM 0-3 and RM 10-24 and

this data should not be the basis for determining "current conditions" in these parts of the lower river.

Response: Both these statements have been removed.

Section 3.9, Page 37

Comment: The chemical transport section should discuss changes in chemistry and/or toxicity, the chemical fate and transport of contaminants in groundwater discharging to surface water, and bioaccumulation.

Response: The requested information has been added to Section 5 (Preliminary Conceptual Site Model).

Section 4.1, Page 38:

Comment: Chemical Distributions in Sediment. The statistics provided are all for surface sediment chemistry. There should be an analysis of subsurface chemistry as well.

Response: This information is presented in Table 4-3.

Section 4.1, Page 38:

Comment: Chemical Distributions in Sediment (not including the July 19th revised section 4.1 on Chemical Distributions in Sediment). The statement in the document that "chemicals with a detection frequency of 10% or more may have a relatively broad distribution" raises concern that chemicals with a lower detection frequency will not be considered to be of concern. Initial results cannot be used to make such assumptions about distribution.

Response: The statement has been removed from the text (now Section 4.2 of the revised Work Plan). The list of chemicals being analyzed is provided in the Round 1 QAPP (SEA 2002) and QAPP Addendum (SEA 2003).

Section 4.1, Page 39:

Comment: Elevated levels of metals are associated with Mar Com (TBT) Crawford Street Corporation (Copper), Schnitzer (TBT) and the US Moorings sites. The organic compound discussion should include petroleum contamination associated with bulk fuel facilities and polychlorinated dibenzo-dioxin and furan (PCDD/PCDF) contamination associated with the Rhone Poulenc and McCormick and Baxter sites.

Response: These sources are addressed in Section 4.2.2.

Section 4.1, Page 39:

Comment: Metals and Tributyltin: This section describes "elevated" metal and TBT concentrations within the ISA. What does "elevated" mean? Compared to other samples in the ISA, some "background" concentration, or a risk-based screening level?

Response: This term was removed from Section 4.2.

Section 4.2.2, Page 44:

Comment: In discussing the USGS water sample data for pesticides, the Work Plan states that thirty compounds were detected, including atrazine, metolchlor, simazine, and deethyl atrazine. If pesticides were detected in surface water, they should have been included as chemicals of interest, and screened for inclusion in the risk assessment. Also, in the USGS study cited on this page, the most frequently detected pesticides in water samples from the Lower Willamette were atrazine, metachlor, simazine and deethyl atrazine. These compounds are not on the list of analytes for water in the QAAP. Will these be analyzed for in surface water and/or groundwater to determine their source? What about the other compounds detected in the USGS water samples?

Response: The process eventually agreed to in spring 2002 by LWG and EPA for selection of analytes was to include all compounds that are routinely reported by the laboratory responsible for that matrix, rather than to rely on risk-based screening. (This process was agreed to following LWG's submission of the Preliminary

Analytical Concentration Goals memo and the subsequent Target Analyte List memo). For water samples, Analytical Resources, Inc. (ARI) provided their list of routinely reported analytes for each of the required analytical methods. EPA modified the LWG's proposed water analyte list and added compounds (hand-annotated by Julie Wroble) and that final list was used in the draft Round 1 FSP and QAPP. The water analyte list was later removed from the final Round 1 QAPP because EPA required that the water sampling program be eliminated from the Round 1 field program.

The water analyte list presented in the Round 2A FSP and QAPP Addendum is the same analyte list as was presented in the Round 1 FSP and QAPP and includes all compounds normally reported by ARI for each of the identified analytical methods. Earlier agreements with EPA and its partners stated that compounds that require method research and development would not be analyzed as part of the program.

Section 4.3.1, Page 45:

Comment: Discussion of bioassay data. The text here does a nice job of explaining what data exists, but says absolutely nothing about the results. The Work Plan should at least include a map showing where sediments were toxic.

Response: Results are now included in Appendix C, Section 3.5. A map was added, Figure 4-38.

Section 4.3.3, Page 46:

Comment: Enzyme Induction Studies. "Per the AOC/SOW, the risk assessment will only consider effect endpoints associated with growth, reproduction, and mortality." It is unclear how enzyme induction, histopathology, and biomarkers will be treated in the effects assessment. These responses, along with behavioral alteration, hormonal imbalance, increased cortison, are a few of the responses that may lead to mortality or severely impaired biological functioning.

Response: These effects will be considered in TRV review – see Section 5.0 and Attachments C.5 and C.8.

Section 4.3.4, Page 47:

Comment: Fish Histopathology, third full paragraph. The text here describes two skeletal deformity studies performed in the Portland Harbor area, but only summarizes the results for one of the studies. What did the EVS 2000 study show?

Response: The results of this study were added to Section 4.4.6.

Page 49:

Comment: It is not clear how the population distributions described on this page would be used for the human health risk assessment. Risk assessments for Superfund are to be done using exposures for the individual with the "reasonable maximum exposure." How do census data relate to the individual? What is the nature of the "Portland specific data" that is referred to? This language should be deleted from the Work Plan, unless the use of the population data methods are described in more detail and agreed to by EPA.

Response: The language and data have been removed.

Section 4.4.2, Page 50:

Comment: Human Activities in the Lower Willamette. The document states that there is no Native American cultural use within the ISA. Although this may be true at present, historical use cannot be ignored and should be addressed in the Work Plan.

Response: This section was revised to recognize tribal subsistence and ceremonial fish use.

Section 5.2.3, page 54:

Comment: Although there is generally a downward gradient from shallow fill zones to the underlying alluvial zones, the gradient is very slight in some instances. In addition, an upward gradient between deep alluvial and basalt water bearing zones to the intermediate alluvial zone is sometimes observed.

Response: This section has been rewritten and the focus has changed. Section 2.1 covers a range of groundwater gradient conditions that exist.

Section 5.2.5, Page 55:

Comment: DNAPLs. "Experience at other locations has shown that a DNAPL commonly perches on the CRBG flows unless or until a fully penetrating fracture is encountered by the DNAPL, which allows deeper migration and spreading." Where was this seen? What constitutes a "fully penetrating fracture" and how common are these fractures in the CRBG?

Response: This text was removed.

Section 5.2.5, page 55:

Comment: Dissolved or Aqueous Phase (e.g., VOCs, metals, ketones). In addition to halogenated VOCs, dissolved metals may also partition to aquifer materials and sediments as they migrate from anaerobic zones to more oxygenated zones. The discussion regarding dissolved or aqueous phase should further evaluate the potential for some metals pesticides and PAHs to migrate through the river sediments and enter the Willamette River as dissolved constituents.

Response: Section 7.2.3 details the proposed groundwater approach, which considers all potential chemical-types.

Section 5.2.5, Page 55:

Comment: Last sentence, "VOCs should be the focus of any evaluation of groundwater contribution to ecological risk." EPA disagrees with this statement - VOCs should not be the only focus. Dissolved metals, pesticides, and PAHs can also move into the river in dissolved form in concentrations high enough to cause adverse effects. The groundwater evaluation should not be limited to VOCs.

Response: Section 7.2.3 details the proposed groundwater approach, which considers all potential chemical-types.

Section 5.3.1, Page 58:

Comment: Fish Species, Piscivores. Northern pikeminnow should be included as an additional (not instead of) piscivorous fish. Pikeminnow have a larger range, integrate food items over a larger area, and are more strictly piscivorous (above a certain size) than smallmouth bass. This issue was discussed, and an agreement reached to include northern pikeminnow as an additional species, at a June 26, 2002 meeting with Respondents.

Response: The northern pikeminnow was sampled in Round 1 and added as a receptor in the Work Plan (Section 5.0) and Appendix C (Section 2).

Section 5.3.1, Page 58:

Comment: Fish Species, Carnivores. Juvenile chinook salmon should be evaluated as a unique resource to represent anadromous fish. However, because of the variation in life history characteristics exhibited by juvenile chinook in the Willamette River, the varying lengths of time a particular stock may reside in the river, and the limited information with which to design an appropriate sampling program, they are not appropriate to represent carnivorous fishes. The sculpin, which is a good representative of a benthivorous carnivorous fish, should be retained. In addition to the sculpin (not instead of), the peamouth (Mylochelius caurinus) should be collected as a representative of this group. This resident fish is common in the Willamette River, is primarily insectivorous, and feeds across a wider range of habitats than the sculpin. This issue was discussed, and an agreement reached to include peamouth as an additional species, at a June 26, 2002 meeting with the Respondents.

Response: Peamouth was sampled in Round 1 and added as a receptor in the Work Plan (Section 5.0) and Appendix C (Section 2).

Section 5.3.1, Page 58:

Comment: Fish Species, Carnivores. Juvenile chinook salmon are not the only fish present within the site during a sensitive life state. Resident fish may spawn within

the site and therefore be present as eggs and larval fish. These sensitive life stages should be addressed in the risk assessment.

Response: All stages of fish present in the ISA will be addressed in the risk assessment. See Attachment C.5 and Section 5.3 of Appendix C.

Section 5.3.1, Page 59:

Comment: Birds. It is stated that the osprey was chosen as the representative species for the piscivorous birds, but that the bald eagle will be evaluated to ensure the osprey exposure model is representative of bald eagle exposure. The same exposure time, and effects level (NOAEL) should be used for the osprey as would be used for the bald eagle.

Response: The bald eagle was added as a listed species receptor in Section 5.0 of the Work Plan and Section 2 of Appendix C. Therefore, it will be assessed using a NOAEL. Exposure time will be assumed conservatively in the PRE with more realistic assumptions applied in the BERA.

Section 5.3.2, Page 60:

Comment: Bulleted description of exposure pathways. What is the difference in how these will be addressed? From the descriptions of pathways in the following sections, it appears that "complete and minor" pathways, which "will not be evaluated explicitly" in the data evaluation, will not be evaluated at all. Another designation needs to be made for pathways – "incomplete and of unknown significance;" which would lead to more data evaluation and potential investigations in Round 2 sampling. This would be consistent with the intent of a risk assessment, as stated on Page 72 of this document: "The first tier is often conservative and broad in scope to ensure no potential pathways, COPCs, or potential receptors are prematurely eliminated from the analysis."

Response: The exposure pathway designations were redefined to include "complete and major", "complete and minor", "complete and unknown" and "incomplete". Because incomplete pathways do not need to be assessed, no descriptors other than

"incomplete" are necessary. All complete and major pathways will be assessed quantitatively when sufficient toxicological data exists. Minor pathways will be discussed qualitatively to a level of certainty based on available studies. See changes in Section 2.6 of Appendix C and Section 5.0 of the Work Plan.

Section 5.3.2, Page 60:

Comment: Last bullet (Complete and Uncertain). More detail is needed on what is meant by the "uncertainty assessment." How will it be used to assess risk? Will it be used to identify data gaps to be filled during Round 2 sampling investigations? More discussion is needed on how pathways identified as complete and uncertain will be addressed in the ecological risk assessment.

Response: We added text to Section 5.2.2 of the Work Plan and Section 2.6 of Appendix C to clarify how pathways would be assessed. Complete and major pathways will be quantitatively assessed when relevant tools are available. Pathways considered uncertain or minor will be qualitatively assessed in risk characterization.

Section 5.3.2.1, Page 60:

Comment: Aquatic Receptors. Benthic infauna may be exposed to chemicals associated with pore water, an exposure not reflected in sediment concentrations for chemicals such as volatile organic compounds and dissolved metals. How will the pore water pathway be addressed?

Response: Appendix C, Sections 2.1.3, 2.6.1.2, and 5.3 as well as Section 7 DQO tables now contain discussions of this pathway.

Section 5.3.2.1, Page 61:

Comment: (changed #, used to be 5.3.1) The direct sediment pathway should be evaluated for PAHs and metals, and the pathway should not be considered complete and uncertain. Pathways considered complete and minor should be considered in the risk assessment. For example, sediment ingestion is considered complete and minor for the smallmouth bass, and therefore will not be evaluated in the risk

estimate. However, it is possible this is a significant exposure to contaminants, as bass are feeding on crayfish and other sediment dwelling organisms.

Response: The pathways and designations were redefined (See Section 5.2 of the Work Plan and Section 2 of Appendix C). Where sufficient toxicological data exists, the complete and major pathways will be assessed quantitatively. Pathways considered complete and minor, and complete and uncertain, will both be discussed qualitatively in the risk assessment, to a level of certainty based on available studies. See also, responses for Appendix C.

Section 5.3.2.1, Page 61:

Comment: Fish: Piscivore-Smallmouth Bass. Are data available to substantiate the determination that sediment ingestion is a minor pathway? A comparison of the determination of the significance of sediment ingestion for smallmouth bass, piscivorous birds (Page 62), and mink (Page 63), is interesting. All three species consume similar prey items, yet sediment ingestion is considered a complete pathway of exposure for piscivorous birds and mink, but not for smallmouth bass. The basis for this determination should be explained in the Work Plan. This is a candidate for an "incomplete and of unknown significance" designation.

Response: The pathways and designations were redefined (See Section 5.2 of the Work Plan and Section 2 of Appendix C). Where sufficient toxicological data exists, the complete and major pathways will be assessed quantitatively. Pathways considered complete and minor, and complete and uncertain, will both be discussed qualitatively in the risk assessment, to a level of certainty based on available studies. See also, responses for Appendix C.

Section 5.3.2.1, Page 61:

Comment: Fish: Carnivore-Sculpin Species. Is the fact that sufficient toxicological data are not available to assess the PAH and metals risk via the direct sediment pathway a reason to relegate this to a discussion in the uncertainty assessment? This

is a pathway that could cause significant exposure. Some discussion is needed on how this will be incorporated into the risk assessment.

Response: The pathways and designations were redefined (See Section 5.2 of the Work Plan and Section 2 of Appendix C). Where sufficient toxicological data exists, the complete and major pathways will be assessed quantitatively. Pathways considered complete and minor, and complete and uncertain, will both be discussed qualitatively in the risk assessment, to a level of certainty based on available studies. See also, responses for Appendix C. By utilizing tissue TRVs, ALL pathways of exposure to fish are addressed. However, direct sediment contact (dermal) cannot be quantitatively evaluated for metabolized chemicals using the TRV method. Too little toxicity data is available to quantitatively evaluate the direct contact (dermal) pathway for metabolized chemicals.

Section 5.3.2.1, Page 61:

Comment: Fish: Carnivore-Juvenile Chinook Salmon. Juvenile salmonid stomach content analysis in Puget Sound estuaries indicates that they ingest sediments. Sampling has shown PAH concentrations in juvenile salmonid stomachs in the hundreds of parts per million. These concentrations are higher than those found in prey items consumed, indicating that these fish may be ingesting sediment or tar balls that may be on the sediment surface. Sediment is also ingested through the gut content of prey items. This is a candidate for an "incomplete and of unknown significance" designation. An explanation for the basis of this determination is needed.

Response: The pathways and designations were redefined (See Section 5.2 of the Work Plan and Section 2 of Appendix C). Where sufficient toxicological data exists, the complete and major pathways will be assessed quantitatively. Pathways considered complete and minor, and complete and uncertain, will both be discussed qualitatively in the risk assessment, to a level of certainty based on available studies. See also, responses for Appendix C. By utilizing tissue TRVs, ALL pathways of exposure to fish are addressed. However, direct sediment contact (dermal) cannot be quantitatively evaluated for metabolized chemicals using the TRV method. Too

little toxicity data is available to quantitatively evaluate the direct contact (dermal) pathway for metabolized chemicals.

Section 5.3.2.1, Pages 61-62:

Comment: Fish: Omnivore/Herbivore-Largescale Sucker. Similar comment as sculpin. How will metals and PAH exposure via direct sediment contact and sediment ingestion be incorporated into the risk assessment?

Response: The pathways and designations were redefined (See Section 5.2 of the Work Plan and Section 2 of Appendix C). Where sufficient toxicological data exists, the complete and major pathways will be assessed quantitatively. Pathways considered complete and minor, and complete and uncertain, will both be discussed qualitatively in the risk assessment, to a level of certainty based on available studies. See also, responses for Appendix C. By utilizing tissue TRVs, ALL pathways of exposure to fish are addressed. However, direct sediment contact (dermal) cannot be quantitatively evaluated for metabolized chemicals using the TRV method. Too little toxicity data is available to quantitatively evaluate the direct contact (dermal) pathway for metabolized chemicals.

Section 5.3.2.1, Page 62:

Comment: Fish: Detritivore-Pacific Lamprey Ammocoetes. Similar comment as sculpin. How will metals and PAH exposure via direct sediment contact and sediment ingestion be incorporated into the risk assessment?

Response: The pathways and designations were redefined (See Section 5.2 of the Work Plan and Section 2 of Appendix C). Where sufficient toxicological data exists, the complete and major pathways will be assessed quantitatively. Pathways considered complete and minor, and complete and uncertain, will both be discussed qualitatively in the risk assessment, to a level of certainty based on available studies. See also, responses for Appendix C. By utilizing tissue TRVs, ALL pathways of exposure to fish are addressed. However, direct sediment contact (dermal) cannot be quantitatively evaluated for metabolized chemicals using the TRV method. Too

little toxicity data is available to quantitatively evaluate the direct contact (dermal) pathway for metabolized chemicals.

Section 5.3.2.2, Page 63:

Comment: Surface water contact and ingestion and direct sediment contact may by mammals not be minor and should be considered in the risk assessment.

Response: Pathways were redefined in Section 2.6 of Appendix C and Section 5.2.2 of the Work Plan and minor pathways are not automatically removed from evaluation. Surface water ingestion is considered minor compared to ingestion of prey or sediment (i.e., risk will be driven by the latter two pathways, if risk is identified). There is insufficient toxicological data to assess dermal contact in wildlife.

Page 64:

Comment: The combination of exposures for some individuals through different receptor categories (e.g., a transient who would be in direct contact with sediment, use water from the river, and eat the fish) should be addressed quantitatively in the HHRA (see Appendix D comments). (Note: as agreed upon in the human health subgroup).

Response: Overlapping exposures will be addressed in the baseline HHRA. Text regarding evaluation of overlapping exposures is included on page 89 of the Programmatic Work Plan and Sections 3.3.5 and 5.3 of Appendix D. The method for evaluation and presentation of overlapping exposures will be discussed further during the development of the baseline HHRA. The human health CSM (Figure 5-6 in the work plan and Figure 2 in Appendix D) has been revised to reflect the potential for overlapping exposures. The revised CSM was reviewed by the HH subgroup prior to incorporation into the Work Plan.

Section 6.0, Page 66:

Comment: Remedial Investigation and Feasibility Study Approach.

The statement that sediment contamination is not widespread is not proven, and is also contrary to the assertion earlier in the document (Section 4.1) that sediment can be transported long distances.

Response: Statement has been removed.

Section 6.0, page 66:

Comment: The Work Plan states that additional sampling will better define the nature and extent of sediment contamination adjacent to upland facilities. However, the proposed sampling scheme does not accomplish this. In addition, it unclear how the proposed scope of work will be used to validate or refine the Site Conceptual Model presented in Section 5.

Response: We have revised the sampling approach substantially in the revised Work Plan, and the new approach for the next round of sampling as it specifically relates to sources is detailed in the Round 2A Field Sampling Plan. In addition, work Plan Sections 7.2.1 and 7.2.2 present a revised approach for determining the need for sampling for both sediment and water related sources. Finally, the FS approach describes how the issue of potential recontamination by ongoing sources will be handled (Section 8.7).

Page 66, Section 4.4.3, Fish.

Comment: Although the effects of Portland Harbor contaminants on Salmon reproduction may be small, it should not be eliminated at this stage in the process.

Response: Windward does not find the text that this comment references. However, reproductive effect of contaminants on salmon will be assessed in the PRE and BERA. See Section 5.3 of Appendix C for the assessment methods for fish.

Page 66:

Comment: The opening paragraphs on this page which are an introduction to the RI/FS approach focus only on sediments. The discussion should be expanded to include all media that are an important part of the site conceptual model.

Response: The statements have been deleted. The overall approach now includes sediments, water, and tissues.

Section 6.1.1, Page 67.

Comment: The RI should gather the information necessary to identify potential early action areas. Although parties who wish to voluntarily pursue early action should be encouraged to do so, the RI must evaluate potential early action areas in a meaningful way. If the RI determines that an early action is appropriate from a technical and environmental stand point, it should be identified to EPA for follow-up.

Response: This item is under negotiation with EPA. It should be noted that initiation of Early Actions is not completely dependent upon analysis in the RI/FS. Parties may initiate EAs before the RI/FS is complete. The Work Plan text was revised to identify a process forward outside the Work Plan context. See response under General Comments—Early Actions above.

Section 6.1.3, Page 68:

Comment: The current characterization approach is not adequate to determine the nature and extent of contamination at the site. Furthermore, characterization of in-water source areas is not contemplated during Round 2. With respect to subsurface sampling, it is likely that characterization of subsurface sediments will be required to evaluate the nature and extent of contamination and to evaluate potential exposures in a dynamic river system.

Response: We have revised the sampling approach substantially in the new version of the Work Plan, and the new approach for the next round of sampling, as it specifically relates to sources, is detailed in the Round 2A Field Sampling Plan. In addition, Work Plan Sections 7.2.1 and 7.2.2 present a revised approach for determining the need for sampling for both sediment and water related sources. Subsurface sampling is planned for Rounds 2A and 3 (Section 6).

Section 6.2, page 69:

Comment: The sediment sampling approach proposed is more of a site assessment sampling approach. The Work Plan correctly notes that elevated levels of contamination tend to be present in the vicinity of upland and in-water source areas. However, no focused sampling of these areas is proposed in Round 1 or contemplated for Round 2. Round 1 should include an additional objective: Characterize the nature and extent of in-water sources that have not been characterized previously.

Response: We have revised the sampling approach substantially in the new version of the Work Plan, and the new approach for the next round of sampling as it specifically relates to sources is detailed in the Round 2A Field Sampling Plan. In addition, Work Plan Sections 7.2.1 and 7.2.2 present a revised approach for determining the need for sampling for both sediment and water related sources. Finally, the FS approach describes how the issue of potential recontamination by ongoing sources will be handled (Section 8.7).

Section 6.2.1, Page 69:

Comment: Sediments, first paragraph. The text here asserts that chemical concentrations in the navigational channel "tend to be low." This theory has heavily influenced the location of proposed samples, so it deserves a more rigorous examination and explanation than the few sentences provided here.

Response: The specific text in question was revised. In addition, the Round 2A FSP contains numerous samples in the channel. However, in some areas, existing information does suggest that chemical concentrations are relatively low, and sampling is biased away from these areas where these historical data appear to be of sufficient quality and density.

Section 6.2.1, Page 69:

Comment: Sediments, second paragraph. "The focus of the nature and extent evaluation is to identify potential areas of concern (i.e., hot spots) in Portland Harbor." If this is true, why isn't a portion of the sediment samples biased toward

collecting data near suspected sources? There are some obvious sources in the ISA, including the outfalls that drain Rhone Poulenc and Wacker Siltronic for example, where no samples have been proposed.

Response: We have revised the sampling approach substantially in the new version of the revised Work Plan, and the new approach for the next round of sampling as it specifically relates to sources is detailed in the Round 2A Field Sampling Plan. In addition, Work Plan Sections 7.2.1 and 7.2.2 present a revised approach for determining the need for sampling for both sediment and water related sources. Finally, the FS approach describes how the issue of potential recontamination by ongoing sources (Section 8.7) and sediment management areas (including principal threat areas) will be assessed (Section 8.6).

Section 6.2.1, Page 70:

Comment: End of second full paragraph. "Sediment data may also be correlated with tissue residue data in the ecological risk assessment process to help identify areas associated with unacceptable risk." Are Respondents planning to correlate sediment chemistry and fish tissue?

Response: This is the proposed approach, which is detailed in Appendix C, Section 5.3.

Section 6.2.2, page 70.

Comment: The approach to surface water is unacceptable. Bioaccumulative chemicals present in surface water may accumulate in fish at concentrations that represent a risk to birds, wildlife or humans through fish consumption. As a result, better detection limits for bioaccumulative chemicals in surface water are required. The use of lipid bags or high volume sampling devices is needed.

Response: Additional surface water sampling using appropriate sample collection methods and analytical detection limits may be conducted in Round 2B or 3 for bioaccumulative chemicals identified as tissue COPCs (based on review of the Round 1 data). These data will be used to evaluate chemical sources to fish. Human

exposure to bioaccumulative compounds through fish consumption will be addressed quantitatively using fish tissue data in the baseline human health risk assessment.

Section 6.2.2, Page 71:

Comment: First bullet on page. "If the Round 1 water quality data are comparable at the locations sampled, consider those data to be representative of conditions throughout the site." This would only be acceptable if water quality sampling was proposed throughout the site, including immediately offshore of sites where contaminated groundwater may be moving into the river, and if a low-detection technique was used, such as high volume sampling or diffusion samplers. Grab samples from three locations won't provide enough data to represent conditions throughout the site.

Response: As noted in the previous response, additional surface water sampling using appropriate sample collection methods and analytical detection limits for bioaccumulative chemicals may be conducted in Round 2B or 3 to evaluate chemical sources to fish. Human exposure to bioaccumulative compounds through fish consumption will be addressed quantitatively using fish tissue data in the baseline human health risk assessment. In addition, the Round 2A sampling includes water samples in a number of quiescent nearshore areas that are expected to be representative of general surface water conditions at the site. Sampling techniques and analytical detection limits will be optimized for detection of low levels of contaminants. Sampling of specific sources such as outfalls is expected to be conducted under direction of DEQ through upland efforts.

Section 6.3, Page 72:

Comment: The ERA approach should include sediment toxicity testing to evaluate the effects on the benthic community.

Response: Toxicity testing will be conducted as part of the ERA. See Section 5.3 of Appendix C and Attachment C.3.

Section 6.5, page 74:

Comment: The data necessary to identify areas and volumes of contaminated sediment that pose unacceptable risks to human health or the environment will not be obtained through the proposed sampling approach.

Response: The proposed sampling approach has been substantially revised. Subsurface coring will be conducted in Rounds 2B and 3 (see Section 6 for overview).

Page 74 –

Comment: What methods will be used for human health data evaluation process following Round 1?

Response: Appendix D details the human health data evaluation process. Round 1 beach sediment data will be compared to screening levels (described in Section 2.3.1 of Appendix D) to determine if there are any data gaps that need to be filled in Round 2. Proposed methods for other evaluations of Round 1 data prior to the baseline HHRA are currently under development.

Section 7.1, Page 77.

Comment: Items 1 - 6. The preliminary RAOs all discuss reducing risks to acceptable or ambient levels. EPA guidance on the role of background data says that comparison to ambient levels, if it occurs at all, should happen in the risk management context, not in the risk assessments themselves. If Respondents intend to compare risks in the ISA to "ambient" risks, that should be stated up front, and there should be an extensive discussion of how "ambient" risk will be defined. Defining "ambient" should be listed as a clear data gap, and the samples and analyses that will go into defining "ambient" should be clearly enumerated.

Response: The RAOs were revised to include the concept of "background" in a manner that is consistent with EPA guidance. Background risk will be defined as those chemicals present within the site that are not related to CERCLA releases.

Page 77.

Comment: The word "ambient" implies that risks from outside sources will be subtracted from the site risk. The risk assessment determines risk at the site. Comparisons to levels outside of the site are only considered in risk management.

Response: See response above. In addition, our risk assessment approach will consider all risks at the site, and this is the approach that is proposed in the Work Plan. Appropriate RAOs must consider both assessed risks and how to manage those risks. Consequently, it is appropriate to define RAOs in terms of risk management. The objective of the risk assessment is to assess all risks. The objective of the remedial action is to remediate risks related to the CERCLA release in question.

Section 7.1, Page 77.

Comment: The remedial action should be selected in accordance with EPA and DEQ's remedial action selection factors. RAOs should not include statements such as Consider the effects of the remedial action on current or planned uses of the river," or "Evaluate the feasibility of remedial actions with respect to the physical system of the Willamette River."

Response: These statements are no longer referred to as RAOs.

Section 7.1, Page 77:

Comment: Additional project objectives should be considered, for example:

- Reduce ecological health risks from direct contact with contaminated sediments.
- Reduce ecological or human health risks from direct contact or ingestion of contaminated groundwater discharge to the river.

Response: The RAOs have been revised to include sediments and water (regardless of its source).

Page 77 –

Comment: Under the second objective, "fish" should be changed to "aquatic organisms" since we are concerned about crayfish and clams as well as fish.

Response: The RAOs have been revised.

Page 79 –

Comment: It's difficult to understand how the physical system can be defined and/or modeled without more information on sediments at depth and groundwater inputs.

Response: Both subsurface sampling and additional groundwater work have been proposed (see Section 6 for overview).

Section 7.2, Page 79:

Comment: Physical System Data Needs. "Sediment transport modeling will be conducted to determine the scale over which sediment deposition or erosion may occur; model selection, assumptions, and inputs will be documented in a separate technical memorandum." This deserves more discussion. How will sediment transport modeling results be used in the overall site assessment? If site-specific data is needed for the model, when will it be collected – as part of Round 1? \

Response: A modeling technical memorandum (as required by the SOW) has been submitted to EPA. It details the modeling methods and data needs. The uses of the hydrodynamic modeling results are numerous and are described throughout Section 7 and 8.

Section 7.2, page 79:

Comment: It is likely that episodic events of high magnitude (i.e. major flood events) will control sediment transport within Portland Harbor. As a result, the assessment of the physical system must be robust enough to account for these events.

Response: The primary purpose of the hydrodynamic modeling proposed is to understand the effects of large flow events on sediment transport, particularly since these events are not readily observable in a short time period.

Section 7.3, Page 80

Comment: "chemical distributions beyond the current ISA boundaries have not been fully evaluated." Having identified this data gap, the Work Plan should explain how it will be addressed. How many samples will be taken above and below the ISA and how will the resulting data be analyzed? How do the Respondents propose to define the site boundaries?

Response: A significant number of existing data points are located between RM 9-10 and 10-11 which the LWG plans to use in the overall evaluation of sediment quality and risk for this site. The data for RM 9-10 will be supplemented by four stations in Round 2A in addition to the five stations sampled in Round 1. This density of stations is similar to that observed in other parts of the site that lack significant upland sources. Sampling may occur upstream during Round 2B or Round 3 if unacceptable risks from contiguous chemical concentrations in sediments are found to extend upstream from the ISA.

Because a risk-based framework is being applied to this site, decisions regarding sources and sources that need to be controlled prior to remediation must be based on the association of the source to unacceptable risk. Conducting extensive sampling to determine the area with unacceptable risk resulting from a source is important from both source control and a remediation viewpoints, whereas conducting extensive sampling to determine the area affected by a source when the area does not pose an unacceptable risk does not support the objectives of the RI/FS. The LWG believes that sampling programs need to focus on understanding the media that have unacceptable risk levels, and providing engineering solutions for those areas so that risks to human health and ecological receptors are reduced to acceptable levels. Therefore, additional upstream or downstream sampling will be conducted if there appears to be the potential for unacceptable risks from contiguous chemical concentrations in sediments to extend either above or below the ISA.

Section 7.3, Page 80:

Comment: It is unclear why the evaluation of porewater chemistry should be evaluated by DEQ. Unless there is a need for this data to support a source control activity, the responsibility for this evaluation belongs to Respondents.

Response: This section has been substantially revised. The evaluation of groundwater vs. porewater is described in Section 7.2.3.

Section 7.3, Page 80:

Comment: Nature and extent of contamination data needs to include information on in-water and upland contaminant sources and subsurface sediment data to evaluate chemical distribution and potential exposure.

Response: We have revised the sampling approach substantially in the new version of the Work Plan, and the new approach for the next round of sampling as it specifically relates to sources is detailed in the Round 2A Field Sampling Plan. In addition, Work Plan Sections 7.2.1 and 7.2.2 present a revised approach for determining the need for sampling for both sediment and water related sources. The FS approach describes how the issue of potential recontamination by ongoing sources will be handled (Section 8.7). Both Round 2A and Round 3 will collect subsurface data (see Section 6 for overview).

Section 7.3, Page 81:

Comment: Bullets at top of page. The data listed here will define only the extent of surficial sediment chemistry, and won't even do that very well. As discussed previously, there needs to be more sampling near suspected sources; the water column sampling is inadequate; and porewater should be added to this list. Also missing is any attempt to gain an understanding of the nature of contamination. Is TBT bound up in paint chips, or is it readily bioavailable? Are PAHs bound to soot particles, in tar balls, in creosote, or in dissolved form? The extent of contamination is certainly important, but understanding the nature of the contamination, the form in which chemicals occur and their bioavailability is important, too.

Response: We have revised the sampling approach substantially in the new version of the Work Plan, and the approach for the next round of sampling as it specifically relates to sources is detailed in the Round 2A Field Sampling Plan. In addition, work Plan Sections 7.2.1 and 7.2.2 present a revised approach for determining the need for sampling for both sediment and water related sources. The FS approach describes how the issue of potential recontamination by ongoing sources will be handled (Section 8.7). An approach for understanding groundwater contributions to porewater is described in Section 7.2.3. Water column sampling in Round 2A will be augmented in Round 2B for bioaccumulative compounds as needed. Most of the nature of contamination described in the comment examples will be determined through visual observations of sediment samples. Bioavailability will also be directly addressed by tissue samples (bioaccumulation) from Round 1 and bioassay data in Round 2A.

Section 7.4, Page 81:

Comment: This section should be expanded to included other contaminants known or suspected to be present in groundwater such as pesticides, selected PAHs and metals. The identification of potential preferential groundwater flow pathways should also be included.

Response: The groundwater approach has been revised (Section 7.2.3).

Page 81 –

Comment: Summaries of the available groundwater data and analyses of groundwater should include not only VOCs but other chemicals as well. In discussing groundwater with the Respondents, EPA used VOCs as an example of a class of chemicals of concern, but never intended to limit investigations to this class of chemicals. Depending on the site, groundwater may need to be analyzed for many of the contaminants listed in the QAPP for "water;" elimination of classes of chemicals should only be done after consultation with EPA. The contaminants detected in surface water in the USGS study (see comment on page 44), including the pesticides, should be included in the QAAP list of analytes for water. Respondents

should also include all chemicals in their data summary for groundwater, not just VOCs.

Response: The groundwater approach has been revised and includes evaluation of all chemicals of potential interest in groundwater (Section 7.2.3).

Section 7.5, Page 82:

Comment: Benthic Invertebrates. Item c says that crayfish and shellfish will be collected. This is the first reference to shellfish collection, and it appears to be inconsistent with the Field Sampling Plan. We support the collection of shellfish, but if it is going to occur, collection areas should be shown on the sampling maps, and the sampling plan should discuss handling, compositing, and chemical analysis.

Response: Crayfish and clams were collected (and collection of several other species was attempted) during Round 1 in accordance with the Round 1 Field Sampling Plan (SEA et al. 2002). Clams were collected in lieu of all benthic invertebrates because insufficient volumes of all invertebrates for tissue analysis were found during the juvenile lamprey and benthic infauna reconnaissance survey. Also, see Attachment C.4 and Section 7.3 of the Work Plan.

Section 7.5, Page 82:

Comment: Fish. The list here does not include the collection of benthic invertebrates for use in evaluating the dietary pathway, as is discussed elsewhere.

Response: Data needs have been outlined in Section 5 of Appendix C and Section 7.3 of the Work Plan. The LWG attempted to collect benthic samples for tissue residue analysis in Round 1, but were not able to collect sufficient volumes of tissue for most species.

Page 84 –

Comment: A statement on this page says, "To evaluate potential risks associated with consumption of biota, estimates of the quantity and types of fish and shellfish that are consumed by people using the ISA as a fishing area are necessary.

Differences in use (e.g., amount and type of tissue consumed) among groups that may collect fish and shellfish in the river needs to be evaluated in order to refine estimates of consumption rates." How will these differences in use be evaluated and used to refine estimates of consumption? A good fish consumption study takes several years to design, implement, and analyze. It is extremely unlikely this could be done in time to impact the risk assessment or decision-making process for this site.

Response: The Human Health risk subgroup extensively discussed the issue of exposure assumptions and fish consumption rates. Section 3.5.1.4 of Appendix D presents our proposed methods for selecting consumption rates. A technical memorandum will be submitted to EPA in May 2003 that describes the evaluation of available studies relevant to the Site and proposes fish and shellfish consumption rates for adults and children in the three receptor groups identified.

Section 7.7, Page 85:

Comment: Potential for Recontamination and Source Evaluation. It is unclear why DQOs for this work are not identified, as they are for other types of data collection.

Response: Section 8.7, which describes our approach to this issue, has been added to the Work Plan.

Section 7.7, Page 85.

Comment: This section does not describe what actions will be taken by the Respondents to specifically evaluate the potential for recontamination or for source evaluation. These activities are not likely to be fully addressed by DEQ's upland activities as suggested. In fact, the Statement of Work for this RI/FS clearly states that "Respondents will identify source areas that are contributing contamination to the in-water portion of the site. Although DEQ is primarily responsible for ensuring that parties responsible for upland sources institute source control, as part of the RI/FS, Respondents shall evaluate the distributions of sediment contaminants, and, if appropriate, make recommendations to EPA and DEQ if the need for further investigation or control of sources is identified." Ultimately, the in-water RI/FS must determine recontamination potential.

Response: Text on the recontamination issue was added to Section 8.7. Source evaluation is one objective identified as a part of nature and extent sampling DQO. The Round 2A FSP contains the proposed sampling that addresses this issue (for that round of sampling).

Section 7.7, Page 85:

Comment: Third paragraph. "This will include an assessment of methods to determine concentrations of volatile organic compounds in sediment offshore of facilities with VOCs in groundwater." This is too limited; the assessment should include chemicals other than VOCs (including metals and PAHs), should address porewater as well as sediment, and should not be limited to areas next to known VOC plumes.

Response: Section 7.2.3 describes our revised groundwater approach, which includes consideration of all potential chemicals of interest in groundwater.

Section 7.7, Page 87.

Comment: The Work Plan states that Respondents will lead the investigation and evaluation of in-water sources that could affect site risks and remedies. A plan for this should be included. The evaluation of recontamination should be included as part of a detailed early action evaluation for early action candidate areas.

Response: Investigation of in-water sources is an objective of the nature and extent and groundwater DQOs. In addition, the recontamination potential evaluation approach is described in Section 8.7. However, the exact number and locations of samples for source investigation is under negotiation with EPA and not been resolved at the time the Work Plan was submitted.

Section 7.8, page 87:

Comment: Oxidation/Reduction potential should be included as a natural attenuation parameter.

Response: This parameter has been included in the natural attenuation methodology, Appendix A, Attachment A4, Section 3.5.

Page 87 –

Comment: It is not clear how the current sampling that is proposed will provide information on the "chemical inputs that are likely occurring regardless of any activities in the ISA" nor what is meant by "These levels will be compared to risk-based levels generated from the risk assessments to determine whether river flow may be transporting chemicals at levels causing risk in the site." What "incoming levels" are being referred to here? Are these from upstream? Are they water or sediments? What data is being gathered to "establish these incoming levels as representing background?"

Response: Methods for understanding water borne sources either from upstream or upland discharges within the site are proposed in Sections 7.2 and 8.7.

Section 7.8, Page 87.

Comment: The rationale behind the Natural Attenuation (NA) investigation is not clearly presented. It seems premature to begin this study until the nature and extent of contamination has been defined and contaminant fate and transport is understood. What is the rationale for the selection of the proposed sites and what are they considered representative of? For example, it is unclear what the data from the Willamette Cove sample will mean. While the extent of contamination in the Cove associated with the McCormick and Baxter site has been defined, sediments have not been investigated to determine the impacts from past site activities (dry docks, ship building, plywood and lumber mill, cooperage, etc.).

Response: The nature and extent work group discussed this item extensively and a tiered approach to natural attenuation investigations similar to the one in the draft plan was tentatively agreed to (EPA/DEQ/LWG Nature and Extent Work Group January 21, 2003 meeting minutes. The Work Plan Section 8.5 and Appendix A, Attachment A4 were revised to further clarify the reasoning behind this tiered approach consistent with the discussions in the work group.

Section 8.0, Page 89: Groundwater Work Plan

Comment: The groundwater investigation is inadequate. Work elements (Section 8.2) should address more than just the VOCs and should include all known chemicals that are of concern for upland sites and have the potential for entering groundwater and surface water. Pesticides, PAHs, metals, and compounds that may be transported due to cosolvency should also be investigated. Chemicals that are present in upland soils and/or in-river sediments that are at or near identified groundwater plumes and seeps should be of particular focus in the groundwater investigation. Significantly more samples will be required to characterize groundwater inputs. Porewater should be analyzed in areas where contaminated groundwater discharges to the river.

Response: The revised groundwater approach is presented in Section 7.2.3 and includes an evaluation of all chemicals of interest in groundwater . Specific locations and methodologies for sampling porewater will be provided in a Round 2B FSP.

Figure Comments

Figure 2-4:

Comment: Are all the changes positive changes in bathymetry (deposition) or are some of these changes negative changes due to dredging or scour? This figure would be more helpful if positive and negative changes were depicted with different colors.

Response: Figure 2-4 (now Figure 2-11 in revised Work Plan) shows both accretion and loss because the analysis considered net change over a ten-year period. New maps (Fig 2-15 series) were added that show depth differences between January 2002 and summer 2002 using precision multibeam bathymetry survey data; on these maps, areas with positive and negative changes are mapped in different colors.

Figure 2-6:

Comment: Preliminary Conceptual Site Model for Ecological Risk Assessment, Groundwater/pore water is a separate and complete pathway for the benthic

community. Direct contact to the Sculpin, Largescale sucker and Pacific lamprey ammocoete for PAHs and metals should be complete and evaluated.

Response: The CSM was revised to explicitly include exposure by benthic invertebrates to sediments or porewater impacted by the discharge of contaminated groundwater (see Section 2.6 of Appendix C and Section 5.2.2 of the Work Plan). The pathways designations were redefined in Section 2.6.1 of Appendix C and Section 5.2.2 of the Work Plan and all pathways will be evaluated in fish using the TRV approach. However, the direct contact (dermal)pathway cannot be quantitatively evaluated for metabolized chemicals using this method. Too little toxicity data is available to quantitatively evaluate the direct contact pathway for metabolized chemicals.

Figure 3-1:

Comment: The map showing outfalls and CSOs is very helpful. It would be more helpful if it showed the area (and facilities) that drain into each outfall.

Response: This revised figure depicts drainage basins.

Figure 3-2:

Comment: What do the light blue polygons signify? How are the different from the green "no data" polygons?

Response: The figure has been revised; all facility designations have been defined.

Figures 4-1 and Tables 4-2.

Comment: The figures and tables would be more useful if: a) Some comparison to sediment screening criteria was provided; b) Both level 1 and 2 data were included; and c) Subsurface data was included.

Response: EPA and the LWG have agreed that comparison of historical data to sediment criteria was not necessary for the Work Plan. EPA/DEQ/LWG Nature and Extent Work Group January 21, 2003 meeting minutes state: "Group agreed that data screening was not needed to scope the Round 2 N&E investigation but would be

part of the risk assessment process and further discussion was needed with the ECO Subgroup."

Figures 4-1a – 4-1k

Comment: These figures would be much more helpful if the data were screened against risk-based screening criteria, such and the TEC / PEC values or Oregon's draft sediment screening criteria.

Response: EPA and the LWG have agreed (EPA/DEQ/LWG Nature and Extent Work Group January 21, 2003 meeting minutes) that comparison of historical data to sediment criteria was not necessary for the Work Plan.

Figure 4-4c:

Comment: Recreational Beach Use Areas: Maps need to be updated based on latest information on the Swan Island side of the river. This area, marked "rip rap river beach" on the map, should be considered a recreational beach.

Response: The figure was revised (Figure 5-6 in the revised work plan and Figure 2 in Appendix D) to reflect consensus reached in the HH subgroup regarding pathways that will be quantitatively evaluated in the baseline HHRA.

Figure 5-1:

Comment: Preliminary Conceptual Site Model. On other figures, there is a notation indicating that "sediment" includes porewater. That notation does not occur on this figure. Porewater should be included with sediment, or added as a separate source.

Response: The figure was revised. Porewater is now indicated as a potential exposure medium.

Figure 5-3:

Comment: Preliminary Conceptual Site Model for Ecological Risk Assessment. How could direct contact with surface water be a minor pathway for mink, when they swim and feed in water frequently?

Response: More support has been added to Section 2.5.6 of Appendix C. Dermal contact from water exposure is not viewed as a significant exposure pathway for either mink or otter due to their heavy fur.

Figure 5-4:

Comment: This should be modified to reflect consensus of the human health subgroup.

Response: The figure was revised (Figure 5-6 in the revised work plan and Figure 2 in Appendix D) to reflect consensus reached in the HH subgroup regarding pathways that will be quantitatively evaluated in the baseline HHRA.

Figure 5-4 –

Comment: Change the Conceptual Site Model for Human Health to reflect the current consensus of the human health subgroup. Include fish consumption for transient residents as well as ingestion of water and dermal contact. It is likely that transients use the river for many of their basic needs (e.g., drinking water, bathing, eating). Also, for recreational beach users, include the fish consumption pathway in the conceptual model and in the quantitative evaluation of risk.

Response: The CSM was revised (Figure 5-6 in the revised work plan and Figure 2 in Appendix D) to reflect consensus reached in the HH subgroup. Dermal contact with and ingestion of surface water will be quantitatively evaluated for transients. Rather than adding the fish consumption pathway to receptor groups other than the three fisher receptor groups identified, it was agreed in the HH subgroup that fish consumption by transients, recreational beach users, and dockside workers would be evaluated as potentially overlapping exposures, which is reflected in the revised CSM. Text regarding evaluation of overlapping exposures is included on page 89 of the Programmatic Work Plan and Sections 3.3.5 and 5.3 of Appendix D. The method for evaluation and presentation of overlapping exposures in the baseline HHRA has not yet been developed.

Figure 6-1:

Comment: What is the difference between "What are the COPCs, pathways, and exposure scenarios that drive risk" box in Round 1, and the "Refine list of COPCs, pathways, receptors" box in Round 2? We note that there will be no new data collected between these steps to further inform a decision. What methods will be used to "Conduct Preliminary ERA?"

Response: This figure has been removed from the document.

Figures 6-3 and 7-1-

Comment: What methods will be used to "Conduct Round 1 Data Evaluation" and for the "Data Evaluation Report?" What criteria will be used to define "acceptable risks" in these reports? The Baseline Risk Assessment should not be used to identify "unacceptable risks" - this is done as a part of the RAO/PRG/FS process and is a risk management decision.

Response: These figures have been removed from the document. The PRE will contain a fish and wildlife assessment, which will be used to identify COPCs that drive risk to fish and wildlife. The BERA will identify areas, pathways, COPCs and COCs that potentially pose risk. Decisions related to reducing uncertainties around the baseline risk estimates may result in additional studies or remedial options focused on risk reduction. Section 5.0-5.3 of Appendix C describes the assessment methods to be used in the PRE and BERA. Also, Section 6.2 of the Work Plan explains how risk assessment results will be used to make risk management decisions. Please see Section 8.2 for a discussion of the RAO development.

Table Comments

Table 3-1:

Comment: There should be lines between the columns to indicate that this is really a series of lists and not a table; perhaps this would work better as a figure.

Response: The format of this table has been revised.

Table 3-2:

Comment: Chemicals Associated with Selected Industries. This table is so general that it is not useful. The first column should list specific properties instead of general industries, and a third column should be added that lists the chemicals found in soils, groundwater, and wastewater during DEQ investigations and/or discharge monitoring.

Response: While the table is general, we have retained it because it supports the general level discussion in the text. A footnote has been added to see Appendix F, which contains detailed information.

Table 3-2:

Comment: The following additions are recommended:

a. Add metals to Marine Construction/repairs
b. Add herbicides to Electric power substation
c. Add herbicides to Railroad switching

Response: All additions were made.

Table 4-7 –

Comment: The units for the tissue summary data are given in ppb for some chemicals and ppm for others. Also, some results are given in wet weight and others in dry weight. Are these accurate? Also, some of the PCB congener data are in ppb? Is that accurate? It would be very useful if the units were consistent.

Response: Metals concentrations were converted to parts per million, organics to parts per billion, and dioxins/furans to parts per trillion. We could not convert all dry weight data to wet weight because we could not obtain the information needed to do the conversion.

Table 4-8:

Comment: Three of the columns have the same heading of 4,4'-DDD. The intended headings of the first three columns may have been 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT, judging from the footnote. This would be consistent with the reported total DDT values for the control and first three samples. However, the total DDT values for the last two samples (WR-VC-04 and WR-VC-05) are not consistent.

Response: The typos in this table have been corrected.

Table 5-1:

Comment: Assessment endpoint for Birds, Osprey/Bald Eagle. The toxicity benchmark for the bald eagle should be the NOEL. Fish, Chinook Salmon, prey and fish tissue. The toxicity benchmark for listed salmon species should be NOAEL.

Response: The table has been deleted.

Table 7-1:

Comment: The preliminary RAOs refer to reducing risks to acceptable levels or ambient levels. The use of the term ambient is inappropriate.

Response: The term has been changed to background to be consistent with CERCLA guidance. See Section 8.2 for discussion of background and how it will be used consistent with CERCLA guidance.

Table 7-1:

Comment: Summary of RAOs, Data Gaps. Two RAOs are missing from this table: #3, human health risk from surface water, and #6, fish and wildlife risk from surface water.

Response: The RAOs have been revised, see Section 6.1.

Table 7-1:

Comment: Summary of RAOs, Data Gaps, and Sampling Locations, second row. Lipids will be measured in tissues of species consumed by humans. EPA supports

measuring lipids because it will make the data more useful for eco risk purposes. But we wonder - how will lipid data be used in a human health risk assessment? The rate of seafood consumption, the rate of contaminant transfer between sediment and tissue, and the location of fishing areas are identified as data gaps, but there is no sampling planned to address these data gaps.

Response: This table has been revised. Fish and shellfish consumption rates will be proposed in a technical memorandum currently in preparation that will be submitted to the EPA and its partners in May 2003. Fish tissue data from the Site will be used in the baseline HHRA to estimate chemical intake from fish consumption, therefore, the rate of contaminant transfer between sediment and tissue is not needed and is not included in the table. Fish have been collected throughout the Site to be representative of all potential fishing locations. Maps of fish sample locations will be included in the Round 1 data report. These issues are not directly addressed in the work plan text.

Table 7-1:

Comment: Summary of RAOs, Data Gaps, and Sampling Locations, fourth row. Rate of prey consumption, home ranges of prey and target receptors, rate of contaminant transfer between sediment and receptors and prey, and "site-specific" no and low effect levels in tissue are all identified as data gaps in the middle column. No work is proposed to fill any of these data gaps in the third column.

Response: This table has been revised. Ingestion rates, home ranges, and TRVs will be gathered from relevant published literature . When needed, chemical transfer rates will be derived from the literature if possible, otherwise a default conservative value will be assumed.

Table 7-1:

Comment: Summary of RAOs, Data Gaps, and Sampling Locations, fifth row. The volume of sediment requiring remediation is listed as a data gap in the middle column. How will this data gap be addressed with no subsurface sediment to show the vertical extent of contamination?

Response: The table has been revised. Subsurface sampling is proposed in Rounds 2A and 3 (see Section 6, for overview).

Table 7-1:

Comment: Summary of RAOs, Data Gaps, and Sampling Locations, sixth row. The third column includes current measurements along multiple transects within the ISA, but this sampling is not mentioned elsewhere.

Response: This table has been revised. This sampling is being conducted as a part of Round 1 to support hydrodynamic/sedimentation modeling. See the hydrodynamic/sedimentation modeling technical memorandum (WEST Consultants 2003).

Table 7-1:

Comment: Change sampling location language for eating fish to reflect latest sampling plan. Change "fish" to "aquatic organisms" or "biota." Eliminate "(or ambient levels)."

Response: The table has been revised.

Table 7-2:

Comment: Item 2: The first decision should be modified to read: Determine the effect of sediment transport on risk estimates. Add a decision related to the evaluation of remedial action alternatives (e.g., Determine the effect of sediment transport mechanisms on remedies involving the removal or capping of sediments).

Response: The table has been revised.

Table 7-2:

Comment: The DQO process for the Physical River System. In step 2, drop the last item, which is risk-based and is not a physical river system question.

Response: The table has been revised.

Table 7-2:

Comment: Item 4: Some aspects of the physical model may need to consider a large portion of the Willamette River watershed and influences of the Columbia River. The DQO process should consider the scale of the system - understanding sediment transport will be important not only harborwide but at individual localized sources of contamination.

Response: The hydrodynamic modeling, bathymetry, STA analysis, and SPI sampling provide an understanding of the physical system on a harbor wide basis. The issue of spatial scale and localized sources is addressed in response to comments on Risk Assessment and Exposure Pathways—see Comment [Page 6, 1st paragraph] above.

Table 7-2:

Comment: Item 5: The decision rules as written seem too rigid for a dynamic system where erosion and deposition may occur simultaneously. Moreover, it is likely that exposure to subsurface sediment is likely at various times and locations. The decision rule should be designed to determine the degree.

Response: The decision rules have been revised.

Table 7-2:

Comment: The DQO process for the Physical River System. In step 5, it says "If bed elevation losses over time are greater than the surface sediment sampling interval (0-15 cm), then evaluate subsurface sediment quality." The defining factor should not be the sediment sampling interval, but the depth to which organisms are exposed. There may also be risk associated with subsurface contamination.

Response: The table has been revised.

Table 7-2

Comment: The DQO process for the Physical River System. In step 7 and elsewhere, the sediment cores should be included.

Response: Sediment cores will provide only limited information on the physical river system as compared to the information gathering and data analysis proposed. However, they will provide some information, particularly radio-isotope coring in Rounds 2A and 3.

Table 7-2

Comment: It is not clear how the current sampling of sediments (none at depth and limited in spatial area) will help answer the problem statement regarding the physical river system. The decision error for depth (plus or minus 6 inches) is too shallow and no decision error is given for spatial area. How big of a hot spot could be missed given the density of sampling for both historic and currently proposed sediment samples combined?

Response: This sampling approach is not intended to answer the problem statement regarding the physical river system. Rather, it will help make the decisions described in Step 2. Additionally, the proposed approach does not consider the size of a theoretical "hot spot" that could be missed within the ISA because it uses a biased sampling design that focuses on likely source areas in nearshore portions of the ISA. Areas of relatively high concentrations (or hot spots) will be defined through the multiple round sampling approach defined in the Work Plan (see Section 6 for overview). The overall approach is to fill data gaps as information collected in a variety of programs over several rounds indicates that significant potential areas of contamination could be missed. However, it is not the proposed purpose of the RI/FS to necessarily delineate all areas of contamination in absolute detail. Some of this detailed delineation work may be conducted as a part of the remedial design process.

Table 7-3:

Comment: General: As stated above, it is likely that exposure to subsurface sediment occurs. The DQO should consider subsurface sediments as part of the nature and extent of contamination determination.

Response: The decisions to be made and the necessary sampling, have been revised to be more explicit about this issue.

Table 7-3, Item 2

Comment: The term "consistent" has virtually no meaning within this context. Better wording is: Determine the temporal and spatial variability of sediment contamination.

Response: This comment inadvertently was not incorporated into the revised Work Plan; this comment will be incorporated into the final Work Plan.

Table 7-3:

Comment: The DQO process for nature and extent. In step one, three additional problems should be added: upland sources are not well understood, chemical distributions outside the ISA are unknown, and the influence of upstream sources is not well understood.

Response: These items have been added.

Table 7-3: The DQO process for nature and extent, step 2.

Comment: "Determine the nature and extent of contamination in surface sediment and water." Strike the word "surface" and add "and porewater." The second two elements are risk questions and do not belong in the DQO for nature and extent.

Response: Porewater is addressed in Table 7-5.

Table 7-3: The DQO process for nature and extent, step 3.

Comment: Subsurface sediment and porewater should be included.

Response: Porewater is addressed in Table 7-5.

Table 7-3: The DQO process for nature and extent, step 4.

Comment: "For sediment, bank area to bottom of channel to coincide with risk assessment exposure areas." Does this mean the risk assessments assume that there is no exposure to the channel sediments? That only the bank area and slope are contaminated?

Response: This statement was inadvertently not clarified in the revised Work Plan, however, the bank area, slope, and entire channel (including the channel bottom) are considered potential exposure areas.

Table 7-3: The DQO process for nature and extent, step 5.

Comment: "Time-series chemistry data for each COC is within the same range of concentrations over time and triggers the same risk management decision." Samples collected at previously occupied sampling stations may show different chemistry results for a number of reasons, including sediment heterogeneity, laboratory bias, or a real change in chemistry. It is not clear how the source of variance will be established or how temporal differences in chemistry will affect the site assessment.

Response: This statement was inadvertently left in the revised Work Plan and will be removed in the final Work Plan. The LWG agrees that the source of the variance at specific sampling stations cannot be determined with adequate confidence to draw conclusions regarding temporal changes in sediment quality at any single location. However, as discussed in Section 4.6 of the revised Work Plan, the LWG believes that the historical Category 1 sediment chemistry data are usable for the RI/FS. Area-weighted averaging or other statistical approaches may be proposed to further evaluate temporal changes in sediment quality within the ISA following receipt of RI site characterization sampling results.

Table 7-3:

Comment: The DQO process for nature and extent, step 6. "There is no unacceptable risk to human health and ecological receptors from exposure to chemicals in sediment and/or water that is the result of historical and/or ongoing activities within

the ISA." This a risk-based statement that does not belong in the DQO for nature and extent.

Response: This statement was removed.

Table 7-3

Comment: How will the "defined area" be determined when making decisions that a risk based threshold is exceeded? For sediments, how is "sufficient" sampling density defined to estimate spatial variability? What is the decision rule and how large of a hot spot area could be missed?

Response: The LWG does not plan to quantify the size of a theoretical "hot spot" that could be missed within the ISA because a biased sampling design has been proposed that focuses on likely source areas in nearshore portions of the ISA. The resulting highly variable sampling density generated by the biased sampling approach, will not support a statistical estimate of a "hot spot" area that could be missed. Areas of relatively high concentrations (or hot spots) will be defined through the multiple round sampling approach defined in the Work Plan (see Section 6 for overview). The overall approach is to fill data gaps as information collected in a variety of programs over several rounds indicates that significant potential areas of contamination could be missed. However, it is not the proposed purpose of the RI/FS to necessarily delineate all areas of contamination in absolute detail. Some of this detailed delineation work may be conducted as a part of the remedial design process.

Table 7-3: Item 7:

Comment: The sampling design may be optimized by focusing on areas of known or suspected contamination.

Response: This bias is reflected in revised Item 7 language.

Table 7-4: General:

Comment: The evaluation of groundwater discharging to the river should not be limited to VOCs. Pesticides, PAHs, metals, and compounds that may be transported due to cosolvency should also be investigated.

Response: Section 7.2.3 contains our revised approach to groundwater, which considers more than just VOCs. This table has been revised to use the more general term "COIs" (chemicals of interest).

Table 7-4: Item 6: (changed from 7-3 to 7-4)

Comment: The null hypothesis is focused solely on risk rather than nature and extent of contamination. It may be that nature and extent of contamination will have to be delineated before risk estimates are fully developed. Particularly, because risk based PRGs will not be developed until the risk assessment is underway.

Response: This item was revised.

Table 7-4:

Comment: The DQO process for nature and extent, step 7. For both water and sediment sampling, collecting data near suspected sources (i.e., looking for hot spots) should be added.

Response: The issue of sediment management area definition is addressed in Table 7-3 (sediment) and Section 8.6. Table 7-4 is consistent with LWG proposed approach as defined in Sections 7.2 and 8.7.

Tables 7-5 through 7-10:

Comment: The ISA is, by definition, an initial area of investigation. Expansion beyond the ISA may be necessary and has already been contemplated by extending the sampling area to RM 2 through 11. The DQO process must allow for expansion of the ISA based on the results of the investigation.

Response: The tables have been revised to recognize areas outside the ISA. See response to Comment page 5, middle 5th paragraph on this issue.

Table 7-5:

Comment: DQO for groundwater risks. As discussed previously, the groundwater investigation should not be limited to VOCs. In step 4, the intermediate groundwater system should be included along with the shallow system, because these two layers meet near the edge of the river and both discharge to the river.

Response: The DQO has been expanded to "COIs".

Table 7-5:

Comment: DQO for eco risk evaluation. In step 3, "toxicological literature and existing toxicity tests will be evaluated to determine potential toxicity and/or bioavailability." Conservative literature values are acceptable for a screening level assessment, but site-specific toxicity and bioavailability information will be needed to support a final cleanup decision. Step 5 refers to a "threshold value" for invertebrate toxicity in the event single contaminant data are unavailable; what is a threshold value and how would it be developed?

Response: This is now Table 7-6. Refer to the Attachment C.3 for the benthic risk approach. The approach involves bioassy testing to develop a predictive tool relating sediment concentration and toxicity.

Table 7-5 –

Comment: Define "reference areas" that will be used for invertebrate communities. When will data on habitat for amphibian and plant communities be available? How will it be factored into Round 1 sampling within the ISA and what data will be collected to do the "comparison with upstream risk levels?"

Response: The term "reference" areas is no longer used. A reconnaissance of habitats was conducted in 2002 and a draft report was provided to EPA.

Table 7-6:

Comment: DQO process for fish risk. In step 2, "Are levels of contaminants in media in the ISA sufficient to cause adverse toxic effects or reproductive impairment ..." Either drop the words "in media," or add "or prey items." As written, it is not clear that food chain impacts will be addressed. Step 4 discusses using historic and new data to evaluate the temporal scale of risk; we doubt whether there is enough historic tissue data to say anything meaningful about risk over time. From step 6, drop "Compare upstream risk levels with ISA risk levels." As discussed elsewhere in our comments, this is an inappropriate use of background data.

Response: This table is now Table 7-7. The words "abiotic and biotic media" have been added for clarification. Both the historic comparison and background comparison were removed.

Table 7-10 –

Comment: Adequate quantitative fish consumption surveys are expensive and take several years to complete. Unless Respondents intend to conduct such a study, it is unlikely that the data that is gathered from "an additional quantitative consumption survey" which may be conducted "following the Round 1 Preliminary Risk Assessment to gather additional site-specific information regarding consumption rates" would be useful or appropriate for the site risk assessment. Any decision rule should include reference to State of Oregon ARARs. What is meant by a decision error of 0.5 for false positives and 0.1 for false negatives? How will this be used for defining unacceptable risk?

Response: The table has been revised (Table 7-11 in the revised work plan), and the fish consumption survey text has been removed. This issue is addressed in Section 3.5.1.4. ARARs are addressed in Appendix A, Attachment A1. The text on false positive/negatives was removed.

Appendix A Comments

Section 1.0, Page 1.

Comment: Habitat restoration could be folded into Portland Harbor clean-up activities, but the RI doesn't contemplate the collection of such data. As a result, it is premature to discuss habitat restoration in any detail within the FS Work Plan.

Response: We disagree with this comment. This introduction merely states that integration of the cleanup remedy with habitat restoration is a possibility that is left open by the FS process. Restoration efforts will likely proceed in parallel to the RI/FS and may provide various types of useful information that should not be ignored. We see no reason to delete this factual statement about the FS process.

Section 3.2, Page 7:

Comment: Although not strictly treatability studies, evaluation of the physical parameters of the sediment will be necessary to evaluate dredging or excavation techniques that may be used to remove contaminated sediments from Portland Harbor.

Response: Text has been added to the third paragraph of page 6 to indicate that physical information is needed to complete treatability studies.

Appendix A, Attachment A Comments

Attachment A, Section 2.2, (changed from 2.1) Page 3:

Comment: River water must be considered in the FS Work Plan. River water was identified as a complete and significant exposure pathway to be evaluated in the ecological risk assessment Work Plan (See Figure 2-6).

Response: River water has been added as a relevant matrix at the top of page 3.

Attachment A, Section 2.3.2, Page 4:

Comment: Subsistence and Tribal fishing scenarios must be listed. These do not fall under the human recreational exposure pathway.

Response: Native American consumption fishers are noted in the bullet list on page 4.

Section 2.4, Page 6.

Comment: As stated previously, it is premature to discuss issues related to Natural Resource Damage Assessment restoration at this time.

Response: We disagree with this comment. This paragraph states that integration of restoration and cleanup is desirable where possible. Restoration efforts will likely proceed in parallel to the RI/FS and may provide various types of useful information that should not be ignored. This section merely recognizes this fact.

Section 2.5, Pages 7 and 8.

Comment: It is inappropriate to limit preliminary remedial action objectives to "ambient levels" as defined in this section. The FS must consider protective or natural occurring background. It may be determined that it is infeasible to remediate to concentrations that are below anthropogenic background. However, it is premature to make that determination at this time. In addition, the term "Promote" is inappropriate in the CERCLA context. The FS must consider the implementability of actions within the context of an industrial harbor and a dynamic river system.

Response: See responses to comments on main text page 77 regarding RAOs.

Attachment A, Section 3.6, Page 12:

Comment: Sediment removal and disposal options should include hazardous waste determinations and potential evaluation of land ban restrictions.

Response: Text has been added on hazardous waste determinations and land ban restrictions at the top of page 14.

Attachment A, Section 4.3, Page 15:

Comment: Evaluation of potential future natural attenuation should include evidence of past or current natural attenuation.

Response: Evaluation of past evidence of natural attenuation has been added to the last line of Section 4.3 on page 16.

Attachment A, Section 5.0, Page 22: Table 2:

Comment: TMDLs should be included as an ARAR.

Response: TMDLs are now specifically mentioned in the table.

Appendix A, Attachment D Comments

Section 2.1, Page 5.

Comment: Another step in evaluating natural attenuation could be to identify contaminants that are not suitable for natural attenuation (e.g., PBTs), and eliminate those areas from further consideration.

Response: We disagree with this comment. The proposed approach ignores the basic processes outlined in Figure 1 of Attachment D that contribute to natural attenuation. Burial and advective/diffusive loss may take place at some portions of the site, and these processes operate on all chemicals including those that do not degrade over time. Consequently, even chemicals with no potential to degrade (e.g., metals and PBTs) may be suitable for natural attenuation at some sites. There are many examples of natural attenuation of metals at sites around the country and the Pacific Northwest.

Section 5.0, Page 14.

Comment: Most mass movement occurs during infrequent storm/flood events. Remedies should take this into account. For example, sediment caps should withstand these more intense erosional periods.

Response: This comment is more important to non-natural attenuation remedial technologies like capping and confined disposal. We believe that the issue of floods and high velocities is adequately addressed in our approach as detailed throughout Appendix A.

Appendix B Comments

General Comments

Comment: This technical memorandum is not an objective analysis of potential early action sites. All it clearly demonstrates is the parties' unwillingness to perform early actions.

Response: The existing Early Action memorandum included as Appendix B of the Work Plan, constituted the initial evaluation required under the AOC and SOW. The Early Action memorandum proposed a process of periodic reevaluation of the site for early actions, including after Round 1 data collection as proposed in the comment. It should also be noted that both the nature and extent sampling (much of which will occur in Round 2A), and particularly, the sampling related to sources conducted both by LWG and directed by DEQ at individual sites is expected to help identify potential ongoing sources, which was one of the major obstacles identified by the Early Action memorandum.

The LWG has expressed concern to EPA outside the Work Plan process that the timing of early actions coincide with sufficient progress toward completion of the RI/FS. LWG views this as necessary so that parties undertaking early actions can be assured that early actions are a cost-effective means of reducing actual risk at the site and that early action areas will not be recontaminated by uncontrolled sources. Dan Opalski's March 28, 2003 letter to the LWG states,

> "...remedial actions taken after completion of an RI/FS and issuance of a ROD provide greater certainty that the remedy will not need to be revisted...Here, prior to completion of an RI/FS, a given removal action may provide little certainty with respect to long-term effectiveness...Given where we are in the process, the main thrust of Respondents' funds, focus, and action are best spent on work with DEQ to investigate and perform cleanups in upland areas to address ongoing sources to contaminants to the river while working with EPA under the AOC to perform a thorough and complete RI/FS to reach in-water cleanup decisions as expeditiously as possible. This is the best strategy for using everyone's resources most efficiently"

Section 2.3.1, Page 7: Criterion 2,

Comment: "River Sources." Basically, this criterion says that if a site could be re-contaminated from in-river sources, it should not be cleaned up. Is there enough information to determine whether re-contamination is likely? If not, this is a significant data gap that should be clearly addressed in the sampling plan.

Response: We believe the memorandum conclusions are clear that there is insufficient information to determine whether recontamination is likely. This is recognized as one of the primary obstacles to Early Actions at this time. The Round 2A FSP is designed to collect information relevant to ongoing in-river sources including surface sediment chemistry (in conjunction with comparisons to historical surface sediment chemistry) and water sampling. Section 6 of the Work Plan recognizes that additional information of this type may be needed in Rounds 2B and/or 3 to further understand the potential for re-contamination. Section 8.7 describes a specific approach for quantifying the potential for recontamination.

Section 2.3.1, Page 8, Table 1.

Comment: The text here says that the decision to proceed with an early action must be made using existing information. Necessary information can and should be collected during Round 1. Developing sufficient information to make early action decisions should be identified as a Round 1 data gap.

Response: The criteria can be applied at many points in the RI/FS process as proposed in Section 4. Sampling to determine chemical distributions in combination with existing data and ongoing DEQ data collection regarding upland sources will be sufficient to fulfill the data needs identified in this memorandum.

Section 3.1.1, Page 11.

Comment: The areas evaluated were limited by the navigation boundaries. Why? Do Respondents assert that contamination from upland facilities cannot move into the navigation channel?

Response: Consistent with the conceptual site model, the highest levels of contamination are found in the nearshore. Therefore, it was reasonable to focus on these areas for early actions. It should also be noted that where groups of stations were present in the channel, these were included in evaluation areas (e.g., evaluation areas 51 and 52).

Section 3.1.2, Page 17.

Comment: "*Fish are the only likely food to be contaminated in the river.*" Not true; people eat crayfish as well.

Response: We revised the text to indicate that information on other food items such as crayfish were not available at the time of the evaluation.

Section 3.2, Page 18.

Comment: "*Most of the evaluation areas have unconfirmed potential upland sources nearby and/or upstream.*" It may not be necessary to achieve source control before early actions, especially if the purpose of the early action is to remove a mass of highly contaminated material. Early actions need not be final actions. Early actions could be performed to remove large in-water sources now once the RI is complete and risk-based cleanup levels have been determined.

Response: We agree with this idea and it is discussed in detail in Section 2.3.1 under Criterion 1. The point of the criterion is that where there is poor understanding of ongoing sources, it is difficult to gauge whether the early action might be totally ineffectual (i.e., recontaminate within a few years). While it is recognized by EPA guidance that early actions do not have to be permanent (also discussed in the memo), the early action should be effective at least in the short term. There continues to be uncertainty regarding even the short-term effectiveness of Early Actions at most of these sites.

Section 3.3, Page 21.

Comment: We disagree with the conclusions presented in the early action technical memorandum. There are numerous candidate areas for early actions such as Atofina and GASCO. This technical memorandum is not an objective analysis of potential early action areas.

Response: See response to general comment for Appendix B.

Appendix C General Comments

General Comments

Comment: The ERA indicates in most places that the risks to fish will be assessed using comparisons to tissue residue TRVs, with the addition that non-accumulating COPCs, specifically PAHs and most metals, would be assessed using dietary-dose TRVs. However, given the limitations of the TRV data available, both dietary-dose TRVs and tissue residue TRVs should be developed for all COPCs if possible, and used in a weight-of-evidence discussion of risks.

Response: The application of dietary-dose TRVs was proposed to address metabolized chemicals that can not be accurately assessed from a tissue residue TRV. Reviewing tissue residue TRVs for metabolized compounds is uninformative and could be misleading. Tissue residue TRVs are preferable for non-metabolized chemicals because they more accurately reflect potential exposure and risk via all pathways. Therefore, only tissue residue TRVs will be targeted for all COIs except metabolized chemicals. The TRV approach is described.

Comment (cont.): The modeling to be used to estimate dietary doses for fish (or other wildlife) is not presented. The most limited reading of the proposed approach is that the crayfish tissue concentrations will be the only measure of COPC concentrations in fish feeding. But it is not clear how such an approach would or could be extended to areas where the prey biota were not sampled. More-or-less standard Gobas-type models are available and should be used, using literature and best professional judgment to parameterize the model for data not directly measured.

Response: The dietary dose algorithm and clarified text was added into Section 5.3 of Appendix C of the Work Plan. All the fish and invertebrates sampled will be considered as prey items for fish receptors as appropriate. The station locations of fish prey items collected in 2002 are considered representative of prey exposure for all fish receptors except sculpin, because sculpin have a very small home range. The

regression relationship will be investigated between sediment and sculpin and applied if appropriate to areas where sculpin were not collected. If the relationship is not predictive, the food web model selected for development of PRGs will be applied to predict sculpin tissue in areas where sediment data exist and tissue data are lacking.

Comment (cont.): There is no discussion of how exposure concentrations will be developed, considering the locations where samples are collected, collection frequency, and home ranges. The approach indicates that either 95% UCL or spatial weighting would be used, but limited details are presented about what data would be assigned to the exposure field for each specific measured or potential receptor species. At other sites, the sediment data have been used to develop an overall exposure field using krieging or simple spatial weighting using such procedures as Thiesen polygons, then overlaying the biota ranges on this field to estimate exposure conditions. However, it is difficult to apply these approaches to large river systems such as the Willamette. Because of dynamic flows, river sedimentation is known to be very complex in space and time. Most of the proposed new sediment samples proposed for Round 1 are hundreds of meters apart. This coverage seems very limited to provide reasonable exposure estimates, particularly since there are limited data to estimate the heterogeneity in most of the river sediments.

Response: Text was added to Section 5.0 describing how exposure point concentrations would be determined for the PRE and BERA. A 95%UCL on the mean will be calculated for each receptor based on habitat-specific data, e.g, a subset of the sediment data that only includes data from habitat for the specific receptor. Round 1 sampling stations were placed in foraging habitat and centered on sources. The historical Category 1 sediment stations combined with the Round 1 sediment stations and proposed Round 2 sediment stations will result in higher density of stations than appears from the Round 1 field sampling plan.

Comment (cont.): The document does not addresses the cumulative effects of multiple contaminants nor the possibility of threshold effects.

Response: No change made. Cumulative effects of multiple contaminants cannot be addressed because of a lack of appropriate risk assessment tools. This issue will be addressed in the uncertainty analyses (see Section 7 of Appendix C). Threshold effects will be addressed in the TRV approach by examining available dose-response information. See Section 5.3 of the Appendix for a description of the TRV approach for each receptor.

Appendix C Specific Comments

Section 1.1, Page 2:

Comment: Top of page. The text here contradicts the bullets on the preceding page. The text on page 2 says that a baseline risk assessment won't be prepared until after Round 2. Respondents should clarify which is correct, and explain how the Round 1 data will be used to define the Round 2 sampling needs. The text sometimes refers to a baseline ERA after Round 1, but in other places calls it a "Data Evaluation Report" or a "screening level risk assessment." The word used to describe the report that will be written following Round 1 and more importantly, the purpose of it, should be clear and consistent throughout the document.

Response: Agreed; Section 1.3 now explains the order of events for baseline ERA and the Preliminary Risk Evaluation (PRE) as well as sampling events and data gap evaluation. Text was added to describe how Round 1 data will be used to define Round 2 data needs. The document now only refers to a PRE not a data evaluation report or screening ERA. Language was added to clarify the objective of the PRE.

Section 1.7, Page 5: Deliverables:

Comment: It is stated that round 1 data will be analyzed in an "ERA Tier 1 or screening level analysis." The objectives of this exercise should be clearly stated.

Response: Agreed; objectives were added to Section 1.3.

Section 2.1.1, Page 8: Bulleted text:

Comment: It is stated that the assessment endpoints were selected based on several criteria including "consistency with ecological management goals for the site." This

is not appropriate given there is not agreement with Respondents' current management goal.

Response: No change made. During the discussion of the Ecological Risk Work Group it was agreed it was sufficient to recognize that there was more than one possible goal, so that use the plural "goals" was sufficient.

Section 2.1.1, Page 8: Assessment Endpoints, Benthic Invertebrates:

Comment: It is stated that the benthic invertebrates will be assessed as a community. This could mean that certain populations may not be protected (usually the most sensitive) because the "community" or one aspect of the community may be okay. This may not be appropriate if there are certain "keystone species" on which certain organisms depend on. This may include aquatic insects for salmonids, or clams as an important resource. These organisms may need to be assessed separately.

Response: Text was added to Section 2.1.1 that clearly defines the individual, population and community levels of assessment and how specific receptors are being evaluated. The benthic invertebrates will be assessed as a community but methods are included in the ERA analytical approach to assess risk from direct toxicity using the predictive effects relationship (see details in Attachment C.3 of Appendix C) and from bioaccumulative compounds using tissue from crayfish and clams. Therefore, specific potentially important species of invertebrates are being evaluated separately in the benthic community assessment.

Section 2.1.1, Page 11: Top of page.

Comment: "Fish, birds, mammals, amphibians, and reptiles will be evaluated at the population level." What does this mean? EPA guidance says that cleanups should be protective of "local" populations of animals. How will Respondents define a population for the purposes of the risk assessment?

Response: EPA ERA guidance does not define a population in any terms. Guidance implies that the levels of assessment are project-specific, are defined within the assessment endpoint, and therefore depend on the ecological values that are judged

to be important. Text has been added to Section 2.1.1 to clarify the three different levels of assessment that will be applied in the Portland Harbor ERA for each assessment endpoint.

Section 2.1.2, Page 11: Testable Hypotheses.

Comment: Is their ecosystem function impaired? An example of such impairment is a decrease in the ability of plants to uptake nutrients.

Response: Ecosystem function will not be quantitatively assessed in the ecological risk assessment. However, the potential for risk and the implications for ecosystem function will be.

Section 2.1.2, Page 11: Assessment Endpoints.

Comment: The assessment endpoints refer to "concentrations in media in the ISA." Will this allow for the assessment of food chain impacts? If not, it should say "in media or prey items." Also, the assessment should be focused on the ISA, but not limited to it.

Response: Text was clarified in Section 2.1.3.3 to specify abiotic and biotic media.

Section 2.1.3.3, Page 13: Measures of Ecosystem and Receptor Characteristics, 2nd Paragraph:

Comment: It will be difficult to separate out effects of chemicals and effects of physical stressors (temp, oxygen, etc.) on receptors in the risk estimates.

Response: Agreed., Text was clarified in Section 2.1.3.3.

Section 2.3.1, Page 16: Top of page.

Comment: Why doesn't Table 2-1 include the 16 Dames and Moore stations, the Hjort study, or the Ward studies?

Response: These data were added to Table 2-1.

Section 2.3.1.2, Pages 17-20: Epibenthic Community Structure and Function.

Comment: The descriptions of the various taxa appear to be a mix of information from site-specific data and the literature. It should be noted that this information does not, in all cases, present an accurate representation of the community. The Amphipoda section is a generic description of this organism. The section does not mention the amphipod Corophium salmonis, an important food item for juvenile salmonids that is found in the lower Willamette River. The description of amphipod habitat (from Pennak 1978) does not characterize that of C. salmonis, which is often found in water deeper than 1 meter. The description of habitat of Decapoda (crayfish seldom found in depths greater than 1 meter) may not represent the habitat used by crayfish in the Willamette River.

Response: In Section 2.3.1.2, an additional statement was added about Corophium spp. and wording was changed regarding crayfish habitat to include habitats below 1 meter.

Section 2.3.1.2, Page 18: Ephemeroptera:

Comment: Burrowing mayflies should be added to this description.

Response: Text was added to this section (2.3.1.2) about burrowing mayflies (Hexagenia sp.) and their preferred habitat.

Section 2.3.1.2, Page 19: 1st Paragraph, Crayfish:

Comment: Crayfish can be found in deeper waters (greater than 1 meter). As a result, habitat greater than 1 meter should be considered in the eco evaluation.

Response: In Section 2.3.1.2, wording was changed regarding crayfish habitat to include habitats below 1 meter.

Section 2.3.1.2, Page 20: 3rd Paragraph, Clams:

Comment: Clams are found in the river system and are important as a resource both to ecological receptors and possibly human health. These organisms may also be

important indicators of PAH accumulation, and therefore should be sampled separately.

Response: Text has been added throughout Appendix C regarding the collection of clams during Round 1, their exposure pathways and the methods for assessing them separately (Sections 2.6.1.2, 4.2, 5.3).

Section 2.3.2.3, Pages 28-31: Carnivores (salmonid).

Comment: It should be noted that the discussion and conclusions regarding residence time for juvenile salmonids is based on preliminary data. Because of minimum size limitations associated with the weight of the transmitter tag, radio telemetry studies are limited to observations of larger juveniles. The studies do not represent the residence timing of smaller subyearling fish. Studies conducted with subyearling fall chinook salmon (peak migration past Willamette Falls in May and June) do not represent subyearling chinook that are found in the river in February through April. Recent studies (North et al. 2002) have shown that juvenile salmonids are present in the lower Willamette River during all months of the year, and that a variety of age classes, with varying life history characteristics and residence times are present.

Response: Text was added to Section 2.3.2 stating that residence time data is based on only calendar year 2001 observations. Also, we added text stating that fish smaller than 108 mm were not tracked and may have different residence time than those observed. We acknowledge the potential differences between juvenile chinook residence time in the ISA and other salmonid species. Therefore, we added text throughout the document (e.g., Section 2.5.3.2) stating that adult peamouth (similar habitat and diet as juvenile salmonids, but year-round residents) will be used as a conservative estimate for risk to other juvenile salmonid species.

Section 2.3.2.3, Page 30.

Comment: Regarding the discrepancy on out-migrant counts, what entity did the counts at Willamette Falls and Clackamas hydroelectric dam and what was the reason for the count discrepancy by North et al 2002?

Response: Text was added to Section 2.3.2.2 stating that Portland General Electric conducts counts at the falls and that the most likely reason for the discrepancy is that data were collected using different methods and in different locations.

Section 2.3.2.3, Page 31.

Comment: What are the salmon lifestages known to occur in the lower Willamette River (LWR)? What are the known out migration times for adult salmon? Also, the description of migration time from RM 3.5 – RM 18.5 presumably refers to downstream migration and is a typo (RM 3.5-1.8?).

Response: Adult salmon generally do not outmigrate from the river. Adult return timing and juvenile outmigration timing is shown in Figure 2-4. The typographical error was corrected (RM 18.5-3.5). We noted in Section 2.3.2.2 that juvenile and adult salmonids use this area for rearing and holding, respectively.

Section 2.5, Page 41: Bullets.

Comment: Were lipid content and the propensity to bioaccumulate contaminants considered? How about existing tissue data?

Response: Bioaccumulation was added as a bullet to Section 2.5. The existing tissue data were considered as an overall indication of both bioaccumulation potential and exposure, so no additional bullet was added.

Section 2.5.2.1, Page 43: Omnivores/herbivores.

Comment: It is assumed that early life stages of largescale sucker and white sturgeon are likely to be present in the ISA. Juvenile fishes are often more susceptible to contaminants than adults. How does this risk assessment, with its focus on tissue toxicity reference values, address the risk to juvenile fishes?

Response: We have included text in Section 5.3 about inclusion of early-life stage toxicity studies in the TRV review in which we will select the most sensitive applicable life stage for the final TRV.

Section 2.5.2.2, Pages 44-45: Carnivores.

Comment: In addition to the sculpin (not instead of), the peamouth (Mylochelius caurinus) should be collected as a representative of this group. This resident fish is common in the Willamette River, is primarily insectivorous, and feeds across a wider range of habitats than the sculpin. This issue was discussed, and an agreement reached to include peamouth as an additional species, at a June 26, 2002 meeting with Respondents.

Response: Yes. Peamouth has been added throughout the work plan as a receptor (See Section 2.5.3.2 and 2.6.1.3).

Section 2.5.2.2, Page 44: Carnivores.

Comment: We suggest that spring chinook rather than or in addition to fall chinook be the selected representative salmon species for the ERA since spring chinook spend more time in freshwater.

Response: We added text throughout the document (e.g., Section 2.5.3.2) stating that adult peamouth (similar habitat and diet as juvenile salmonids, but year-round residents) will be used as a conservative estimate for risk to other juvenile salmonid species.

Section 2.5.2.2, Page 45: (changed from p. 35) First full paragraph.

Comment: "A particular species of sculpin as (sic) not chosen because they are difficult to distinguish and are similarly exposed." Several species of sculpin are found within the proposed sampling areas (mottled sculpin, prickly sculpin, and reticulate sculpin). We do not know how chemical residues might vary among species, but having differing amounts of multiple species in composite samples will likely increase the variability among sites.

Response: Comment noted as a potential source of uncertainty. However, the variation between sculpin species is expected to be captured in the sample design for Round 1.

Section 2.5.2.3, Pages 45-46: Piscivores.

Comment: The fact that the northern pikeminnow has a bounty on it is irrelevant to its potential selection as a representative of this guild. Northern pikeminnow should be included as an additional (not instead of) piscivorous fish. Pikeminnow have a larger range, integrate food items over a larger area, and are more strictly piscivorous (above a certain size) than smallouth bass. This issue was discussed, and an agreement reached to include northern pikeminnow as an additional species, at a June 26, 2002 meeting with Respondents.

Response: This statement was removed from Section 2.5.3.3 and northern pikeminnow was added.

Section 2.5.2.4, Page 46: Detritivores – Lamprey –

Comment: It is assumed that lamprey are likely to be less exposed to ISA contaminants than the "maximum residence in fresh water." Depending on the "maximum residence in fresh water," this may or may not be true. Lamprey ammocoetes, despite moving "progressively downstream" as they mature, remain in freshwater for up to 7 years. Sculpin, a targeted ERA species, lives 4-7 years, crayfish live 2 years. In addition, lamprey also have a very high lipid content as compared resident species.

Response: This statement (Section 2.5.3) referred to the fact that lamprey spend less than their lifespan (the maximum) in the ISA. The statement was reworded for clarification.

Section 2.5.2.4, Page 46: Detritivores.

Comment: No mention is made of adult lamprey, which migrate through the ISA on their spawning migration. Has information on their transit time through the ISA, area of occurrence, habitat preferences, etc., been evaluated and does this information indicate that there is no risk? If not, information should be sought on the habits of this life history phase, and toxicity data from the Great Lakes lamprey

control programs should be reviewed to assess the potential for risk from contaminants occurring in the ISA to adult Pacific lamprey.

Response: We added text on adult lamprey residence time to Section 2.5.3.4.

Section 2.5.3.1, Page 47: Omnivores/Herbivores.

Comment: Although members of this group may not be as exposed to contaminants as others groups, they are exposed and could be more sensitive or biomagnify chemicals at a greater rate. Also, the document fails to acknowledge that these species drink water, and so that water is an exposure pathway.

Response: As discussed and agreed upon in the ecorisk ad-hoc meetings, the spotted sandpiper was selected as a surrogate for herbivores because their overall exposure to COPCs is greater. Text has been added to Section 2.5.5.3 to clarify. Exposure pathways are described in Section 2.6.2.1 and water consumption is included as a complete but minor pathway (compared to ingestion of sediment or prey items).

Section 2.5.3.3, Page 48: Piscivores- Birds-

Comment: Given that Osprey are migratory birds, spending only several months feeding in the ISA, how will Respondents address this bird's body burden of contaminants relative to uptake from food sources outside the ISA? And how could this allocation methodology be applied to Anadromous fish? The Belted Kingfisher and the Pelagic cormorant are described as a "confirmatory species." What does this mean and how will "confirmatory" data be used in the ERA?

Response: As stated in Section 1.6, 100 percent site use will be assumed for the Preliminary Risk Evaluation. Language regarding confirmatory species was removed from Section 2.5.5.

Section 2.5.4, Page 49: Mammals.

Comment: The document states that river otters are less sensitive than mink to contaminants, but there is no evidence given to support this. The fact that mink are

sensitive to PCBs, while a good criterion for mink, does not preclude otters also being sensitive. In addition, PCBs are only one contaminant. Another consideration is that since river otters spend a lot of time in the water, it seems that their exposure is greater.

Response: More support was added to Section 2.5.6.. However, the LWG does not agree that water exposure is a significant exposure pathway for either the mink or the otter due to their heavy fur.

Section 2.6, Page 50: Potential Exposure Pathways.

Comment: The paucity of data regarding some of the potential exposure routes warrants consideration of additional designations: "incomplete and of unknown significance," and "complete and of unknown significance," which would lead to more data evaluation and potential investigations in Round 2 sampling. This would be in keeping with the intent of a risk assessment, as stated on Page 72 of the Round 1 Work Plan, volume 1: "The first tier is often conservative and broad in scope to ensure no potential pathways, COPCs, or potential receptors are prematurely eliminated from the analysis."

Response: The pathway designations have been redefined in Section 2.6 and include complete and major, complete and minor, complete and uncertain, and incomplete. All major pathways will be assessed when sufficient toxicological data exists. If pathways are incomplete, it is not necessary to assess them in the risk assessment.

Section 2.6, Page 50: Potential Exposure Pathways.

Comment: Some elaboration should be provided on what is intended for "complete and minor" and "complete and uncertain" pathways. Exposure via pathways determined to be complete and minor is considered to be minimal. What does it mean that they will not be evaluated explicitly in the data evaluation? How will the uncertainty assessment be factored into the determination of risk?

Response: The designations have been redefined in Section 2.6 and include complete and major, complete and minor, complete and uncertain, and incomplete. All major pathways will be assessed when sufficient toxicological data exists.

Section 2.6, Page 50: Potential Exposure Pathways.

Comment: We are concerned that "complete and minor" pathways will not be evaluated explicitly in the data evaluation. Even though a path may be minor when compared to other pathways, it may still have impact. This approach also ignores cumulative impacts of multiple chemicals and threshold effects.

Response: The designations have been redefined in Section 2.6. All major pathways will be assessed when sufficient toxicological data exists. Cumulative and threshold effects comment was previously discussed under General Comments.

Section 2.6.1.1, Page 50: Benthic Invertebrate Community.

Comment: Along with direct dermal exposure to the particulate phase and ingestion, pore water represents a significant source of exposure for sediment dwelling organisms. Section 4.1, Chemical Distributions in Sediment, in Volume 1 of the Work Plan, states "For some analytes, sediment pore water is the preferred media." How will bulk sediment chemistry evaluate pore water contact? Will bulk sediment chemistry reflect concentrations of volatile organic compounds and some metals, that do not partition into sediments?

Response: We have added information on our approach for assessing risk at the groundwater/surface water interface in Sections 2.6.1, 5.3 and Attachment C.3. Porewater risk to infaunal invertebrates will be assessed for those chemicals that do not adhere to sediment particles if the groundwater evaluation confirms a complete exposure pathway.

Section 2.6.1.1, Page 51: Top of page.

Comment: The text here does not match Figure 2-6. The text describes benthic infauna exposure to groundwater to be complete and uncertain, but it is filled in as

complete and evaluated on the figure. A similar error occurs for the direct exposure of crayfish to sediment.

Response: The pathway designations in Section 2.6 and Figure 2-6 were redefined and checked for consistency. All major pathways will be assessed when sufficient toxicological data exists.

Section 2.6.1.2, Pages 51-52: Sculpin, Largescale Sucker, and Lamprey:

Comment: It is stated for these species that "sufficient toxicological data are not available to assess risk via the direct sediment pathway for polycyclic aromatic hydrocarbons (PAHs) and metals, and therefore the pathway for these chemicals is complete and uncertain" (will not be evaluated). This is not appropriate, as direct contact with sediment contaminated with metals and PAHs may be a significant uptake pathway.

Response: The pathways were redefined in Section 2.6 and now the "complete and uncertain" designation will be evaluated qualitatively.

Section 2.6.1.2, Page 51: 1st Paragraph, Crayfish.

Comment: It is stated that absorption of chemicals from sediments through the carapace of crayfish is likely to be minor and will not be evaluated. Is there enough data to support this?

Response: Pathway designations were redefined in Section 2.6 and although this pathway is considered minor, it will be assessed through the tissue residue assessment.

Section 2.6.1.2, Page 51: Smallmouth Bass.

Comment: Sediment ingestion may not be a minor pathway for this species. They feed on crayfish which live in the sediment, and often reside in burrows.

Response: Pathways were redefined in Section 2.6 and this pathway is defined as minor but will be evaluated through the tissue residue and dietary TRV assessment for fish.

Section 2.6.1.2, Page 51: Piscivore - smallmouth bass.

Comment: Are data available to substantiate the determination that sediment ingestion is a minor pathway? A comparison of the determination of the significance of sediment ingestion for smallmouth bass, piscivorous birds (Page 62), and mink (Page 63), is interesting. All three species consume similar prey items, yet sediment ingestion is considered a complete pathway of exposure for piscivorous birds and mink, but not for smallmouth bass. This is a candidate for an "incomplete and of unknown significance" designation. Information could be developed during the Round 2 investigation to address this pathway.

Response: The pathways were redefined in Section 2.6 and sediment ingestion pathway will be evaluated through the tissue residue approach. See previous comment.

Section 2.6.1.2, Page 51: Carnivore - sculpin.

Comment: It is not clear how pathways determined to be complete and uncertain will be evaluated ("...will not be evaluated explicitly in the data evaluation."). The direct sediment pathway, which may be an important exposure pathway to sculpin, is determined to be complete and uncertain for PAHs and metals because of insufficient toxicological data. Does this imply that there is sufficient data to evaluate this pathway for other chemicals? This is another candidate for a separate designation of "complete and of unknown significance." Additional information could be developed during the Round 2 investigation to address this pathway.

Response: The pathways designations were redefined in Section 2.6 and the sediment ingestion pathway will be evaluated in fish through the tissue residue approach. Direct contact (dermal pathway) with sediment is a pathway that will be quantitatively assessed using the tissue residue TRVs (tissue residue approach incorporates all pathways). However, the direct contact (dermal) pathway can't be

quantitatively evaluated for metabolized chemicals using this method. Too little toxicity data is available to quantitatively evaluate the direct contact pathway for metabolized chemicals.

Section 2.6.1.2, Pages 51-52: Carnivore - juvenile chinook salmon.

Comment: Juvenile salmonid stomach content analysis in Puget Sound estuaries indicates that they ingest sediments. Sampling has shown PAH concentrations in juvenile salmonid stomachs in the hundreds of parts per million. These concentrations are higher than those found in prey items consumed, indicating that these fish may be ingesting sediment or tar balls that may be on the sediment surface. Sediment is also ingested through the gut content of prey items. This is a candidate for an "incomplete and of unknown significance" designation, rather than "complete and minor." Additional information could be developed during the Round 2 investigation to address this pathway.

Response: The pathways were redefined in Section 2.6 and sediment ingestion is now a complete pathway that will be assessed for fish using the tissue residue approach.

Section 2.6.1.2, Page 52: Omnivore/herbivore - largescale sucker.

Comment: Please refer to the comment on sculpin, above, with regard to the potential effects of PAHs and metals through the direct sediment pathway. This is another candidate for a separate designation of "complete and of unknown significance." Additional information could be developed during the Round 2 investigation to assess this pathway.

Response: The pathways designations were redefined in Section 2.6 and the sediment ingestion pathway will be evaluated in fish through the tissue residue approach. Direct contact (dermal pathway) with sediment is a pathway that will be quantitatively assessed using the tissue residue TRVs (tissue residue approach incorporates all pathways). However, the direct contact (dermal) pathway can't be quantitatively evaluated for metabolized chemicals using this method. Too little

toxicity data is available to quantitatively evaluate the direct contact pathway for metabolized chemicals.

Section 2.6.1.2, Page 52: Detritivore - Pacific lamprey ammocoetes.

Comment: Please refer to the comment on largescale sucker, above, with regard to the effects of PAHs and metals through the direct sediment pathway. This is another candidate for a separate designation of "complete and of unknown significance." Additional information could be developed during the Round 2 investigation to assess this pathway.

Response: The pathways designations were redefined in Section 2.6 and the sediment ingestion pathway will be evaluated in fish through the tissue residue approach . Direct contact (dermal pathway) with sediment is a pathway that will be quantitatively assessed using the tissue residue TRVs (tissue residue approach incorporates all pathways). However, the direct contact (dermal) pathway can't be quantitatively evaluated for metabolized chemicals using this method. Too little toxicity data is available to quantitatively evaluate the direct contact pathway for metabolized chemicals.

Section 2.6.2.1, Page 53: Spotted Sandpiper.

Comment: Surface water contact and ingestion are considered complete and minor pathways, and will be not evaluated. This may not be appropriate, given that this organism may be ingesting surface water while feeding in sediments.

Response: Pathways were redefined in Section 2.6 and minor pathways are not automatically removed from evaluation. However, surface water ingestion is considered minor compared to ingestion of prey and sediment exposure and will not influence the estimation of risk.

Sections 2.6.1.2-2.6.1.3, Pages 51-53:

Comment: We disagree with the assumption that juvenile chinook salmon, small mouth bass and mink do not come in direct contact with sediment and that ingestion of sediment is a complete but minor pathway. The ingestion of sediment should be

considered "complete and evaluated" according to Respondents' exposure pathway designations. Simply because a pathway may be minor when compared to other pathways does not justify a "null exposure" conclusion. This reasoning ignores the cumulative impacts from multiple exposures to the same chemical and multiple exposures to multiple chemicals.

Response: Pathways were redefined in Section 2.6 and minor pathways are not automatically removed from evaluation.

Section 2.6.2.2, Page 53: Mammals.

Comment: The pathway designation in the text does not agree with the pathway designation in Figure 2-6. Also, how can direct exposure to water be insignificant for a mink? Mink swim and feed in the river.

Response: Pathways were redefined in the text and figure 2-6 and justification was added in Section 2.6.2 supporting this. We disagree that direct water exposure is a significant pathway to mink because of their protective fur.

Section 2.6.2.2, Page 53: Mammals.

Comment: We disagree with the assumption that mammals do not come into direct contact with sediment. Information on ingestion of sediment should be included and discussed for mink or other mammals prior to eliminating this pathway.

Response: The pathways were redefined in Section 2.6 and minor pathways are not automatically removed from evaluation. The sediment ingestion pathway will be quantitatively evaluated for mammals.

Section 2.6.2.2, Page 53: Mink.

Comment: The surface water pathway (contact and ingestion) is eliminated for this organism. Information on this pathway should be included and discussed prior to eliminating this pathway.

Response: Surface water ingestion and dermal contact are considered minor pathways compared to ingestion of prey and sediment exposure will not be influence (increase or decrease the risk estimate) the estimation of risk.

Section 3.4, Page 55: Tissue Data.

Comment: It is stated that uncertainties are associated with QA/QC in all tissue studies. These uncertainties should be described.

References: We added reference to Appendix G in the main work plan where uncertainties are presented.

Section 3.6, Pages 55-56: Summary.

Comment: The text only explains what data currently exists, and offers no insights into how existing data influence the Work Plan.

Response: We have added text in multiple sections to explain what historical data was used and how: Section 1.3, 4.0, and 5.1.

Section 4.1, Page 57: Target Analyte Selection and List Development.

Comment: This section should include a discussion of how the historic data was used (if it was) to select the target analyte list for Round 1.

Response: This section has been removed. The target analyte list was developed after consideration of historical data, land uses, and sources. The QAPP (SEA 2002) provides details regarding the target analyte list.

Section 4.1, Page 57: Target Analytes.

Comment: It is stated that only category 1 data was used to determine target analytes for sediment. Category 2 data should be uses as well; anything detected in previously sediments above screening levels should be included as a target analyte.

Response: Both Category 1 and 2 data were used to evaluate potential sources and target analytes. Section 5.4 describes that Category 1 and 2 data are used for scoping purposes when designing sampling events.

Section 4.1, Page 57: Target Analyte Selection and List Development.

Comment: The process described in the document for selecting the target analytes and the COPCs gives insufficient detail. It is not clear how historical data will be used, and no justification is given for the 1990 cutoff date for data.

Response: In Section 4.0, we added text to explain more clearly the COPC selection process and what data will be used. Pre-1990 data will not be used based on the results of a QA/QC review and discussions with the agencies.

Section 4.2, Page 58: COPC Selection Process.

Comment: The document states that, "the Round 1 data will be combined with the existing sediment data [but that] existing tissue and surface water data will not be used due to QA/QC concerns to identify specific COPCs for each receptor." How will the data be "combined" and then how will this "combined" data be used in the COPC selection process? If existing tissue and surface water data are not used, will the Round 1 tissue data really be enough to develop a COPC list for each receptor? We believe the Round 1 tissue data, as proposed, will, by itself, be insufficient data from which to select COPCs for receptors. How and what criteria will be used to "further evaluate and refine" the COPCs for each receptor in the "data evaluation and baseline risk assessment?" The selection process is not well defined and appears to result in the elimination of COPCs without adequate justification.

Response: In Section 4.0, we added text to explain more clearly the COPC selection process and what data will be used. The LWG is currently re-evaluating Category 2 data for its potential to be upgraded. However, the LWG believes that the fish tissue data from Round 1 are more than adequate for the risk assessment considering the number of species and individuals collected.

Section 4.2, Page 58: COPC Selection Process:

Comment: It is stated that "analytes for which no toxicological values are obtained will not be retained as COPCs". This is not appropriate. All COIs that are detected without toxicological information should be retained as COPCs. COPCs should be selected based on the concentration of an individual COI concentration, and also on a multiple contaminant basis for one media (i.e. sediment). Also, contaminants detected in multiple media (e.g. both surface water and sediment) should be screened against benchmarks accounting for exposure that could occur in both media.

Response: Section 4.0 has been revised to add more detail to the COPC selection process. COPCs without toxicological values will be discussed as an uncertainty. The COPCs will be defined through the Preliminary Risk Evaluation and Baseline Ecological Risk Assessment process.

Section 4.2.1, Page 58: Benthic invertebrates.

Comment: Are the TECs to be used as conservative effects-based sediment concentrations from Ingersoll et al. (2001)? Additional information should provided on how screening values will be determined for chemicals that do not have a published TEC. More information should be provided on how "appropriate toxicity values" will be determined for analytes that do not have corresponding AWQC values. It is recommended that this value be determined based on the lowest reported effect level, used with an application of a safety factor of ten to protect sensitive species. This comment also applies to the following sections where AWQCs will be used in the selection of COPCs. Also, sediment concentrations that exceed bioaccumulation-based sediment quality guidelines (PCBs, organochlorine pesticides, PCDDs, PCDFs) should be included as COPCs (NYSDEC 1999).

Response: Our benthic risk assessment approach is described in detail in Attachment C.3 of Appendix C and generally in Section 5.3 of Appendix C. The approach involves development of a predictive concentration-response tool using sediment chemistry and toxicity test results.

Section 4.2.1, Page 58: Benthic Invertebrates.

Comment: If there is no TEC, what would be the other "conservative benthic screening value" that would be used?

Response: Our benthic risk assessment approach is described in detail in Attachment C.3 of Appendix C and generally in Section 5.3 of Appendix C. The approach involves development of a predictive concentration-response tool using sediment chemistry and toxicity test results.

Section 4.2.1 and 4.3.1, Pages 58 and 61:

Comment: It is stated that to determine COPCs for the site, sediment concentrations will be compared to conservative effects-based sediment benchmarks, which will be TECs (threshold effects concentrations). However, to determine which organisms are potentially exposed to COPCs, sediment data will be compared to PECs (probable effect concentrations). Since the objective of this screen is to "identify the chemicals whose concentrations exceed sediment quality guidelines and to define the areas where exceedances occur", the PEC is an inappropriately high value to screen against. This process could screen out areas below the PEC where effects are occurring. The TEC should be used for exposure screening.

Response: Our benthic risk assessment approach is described in detail in Attachment C.3 of Appendix C and generally in Section 5.3 of Appendix C. The approach involves development of a predictive concentration-response tool using sediment chemistry and toxicity test results.

Section 4.2.2, Pages 58-59: Fish.

Comment: The COPC list should be the same for all fish, so that if an analyte shows up as a concern for one fish via any pathway, it is evaluated for all fish. As with benthic invertebrates, sediment concentrations that exceed bioaccumulation-based sediment quality guidelines (PCBs, organochlorine pesticides, PCDDs, PCDFs) should be included as COPCs (NYSDEC 1999).

Response: The COPC selection process for fish is described in Section 4.3. The COPC will be retained if it exceeds the TRV. The implications for various feeding guilds will be discussed. The NYSDEC, 1999 guidance is not applicable to Portland Harbor Superfund Site. A fish-to sediment modeling approach is described in Appendix C.

Section 4.2.3, Page 59: Wildlife.

Comment: Typographical error in fourth line; change Section 4.2.3 to 4.3.3.

Response: We corrected this in Section 4.5.

Section 4.2.3, Page 59: Wildlife.

Comment: Note: The document states that "methods for calculating doses for wildlife receptors are presented in detail in Section 4.2.3," which is this section.

Response: We corrected this in Section 4.5.

Sections 4.2.4 and 4.2.5, Page 59:

Comment: Amphibians and Reptiles and Plants. What are the proposed methodologies for the amphibian and reptile and plant reconnaissance surveys? If these resources are of concern, how will they be included when considering them as dietary pathways for higher organisms in the ERA?

Response: The plant and amphibian survey methods were submitted to EPA as a part of the Round 1 FSP. These methods were discussed with EPA, and EPA concurred with LWG moving forward with the survey, which was conducted in 2002. The methods and results of the survey are presented in Attachment C.1. Sections have been added discussing how these receptors will be assessed (Section 2.4, and parts of Section 2.6 and 5.3). LWG has evaluated the dietary components of receptors, and determined that the significant prey items were included in the Round 1 sampling event.

Section 4.3, Pages 59-60: Characterization of Exposure.

Comment: The first full paragraph on page 60 discusses the determination of exposure areas based on the home ranges of foraging areas of the receptor. What information is available with which to determine the foraging areas or range for juvenile salmonids in the lower Willamette River? This is of special concern for subyearling chinook salmon occurring in late winter and early spring, which may be part of the threatened Upper Willamette chinook ESU. These fish may occur in specific habitat types and reside in the lower Willamette River for several months. Because of the lack of information and the threatened status of this species, it should be treated as having a localized home range, and the maximum concentration used for exposure.

Response: This section exists now in Section 5.0 as part of the analysis plan. Forage areas will be established using available information and using conservative estimates where uncertainty is high.

Section 4.3, Page 60: Characterization of Exposure

Comment: It seems that this approach is based on very assumptive variables, which, if not developed accurately, would greatly influence the proposed approach for characterizing exposure. The document states that, "the exposure point concentration will be the 95% UCL of all the data for a specific media within the ISA." Does "all" the data include historical data or only Round 1 data? Also, Equation 1 was not in the document.

Response: In Section 5.0, we have added explanation that "all" data refers to both Round 1 data and QC'd historic data. EPA (1998) is now referenced to support selection of 95% UCL v. maximum concentrations. The equation formatting was corrected so that it appears now in the document.

Section 4.3, Page 60: Characterization of Exposure.

Comment: There are no references given for this approach, and so it is not clear if it is a scientifically accepted approach or simply one derived for Portland Harbor. The data that will be used for the calculations is also unclear. It seems that the

assumptions made and the choice of data to be used will greatly influence the outcome. The characterization of exposure needs to be more clearly defined before it would be acceptable. Equation 1 was not in the document.

Response: See response to previous comment. An analysis plan has been designed to clarify the exposure characterization methods and an EPA guidance document was cited for reference.

Section 4.3, Page 60: 2nd Paragraph, Benthic COPC Distributions:

Comment: It is useful to map the areas that exceed sediment benchmarks, but is unclear how risk will be characterized using this approach to "evaluate the proportion of habitats or areas of concern that have exceedances of benchmarks". This appears to be getting into establishing what is an appropriate area over which to have benthic exceedances, or defining a benthic "population". This area is likely to be very small, if it exists at all. Also, the document proposes to use PECs to map these areas, which is inappropriate.

Response: Our benthic risk assessment approach is described in detail in Attachment C.3 of Appendix C and generally in Section 5.3 of Appendix C. The approach involves development of a predictive concentration-response tool using sediment chemistry and toxicity test results.

Section 4.3.1, Page 61: Benthic invertebrates.

Comment: "Sediment data will be compared to sediment quality benchmarks, such as the PECs, as a function of spatial distribution, magnitude, and frequency of exceedance." EPA does not support the use of PECs in this manner. PECs are concentrations above which adverse effects are likely to occur. The TECs would be appropriate for screening and identifying areas of potential concern. Areas with concentrations between the TEC and PEC should undergo further evaluation, such as bioassays, to determine risk.

Response: Our benthic risk assessment approach is described in detail in Attachment C.3 of Appendix C and generally in Section 5.3 of Appendix C. The

approach involves development of a predictive concentration-response tool using sediment chemistry and toxicity test results.

Section 4.3.1, Page 61: Benthic invertebrates.

Comment: "Crayfish tissue residue concentrations will be used to integrate the sediment, water, and dietary exposure to chemicals." There is some variability in the levels to which different macroinvertebrates bioaccumulate and bioconcentrate contaminants due to differences in the uptake and elimination kinetics between species. If there are data indicating that crayfish tissue residues are representative of the macroinvertebrate community, and that crayfish tissue residues will provide information to allow an assessment of the risk to this community, it should be presented. If this information is not available, additional species/communities should be analyzed. Other sections of the Work Plan indicate that benthic invertebrate grabs will be collected. Is the text here wrong?

Response: The tissue TRV approach for infaunal invertebrates is limited by the fact that obtaining sufficient tissue volume for analysis is not possible, even when taken as a whole community sample. There are a number of TRVs available for crayfish, crayfish are an abundant species, and they are longer-lived making them more likely to bioaccumulate contaminants at higher concentrations than smaller invertebrates. This rationale is described in the Section 2.5.

Comment (con't): Mollusks are one of the more sensitive taxa to TBT due to their high rate of uptake and limited ability to metabolize it. If there is information indicating that crayfish TBT tissue residues are sufficiently representative to assess the risk to mollusks, it should be presented. If this information is not available, Corbicula sp. or some other mollusk should be collected and analyzed. Meador et al. (1997) reported TBT BSAF values for three marine invertebrates ranging from 0.4 to 4.6 in laboratory exposures. Where do crayfish fall in the range of macroinverbrate bioaccumulation potential? Also, the EPA citation (1999) is wrong and the Meador citation is not included in the reference list.

Response: Mollusks (bivalves) will also be collected and analyzed for TBT (and other chemicals). This point was clarified in Section 5. (and see previous comments for similar concerns). References were corrected.

Section 4.3.1, Page 61: TRVs.

Comment: If no TRV exists for a given organism, the COPCs still need to be included as COPCs for tissue.

Response: These chemicals will not be excluded (they will be discussed in the evaluation of uncertainties). See response to comment on COPC Selection, Section 4.2, Page 58.

Section 4.3.1, Page 61: TBT Evaluation.

Comment: It is stated that the effects of TBT on the benthic community will be conducted using crayfish only. There may be other important benthic receptors for which TBT needs to be evaluated, such as clams. Also, pore water should be evaluated for the effects of TBT on the benthic community.

Response: Clam tissues will be evaluated for TBT and other chemicals. Tissue levels are a more appropriate medium for determining adverse TBT effects than porewater based on recent research in this scientific arena.

Section 4.3.1, Page 61: Benthic Invertebrates, Groundwater.

Comment: It is stated that the effects of groundwater exposure by benthic invertebrates will not be evaluated in Round 1. Therefore, contaminants should not be screened out for this pathway until it is evaluated in Round 2.

Response: Agreed. The COPCs for this pathway have not been established yet because the exposure pathway from contaminated groundwater discharging to porewater has not yet been characterized as complete or incomplete.

Section 4.3.1, Page 61: Benthic Invertebrates.

Comment: The document states that, "Measured crayfish tissue residue concentrations will be used to integrate the sediment, water, and dietary exposure to chemicals." How will this information be "integrated?"

Response: This refers to using the tissue residue TRV approach to assess exposure from multiple pathways. The text was rewritten in Section 5.3 to clarify.

Section 4.3.2, Page 61: Fish.

Comment: BSAF (biota-sediment accumulation factor) needs to be addressed in the Work Plan with an explanation of why it will and how it will be calculated or an explanation of why it will not be calculated. On an editorial note, the document references section 4.1.3 as the section discussion COPC selection for fish. The section is actually 4.2.2 and we refer the reader back to our comments on section 4.2.2 as being applicable to the approach described here in section 4.3.2.

Response: A description of the linear regression analysis for collocated tissue/sediment samples was added to Section 5.3 that explains when the LWG will or will not use the regression relationship.

Section 4.3.2, Page 61: Fish.

Comment: It is stated that chemical concentrations in whole body tissues of the representative species for each feeding guild will be analyzed to determine exposure concentrations. If there are more than one species for a given guild, tissue concentrations should be estimated for both.

Response: Agreed. Text was revised to clarify in Section 5.

Section 4.3.2, Pages 61-62: Fish.

Comment: What information will be used to determine the area from which to determine the spatially weighted average for the surface water exposure assessment? How will this be determined for species for which there is limited information on residence time of area of occurrence (e.g. juvenile salmonids)?

Response: The text has been revised in Section 5.0. There is no reference to spatially-weighted averaging.

Comment (cont.): For the dietary approach for COPCs that are metabolized or otherwise regulated by fish, how will the approximation of the COPC concentration in a representative prey species be done? Will it be an area weighted average, specific habitat area weighted average, community type average, etc.? What "representative prey species" will be used in the dietary pathway for piscivores and will PAHs be measured in the prey species? We are skeptical about the dietary TRV approach for PAHs. We are not aware of any directly applicable toxicity studies. If an appropriate dietary TRV cannot be found, another approach may be needed to assess risk to fish from PAHs.

Response: The dietary exposure model is presented in Section 5.3. The PAH paper presenting a dietary exposure study will be provided to EPA.

Section 4.3.2, Page 62: Fish:

Comment: Estimating dietary exposure is mentioned here, but according to the Round 1A Work Plan, PAHs will be analyzed in fish tissue as well. A dietary approach and a tissue approach should be used together.

Response: Section 5.3 explains that the dietary approach will be applied to metabolizable chemicals and the residue approach will be applied to other chemicals in the fish assessment.

Section 4.3.3, Page 63: 1st Paragraph:

Comment: It is stated that foraging ranges, daily food consumption rates, and body weights will be obtained from EPA's Wildlife Exposure Factors Handbook (EPA 1993). There may be local information that should be used to make sure the assessment is realistic and appropriate for this site. This may include the Oregon Department of Fish and Wildlife, USFWS, and other local resources and local

references such as "Atlas of Oregon Wildlife", Csuti et al., 1997, which has distribution, habitat and natural history information.

Response: Agreed. The text in Section 5.0 has been changed to indicate that other published literature will be considered. If relevant local information is available, it will be reviewed.

Section 4.3.3, Page 64: 1st Paragraph:

Comment: The Peamouth should also be considered as a prey item for the hooded merganser.

Response: The peamouth will be considered as a prey item for the hooded merganser.

Section 4.3.3, Page 64: 3rd Paragraph, Mink:

Comment: It is stated that sediment from likely mink habitat areas will be used in the exposure estimate. Do we have enough information to distinguish "mink habitat". If so, this information should be presented. Also, Figure 2-3 a-b shows mink foraging throughout the ISA, so perhaps habitat areas are not appropriate.

Response: Section 5 has been rewritten and this statement has been removed.

Section 4.4.2, Page 66: Benthic Invertebrates:

Comment: It is stated that potential adverse effects will be determined based on a comparison of COPCs in sediment to PECs (Probably Effects Concentrations). A screening step to determine benthic effects should be conservative, and should include a TEC (Threshold Effects Concentration) instead of a PEC. Below the TEC, adverse effects in benthic species are not frequently expected, and therefore is a more appropriate benchmark to use for determining areas where adverse effects could occur.

Response: Our benthic risk assessment approach is described in detail in Attachment C.3 of Appendix C and generally in Section 5.3 of Appendix C. The

approach involves development of a predictive concentration-response tool using sediment chemistry and toxicity test results.

Section 4.4.2, Page 66: Benthic Invertebrates.

Comment: PECs or TECs (see comment on page 61, above) will be used to determine potential adverse effects to aquatic invertebrates. How will the potential effect of contaminant mixtures be evaluated? A measure such as mean PEC quotients should be considered as a means of quantifying the chemical composition of sediments that contain mixtures of environmental contaminants (US EPA 2000). U.S. EPA (2000) and Ingersoll et al. (2001) found sediments with chemical characteristics exhibiting mean PEC-Qs equal to or greater than 0.7 showed an incidence of toxicity greater than 50% for the amphipod Hyalella aztecain 28- to 42-day tests. Predictions of toxicity should be validated by running laboratory toxicity tests.

Response: Our benthic risk assessment approach is described in detail in Attachment C.3 of Appendix C and generally in Section 5.3 of Appendix C. The approach involves development of a predictive concentration-response tool using sediment chemistry and toxicity test results.

Comment (con't): Information should be presented on how a comparison of tissue levels in crayfish to tissue residue effects levels in decapods will appropriately assess adverse effects to aquatic invertebrates.

Response: The tissue TRV approach for infaunal invertebrates is limited by the fact that obtaining sufficient tissue volume for analysis is not possible, even when taken as a whole community sample. There are a number of TRVs available for crayfish, crayfish are an abundant species, and they are longer-lived making them more likely to bioaccumulate contaminants at higher concentrations than smaller invertebrates. This rationale is described in the Section 2.5. .

Section 4.4.3, Page 66: Fish.

Comment: For juvenile salmon, only the survival and growth (not reproductive) measures of effect will be looked at because they don't reproduce in the ISA and

early life stages are not likely to be present for long periods of time. This may not be appropriate, since exposures early on may have an effect on reproduction. This section also states that "a tissue residue approach will be used for chemicals that bioaccumulate (such as PCBs and mercury) because tissue residues incorporate all exposure pathways, and bioavailability is explicitly considered." These chemicals should also be evaluated for direct toxicity, and not just toxicity resulting from tissue residues.

Response: The text in Section 5.3 that discusses the effect characterization for fish explains that all life stages of fish that occur within the ISA will be considered for each receptor. Text has been added to Section 5.3 describing the surface water direct toxicity assessment using water quality criteria. There are no tools to assess direct toxicity from sediment.

Section 4.4.3, Page 66: Fish.

Comment: The document states that "juvenile chinook salmon ... do not reproduce in the LWR and early life stages are not likely to be present in the LWR for significant periods of time ... adults of these species accumulate the majority of their chemical tissue residues outside of the LWR so maternal transfer of chemicals to eggs is not likely to be reflective of the LWR." Are these statements known to be true? No references are given and only one reference is given elsewhere in the document. Sufficient data must be collected to determine these facts since they are important for the effects analysis.

Comment: This specific text was deleted from Section 5.0.

Section 4.4.3, Pages 66 – 68: Fish.

Comment: How will lipid content be taken into account with COPCs such as PCBs? The higher the lipid content, the higher the resistance to lipophilic toxicants, because the compounds are associated with the lipid and not available to cause toxicity. This is especially significant with regard to evaluating potential effects on juvenile salmonids, which exhibit variable lipid contents related to their origin (hatchery vs. wild), time of year (abundant vs. sparse food supply), physiological state (smolting

vs. non-smolting), etc. (Meador et al. 2002). This emphasizes the importance of ensuring that juvenile salmonids collected for tissue analysis are sampled at the appropriate time of year, are of the appropriate stock, and appropriate life stage. Whole body lipid levels should be determined and used in conjunction with the evaluation of tissue levels of lipophilic contaminants.

Response: A description of the rules for lipid-normalization has been added to Section 5.0. Lipid-normalization of whole-body concentrations in fish will be conducted for lipophilic COPCs that are assessed with a tissue-residue TRV.

Comment (cont.): Survival, growth, and reproduction are emphasized in the selection of studies used to determine TRVs. How will studies related to sublethal effects, such as increased incidence of deformities, fin erosion, altered organ morphology, DNA damage, lesions, tumors, immunosuppression, etc., be factored in? These effects, which are indicators of impaired fish health, can result in increased mortality, reduced growth, and impaired reproduction.

Response: Attachment C.5 describes the consideration of sublethal effects data during TRV selection.

Comment (cont.) "Separate TRVs will be selected for COPC concentrations in water and diet or whole-body tissue residues for each representative species." This sounds good, but there may not be sufficient data to develop different TRVs for each species. Also, TRVs should be developed water, diet, and whole-body tissue residues, if sufficient data are available for all three lines of evidence.

Response: Section 5.3 text regarding TRVs has been revised so that TRVs are not necessarily species-specific. Attachment C.5 describes how surrogate species will be selected where too little species data exist. TRVs will be developed for diet and whole-body tissue residues in fish as appropriate (dietary TRVs for metabolized chemicals, residue for others). The toxicity of water to fish will be assessed in the surface water evaluation using AWQC or chronic toxicity tests. See Section 5.3 for details.

Section 4.4.3, Page 66: Characterization of Effects - Fish.

Comment: Regarding the preference of studies for juvenile chinook and Pacific lamprey, the document states that, "closely related species will be given preference ... after which all fish will be given equal preference." We suggest that additional criteria be applied to the preferential treatment of toxicity studies such as similarities in lipid content, chemical sensitivity, feeding patterns, habitat, etc. that will result in the highest degree of certainty that the extrapolated data corresponds to dynamics known about chinook and lamprey.

Response: Attachments C.5 and C.8 restate this in a less-restrictive manner and present study characteristics that will be used to prioritize studies that have been reviewed.

Section 4.4.3, Page 67: Bullets.

Comment: Some of these requirements are quite restrictive, and if they are strictly applied as a set, it may be hard to come up with TRVs. Bullet two, using only studies with single chemical exposures, will preclude the use of field-collected data. Most of the studies looking at the dietary effects of metals on fish are from the Clark Fork, and used field-collected prey items or laboratory-prepared food that contained a mixture of metals. The fourth bullet, requiring biological effects "directly related to the endpoints of survival, growth, or reproduction" is somewhat unclear. Would reduced ability to capture prey or sense predators be considered effects on survival? We think they should. These two bullets could be used to rank or weight studies for inclusion in the TRV determination, but they should not be used to eliminate otherwise appropriate studies.

Response: Attachments C.5 and C.8 lay out guidelines for TRV study review. Preferences have been defined but will not be applied as strict criteria. The use of field studies and/or chemical mixtures is not preferred but is open for consideration if the studies available demonstrate a clear dose-response to an individual chemical.

Section 4.4.3, Page 68: LOEC and NOEC discussion.

Comment: Additional criteria should be applied to the selection of TRVs based on the lowest relevant LOEC and the highest relevant NOEC. A LOEC is the lowest concentration tested where adverse effects are observed. Several contaminants have relatively few studies, and the lowest reported LOECs may be an LC50 (benzene) or an LR98 (lethal body residue) (dieldrin). Selection of a TRV based on values such as these would underestimate the potential adverse effects to receptor species. This is significant in that the null hypotheses (Table 5-1) are that the dietary or tissue concentrations do not exceed peer-reviewed literature-based LOEC for survival, growth, or reproduction. An uncertainty factor should be applied to studies where the lowest tested dose caused significant adverse effects. Also, the literature contains few studies related to reproduction, and effects are generally expressed as reduced fecundity, reproductive success, egg hatch, etc. How will TRVs address potential effects on larval or other juvenile life stages of fishes?

Response: Attachments C.5 and C.8 describe the application of LOAEL-to-NOAEL and LOEC-to-NOEC safety factors and the evaluation of TRVs for all life stages of fish applicable to the ISA (See also Section 5.3).

Section 4.4.4, Page 69: Wildlife, Last paragraph in section:

Comment: It is stated that "the lowest relevant LOAEL and highest relevant NOAEL will be selected as TRVs for use in the data evaluation." For the selected range, the highest NOAEL may not be appropriate, and may be higher that a LOAEL from a different study. A range needs to be presented that considers the lowest NOAEL.

Response: Attachment C.8 explains that in this scenario, the selected TRVs will be examined in the context of all the available toxicity values to assess the accuracy of the NOAEL and LOAEL. Alternative studies may be chosen based on this comparison to all available dose-response toxicity data. Final TRVs will be selected through discussion with EPA.

Section 4.5, Page 70: Identification of Ecosystem and Receptor Characteristics.

Comment: The document states that "impacts of these factors on the receptor population will be assessed to determine whether they will influence the exposure of receptor populations." More detail is needed here. This analysis could be important for cumulative impacts of multiple chemicals and threshold effects.

Response: Language was added in Section 5.3 indicating that this evaluation will be limited to a qualitative discussion in the risk characterization.

Section 4.5, Page 70: Ecosystem and Receptor Characteristics:

Comment: It is stated that "the impacts of these factors (exotic fish, mammal, amphibian, and plant species in the LWR altering habitat structure, increasing competition for food and habitat, and increasing predation) on the receptor populations will be assessed to determine whether they will influence the exposure of receptor populations." How is this going to be used in the risk assessment? It will be difficult to distinguish between these effects or use these other factors to diminish the significance of chemical effects.

Response: Language was added in Section 5.3 indicating that this evaluation will be limited to a qualitative discussion in the risk characterization.

Section 4.5, Page 70: Ecosystem and Receptor Characteristics.

Comment: The text here lists other factors that can effect the exposure of a receptor to COPCs, such as habitat alterations. We understand that the lower Willamette is a highly altered environment, and that the physical system is stressful for fish. However, some of the factors listed could be caused the very chemicals the Work Plan is supposed to assess. Increased predation can be caused by chemical-induced neurological damage that impairs the ability of fish to sense predators, and slows reaction time. PCBs have been shown to cause reduced immune function in fish, making them more susceptible to pathogens. Problems caused by chemicals should not be ascribed to "other factors." Also, how will these other factors be used in the risk assessment? In the uncertainty analysis, or in a more quantitative fashion?

Response: Language was added in Section 5.3 indicating that this evaluation will be limited to a qualitative discussion in the risk characterization.

Section 4.6.2, Page 71: Risk Description:

Comment: It is outlined that a weight of evidence approach will be used to estimate the likelihood of adverse effects from all potential pathways. Risk should be calculated for each media independently, and they quantitatively combined to show an overall risk from multiple pathways.

Response: Where possible, this will be done. However, note that some estimates of risk are based on a calculated dose, where each medium concentration is in the equation, but one risk estimate will result.

Section 5.1, Pages 74-75: Proposed Work, Assessment Endpoint No. 1: survival, growth, and reproduction of aquatic invertebrates.

Comment: Pore water represents a significant source of chemical exposure to sediment associated organisms. Evaluation of the concentrations of contaminants in pore water should be included in the proposed work. Toxicity testing (survival and growth of relevant organisms) with whole sediment, pore water, and sediment elutriates should be included to identify conditions that may adversely affect benthic organisms.

Response: The groundwater evaluation process is discussed in Section 7.2.3 of the Work Plan. As Section 5.3 states, if porewater is identified as a complete pathway to benthic invertebrates, an assessment of this pathway may be conducted.

Section 5.1, Page 74: Assessment Endpoint No.1, Aquatic Invertebrates, bullet c:

Comment: It is stated that "crayfish and shellfish will be collected and chemically analyzed to identify potential risks to shellfish and crayfish." In order to support this assessment endpoint, risk estimates for shellfish and crayfish need to be analyzed and calculated separately as populations (not as a part of the "benthic community." This is not outlined in the Work Plan.

Response: Sections 2.1, 2.5, 2.6, and 5.3 present crayfish and mollusks as additional measures for the benthic community. They are not assessed as separate endpoints.

Section 5.1, Page 75: Assessment Endpoint No.1, Aquatic Invertebrates, bullet f.

Comment: The sampling proposed for round 1 is not extensive enough to "identify potentially complete pathways to groundwater." This should be an objective of a more complete sampling event, possibly in round 2.

Response: See previous comment on groundwater approach. A groundwater evaluation is being conducted to assess pathway completeness and additional sampling may occur after Round 1 if warranted.

Section 5.1, Page 75: Proposed Work, Assessment Endpoint No. 2: survival, growth, and reproduction of fish.

Comment: Sublethal effects that are indicators of fish health should be evaluated, including incidence of deformities, fin erosion, altered organ morphology, DNA damage, lesions, tumors, etc. How will information from the proposed work be used to evaluate the potential effects of COPCs on larval and other juvenile life stages of fishes? Benthic community samples should be analyzed for the full suite of contaminants, not just PAHs and metals, if sufficient tissue volume can be obtained. This data will be very helpful when / if we decide to do more formal food-web modeling.

Response: See previous comment on sublethal effects. An insufficient volume of benthic invertebrate community tissue was collected for chemical analyses as stated now in Section 5.3.

Section 5.1, Page 75: Assessment Endpoint No. 2, Fish, Bullets b and c.

Comment: It is not clear how sediment samples collected in round 1 will be used to identify potential adverse effects using the dietary pathway. The proposed sampling does not include an evaluation of the effects of direct sediment exposure for PAHs and metals, major contaminants that need to be assessed in this pathway. It appears that instead, the plan attempts to use tissue concentrations of the benthic community

to get at dietary exposure of these contaminants to fish. This is not appropriate, and is missing a major route of exposure.

Response: As is stated in a previous response (see also Section 2.6), the sediment ingestion pathway will be assessed for fish using the TRV approach and will be included in the dietary exposure model for metabolizable chemicals such as PAHs. See Section 5.3.

Section 5.1, Page 75: Assessment Endpoint No. 3, Birds.:

Comment: It is stated that potential adverse effects to birds will be determined in "selected foraging areas". Justification for the selection of specific areas needs to be made, as birds have been observed foraging in less that desirable habitat within the ISA. This should include actual local information on sightings and information on where birds forage within the ISA. By limiting the assessment to preconceived "foraging areas" the assessment may be missing key areas of exposure.

Response: LWG has defined bird foraging areas for now, only in broad terms, using all open sediment or beach habitat as shorebird foraging areas. All other habitats are viewed as potential foraging areas for hooded merganser, bald eagle and osprey, although the merganser may be limited by water depth. The Round 1 sampling stations for ecological risk were designed in part around the shorebird foraging habitat and EPA was in agreement with LWG on this operational definition.

Section 5.1, Page 75: Assessment Endpoint No. 4, Mammals.

Comment: The one mammal outlined as a receptor for the ISA, has had surface water eliminated as being evaluated in round 1 assessment (stated here as being used to determine adverse effects to mammals).

Response: Surface water sampling for purposes of assessing risk to mammals will not occur. Surface water ingestion pathway to mammals will not be quantitatively evaluated because this pathway is minor relative to ingestion of prey and sediment. Text has been updated in Section 5.3.

Section 5.1, Page 76:

Comment: When the risk assessment is completed, then what? The process described here will generate a list of hazard quotients. What's missing is any sense of how the hazard quotients will be interpreted, combined, and analyzed to characterize the overall ecological risks.

Response: Text has been added to Section 6.2 of the Work Plan that explains how the ecological risk assessment results will be used to get to the ROD. In addition, Section 6.0 of Appendix C contains the Risk Description and describes the weight-of-evidence approach planned for interpretation of the results of quantitative analyses.

Figure 1-1, Portland Harbor Tiered Process:

Comment: This figure, as well as language throughout the Work Plan has concentrated on identifying "risk drivers" and then concentrating on this "risk drivers" in subsequent rounds. Although it is important to identify the major pathways, this emphasis may be inappropriate since several risk pathways may add up to an overall unacceptable risk. These pathways could potentially need further evaluation. This figure is perhaps a look at the proposed overall framework for the eco assessment in Portland Harbor, which is missing from the text. More expansion on sampling that is to take place in future rounds, and how Round 1 fits into this picture is needed.

Response: Figure 1-1 has been deleted.

Figure 1-1:

Comment: It is interesting that "bioavailability testing" is listed as a Post Round 2 activity. We think it should be addressed earlier, and that addressing it will require the collection of site-specific data not currently slated for collection.

Response: Figure 1-1 has been deleted.

Figure 2-4:

Comment: Referenced to show the timing of salmonid migration through the LWR is, as noted in the footnote, an estimate based on limited information on the Columbia and Willamette rivers. The timing of juvenile outmigration should be updated based on more recent studies (i.e. North et al. 2002 and data from subsequent rounds of this ongoing study when available).

Response: The figure was updated reflecting North et al. 2002 data. The migration time was changed to February through June, with peak migration occurring in April and May.

Figure 2-6: Preliminary Conceptual Site Model for Ecological Risk.

Comment: The figure should be modified as follows:

Add two new designations:

- Incomplete and of unknown significance, and 2) Complete and of unknown significance.
- The smallmouth bass sediment ingestion exposure route should be from incomplete and of unknown significance.
- The chinook salmon sediment ingestion exposure route should be incomplete and of unknown significance.
- The sculpin, largescale sucker, and Pacific lamprey ammocoete sediment direct contact exposure route designation for metals and PAHs should be complete and of unknown significance.

Response: Figure 2-6 has been revised to reflect changes in appendix text. New designations are: complete and major, complete and minor, complete and uncertain, and incomplete. Smallmouth bass sediment ingestion has been changed to complete and minor; Chinook salmon ingestion exposure was changed to complete and uncertain; and sculpin, largescale sucker and Pacific lamprey (and all fish receptors) ingestion of sediment will be evaluated using the tissue residue approach.

Figure 2-6, Preliminary Conceptual Site Model For Ecological Risk Assessment.

Comment:

- Pore water should be separated out from sediment, as exposure to aquatic organisms may be different, especially in contaminated groundwater flux areas. [Groundwater > pore water > surface water]. Pore water exposure should be separate and complete for the benthic community.
- Direct contact to surface water should be revised for mink, sandpiper, and hooded merganser (to be complete and evaluated).
- Sediment ingestions should be complete and evaluated for the smallmouth bass.
- For direct contact to the Sculpin, Largescale sucker, and Pacific lamprey ammocoete for PAHs and metals should be complete and evaluated.

Response: The porewater pathway was added to this figure through groundwater. See above comment response.

Table 2-3: (changed from 2-5) Fish Home Ranges.

Comment: This should be revised to reflect a more accurate assessment of the North et al. study for the smallmouth bass home range – not the largest reported. The same should be done for the northern pikeminnow

.

Response: Figure 2-5: Footnotes were added to figure to designate both the maximum and most common home range reported for northern pikeminnow and smallmouth bass as reported in North et al.

Comment (cont.): Does this mean that it is impossible for a black crappie to have a home range smaller than 2 miles? (which is not likely).

Response: Some black crappie in the cited study were reported to have not moved from the release site, the home range for crappie was extended to 0-7 miles in Figure 2-5.

Table 2-8: Species of Special Interest Within The ISA:

Comment: The Columbia spire snail is listed as SOC (species of special concern) status within the ISA. This is a federal status. Special consideration should be given

to determine if this snail is found within the ISA and where. This also applies to the Columbia tern and the reptiles / amphibians on the list.

Response: The ecological risk assessment (ERA) process identifies "representative" species in particular trophic levels, since not every organism can be assessed. The ERA process in Appendix C of the Programmatic Work Plan presents the representative species selected for the Portland Harbor Superfund Site and the rationale for their selection. Threatened and endangered species are given special consideration through selection of more conservative (more protective) toxicity reference values, provided there is a complete exposure pathway from the river sediments, prey, and/or water to that organism (and there are toxicity reference values available). Each threatened and endangered species will be evaluated as part of the ERA and the results of this evaluation provided in the preliminary ecological evaluation and/or the baseline risk assessment.

Table 2-8:

Comment: Add the Chinook salmon Upper Willamette ESU as a threatened species. Also, a key at the bottom to define "SV," "SU" and other acronyms would be helpful.

Response: "Upper Willamette ESU" was already part of table, cell was lengthened to show this text. A key was added to the bottom of the table defining acronyms.

Table 3-3:

Comment: Sediment Surveys Within the ISA, Usability Column. A large quantity of the studies were considered "category 2 data." More description should be provided on why certain data was excluded. If it is a matter of obtaining the appropriate reports, perhaps more effort needs to be made to obtain the documentation instead of potentially ignoring valuable data. Although the category 2 may not be useable for the risk assessment, it is likely suitable for identifying contaminants and areas of concern.

Response: No change was made in Table 3-3; explanation of "category 2" data use has been added in the text – see previous comment.

Table 4-1:

Comment: Secondary stressors that may receptor populations in the LWR. Although this table is described in the text as examples of secondary stressors, it is incomplete.

Response: The title of Table 4-1 was changed to "Limited list of secondary stressors that may influence receptor populations within the LWR" to imply that there are more secondary stressors that aren't included in the table.

Table 5-1:

Comment: It appears there was a printing or formatting error – the Null Hypotheses column in incomplete for several rows.

Response: This table has been removed.

Table 5-1:

Comment: Assessment Endpoint for Birds, Osprey/Bald Eagle. It is stated that the null hypothesis is "the exposure dose does not exceed a peer-reviewed literature-based LOEC for survival, growth, or reproduction". The toxicological benchmark should be the NOAEL for the bald eagle, as well as the osprey if it is being used to represent eagle, because the eagle is a listed species.

Other birds: Ingestion of contaminated prey is listed as the linkage between assessment endpoint and measures. This should also include direct sediment and surface water exposure. This also includes the evaluation of exposures to PAHs and metals.

Response: This table has been removed.

Table 5-1:

Comment: Fish, Chinook Salmon, prey and fish tissue: For PAHs and metals and tissue concentrations it is stated that the hypothesis is that "the dietary concentration

does not exceed a peer-reviewed literature-based LOEC for survival or growth." The benchmark should be a NOAEL for listed species.

Response: This table has been removed.

Attachment 1, Section 1.0, Page 1:

Comment: Ecotoxicological Profiles, Introduction. "The historical dataset for the ISA was evaluated in order to identify the classes of compounds that have been previously measured in the sediment, tissues, and surface water ...." It is not clear how, if at all, the historical data was used in the selection of COPCs. Overall, this is a good write-up. It identifies behavioral effects, immune system response effects and other effects that should be addressed in the risk assessment.

Response: The use of historical data has been addressed in a previous comment. It is not directly relevant to the Ecotoxicological Profiles Attachment.

Appendix D General Comments

Pregnant and Lactating Women

Comment: Pregnant and lactating women and their offspring are a unique subgroup of concern. Some contaminants that may be present in fish or other contaminated media within Portland Harbor may accumulate in breast milk or be transferred to unborn children. Methods for quantitative assessment of these exposures are emerging, and should be considered for at least some contaminants by Respondents.

Response: Discussions in the HH subgroup did not progress enough for this issue to be addressed in the Work Plan. A technical memorandum or addendum to the work plan will be issued at a later date.

Range of Values Presented in Comments

Comment: Also, note that some comments below present a range of values (e.g., ingestion rates for fish consumption). We have included a variety of values rather than recommend a specific value at this time because discussion on some exposure factors are ongoing and we want Respondents to be aware of the range of values under consideration.

Response: Values for many exposure parameters are included in Tables 6 through 21 of Appendix D. Parameters to be included in the exposure calculations for the fish ingestion pathway are included in Tables 16 through 21, but no values are presented, as they were still under discussion in the HH subgroup when the work plan revision was completed. This presentation of exposure factor values was discussed by the HH subgroup in meetings in February and March 2003. An agreement was reached within the HH subgroup that fish ingestion rates would continue to be developed through additional research and would be submitted to EPA and its partners in a separate document.

Appendix D Specific Comments

Section 1.0, page 1

Comment: The text states "this document is intended to facilitate discussions...." This statement implies that the approach presented in the Work Plan is "soft" and subject to modification pending comments. We would have rather seen a document that encompassed discussions conducted to date between the EPA and its partners and Respondents. Instead, this document reiterates approaches that have not been acceptable to EPA and its partners.

Response: We have addressed this issue to the extent possible in this version of the Work Plan and this statement was removed. Results of discussions in the HH subgroup up to late February 2003 have been included. Areas that are still under discussion or require a process are presented as such, wherever possible.

Round 1 Sampling

Comment: Round 1 sampling, as proposed in the Work Plan, is a very initial and limited aspect of the RI/FS (focused on the ISA) and should not be considered "the most significant data-gathering event of the RI/FS" nor should it be characterized as "focusing on the nature and extent of chemicals in sediment ... in the lower Willamette River." The focus appears to be on the ISA and does not fully address CERCLA's statutory scope of *where site contaminants may have become located.* Generally, the Yakama Nation remains concerned about Respondents' repeated expectations for this Round 1 sampling/investigation effort and the lack of any description or data criteria that would or would not instigate a Round 2 sampling effort.

Response: These descriptions of the Round 1 sampling event have been revised or deleted. Three major rounds of sampling are described in the revised Work Plan to address data needs for the RI/FS, including data needs for the baseline HHRA. Data needs for the HHRA and the associated sampling round(s) in which the data will be collected are described in Section 7.4 of the Work Plan and in Sections 1.0, 1.2, and 2.2 of Appendix D.

Pages 1-3, Section 1.1 HHRA Objectives and Section 1.2 HHRA Approach

Comment: The HHRA objectives and scope need to address not only risks associated with the ISA but also risks associated with *where site contaminants may have become located* and pose human health risks. Regarding biota consumed by humans, we object to limiting the HHRA to those species caught in the ISA. Rather, reality dictates that Respondents must determine whether or not species caught and consumed outside the ISA are contaminated with site related contaminants due that species' use of the LWR as habitat and are consequently posing a human health risk to people who eat those species.

Response: According to EPA guidance (EPA 2002a), the baseline risk assessment is conducted to characterize risks to human health and the environment posed by hazardous substances, pollutants, and contaminants at a site. The overall objective of the baseline HHRA discussed in Section 1.1 reflects this guidance. It is recognized that the boundaries of the site have not yet been finalized. Using resident species caught in the ISA will be applicable to fish caught outside the ISA that may be exposed to site-related contaminants.

Comment (cont.): We appreciate the direction of the logic that certain resident species are more likely to bioaccumulate certain site contaminants at higher levels than certain anadromous species. The only way that tribal members will be protected by cleanup goals established from data generated under the current Work Plan will be if: 1) resident species really do have higher levels of all site contaminants (which drive risks) in their tissue as compared to adult Anadromous species and; 2) human consumption rates and other assumptions used in the HHRA are protective of tribal subsistence consumption patterns and exposure scenarios.

Response: EPA has agreed to the target fish species identified for the HHRA, and the exclusion of anadromous species from the HHRA is consistent with regulatory decisions at other sites in Region 10. Data collected for resident species for the purposes of the HHRA can be compared to available data for anadromous species. However, it is not possible to relate tissue concentrations to Site exposures for

anadromous species. Therefore, the comparison will be of little use because the source of chemicals in anadromous tissue cannot be determined, while the source of chemicals in the tissue of resident species is most likely the lower Willamette River. Tribal subsistence consumption patterns (both species consumed and geographic areas fished) will be included in calculation of intake of chemicals in fish tissue from the Site by tribal members.

Comment (cont.): Respondents do not currently know what accurate consumption rates are for tribal and non-tribal members consuming resident or anadromous species. We do not have good site-specific data on tribal consumption of Willamette River spring chinook and Pacific lamprey. Nor do we really know with absolute certainty that tribal members do not consume River Lamprey or other lamprey species. (Representatives of Kennedy Jenks accompanied Yakama Nation tribal members during the lamprey collection on July 22, 2002, but the attending biologists examined only 4-5 lampreys out of over 200 collected by tribal members).

Response: The CRITFC study, which is based on four of the six Tribes and is one of the widest used and most accepted Native American fish consumption surveys, includes consumption rates and proportion of anadromous species consumed by members of these four Tribes. Data from this study will be used to develop consumption rates of various species by tribal members.

The results of the lamprey reconnaissance survey were submitted to EPA and its partners in a technical memorandum on April 7, 2003. Although the biologists may not have examined all lampreys that were harvested, conversations with tribal members participating in the harvest indicate that Pacific Lamprey is the only lamprey species harvested for consumption. It was clear during the reconnaissance event that river lamprey were not taken by Tribes participating in the harvest.

Section 1.2, page 2

Comment: While site-specific data is preferable to default assumptions in risk assessment, it must be of sufficient quality so that it accurately represents potential exposures at a site. In the case of some of the fish consumption data proposed for

use in the baseline HHRA, there are questions about how well that data represents potential consumption patterns within the ISA.

Response: Fish ingestion rates for the three fisher receptor groups to be evaluated at the Site have not been specified in the Work Plan. The LWG is preparing a technical memorandum with proposed fish ingestion and shellfish ingestion rates for adult and child receptors that will be submitted to EPA and its partners in May 2003.

Comment (cont.): Some level of evaluation will need to be done with the data collected in Round 1. It is unclear from the RI/FS Work Plan if Respondents are proposing a risk screening against "risk-based screening levels" or a "human health risk assessment" as mentioned in this section using the assumptions in Appendix D. The level of evaluation and the methods to be used must be decided in subsequent meetings with EPA and its partners and Respondents.

Response: Because surface water data was not collected during Round 1 due to opposition by EPA, data needed to conduct a comprehensive preliminary human health risk evaluation are lacking. As a result, a preliminary risk evaluation would at this point be an unnecessary step in the risk assessment process and would have high uncertainty. Therefore, the human health risk assessment for the Site will be the baseline HHRA, as described in Appendix D. This approach is consistent with the CERCLA process and EPA HHRA guidance. Under CERCLA, the baseline RA will be site-specific and should be conducted after the site investigation has been completed. As a result, a formal preliminary risk evaluation following Round 1 would be incomplete and would be based on conservative assumptions that may be refined as additional site-specific information is generated. In addition, the AOC does not require a preliminary risk assessment. The proposed method and purpose for presenting the Round 1 data will be discussed with EPA and ODHS.

Section 2.3 - Identification of COPCs

Section 2.3.1 Sediments

Comparison with Background (Section 2.3.1.1, page 6)

Comment: EPA recently issued guidance on dealing with background in the

Superfund process (Role of Background in the CERCLA Cleanup Program, April 26, 2002, OSWER 9285.6-07P). This policy "recommends a baseline risk assessment approach that retains constituents that exceed risk-based screening concentrations. This approach involves addressing site-specific background issues at the end of the risk assessment, in the risk characterization. Specifically, the COPCs with high background concentrations should be discussed in the risk characterization, and if data are available, the contribution of background to site concentrations should be distinguished. COPCs that have both release-related and background-related sources should be included in the risk assessment. When concentrations of naturally occurring elements at a site exceed risk-based screening levels, that information should be discussed qualitatively in the risk characterization. In summary:

(1) The COPCs retained in the quantitative risk assessment should include those hazardous substances, pollutants, and contaminants with concentrations that exceed risk-based screening levels.

(2) The Risk Characterization should include a discussion of elevated background concentrations of COPCs and their contribution to site risks.

(3) Naturally occurring elements that are not CERCLA hazardous substances, pollutants, and contaminants, but exceed risk-based screening levels should be discussed in the risk characterization."

Any comparisons with "background" for sediments and other media must follow this guidance/policy.

Response: Agreed. The screening process for sediment COPC selection has been revised and does not include comparison to background (Section 2.3.1 of Appendix D). Background concentrations may be considered when remedial actions are reviewed for the site, as recommended in the EPA 2002 guidance. Text in the work plan regarding remedial action objectives (RAOs) in Section 8.2 has been revised to indicate the EPA 2002 guidance document on use of background levels in the RI/FS process will be followed.

Comment: This section refers to Table 1 which contains background screening levels and risk based screening levels for "naturally occurring":

(1) A column showing baseline concentrations of "naturally occurring" chemicals which are those used for screening in the DEQ Portland Harbor Sediment Management Plan. EPA would like more information on the derivation of these numbers before agreeing to use them as baseline concentrations.

(2) A column showing the Region 9 PRGs for industrial soil to be used as risk based screening values for sediment. These are based on exposure assumptions that address only direct contact at industrial sites. They are not conservative enough for direct contact for the beach use scenarios, especially those involving children and transients. The Region 9 PRGs for residential scenarios should be used instead. If any of these chemicals have the potential to bioaccumulate in the food chain, sediment PRGs that are based upon bioaccumulation should be used for the fish ingestion pathway.

(3) DEQ's draft Sediment Evaluation Guidance, external review draft (July 31, 2002) includes a table showing background concentrations of inorganic chemicals in sediment (Table 3-4).

Response: Table 1 has been removed. Comparison to background will not be used in COPC screening in the HHRA. The sediment COPC screening method has been revised to use Region 9 PRGs (residential soil PRGs for recreational beaches and industrial soil PRGs for industrial beaches). Details are provided in Section 2.3.1 of Appendix D. Risk from potentially bioaccumulating chemicals will be assessed using fish tissue data collected from the Site in the fish ingestion pathway. The screening process for COPCs in tissue is described in Section 2.3.3 of Appendix D.

Frequency of Detection - Section 2.3.1.2, page 6

Comment: EPA does not agree with the use of frequency of detection as a criterion for limiting the number of COPCs selected for quantitative evaluation in the risk

assessment. EPA expressed this opinion at several face-to-face meetings with Respondents and their contractors and also expressed this comment in writing related to the Preliminary Planning, Scoping, and Problem Formulation Document. The site is heterogeneous in nature and the location of potential sources may result in relatively isolated "hot spots" of certain contaminants. The frequency of detection assessment should be removed as a contaminant screening step. The text and Figures 1 and 2 should be revised accordingly.

Response: Frequency of detection will not be used in COPC screening. Section 2.3.1.2 has been revised to reflect this. Figures are not included in revised work plan.

Comparison with Risk-Based Concentrations -
Section 2.3.1.3, page 6, also twice on page 8

Comment: "Phenanthracene" should probably be changed to "phenanthrene."

Response: Corrected.

Comment (cont.): As discussed above, the Region 9 PRGs for industrial soil are not conservative enough for some of the beach exposures that will be evaluated -the residential PRGs should be used instead. EPA Region 10 recommends that a hazard quotient of 0.1 be used for screening noncarcinogens to be protective of "cumulative effects that could occur when multiple noncarcinogenic hazardous constituents with similar toxic endpoints are present." (EPA 1998) In addition, these industrial PRGs do not take into account the potential for bioaccumulation and movement through the food chain. Additional PRGs (such as those developed by ODEQ) should be used for screening of bioaccumulative chemicals in sediment. Thus, the residential PRGs should be used to screen out chemicals in beach sediments where direct contact with sediments by people are possible and screening values which account for bioaccumulation through the food chain should be used to screen chemicals in deeper sediments (where contact with people is unlikely). Chemicals failing either of these PRGs should be retained as COPCs.

Response: A hazard quotient of 0.1 will be used, per Region 10 guidance, and

industrial or residential PRGs will be used depending on the potential beach exposures, as described in Section 2.3.1.1 of Appendix D.

Section 2.2.2 -Surface Water

Frequency of Detection -Section 2.3.2.1, page 7

Comment: See comment above regarding frequency of detection less than 5%. For surface water, an isolated detection in a near shore area may indicate the presence of groundwater inputs from an upland source; therefore, FOD < 5% should not be used to screen out contaminants.

Response: Frequency of detection will not be used to screen COPCs in surface water. Text has been revised and is now Section 2.3.2.2.

Comparison with Risk Based Concentrations- Section 2.3.2.2, page 7

Comment: The Region 9 PRGs for tap water are based on ingestion and inhalation of volatiles emitted from the tap; dermal contact while bathing is not included. As noted above, a hazard quotient of 0.1 should be used for screening noncarcinogens. To screen for bioaccumulation of contaminants in water into biota, USEPA's Water Quality Criteria for the Protection of Human Health from Fish Consumption and ODEQ's Water Quality Standards should be included as PRGs.

Response: The surface water screening method has been agreed upon in the HH subgroup and is included in Section 2.3.2. Exposure scenarios for surface water include direct contact only, and not potential for bioaccumulation. Risks from bioaccumulation due to fish ingestion are addressed under the fisher scenarios. Bioaccumulation is addressed through direct measurement of concentrations of bioaccumulating chemicals in tissues.

Section 2.3.3 - Tissue

Section 2.3.3, page 8

Comment: The human health screening values presented in Table 2 do not include all the possible COPCs that may be identified in fish tissue. To determine that detection limits are adequate for protection of human health and also to screen the

complete list of COPCs, additional HHSVs should be included in Table 2 or developed when tissue data are available.

Response: Instead of human health screening values, tissue data will be screened against analytical concentration goals (ACGs), which are shown in Table 1 (the revised version of the previous Table 2). The ACGs were established by EPA for the tissue analytes in Round 1 to be consistent with the data needs for the human health risk assessment.

Comment (cont.): Referring back to the Analytical Concentration Goals document, Table C-4 and C-5 (submitted to EPA April 1, 2002) from which the HHSVs were derived, we have some concerns about the values proposed. For cancer endpoints, we recommend that the exposure duration be 70 years rather than 30 years. For non-cancer endpoints, we recommend that the fish ingestion rate be at least 389 grams per day (gpd) rather than 77.95 gpd and that the exposure duration be 70 years rather than 6 years. These recommended values would provide a more conservative and protective approach to developing human health screening values for cancer and non-cancer endpoints.

Response: Human health screening values will not be used for tissue screening. ACGs are included in Table 1 of Appendix D, and were provided by EPA based on a fish ingestion rate of 389 g/d.

Page 9 Section 3.0 Exposure Assessment

Comment: The first sentence reads, "The objectives of the exposure assessment will be to identify potential exposure pathways to individuals who may come in contact with COPCs at the site." The scope of the objective should be expanded to include COPCs at the site or *where site contaminants may have become located.* Recognizing that the RI has not yet fully identified the nature and extent of where site contaminants may have become located, it is important to recognize in the Work Plan that human health exposures and subsequent health risks may extend beyond human contact with only the ISA.

Response: It is recognized that the site boundaries may extend beyond the ISA.

Comment (cont.): The document lists four primary tasks of an exposure assessment according to EPA guidance. The second task is to, "Identify relevant exposure pathways for human populations by which potentially exposed populations may contact environmental media containing chemicals." We believe consumption of lamprey and adult spring chinook by tribal members is a relevant pathway that needs to be addressed.

Response: Consumption of fish is a relevant exposure pathway. Target species for the Site have been determined and are described in the HHRA approach (Section 3.3.4.3 and Table 5 of Appendix D). EPA agreed to the selected target species, which were proposed in the previous version of the work plan. Target species were collected from the ISA in Round 1 and are undergoing chemical analysis.

Section 3.1, page 10

Comment: The combination of exposures for an individual through different receptor categories should be addressed quantitatively for those combinations which are considered reasonable (i.e., recreational beach user and recreational fisher). The risks associated with these receptors should be summed to show what the risk would be for an individual who engages in both types of activities.

Response: Overlapping exposures will be addressed in the baseline HHRA. Text regarding evaluation of overlapping exposures is included in Sections 3.3.5 and 5.3 of Appendix D. The method for evaluation and presentation of overlapping exposures in the baseline HHRA will be determined before the baseline HHRA. The human health CSM (Figure 2 in Appendix D) has been revised to reflect the potential for overlapping exposures.

Section 3.1.1, page 10

Comment: The first sentence states, "The Site encompasses approximately six miles of the lower Willamette River." Here and in all other references in the Work Plan, it should be clear that the ISA, not the "site" encompasses this six-mile stretch. This

language is misleading and inaccurate and should be changed in every instance.

Response: The language has been revised throughout Appendix D.

Section 3.1.1, page 11

Comment: Regarding groundwater, it seems the analysis of human exposure is too simplified. The document states, "If groundwater seeps are located within human use areas above the low-water mark, then potential contact with groundwater is possible. However, if seeps are not located within human use areas or if discharge occurs below the river surface, then an exposure point does not exist and the pathway is therefore incomplete [requiring no further investigation]." Why would groundwater seeps below the high-water mark not also be of concern? Contaminated groundwater released above or below the river's surface can come in contact with humans immediately at the point of seepage as well as downriver due to the downstream flow of contaminated groundwater into a human use area. Certain contaminants that enter the river via groundwater may also contaminate sediments regardless of the release occurring above the low-water mark or below the high-water mark. All receptors can become exposed to contaminated groundwater released into the environment regardless of the exact proximity to the seepage point.

Response: The reference to the low-water mark related to groundwater seeps was removed. The contribution of groundwater as a potential source is reflected in the CSM (Figure 2).

Section 3.2.2.1, page 13

Comment: It is possible that dockside workers may consume fish as either Native Americans or non-tribal consumers.

Response: This possibility will be evaluated under overlapping scenarios. Text regarding evaluation of overlapping exposures is included in Sections 3.3.5 and 5.3 of Appendix D. The human health CSM (Figure 2 in Appendix D) has been revised to indicate which pathways may overlap.

Section 3.2.3.3, page 14

Comment: We do not agree that a transient's exposure to water would be minimal. Direct contact with and ingestion of surface water may be a complete and significant exposure pathway for transient residents. Someone who lives adjacent to the river may have no other source of water for drinking, bathing, and cooking; therefore, it is possible that this exposure pathway could be important for this receptor group. The text, Table 3, and Figure 4 should be modified to include these exposure pathways.

DHS has some major concerns with the potential exposure of the transient population to contaminated drinking water from the Willamette River. Our rationale for including this population is that transients, who may not have reliable access to treated water, will likely obtain some drinking water from the Willamette River (and potentially, upland surface water sources). In addition, river water may serve as the primary means of bathing for transients. These exposure pathways should be included in a quantitative assessment of risk to transients."

Response: Transient exposure to surface water is included as an exposure pathway, but the magnitude of the exposure is an area of disagreement between LWG and the agencies. Exposure factor values consistent with incidental ingestion of and direct dermal contact with surface water are included in Table 8 of Appendix D.

Section 3.2.4, page 14

Comment: Care must be taken in selection of beach areas to be assessed for recreational use. If beach areas are limited to a few areas as indicated on Figure 3, then conclusions that this scenario is protective of other exposures/areas within the ISA cannot be made. We are concerned that there may be less obvious areas that are used by people for beach use for which data will not be collected. Following the EPA boat trip on June 27, 2002, EPA recommends that additional beach areas be sampled. These areas are provided in the comments on the Field Sampling Plan.

Response: This concern was addressed in Round 1, and agreement with EPA was reached prior to beach sediment sample collection in Round 1. Figures 1a through 1c show human use areas throughout the ISA.

Section 3.2.4.1, page 15

Comment: Recreational beach users also may consume fish as either Native Americans or non-tribal consumers.

Response: This possibility will be evaluated under overlapping scenarios. Text regarding evaluation of overlapping exposures is included in Sections 3.3.5 and 5.3 of Appendix D. The method for evaluation and presentation of overlapping exposures in the baseline HHRA will be determined before the baseline HHRA. The human health CSM (Figure 2 in Appendix D) has been revised to indicate which pathways may overlap.

Section 3.2.4.3, page 15 and 3.2.5.3, page 20

Comment: It does not make sense that because river water concentrations are expected to be varied, that most risk is likely associated with sediments rather than water. Risk is dependent upon concentration, exposure, and dose. Therefore, the relative risk associated with surface water contact should not be discounted until data are collected.

Response: Surface water exposure pathways will be evaluated for appropriate receptors in the baseline HHRA to determine significance, which is reflected in the CSM (Figure 2). Surface water exposure pathways are included in Sections 3.2 and 3.3 of Appendix D.

Section 3.2.5, page 15

Comment: Based on information collected by Respondents' contractors and presented in Appendix A (Conversation Log), it appears that a recreational fisher *does* exist within the ISA. Please revise text. Also, the assessment of recreational fishers also should include exposures to children.

Response: Text was revised (Section 3.3.4). Fish ingestion by recreational fishers and children is included in Section 3.3.4 of Appendix D.

Page 16

Comment: We do not agree with the statement that "Estimates for recreational and Native American fishers are likely to provide conservative estimates of potential fish consumption". Recreational fishers fish for pleasure and do not necessarily rely on the River for a major portion of their protein source. Native Americans likely rely on the River as a major source of protein but many may be eating anadromous species which are likely to be less contaminated than resident fish. The non-tribal consumption fisher (who relies on self-caught resident fish as a major protein source) is the receptor with the potential for the highest exposures and risks. It is this group that may be using the River to provide the majority of the protein in their diet as well as catching resident species.

Response: The text in Section 3.3.4 (formerly 3.2.5) of the revised Appendix D has been revised. Reference to relative levels of conservatism among the fisher scenarios has been deleted.

Section 3.2.5.1, Consumption of Fish, page 17-19

Comment: The analysis for receptors that consume fish and shellfish needs to be expanded beyond fish and shellfish "caught within the site" and beyond fishers who "catch fish within the site." First, the word "site" should be replaced with "ISA." A more accurate and realistic description of receptors should also include those who fish outside the ISA and who catch and eat fish that are likely to be contaminated with ISA-related chemicals (i.e., those fish that may be exposed to COPCs within the ISA but that are otherwise caught outside the ISA).

Response: This is very similar to the comment on Pages 1-3, Section 1.1 HHRA Objectives and Section 1.2 HHRA Approach, above. As stated above, it is recognized that the boundaries of the site have not yet been finalized. Using resident species caught in the ISA in the baseline HHRA will be applicable to fish caught outside the ISA that may be exposed to site-related contaminants.

Comment (cont.): The home ranges of small mouth bass and black crappie, "are too

large to determine exactly where exposure to COPCs may have occurred." How will the HHRA address this problem for resident species for the HHRA?

Response: The baseline HHRA will estimate risks to human health from consuming resident fish species in Portland Harbor, regardless of where exact exposure to COPCs may have occurred. At the feasibility study, sediment data will be evaluated along with fish tissue data to identify sediment management areas. The sediment management areas to address human health risks will take into consideration the home ranges of resident species. Smaller home range species (such as crayfish, sculpin, or benthic invertebrates) will also be included in the identification of sediment management areas, so that the sediment management areas reflect both limited and wide ranging species.

Comment (cont.): Tribal members consume spring Chinook salmon and Pacific lamprey in significant quantities and these species need to be investigated for the HHRA. At the very least, the proposed juvenile salmon and lamprey ammocoete tissue residue data should be used to make better determinations about potential human health risks from consuming these species that utilize the Harbor.

Response: Anadromous species (including spring Chinook salmon and Pacific lamprey) are not appropriate to assess the risks to human health posed by the Site, which is the basis of CERCLA. Target species for the Site have been selected and are described in the HHRA approach (Section 3.3.4.3 and Table 5 of Appendix D). EPA has agreed to the target fish species identified for the HHRA, and the exclusion of anadromous species from the HHRA is consistent with regulatory decisions at other sites in Region 10. It is not possible to relate tissue concentrations to Site exposures for anadromous species. Juvenile anadromous species are not relevant for consumption by humans and will not be addressed in the HHRA.

Comment (cont.): Regarding the exclusion of Anadromous species and sturgeon from the HHRA, we recognize that certain resident species may be more likely to bioaccumulate certain site contaminants at higher levels than certain Anadromous or "semi-anadromous" species. In sum, the only way that tribal members will be protected by cleanup goals established from data generated under the proposed

Work Plan and HHRA assumptions will be if: 1) resident species really do have higher levels of site contaminants, especially those that may drive health risks, in their tissue as compared to adult Anadromous species consumed by people and; 2) human fish/shellfish consumption rates and other assumptions used in the HHRA are protective of tribal consumption patterns and exposure scenarios.

Response: We disagree. Chemical levels in the agreed-upon target species caught within the Site and consumed are most representative of chemical levels acquired from exposure to the Site, and this is the appropriate evaluation under CERCLA.

Comment (cont.): Specifically related to the 1% concentration comment (O'Neill et al., 1998): due to the lack of comprehensive studies and the limited amount of data available on bioaccumulation of various fish species, the 1% chemical concentration restriction should not apply. For example, only one study is cited by Respondents and other data are needed before such a broad discussion can be applied to juvenile uptake exposures. Also, this study examined only PCBs, which have different uptake and fate/transport mechanisms compared with other contaminants. Finally, this study used a mathematical model to estimate 1% adult uptake. Has this model been validated? Is it applicable to Portland Harbor?

Response: For reasons previously discussed, anadromous species have not been selected as target species for the HHRA. We have no reason to suspect that bioaccumulation in salmon caught in Portland Harbor would differ from that at other locations in the Pacific Northwest.

Page 18 – Resident Fish and Shellfish - Criteria used for selection of target species

Comment: The criteria listed for target species for the HHRA include: significant human consumption, limited home range, potential for bioaccumulation, predators and bottom-feeders and relative abundant species. Page 19 states that these criteria were "combined" to select the initial target species. How were they combined and what priority was each criterion given?

For example, the document notes that significant human consumption is considered

by EPA guidance to be the most important criteria for selecting target species. Appendix A of the Work Plan consists of Conversation Logs conducted by Kennedy/Jenks Consultants with several local fishing groups. The discussions obviously focused on resident species (because Respondents pre-determined that Anadromous species would not be addressed) but it is important to note that every conversation log identified the extensive nature of salmon fishing in the LWR by local fishers, with one individual (Mr. Ralph Steele) describing salmon fishing as the largest recreational fishery. How much salmon is caught and consumed by these local fishers? What are the predominant species consumed by Asian and Euro-American fishers and what fish parts do they typically consume, other than the fillet? The conversation log with Mr. Bud Hartman notes that, "Several local populations (Asian and Euro Americans) fish for and consume just about any fish in the River. Some of these populations probably use the River as much or more than the local anglers."

How do the interviewees know what the most caught species are? Do people report their catch to these individuals? Are they on the river observing? Do the interviewees also fish for salmon? Do they know how much salmon is caught from the LWR? Do they know how much sturgeon is caught from the LWR? While it is generally recognized that tribal members collect lamprey from Willamette Falls, do other groups catch lamprey for consumption?

In sum, while these informal and limited discussions are helpful, they should not be the sole basis for identifying target species significantly consumed by humans for use in the HHRA.

Response: Conversations with local fishers were just one source of information in identifying target fish species. The results of other qualitative surveys (such as those conducted by ATSDR and the Oregonian) were also used. In selecting the target fish species, priority was given to those species consumed in greatest quantity, if the other criteria (limited home range, potential for bioaccumulation, predators and bottom-feeders, and relatively abundant species) were met. Anadromous and semi-anadromous species (such as salmon, sturgeon, and lamprey) do not meet the

limited home range criteria, though they may be caught and consumed in relatively large quantities from the Site.

Target species for the Site have been determined and are described in the HHRA approach (Section 3.3.4.3 and Table 5 of Appendix D). Information on each of the fish species considered in selection of target species is included in Table 5, with references to information sources. As indicated in Table 5, much of the information relied on for selection of target species came from ATSDR 2002 and Adolfson 1996, both of which are published studies that include data on local fishing practices. EPA agreed to the selected target species, which were proposed in the previous version of the work plan.

Page 19 – Potential for Bioaccumulation.

Comment: Table 5 shows a summary of limited tissue data from studies that were limited in the types of chemicals analyzed for in each species (i.e., not all COPCs or bioaccumulative compounds were analyzed for in every species) and this information should not be the only basis for determining whether one species bioaccumulates more of a certain contaminant than another species. Other factors such as specie's lipid content, age, sex, predator-prey relationships and feeding habits should be considered as well since these factors also contribute to a specie's potential to bioaccumulate contaminants.

Response: Text in Section 3.3.4.3 of Appendix D has been revised to include these factors. The tissue data summary table is now Table 4.

Section 3.2.5.2, page 19

Comment: More discussion is needed regarding the elimination of dermal exposure and ingestion of sediments for fishers. We do not necessarily agree that these pathways are "minimal" or "insignificant." Children should be included as a receptor in the assessment of recreational fishers. Due to elevated hand-to-mouth activity and presence of children on beach sites and banks, a quantitative assessment of sediment ingestion should be included in the HHRA.

Response: Sediment exposures to fishers will be quantitatively evaluated in the baseline HHRA (Section 3.3.4 Appendix D). Fish ingestion by children has been added to all fisher receptors (Section 3.3.4 Appendix D); however, direct contact with sediment by children will be addressed under the recreational beach user scenario.

Section 3.4.1.1, page 21

Comment: How will data be collected to evaluate risks to dockside workers? Will a single composite sample be used to represent the exposure concentration for each industrial facility where this scenario is possible?

Response: The Round 1 field effort included collection of a single composite sediment sample from each industrial facility beaches that was identified as a potential use area for dockside workers. Prior to the field effort, EPA reviewed and agreed to the sampling design for collection of composite samples and the selection of beaches for sampling. Section 3.4.2.1 of the revised Appendix D discusses how exposure point concentrations (EPCs) for dockside workers will be estimated using the Round 1 sediment data. The approach to estimate EPCs, which will be developed for each dockside worker use area using the composite sample collected at that facility, was discussed and agreed to by EPA during the human health subgroup conference call on 16 January 2003. It was also agreed that additional sampling of individual beaches might occur, if deemed necessary based on Round 1 results.

Section 3.4.1.2, page 21

Comment: EPA does not agree with the proposed approach for evaluating exposure point concentrations for transient residents. Shanties and other rough dwellings have been observed in upland areas adjacent to the site indicating that people may "camp" in the same area for a while. EPA recommends that exposures to transient residents be considered over smaller areas, possibly also including some recreational beach areas to evaluate exposures that occur over a long period in a smaller area.

Response: Transient beaches will be evaluated individually. Sediment exposure factor values have been included in Appendix D, Section 3.3.2 and Table 7.

Section 3.4.1.3, page 21

Comment: Remove the word "highly" from the 3rd sentence in this section. If a person lives close to a given beach area or prefers one beach area over others, it is likely that they may spend most of their time visiting a particular beach.

Response: The word has been deleted (Section 3.4.2.3 Appendix D).

Section 3.4.2

Comment: We are concerned about both the sampling design for surface water and how the data will be used. Surface water is of concern to human health because it may result in exposure to humans who are swimming in the River (ingestion or dermal exposure). In addition, humans may be exposed to pollutants in water as a result of bioaccumulation into fish which are then consumed. The detection levels that are used for analyses of water should be low enough to deal with both types of exposure. For the fish consumption pathway, this assumes that detection limits would be as close as possible to the WQC or OR WQS which is not the case in the RI/FS QAPP. In addition to detection limit concerns, it is not clear that a one-time sampling event will provide much useful information. More discussion is needed to try to make the collection of surface water as useful as possible.

Response: Exposure due to bioaccumulation in fish will be addressed under the fish ingestion pathway using fish tissue data collected from the Site, and detection limits for water do not need to be low enough to deal with the bioaccumulation pathway for purposes of the baseline HHRA. Detection limits and analytical concentration goals (ACGs) for water analyses are included in the Round 2A QAPP Addendum submitted with the Round 2A FSP. ACGs are the lower of the EPA Region 9 Preliminary Remediation Goals (PRGs) for tap water (EPA 2002b) or chronic freshwater aquatic life criteria. Detection limits may not always meet the ACG. The surface water COPC screening process described in Section 2.3.2 includes a discussion of comparison to risk-based concentrations and potential detection limit issues. Surface water sampling and frequency to address the HHRA data needs are addressed in the Round 2A FSP.

Section 3.4.3, page 22

Comment: Additional detail needs to be provided to illustrate how composite samples collected from different areas for different organisms will be used to assess risk to individuals who consume fish from the ISA. If EPA's recommended approach is adopted (i.e., to use whole body fish samples for dioxins/furans and dioxin-like PCB congeners), then whole body samples should be used for these contaminants for all potential fish consumers.

Response: Tissue exposure point concentration development is described in Section 3.4.3. Specific considerations concerning arsenic and PCBs are discussed in Sections 3.4.5.1 and 3.4.5.2.

Section 3.5.1 and Table 21

Comment: Chemical-specific absorption factors have been provided for several compounds consistent with current EPA dermal guidance; however, additional discussion of how to handle chemicals for which specific values are not available should be presented.

Response: A default absorption factor is provided in Table 22 (formerly Table 21) for semi-volatile organic compounds (not included in previous version of table), which is consistent with current EPA dermal guidance. Consistent with current EPA dermal guidance (EPA 2001), dermal exposure to compounds not included in Table 22 will be addressed qualitatively in the uncertainty assessment unless additional default dermal absorption factors become available prior to the baseline HHRA.

Section 3.5.1.2, page 24

Comment: The rationale provided (e.g., based on temperature above 32 degrees for every day of the month) for using 6 months per year for transient residents is weak. It is possible that transients may reside in the site vicinity even during cold weather months and for longer than 6 months. It is not appropriate to assume that transients "move throughout the Site and are not anticipated to remain in the Site for an extended period of time." During successive ATSDR site visits, the same transient

camp was spotted over a long time interval. As many people tend to be habit-forming, it is reasonable to assume that some transients may return to familiar sites. The assumption should be that transients remain in an area that they prefer for periods of up to 365 days/year for a minimum of 2 years.

Response: A reasonable maximum exposure (RME) of 2 years (daily) and central tendency (CT) of six months for sediment exposure duration for transients were agreed upon in the HH subgroup and are included in Table 7. Surface water exposure duration and frequency values proposed by the LWG are included in Table 8.

Section 3.5.1.3, pages 25, 26 and Tables 10 and 12

Comment: The use of 12 days/year as the exposure frequency for water contact for recreational beach users seems low, especially given that they are assumed to contact sediment for 94 days/year. Children frequently swim at Willamette Cove. Other beach and intensive use areas may be used as well. Perhaps surface water contact could be assumed for a greater number of days per year (e.g., 5 days/week during summer months) but for a shorter exposure time per day.

Response: Exposure factor values for water contact for recreational beach users were agreed upon in the HH subgroup and are included in Tables 10 and 12 for adults and children, respectively. Exposure frequency for adults is estimated at 26 and 13 events per year, RME and CT, respectively, and 65 and 26 events per year RME and CT, respectively, for children. Rationale for each value is provided in the tables.

Section 3.5.1.4, page 27

Comment: EPA does not believe that sufficient data is available for a site-specific market basket approach for estimating risk. While a market basket approach can be useful in providing an example of how a multiple species diet can impact risk, there is little information on the species and amounts of fish consumed by the tribes using the Willamette River (especially the Siletz and Grande Ronde) nor on the levels of contaminants in all of the species that may be consumed. And it is unlikely that such data will be available any time soon since a market basket survey in support of the

risk assessment is not planned. Therefore, the market basket approach should not be proposed at this time.

Response: The LWG firmly believes that a market basket approach (mixed diet) should be used in the baseline HHRA to estimate a realistic site-specific intake from fish and shellfish consumption. The LWG is preparing a technical memorandum with proposed fish and shellfish ingestion rates for adult and child receptors that will be submitted to EPA and its partners in May 2003. Included in this memorandum are data on species types consumed by the target receptor populations at the Site from relevant published consumption studies.

Section 3.5.1.4, page 28, and Tables 15 and 16

Comment: EPA and its partners have commented to Respondents and its contractors that a longer exposure duration than 30 years (i.e., 70 years) should be used for the Native American consumption scenario. In addition, an exposure frequency of 365 days per year should be used for all of the populations that are assessed. Fish is often taken home and frozen for future use. And more importantly, 365 days per year should be used because fish consumption studies provide data in grams per day and/or in grams per kg per day, assuming daily consumption.

Response: Fish ingestion exposure factor values have not been provided in Appendix D. The Native American exposure duration for fish consumption will be determined prior to the baseline HHRA. An exposure frequency of 365 days per year for fish consumption will be used for all receptor groups addressed.

Comment (cont.): As discussed in the opening statement to these comments, many parts of Appendix D do not appear to reflect the numerous ad hoc and more formal meetings that we have participated in over the past several months. In many cases, we have provided specific comments on previous deliverables that were not incorporated into this Work Plan. This is especially true for the ingestion rates that are given in Appendix D for all of the populations. All of these ingestion rates are lower than those recommended to Respondents by EPA, ODEQ, and the trustees in the ad hoc meetings. In addition, we are not in agreement with some of the

references/studies cited in support of ingestion rates in Appendix D and/or in the selection of ingestion rates using the data from these studies.

Response: As noted previously, ingestion rates were not included in Appendix D. As also previously noted, the LWG is preparing a technical memorandum with proposed fish and shellfish ingestion rates for adult and child receptors that will be submitted to EPA and its partners in May 2003.

Comment: The entire discussion of the Native American fish consumption scenario is NOT conservative and ignores *all of the points* that EPA and the Trustees have made. Ingestion rates, exposure duration, types of fish consumed are all unacceptable. A higher consumption rate should be used to assess Native American consumption. The following discussion includes a variety of recommendations; one approach for the risk assessment is to present ranges of ingestion rates for the various receptor groups.

Rates as high as 885 grams of fish per day for Native Americans in the Pacific Northwest have been documented recently (Harper *et al*, 2002). The point has been made to Respondents that a lifetime exposure duration should be used for the Native American consumption scenario. Moreover, a market-basket type of approach at the site without collection of site-specific information is inappropriate; for example, Lamprey are included as 7% of total fish consumption, but no information regarding fish tissue levels in adult lamprey will be collected.

We recommend that the exposure duration for fish consumption for adult tribal members be changed from 30 years to 70 years. According to CRITFC's 1994 study, most Yakama Nation tribal members regularly consume fish throughout their lives and begin eating fish at a very early age, often by the time they are 1-2 years old. Also, some ingestion rates for children are based on a longer than 6-year exposure; if this is the case, then the exposure duration should match the period for which the ingestion rate is calculated (e.g., 15 years for some data sets). Because tribal members fish year-round and engage in fishing practices that expose the arms and often the torso as well as the legs and hands to water and sediment, we recommend

that the skin surface area for dermal exposure be increased and that the duration be increased from 6 months to 12 months.

For fish consumption, we recommend, to assure that protective and conservative assumptions are used until site-specific data is obtained, that a fish consumption rate of at least 389 gpd be used to estimate fish consumption for adult tribal members. 389 gpd represents the 99th percentile from CRITFC's 1994 fish consumption survey.

Response: Ingestion rates for fish are not in the Work Plan. The LWG is preparing a technical memorandum with proposed fish and shellfish ingestion rates for Native American (and other target receptor groups) adult and child receptors that will be submitted to EPA and its partners in May 2003.

Section 3.5.2.1, page 31

Comment: We do not agree with the assumption that 5.3% of total arsenic is inorganic arsenic in resident fish. The data base for the Willamette (as well as for the lower Columbia River) on percent inorganic arsenic is very limited and show wide ranges even within the same species. In addition, the uncertainties in lab analyses and in the toxicity of DMA. argue for the assumption, at a minimum, of 10% inorganic arsenic for resident species.

Response: A value of 10% of the total arsenic concentration will be used initially for inorganic arsenic. Text in Section 3.4.5.1 describes the procedure to be used.

Section 4.0, general

Comment: This section does not contain any discussion of how toxicity values for dermal exposures will be developed. Because dermal toxicity values are not available for most contaminants, route-to-route extrapolation may be required. Additional discussion of dermal toxicity assessment should be included in Section 4.

Response: Additional discussion of dermal toxicity assessment is included in Section 4.6.

Section 4.1, page 33

Comment: A new version of HEAST is being developed. In addition, there are NCEA values available that may not be included in the Region 9 tables. EPA can assist Respondents with the compilation of toxicity values from the newest version of HEAST and from NCEA.

Response: Comment noted. The latest version of the toxicological databases listed in Section 4.1 will be used to compile toxicity values.

Section 4.4, page 36 and 37

Comment: There is not enough detail in this section to be able to tell if we agree or disagree with the manner in which non-detects are to be handled. For example, it is not clear what is meant by a "sample". Is it all composites caught in an area, all composites of a species, etc?. We recommend that some decision rules on how to deal with non-detected data for all analytes be discussed and agreed to by Respondents, EPA, ODEQ and the trustees. This should be done before any manipulation of the raw data is started.

Response: This issue was discussed in the HH subgroup and consensus was reached. The consensus position is detailed in Section 3.4.4. Section 4.4 of the revised Appendix D is specific to dioxins/furans and refers to the rules for incorporation of non-detects outlined in Section 3.4.4. Briefly, if a chemical is not detected in any sample for a given species and tissue type, it will be assumed not to be present and will not be evaluated. If a chemical is detected in any sample of a given species and tissue type, but is not detected in other samples, it will be incorporated into the EPC at one-half the detection limit for the chemical in that sample. Smallmouth bass will be evaluated on a river mile basis, and carp, crappie and brown bullhead will be evaluated on a river zone basis. Greater detail is provided in Section 3.4.4.

Comment (cont.): Also, Table 22 includes footnotes which are not defined.

Response: The footnotes in this table (Table 23 of revised Appendix D) have been defined.

Comment: The ATSDR publishes non-cancer health guidelines that include 2,3,7,8-TCDD. In addition, a weight-of-evidence toxicological review should be conducted on any contaminant that may pose a risk to human health, regardless of whether an agency approved methodology exists or not.

Response: The ATSDR non-cancer guidelines for 2,3,7,8-TCDD will be consulted for the baseline HHRA. A weight-of-evidence toxicological review of chemicals not addressed in the databases listed in Section 4.1 is outside the scope of this RI/FS. We will only use toxicity data from sources listed in Section 4.1, per EPA guidance.

Section 5.2, page 39

Comment: Calculated cancer risks will be compared to the EPA acceptable risk range of 1×10^{-6} to 1×10^{-4}. In addition, calculated excess cancer risks from individual carcinogens should be compared with the acceptable risk level of 1×10^{-6} stated in DEQ rule.

Response: This revision has been made to Section 5.2, page 38.

Section 5.3, page 39

Comment: Will cancer risks and hazard indices associated with contact with sediment and surface water outside of the ISA be determined? No discussion or other supporting information (i.e., figures) has been provided to describe where and how a reference location for sediment contact would be evaluated. A figure showing the sediment reference location upstream of the Clackamas river should be provided. Also, a discussion in the text of the types of activities and land uses associated with this location should be presented to support the selection of this as a reference site for sediment.

In order to make a statistically valid comparison of concentrations (and thus risks) associated with the site and in the reference area, sufficient reference area data should be collected so that a statistical analysis of the difference in the two populations can be assessed.

Oregon rule specifies that consideration of background levels in the risk assessment only applies to naturally-occurring chemicals (primarily limited to inorganics). Separation of Site-related risks from risks associated with chemicals from anthropogenic sources unrelated to the Site is a risk management decision. This decision should not be part of the risk assessment process.

Response: Section 5.3 from the June 2002 version of Appendix D has been deleted. All discussion of reference areas has been deleted from Appendix D. Consideration of background levels will be in accordance with the EPA (2002a) guidance document on use of background levels in the RI/FS process.

Figures 1 and 2

Comment: See previous comments on "detection frequency", "baseline" and "naturally occurring." What does "wide spatial distribution" mean? It is confusing and possibly incomplete to have two "No" directions from the "Detection Frequency >5%" decision box. For instance, if the right side decision pathway is followed, a site chemical would be excluded if the detection limit was less than the concentration goal. However, this conclusion may not be appropriate if there is not wide spatial distribution (left decision pathway).

Response: Figures 1 and 2 have been deleted.

Figure 4 [Human Health Conceptual Site Model]

Comment: Recreational beach users should include swimmers, so the surface water ingestion and dermal absorption routes should be evaluated. Transients and recreational beach users may also be fishers; transients likely also use the river as a source of water for drinking and cooking and for bathing. These additional pathways as well as those discussed previously should be included in Table 3.

Response: This table (Table 2 in the revised Appendix D) has been revised. Surface water ingestion and dermal exposure pathways will be quantitatively evaluated in the baseline HHRA for recreational beach users and transients. Table 2 does not

include fish ingestion for transients; however, as shown in the revised human health CSM (Figure 2 in revised Appendix D), this will be evaluated as an overlapping exposure.

Table 1

Comment: The EPA Region 9 PRGs stated are for industrial soil. For the beach areas, it is more appropriate to screen using residential soil PRGs.

Response: Table 1 has been deleted from Appendix D. The sediment screening process will be conducted per Region 10 guidance and is described in Section 2.3.1.1 of Appendix D. Residential soil PRGS will be used to screen beach sediment chemical concentrations at recreational and transient beaches, and industrial soil PRGs will be used for industrial beach areas.

Table 3

Comment: Recreational fisher consumption of resident fish in the ISA should consider child exposure in addition to adult exposure. Adult fishers could bring caught fish home for family use, so fish tissue consumption by children could occur independent of catching fish. If there are child recreational fishers, dermal contact with surface water should be considered. In addition, transients may not have unintentional and infrequent contact with surface water. There may be instances where they have intentionally use surface water for basic needs (i.e., drinking water).

Response: Child recreational fish ingestion was added (Section 3.5.1.4 and Table 2 of revised Appendix D). As agreed to by the HH subgroup, surface water will not be quantitatively evaluated for any of the fisher scenarios. Transient exposure to surface water will be quantitatively evaluated (Table 2).

Tables 7 through 20

Comment: Central tendency exposure values should be presented in addition to reasonable maximum values.

Response: CT values have been added to Tables 6 through 21 of the revised

Appendix D.

Table 7

Comment: It is not appropriate to apply the DF factor to incidental ingestion of sediment.

Response: This is corrected in Table 6.

Table 8

Comment: More appropriate values for transient exposure are 365 days/year for 2 years.

Response: This value is included as the RME for transients in Tables 7 and 8.

Table 10

Comment: An exposure frequency of 12 days/year for beach users is too low. A more reasonable value is 90 days/year for nearby residents who may visit the local beach on a daily basis during the summer.

Response: An RME of 26 days/year and a CT of 13 days/year will be used for the surface water exposure frequency values for adult recreational beach users (Table 10). An RME of 65 days/year and a CT of 26 days/year will be used for the exposure frequency values for child recreational beach users (Table 12). These values were agreed to by the HH subgroup.

Table 13

Comment: An exposure frequency of 52 days/year for recreational fishers appears low. A more reasonable maximum value is 104 days/year.

Response: We disagree. Based on discussions with local anglers and our current understanding of the site, recreational fishing is likely to occur no more than once per week, on average over the entire year. An RME of 52 days/year and a CT of 26 days per year will be used for exposure frequency for recreational fishers (Table 13).

Table 14

Comment: The fish ingestion rate of 17.5 g/day is low. A more appropriate value is 78 g/day (90th percentile for Pacific Northwest recreational anglers).

Response: Fish ingestion rates are not included in the revised Appendix D. The LWG is preparing a technical memorandum with proposed fish ingestion and shellfish ingestion rates for adult and child fisher receptors that will be submitted to EPA and its partners in May 2003.

Table 19

Comment: The fish ingestion rate of 74.4 g/day is low. A more appropriate value is 170 g/day (95th percentile for Native American populations, which may be similar to non-tribal exposure rates).

Response: Fish ingestion rates are not included in the revised Appendix D. The LWG is preparing a technical memorandum with proposed fish ingestion and shellfish ingestion rates for adult and child fisher receptors that will be submitted to EPA and its partners in May 2003.

Table 22

Comment: The source of the TEF values should be specified.

Response: Sources of TEF values have been added to Table 23.

Appendix E Comments

Comment: Some text to describe what these graphs tell the reviewer, and how this information will be used in the assessment would be helpful. What is the zero point in these graphs? Is this an estimation of the sediment volume above bedrock, or are all the changes relative to the sediment volume in 1990? We don't have any sense of what 150,000 cy of sediment means – over a mile of river bottom, is this a few inches, a few feet? Is the change uniform over the reach? Without some interpretative text, all we get from this appendix is that periods of accretion followed by periods of erosion are normal for the Willamette, that this effect is more pronounced in some sections of the river than in others, and that the 1996 flood brought a lot of new sediment into the lower river.

Response: A page of text explaining the graphs and the process used to develop them has been added to Appendix E.

Appendix G Comments

Comment: There is not enough detail presented in this appendix for EPA to approve the category 1 and category 2 designations. Attachment 1 lists the reason for a category 2 designation for some studies / chemicals, but for many, the only comment is "category 2." For example, the U.S. Moorings 1994 data is all category 2, except for the chlorinated dioxins and furans. Why? Also, detection limits do not appear to have had any effect of the category 1 / category 2 designation. Moreover, usability of data should consider factors such as physical changes in the river to determine if data is still representative of site conditions.

Response: The Category 1 and Category 2 designations are currently under review and a Historical Chemistry Data Category Reclassification Report is in preparation and will be submitted to EPA. Data with high detection limits may have Category 1 designation because the lab's QC data were acceptable. However, the risk assessors

may elect to exclude some Category 1 data from their analyses due to high detection limits; in which case, the risk assessment report will indicate which data were excluded.

Appendix H Comments

Comment: Data generated in Round 1 and subsequent rounds should be delivered in Query Manager format, and tables that clearly show the new data and any other changes should be provided.

Response: Statements have been added to Section 6.0 of Appendix H indicating that electronic data files will be delivered in formats compatible with NOAA's Query Manager, and, as part of the database deliverable, tables that clearly show the new data and any other changes will also be provided.

References

EPA, January 1998, Interim Final Guidance: Developing Risk-Based Cleanup Levels at Resource Conservation and Recovery Act Sites in Region 10, Office of Waste and Chemicals Management, Seattle, Washington.

Harper, Barbara L., Brian Flett, Stuart Harris, Corn Abeyeta, and Fred Kirschner, 2002, "The Spokane Tribe's Multipathway Subsistence Exposure Scenario and Screening Level RME," Risk Analysis, Vol. 22, No. 3, pp. 513 - 525.

EPA, 2002a. Role of Background in the CERCLA Cleanup Program. U.S. EPA Office of Solid Waste and Emergency Response. OSWER 9285.6-07P. April 26, 2002.

EPA, 2000b. EPA Region 9 Preliminary Remediation Goals (PRGs). 1 October 2002.