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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
OREGON OPERATIONS OFFICE
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Portland, Oregon 97204

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March 15, 2004

Mr. Jim McKenna
Port of Portland & Co-Chairman, Lower Willamette Group
121 NW Everett
Portland, Oregon 97209

Mr. Robert Wyatt
Northwest Natural & Co-Chairman, Lower Willamette Group
220 Northwest Second Avenue
Portland, Oregon 97209

Re: Portland Harbor Superfund Site; Administrative Order on Consent for Remedial Investigation and Feasibility Study; Docket No. CERCLA-10-2001-0240
RI/FS Work Plan

Dear Messrs. Wyatt and McKenna:

We have completed our review of the February 27, 2004 and March 5, 2004 Revised Draft FinalWork Plans for the Portland Harbor RI/FS (Work Plan). A significant amount of progress on issues was made in our meeting on March 3, 2004. The Work Plan is in large part acceptable, with only a few substantive outstanding issues to work through and several language changes to be made. The Respondents have requested that EPA provide conditional approval of the Work Plan. EPA is providing conditional approval of the Work Plan on the terms set forth below.

The Work Plan is approved conditioned upon the successful completion by the Respondents, and EPA's approval of the following four items:

1. The Ecological Assessment Endpoint Table must be resolved no later than March 23, 2004, and incorporation of the Table that EPA agrees with into the final Work Plan no later than March 31, 2004;

2. The RI/FS Schedule must be resolved no later March 29, 2004, and incorporation of the Schedule that EPA agrees with into the final Work Plan no later than March 31, 2004;

3. The directed changes to the Work Plan specified in EPA's attached comments on the February 27, 2004 and March 5, 2004 drafts must be incorporated without change into a final Work Plan no later than March 31, 2004; and

4. EPA's written acceptance of the final Work Plan.

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Our review and c ments have attempted to reconcile soı pparent inconsistencies in the Work Plan. However, since the main text and various appendices have gone through several revisions there may still be some inconsistent language and references in the document. Rather than take the time to re-check and resolve all of these issues, EPA prefers to move ahead with the Work Plan approval recognizing this limitation.

Through the development of the Work Plan, EPA and Respondents have agreed that many RI/FS issues are deferred and will be later resolved through submittal of interim deliverables, addenda, and technical memoranda by the Respondents. For example, the Ecological Risk Assessment approach presented in Work Plan is very general, and most of the details of the approach have been deferred to the upcoming technical memoranda. Through EPA's review and approval of such interim deliverables, addenda, and technical memoranda, those deliverables, addenda, and memoranda will become a part of the Work Plan and, where inconsistent with the final Work Plan, the subsequently approved document will be the prevailing RI/FS Work Plan requirement.

Additionally, there are numerous statements and assumptions throughout the Work Plan, particularly with respect to fish biology, habitat, and the physical system, that may be determined to be inaccurate or need to be modified as the investigation progresses. While such statements and assumptions may represent current understandings and provide some direction in defining the work to be carried out under this Work Plan, it is recognized that additional data and other information will be also need to be considered to verify these assumptions and conclusions during the RI/FS.

EPA appreciates the efforts the Respondents have taken in the last couple of months to expedite resolution on the Work Plan and Field Sampling Plan. We are encouraged that final, unconditional approvals of these critical RI/FS documents may soon be a reality.

If you have any questions, please call Chip Humphrey at (503) 326-2678 or Eric Blischke (503) 326-4006. All legal inquiries should be directed to Lori Cora at (206) 553-1115.

Sincerely,

Chip Humphrey
Eric Blischke
Remedial Project Managers

cc: John Crellin, ATSDR
Helen Hillman, NOAA
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Brian Cunninghame, Confederated Tribes of Warm Springs
Rick Eichstaedt, Nez Perce Tribe
Paul Ward and Tom Zeilman, Confederated Tribes of Yakama Nation
Valerie Lee, Environment International
Keith Pine, Integral Consultants

EPA Conditional Approval of RI/FS Work Plan
March 15, 2004

Condition 3 - Text changes to the RI/FS Work Plan:

The following text changes are based on review of the February 27, 2004 and March 5, 2004 redline versions of the Work Plan, discussion and agreements during our March 3, 2004 meeting and subsequent discussions between the U.S. Environmental Protection Agency (EPA) and the Lower Willamette Group (LWG). In general, comments are limited to the LWG's response to EPA's February 11, 2004 comments on the Work Plan and subsequent language changes. However, a small number of additional comments have been included.

February 27, 2004 Redline:

In general, the February 27, 2004 redline of the Work Plan adequately addressed the majority of EPA's previous comments. Several directed changes below address responses that did not fully resolve EPA's February 20, 2004 work plan comments. The comments reference comment numbers as provided in the LWG's February 27, 2004 response to EPA's comments and the appropriate section of the Work Plan. EPA directs the LWG to make the changes as specified below:

General Comment 11, Site Use Factors: Appendix B, Section 5.3, Assessment Endpoint No. 5 and 6 should be revised to state that site use factors of 100% will be used unless sufficient supporting documentation is provided to justify site use factors of less than 100%.

General Comment 13 - Sources of Contamination: The following paragraph should be inserted into Section 6.2 (Objectives of the RI/FS): "Sources of contamination to Portland Harbor may contribute localized areas of risk exceeding acceptable levels. Sources include storm water discharges, groundwater discharges, atmospheric deposition and non-point source runoff. If it is determined that these sources contribute to unacceptable risk to the site, a combination of upland source control measures and in-water remediation measures will be required. The RI/FS must gather sufficient data for the human health and ecological risk assessments to evaluate the risks associated with the release, discharge or emission of these sources to Portland Harbor."

General Comment 14, Interim Risk Evaluations: The following statement should be inserted into Section 6.2: "Interim risk evaluations will be used to focus the remedial investigation. These interim risk evaluations will be based on conservative exposure assumptions and will consider all relevant RI/FS data to understand whether (and under what conditions) receptors may be exposed contaminated subsurface sediment above acceptable levels."

General Comment 21, Conceptual Site Model: The following language should be inserted into Section 1.3.2, Overview of the RI/FS Tasks - RI Scoping Process:

A Conceptual Site Model (CSM) will be developed that portrays the relationship among sources, chemicals, transport mechanisms (including sediment transport, surface runoff and groundwater discharges to the Site), receptors, and other parameters that are determined to be relevant.

A CSM will be submitted in accordance with the approved schedule. The purpose of the CSM is to:

1. Focus sampling.
2. Gain a better understanding of potential contaminant loadings from upland sources (including direct discharge, overland transport, groundwater and bank erosion) and the relative importance of the various transport mechanisms in different river miles.
3. Identify where there may be continuing sources of contamination and pathways to the river (including persistent bioaccumulative toxins) based on historical site use information, site information and analytical data.
4. Identify historical sources of contamination and pathways to the river.
5. Identify overwater activities that may have released contamination to the Willamette River sediments.
6. Identify areas of the river where recontamination of sediments by upland and other sources is a risk.
7. Gain insight regarding upland source control strategies and help DEQ identify where additional work must be done by responsible parties and DEQ on upland sites.

Comment 25, Section 1.3.3, RI/FS Reporting: EPA acknowledges that this section will need to be revised based on resolution of the project schedule. The revised language should include the following: "As specified in the Administrative Order on Consent (AOC), analytical data will be provided to EPA within 60 days of each sampling activity (e.g., Round 2 surface sediment sampling, Round 2A sediment coring, Round 2B sediment coring, sediment beach sampling, surface water sampling, groundwater pathways sampling, natural attenuation sampling, Round 3 sampling and any other sampling activity). Data will be included in a field sampling report for each sampling effort. Data will be provided in electronic format showing location medium and results. Data will be provided in sufficient detail for EPA and its partners to begin preliminary analysis."

Please note also that EPA expects that the project schedule will include a site characterization summary (including data gaps analysis) that will be provided to EPA within 120 days after completion of field sampling and analysis as specified in the AOC. Site characterization summarys will serve as the basis for identifying data gaps and focusing subsequent phases of the investigation.

Comment 26, Section 1.4, Cultural Resources: EPA anticipates providing specific direction to Respondents by March 19, 2004.

Comment 27, Section 1.5, Community Relations: All but the first sentence in the second

paragraph of this section should be deleted.

Comment 29, Section 2.1.5, Groundwater Transition Zone: The term transition zone should replace the term porewater through the Ecological Risk Assessment work plan (Appendix B).

Comment 36, Section 4.5, Summary of Human Uses: The fourth sentence in the second to last paragraph of this section should be revised to read: "A news story by the Oregonian and limited interviews conducted by ATSDR suggest that groups likely to be catching and eating fish from the LWR *include* immigrants from Eastern Europe..."

Comment 43, Section 6.0, Overview of Portland Harbor RI/FS Process: The paragraph following the bullets should be revised to read: However, additional sampling rounds may be required to address data gaps identified as a result of technical memorandum development, review of Round 1 data, round 2 data or review of relevant new data or information.

Comment 44: Section 6.1, Preliminary RAOs: Data regarding recreational and subsistence fishery use is not being collected as part of the RI/FS. Delete the reference to recreational and subsistence fishery data in this section. In addition, sediment toxicity data should be added as a data category.

Comment 46, Section 6.2, Objectives of the RI/FS: The newly inserted sentence should read: Additional data collection may also be required to address data needs identified in subsequent TMs, data gaps identified during sampling rounds 2A and 2B and/or new information relevant to the RI/FS.

Comment 51, Section 6.3.1, Scope of Upstream and Downstream Sampling: This section should be revised to state that a Technical Memorandum will be submitted on this issue.

Comment 61, Section 8.4.4, Facility Siting Tasks: The following sentence should be added to the last paragraph of this section: "It is anticipated that early outreach on the proposed disposal site list for FS evaluation may be conducted to help understand the range of potential public opinion on the sites." In addition, delete all language following "aquatic resources." in the last paragraph of Section 8.8 and replace with "Thus, the remedial alternatives will need to have some early assessment of the magnitude of mitigation and its cost to run through the nine criteria evaluation."

Comment 64, Section 8.6.4, Define Preliminary SMAs and Volumes: The principal threat evaluation is the appropriate mechanism to develop the concept of "high" and "low" risk areas. The relevant sentences should read:

> "The general magnitude of risks as described in the ERA and HHRA documents will also be considered using information such as hazard quotients, risk probabilities, and other risk estimates. so that areas of relatively "high" and "low" risks can be defined. Note

that these designations are not intended to imply any regulatory designation (which can only be applied by EPA), but rather are a means to understand how risks vary spatially across the site. The LWG will coordinate closely with EPA on the mapping of risk areas and how this information is finally presented in the FS. The identification of principal threat areas will assist in the evaluation of remedial alternatives that may better address areas of particularly concentrated or toxic chemicals that differ in character from other SMAs or the Site in general."

Comment 67, Table 7-11, The DQO Process for the Human Health Risk Assessment: Under Step 2, delete "in the ISA" and replace with "in the Site".

Comment 73, Table 7-11, The DQO Process for the Human Health Risk Assessment: Under Step 4 change "In-water surface sediments collected in Round 2 in areas within the Site where fishing occurs or commercial diving has been documented" to "Selected in-water sediments collected in Round 2".

Comment 87, Appendix B, Section 2.5.3.4: The work plan should state: "If lamprey are observed during sediment sampling, they should be collected and held for possible analysis. If sufficient tissue mass is obtained, a plan for sample analysis will be developed in cooperation with EPA."

Comment 101, Attachment B-7: Section 5.3, Assessment Endpoint No. 2 was apparently revised in response to this comment. However, the language provided is confusing on how invertebrate tissue concentrations will be estimated. The ecological risk assessment technical memorandums and/or the food web technical memorandums must include an approach for estimating invertebrate tissue concentrations through modeling and/or data collection.

March 5, 2004 Redline:

A number of changes have been made based on the outcome of our March 3rd meeting. Some of this language was developed during subsequent discussions between EPA and LWG representatives. The following changes reflect either language agreed to by EPA and the LWG or reflect review of the March 5, 2004 Redline version of the Work Plan.

Section 6.2 - Objectives of the RI/FS: The sentences that refer to chemicals entering the ISA should be revised to read: "Chemicals may be entering the ISA from sources located within the ISA or upstream of the ISA, and some chemicals may be contributed from both ISA and upstream sources. Background levels will be established in accordance with EPA (2002c) and other relevant guidance and will be used in the overall remedial decision-making for the Site. The approach that will be used to establish background levels will be submitted to EPA for review as a technical memorandum. It is anticipated that consideration of background conditions would follow EPA guidance (2002) on this subject as well as other relevant EPA Superfund guidance and regulatory and statutory requirements."

Section 6.3.2 - Define Background Conditions:

This section should be revised to read: "Background conditions are typically considered to make appropriate risk management decisions, and will be considered in the FS. Evaluation of background conditions will be performed in conjunction with EPA and EPA guidance on this subject (EPA 2002) and other relevant EPA Superfund guidance. Site-Specific background conditions for various data types (e.g., sediment chemistry, sediment toxicity, surface water chemistry) will be identified in a future technical memorandum as noted in Sections 6.2 and 7.3.4."

Section 6.4.3 - Ecological Risk Assessment Scoping Activities:

This section should be re-written to list the purpose, content and production schedule of each Ecological Risk Assessment Technical Memorandum. Each of the elements described in EPA's February 11, 2004 comments on the programmatic work plan (General Comment - Ecological Risk Assessment Work Plan) must be incorporated into the technical memorandum process. In addition, methodologies for estimating invertebrate tissue concentrations must also be described.

Section 6.4.4, Round 2 Work:

The new language added regarding the Round 2 Data Evaluation should be revised to read: "As specified in the Administrative Order on Consent (AOC), Round 2 analytical data will be provided to EPA within 60 days of each sampling activity (e.g., Round 2 surface sediment sampling, Round 2A sediment coring, Round 2B sediment coring, sediment beach sampling, surface water sampling, groundwater pathways sampling, natural attenuation sampling). Data will be a field sampling report for each sampling effort. Data will be provided in electronic format showing location medium and results. Data will be provided in sufficient detail for EPA and its partners to begin preliminary analysis. A site summary characterization summary (including data gaps analysis) will be provided to EPA within 120 days after completion of field sampling and analysis as specified in the AOC. Site characterization summarys will serve as the basis for identifying data gaps and focusing subsequent phases of the investigation."

Section 7.2.2. - Surface Water:

This section should be revised to read:

7.2.2 Surface Water

Surface water samples will be collected to identify potential sources, to understand the distribution of chemicals resulting in potentially unacceptable ecological and human health risk (described in Sections 7.3 and 7.4), and to understand the potential for recontamination for the FS (described in Section 8).

The DQO process for understanding the distribution of chemicals in surface water is summarized in Table 7-4.

Problem Description

There is little existing water quality data for the ISA. Therefore, the objectives of the water sampling program are to assess water quality conditions in the ISA under different flow conditions, provide water quality data for use in the ecological and human health risk assessments, and provide water quality data for the assessment of recontamination potential during the FS.

Data Uses

Surface water data will be used to determine:

- If upland sources in the ISA are contributing to unacceptable risk from river water
- Support for the ecological and human health risk assessments
- If various river stages and flows and storm events have a measurable effect on the nature or concentration of surface water chemical constituents
- The impact to the ISA of potential upstream sources of surface water chemical constituents
- The potential presence of natural attenuation processes within the ISA
- The potential for recontamination of remedial alternatives (examined in the FS).

Data Needs

Sampling and analytical methods must be adequate to achieve detection limits that are below risk-based water quality screening levels. Sampling will be conducted during an early fall "first flush" stormwater runoff event and both low-flow and high-flow river conditions. Sample location and density must be adequate to assess variation in chemical concentrations in surface water immediately upstream, downstream, and within the ISA. Sample location and density must also be adequate to understand the potential for source effects to river water and sediments.

RI/FS Tasks

A tiered approach to the water quality investigation is proposed. Surface water sampling was proposed by the LWG but not approved by EPA in Round 1. In Round 2A, surface water samples will be collected using high-volume sampling methods at three transects: one transect at RM 11 above the upstream boundary of the ISA, one transect at RM 6 within the ISA, and one transect at RM 3.5 at the lower boundary of the ISA. Upstream samples will be used to evaluate the upstream contribution of chemicals to the ISA. High-volume samples also will be collected at four locations (Rhone Poulenc, Willamette Cove, Atofina and Portland Shipyard) during an optimum flow sampling event to assess potential source effects. Grab samples will be collected to support the ERA. Grab samples will also be collected in potential swimming areas to support the HHRA.

Specific Round 2A water quality sample locations, analyses, collection methods, and required analytical detection limits will be provided in the Round 2 surface water sampling FSP. High-volume surface water sampling methods will achieve minimum reporting limits below chronic and acute Ambient Water Quality Criteria (AWQC) and Oak Ridge National Laboratory ecological screening values and below AWQC for the

protection of human health and EPA Region 9 PRGs. Grab sampling methods will achieve minimum reporting limits below chronic and acute AWQC and Oak Ridge National Laboratory ecological screening values and below EPA Region 9 PRGs for all COPCs except N-nitrosodimethylamine, toxaphene, and dioxins/furans. These criteria are used to identify analytical reporting limits and for screening purposes.

Additional surface water samples will be collected in Round 2B for analysis of persistent, bioaccumulative toxins (PBTs) using high-volume sampling methods if a data gaps analysis based on Round 2A sampling results, the ecological preliminary risk evaluation, food web modeling results, and groundwater impacts evaluation scoping determines that additional surface water data with very low minimum reporting limits are needed to develop PRGs or evaluate source effects. Similarly, if additional surface water sampling to determine chemical distributions, source effects, natural attenuation, or recontamination potential is necessary, the proposed approach will be presented in a Round 3 FSP.

In addition, Table 7-4 must be revised accordingly to reflect the described approach.

Section 8.2 Remedial Action Objectives:

The Fifth paragraph of this section should be revised to read: The five preliminary RAOs listed in Section 6.1 all follow the specific requirements of RAOs in EPA (1988) guidance. The FS will consider "background" following EPA guidance (EPA 2002) on the use of background in RI/FS evaluations and other relevant EPA Superfund guidance.

Section 2.5 - Attachment A-1 of FS Work Plan (Appendix A):

The last paragraph of this section should read:

These preliminary RAOs all follow the specific requirements of RAOs in EPA (1988) guidance. Preliminary RAOs will be refined as the project moves forward. It should be noted that reference to background may be considered in coordination with EPA in the FS. The FS will consider "background" following EPA guidance (EPA 2002) on the use of background in RI/FS evaluations and other relevant EPA Superfund guidance.

Appendix B, Section 2.3.2.2:

Narrative language regarding sturgeon was agreed upon by EPA and the LWG for Appendix C of the Programmatic Work Plan. Identical language should be inserted into Section 2.3.2.2 of Appendix B. The fifth paragraph of this section should be revised to read: "White sturgeon are found in the lower Willamette River, including in Portland Harbor. They are highly valued by tribes as a food source and for cultural uses. They are also highly valued as sport fish. The annual harvest of sturgeon from the lower Willamette River has been estimated to be from 1000 to 2000 fish (ODFW 2002). White sturgeon is the largest freshwater fish in North America and has a

long life span. Some studies suggest that sturgeon can show strong site fidelity (Veinott et al 1999) while other studies indicate individual sturgeon can have large ranges (Devore and Grimes 1993)." In addition, the second to last sentence in paragraph 3 should be deleted and the last sentence should be revised to read: "All of the omnivorous species are predominantly bottom-feeders." The paragraph referring to green sturgeon should be revised to read: Another sturgeon species, which may be present in the Lower Willamette River, is the green sturgeon (*Acipenser medirostris*)."

Appendix B, Section 2.5.3, Fish Species: This section will need to be revised pending finalization of the Assessment Endpoint Table.

Appendix C (Various Sections):

This section needs to be revised as specified below. Most of these changes were previously agreed upon by EPA and the LWG:

Section 3.1.1 –

Additional potential use areas outside of the ISA were identified during 2003 and will be sampled as a part of Round 2 of the RI; these areas will be included in the human health risk assessment. Additional use areas may be identified during the RI/FS. For example, as a part of Round 2, beach samples are being collected in areas where shorebird exposure may occur. If credible information suggests that these beaches are or would become accessible to and used by humans, these shorebird beaches will be designated as human use areas and evaluated for the appropriate scenario.

Section 3.3.4.3 –

Pacific lamprey are harvested by Native American Tribes primarily at Willamette Falls. Juvenile Pacific lamprey spend from 3 – 7 years in freshwater rivers and tributaries before transforming into adults (Kostow 2002). The preferred habitat of juvenile Pacific lamprey is muddy bottoms, backwater, and low gradient areas (Kostow 2002). Its main food source is microscopic biota obtained by filtering mud and water (Kostow 2002). This may result in high juvenile lamprey exposure to contaminants present in sediments. After transforming to the adult form, lamprey move into the ocean where they live as predators/parasites for an estimated 20 to 40 months on larger fish and whales before returning to fresh water for as long as a year before spawning (Kostow 2002).

Sturgeon
White sturgeon are found in the lower Willamette River, including in Portland Harbor. They are highly valued by tribes as a food source and for cultural uses. They are also highly valued as sport fish. The annual harvest of sturgeon from the lower Willamette River has been estimated to be from 1000 to 2000 fish (ODFW 2002). White

sturgeon is the largest freshwater fish in North America and has a long life span. Some studies suggest that sturgeon can show strong site fidelity (Veinott et al 1999) while other studies indicate individual sturgeon can have large ranges (Devore and Grimes 1993).

Sturgeon was not sampled as a part of the RI/FS Round 1 investigation. However, juvenile sturgeon were collected within the Portland Harbor site in July, 2003, as a part of the cooperative effort by ODHS, ATSDR, ODFW, the City of Portland, and USEPA, Region 10.

The potential risk to Native American consumption fishers resulting from consumption of salmonids, lamprey, and sturgeon will be included in the risk assessment by including these species in a multiple species diet along with resident fish. This multiple species diet will be based upon tribal consumption information in the CRITFC Fish Consumption Report. The risk assessment will include a discussion of the uncertainties in determining the chemical body burden in sturgeon, salmon, and lamprey resulting from exposure to COPCs from the Site.

The use of adult salmon, lamprey, and sturgeon in the risk assessment is intended to provide a more complete picture of exposure to persons ingesting fish harvested from the ISA. However, the source of COPC concentrations in the tissues of adults from the Site for such species may be difficult to determine because of their life history and habits.

Section 3.4.3

Tissue EPCs will be estimated for resident species and for lamprey, salmonids, and sturgeon. The EPCs for lamprey, salmonids, and sturgeon will be used to evaluate risks to Native American consumption fishers in a multiple species diet. The fish consumption evaluation will be based on a range of fish consumption rates. Because these consumption rates will not be designated as representing either RME or CT exposures the EPCs for tissue will not be developed specifically for RME or CT scenarios. The process to estimate tissue EPCs is described below.

3.4.3.1 Resident Species

Data from uncooked resident fish and shellfish samples collected during Round 1 and any subsequent investigations will be used to estimate the EPCs for tissue. Historic tissue data selected for use in the HHRA (see Section 2.1) will also be used to estimate EPCs for tissue. EPCs will be estimated only for individual fish and shellfish species that are consumed by fishers in the area. EPCs for fish will be calculated for both fillets and whole bodies.

EPCs for tissue will be estimated both for individual sampling locations and for the entire Site. EPCs will be estimated by location for crayfish, by river mile for bass (due to their small home range), and by fishing zone (defined as RM 3-6 and RM 6-9, representing the upper and lower ends of the ISA) for carp, crappie, and bullhead,

since these fish have larger home ranges than bass. Site-wide EPCs will also be estimated for each species.

Replicate composite samples were collected for each fishing zone for carp, crappie, bullhead, and at three of the eight river mile stations for bass. The replicate composite samples will be averaged and the arithmetic mean concentrations will be used as EPCs for individual sampling locations. To address potential variation in tissue concentrations, the maximum composite results for each fishing zone and at the three river mile segments will also be used as EPCs for individual sampling locations. The uncertainty associated with using the average and maximum concentrations as EPCs will be discussed in the risk assessment.

At the one-mile river stations where replicate composite samples were not collected for bass, the results of the single composite sample will be used as EPCs for these stations.

Site-wide tissue EPCs will also be estimated using mean concentrations and 95 percent upper confidence limit (UCL) on the average or maximum composite results. Where sufficient data are available, the 95% UCLs will be calculated using an approach agreed to by the LWG and EPA and its partners, and the 95% UCLs will be used as site-wide EPCs. If sufficient data are not available, the maximum composite results will be used as site-wide EPCs. In addition, the arithmetic mean of individual sampling location EPCs will be used as site-wide EPCs.

3.4.3.2 Lamprey, Salmonids, and Sturgeon

Data from uncooked fish samples collected as a part of the ODHS study and any subsequent investigations will be used to estimate the EPCs for tissue for use in a multiple species diet that is based upon the proportion of fish consumed in the CRITFC Fish Consumption study. For sturgeon (fillet without skin), site wide EPCs will be calculated. For lamprey (whole body) and Chinook salmon (whole body and fillets), the EPCs will be estimated using the composite samples collected at Willamette Falls and at the Clackamas Hatchery, respectively. Site-wide EPCs calculated for resident species will be included in the multiple species diet.

Because it is currently not known exactly what tissue data are available, the process to estimate EPCs for lamprey, salmonids, and sturgeon will be developed at a later date, in cooperation with EPA and its partners. This process will be consistent with the methods used for developing EPCs for the resident species.

Section 3.4.5.1 –

arsenic speciation analysis of the fish tissue. Regardless of the risk characterization

Section 3.5.1.4 –

For the tribal scenario, a multiple species approach will be done using the fish

consumption data from the CRITFC Fish Consumption study (CRITFC 1994) with concentration data from the target resident species as well as from sturgeon, salmon and lamprey caught as a part of the ODHS sampling effort. The risk assessment will include a discussion on the uncertainty in estimating the proportion of contaminants in sturgeon, salmon and lamprey and associated risks that result from contaminants at the Site.

3.5.1.4 Fishers

The HHRA will use different fish ingestion rates encompassing the 3 fisher scenarios selected: recreational fisher; high consumption non-tribal fisher; and Native American consumption fisher. Consumption of resident fish species will be evaluated for the recreational fisher and high consumption non-tribal fisher scenarios. A multiple species diet that includes resident fish as well as salmonids, lamprey, and sturgeon will be evaluated for the Native American consumption fisher scenario. Consumption of crayfish will be evaluated separately. The approaches that will be used to evaluate these consumption scenarios are discussed below.

The approaches discussed below are based on information currently available. In the case that additional information becomes available prior to the HHRA, it will be discussed with EPA and its partners as to if and how it will be used in the risk assessment.

Resident Fish Species

Site-specific fish consumption information is not available for the recreational fisher or high consumption non-tribal fisher scenarios. Therefore, to evaluate the potential range in consumption patterns that may exist for these receptors, 3 ingestion rates will be used to calculate intakes for adults and 3 will be used for children. For adults, the fish ingestion rates that will be used in the HHRA are 17.5 grams per day (g/day), 73 g/day, and 142 g/day. The corresponding rates that will be used for children are 7 g/day, 31 g/day, and 60 g/day. These ingestion rates are anticipated to represent average to high end ranges of fish consumption for these receptors.

Two of these rates, 17.5 g/day and 142 g/day, represent the 90th and 99th percentile ingestion rates for freshwater and estuarine fish and shellfish for individuals (consumers and non-consumers) of age 18 and over in the United States (EPA 2002). Because these rates are from a national dietary study, they may not be representative of site-specific consumption patterns. The other ingestion rate, 73 g/day, is from a creel study conducted in the Columbia Slough and is the 95 percent upper confidence limit on the average for ingestion of fish where 75 percent of the total fish is consumed (Adolfson 1996). While this study may be more representative of consumption patterns for the Site, the study was limited in scope and the reported ingestion rates were estimated based on numerous assumptions. The uncertainties associated with each of the fish ingestion rates will be discussed in the HHRA.

For the recreational fisher and high consumption non-tribal fisher scenarios, the risk

assessment for the target resident fish species (bass, black crappie, bullhead, and carp) will be done using the ingestion rates for these two scenarios with concentration data on each individual resident species (for whole body and fillet tissue). EPCs will be calculated for fishing zones (carp, crappie and bullhead) and mile reach (bass) as well as for the entire Site, as described in Section 3.4.3. In addition to the individual species diet, multiple species diet will also be done for these two fisher groups by using the fish ingestion rates for the scenarios with the concentration data of all resident species (for whole body and fillet tissue) for the Site (i.e., a multiple species diet assuming that each of the 4 fish target species represents 1/4 of a person's diet). The following scenarios will be evaluated for each of the above ingestion rates.

	River Mile	Fishing Zone	Entire Site
Smallmouth bass	X[1]		X[3]
Black crappie		X[2]	X[3]
Carp		X[2]	X[3]
Brown bullhead		X[2]	X[3]
Multiple species			X[4]

[1]Three replicate bass composites were caught at 3 of the river mile locations - EPCs will be calculated by river mile using the arithmetic mean of the replicate composites and also using the maximum concentration of each chemical in any of the 3 composites in each river mile (by body type). Where replicates were not collected, the results for the single sample will be used as the EPCs.
[2]Three replicate composites for crappie, carp and bullhead were caught at fishing zones 3 to 6 and 6 to 9; EPCs will be calculated for the 3 to 6 mile reach and for the 6 to 9 mile reach using the arithmetic mean of the replicate composites and also using the maximum concentration of each chemical in any of the 3 composites in each reach for each species (by body type).
[3]EPCs will be calculated using the arithmetic mean of the replicate composites and also using the maximum concentration of each chemical in any of the composites caught in the entire site.
[4]EPCs for multiple species will be calculated using the EPCs calculated for individual species in footnote 3 (by body type).

Tribal Multiple Species Diet

While site-specific fish consumption information is not available for the Native American fisher scenario, a fish consumption survey was conducted on the reservations of four of the participating Tribes (CRITFC 1994). The 95th percentile fish ingestion rate from the CRITFC Fish Consumption study, which is 175 g/day, will be used to calculate intakes for adult Native American fish consumers. The corresponding rate of 73 g/day will be used for child Native American fish consumers.

For the tribal scenario, a multiple species approach will be done using the fish

consumption data from the CRITFC Fish Consumption study (CRITFC 1994) with concentration data from the target resident species as well as from sturgeon, salmon and lamprey caught as a part of the ODHS sampling effort. The fish consumption information from the CRITFC study will be used to determine the ingestion rate for each fish species, as shown below:

Species	Grams per day[1]	Percent of diet
Salmon	67	38.4
Lamprey	12.3	7.0
Sturgeon	8.6	4.9
Smelt	12.5	7.2
Whitefish	23.2	13.3
Trout	25.1	14.3
Walleye	9.9	5.7
Northern Pikeminnow[2]	3.7	2.1
Sucker	7.3	4.2
Shad	5.2	3.0
Total Ingestion Rate	175	100

[1]Grams per day are based upon weighted mean data in Table 18 of the CRITFC study.

[2] Squawfish is now called Northern Pikeminnow

Unless new data are collected, data from the 2003 ODHS fish sampling effort will be used to calculate EPCs for salmonids, lamprey, and sturgeon. As with the resident fish, the arithmetic mean of composites and the maximum concentration in any of the composites (for salmon and lamprey) will both be used as the EPCs. Sturgeon were collected as individual samples, so the arithmetic mean of the individual samples and the maximum concentration in sturgeon samples will both be used as EPCs. The uncertainty associated with using the mean and maximum concentrations as EPCs will be discussed in the risk assessment.

For adult Native American consumers, the ingestion rates for salmonids (67 g/day), lamprey (12.3 g/day), and sturgeon (8.6 g/day) will be used with the respective EPCs for those species to calculate intakes. For the remaining species, each of the EPCs calculated for the entire Site for smallmouth bass, black crappie, carp, and brown bullhead will be used with an ingestion rate of 21.7 g/day (i.e., the ingestion rate for the sum of the species that are not salmonid, sturgeon or lamprey, 86.9 g/day, divided by 4). The combined intakes from salmonids, lamprey, sturgeon, and ~~resident~~ the remaining fish species in the above table will be used to estimate risks from fish consumption. The intakes for child Native American consumers will be calculated using the same dietary percentages as the adult Native American consumers, but with a total ingestion rate of 73 g/day.

The risk assessment will include a discussion on the uncertainty in estimating the

proportion of contaminants in sturgeon, salmon and lamprey and associated risks that result from contaminants at the Site.

Other Comments:

Section 1.0, Introduction: Due to the reliance on the technical memorandum process to resolve key issues related to the work plan, the last sentence should be revised to read: "These memoranda will be submitted to EPA and its partners for review and approval, in accordance with the Work Plan schedule." Add additional sentence at end of paragraph: "Any EPA approved interim deliverable, addenda, or technical memorandum will be incorporated into this Work Plan and become a substantive part of this Work Plan under the AOC."

Section 1.3.2, Overview of RI/FS Tasks, Number 7: Add "as well as other data agreed to by EPA and the LWG" at the end of "The baseline risk assessments will be based on pre-AOC, Round 1, Round 2, and historic Category 1 data."

Section 2.1, Hydrogeology: The final sentence should read: The results of the groundwater review will be provided in the Conceptual Site Model report.

Section 5.3.2, Potential Exposure Pathways: After "Fishers may consume fish and shellfish that are caught from the Site and may also have dermal contact with, and incidental ingestion of, sediments at banks" add "and in water".

Appendix B, Section 5.3 - Assessment Endpoint 3: The text should include the following statement: "Chemical Concentrations in whole body tissues of each receptor of concern will be analyzed to determine exposure point concentrations for each fish species." In addition, text should be added that indicates the use of a 95% UCL applies only to a dietary analysis and not a tissue TRV analysis.

Appendix A, Attachment A-4, Section 1: The second and third sentences of the fourth paragraph of this section should be deleted.

Appendix A1 - Table 2: The following changes should be made:

i. The comment section for "Statement of Procedures on Floodplain Management and Wetlands Protection" last sentence should be revised as follows: "This includes City of Portland Ordinance, Ch. 24.50.060(D) & (F)(8), as those provisions implement federal law."

ii. Endangered Species Act - comment section last sentence must be revised to end after the word "services." Although the final ESA BA may be completed at the end of the RI/FS, we likely will need preliminary assessments and some consultation during development of the FS.

iii. National Historic Preservation Act - per prior comments, the last sentence of the comment section should be deleted. Although procedure is not required, the plan likely would be needed to implement substantive requirements of this ARAR.

iv. Environmental Cleanup Act -ORS 465.315 - Comment section. Revised last sentence as follows: "Where State regulations go beyond or are more stringent than federal law and regulations, State regulations are applicable or relevant and appropriate requirements. State regulations are not only ARARs if they are consistent or not more stringent than federal law.