### Analyses for Dredge Sediment Characterization

<table>
<thead>
<tr>
<th>Potential Chemicals of Concern (a)</th>
<th>Analytical Methods (b)</th>
<th>Detection Limit Goals (mg/kg)</th>
<th>Typical Costs per Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Polyaromatic Aromatic Hydrocarbons (PAH)</strong></td>
<td>EPA Method 8270</td>
<td>0.005</td>
<td>$300-400 (c)</td>
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<tr>
<td>Naphthalene</td>
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<tr>
<td>Acenaphthylene</td>
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<tr>
<td>Acenaphthene</td>
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<tr>
<td>Phenanthrene</td>
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<td>Anthracene</td>
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<td>2-Methylnaphthalene</td>
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<tr>
<td>Benzo(a)anthracene</td>
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<td>Chrycene</td>
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<td>TOTAL PAH</td>
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<td><strong>Chlorinated Organic Compounds</strong></td>
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<td>1,4-Dichlorobenzene</td>
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<td>1,2-Dichlorobenzene</td>
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<td>1,2,4-Trichlorobenzene</td>
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<td>Hexachlorobenzene (HCB)</td>
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<td>2,4-Dimethylphenol</td>
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Ross Island Sand & Gravel
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<th>Potential Chemicals of Concern (a)</th>
<th>Analytical Methods (b)</th>
<th>Detection Limit Goals (mg/kg)</th>
<th>Typical Costs per Sample</th>
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<td>MISCELLANEOUS EXTRACTABLES (Part 1)</td>
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<td>Benzyl alcohol</td>
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<td>Endrin</td>
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<td>Manganese</td>
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<td>PETROLEUM HYDROCARBONS</td>
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<td>Total Organic Carbon (TOC)</td>
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<td>BIOLOGICAL (Toxicity)</td>
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<td>Hyallela azteca: 10-d survival</td>
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<td>Chironomus tentans: 10-d survival and growth</td>
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<td>BIOLOGICAL (Bioaccumulation)</td>
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<td>Lumbriculus variegatus: Bioaccumulation</td>
<td>ASTM E 1688-00a</td>
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<td>$6,000 (m)</td>
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</table>
NA = Not applicable.

(a) Sources of Potential Chemicals of Concern:
- Dredged Material Evaluation Framework, Lower Columbia River Management Area (LCRMA), November 1998, EPA and USACE

Note that the Washington State Sediment Management Standards (SMS) and the Dredged Material Management Program (DMMP; previously the Puget Sound Dredged Disposal Analysis, or PSDDA program) provide options for confirmatory biological testing that may override chemical data.

Some chemical values are normalized to total organic carbon (TOC), and are expressed as mg/kg-TOC or ppm-TOC. To normalize to TOC, the dry weight concentration for that parameter reported by the lab (in mg/kg dry weight) is divided by the decimal fraction representing the percent total carbon content of the sediment.

(b) Analytical methods are from Test Methods for Evaluating Solid Waste (SW-846) (EPA 1986 and updates) unless otherwise noted.

(c) Cost shown is for a full semivolatile organic compound analysis of which the polynuclear aromatic hydrocarbon (PAH) analysis is a part. PAH analyses alone usually cost $150-200.

(d) The LPAH (“Low Molecular Weight Polynuclear Aromatic Hydrocarbons”) criterion is not the sum of the criteria values for all of the individually listed LPAH compounds. The SMS and DMMP LPAH criteria represent the sum of: Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, and Anthracene.

(e) Under the SMS, the benzozfluoranthenes criterion represents the sum of the concentrations of the “b,” “j,” and “k” isomers; under the DMMP and the LCRMA, the criterion represents the sum of the “b” and “k” isomers only.

(f) High Molecular Weight Polynuclear Aromatic Hydrocarbons. (The SMS and DMMP “HPAH Total” represents the sum of the nine listed HPAH compounds, but is NOT the sum of the criteria values for the nine HPAH compounds.)

(g) Usually combined with PAHs using EPA Method 8270, the full semivolatile organic compound analysis.

(h) Under the SMS and DMMP, Total PCB includes the six listed Aroclor compounds.

(i) Under the SMS, DMMP, and LCRMA, Total DDT represents the sum of the p,p’-DDE, p,p’-DDD, and p,p’-DDT isomers (also referred to as the 4,4’-isomers).


(k) Analytical method is from Methods for Chemical Analysis of Water and Wastes (EPA 600/ 4-79/020).

(l) Analytical method in Methods for Measuring the Toxicity and Bioaccumulation of Sediment Associated Contaminants with Freshwater Invertebrates (EPA 600/R-94/024) (2000) and the LCRMA document noted above under (a).

(m) Sediment bioaccumulation testing involves exposing a test organism (e.g., the worm Lumbricus variegatus) to test sediment over a 28-day time period under controlled laboratory conditions. Subsequent to the exposure, the organism tissues undergo chemical testing for chemicals of potential bioaccumulative concern and conventional parameters. The cost shown includes performance of the 28-day exposure with one sediment sample (including the recommended five replicates of the sample) and one control sample (including the recommended five replicates of the control sample), and chemical testing of tissues for TOC, percent lipid, and PCBs. Each additional chemical of bioaccumulative concern would increase the cost by an increment approximately equal to ten times the per-sample chemical analytical costs for each chemical that are provided elsewhere in this Fact Sheet.