Fact Sheet

ANALYSES FOR DREDGE SEDIMENT CHARACTERIZATION

Potential Chemicals of Concern (a)	Analytical Methods (b)	Detection Limit Goals (mg/kg)	Typical Costs per Sample
POLYNUCLEAR AROMATIC HYDROCARBONS (PAH)			$300-400 (c)
Naphthalene	EPA Method 8270	0.005	
Acenaphthylene	EPA Method 8270	0.01	
Acenaphthene	EPA Method 8270	0.01	
Fluorene	EPA Method 8270	0.01	
Phenanthrene	EPA Method 8270	0.01	
Anthracene	EPA Method 8270	0.005	
2-Methylnaphthalene	EPA Method 8270	0.005	
TOTAL LPAH (d)	EPA Method 8270	0.01	
Fluoranthene	EPA Method 8270	0.01	
Pyrene	EPA Method 8270	0.01	
Benzo(a)anthracene	EPA Method 8270	0.01	
Chrysene	EPA Method 8270	0.01	
Benzofluoranthenes (e)	EPA Method 8270	0.01	
Indeno(1,2,3-cd)pyrene	EPA Method 8270	0.005	
Dibenz(a,h)anthracene	EPA Method 8270	0.005	
Benzo(g,h,i)perylene	EPA Method 8270	0.005	
TOTAL HPAH (f)	EPA Method 8270	0.01	
TOTAL PAH	EPA Method 8270	0.01	
CHLORINATED ORGANIC COMPOUNDS			(g)
1,3-Dichlorobenzene	EPA Method 8270	0.01	
1,4-Dichlorobenzene	EPA Method 8270	0.01	
1,2-Dichlorobenzene	EPA Method 8270	0.01	
1,2,4-Trichlorobenzene	EPA Method 8270	0.01	
Hexachlorobenzene (HCB)	EPA Method 8270	0.01	
POLYCHLORINATED BIPHENYLS (PCBs)			$100
Aroclor 1242/1016	EPA Method 8082	0.001	
Aroclor 1248	EPA Method 8082	0.001	
Aroclor 1254	EPA Method 8082	0.001	
Aroclor 1260	EPA Method 8082	0.001	
Aroclor 1221	EPA Method 8082	0.001	
Aroclor 1232	EPA Method 8082	0.001	
TOTAL PCBs (h)	EPA Method 8082	0.001	
PHTHALATES			(g)
Dimethyl phthalate	EPA Method 8270	0.01	
Diethyl phthalate	EPA Method 8270	0.01	
Di-n-butyl phthalate	EPA Method 8270	0.01	
Butylbenzyl phthalate	EPA Method 8270	0.01	
Bis(2-ethylhexyl) phthalate	EPA Method 8270	0.2	
Di-n-octyl phthalate	EPA Method 8270	0.01	
PHENOLS			(g)
Phenol	EPA Method 8270	0.05	
2-Methylphenol	EPA Method 8270	0.10	
4-Methylphenol	EPA Method 8270	0.10	
2,4-Dimethylphenol	EPA Method 8270	0.20	
Pentachlorophenol	EPA Method 8270	0.30	

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Potential Chemicals of Concern (a)	Analytical Methods (b)	Detection Limit Goals (mg/kg)	Typical Costs per Sample
MISCELLANEOUS EXTRACTABLES (Part 1)			(g)
Benzyl alcohol	EPA Method 8270	0.05	
Benzoic acid	EPA Method 8270	0.25	
Carbozole	EPA Method 8270	0.25	
MISCELLANEOUS EXTRACTABLES (Part 2)			(g)
Dibenzofuran	EPA Method 8270	0.005	
Hexachloroethane	EPA Method 8270	0.04	
Hexachlorobutadiene	EPA Method 8270	0.01	
N-nitrosodiphenylamine	EPA Method 8270	0.01	
VOLATILE ORGANICS			$150
Trichloroethene	EPA Method 8260	0.01	
Tetrachloroethene	EPA Method 8260	0.01	
Benzene	EPA Method 8260	0.01	
Toluene	EPA Method 8260	0.01	
Ethylbenzene	EPA Method 8260	0.01	
Total xylenes (sum of o-, m-, and p-isomers)	EPA Method 8260	0.01	
PESTICIDES			$120
p,p'-DDE	EPA Method 8081	0.002	
p,p'-DDD	EPA Method 8081	0.002	
p,p'-DDT	EPA Method 8081	0.002	
Total DDT (i)	EPA Method 8081	0.002	
Aldrin	EPA Method 8081	0.002	
Chlordane	EPA Method 8081	0.002	
Dieldrin	EPA Method 8081	0.002	
Heptachlor	EPA Method 8081	0.002	
Heptachlor Epoxide	EPA Method 8081	0.002	
Lindane (gamma-BHC)	EPA Method 8081	0.002	
Toxaphene	EPA Method 8081	0.045	
Endrin	EPA Method 8081	0.002	
Tributylin (µg/L; interstitial water) (j)	Krone et al.	0.002	$350
METALS			$75-175
Antimony	EPA Method 6000/7000 or 200.8 (k)	1.0	
Arsenic	EPA Method 6000/7000 or 200.8 (k)	1.0	
Cadmium	EPA Method 6000/7000 or 200.8 (k)	0.5	
Copper	EPA Method 6000/7000 or 200.8 (k)	10.0	
Chromium	EPA Method 6000/7000 or 200.8 (k)	10.0	
Lead	EPA Method 6000/7000 or 200.8 (k)	10.0	
Manganese	EPA Method 6000/7000 or 200.8 (k)	100.0	
Mercury	EPA Method 7471 or 200.8 (k)	0.05	
Nickel	EPA Method 6000/7000 or 200.8 (k)	10.0	
Silver	EPA Method 6000/7000 or 200.8 (k)	1.0	
Zinc	EPA Method 6000/7000 or 200.8 (k)	100.0	
PETROLEUM HYDROCARBONS			
Gasoline	NWTPH-G	25	$75
Diesel	NWTPH-Dx	25	$75
Heavy Oil	NWTPH-Dx	50	$75
OTHER			
Total Organic Carbon (TOC)	ASTM D 4129-82M	0.05%	$50
BIOLOGICAL (Toxicity)			
Hyallela azteca: 10-d survival	ASTM E 1706 (l)	NA	$600
Chironomus tentans: 10-d survival and growth	ASTM E 1706 (l)	NA	$650
BIOLOGICAL (Bioaccumulation)			
Lumbriculus variegatus: Bioaccumulation	ASTM E 1688-00a	NA	$6,000 (m)

Fact Sheet

NA = Not applicable.

(a) Sources of Potential Chemicals of Concern:

- Environmental Canada, at http://www.ec.gc.ca/ceqg-rcqe/public.htm
- *Dredged Material Evaluation Framework, Lower Columbia River Management Area* (LCRMA), November 1998, EPA and USACE
- *Creation and Analysis of Freshwater Sediment Quality Values in Washington State*, Washington State Department of Ecology, Publication No. 97-323a, July 1997.

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 benzofluoranthenes 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).

(j) Also refer to *Testing, Reporting, and Evaluation of Tributyltin Data in PSDDA and SMS Programs* at URL http://www.nws.usace.army.mil/dmmo/8th_arm/tbt_96.htm and Krone et al., 1989, *A Method for Analysis of Butyltin Species and Measurement of Butyltins in Sediment and English Sole Livers from Puget Sound*. Mar. Environ. Res. 27:1-18.

(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 *Lumbriculus 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.