

## RECOMMENDED TARGET REPORTING LIMITS FOR TRACE METALS

<u>Analysis</u>	<u>Matrix</u>	<u>Units</u> (sediment & tissue are reported in <u>DRY</u> weight)	<u>*Suggested Analytical Methods</u> (See *Note at end of table)	<u>Target Reporting Limit (TRL)</u>  <b>RECOMMENDED</b> (not required yet)
<b>TRACE METALS</b>				
<b>ALUMINUM</b>	water (a)	ug/L (ppb)	Modified USGS 1996 (e), SM 3111B, EPA 1639, EPA 200.8, EPA 6020	0.3
	sediment	mg/kg (ppm)	Modified USGS 1996 (e), EPA 200.8, EPA 6020	0.3
	tissue	mg/kg (ppm)	Modified USGS 1996 (e), EPA 200.8, EPA 6020	0.3
<b>ARSENIC</b>	water (salinity >0.5 ‰)	ug/L	Modified USGS 1996 (e), EPA 1639, EPA 200.8, EPA 6020	0.3
	water (salinity >0.5 ‰) (b)	ug/L	DFG 1986 (c) , EPA 200.8, EPA 6020	1.0 (b)
	sediment	mg/kg	SW6010/EPA 200.7, Modified USGS 1996 (e), DFG 1986 (c) , EPA 200.8, EPA 6020	0.3
	tissue	mg/kg	Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.3
<b>CADMIUM</b>	water (a)	ug/L	Modified USGS 1996 (e), SM 3113, SM 3111B, EPA 1639, EPA 200.8, EPA 6020	0.01
	sediment	mg/kg	SW6010/EPA 200.7 Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.01
	tissue	mg/kg	Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.01
<b>CHROMIUM</b>	water (a)	ug/L	Modified USGS 1996 (e), SM 3113, SM 3111B, EPA 1639, EPA 200.8, EPA 6020	0.10
	sediment	mg/kg	SW6010/EPA 200.7 Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.10
	tissue	mg/kg	Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.10

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<b>TRACE METALS</b>				
<b>COPPER</b>	water (a)	ug/L	Modified USGS 1996 (e), SM 3113, SM 3111B, EPA 1639, EPA 200.8, EPA 6020	0.01
	sediment	mg/kg	SW6010/EPA 200.7, Modified USGS 1996 (e), EPA 200.8, EPA 6020	0.01
	tissue	mg/kg	Modified USGS 1996 (e), EPA 200.8, EPA 6020	0.01
<b>LEAD</b>	water (a)	ug/L	Modified USGS 1996 (e), SM 3113, SM 3111B, EPA 1639, EPA 200.8, EPA 6020	0.01
	sediment	mg/kg	SW6010/EPA 200.7, Modified USGS 1996 (e), EPA 200.8, EPA 6020	0.01
	tissue	mg/kg	Modified USGS 1996 (e), EPA 200.8, EPA 6020	0.01
<b>MANGANESE</b>	water (a)	ug/L	Modified USGS 1996 (e), EPA 200.8, EPA 6020	0.01
	sediment	mg/kg	Modified USGS 1996 (e), EPA 200.8, EPA 6020	0.01
	tissue	mg/kg	Modified USGS 1996 (e), EPA 200.8, EPA 6020	0.01
<b>MERCURY</b>	water (low level, parts per trillion)	<u>ng/L (ppt)</u>	EPA1631	0.2
	sediment	mg/kg	CALFED-D16	.03
	tissue	mg/kg	CALFED-D16	.03
<b>METHYL MERCURY</b>	water	<u>ng/L (ppt)</u>	CALFED-D10	0.05
	sediment	<u>ng/g (ppb)</u>	CALFED-D7	0.02
	tissue	<u>ng/g (ppb)</u>	CALFED-D7	10.0

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<b>TRACE METALS</b>				
<b>NICKEL</b>	water (a)	ug/L	Modified USGS 1996 (e), SM 3113, EPA 1639, EPA 200.8, EPA 6020	0.02
	sediment	mg/Kg	SW6010/EPA 200.7, Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.02
	tissue	mg/Kg	Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.02
<b>SELENIUM</b>	water (salinity >0.5 ‰)	ug/L	Modified USGS 1996 (e), EPA 1639, EPA 200.8, EPA 6020	0.30
	water (salinity >0.5 ‰) (b)	ug/L	DFG 1986 (c)	1.0 (b)
	sediment	mg/Kg	DFG 1986 (c)	0.10
	tissue	mg/Kg	Modified USGS 1996 (e), EPA 200.8, EPA 6020	0.30
<b>SILVER</b>	water (a)	ug/L	Modified USGS 1996 (e), EPA 1639, EPA 200.8, EPA 6020	0.02
	sediment	mg/Kg	SW6010/EPA 200.7, Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.02
	tissue	mg/Kg	Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.02
<b>ZINC</b>	water (a)	ug/L	Modified USGS 1996 (e), SM 3111B, EPA 1639, EPA 200.8, EPA 6020	0.10
	sediment	mg/Kg	SW6010/EPA 200.7, Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.10
	tissue	mg/Kg	Modified USGS 1996 (e) , EPA 200.8, EPA 6020	0.10

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### \*NOTE REGARDING SUGGESTED METHODS LISTED ABOVE

All analytical methods listed above are suggested. Other methods may be employed, and modifications of standard methods are encouraged, as long as the methods used: 1) meet the sensitivity requirements of the TRL's, and 2) are contained in 40CFR36, the most current version of Standard Methods, or another reliable procedure as documented to produce results that are equal to or more stringent than the method being modified (modifications made according to CFR (Title 40, Part 136.4).

Any changes in procedures due to equipment changes or to improved precision and accuracy will be documented. Analyses and determinations must be performed by qualified personnel in conformance with the United States Environmental Protection Agency (EPA) or DHS approved test procedures described in the current Code of Federal Regulations (CFR) (Title 40, Part 136); "Test Methods for Evaluating Solid Waste," SW-846; or Title 22, CFR, Article 11, as appropriate. The test procedures may be modified subject to the application and approval of alternate test procedures under the CFR (Title 40, Part 136.4). The SWAMP Program strongly encourages the use of "performance-based methodology" (PBM) for conducting analytical procedures and therefore recognized the use of modified standard procedures, as appropriately documented following CFR 40, Part 136.4. The use of PBM allows for approved procedures to be modified according to these guidelines, which provide results that are equal to or better than (more stringent than) the standard protocol that was modified.

### FOOTNOTES

**(a)** = For all water samples to be analyzed for Trace Metals, if the salinity is greater than 3.0 parts per thousand (‰), an extraction (MLML 2002, Saline Water Trace Metals Extraction) is to be performed prior to the analytical procedure (ICP-MS in most cases) being performed. For all Trace Metals, **except for Selenium and Arsenic**, the detection limit remains the same even after the extraction is performed. This is because the same analytical methodology (ICP-MS) is used for water samples <3.0 ‰ salinity **AND** for water samples that are >3.0 ‰ salinity on which an extraction has been run. See (c) below for notes pertaining to analyzing water samples for Selenium and Arsenic if the water has salinity >3.0 ‰. Post-extraction analysis will not include Manganese and Chromium, unless otherwise specifically requested, since a second extraction would be necessary in order to analyze for Mn and Cr.

**(b)** = For all water samples over 0.5 ‰ salinity which are to be analyzed for Selenium and Arsenic, a different Target Report Limit (TRL) applies as noted, since the extracted water sample is analyzed for Se and As using method "DFG 1986". This applies to water samples over 0.5 ‰ salinity to be analyzed for Selenium and Arsenic, and for which an extraction process (MLML 2002, Saline Water Trace Metals Extraction) has been performed.

**(c)** DFG 1986--Procedures for Analysis of Selenium and Arsenic in Fish and Wildlife with Emphasis on Quality Control (by Hydride Generation AAS), 1986, Laboratory Report No. 86-3, CA Dept of Fish and Game, Fish and Wildlife Water Pollution Control Laboratory, Rancho Cordova, CA.

**(d)** MLML 2002--Procedures for Preparation of High Salinity (>3.0 ‰ salinity) Water Samples for Trace Metals Analysis Using Column Extraction. 2002. CDFG Marine Pollution Studies Laboratory Analytical Procedures Manual, CA Dept of Fish and Game, Moss Landing, CA

**(e)** Modified USGS 1996--Garbarino, J.R. and H.E. Taylor (1996). Inductively-coupled plasma-mass spectrometric method for the determination of dissolved trace elements in natural water. U.S. Geological Survey Open-File Report 94-358, 49 pp.

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<b>Suggested Sample Preparation for Trace Element Analysis</b>	
Acid Digestion of Sediments, Sludges and Soils	EPA 3050A
Acid Soluble Metals	EPA 200.1
Tissue Digestion for Trace Metals	DFG
Total Recoverable Metals	EPA 3005
Total Metals (Aqueous Samples w/ Susp. Solids)	EPA 3010A
Total Metals (Aqueous Samples)	EPA 3020A
SEM metals - Cu	FY94-32-07
Dissolved Metals (Filter 0.45 um)	DFG
Deionized water extraction (4 hour stir)	DFG
Soil extraction with water (short stir)	DFG
Tissue Dissection and Homogenization	DFG