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**Professional Services
Guide**

2023

ENERGY LABORATORIES, INC.

Trust our People. Trust our Data.

TM

www.energylab.com

Prices subject to change.

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ENERGY LABORATORIES, INC.

GENERAL INFORMATION

Energy Laboratories, Inc. (ELI) is a commercial environmental testing laboratory offering technical services under fee schedule and contractual arrangements. ELI is an independent, privately held corporation, whose continued existence depends upon the quality of our product. Since our inception in 1952, we continue to demonstrate to our clients an unyielding commitment to providing that quality.

Summary of Fee Schedule

The following fee schedule contains a summary of services that are available through all Energy Laboratories, Inc.'s many regional locations. List prices are presented for specific methods and analytes tested at our facilities.

Although the fee schedule reflects ELI's extensive capabilities in all types of process and environmental analysis, inquiries are welcome for your special needs and specific project requirements (detection limits, accelerated turn around times, etc.) To ensure the most cost effective pricing for your projects, ELI provides project specific analytical quotations to incorporate sample volume, analytes, reporting limits, and project duration. You can receive project specific quotations from any of ELI's four locations.

The fee schedule has an identifying version number. ELI makes every effort to maintain current pricing and methodology updates. However, pricing and methodology is always subject to change without prior notice. You can receive the current version by contacting any of our branch locations or by visiting ELI's web site www.energylab.com.

Quality Assurance and Quality Control (QA/QC)

ELI's comprehensive QA/QC program follows the rigorous criteria established by USEPA, TNI, DOD and various State agencies.

ELI maintains certification from The NELAC Institute (TNI) and DOD for the analysis of water and wastewater (NPDES), hazardous and solid wastes (RCRA) and drinking water (SDWA). ELI also maintains certification under various State Agencies and USEPA Regions.

Samples received at ELI are tracked and monitored by a strict laboratory information management system (LIMS) from receipt to report. Samples are logged in upon receipt and immediately inspected to determine any special handling requirements. All analytical procedures, sample handling, and preservation techniques are USEPA approved (where applicable). QA/QC test samples including matrix spikes and duplicates comprise greater than 10% of ELI's analytical load.

Analytical Methods

Energy Laboratories, Inc. performs analytical services according to methods set forth by the US Environmental Protection Agency (EPA), the American Society for Testing and Materials (ASTM), the Association of Official Analytical Chemists (AOAC), the American Public Health Association (APHA), and various state agencies.

Reporting limits on all methods subject to change, low level detection limits available on many methods, please consult with your project manager for current laboratory capabilities.

Refer to the **Chain-of-Custody Section**, on the following page, for additional analytical method information.

Prices subject to change.

Visit www.energylab.com for more information about our services.



ENERGY LABORATORIES, INC.

GENERAL INFORMATION, continued

Analytical Reporting

Our laboratory analysis report includes analytical and quality control results and a description of the analytical methods and QA/QC protocols, holding time information, and pertinent observations. A variety of reporting formats (including Level IV) and electronic transfer (EDD/EDT) of data are available.

Sample Containers

For safety and convenience, Energy Laboratories, Inc. provides properly cleaned sample bottles, preservatives, bottle labels, shipping containers, sampling instructions, and chain-of-custody forms at no charge. Special sample containers, such as Tedlar bags, are an additional charge.

Sample Disposal

Samples will be stored for at least 90 days after the analysis report is mailed. Extended sample storage can be provided.

Sample management/disposal surcharge of \$3.00 per sample may apply to all samples. Disposal and/or return cost of any samples identified as hazardous will be charged to the client.

Terms

For customers with established credit, our payment terms are net 30 days. After 30 days, interest charges will be accrued at 1.5% per month. If credit has not been established, payment for services is expected when the samples are submitted. Test results will not be released until payment arrangements are made.

Chain-of-Custody (COC)

ELI supplies *Chain-of-Custody* forms and custody seals (when requested) to our clients. When properly used, they provide documentation of the sample's integrity prior to receipt at the laboratory. They are also very useful in communicating vital information about the sample such as owner, location, sampling time/date, tests to be performed, etc. An annotated example of a completed *Chain-of-Custody* form is presented on the reverse side of the example COC form. It should serve as a pattern for using the forms provided by the laboratory.

Samples submitted for regulatory compliance, such as DOD, NPDES (Clean Water Act), drinking water, hazardous determination, or permit requirements for monitoring purposes should be specifically noted on the COC so that the appropriate analytical procedure can be selected.

Custody seals should be signed and dated by the same person that signs the *Chain-of-Custody* form. ELI will compare the signatures on receipt at the laboratory. The seal should be placed over an opening of the shipping package or across the bottle closure so that it will be torn if the samples are tampered with.

Sub-Contracting

In the event that ELI is dependent on the service of an outside laboratory for analyses not available through our facility or our other company laboratories, the client is notified on the laboratory analytical report that their samples were subcontracted to a pre-approved outside laboratory. The outside laboratory reports the results to ELI and these results become part of the final report. Any external or internal subcontracted analyses that require accredited analyses will be performed by a laboratory accredited for those parameters in the State from which the sample originated. All final reports indicate where the analyses were performed.

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WATER

List of Acronyms

E200.7	Inductively Coupled Plasma (ICP - Analytical Method)	MDL	Method Detection Limit
		MPN	Most Probable Number
E200.8	Inductively Coupled Plasma - Mass Spectrometry (ICP-MS - Analytical Method)	NaOH	Sodium Hydroxide
		NPDES	National Pollutant Discharge Elimination System
A	Standard Methods	NR	Not Regulated
ASTM	American Society for Testing & Materials	NTU	Nephelometric Turbidity Units
BOD	Biochemical Oxygen Demand	OH	Hydroxide
CaCO ₃	Calcium Carbonate	PCBs	Polychlorinated Biphenyls
CO ₃	Carbonate	pCi/L	Picocuries per Liter
CFU	Colony Forming Units	ppb	parts per billion
COD	Chemical Oxygen Demand	ppm	parts per million
DBCP	1, 2-Dibromo-3-chloropropane		
DOC	Dissolved Organic Carbon	PQLs	Practical Quantitation Limits If the sample is contaminated, it may require dilution prior to analysis. The PQL of diluted samples will be correspondingly higher.
EDB	Dibromoethane	PVC	Polyvinyl Chloride
E or EPA	US Environmental Protection Agency	SW	Solid Waste 846
		TDS	Total Dissolved Solids
GC/FID	Gas Chromatograph/Flame Ionization Detector	TKN	Total Kjeldahl Nitrogen
H ₂ SO ₄	Sulfuric Acid	TOC	Total Organic Carbon
HCl	Hydrochloric Acid	TOX	Total Organic Halogens
HCO ₃	Bicarbonate	TPH	Total Petroleum Hydrocarbons
HNO ₃	Nitric Acid	TSS	Total Suspended Solids
ICP	Inductively Coupled Plasma	VOA	Volatile Organic Analysis
ICP-MS	Inductively Coupled Plasma - Mass Spectrophotometer	VOCs	Volatile Organic Chemicals
MCL	Maximum Contaminant Level	VSS	Volatile Suspended Solids
MCLG	Maximum Contaminant Level Goals	WAD	Weak Acid Dissociable

The analytical methods listed above are typically referenced for drinking water and clean water regulations.

WATER

METALS	METHOD	UNIT
Total Metals Digestion	E200.2	-
Filtering or preserving samples on receipt at the laboratory, as appropriate - per fraction		
Aluminum	E200.7/E200.8	mg/L
Antimony	E200.7/E200.8	mg/L
Arsenic	E200.7/E200.8/A3114C	mg/L
Arsenic, III & V speciation	E1632A Mod.	mg/L
Barium	E200.7/E200.8	mg/L
Beryllium	E200.7/E200.8	mg/L
Bismuth	E200.7/E200.8	mg/L
Boron	E200.7/E200.8	mg/L
Cadmium	E200.7/E200.8	mg/L
Calcium	E200.7/E200.8	mg/L
Chromium	E200.7/E200.8	mg/L
Chromium, Hexavalent (Cr+6)	A 3500 Cr B	mg/L
Cobalt	E200.7/E200.8	mg/L
Copper	E200.7/E200.8	mg/L
Gallium	E200.8	mg/L
Gold	E200.7/E200.8	mg/L
Iron	E200.7/E200.8	mg/L
Iron, Ferrous (Fe II)	E200.7/E200.8	mg/L
Iron, Ferrous (Fe II)	A3500FeB	mg/L
Iron, Ferric (Fe III)	Calculated from Iron and Iron, Ferrous	
Lead	E200.7/E200.8	mg/L
Lithium	E200.7/E200.8	mg/L
Magnesium	E200.7/E200.8	mg/L
Manganese	E200.7/E200.8	mg/L
Mercury	E200.8	mg/L
Mercury	E245.1/E245.7/SW7470	mg/L
Mercury, low level	E245.1/E245.7/E200.8/SW7470	mg/L
Low Level Metal (lower than the reporting limit indicated above) – per metal		
<i>Please contact your Project Manager to discuss our low level capabilities</i>		

WATER

METALS	METHOD	UNIT
Mercury, ultra low-level	E245.7	ng/L
<p>For Ultra low-level mercury by method 245.7, both a trip blank and field blank are required for each set of samples. Both the trip blank and field blank will be analyzed and charged at \$55 each.</p>		
Molybdenum	E200.7/E200.8	mg/L
Nickel	E200.7/E200.8	mg/L
Potassium	E200.7/E200.8	mg/L
Rubidium	E200.8	mg/L
Selenium	E200.7/E200.8/A3114C	mg/L
Selenium, IV & VI speciation	A3114C Mod.	mg/L
Silicon	E200.7/E200.8	mg/L
Silver	E200.7/E200.8	mg/L
Sodium	E200.7/E200.8	mg/L
Strontium	E200.7/E200.8	mg/L
Tellurium	E200.7/E200.8	mg/L
Thallium	E200.7/E200.8	mg/L
Tin	E200.7/E200.8	mg/L
Titanium	E200.7/E200.8	mg/L
Tungsten	E200.7/E200.8	mg/L
Uranium	E200.7/E200.8	mg/L
Vanadium	E200.7/E200.8	mg/L
Zinc	E200.7/E200.8	mg/L
Zirconium	E200.7/E200.8	mg/L
<p>Low Level Metal (lower than the reporting limit indicated above) – per metal</p> <p><i>Please contact your Project Manager to discuss our low level capabilities</i></p>		

WATER

NON-METALS	METHOD	UNIT
Acidity, Total as CaCO ₃	A2310B	mg/L
Alkalinity, total as CaCO ₃ , includes bicarbonate as HCO ₃ , Carbonate as CO ₃ , and hydroxide as OH	A2320B	mg/L
Ammonia (see Nitrogen, Ammonia)	-	-
Biochemical Oxygen Demand (BOD)	A5210B	mg/L
Biochemical Oxygen Demand, Carbonaceous	A5210B	mg/L
Bromate	E300.0/E300.1	mg/L
Bromide	E300.0	mg/L
Chemical Oxygen Demand (COD)	E410.4	mg/L
Chlorate	E300.0/E300.1	mg/L
Chloride	E300.0/A4500CL B	mg/L
Chlorite	E300.0/E300.1	mg/L
Chlorine, Residual	A4500CL2-G /E330.5 Mod.	mg/L
Chlorophyll a	A10200H	mg/m ³
Color	A2120B	Color Units
Conductance, Specific @ 25°C	A2510B	µmhos/cm
Corrosivity (Ca, Alkalinity, pH, TDS)	Calculation	-
Cyanates	A4500CN L	mg/L
Cyanide, Amenable to Chlorination	A4500CN G	mg/L
Cyanide, Free (Electrode)	A4500CN F/ Electrode Manufacturer	mg/L
Cyanide, Total	Kelada mod / E335.4	mg/L
Cyanide, Weak Acid Dissociable	ASTM D2036	mg/L
Cyanide, Thiocyanate as N	A4500CN M	mg/L
Ethylene Glycol	ASTM D2982 Mod.	P/A
Foaming Agents	A5540C or LaMotte DS-1	mg/L
Foaming Agents, low level	A5540C	mg/L
Fluoride	A4500F C	mg/L
Formaldehyde	NIOSH 3500 Mod.	mg/L

WATER

NON-METALS, continued	METHOD	UNIT
Hardness, Total as CaCO ₃	A2340 B	mg/L
Iodide	E300.0	mg/L
Methane, ethane, ethene	GC-FID/ Kampbell (SW 8015 Mod.)	mg/L
Nitrogen: Ammonia as N	E350.1	mg/L
Nitrogen: Nitrate plus Nitrite as N	E353.2	mg/L
Nitrogen: Nitrate as N	E353.2/E300.0	mg/L
Nitrogen: Nitrite as N	E353.2/E300.0	mg/L
Nitrogen: Total Kjeldahl as N	E351.2	mg/L
Nitrogen, Total	Total Nitrogen = Nitrate plus Nitrite as N + Total Kjeldahl Nitrogen	
Nitrogen, Total (persulfate -includes TKN, NO ₃ , and NO ₂)	A4500N C	mg/L
Nitrogen, Organic	Organic Nitrogen = Total Kjeldahl Nitrogen - Ammonia Nitrogen	
Odor	A2150B	
Oil and Grease, IR	E418.1	mg/L
Oil & Grease, Gravimetric-Hexane extractable	E1664A / A5520 B	mg/L
Oil & Grease Sulfur corrected w/Copper	E1664-Cu	mg/L
Organic Carbon, Total (TOC)	SW9060	mg/L
Organic Carbon, Total (TOC), low level, public water	A5310C	mg/L
Organic Carbon, Dissolved (DOC)	A5310B/A5310C	mg/L
pH	E150.2/A4500H B	s.u.
Oxidation-Reduction Potential	A2580	mV
Phenolics, Total	E420.4	mg/L
Phosphorus, Hydrolyzable	E365.1	mg/L
Phosphorus, Ortho	E365.1	mg/L
Phosphorus, Total Organic	E365.1	mg/L
Phosphorus, Total	E365.1	mg/L

WATER

NON-METALS, continued	METHOD	UNIT
Residue, Non-Filterable Total Suspended Solids (TSS)	A2540D	mg/L
Residue, Total	A2540B	mg/L
Residue, Total Filtered Total Dissolved Solids (TDS)	A2540C	mg/L
Residue, Volatile Volatile Suspended Solids (VSS) @ 550°	A2540E	mg/L
Residue, Settleable Matter	A2540F	mL/L
Resistivity	A2510B	ohm-meters
Silica	E200.7/E200.8	mg/L
Specific Gravity	D1429	unitless
Sulfate	E300.0/A4500SO4 E	mg/L
Sulfide, Iodine Titrimetric	A4500S F	mg/L
Sulfide, Methylene Blue Colorimetric	A4500S D	mg/L
Sulfite	A4500S B	mg/L
Surfactants (MBAS, Foaming Agents)	A5540C or LaMotte DS-1	mg/L
Surfactants, low level (MBAS, Foaming Agents)	A5540C	mg/L
Tannins and Lignins	A5550	mg/L
Total Petroleum Hydrocarbons	E418.1	mg/L
Total Organic Halogens (TOX)	SW9020B	mg/L
TPH, Gravimetric-Hexane extractable	E1664A / A5520B	mg/L
TPH, Sulfur corrected w/Copper	E1664-Cu	mg/L
Turbidity	A2130B	NTU

WATER

RADIOCHEMISTRY	METHOD	UNIT
Gamma Emitting Radionuclides	E901.1	pCi/L
Gross Alpha Radioactivity Drinking water	E900.0	pCi/L
Gross Alpha Radioactivity	E900.0	pCi/L
Gross Beta Radioactivity Drinking water	E900.0	pCi/L
Gross Beta Radioactivity	E900.0	pCi/L
Gross Alpha and Beta Drinking water	E900.0	pCi/L
Gross Alpha and Beta	E900.0	pCi/L
Gross Radium Alpha (minus Radon & Uranium)	E900.1	pCi/L
²¹⁰ Lead	E909.0	pCi/L
²¹⁰ Polonium	E912.0	pCi/L
²²⁶ Radium (Alpha Emitting Isotopes)	E903.0	pCi/L
²²⁸ Radium	RA-05	pCi/L
²²² Radon	ASTM D5072-92	pCi/L
Radioactive Strontium	E905.0	pCi/L
Isotopic Thorium (²²⁸ Th, ²³⁰ Th, ²³² Th)	E908.0	pCi/L
²³⁰ Thorium	E908.0	pCi/L
Tritium	E906.0	pCi/L
Isotopic Uranium (²³⁴ U, ²³⁵ U, ²³⁸ U)	A7500U-C	pCi/L

For pricing and information on radiochemical analyses of drinking water, please refer to the *Radiochemistry* section: **RADIOCHEMICAL ANALYSES - Drinking Water**

NOTES:

(1) Some reporting limits are dependent on sample volume provided.

WATER

BACTERIA	METHOD	UNIT
E. coli, quantitative	A9223B	MPN/100ml
E. coli, membrane filtration count	E1603	CFU/100mL
Fecal Coliforms, membrane filtration count	A9222D	CFU/100mL
Fecal Coliforms, sludge, membrane filtration count	A9222D	CFU/g
Fecal Coliforms, quantitative	Colilert-18	MPN/100mL
Fecal Coliforms, sludge	A9221E	MPN/g
Fecal Coliforms, water	A9221E	MPN/100mL
Total Coliforms/E.coli, present/absent	A9223B	P/A
Total Coliforms, present/absent (Pools & Spas)	A9221D	P/A
Total Coliforms/E.coli, quantitative	A9223B Colilert Quantitray	MPN/100mL
Total Coliforms, membrane filtration count	A9222B	CFU/100mL
Heterotrophic Plate Count	A9215E / SimPlate	MPN/mL
Sulfate Reducing Bacteria	Indicating ampule - Can take up to 28 days to complete	CFU/mL
Iron Bacteria	A9240B/ Biological Activity Reaction Test (BART) – Can take up to 10 days to complete	CFU/mL
Slime Forming Bacteria	Indicator – Can take up to 8 days to complete	CFU/mL
NOTE: Weekend and holiday rate may apply.		

1. Must schedule a week in advance.

WATER PARAMETER GROUPING

1. HEALTH AND WATER QUALITY

Parameter	Parameter
Potassium	Total Dissolved Solids
Sodium	Alkalinity
Calcium	Conductivity
Magnesium	pH
Sulfate	Nitrate + Nitrite as N
Chloride	Fluoride
Hardness	Iron
Sampling: 1-500ml white capped plastic bottle, 1-250ml red capped plastic bottle, 1-250ml yellow capped plastic bottle, unpreserved. Store at 4-6°C. Preservatives will be added at the laboratory	
Holding Time: Various - refer to Sampling and Preservation table located in the back of this section	
Health and water quality Analysis Sample Without Bacteria	
Health and water quality Analysis Sample With Bacteria	

2. LIVESTOCK AND IRRIGATION SUITABILITY

Parameter	Parameter	Parameter
Nitrate + Nitrite as N	Conductivity	Sulfate
pH	Calcium	Total Dissolved Solids (see notes)
Magnesium	Sodium	Sodium Adsorption Ratio
Sampling: 1-1L white capped plastic bottle, 1-250ml yellow capped plastic bottle, unpreserved. 1-250ml red capped plastic bottle unpreserved. Store at 4-6°C. Preservatives to be added at the laboratory.		
Holding Time: Various - refer to Sampling and Preservation table located in the back of this section		
Livestock Suitability Sample		

3. RESIDENTIAL-STANDARD HOME LOAN

Parameter	Parameter
Nitrite	Bacteria
Nitrate	
Lead	
Sampling: 1-1L white capped plastic bottle, 1-250ml yellow capped plastic bottle, unpreserved. 1-250ml white capped plastic bottle unpreserved, 1 100mL sterile plastic bottle. Store at 4-6°C. Preservatives to be added at the laboratory.	
Holding Time: 30 hours	
Residential-Standard Home Loan sample	

WATER

4. TOTAL COLIFORM BACTERIA ANALYSIS

Sampling: 1-sterile sample container received from laboratory. Maintain at normal water temperature or Store at 4-6°C.	
Holding Time: 30 hours	
Note: The analysis takes 24 hours to complete. Weekend and holiday rate may apply.	
Total Coliform Bacteria Analysis Sample	

5. METALS SCAN

Aluminum	Cadmium	Iron	Nickel	Sodium
Antimony	Calcium	Lead	Phosphorus	Strontium
Barium	Chromium	Magnesium	Potassium	Thallium
Beryllium	Cobalt	Manganese	Silicon	Titanium
Boron	Copper	Molybdenum	Silver	Vanadium
-	-	-	-	Zinc
Sampling: 1-250 mL plastic bottle preserved with HNO ₃ (red capped ampule).				
Holding Time: 6 months				
ICP Scan: Analyzed in water by ICP to a 0.1 mg/L reporting limit. (Calcium, Magnesium, Sodium, Potassium 5 mg/L reporting limit.)				
ICP Scan Sample				
ICP-MS Scan: A semi-quantitative analysis of water by ICP-MS. This includes 65 elements from lithium at 7 atomic mass units (amu) through uranium (238 amu). Semi-quantitative measurements are made at the sub parts per billion concentration range. Not included are scandium, yttrium, indium, bismuth, Germanium, and gold.				
ICP-MS Scan Sample				

RECOMMENDATIONS FOR SAMPLING AND PRESERVATION OF WATERS

MEASUREMENT	Volume Required (mL)	Container P=Plastic G=Glass	PRESERVATIVE	HOLDING TIME
Preservative ampules:	HNO ₃ – nitric acid (red cap) H ₂ SO ₄ - sulfuric acid (yellow cap) HCl - hydrochloric acid (blue cap) H ₃ PO ₄ - phosphoric acid (white cap) NaOH - sodium hydroxide (green cap) Zinc acetate (purple cap)			
Major minerals, including the following: Potassium, Sodium, Calcium, Magnesium, Sulfate, Chloride, Bicarbonate, Carbonate, pH, Specific Conductance, Total Dissolved Solids	500	P or G	Cool, ≤ 6°C	See holding times for each individual parameter, below
METALS				
Dissolved Metals	250	P	Filter (0.45 micron), then add HNO ₃ to pH<2	6 months
Total Metals	250	P	HNO ₃ to pH <2	6 months
Chromium ⁺⁶	200	P	Cool, ≤ 6°C	24 hours
Ferrous Iron	100	P	Filter (0.45 micron), then add HNO ₃ to pH<2	48 hours
(Fe II - requires field filtering)				
Mercury	100	P	Same as tot. or diss. metals	28 days
Mercury (E245.7)	100	P or G	HCL to pH <2	3 months
NON-METALLICS				
Acidity	100	P or G	Cool, ≤ 6°C	14 days
Alkalinity	100	P or G	Cool, ≤ 6°C	14 days
Biochemical Oxygen Demand (BOD)	1000	P or G	Cool, ≤ 6°C	48 hours
Bromide	100	P or G	None Required	28 days
Carbonaceous BOD	1000	P or G	Cool, ≤ 6°C	48 hours
Chemical Oxygen Demand (COD)	50	P or G	H ₂ SO ₄ to pH <2, Cool, ≤ 6°C	28 days
Chloride	50	P or G	None Required	28 days
Chlorine	50	P or G	None Required	15 minutes
Chlorophyll a	1000	P or G	Cool, ≤ 6°C, keep in the dark	28 days
Color	50	P or G	Cool, ≤ 6°C	48 hours
Conductance	100	P or G	Cool, ≤ 6°C	28 days
Cyanates	500	Dark P	NaOH to pH >12, Cool, ≤ 6°C	14 days
Cyanides	500	Dark P	NaOH to pH >12, Cool, ≤ 6°C	14 days
Ethylene Glycol	500	P or G	Cool, ≤ 6°C	NA

RECOMMENDATIONS FOR SAMPLING AND PRESERVATION OF WATERS, continued

MEASUREMENT	Volume Required (mL)	Container P=Plastic G=Glass	PRESERVATIVE	HOLDING TIME
NON-METALLICS continued				
Fluoride	50	P or G	None Required	28 days
Formaldehyde	100	P or G	Cool, ≤ 6°C	NA
Iodide	100	P or G	None Required	28 days
Hardness	100	P	Cool, ≤ 6°C	6 months
Methane	Feb-40	G VOA	Zero Headspace 4 drops H ₂ SO ₄	NA
Nitrogen, Ammonia	50	P or G	H ₂ SO ₄ to pH <2, Cool, ≤ 6°C	28 days
Nitrogen, Total Kjeldahl	500	P or G	H ₂ SO ₄ to pH <2, Cool, ≤ 6°C	28 days
Nitrogen, Nitrate plus Nitrite	50	P or G	H ₂ SO ₄ to pH <2, Cool, ≤ 6°C	28 days
Nitrogen, Nitrate	50	P or G	Cool, ≤ 6°C	48 hours
Nitrogen, Nitrite	50	P or G	Cool, ≤ 6°C	48 hours
Nitrogen, Total (Persulfate Method)	50	P or G	Cool, ≤ 6°C	28 days
Oil and Grease	2 - 1000	G	H ₂ SO ₄ to pH <2, Cool, ≤ 6°C	28 days
Organic Carbon	125	G	H ₃ PO ₄ to pH <2, Cool, ≤ 6°C	28 days
Organic Carbon, Public Water Supply	250	G	H ₃ PO ₄ to pH <2, Cool, ≤ 6°C	28 days
pH	25	P or G	None Required	15 minutes
Phenolics by E420.4	250	G	H ₂ SO ₄ to pH <2,	28 days
Residue, Total	100	P or G	Cool, ≤ 6°C	7 days

RECOMMENDATIONS FOR SAMPLING AND PRESERVATION OF WATERS, continued

MEASUREMENT	Volume Required (mL)	Container P=Plastic G=Glass	PRESERVATIVE	HOLDING TIME
NON-METALLICS continued				
Residue, Volatile Volatile Suspended Solids (VSS)	100	P or G	Cool, $\leq 6^{\circ}\text{C}$	7 days
Settleable Matter	1000	P or G	Cool, $\leq 6^{\circ}\text{C}$	48 hours
Sulfate	100	P or G	Cool, $\leq 6^{\circ}\text{C}$	28 days
Sulfide	250	P or G	Add 2 mL zinc acetate, zero headspace, NaOH to pH > 9, Cool, $\leq 6^{\circ}\text{C}$	7 days
Sulfite	100	P or G	1 mL of EDTA	15 minutes
Surfactants (Foaming Agents)	500	P or G	Cool, $\leq 6^{\circ}\text{C}$	48 hours
Tannins & Lignins	25	P or G	Cool, $\leq 6^{\circ}\text{C}$	14 days
Thiocyanates	100	P or G	HNO_3 to pH < 2	NA
Total Petroleum Hydrocarbons (TPH)	2 - 1000	G	H_2SO_4 to pH < 2, Cool, $\leq 6^{\circ}\text{C}$	28 days
Total Petroleum Hydrocarbons (TPH) by TCEQ 1005	3-VOA vials with zero headspace	G	HCl to pH < 2, Cool, $\leq 6^{\circ}\text{C}$	14 days
Turbidity	100	P or G	Cool, $\leq 6^{\circ}\text{C}$	48 hours
BACTERIA				
Total Coliform Bacteria	100	Sterile	Cool, < 10°C	30 hours
Fecal Coliform Bacteria	100	Sterile	Cool, < 10°C	8 hours
E. Coli	100	Sterile	Cool, < 10°C	8 hours
Heterotrophic Plate Count	100	Sterile	Cool, < 10°C	8 hours
Sulfate Reducing Bacteria	100	Sterile	Cool, < 10°C	48 hours
Iron Bacteria	100	Sterile	Cool, < 10°C	72 hours
RADIOCHEMISTRY				
Gross Alpha / Beta	1 – 1000	P or G	HNO_3 to pH < 2	6 months
$^{210}\text{Lead}$	2 – 2000			
$^{210}\text{Polonium}$	1 – 1000			
$^{226}\text{Radium}$	2 – 2000			
$^{228}\text{Radium}$	2 – 2000			
$^{230}\text{Thorium}$	1 – 1000			
Uranium	1 - 1000			
$^{222}\text{Radon}$	3-VOA vials with zero headspace	G	Cool, $\leq 6^{\circ}\text{C}$	8 days

ORGANIC CHEMISTRY

List of Acronyms

A	Standard Methods	NH ₄ Cl	Ammonium Chloride
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes	NR	Not Regulated
CFR	Code of Federal Regulations	PAH	Polynuclear Aromatic Hydrocarbons
DBCP	1,2-Dibromo-3-chloropropane	PCBs	Polychlorinated Biphenyls
DRO	Diesel Range Organics	POX	Purgeable Halocarbons
EDB	Dibromoethane	ppb	parts per billion
EOX	Extractable Organic Halogens	ppm	parts per million
E or EPA	US Environmental Protection Agency	PQLs	Practical Quantitation Limits The PQL of diluted samples will be correspondingly higher.
EPH	Extractable Petroleum Hydrocarbons	PVC	Polyvinyl Chloride
GC	Gas Chromatograph	SW	Solid Waste 846
		SVOC	Semi-Volatile Organic Compounds
GC/FID	Gas Chromatograph/Flame Ionization Detector	TCL	Target Compound List
GC/MS	Gas Chromatograph/Mass Spectrometer	TOX	Total Organic Halogens
GRO	Gasoline Range Organics	TEPH	Total Extractable Petroleum Hydrocarbons
H ₂ SO ₄	Sulfuric Acid	TPH	Total Petroleum Hydrocarbons
HCl	Hydrochloric Acid	TPH-IR	Total Petroleum Hydrocarbons by Infrared Spectroscopy
HPLC	High Performance Liquid Chromatography	TRPH	Total Recoverable Petroleum Hydrocarbons
IR	Infrared Spectroscopy	VOCs	Volatile Organic Chemicals
MCL	Maximum Contaminant Level	VPH	Volatile Petroleum Hydrocarbons
NaOH	Sodium Hydroxide		

ORGANIC CHEMISTRY

1. DRINKING WATER ANALYSIS

ANALYSIS	METHOD
Trihalomethanes	E502.2/E524.2
Maximum Trihalomethane Potential	40 CFR Part 141.30
Volatile Halogenated Compounds	E524.2
Volatile Aromatic Compounds	E524.2
EDB and DBCP, low level	E504.1
Nitrogen- Phosphorus and Sulfur Pesticides by GC/MS	E507 Mod.
Chlorinated Acid Herbicides	E515.4
Regulated and Unregulated VOCs	E524.2/E502.2
Regulated and Unregulated VOCs, long list	E524.2 long list
Pesticides (Semi-Volatile Organic Compounds), drinking water list	E525.2
Pesticides (Semi-Volatile Organic Compounds), Montana drinking water list	E525.2
Pesticides (Semi-Volatile Organic Compounds), long list	E525.2
Carbamates	E531.1
Glyphosate	E547
Endothall	E548.1
Diquat	E549.1
Haloacetic Acids	E552.2
Maximum Haloacetic Acid Potential	E552.2

2. VOLATILES

ANALYSIS	METHOD
Purgeable Halocarbons (POX)	SW8021B/E624.1 SW8260B
Purgeable Aromatics	E602/SW8021B/E624.1 SW8260B
POX and Purgeable Aromatics together	E602/E624.1 / SW8260B
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	E602 / SW8021B
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	E524.2/E624.1 / SW8260B
Gasoline Range Organics (GRO)	SW8015C
BTEX and GRO together	E602/SW 8021B + SW8015C (GRO)
Purgeable Organics (VOCs), short list	E624.1 / SW8260B
Acrolein and Acrylonitrile	E624.1 / SW8260B
Purgeable Organics (VOCs), long list	SW8260B
Total Petroleum Hydrocarbons	TNRCC 1005 (mod)

ORGANIC CHEMISTRY

3. PETROLEUM, UST, LUST RELATED ANALYSIS

ANALYSIS	METHOD
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	E602/SW 8021B
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	E524.2/E624.1/SW 8260B
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	E524.2
Gasoline Range Organics (GRO)	SW 8015C
BTEX and GRO together	E602/SW 8021B + SW 8015C (GRO)
Diesel Range Organics (DRO)	SW 8015C
Extractable Petroleum Hydrocarbons Screen (EPH)	MT DEQ MA EPH
Extractable Petroleum Hydrocarbons (EPH) (after screening option without PAHs-if required)	MT DEQ MA EPH
Extractable Petroleum Hydrocarbons (EPH) (after screening option with PAHs-if required)	MT DEQ MA EPH
Extractable Petroleum Hydrocarbons (EPH) (complete without screening)	MT DEQ MA EPH
Volatile Petroleum Hydrocarbons (VPH)	MT DEQ MA VPH
Carbon Scan with DRO (product identification - fingerprinting)	SW 8015C or GC/FID - SimDist
Total Petroleum Hydrocarbons	TNRCC 1005 (mod)
Total Petroleum Hydrocarbons by Infrared Spectroscopy (TPH-IR)	E418.1
Purgeable Organics (VOCs)	E624.1/SW8260B
Oil & Grease, Hexanes Extraction/Gravimetric	E1664A
Oil & Grease, Hexanes Extraction/Gravimetric Sulfur Corrected w/Copper	E1664-Cu
TPH, Hexanes Extraction/Gravimetric	E1664A
TPH, Hexanes Extraction/Gravimetric Sulfur Corrected w/Copper	E1664-Cu
Oil and Grease or TPH by Soxhlet Extraction	SW9071
Hydrocarbons in Headspace Gas	GC/FID / Kampbell (SW8015 Mod.)

ORGANIC CHEMISTRY

4. SEMI-VOLATILES

ANALYSIS	METHOD
Semi-volatile Organics (SVOC) by GC/MS	E625.1/SW8270C
SVOC acid extractables	E625.1/SW8270C
SVOC base/neutral extractables	E625.1/SW8270C
2,3,7,8-TCDD Dioxin – Screening test	E625.1 screening
Phenols, individual compounds by GC/MS	E625.1/SW8270C
Phenols, total in water, colorimetric	E420.4
Phenols, total in soil, colorimetric	SW9065
Phthalate Esters	E625.1/SW8270C
Polynuclear Aromatic Hydrocarbons (PAH), by GC/MS	E625.1/SW8270C
Polynuclear Aromatic Hydrocarbons (PAH), by GC/MS Low Level	E625.1/SW8270C
Diesel Range Organics (DRO)	SW8015C
Carbon Scan with DRO (product identification – fingerprinting)	SW 8015C or GC/FID - SimDist
Total Petroleum Hydrocarbons by Infrared Spectroscopy (TPH-IR)	E418.1

5. HERBICIDES, PESTICIDES AND PCBs

ANALYSIS	METHOD
Polychlorinated biphenyls (PCBs)	E608.3/SW8082A
PCBs in transformer oil	SW8082A
Organochlorine Pesticides and PCBs	E608.3 or SW8081B+ SW8082A
Organochlorine Pesticides	E608.3/SW8081B
Chlorinated Herbicides	E615/SW8151A

ORGANIC CHEMISTRY

6. PFAS-PFOA - 537.1 (DW)

ANALYSIS	Alternate ID	METHOD
11-chloroeicosafuoro-3-oxaundecane-1-sulfonicAcid	11Cl-PF3OUdS	E537.1
9-chlorohexadecafluoro-3-oxanone-1-sulfonic Acid	9Cl-PF3ONS	
4,8-dioxa-3H-perfluorononanoic Acid	ADONA	
Hexafluoropropylene Oxide Dimer Acid	HFPO-DA	
N-ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	
N-methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	
Perfluorobutanesulfonic Acid	PFBS	
Perfluorodecanoic Acid	PFDA	
Perfluorododecanoic Acid	PFDoA	
Perfluoroheptanoic Acid	PFHpA	
Perfluorohexanesulfonic Acid	PFHxA	
Perfluorohexanoic Acid	PFHxS	
Perfluorononanoic Acid	PFNA	
Perfluorooctanoic Acid	PFOA	
Perfluorooctanesulfonic Acid	PFOS	
Perfluorotetradecanoic Acid	PFTA	
Perfluorotridecanoic Acid	PFTTrDA	
Perfluoroundecanoic Acid	PFUnA	

ORGANIC CHEMISTRY

7. PFAS-PFOA - 537.1 (Mod)

ANALYSIS	Alternate ID	METHOD
11-chloroeicosafluoro-3-oxaundecane-1-sulfonic Acid	11Cl-PF3OUdS	E537M
1H, 1H, 2H, 2H-perfluorohexane sulfonic acid	4:2 FTS	
1H, 1H, 2H, 2H-perfluorooctane sulfonic acid	6:2 FTS	
1H, 1H, 2H, 2H-perfluorodecane sulfonic acid	8:2 FTS	
9-chlorohexadecafluoro-3-oxanone-1-sulfonic Acid	9Cl-PF3ONS	
4,8-dioxa-3H-perfluorononanoic Acid	ADONA	
Perfluorooctanesulfonamide	FOSA	
Hexafluoropropylene Oxide Dimer Acid	HFPO-DA	
N-ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	
N-methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	
Perfluorobutanoic Acid	PFBA	
Perfluorobutanesulfonic Acid	PFBS	
Perfluorodecanesulfonic Acid	PFDA	
Perfluorododecanoic Acid	PFDoA	
Perfluorodecanesulfonic Acid	PFDS	
Perfluoroheptanoic Acid	PFHpA	
Perfluoroheptanesulfonic Acid	PFHpS	
Perfluorohexanoic Acid	PFHxA	
Perfluorohexanesulfonic Acid	PFHxS	
Perfluorononanoic Acid	PFNA	
Perfluorononanesulfonic Acid	PFNS	
Perfluorooctanoic Acid	PFOA	
Perfluorooctanesulfonic Acid	PFOS	
Perfluoropentanoic Acid	PFPeA	
Perfluoropentanesulfonic Acid	PFPeS	
Perfluorotetradecanoic Acid	PFTA	
Perfluorotridecanoic Acid	PFTTrDA	
Perfluoroundecanoic Acid	PFUnA	

ORGANIC CHEMISTRY

8. OTHER ORGANICS

ANALYSIS	METHOD
Total Organic Halogens (TOX)	SW9020
Ethylene Glycol	ASTM D2982 Mod.
Glycol by GC	GC-FID / SW8015M
Formaldehyde	NIOSH 3500 Mod.
Methanol	SW8015C
Methane	GC-FID/ Kampbell (SW8015 Mod.)

9. PREPARATORY METHODS

Extractions, Preparations and Cleanups From SW-846, Test Methods For Evaluating Solid Waste	
These methods are used to prepare or cleanup samples for analysis. Unless specified by the sample submitter, the laboratory will select the appropriate method based on the sample matrix, the analytical method, and the data objectives.	
Method	DESCRIPTION
SW3510C	Separatory Funnel Liquid-Liquid Extraction
SW3520C	Continuous Liquid-Liquid Extraction
SW3545	Accelerated Solvent Extraction
SW3550C	Ultrasonic Extraction
SW3580A	Waste Dilution
SW5030B	Purge-and-Trap
SW5031	Azeotropic Distillation
SW5035	Extractions for Volatile Organics in Soil and Waste
SW3620B	Florisil Column Cleanup
SW3630C	Silica Gel Cleanup
SW3650A	Acid-Base Partition Cleanup
SW3660B	Sulfur Cleanup
SW3665A	Sulfuric Acid/Permanganate Cleanup

ORGANIC CHEMISTRY SAMPLING AND PRESERVATION

METHOD	SAMPLE BOTTLE(s), Water ⁽¹⁾	SAMPLE BOTTLE, Solids ⁽¹⁾	Preservation of water samples (solids are not preserved) ⁽²⁾	Additional treatment for chlorinated samples	Holding time to extraction, days	Holding time to analysis, days
E502.2	3-40 mL VOA ⁽³⁾	NA	HCl to pH <2	sodium thiosulfate	NA	14
E504.1	3-40 mL VOA ⁽³⁾	NA	3 mg sodium thiosulfate	ascorbic acid or sodium thiosulfate	14	24 hours
E507mod	2-1000 mL G	4oz w/m Amber Glass	None	sodium thiosulfate	14	28
E508A	2-1000 mL G	NA	None	None	14	30
E515.4	1-250 mL G	NA	None	Sodium Sulfite	14	28
E524.2	3-40 mL VOA ⁽³⁾	NA	HCl to pH <2	ascorbic acid	NA	14
E525.2	2-1000 mL G	NA	HCl to pH <2	sodium sulfite – dechlorinate before adding acid.	14	30
E531.1	3-40 mL VOA ⁽³⁾	NA	1.2 mL monochloro-acetic acid	sodium thiosulfate	NA	28
E547	1-40 mL VOA ⁽³⁾	NA	None	sodium thiosulfate	NA	14
E548.1	1-1000 mL G	NA	None	sodium thiosulfate	7	14
E549	2-liter P (or PVC)	NA	None	sodium thiosulfate	7	21
E552.2	3-40 mL VOA ⁽³⁾	NA	NH ₄ Cl, 100 mg/L	none	14	14
E601/ SW8021B	3-40 mL VOA ⁽³⁾	4oz w/m Amber Glass	HCl to pH <2	ascorbic acid	NA	14
E602/ SW8021B	3-40 mL VOA ⁽³⁾	4oz w/m Amber Glass	HCl to pH <2	ascorbic acid	NA	14
E608.3/ SW8081B	3-1000 mL G	4oz w/m Amber Glass	None	sodium thiosulfate	7 (w); 14 (s)	40
E612/ SW8121	1-1000 mL G	4oz w/m Amber Glass	None	none	7 (w); 14 (s)	40
E615/ SW8151A	1-1000 mL G	4oz w/m Amber Glass	None	sodium thiosulfate	7 (w); 14 (s)	40
E624.1/ SW8260B	3-40 mL VOA ⁽³⁾	4oz w/m Amber Glass	HCl to pH <2	ascorbic acid	NA	14
<p>Acrolein and Acrylonitrile should be sampled in separate vials from other VOCs, 3-40 mL VOA vials. Unpreserved (raw), chilled to 4-6°C and analyzed within 3 days of collection. Or, pH adjusted to 4-5 with HCl, chilled to 4-6°C, and analyzed within 14 days. Add ascorbic acid to chlorinated samples. Store at 4-6°C. Contact the laboratory prior to sampling to arrange for this analysis</p>						
E625.1/ SW8270C	2-1000 mL G	4oz w/m Amber Glass	None	sodium thiosulfate	7 (w); 14 (s)	40
BTEX	3-40 mL VOA ⁽³⁾	4oz w/m Amber Glass	HCl to pH <2	ascorbic acid	NA	14
GRO	3-40 mL VOA ⁽³⁾	4oz w/m Amber Glass	HCl to pH <2	none	NA	14
DRO	2-1000 mL G	4oz w/m Amber Glass	H ₂ SO ₄ to pH <2	none	7 (w); 14 (s)	40

ORGANIC CHEMISTRY

SAMPLING AND PRESERVATION (continued)

METHOD	SAMPLE BOTTLE(s), Water ⁽¹⁾	SAMPLE BOTTLE, Solids ⁽¹⁾	Preservation of water samples (solids are not preserved) ⁽²⁾	Additional treatment for chlorinated samples	Holding time to extraction, days	Holding time to analysis, days
E418.1/TPH	1-1000 mL G	4oz w/m Amber Glass	H ₂ SO ₄ to pH <2	none	7	40
TPH by TNRCC 1005 (mod)	3-40mL VOA	4 oz G	HCl to pH <2	none	14	14
E1664 O & G	2-1000 mL c G	NA	H ₂ SO ₄ to pH <2	none	NA	28
E1664 TPH	2-1000 mL c G	NA	H ₂ SO ₄ to pH <2	none	NA	28
EPH	2-1000 mL G	4oz w/m Amber Glass	H ₂ SO ₄ to pH <2	none	14(w); 14(s)	40
VPH	3-40 mL VOA ⁽³⁾	4oz w/m Amber Glass	HCl to pH <2	ascorbic acid	7(s)	14 (w); 28(s)
537.1	3-250 mL PP WM UP ⁽³⁾	4oz PP WM	Trizma		14	28
537.1 Mod	3-250 mL PP WM UP ⁽³⁾	4oz PP WM	Trizma		14	28

Notes: 1 – Sample bottles; P = plastic; G = glass; w/m = wide mouth; c = clear

2 – Most parameters should be shipped and stored at 4-6°C.

3 – Water samples collected for volatiles must be taken with zero headspace. The VOA vial must be completely full, no headspace.

4 – 7 days if heptachlor epoxide is required.

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Trihalomethanes (Method E502.2/E524.2)

Sampling: 3-40 mL glass/teflon VOA vials completely full with no air bubbles. Store at 4-6°C. Add ascorbic acid to chlorinated samples. Preserve with 5-10 drops hydrochloric acid to pH <2 (smaller blue capped ampule).

Holding Time: 14 days

Drinking Water MCL: 80 µg/L total of all four trihalomethanes

	<u>CAS NO.</u>	<u>PQL, µg/L</u>		<u>CAS NO.</u>	<u>PQL, µg/L</u>
Bromodichloromethane	75-27-4	0.5	Chloroform	67-66-3	0.5
Bromoform	75-25-2	0.5	Dibromochloromethane	124-48-1	0.5

Maximum Trihalomethane Potential (40 CFR Part 141.30)

Sampling: Sample in 40 mL glass/teflon VOA vials completely full with no air bubbles. If no residual chlorine is present, obtain 10 vials; if residual chlorine is present, take 4 vials. Store at 4-6°C. Do not preserve.

Holding Time: None specified in method. Incubation should be started upon receipt of samples.

Volatile Halogenated Compounds (Method E502.2/E524.2)

Sampling: 3-40 mL glass/Teflon VOA vials completely full with no air bubbles. Store at 4-6°C. Add ascorbic acid to chlorinated samples. Preserve with 5-10 drops hydrochloric acid to pH <2 (smaller blue capped ampule).

Holding Time: 14 days

Notes: MCL = Drinking Water MCL
EPA MCL for the Total for all four Trihalomethanes = 80 µg/L
For regulatory compliance, DBCP and EDB should be analyzed by Method E504.1, which has lower PQLs.
E500 series methods are appropriate only for drinking water analyses. For other waters, wastewaters or solids use the E600 or SW 8000 series methods.

	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>		<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>
Bromobenzene	108-86-1	NR	0.5	1,2-Dichloroethane	107-06-2	5	0.5
Bromochloromethane	74-97-5	NR	0.5	1,1-Dichloroethene	75-35-4	7	0.5
Bromodichloromethane	75-27-4	(See THM Note)	0.5	cis-1,2-Dichloroethene	156-59-2	70	0.5
Bromoform	75-25-2	(See THM Note)	0.5	trans-1,2-Dichloroethene	156-60-5	100	0.5
Bromomethane	74-83-9	NR	0.5	1,2-Dichloropropane	78-87-5	5	0.5
Carbon Tetrachloride	56-23-5	5	0.5	1,3-Dichloropropane	142-28-9	NR	0.5
Chlorobenzene	108-90-7	100	0.5	1,1-Dichloropropene	563-58-6	NR	0.5
Chloroethane	75-00-3	NR	0.5	Methylene Chloride (Dichloromethane)	75-09-2	5	0.5
Chloroform	67-66-3	(See THM Note)	0.5	1,1,1,2-Tetrachloroethane	630-20-6	NR	0.5
Chloromethane	74-87-3	NR	0.5	1,1,2,2-Tetrachloroethane	79-34-5	NR	0.5
2-Chlorotoluene	95-49-8	NR	0.5	Tetrachloroethene (Tetrachloroethylene)	127-18-4	5	0.5
Chlorodibromomethane	124-48-1	(See THM Note)	0.5	1,1,1-Trichloroethane	71-55-6	200	0.5
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.2 (See Notes)	0.5	1,1,2-Trichloroethane	79-00-5	5	0.5
Dibromoethane (EDB)	106-93-4	0.05 (See Notes)	0.5	Trichloroethene (Trichloroethylene)	79-01-6	5	0.5
Dibromomethane	74-95-3	NR	0.5	Trichlorofluoromethane	75-69-4	NR	0.5
1,2-Dichlorobenzene	95-50-1	NR	0.5	1,2,3-Trichloropropane	96-18-4	NR	0.5
1,3-Dichlorobenzene	541-73-1	600	0.5	Vinyl Chloride (Chloroethene)	75-01-4	2	0.5
1,4-Dichlorobenzene	106-46-7	75	0.5				
Dichlorodifluoromethane	75-71-8	NR	0.5				
1,1-Dichloroethane	75-34-3	NR	0.5				

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Volatile Aromatic Compounds (Method E502.2/E524.2)

Sampling: 3-40 mL glass/teflon VOA vials completely full with no air bubbles. Store at 4-6°C. Add ascorbic acid to chlorinated samples. Preserve with 5-10 drops hydrochloric acid to pH <2 (smaller blue capped ampule).

Holding Time: 14 days

Notes: MCL = Drinking Water MCL
E500 series methods are appropriate only for drinking water analyses. For other waters, wastewaters or solids use the E600 or SW 8000 series methods.

	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>		<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>
Benzene	71-43-2	5	0.5	Naphthalene	91-20-3	NR	0.5
Bromobenzene	108-86-1	NR	0.5	n-Propylbenzene	103-65-1	NR	0.5
n-Butylbenzene	104-51-8	NR	0.5	Styrene	100-42-5	100	0.5
sec-Butylbenzene	135-98-8	NR	0.5	Tetrachloroethene (Tetrachloroethylene)	127-18-4	5	0.5
tert-Butylbenzene	98-06-6	NR	0.5	Toluene	108-88-3	1000	0.5
Chlorobenzene	108-90-7	100	0.5	1,2,3-Trichlorobenzene	87-61-6	NR	0.5
2-Chlorotoluene	95-49-8	NR	0.5	1,2,4-Trichlorobenzene	120-82-1	70	0.5
4-Chlorotoluene	106-43-4	NR	0.5	Trichloroethene (Trichloroethylene)	79-01-6	5	0.5
1,2-Dichlorobenzene	95-50-1	600	0.5	1,2,4-Trimethylbenzene	95-63-6	NR	0.5
1,3-Dichlorobenzene	541-73-1	NR	0.5	1,3,5-Trimethylbenzene	108-67-8	NR	0.5
1,4-Dichlorobenzene	106-46-7	75	0.5	Xylenes:		10000	0.5
Ethylbenzene	100-41-4	700	0.5	M	108-38-3		
Hexachlorobutadiene	87-68-3	NR	0.5	P	106-42-3		
Isopropylbenzene	98-82-8	NR	0.5	O	95-47-6		
p-Isopropyltoluene	99-87-6	NR	0.5				

Low Level EDB and DBCP (Method E504.1)

Sampling: 3-40mL glass/teflon VOA vials completely full with no air bubbles. Store at 4-6°C. Add 3 mg sodium thiosulfate to chlorinated and non-chlorinated samples.

Holding Time: 14 days.

Notes: MCL = Drinking Water MCL
E500 series methods are appropriate only for drinking water analyses. For other waters, wastewaters or solids use the E600 or SW 8000 series methods.

	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>		<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>
1,2-Dibromo-3-Chloropropane (DBCP)	96-12-8	0.2	0.02	1,2-Dibromoethane (Ethylene Dibromide) (EDB)	106-93-4	0.05	0.1
1,2,3,-Trichloropropane	96-18-4	NR	0.05				

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Nitrogen, Phosphorus, and Sulfur Containing Pesticides (Method E507 Mod.)

Sampling: Water: 2-1000 mL glass/teflon bottles. Store at 4-6°C. Add sodium thiosulfate to chlorinated samples.

Soil: 125 mL wide mouth glass jar. Store at 4-6°C.

Holding Time: 14 days to extraction; 28 days to analysis

Notes: All analytes are analyzed and positively identified using a mass spectrometer detector in place of the nitrogen-phosphorus detector specified.

	CAS NO.	—PQL—			CAS NO.	—PQL—	
		mg/Kg	µg/L			mg/Kg	µg/L
Alachlor	15972-60-8	0.003	0.1	Metolachlor	51218-45-2	0.063	
Ametryn	834-12-8	0.003	0.1	Metribuzin	21087-64-9	0.003	0.1
Atraton	1610-17-9	0.003	0.1	Mevinphos	7786-34-7	0.003	0.1
Atrazine	1912-24-9	0.003	0.1	MGK-264	113-48-4	0.003	0.1
Benefin	1861-40-1	0.003	0.1	Molinate	2212-67-1	0.003	0.1
Bromacil	314-40-9	0.003	0.1	Napropamide	15299-99-7	0.003	0.1
Butachlor	23184-66-9	0.003	0.1	Norflurazon	27314-13-2	0.003	0.1
Butylate	2008-41-5	0.003	0.1	Oxadiazon	19666-30-9	0.003	0.1
Carboxin	5234-68-5	0.003	0.1	Oxyfluorfen	42874-03-3	0.003	0.5
Chlorpropham	101-21-3	0.003	0.1	Pebulate	1114-71-2	0.003	0.1
Chlorpyrifos	2921-88-2	0.003	0.1	Pendimethalin	40487-42-1	0.003	0.1
Cyanazine	21725-46-2	0.003	0.1	Phorate	298-02-2	0.003	0.1
Cycloate	1134-23-2	0.003	0.1	Profluralin	26399-36-0	0.003	0.1
Diazinon	333-41-5	0.003	0.1	Prometon	1610-18-0	0.003	0.1
Dichlorvos	62-73-7	0.003	0.1	Prometryne	7287-19-6	0.003	0.1
Diphenamid	957-51-7	0.003	0.1	Pronamide	23950-58-5	0.003	0.1
Disulfoton	298-04-4	0.003	0.1	Propachlor	1918-16-7	0.003	0.1
EPTC	759-94-4	0.003	0.1	Propazine	139-40-2	0.003	0.1
Ethalfuralin	55283-68-6	0.003	0.1	Simazine	122-34-9	0.003	0.1
Ethoprop	13194-48-4	0.003	0.1	Simetryn	1014-70-6	0.003	0.1
Fenamiphos	22224-92-6	0.003	0.1	Stirofos	22248-79-9	0.003	0.1
Fenarimol	60168-88-9	0.017	0.5	Terbacil	5902-51-2	0.003	0.1
Fluridone	59756-60-4	0.003	0.1	Terbufos	13071-79-9	0.003	0.1
Fonofos	944-22-9	0.003	0.1	Terbutryn	886-50-0	0.003	0.1
Hexazinone	51235-04-2	0.003	0.1	Triadimefon	43121-43-3	0.003	0.1
Isopropalin	33820-53-0	0.003	0.1	Triallate	2303-17-5	0.003	0.1
Malathion	121-7-5	0.3	0.1	Tricyclazole	41814-78-2	0.003	0.1
Merphos	150-50-5	0.003	0.1	Trifluralin	1582-09-8	0.003	0.1
Methyl paraoxon	950-35-6	0.017	0.1	Vernolate	1929-77-7	0.003	0.1

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

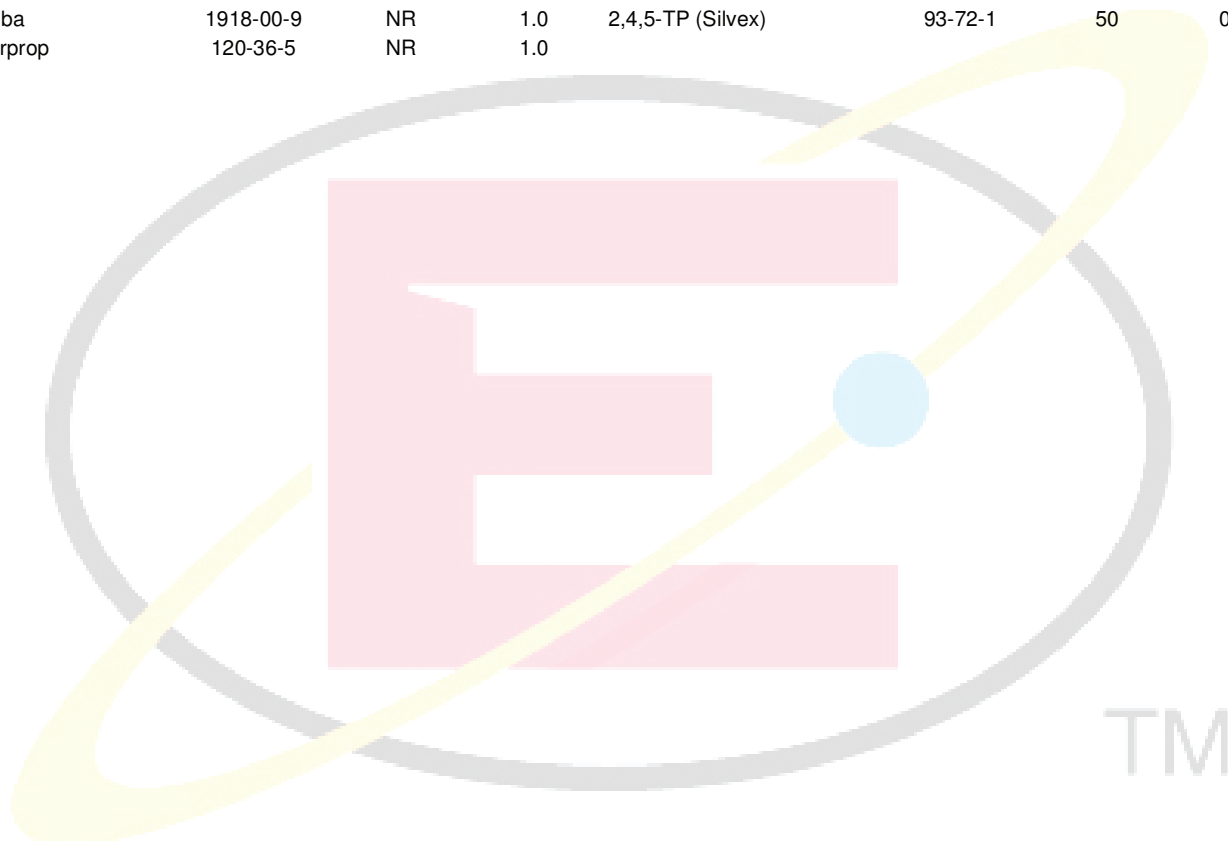
Chlorinated Acid Herbicides (Method E515.4)

Sampling: 1-250 mL Amber Glass with Sodium Sulfite. Store at 4-6°C.

Holding Time: 14 days to extraction; 28 days to analysis.

Notes: MCL = Drinking Water MCL
E500 series methods are appropriate only for drinking water analyses. For other waters, wastewaters or solids use the E600 or SW 8000 series methods.

	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>		<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>
2,4-D	94-75-7	70	1.0	Dinoseb	88-85-7	7	1.0
2,4-DB	94-82-6	NR	1.0	Pentachlorophenol (PCP)	87-86-5	1	0.10
Dalapon	75-99-0	200	2.5	Picloram	1918-02-1	500	0.50
Dicamba	1918-00-9	NR	1.0	2,4,5-TP (Silvex)	93-72-1	50	0.25
Dichlorprop	120-36-5	NR	1.0				



ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Pesticides (Method E525.2 - Drinking Water List)

Sampling: 2-1000 mL glass bottles preserved with hydrochloric acid (large blue capped ampule) to a pH <2. Residual chlorine is reduced in the sample by the addition of 40-50 mg of sodium sulfite. Mix well to ensure it is dissolved in the sample. It is very important that the sample be dechlorinated prior to adding acid to lower the pH. Store at 4-6°C.

Holding Time: 14 days to extraction; 30 days to analysis.

Notes: MCL = Drinking Water MCL
E500 series methods are appropriate only for drinking water analyses. For other waters, wastewaters or solids use the E600 or SW 8000 series methods.

	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>		<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>
Alachlor	5972-60-8	2	0.1	Chlordane	57-74-9	2	1
Aldrin	309-00-2	NR	0.1	Dieldrin	60-57-1	NR	0.1
PCBs		0.5		Endrin	72-20-8	2	0.1
Aroclor 1016	12674-11-2	NR	0.08	gamma-BHC (Lindane)	58-89-9	0.2	0.1
Aroclor 1221	11104-28-2	NR	2	Heptachlor	76-44-8	0.4	0.1
Aroclor 1232	11141-16-5	NR	0.5	Heptachlor epoxide	1024-57-3	0.2	0.1
Aroclor 1242	53469-21-9	NR	0.3	Hexachlorobenzene	118-74-1	1	0.1
Aroclor 1248	12672-29-6	NR	0.1	Hexa-chlorocyclopentadiene	77-74-4	50	0.1
Aroclor 1254	11097-69-1	NR	0.1	Methoxychlor	72-43-5	40	0.1
Aroclor 1260	11096-82-5	NR	0.2	Metolachlor	51218-45-2	NR	0.1
Atrazine	1912-24-9	3	0.1	Metribuzin	21087-64-9	NR	0.1
Benzo(a)pyrene	50-32-8	0.2	0.1	Propachlor	1918-16-7	NR	0.1
bis(2-ethylhexyl)Adipate	103-23-1	400	0.5	Simazine	122-34-9	4	0.1
bis(2-ethylhexyl) Phthalate	117-81-7	6	2	Toxaphene	8001-35-2	3	2
Butachlor	23184-66-9	NR	0.1				

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ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Pesticides (Method E525.2 - Long List)

Sampling: 2-1000 mL glass bottles preserved with hydrochloric acid (large blue capped ampule) to a pH <2. Residual chlorine is reduced in the sample by the addition of 40-50 mg of sodium sulfite. Mix well to ensure it is dissolved in the sample. It is very important that the sample be dechlorinated prior to adding acid to lower the pH. Store at 4-6°C.

Holding Time: 14 days to extraction; 30 days to analysis.

Notes: ** Compounds included on the State of Montana Drinking Water Pesticide List.
MCL = Drinking Water MCL
E500 series methods are appropriate only for drinking water analyses. For other waters, wastewaters or solids use the E600 or SW 8000 series methods.

	<u>CAS NO.</u>	<u>MCL,</u> <u>µg/L</u>	<u>PQL,</u> <u>µg/L</u>		<u>CAS NO.</u>	<u>MCL,</u> <u>µg/L</u>	<u>PQL,</u> <u>µg/L</u>
Acenaphthylene	208-96-8	NR	0.10	** Di (2-ethylhexyl) Adipate	103-23-1	400	0.50
** Alachlor	15972-60-8	2	0.10	Fluorene	86-73-7	NR	0.10
** Aldrin	309-00-2	NR	0.10	** Heptachlor	76-44-8	0.4	0.10
Anthracene	120-12-7	NR	0.10	** Heptachlor Epoxide	1024-57-3	0.2	0.10
** Atrazine	1912-24-9	3	0.10	Heptachlorobiphenyl	52663-71-5	NR	0.10
Benzo(a)anthracene	56-55-3	NR	0.10	** Hexachlorobenzene	118-74-1	1	0.10
Benzo(b)fluoranthene	205-99-2	NR	0.10	Hexachlorobiphenyl	60145-22-4	NR	0.10
Benzo(k)fluoranthene	207-08-9	NR	0.10	** Hexachlorocyclopentadiene	77-47-4	50	0.50
Benzo(g h i)perylene	191-24-2	NR	0.10	Indeno(1 2 3-cd)pyrene	193-39-5	NR	0.10
** Benzo(a)pyrene	50-32-8	0.2	0.10	** Lindane	58-89-9	0.2	0.10
** Butachlor	23184-66-9	NR	0.10	** Methoxychlor	72-43-5	40	0.10
Butylbenzylphthalate	85-68-7	NR	0.10	** Metolachlor	51218-45-2	NR	0.10
** Alpha-chlordane	5103-71-9	(Chlordane	0.10	** Metribuzin	21087-64-9	NR	0.10
** Gamma-chlordane	5103-74-2	MCL: 2)	0.10	Trans-Nonachlor	21641-70-3	NR	0.10
2-Chlorobiphenyl	2051-60-7	NR	0.10	Octachlorobiphenyl	40186-71-8	NR	0.10
Chrysene	218-01-9	NR	0.10	Pentachlorophenol	87-86-5	1	1.0
Dibenzo(a h)anthracene	53-70-3	NR	0.10	Phenanthrene	85-01-8	NR	0.10
2,3-Dichlorobiphenyl	16605-91-7	NR	0.10	** Propachlor	1918-16-7	NR	0.10
** Dieldrin	60-57-1	NR	0.10	** Pyrene	129-00-0	NR	0.10
Diethylphthalate	84-66-2	NR	0.10	** Simazine	122-34-9	4	0.10
** Di(2-ethylhexyl)Phthalate	117-81-7	6	2.0	Tetrachlorobiphenyl	2437-79-8	NR	0.10
Dimethyl Phthalate	131-11-3	NR	0.10	** Toxaphene	8001-35-2	3	0.10
Di-n-Butylphthalate	84-74-2	NR	0.10	2,4,5-Trichlorobiphenyl	15862-07-4	NR	0.10
** Endrin	72-20-8	2	0.10				

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Regulated and Unregulated Volatile Organic Compounds (VOCs) (Method E524.2)

Sampling: 3-40 mL glass/teflon VOA vials completely full with no air bubbles. Store at 4-6°C. Add ascorbic acid to chlorinated samples. Preserve with 5-10 drops hydrochloric acid to pH <2 (smaller blue capped ampule).

Holding Time: 14 days

Notes: MCL = Drinking Water MCL
EPA MCL for the Total for all four Trihalomethanes = 80 µg/L
For regulatory compliance, DBCP and EDB should be analyzed by EPA Method 504.1, which has lower PQLs.
E500 series methods are appropriate only for drinking water analyses. For other waters, wastewaters or solids use the E600 or SW 8000 series methods.

<u>Regulated VOCs</u>	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL*µg/L</u>	<u>Regulated VOCs</u>	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL*µg/L</u>
Benzene	71-43-2	5	0.5	Styrene	100-42-5	100	0.5
Carbon Tetrachloride	56-23-5	5	0.5	Tetrachloroethene	127-18-4	5	0.5
Chlorobenzene	108-90-7	100	0.5	Toluene	108-88-3	1000	0.5
1,2-Dichlorobenzene	95-50-1	600	0.5	1,2,4-Trichlorobenzene	120-82-1	70	0.5
1,4-Dichlorobenzene	106-46-7	75	0.5	1,1,1-Trichloroethane	71-55-6	200	0.5
1,2-Dichloroethane	107-06-2	5	0.5	1,1,2-Trichloroethane	79-00-5	5	0.5
1,1-Dichloroethene	75-35-4	7	0.5	Trichloroethene	79-01-6	5	0.5
cis-1,2-Dichloroethene	156-59-2	70	0.5	Vinyl Chloride	75-01-4	2	0.5
trans-1,2-Dichloroethene	156-60-5	100	0.5	Xylenes:		10000	0.5
1,2-Dichloropropane	78-87-5	5	0.5	M	108-38-3		
Ethylbenzene	100-41-4	700	0.5	P	106-42-3		
Methylene Chloride	75-09-2	5	0.5	0	95-47-6		

<u>Total Trihalomethanes</u>	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL µg/L</u>	<u>Total Trihalomethanes</u>	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL µg/L</u>
Bromodichloromethane	75-27-4	See Note	0.5	Chlorodibromomethane	124-48-1	See Note	0.5
Bromoform	75-25-2	See Note	0.5	Chloroform	67-66-3	See Note	0.5

<u>Other EPA Listed VOCs</u>	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL µg/L</u>	<u>Other EPA Listed VOCs</u>	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL µg/L</u>
Bromobenzene	108-86-1	NR	0.5	1,3-Dichloropropane	142-28-9	NR	0.5
Bromochloromethane	74-97-5	NR	0.5	cis-1,3-Dichloropropene	10061-01-5	NR	0.5
Bromomethane	74-83-9	NR	0.5	trans-1,3-Dichloropropene	10061-02-6	NR	0.5
n-Butylbenzene	104-51-8	NR	0.5	2,2-Dichloropropane	590-20-7	NR	0.5
sec-Butylbenzene	135-98-8	NR	0.5	Hexachlorobutadiene	87-68-3	NR	0.5
tert-Butylbenzene	98-06-6	NR	0.5	Isopropylbenzene	98-82-8	NR	0.5
Chloroethane	75-00-3	NR	0.5	p-Isopropyltoluene	99-87-6	NR	0.5
Chloromethane	74-87-3	NR	0.5	Trichlorofluoromethane	75-69-4	NR	0.5
2-Chlorotoluene	95-49-8	NR	0.5	Naphthalene	91-20-3	NR	0.5
4-Chlorotoluene	106-43-4	NR	0.5	n-Propylbenzene	103-65-1	NR	0.5
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.2 (See Note)	1	1,1,1,2-Tetrachloroethane	630-20-6	NR	0.5
1,2-Dibromoethane (EDB)	106-93-4	0.05 (See Note)	0.5	1,1,2,2-Tetrachloroethane	79-34-5	NR	0.5
Dibromomethane	74-95-3	NR	0.5	Methyl-t-butyl ether	1634-04-4	NR	0.5
1,3-Dichlorobenzene	541-73-1	NR	0.5	1,2,3-Trichlorobenzene	87-61-6	NR	0.5
Dichlorodifluoromethane	75-71-8	NR	0.5	1,2,3-Trichloropropane	96-18-4	NR	0.5
1,1-Dichloroethane	75-34-3	NR	0.5	1,2,4-Trimethylbenzene	95-63-6	NR	0.5
1,1-Dichloropropene	563-58-6	NR	0.5	1,3,5-Trimethylbenzene	108-67-8	NR	0.5

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Volatile Organic Compounds (VOCs) (Method E524.2 - Long List)

Sampling: 3-40 mL glass/teflon VOA vials completely full with no air bubbles. Store at 4-6°C. Add ascorbic acid to chlorinated samples. Preserve with 5-10 drops hydrochloric acid to pH <2 (smaller blue capped ampule).

Holding Time: 14 days

Notes: MCL = Drinking Water MCL
EPA MCL Total for all four Trihalomethanes = 80 µg/L
For regulatory compliance, DBCP and EDB should be analyzed by Method E504.1, which has lower PQLs.
E500 series methods are appropriate only for drinking water analyses. For other waters, wastewaters or solids use the E600 or SW 8000 series methods.

<u>Regulated VOCs</u>	<u>CAS NO.</u>	<u>MCL,</u> <u>µg/L</u>	<u>PQL,</u> <u>µg/L</u>	<u>Regulated VOCs</u>	<u>CAS NO.</u>	<u>MCL,</u> <u>µg/L</u>	<u>PQL,</u> <u>µg/L</u>
Benzene	71-43-2	5	0.5	Styrene	100-42-5	100	0.5
Carbon Tetrachloride	56-23-5	5	0.5	Tetrachloroethene	127-18-4	5	0.5
Chlorobenzene	108-90-7	100	0.5	Toluene	108-88-3	1000	0.5
1,2-Dichlorobenzene	95-50-1	600	0.5	1,2,4-Trichlorobenzene	120-82-1	70	0.5
1,4-Dichlorobenzene	106-46-7	75	0.5	1,1,1-Trichloroethane	71-55-6	200	0.5
1,2-Dichloroethane	107-06-2	5	0.5	1,1,2-Trichloroethane	79-00-5	5	0.5
1,1-Dichloroethene	75-35-4	7	0.5	Trichloroethene	79-01-6	5	0.5
cis-1,2-Dichloroethene	156-59-2	70	0.5	Vinyl Chloride	75-01-4	2	0.5
trans-1,2-Dichloroethene	156-60-5	100	0.5	Xylenes:		10000	0.5
1,2-Dichloropropane	78-87-5	5	0.5	M	108-38-3		
Ethylbenzene	100-41-4	700	0.5	P	106-42-3		
Methylene Chloride	75-09-2	5	0.5	0	95-47-6		
<u>Total Trihalomethanes</u>	<u>CAS NO.</u>	<u>MCL,</u> <u>µg/L</u>	<u>PQL,</u> <u>µg/L</u>	<u>Total Trihalomethanes</u>	<u>CAS NO.</u>	<u>MCL,</u> <u>µg/L</u>	<u>PQL,</u> <u>µg/L</u>
Bromodichloromethane	75-27-4	See Note	0.5	Chlorodibromomethane	124-48-1	See Note	0.5
Bromoform	75-25-2	See Note	0.5	Chloroform	67-66-3	See Note	0.5
<u>Other EPA Listed VOCs</u>	<u>CAS NO.</u>	<u>MCL,</u> <u>µg/L</u>	<u>PQL,</u> <u>µg/L</u>	<u>Other EPA Listed VOCs</u>	<u>CAS NO.</u>	<u>MCL,</u> <u>µg/L</u>	<u>PQL,</u> <u>µg/L</u>
Acetone	67-64-1	NR	20	trans-1,3-Dichloropropene	10061-02-6	NR	0.5
Acrylonitrile	107-13-1	NR	20	2,2-Dichloropropane	590-20-7	NR	0.5
Allyl chloride	107-05-1	NR	10	Diethyl ether	60-29-7	NR	1.0
Bromobenzene	108-86-1	NR	0.5	Ethyl methacrylate	97-63-2	NR	10
Bromochloromethane	74-97-5	NR	0.5	Fluorotrichloromethane	75-69-4	NR	0.5
Bromomethane	74-83-9	NR	0.5	Hexachlorobutadiene	87-68-3	NR	0.5
2-Butanone	78-93-3	NR	20	Hexachloroethane	67-72-1	NR	10
n-Butylbenzene	104-51-8	NR	0.5	2-Hexanone	591-78-6	NR	10
sec-Butylbenzene	135-98-8	NR	0.5	Isopropylbenzene	98-82-8	NR	0.5
tert-Butylbenzene	98-06-6	NR	0.5	p-Isopropyltoluene	99-87-6	NR	0.5
Carbon disulfide	75-15-0	NR	10	Methacrylonitrile	126-98-7	NR	10
Chloroacetonitrile	107-14-2	NR	10	Methylacrylate	96-33-3	NR	10
1-Chlorobutane	109-69-3	NR	10	Methyl iodide (Iodomethane)	74-88-4	NR	1.0
Chloroethane	75-00-3	NR	0.5	Methylmethacrylate	80-62-6	NR	10
Chloromethane	74-87-3	NR	0.5	4-Methyl-2-pentanone	108-10-1	NR	10
2-Chlorotoluene	95-49-8	NR	0.5	Methyl-t-butyl ether	1634-04-4	NR	1.0
4-Chlorotoluene	106-43-4	NR	0.5	Naphthalene	91-20-3	NR	0.5
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.2 (See Note)	1	Nitrobenzene	98-95-3	NR	50
1,2-Dibromoethane (EDB)	106-93-4	0.05 (See Note)	0.5	2-Nitropropane	79-46-9	NR	20
Dibromomethane	74-95-3	NR	0.5	Pentachloroethane	76-01-7	NR	10
1,3-Dichlorobenzene	541-73-1	NR	0.5	Propionitrile	107-12-0	NR	20
trans-1,4-Dichloro-2-butene	110-57-6	NR	1.0	n-Propylbenzene	103-65-1	NR	0.5
Dichlorodifluoromethane	75-71-8	NR	0.5	1,1,1,2-Tetrachloroethane	630-20-6	NR	0.5
1,1-Dichloroethane	75-34-3	NR	0.5	1,1,2,2-Tetrachloroethane	79-34-5	NR	0.5
1,1-Dichloropropanone	513-88-2	NR	20	Tetrahydrofuran	109-99-9	NR	50
1,1-Dichloropropene	563-58-6	NR	0.5	1,2,3-Trichlorobenzene	87-61-6	NR	0.5
1,3-Dichloropropane	142-28-9	NR	0.5	1,2,3-Trichloropropane	96-18-4	NR	0.5
cis-1,3-Dichloropropene	10061-01-5	NR	0.5	1,2,4-Trimethylbenzene	95-63-6	NR	0.5
				1,3,5-Trimethylbenzene	108-67-8	NR	0.5

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Carbamates (Method E531.1)

Sampling: 3-40 mL glass/teflon VOA vials or 1-60 mL vial. The bottle must not be prerinsed with sample. Samples must be preserved at pH 3 with monochloro-acetic acid buffer (1.2 mL/40 mL VOA vial). Store at 4-6°C. Add sodium thiosulfate to chlorinated samples.

Holding Time: 28 days

Note: MCL = Drinking Water MCL
E500 series methods are appropriate only for drinking water analyses

	<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>		<u>CAS NO.</u>	<u>MCL, µg/L</u>	<u>PQL, µg/L</u>
Aldicarb Sulfone	1646-88-4	2	1.0	3-Hydroxycarbofuran	16655-82-6	NR	1.0
Aldicarb Sulfoxide	NA	4	1.0	Methiocarb (MesuroI®)	2032-65-7	NR	1.0
Aldicarb (Temik®)	116-06-3	3	1.0	Methomyl (Lannate®)	16752-77-5	NR	1.0
Carbaryl (Sevin®)	63-25-2	NR	1.0	Oxamyl (Vydate®)	23135-22-0	200	1.0
Carbofuran (Furadan®)	1563-66-2	40	1.0	Propoxur (Baygon®)	114-26-1	NR	1.0

Glyphosate (Method E547)

Sampling: 2-40 mL glass VOA vials. Store at 4-6°C. Add sodium thiosulfate to chlorinated samples.

Note: E500 series methods are appropriate only for drinking water analyses

<u>Holding Time</u>	<u>CAS NO.</u>	<u>Drinking Water MCL, µg/L</u>	<u>PQL, µg/L</u>
14 days	1071-83-6	700	10

Endothall (Method E548.1)

Sampling: 1-1000 mL glass bottle. Store at 4-6°C. Add sodium thiosulfate to chlorinated samples.

Note: E500 series methods are appropriate only for drinking water analyses

<u>Holding Time</u>	<u>CAS NO.</u>	<u>Drinking Water MCL, µg/L</u>	<u>PQL, µg/L</u>
7 days to extraction	145-73-3	100	8
14 days to analysis			

Diquat (Method E549.1)

Sampling: 2-1000 mL plastic or PVC bottles. Store at 4-6°C. Add sodium thiosulfate to chlorinated samples.

Note: E500 series methods are appropriate only for drinking water analyses

<u>Holding Time</u>	<u>CAS NO.</u>	<u>Drinking Water MCL, µg/L</u>	<u>PQL, µg/L</u>
7 days to extraction	85-00-7	20	2.0
21 days to analysis			

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Haloacetic Acids (Method E552.2)

Sampling: 3-40 mL amber glass VOA vials. Store at 4-6°C in dark. Vials are pre-preserved with NH₄Cl.

Holding Time: 14 days to extraction (if preserved with NH₄Cl); 14 days to analysis.

Note: Drinking Water MCL: 60 µg/L total of all five regulated Haloacetic Acids.
Determination of Haloacetic Acids in drinking water by Liquid - Liquid Extraction, Derivatization, and Gas Chromatography with Electron Capture Detection.
E500 series methods are appropriate only for drinking water analyses

	<u>CAS NO.</u>	<u>PQL µg/L</u>		<u>CAS NO.</u>	<u>PQL µg/L</u>
Bromochloroacetic Acid	5589-96-3	0.5 (NR)	Monobromoacetic Acid	79-08-3	0.5
Dibromoacetic Acid	631-64-1	0.25	Monochloroacetic Acid	79-11-8	0.75
Dichloroacetic Acid	79-43-6	0.75	Trichloroacetic Acid	76-03-9	0.5

Purgeable Halocarbons (POX) (Method E601/E624.1/SW 8021B/SW8260B)

Sampling: Water: 4-40 mL (2 preserved samples in glass and 2 unpreserved samples in Teflon) VOA vials completely full with no air bubbles. Store at 4-6°C. Add ascorbic acid to chlorinated samples. Preserve with 5-10 drops hydrochloric acid to pH <2 except for 2-Chloroethyl vinyl ether which requires neutral pH and Acrolein which require a pH of 4-5 for 14 day hold time.

Soil: 125 mL wide mouth glass jar. Store at 4-6°C.

Holding Time: 14 days

	<u>CAS NO.</u>	<u>PQL</u>			<u>CAS NO.</u>	<u>PQL</u>	
		<u>µg/L</u>	<u>mg/Kg</u>			<u>µg/L</u>	<u>mg/Kg</u>
Bromodichloromethane	75-27-4	1.0	0.2	1,1-Dichloroethene	75-35-4	1.0	0.2
Bromoform	75-25-2	1.0	0.2	Cis-1,2-Dichloroethene	156-59-4	1.0	0.2
Bromomethane	74-83-9	1.0	0.2	trans-1,2-Dichloroethene	156-60-5	1.0	0.2
Carbon Tetrachloride	56-23-5	1.0	0.2	1,2-Dichloropropane	78-87-5	1.0	0.2
Chlorobenzene	108-90-7	1.0	0.2	Cis-1,3-Dichloropropene	10061-01-5	1.0	0.2
Chloroethane	75-00-3	1.0	0.2	trans-1,3-Dichloropropene	10061-02-6	1.0	0.2
Chloroform	67-66-3	1.0	0.2	Methylene Chloride	75-09-2	1.0	0.2
Chloromethane	74-87-3	1.0	0.2	(Dichloromethane)			
2-Chlorotoluene	95-49-8	1.0	0.2	1,1,2,2-Tetrachloroethane	79-34-5	1.0	0.2
Chlorodibromomethane	124-48-1	1.0	0.2	Tetrachloroethene	127-18-4	1.0	0.2
1,2-Dichlorobenzene	95-50-1	1.0	0.2	(Tetrachloroethylene)			
1,3-Dichlorobenzene	541-73-1	1.0	0.2	1,1,1-Trichloroethane	71-55-6	1.0	0.2
1,4-Dichlorobenzene	106-46-7	1.0	0.2	1,1,2-Trichloroethane	79-00-5	1.0	0.2
Dichlorodifluoromethane	75-71-8	1.0	0.2	Trichloroethene	79-01-6	1.0	0.2
1,1-Dichloroethane	75-34-3	1.0	0.2	(Trichloroethylene)			
1,2-Dichloroethane	107-06-2	1.0	0.2	Trichlorofluoromethane	75-69-4	1.0	0.2
				Vinyl Chloride (Chloroethene)	75-01-4	1.0	0.2

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Purgeable Aromatics (Method E602/E624.1/SW 8021B/SW8260B)

Sampling: Water: 3-40 mL (2 preserved samples in glass and 2 unpreserved samples in Teflon) VOA vials completely full with no air bubbles. Store at 4-6°C. Add ascorbic acid to chlorinated samples. Preserve with 5-10 drops hydrochloric acid to pH <2

Soil: 4oz wide mouth amber glass jar. Store at 4-6°C.

Holding Time: 14 days

	<u>CAS NO.</u>	<u>—PQL—</u>			<u>CAS NO.</u>	<u>—PQL—</u>	
		<u>µg/L</u>	<u>mg/Kg</u>			<u>µg/L</u>	<u>mg/Kg</u>
Benzene	71-43-2	1.0	0.2	Ethylbenzene	100-41-4	1.0	0.2
Chlorobenzene	108-90-7	1.0	0.2	Toluene	108-88-3	1.0	0.2
1,2-Dichlorobenzene	95-50-1	1.0	0.2	Xylenes:	-	1.0	0.2
1,3-Dichlorobenzene	541-73-1	1.0	0.2	M	108-38-3		
1,4-Dichlorobenzene	106-46-7	1.0	0.2	P	106-42-3		
				O	95-47-6		

Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) (Method E602/SW 8021B or E624.1/SW 8260B)

Sampling: Water: 3-40 mL glass VOA vials with no air bubbles. Store at 4-6°C. Add ascorbic acid to chlorinated samples. Preserve with 5-10 drops hydrochloric acid to pH <2.

Soil: 4oz wide mouth amber glass jar. Store at 4-6°C.

Holding Time: 14 days

Note: The PQL for BTEX in air is 2.5 mg/m³; for MTBE it is 10 mg/m³.

	<u>CAS NO.</u>	<u>—PQL—</u>			<u>CAS NO.</u>	<u>—PQL—</u>	
		<u>µg/L</u>	<u>mg/Kg</u>			<u>µg/L</u>	<u>mg/Kg</u>
Benzene	71-43-2	0.5	0.2	Xylenes	-	1.0	0.2
Toluene	108-88-3	0.5	0.2	M	108-38-3		
Ethylbenzene	100-41-4	0.5	0.2	P	106-42-3		
MTBE	1634-04-4	2	0.8	O	95-47-6		

ORGANIC CHEMISTRY

DESCRIPTION OF METHODS

Organochlorine Pesticides and PCBs (Method E608.3)

Sampling: Water: 3-1000 mL glass/teflon bottle. Store at 4-6°C. Add sodium thiosulfate to chlorinated samples.

Holding Time: 7 days to extraction ; 40 days to analysis

<u>PESTICIDES</u>	<u>CAS NO.</u>	<u>PQL</u> <u>µg/L</u>	<u>PCB'S</u>	<u>CAS NO.</u>	<u>PQL</u> <u>µg/L</u>
Aldrin	309-00-2	0.01	Aroclor-1016	12674-11-2	0.08
alpha-BHC	319-84-6	0.009	Aroclor-1221	11104-28-2	0.08
beta-BHC	319-85-7	0.01	Aroclor-1232	11141-16-5	0.08
delta-BHC	319-86-8	0.01	Aroclor-1242	53469-21-9	0.08
gamma-BHC (Lindane)	58-89-9	0.01	Aroclor-1248	12672-29-6	0.08
alpha-Chlordane	5103-71-9	0.004	Aroclor-1254	11097-69-1	0.08
gamma-Chlordane	5103-74-2	0.004	Aroclor-1260	11096-82-5	0.08
4,4'-DDD	72-54-8	0.01	Aroclor-1262	37324-23-5	0.08
4,4'-DDE	72-55-9	0.01	Aroclor-1268	11100-14-4	0.08
4,4'-DDT	50-29-3	0.01			
Dieldrin	60-57-1	0.006			
Endosulfan I	959-98-8	0.01			
Endosulfan II	33213-65-9	0.01			
Endosulfan Sulfate	1031-07-8	0.01			
Endrin	72-20-8	0.004			
Endrin Aldehyde	7421-93-4	0.030			
Endrin Ketone	53494-70-5	0.01			
Heptachlor	76-44-8	0.009			
Heptachlor Epoxide	1024-57-3	0.01			
Isodrin	465-73-6	0.01			
Methoxychlor	72-43-5	0.01			
Chlordane (technical)	57-74-9	0.1			
Toxaphene	8001-35-2	1.0			

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ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Organochlorine Pesticides (Method SW 8081B)

Sampling: Water: 3-1000 mL glass/teflon bottle. Store at 4-6°C.
Soil: 4 oz wide mouth amber glass jar. Store at 4-6°C.

Holding Time: 7(water) or 14(soil) days to extraction; 40 days to analysis

	—PQL—			—PQL—			
	CAS NO.	µg/L	mg/Kg	CAS NO.	µg/L	mg/Kg	
Aldrin	309-00-2	0.004	0.00067	Endrin	72-20-8	0.004	0.00067
alpha-BHC	319-84-6	0.004	0.00067	Endrin Aldehyde	7421-93-4	0.004	0.00067
beta-BHC	319-85-7	0.004	0.00067	Endrin Ketone	53494-70-5	0.004	0.00067
delta-BHC	319-86-8	0.004	0.00067	Heptachlor	76-44-8	0.004	0.00067
gamma-BHC (Lindane)	58-89-9	0.004	0.00067	Heptachlor Epoxide	1024-57-3	0.004	0.00067
alpha-Chlordane	5103-71-9	0.004	0.00067	Isodrin	465-73-6	0.004	0.00067
gamma-Chlordane	5103-74-2	0.004	0.00067	Kepone	143-50-0	0.02	0.004
4,4'-DDD	72-54-8	0.004	0.00067	Methoxychlor	72-43-5	0.004	0.00067
4,4'-DDE	72-55-9	0.004	0.00067	Chlordane (technical)	57-74-9	0.10	0.0167
4,4'-DDT	50-29-3	0.004	0.00067	Toxaphene	8001-35-2	0.5	0.08
Dieldrin	60-57-1	0.004	0.00067				
Endosulfan I	959-98-8	0.004	0.00067				
Endosulfan II	33213-65-9	0.004	0.00067				
Mirex	2385-85-5	0.004	0.00067				
Endosulfan Sulfate	1031-07-8	0.004	0.00067				

Polychlorinated Biphenyls (PCBs) (Method SW 8082A)

Sampling: Water: 3-1000 mL glass/teflon bottle. Store at 4-6°C.
Soil: 4 oz wide mouth amber glass jar. Store at 4-6°C.
Transformer Oil: 4 dram vial. Store at 4-6°C.

Holding Time: 7(water) or 14(soil) days to extraction; 40 days to analysis

PCBs	—PQL—				Transformer Oil
	CAS NO.	µg/L	mg/Kg	mg/Kg	
Aroclor-1016	12674-11-2	0.08	0.013	2.0	
Aroclor-1221	11104-28-2	0.08	0.013	2.0	
Aroclor-1232	11141-16-5	0.08	0.013	2.0	
Aroclor-1242	53469-21-9	0.08	0.013	2.0	
Aroclor-1248	12672-29-6	0.08	0.013	2.0	
Aroclor-1254	11097-69-1	0.08	0.013	2.0	
Aroclor-1260	11096-82-5	0.08	0.013	2.0	
Aroclor-1262	37324-23-5	0.08	0.013	2.0	
Aroclor-1268	11100-14-4	0.08	0.013	2.0	

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Chlorinated Herbicides (Method E615/SW8151A)

Sampling: Water: 1-1000 mL glass/teflon bottle. Store at 4-6°C. Add ascorbic acid to chlorinated samples.

Soil: 125 mL wide mouth glass/teflon jar. Store at 4-6°C.

Waste: 125 mL wide mouth glass/teflon jar. Store at 4-6°C.

Holding Time: 7(water) or 14(soil) days to extraction; 40 days to analysis

	<u>CAS NO.</u>	<u>—PQL—</u>			<u>CAS NO.</u>	<u>—PQL—</u>	
		<u>µg/L</u>	<u>mg/Kg</u>			<u>µg/L</u>	<u>mg/Kg</u>
2,4-D	94-75-7	1.0	0.020	Dinoseb	88-85-7	1.0	0.02
2,4-DB	94-82-6	1.0	0.020	2,4,5-TP (Silvex)	93-72-1	0.20	0.004
Dalapon	75-99-0	10	0.2	2,4,5-T	93-76-1	0.20	0.004
Dicamba	1918-00-9	0.25	0.005	MCPA	94-74-6	250	5
Dichlorprop	120-36-5	1.0	0.02	MCPP	93-65-2	250	5
				Pentachlorophenol	87-86-5	0.10	0.002

Acrolein (E624.1/SW8260B)

Sampling: Water: 3-40 mL VOA vials. Unpreserved (raw), chilled to 4-6°C and analyzed within 3 days of collection. Or, pH adjusted to 4-5 with HCL, chilled to 4-6°C, and analyzed within 14 days. Add ascorbic acid to chlorinated samples. The vials must be completely full with no air bubbles. Store at 4-6°C. Contact the laboratory prior to sampling to arrange for this analysis.

Soil: 125 mL wide mouth glass jar. Store at 4-6°C.

Holding Time: 14 days (3 days for unpreserved Acrolein)

	<u>CAS NO.</u>	<u>—PQL—</u>			<u>CAS NO.</u>	<u>—PQL—</u>	
		<u>µg/L</u>	<u>mg/Kg</u>			<u>µg/L</u>	<u>mg/Kg</u>
Acrolein	107-02-8	20	4.0	Acrylonitrile	107-13-1	20	4.0

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ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Purgeable Organics (VOCs) by GC/MS (Method E624.1/SW8260B - Short List)

Sampling: Water: 3-40 mL (2 preserved samples in glass and 2 unpreserved samples in Teflon) VOA vials completely full with no air bubbles. Store at 4-6°C. Add ascorbic acid to chlorinated samples. Preserve with 5-10 drops hydrochloric acid to pH <2 except the Acrolein and Acrylonitrile which require a pH of 4-5.

Soil: 125 mL wide mouth glass jar. Store at 4-6°C.

Holding Time: 14 days

Note: Method SW 8260B is the capillary column equivalent to Method SW 8240

	—PQL—			—PQL—			
	CAS NO.	$\mu\text{g/L}$		mg/Kg	CAS NO.	$\mu\text{g/L}$	mg/Kg
Benzene	71-43-2	1.0	0.20	2,2-Dichloropropane	594-20-7	1.0	0.20
Bromobenzene	108-86-1	1.0	0.20	1,1-Dichloropropene	563-58-6	1.0	0.20
Bromochloromethane	74-97-5	1.0	0.20	cis-1,3-Dichloropropene	10061-01-5	1.0	0.20
Bromodichloromethane	75-27-4	1.0	0.20	trans-1,3-Dichloropropene	10061-02-6	1.0	0.20
Bromoform	75-25-2	1.0	0.20	Ethylbenzene	100-41-4	1.0	0.20
Bromomethane	74-83-9	1.0	0.20	Methyl -t-butyl ether	1634-04-4	1.0	0.20
Carbon Tetrachloride	56-23-5	1.0	0.20	Methylene Chloride	75-09-2	1.0	0.20
Chlorobenzene	108-90-7	1.0	0.20	(Dichloromethane)			
Chloroethane	75-00-3	1.0	0.20	Methyl Ethyl Ketone	78-93-3	20	4.0
Chloroform	67-66-3	1.0	0.20	(2-Butanone)			
Chloromethane	74-87-3	1.0	0.20	Styrene	100-42-5	1.0	0.20
2-Chlorotoluene	95-49-8	1.0	0.20	1,1,1,2-Tetrachloroethane	630-20-6	1.0	0.20
4-Chlorotoluene	106-43-4	1.0	0.20	1,1,2,2-Tetrachloroethane	79-34-5	1.0	0.20
Chlorodibromomethane	124-48-1	1.0	0.20	Tetrachloroethene	127-18-4	1.0	0.20
1,2-Dibromoethane	106-93-4	1.0	0.20	(Tetrachloroethylene)			
Dibromomethane	74-95-3	1.0	0.20	Toluene	108-88-3	1.0	0.20
1,2-Dichlorobenzene	95-50-1	1.0	0.20	1,1,1-Trichloroethane	71-55-6	1.0	0.20
1,3-Dichlorobenzene	541-73-1	1.0	0.20	1,1,2-Trichloroethane	79-00-5	1.0	0.20
1,4-Dichlorobenzene	106-46-7	1.0	0.20	Trichloroethene	79-01-6	1.0	0.20
Dichlorodifluoromethane	75-71-8	1.0	0.20	(Trichloroethylene)			
1,1-Dichloroethane	75-34-3	1.0	0.20	Trichlorofluoromethane	75-69-4	1.0	0.20
1,2-Dichloroethane	107-06-2	1.0	0.20	1,2,3-Trichloropropane	96-18-4	1.0	0.20
1,1-Dichloroethene	75-35-4	1.0	0.20	Vinyl Chloride	75-01-4	1.0	0.20
cis-1,2-Dichloroethene	156-59-2	1.0	0.20	(Chloroethene)			
trans-1,2-Dichloroethene	156-60-5	1.0	0.20	Benzene	71-43-2	1.0	0.20
1,2-Dichloropropane	78-87-5	1.0	0.20	Ethylbenzene	100-41-4	1.0	0.20
1,3-Dichloropropane	142-28-9	1.0	0.20	Toluene	108-88-3	1.0	0.20
				Xylenes:	-	1.0	0.20
				meta-	108-38-3		
				Para-	106-42-3		
				ortho-	95-47-6		

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Purgeable Organics (VOCs) by GC/MS (Method SW8260B - Long List)

Sampling: Water: 3-40 mL glass/teflon VOA vials. Add 3-5 drops of HCl.

For Acrolein and Acrylonitrile take an additional 3-40 mL VOA vials. Unpreserved (raw) and analyzed within 3 days of collection. Or, pH adjusted to 4-5 with HCL, and analyzed within 14 days. Contact the laboratory prior to sampling to arrange for this analysis.

Add sodium thiosulfate or ascorbic acid to chlorinated samples. The vials must be completely full with no air bubbles. Store at 6°C.

Soil: 125 mL wide mouth glass jar. Store at 4-6°C

Holding Time: 14 days (3 days for unpreserved Acrolein and Acrylonitrile)

Note: Method SW 8260B is the capillary column equivalent to Method SW 8240

	CAS NO.	PQL			CAS NO.	PQL	
		µg/L	mg/Kg			µg/L	mg/Kg
Acetone	67-64-1	50	10	2,2-Dichloropropane	594-20-7	1.0	0.20
Acetonitrile	75-08-8	20	4.0	1,1-Dichloropropene	563-58-6	1.0	0.20
Acrolein	107-02-8	20	4.0	cis-1,3-Dichloropropene	10061-01-5	1.0	0.20
Acrylonitrile	107-13-1	20	4.0	trans-1,3-Dichloropropene	10061-02-6	1.0	0.20
Benzene	71-43-2	1.0	0.20	Ethylbenzene	100-41-4	1.0	0.20
Bromobenzene	108-86-1	1.0	0.20	Hexachlorobutadiene	87-68-3	1.0	0.20
Bromochloromethane	74-97-5	1.0	0.20	2-Hexanone	591-78-6	20	4.0
Bromodichloromethane	75-27-4	1.0	0.20	Iodomethane	74-88-4	1.0	0.20
Bromoform	75-25-2	1.0	0.20	Isopropylbenzene	98-82-8	1.0	0.20
Bromomethane	74-83-9	1.0	0.20	p-Isopropyltoluene	99-87-6	1.0	0.20
n-Butylbenzene	104-51-8	1.0	0.20	Methyl-t-butyl ether	1634-04-4	1.0	0.20
sec-Butylbenzene	135-98-8	1.0	0.20	Methyl Ethyl Ketone	78-93-3	20	4.0
tert-Butylbenzene	98-06-6	1.0	0.20	(2-Butanone)			
Carbon Disulfide	75-15-0	1.0	0.20	Methyl Isobutyl Ketone	108-10-1	20	4.0
Carbon Tetrachloride	56-23-5	1.0	0.20	(4-Methyl-2-pentanone)			
Chlorobenzene	108-90-7	1.0	0.20	Methylene Chloride	75-09-2	1.0	0.20
Chloromethane	124-48-1	1.0	0.20	(Dichloromethane)			
Chloroethane	75-00-3	1.0	0.20	Naphthalene	91-20-3	1.0	0.20
2-Chloroethyl Vinyl Ether	110-75-8	1.0	0.20	n-Propylbenzene	103-65-1	1.0	0.20
Chloroform	67-66-3	1.0	0.20	Styrene	100-42-5	1.0	0.20
Chloromethane	74-87-3	1.0	0.20	Tetrachloroethene	127-18-4	1.0	0.20
				(Tetrachloroethylene)			
2-Chlorotoluene	95-49-8	1.0	0.20	1,1,1,2-Tetrachloroethane	630-20-6	1.0	0.20
4-Chlorotoluene	106-43-4	1.0	0.20	1,1,2,2-Tetrachloroethane	79-34-5	1.0	0.20
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	1.0	0.20	1,2,3-Trichlorobenzene	87-61-6	1.0	0.20
1,2-Dibromoethane (EDB)	106-93-4	1.0	0.20	1,2,4-Trichlorobenzene	120-82-1	1.0	0.20
Dibromomethane	74-95-3	1.0	0.20	1,1,1-Trichloroethane	71-55-6	1.0	0.20
1,2-Dichlorobenzene	95-50-1	1.0	0.20	1,1,2-Trichloroethane	79-00-5	1.0	0.20
1,3-Dichlorobenzene	541-73-1	1.0	0.20	Trichloroethene			
1,4-Dichlorobenzene	106-46-7	1.0	0.20	(Trichloroethylene)	79-01-6	1.0	0.20
Dichlorodifluoromethane	75-71-8	1.0	0.20	Trichlorofluoromethane	75-69-4	1.0	0.20
1,1-Dichloroethane	75-34-3	1.0	0.20	1,2,3-Trichloropropane	96-18-4	1.0	0.20
1,2-Dichloroethane	107-06-2	1.0	0.20	1,2,4-Trimethylbenzene	95-63-6	1.0	0.20
1,1-Dichloroethene	75-35-4	1.0	0.20	1,3,5-Trimethylbenzene	108-67-8	1.0	0.20
cis-1,2-Dichloroethene	156-59-2	1.0	0.20	Toluene	108-88-3	1.0	0.20
trans-1,2-Dichloroethene	156-60-5	1.0	0.20	Vinyl Acetate	108-05-4	1.0	0.20
1,2-Dichloropropane	78-87-5	1.0	0.20	Vinyl Chloride			
1,3-Dichloropropane	142-28-9	1.0	0.20	(Chloroethene)	75-01-4	1.0	0.20
				Xylenes:			
				meta-	108-38-3		
				para-	106-42-3		
				ortho-	95-47-6		

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Semi-Volatile Organics (SVOCs) by GC/MS (Method E625.1/SW8270C)

Sampling: Water: 2-1000 mL glass/teflon bottles. Store at 4-6°C. Add 80 mg sodium thiosulfate to chlorinated samples.

Soil: 125 mL wide mouth glass jar. Store at 4-6°C.

Holding Time: 7(water) or 14(soil) days to extraction; 40 days to analysis

ACID EXTRACTABLES

	CAS NO.	PQL			CAS NO.	PQL	
		µg/L	mg/Kg			µg/L	mg/Kg
4-Chloro-3-methylphenol (p-Chloro-m-cresol)	59-50-7	10	0.33	4,6-Dinitro-2-methylphenol (4,6-Dinitro-o-cresol)	534-52-1	50	1.65
2-Chlorophenol	95-57-8	10	0.33	2,4-Dinitrophenol	51-28-5	50	1.65
4-Chlorophenol	106-48-9	10	0.33	2-Nitrophenol	88-75-5	10	0.33
Cresols:				4-Nitrophenol	100-02-7	50	1.65
2-Methylphenol	95-48-7	10	0.33	Pentachlorophenol	87-86-5	50	1.65
3-Methylphenol	108-39-4	10	0.33	Phenol	108-95-2	10	0.33
4-Methylphenol	106-44-5	10	0.33	2,4,5-Trichlorophenol	95-95-4	10	0.33
2,4-Dichlorophenol	120-83-2	10	0.33	2,4,6-Trichlorophenol	88-06-2	10	0.33
2,4-Dimethylphenol	105-67-9	10	0.33				

BASE NEUTRAL EXTRACTABLES

	CAS NO.	PQL			CAS NO.	PQL	
		µg/L	mg/Kg			µg/L	mg/Kg
Acenaphthene	83-32-9	10	0.33	Diethyl phthalate	84-66-2	10	0.33
Acenaphthylene	208-96-8	10	0.33	Dimethyl phthalate	131-11-3	10	0.33
Anthracene	120-12-7	10	0.33	2,4-Dinitrotoluene	121-14-2	10	0.33
Benzo(a)anthracene	56-55-3	10	0.33	2,6-Dinitrotoluene	606-20-2	10	0.33
Benzidine	92-87-5	20	0.66	1,2-Diphenylhydrazine as Azobenzene	103-33-3	10	0.33
Benzo(b)fluoranthene	205-99-2	10	0.33	Fluorene	86-73-7	10	0.33
Benzo(k)fluoranthene	207-08-9	10	0.33	Fluoranthene	206-44-0	10	0.33
Benzo(g,h,i)perylene	191-24-2	10	0.33	Hexachlorobenzene	118-74-1	10	0.33
Benzo(a)pyrene	50-32-8	10	0.33	Hexachlorobutadiene	87-68-3	10	0.33
Bis(2-chloroethoxy)methane	111-91-1	10	0.33	Hexachlorocyclopentadiene	77-47-4	10	0.33
Bis(2-chloroethyl)ether	111-44-4	10	0.33	Hexachloroethane	67-72-1	10	0.33
Bis(2-chloroisopropyl)ether	108-60-1	10	0.33	Indeno(1,2,3-cd)pyrene	193-39-5	10	0.33
Bis(2-ethylhexyl)phthalate	117-81-7	10	0.33	Isophorone	78-59-1	10	0.33
4-Bromophenylphenylether	101-55-3	10	0.33	1-Methylnaphthalene	90-12-0	10	0.33
Butyl benzyl phthalate	85-68-7	10	0.33	2-Methylnaphthalene	91-57-6	10	0.33
2-Chloronaphthalene	91-58-7	10	0.33	Naphthalene	91-20-3	10	0.33
4-Chlorophenyl-phenylether	7005-72-3	10	0.33	Nitrobenzene	98-95-3	10	0.33
Chrysene	218-01-9	10	0.33	N-Nitrosodi-n-propylamine	621-64-7	10	0.33
Di-n-butyl phthalate	84-74-2	10	0.33	N-Nitrosodimethylamine	62-75-9	10	0.33
Di-n-octyl phthalate	117-84-0	10	0.33	N-Nitrosodiphenylamine	86-30-6	10	0.33
Dibenzo(a,h)anthracene	53-70-3	10	0.33	Phenanthrene	85-01-8	10	0.33
1,2-Dichlorobenzene	95-50-1	10	0.33	Pyrene	129-00-0	10	0.33
1,3-Dichlorobenzene	541-73-1	10	0.33	Pyridine	110-86-1	20	0.66
1,4-Dichlorobenzene	106-46-7	10	0.33	1,2,4-Trichlorobenzene	120-82-1	10	0.33
3,3'-Dichlorobenzidine	91-94-1	20	0.66				

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Phenols, Individual Compounds by GC/MS (Method E625.1/SW8270C)

Sampling: Water: 2-1000 mL glass/teflon bottles. Store at 4-6°C. Add 80 mg sodium thiosulfate to chlorinated samples.

Soil: 125 mL wide mouth glass jar. Store at 4-6°C.

Holding Time: 7(water) or 14(soil) days to extraction; 40 days to analysis

	<u>CAS NO.</u>	<u>PQL</u>			<u>CAS NO.</u>	<u>PQL</u>	
		<u>µg/L</u>	<u>mg/Kg</u>			<u>µg/L</u>	<u>mg/Kg</u>
4-Chloro-3-methylphenol (p-chloro-m-cresol)	59-50-7	10	0.33	4,6-Dinitro-2-methylphenol (4-6-Dinitro-o-cresol)	534-52-1	50	1.65
2-Chlorophenol	95-57-8	10	0.33	2,4-Dinitrophenol	51-28-5	50	1.65
Cresols:				2-Nitrophenol	88-75-5	10	0.33
2-Methylphenol	95-48-7	10	0.33	4-Nitrophenol	100-02-7	50	1.65
3-Methylphenol	106-44-5	10	0.33	Pentachlorophenol	87-86-5	50	1.65
4-Methylphenol	108-39-4	10	0.33	Phenol	108-95-2	10	0.33
2,4-Dichlorophenol	120-83-2	10	0.33	2,4,5-Trichlorophenol	95-95-4	10	0.33
2,4-Dimethylphenol	105-67-9	10	0.33	2,4,6-Trichlorophenol	88-06-2	10	0.33

Phthalate Esters (Method E625.1/SW 8270C)

Sampling: Water: 2-1000 mL glass/teflon bottles. Store at 4-6°C.

Soil: 125 mL wide mouth glass jar. Store at 4-6°C.

Holding Time: 7(water) or 14(soil) days to extraction; 40 days to analysis

	<u>CAS NO.</u>	<u>PQL</u>			<u>CAS NO.</u>	<u>PQL</u>	
		<u>µg/L</u>	<u>mg/Kg</u>			<u>µg/L</u>	<u>mg/Kg</u>
Bis(2-ethylhexyl) Phthalate	117-81-7	10	0.33	Di-n-octyl phthalate	117-84-0	10	0.33
Butyl benzyl phthalate	85-68-7	10	0.33	Diethyl phthalate	84-66-2	10	0.33
Di-n-butyl phthalate	84-74-2	10	0.33	Dimethyl phthalate	131-11-3	10	0.33

2,3,7,8-TCDD - Dioxin Screening (Method E625.1 Screening Test)

Sampling: Water: 2-1000 mL glass/teflon bottles. Store at 4-6°C.

Soils: 125 mL wide mouth glass jar. Store at 4-6°C.

Holding Time: 7(water) or 14(soil) days to extraction; 40 days to analysis.

PQL: Water: 2 µg/L
Soils: 0.066 mg/kg

ORGANIC CHEMISTRY

DESCRIPTION OF METHODS

Polynuclear Aromatic Hydrocarbons (PAH) (Method E625.1/SW8270C - GC/MS)

Sampling: Water: 2-1000 mL glass/Teflon bottles. Store at 4-6°C. Add 80 mg sodium thiosulfate to chlorinated samples.

Soil: 125 mL wide mouth glass jar. Store at 4-6°C.

Holding Time: 7(water) or 14(soil) days to extraction; 40 days to analysis

	<u>CAS NO.</u>	<u>—PQL—</u>			<u>CAS NO.</u>	<u>—PQL—</u>	
		<u>µg/L</u>	<u>mg/Kg</u>			<u>µg/L</u>	<u>mg/Kg</u>
1-Methylnaphthalene*	90-12-0	10	0.33	Benzo(a)pyrene	50-32-8	10	0.33
2-Methylnaphthalene*	91-57-6	10	0.33	Chrysene	218-01-9	10	0.33
Acenaphthene	83-32-9	10	0.33	Dibenzo(a,h)anthracene	53-70-3	10	0.33
Acenaphthylene	208-96-8	10	0.33	Fluoranthene	206-44-0	10	0.33
Anthracene	120-12-7	10	0.33	Fluorene	86-73-7	10	0.33
Benzo(a)anthracene	56-55-3	10	0.33	Indeno(1,2,3-cd)pyrene	193-39-5	10	0.33
Benzo(b)fluoranthene	205-99-2	10	0.33	Naphthalene	91-20-3	10	0.33
Benzo(k)fluoranthene	207-08-9	10	0.33	Phenanthrene	85-01-8	10	0.33
Benzo(g,h,i)perylene	191-24-2	10	0.33	Pyrene	129-00-0	10	0.33

*Included in the Montana PAH list

Gasoline Range Organics (GRO)

EPA Method: SW8015C

Sampling: Water: 3-40 mL glass/teflon VOA vials completely full with no air bubbles. Preserved with 5-10 drops hydrochloric acid to pH <2. Store at 4-6°C.

Soil: 125 mL glass jar. Store at 4-6°C.

Holding Time: 14 days

PQL: GRO: 20 µg/L (water); 2 mg/Kg (soil); 20 mg/m³ (air)

ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Diesel Range Organics (DRO) or Carbon Scan

EPA Method: SW8015C or Carbon Scan = SimDist

Sampling: Water: 2-1000 mL glass bottles preserved with sulfuric acid. Store at 4-6°C.
Soil: 4oz Wide Mouth Amber Glass jar. Store at 4-6°C.

Holding Time: 7(water) or 14(soil) days to extraction; 40 days to analysis

PQL: 0.3 mg/L (water); 10 mg/Kg (soil)

Volatile Petroleum Hydrocarbons (VPH)

EPA Method: May 2004 Massachusetts method as modified by Montana DEQ

Sampling: Water: 3-40 mL glass/teflon VOA vials completely full with no air bubbles. Preserved with 5-10 drops hydrochloric acid to pH <2. Store at 4-6°C.
Soil: 4oz Wide Mouth Amber Glass jar. Store at 4-6°C.

Holding Time: 7 (soil) days to extraction; 14 (water) & 28 (soil) days to analysis

	—PQL—				—PQL—		
	CAS NO.	µg/L	mg/Kg		CAS NO.	µg/L	mg/Kg
Methyl t-butylether	1634-04-4	1.0	0.10	Total Xylenes	NA	0.50	0.050
Benzene	71-43-2	0.50	0.050	Naphthalene	91-20-3	1.0	0.10
Toluene	108-88-3	0.50	0.050	C ₉ to C ₁₀ Aromatics	NA	20	2.0
Ethylbenzene	100-41-4	0.50	0.050	C ₅ to C ₈ Aliphatics	NA	20	2.0
m+p Xylenes	108-38-3/ 106-42-3	0.50	0.050	C ₉ to C ₁₂ Aliphatics	NA	20	2.0
o-Xylene	95-47-6	0.50	0.050	Total Purgeable Hydrocarbons	NA	20	2.0

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ORGANIC CHEMISTRY DESCRIPTION OF METHODS

Extractable Petroleum Hydrocarbons (EPH)

Method: May 2004 Massachusetts method as modified by Montana DEQ

Sampling: Water: 2-1000 mL glass bottles preserved with sulfuric acid. Store at 4-6°C.
Soils: 4oz Wide Mouth Amber Glass jar. Store at 4-6°C.

Holding Time: 14(water) or 14(soil) days to extraction; 40 days to analysis

PQL EPH Screen: Water: 300 ug/L as total extractable hydrocarbons
Soil: 10 mg/Kg as total extractable hydrocarbons

Notes: EPH screening: Samples that contain 200 mg/Kg for soil or 1000 µg/L for water may require EPH aromatic/aliphatic fractionation and MBTEX analysis. The need for PAH analysis on these samples will be determined by the MDEQ case manager on a case by case basis.
PAHs are analyzed using GC-MS method SW-846 8270C.

EPH Complete:

	—PQL—				—PQL—		
	CAS NO.	ug/L	mg/Kg		CAS NO.	ug/L	mg/Kg
C9-C18 Aliphatics	NA	300	10	Anthracene	120-12-7	5.0	0.167
C19-C36 Aliphatics	NA	300	10	Fluoranthene	206-44-0	5.0	0.167
C11-C22 Aromatics	NA	300	10	Pyrene	129-00-0	5.0	0.167
Total Extractable Hydrocarbons (Screen)	NA	300	10	Benzo(a)Anthracene	56-55-3	5.0	0.167
Total Extractable Hydrocarbons (Fractionation)	NA	300	10	Chrysene	218-01-9	5.0	0.167
				Benzo(b)Fluoranthene & Benzo(k)Fluoranthene	205-99-2 207-08-9	5.0	0.167
Naphthalene	91-20-3	5.0	0.167	Benzo(a)pyrene	50-32-8	5.0	0.167
2-Methylnaphthalene	91-57-6	5.0	0.167	Indeno(1,2,3-cd)Pyrene & Dibenzo(a,h)Anthracene	193-39-5 53-70-3	5.0	0.167
Acenaphthylene	208-96-8	5.0	0.167	Benzo(g,h,i)Perylene	191-24-2	5.0	0.167
Acenaphthene	83-32-9	5.0	0.167	1-Methylnaphthalene	90-12-0	5.0	0.167
Fluorene	86-73-7	5.0	0.167				
Phenanthrene	85-01-8	5.0	0.167				

Glycols by GC-FID

EPA Method: SW 8015 M

Sampling: Water: 500 mL glass or plastic bottle, unpreserved. Store at 4-6°C.
Soil: 4oz Wide Mouth Amber Glass jar. Store at 4-6°C.

Holding Time: N/A

	—PQL—				—PQL—		
	CAS NO.	ug/L	mg/Kg		CAS NO.	ug/L	mg/Kg
Ethylene Glycol	107-21-1	5	5	Propylene Glycol	57-55-6	5	5

ORGANIC CHEMISTRY

DESCRIPTION OF METHODS

Total Petroleum Hydrocarbons by IR

Method:	Method E418.1 or E418.1 Mod. using Freon extraction and infrared spectroscopy.
Sampling:	Water: 1000 mL glass bottle preserved with sulfuric acid. Soil: 125 mL glass jar.
Holding Time:	7 days to extraction; 40 days to analysis
PQL:	0.1 mg/L (water); 10 mg/Kg (soil)
Note:	TPH by IR is primarily recommended for use as a screening tool, as it cannot speciate between hydrocarbon types.

Oil and Grease - Freon Extraction/Gravimetric

Method:	E413.1 Freon Extraction/Gravimetric
Sampling:	Water: 1000 mL glass bottle preserved with sulfuric acid. Soil: NA
Holding Time:	28 days
PQL:	1 mg/L (water)
Notes:	This method is used to determine relatively non-volatile hydrocarbons, vegetable or animal oils, and related matter. It is not applicable to the measurement of light hydrocarbons that volatilize below 85°C. Petroleum fuels, from gasoline through No. 2 fuel oils, are completely or partially lost.

Oil and Grease - Freon Extraction/IR

EPA Method:	E413.2 or E413.2 Mod. using Freon extraction and infrared spectroscopy.
Sampling:	Water: 1000 mL glass bottle preserved with sulfuric acid. Soil: 125 mL glass jar.
Holding Time:	28 days
PQL:	0.1 mg/L (water); 10 mg/Kg (soil)

Oil and Grease or TPH - Soxhlet Extraction

EPA Method:	SW9071 Soxhlet Extraction/Gravimetric
Sampling:	Water: NA Soil: 125 mL glass jar
Note:	This method is used to measure relatively polar, non-volatile petroleum hydrocarbons. It is not suitable for fractions that volatilize below 70°C.

Oil and Grease - Hexanes Extraction/Gravimetric and Sulfur Corrected w/Copper

EPA and Standard Method:	E1664/A 5520 B, Hexanes Extractable/Gravimetric E1664-Cu Hexanes Extractable/Gravimetric Sulfur Corrected w/Copper
Sampling:	Water: 1000 mL glass bottle preserved with sulfuric acid. Soil: NA
Holding Time:	28 days
Note:	This method is not applicable to the measurement of light hydrocarbons that volatilize below 85°C. Petroleum fuels, from gasoline through No. 2 fuel oils, are completely or partially lost.

ORGANIC CHEMISTRY

DESCRIPTION OF METHODS

Total Organic Halogens (TOX)

Method: SW9020

Sampling: Water: 250 mL amber glass septum bottles, completely full no air bubbles, preserved with sulfuric acid. Store at 4-6°C.

Soil: 125 mL wide mouth glass jar. Store at 4-6°C.

Holding Time: 14 days

Hydrocarbons in Headspace Gas

Method: GC/FID Kampbell (SW8015 Mod.)

Sampling: 3-40 mL VOA vials, completely full with no air bubbles, preserved with 5-10 drops H₂SO₄

Holding Time: NA

Note: This analysis determines the ppm concentration of methane and heavier volatile hydrocarbons in air.



TM

WASTES

List of Acronyms

SW 6010	Inductively Coupled Plasma (ICP) (Analytical Method)	ICP-MS	Inductively Coupled Plasma - Mass Spectrometry
SW 6020	Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) (Analytical Method)	MWMP	Meteoric Water Mobility Procedure
A	Standard Methods	NIOSH	National Institute of Occupational Safety & Health
AOAC	Association of Official Analytical Chemists	PCBs	Polychlorinated Biphenyls
ASTM	American Society for Testing & Materials	RCRA	Resource Conservation Recovery Act
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes	SW	Solid Waste 846
DRO	Diesel Range Organics	SPLP	Synthetic Precipitation Leaching Procedure
E or EPA	US Environmental Protection Agency	TCLP	Toxicity Characteristic Leaching Procedure
FLAA	Flame Atomic Absorption	TPH	Total Petroleum Hydrocarbons
GRO	Gasoline Range Organics	TPH-IR	Total Petroleum Hydrocarbons - Infrared Spectroscopy
ICP	Inductively Coupled Plasma	VOCs	Volatile Organic Chemicals

The analytical methods listed above are typically referenced for liquid and solid waste regulations.

WASTES

1. RESOURCE CONSERVATION RECOVERY ACT (RCRA) CHARACTERISTICS - IGNITABILITY, CORROSIVITY, REACTIVITY, AND TOXICITY.

PARAMETER	METHOD	REPORTING LIMIT, mg/L
IGNITABILITY , flashpoint	SW1010	° F
CORROSIVITY , pH of solids or liquids	SW9045D/ SW9040C	0.01 std. units
REACTIVITY , reactive cyanide and sulfide		
Reactive Cyanide	SW Sec. 7.3.3.2	0.05 mg/Kg
Reactive Sulfide	SW Sec. 7.3.4.2	20 mg/Kg
TOXICITY - Toxicity Characteristic Leaching Procedure (TCLP)		
TCLP Extractions - Prior to analysis		
TCLP Metals Digestion as Totals for water	SW3010	
TCLP Metals Digestion as Totals for oil matrix	SW3050 / SW7471 (Hg)	
TCLP extraction for metals, base neutrals, acid extractables, pesticides and herbicides.	SW1311	
TCLP zero headspace extraction for volatiles	SW1311	
TCLP METALS	CAS No.	
Arsenic	7440-38-2	SW7062 / SW6010
Barium	7440-39-3	SW6010
Cadmium	7440-43-9	SW6010
Chromium	7440-47-3	SW6010
Lead	7439-92-1	SW6010
Mercury	7439-97-6	SW7470A / SW6010
Selenium	7782-49-2	SW7742 / SW6010
Silver	7440-22-4	SW6010

WASTES

1. RESOURCE CONSERVATION RECOVERY ACT (RCRA) CHARACTERISTICS - IGNITABILITY, CORROSIVITY, REACTIVITY, AND TOXICITY (continued)

PARAMETER	CAS No.	METHOD	REPORTING LIMIT, mg/L	
Analysis of TCLP extracts continued				
TCLP BASE NEUTRALS/ACID EXTRACTABLES				
2,4-Dinitrotoluene	121-14-2	SW8270C	0.05	
Hexachloro-1,3-Butadiene	87-68-3		0.05	
Hexachlorobenzene	118-74-1		0.05	
Hexachloroethane	67-72-1		0.05	
Nitrobenzene	98-95-3		0.05	
Pyridine	110-86-1		0.1	
Cresols (m,p,o)	108-39-4, 106-44-5, 95-48-7		0.15	
Pentachlorophenol	87-86-5		0.25	
2,4,5-Trichlorophenol	95-95-4		0.05	
2,4,6-Trichlorophenol	88-06-2		0.05	
TCLP PESTICIDES				
Chlordane	57-74-9	SW8081B	0.025	
Heptachlor(+hydroxide)	76-44-8		0.0005	
Endrin	72-20-8		0.0005	
Lindane	58-89-9		0.0005	
Methoxychlor	72-43-5		0.0005	
Toxaphene	8001-35-2		0.05	
TCLP HERBICIDES				
2,4-D	94-75-7	SW8151A	0.01	TM
2,4,5-TP(Silvex)	93-72-1		0.002	

WASTES

1. RESOURCE CONSERVATION RECOVERY ACT (RCRA) CHARACTERISTICS - IGNITABILITY, CORROSIVITY, REACTIVITY, AND TOXICITY (continued)

PARAMETER	CAS No.	METHOD	REPORTING LIMIT, mg/L
Analysis of TCLP extracts continued			
TCLP VOLATILES			-
Benzene	71-43-2	SW8260B	0.01
Carbon Tetrachloride	56-23-5		0.01
Chlorobenzene	108-90-7		0.01
Chloroform	67-66-3		0.01
1,4-Dichlorobenzene	106-46-7		0.01
1,2-Dichloroethane	107-06-2		0.01
1,1-Dichloroethylene	75-35-4		0.01
Methyl Ethyl Ketone	78-93-3		0.25
Tetrachloroethylene	127-18-4		0.01
Trichloroethylene	79-01-6		0.01
Vinyl Chloride	75-01-4		0.01
Benzene only in TCLP extract	71-43-2	SW8260B	0.01
TCLP Package Prices Includes Extraction and Analyses			
Complete TCLP			Contact Lab
Complete TCLP less Pesticides and Herbicides			Contact Lab
TCLP Metals only (includes SW1311 extraction for solids, filtering for both solids and liquids and SW3010 digestion)			Contact Lab
TCLP Volatiles only			Contact Lab

2. Waste Oil Characteristics

PARAMETER	CAS No.	METHOD	REPORTING LIMIT, mg/Kg
Arsenic	7440-38-2	SW7062/SW6010	1
Cadmium	7440-43-9	SW6010	0.5
Chromium	7440-47-3	SW6010	0.5
Lead	7439-92-1	SW6010	5
Metals Digestion	-	SW3050	-
Total Halogens	-	SW9076	200
Flashpoint	-	SW1010	-

NOTE: Total Halogens of 4000 mg/Kg is acceptable if it can be proven that the oil was not mixed with a hazardous waste.

Used Oil Analysis Cost Per Sample	Contact Lab
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WASTES

3. 503 ANALYSIS – TEST GROUP PARAMETERS FOR SOLID WASTE/SLURRY ANALYSIS OF WASTEWATER SYSTEM SOLIDS AS PRESCRIBED BY 40CFR PART 503

PARAMETER	METHOD	DETECTION LIMIT, mg/Kg
Arsenic	SW6010	1
Cadmium	SW6010	1
Chromium	SW6010	1
Copper	SW6010	1
Lead	SW6010	1
Nickel	SW6010	1
Mercury	SW7471	1
Molybdenum	SW6010	1
Selenium	SW6010	1
Zinc	SW6010	1
Total Metals Digestion	SW3050 and SW7471	N/A
OTHER ANALYSIS		
Ammonia as Nitrogen	ASA Monograph No. 9, Method 33-7.3.3	1
Fecal Coliform Bacteria, dry	A9222D	100 cfu/g
... or Fecal Coliform Bacteria, dry	A9221E	1 MPN/g
Nitrate plus Nitrite as Nitrogen	ASA Monograph No. 9, Method 33-8.1	1
Percent Solids	Loss @ 105°C	0.1 wt %
Total Kjeldahl Nitrogen	ASA Monograph No. 9, Method 31-3	1
NOTE: Reported detection limit is dependent on the % solids of the sample.		
Total Cost per Sample		Call for Quote

WASTES

4. OTHER ANALYSIS OF WASTES

PARAMETER	METHOD
Digestion for Total Metals	SW3010/SW3050B/ SW7471
Synthetic Precipitation Leaching Procedure (SPLP)	SW1312
Meteoric Water Mobility Procedure (MWMP) Column Leaching Procedure	E2242-13
Modified MWMP Bottle Roll Procedure	MWMP Mod
NOTE: Analysis of the above digestions or extracts are done according to TCLP or Water methods and fees	
Ash	D2974/D482
Density	ASTM E1109
Lead in paint	SW3050 with SW6010/SW6020
Loss on ignition, calculated from % ash	D2974
Moisture and Total Solids	Loss at 105°C/A 2540G/D2974
Paint Filter Test	SW9095
PCBs in transformer oil, 5 µg/g	SW8082A
pH	SW9045D / SW9040C
Sulfur, Total	LECO Combustion IR Detection
Total Organic Halogen (TOX)	SW9020B

TM

WASTES SAMPLING AND PRESERVATION

MEASUREMENT	MATRIX	SAMPLE SIZE/ SAMPLE BOTTLE	PRESERVATIVE ²	HOLDING TIME
Flashpoint	liquid	100 mL P or G	None	NA
pH	water	25 mL P or G	None	analyze as soon as possible
pH	non-aqueous	50 g P or G	None	analyze as soon as possible
Cyanide, Reactive	water	250 mL P or G	NaOH to pH >12	14 days
Cyanide, Reactive	non-aqueous	50 g P or G	None	NA
Sulfide, Reactive	water	250 mL P or G	Zinc Acetate and NaOH to pH >9	7 days
Sulfide, Reactive	non-aqueous	50 g P or G	None	NA
TCLP	water	See individual methods in the <i>water</i> or <i>organics</i> sections.		
TCLP	solids	500 g P or G	None	See chart at the end of this section.
TCLP	multiphasic	Call the laboratory for advice on sampling.		
Metals, total	water	250 mL P or G	HNO ₃ to pH < 2	6 mo. (Hg: 28 days)
Metals, total	non-aqueous	50 g P or G	None (Hg: cooled to 6°C, when possible)	6 mo. (Hg: 28 days)
BTEX	water	3-40 mL VOA vials ³	5-10 drops HCl to pH <2	14 days
BTEX	solids	4oz w/m Amber Glass	None, No headspace	14 days
GRO	water	3-40 mL VOA vials ³	5-10 drops HCl to pH <2	14 days
GRO	solids	4oz w/m Amber Glass	None, No headspace	14 days
DRO	water	2-1000 mL G	H ₂ SO ₄ to pH <2	7 days to extract; 40 to analysis
DRO	solids	4oz w/m Amber Glass	None	14 days to extract; 40 to analysis
VPH	water	3-40 mL VOA vials ³	5-10 drops HCl to pH <2	14 days to analysis
VPH	solids	4oz w/m Amber Glass	None	7 days to extract; 28 days to analysis
EPH	water	2-1000 mL G	H ₂ SO ₄ to pH <2	14 days to extract; 40 to analysis
EPH	solids	4oz w/m Amber Glass	None	14 days to extract; 40 to analysis
TPH, IR	water	1-1000 mL G	H ₂ SO ₄ to pH <2	7 days to extract; 40 to analysis
TPH, IR	solids	4oz w/m Amber Glass	None	14 days to extract; 40 to analysis
TPH, Soxhlet ext.	solids	4oz w/m Amber Glass	None	NA
PCBs, Transformers	Oil	5 mL G	None	40 days
Waste oil analysis	Oil	250 mL P or G	None	Refer to individual parameter
BTU	NA	25 g P or G	None	NA

WASTES

SAMPLING AND PRESERVATION, continued

MEASUREMENT	MATRIX	SAMPLE SIZE/ SAMPLE BOTTLE ¹	PRESERVATIVE ²	HOLDING TIME
Density	solids	500g depends on particle size	None	NA
Loss on ignition	solids	50g P or G	None	NA
Moisture/solids	solids	50g P or G	None	NA
Paint filter test	-	>100g P or G	NA	NA
Lead in paint	solids	5g P or G	NA	NA

NOTES: 1. Sample bottles: P = plastic; G = glass; w/m = wide mouth.

2. Most parameters should be shipped and stored at 6°C.

3. Samples collected for volatiles must be taken with zero headspace. The VOA vial must be completely full, no headspace.

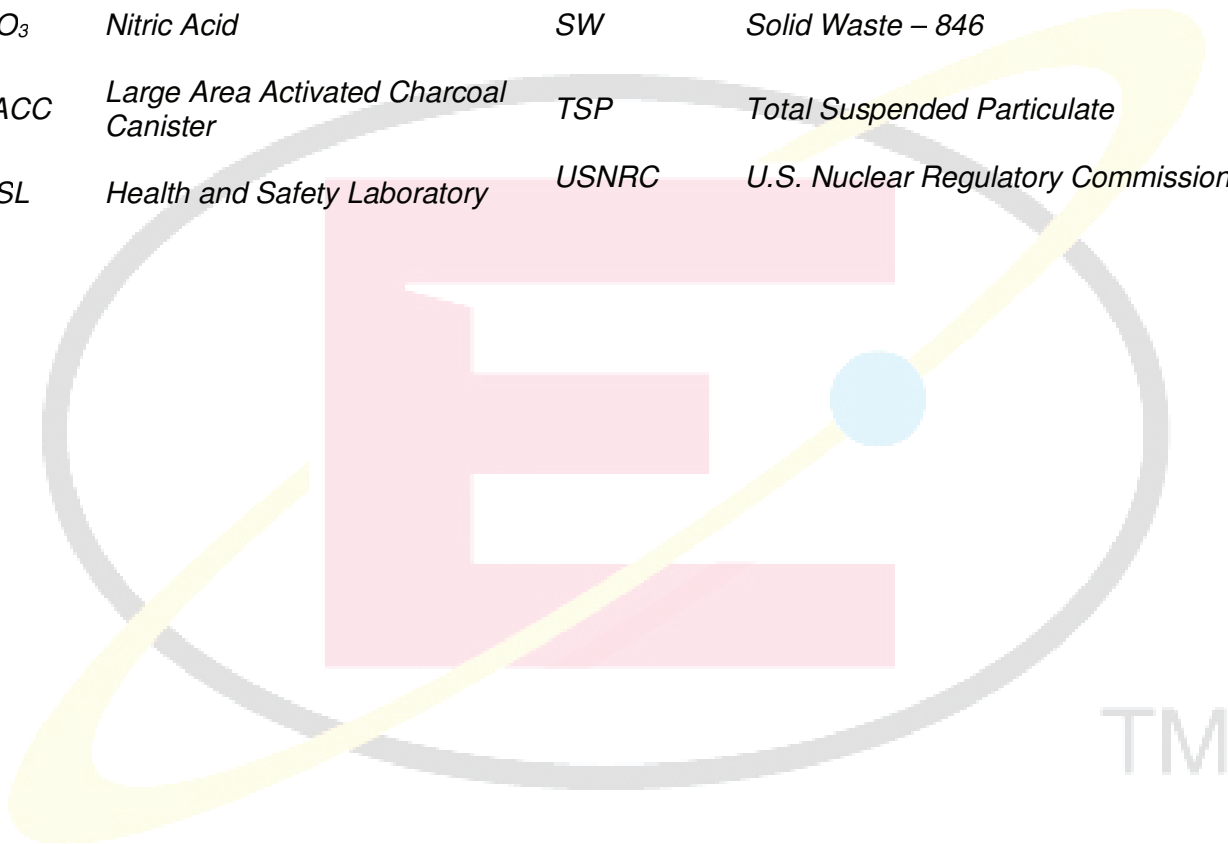
HOLDING TIMES FOR TCLP ANALYSIS (days)

ANALYSIS	SAMPLING TO TCLP EXTRACTION	TCLP EXTRACTION TO METHOD EXTRACTION	METHOD EXTRACTION TO ANALYSIS	TOTAL SAMPLING TO ANALYSIS
Metals (not mercury)	180	NA	180	360
Mercury	28	NA	28	56
Base Neutrals	14	7	40	61
Acid Extractables	14	7	40	61
Pesticides	14	7	40	61
Herbicides	14	7	40	61
Volatiles	14	NA	14	28

RADIOCHEMISTRY

List of Acronyms

<i>A</i>	<i>Standard Methods</i>	<i>NERHL</i>	<i>North Eastern Health Radiological Laboratory</i>
<i>ASTM</i>	<i>American Society for Testing & Materials</i>	<i>NORM</i>	<i>Naturally Occurring Radioactive Materials</i>
<i>E or EPA</i>	<i>US Environmental Protection Agency</i>	<i>MDC</i>	<i>Minimum Detection Concentration</i>
<i>HNO₃</i>	<i>Nitric Acid</i>	<i>SW</i>	<i>Solid Waste – 846</i>
<i>LAACC</i>	<i>Large Area Activated Charcoal Canister</i>	<i>TSP</i>	<i>Total Suspended Particulate</i>
<i>HASL</i>	<i>Health and Safety Laboratory</i>	<i>USNRC</i>	<i>U.S. Nuclear Regulatory Commission</i>



TM

RADIOCHEMISTRY

1. MATRIX DIGESTIONS – Prior to analysis

MATRIX	PREPARATION TECHNIQUE	AMOUNT OF SAMPLE REQUIRED
Drinking Water	HNO ₃ to pH <2	1000 mL plastic
Drinking Water – ²²² Radon	None Required	40 mL VOA vial – no headspace
Mine and Process Water – Soluble Constituents	Filtration, HNO ₃ to pH <2	2000 mL plastic
Mine and Process Water – Total Constituents	HNO ₃ to pH <2	2000 mL plastic
Solids – Core, Sediments, Sludges, Soils, Rock	Acid Digestion	100 g
Vegetation – USNRC Guidelines	Ashing, Acid Digestion	20 Kg
Biomass – USNRC Guidelines	Ashing, Acid Digestion	20 Kg
Air Filters	Acid Leaching	Filter sample and blank filter
Oils	Acid Leaching	100 g
Sample Preparation	Drying, Pulverizing	500 g
Sample Preparation	Canning	500 g

2. RADIOCHEMICAL ANALYSES – Drinking Water

ANALYSIS	METHOD	Drinking Water MCL	MIN. REQUIRED REPORTING LIMIT	UNITS
Gamma Emitting Radionuclides	E901.1	NA	dependent on sample size	pCi/L
Gross Alpha and Beta Radioactivity	E900.0	15/50 (see note)	3.0/4.0	pCi/L
Gross Radium Alpha (minus Radon & Uranium)	E900.1	15	3	pCi/L
²²⁶ Radium (Alpha Emitting Isotopes)	E903.0	5.0 (see note)	1	pCi/L
²²⁸ Radium (Beta Emitting Isotopes)	RA-05	5.0 (see note)	1	pCi/L
²²² Radon	ASTM D5072-92	NA	100	pCi/L
Isotopic Uranium (²³⁴ U, ²³⁵ U, ²³⁸ U)	E908.0	NA	0.67	pCi/L
Uranium	E200.8	30	1	ug/L
Sample Location: Entry point to distribution				
Notes:				
Gross Beta Activity MCL = 4 mRem/year ~ = 50 pCi/L. Regulation specifies monitoring for vulnerable systems.				
The Radium MCL is for a combined Radium 226+Radium 228 = 5.0 pCi/L.				

RADIOCHEMISTRY

3. RADIOCHEMICAL ANALYSES - Applicable to most matrices listed above (after digestion)

Reporting Limits are matrix dependent

ANALYSIS	METHOD	MIN. REQUIRED REPORTING LIMIT	UNITS
Gamma Emitting Radionuclides	E901.1	dependent on sample size	pCi/L
Gross Alpha and Beta Radioactivity	E900.0	1.0/2.0	pCi/L
Gross Radium Alpha (minus Radon & Uranium)	E900.1	1	pCi/L
²¹⁰ Lead	E909.0	1	pCi/L
²¹⁰ Polonium	HASL-300 Po-02-RC	1	pCi/L
⁴⁰ Potassium	E901.1	dependent on sample size	pCi/L
²²⁶ Radium (Alpha Emitting Isotopes)	E903.0	0.2	pCi/L
²²⁸ Radium (Beta Emitting Isotopes)	RA-05	1	pCi/L
²²² Radon	ASTM D5072-92	100	pCi/L
Isotopic Thorium (²²⁸ Th, ²³⁰ Th, ²³² Th)	E908.0	0.2 per Isotope	pCi/L
²³² Thorium	E200.8/SW6020	1	pCi/L
Isotopic Uranium (²³⁴ U, ²³⁵ U, ²³⁸ U)	A7500-U-C	0.2 per Isotope	pCi/L
Uranium, natural	E200.8/SW6020	0.2	pCi/L
Uranium, natural – low level	E200.8/SW6020	-	pCi/L

4. BIOASSAY - Uranium and other radionuclides in urine per USNRC Guideline 8.22.

ANALYSIS	REQUIRED VOLUME, mL	QC REQUIRED	MIN. REQUIRED REPORTING LIMIT	UNITS
Isotopic Uranium	1000 plastic	client specific	0.1	pCi/L
Uranium	100 plastic	25%	5	µg/L

RADIOCHEMISTRY

5. RADIOLOGICAL FIELD SERVICES

SERVICE	
Radon - inside air by charcoal canister method (Ramses II Detector)	by Quote
Consulting Radiation Safety Officer – USNRC Accepted	by Quote
Surface Gamma Surveys - baseline, decontamination and decommissioning, process operations	by Quote
Air Quality Sampling - TSP, High Volume Air Sampling	by Quote
Equipment Decontamination and Release Surveys	by Quote
Emanation Coefficient	by Quote
Naturally Occurring Radioactive Materials (NORM) Surveys – oilfield related	by Quote
Large Area Activated Charcoal Canister (LAACC) Tailings Surveys - Radon Flux by Method E115	by Quote
Indoor Radon and Radon Progeny Measurements – Single or Multiple Site	by Quote
Custom Radiation Safety Courses - mining, milling, and reclamation projects	by Quote

TM

AQUATIC TOXICITY

TERMS AND ACRONYMS USED IN AQUATIC TOXICITY

The **acute Whole Effluent Toxicity (WET) test** is short term, generally 4 days or less, usually with multiple concentrations. Mortality is the response measured.

The **chronic WET test** runs for a longer period of time, generally 7 days but may be longer, measuring continuous long-term effects such as reproduction for the Ceriodaphnia dubia and growth in the fathead minnow. The chronic test also tests for mortality and may have multiple or single concentrations.

Test conditions and durations of the WET tests vary with the National Pollutant Discharge Elimination System (NPDES) permits. Methods and procedures used to test effluents are strictly defined by the EPA guidelines and Region VIII requirements.

Test organisms	
Ceriodaphnia dubia	A small invertebrate commonly known as a "water flea" and found throughout most of the aquatic world.
Pimephales promelas	More popularly known as the "fathead minnow", is widely distributed in North America.
Both animals are raised in-house to maintain a readily available source of healthy test organisms. These test organisms are used in Whole Effluent Toxicity (WET) testing for both acute and chronic tests.	

Terms and Acronyms	
Acute	A stimulus that lasts a brief time. Acute aquatic toxicity tests last 48 hours for Ceriodaphnia dubia and 96 hours for fathead minnows. Mortality is the response measured.
Bioassay	A test used to evaluate the relative potency of a chemical by comparing its effect on a living organism with respect to a "standard" control.
CO ₂	Carbon Dioxide
Chronic	A stimulus that lingers. In the case of the ceriodaphnia, the toxicity test continues until 3 broods are born in 60% of the control population. Average number of young is the response measured. Fathead minnow chronic tests last seven days. Growth weight is the response measured.
Composite sample	Effluent water that is caught over a continuous period of recorded time by a trickle, or by use of an auto sampling device. It may also be a series of grab samples taken at recorded time intervals and blended into a single sample.
Control	A treatment in a toxicity test that duplicates all the conditions of the exposure treatments but contains no test material.
Dilution Water	(diluent) Water used to dilute the test water in an aquatic toxicity test in order to prepare different percentages of an effluent. Can be reconstituted or receiving water.
Effluent	A liquid industrial discharge or sewage, which may be released to the environment.

AQUATIC TOXICITY

TERMS AND ACRONYMS USED IN AQUATIC TOXICITY, continued

Terms and Acronyms, continued	
Flow-Thru (system)	An exposure system for aquatic toxicity tests in which the test solutions and control water flow into and out of test chambers or flumes on a once-through basis either intermittently or continuously.
Grab sample	Effluent or dilution water that is caught in the briefest possible time it takes to fill the rinsed container.
IC	Inhibition Concentration – A point estimation of the chemical concentration that would cause a given percent reduction (e.g. IC ₂₅) in a non-lethal biological measurement of the test organisms, such as reproduction or growth.
IC25	Inhibition Concentration – (Causes 25% reduction in reproduction of growth)
LC50	Lethal Concentration: 50% - The concentration of pollutant in water to which test organisms are exposed that is statistically or observably estimated to be lethal to 50% of the test organisms.
LOEC	Least Observable Effect Concentration - The lowest concentration in a dilution series having a statistically significant toxic effect (death, reduced fecundity, or curtailed growth) on an exposed population of test organisms when compared to the controls.
NOEC	No Observable Effect Concentration - The highest concentration of a pollutant in a toxicity test that has no statistically significant adverse effect (death, reduced fecundity, or curtailed growth) on the exposed population of test organisms when compared to the controls.
NPDES	National Pollutant Discharge Elimination System
Non-Renewal	Implies that once a toxicity test is set up, it remains undisturbed and unreplaced throughout its total time interval.
Receiving Water	(influent) This is the water that the industry/city obtains for its use before it is processed and becomes effluent.
Reconstituted Water	A water used in culturing and testing animals prepared with deionized water and reagent grade chemicals.
Renewal	Implies that the controls and dilution waters are replaced each 24 hours of a static toxicity test.
Screen Test	A preliminary test used to estimate the concentrations to be used in a real test or to observe consistency of an effluent on a routine basis. This test is available and priced according to requirements of the client.
Static (system)	An exposure system for aquatic toxicity tests in which the test chambers contain still solutions of test materials and controls. Tests are static renewal or static non-renewal.
T.C.P.	Toxicity Confirmation Procedures
T.I.E.	Toxicity Identification Evaluation
T.R.E.	Toxicity Reduction Evaluation
TU	Toxic Unit – A standard mechanism for quantifying whole effluent toxicity. The TU increases as toxicity increases. Acute Toxic Unit (TU _a) is 100/LC ₅₀ . Chronic Toxic Unit is 100/IC ₂₅ or 100/NOEC.
Toxicity Test	Determines the adverse toxic effects of a test material at a specific stimulus level or concentration using living organisms.
WET	Whole Effluent Toxicity
Zero Headspace	When a lid is placed on a container so that no airspace or air bubbles exist below it.

AQUATIC TOXICITY

1. ACUTE TOXICITY

TEST	AMOUNT OF EFFLUENT	AMOUNT OF RECEIVING WATER ⁽¹⁾
Acute Tests, Single Species		
48 hour <u>Ceriodaphnia dubia</u> 5 concentrations + control 4 replicates per concentration daily renewal, includes water chemistries	1 gallon	1 gallon
96-hour fathead minnow 5 concentrations + control 2 replicates per concentration daily renewal, includes water chemistries	2-3 gallons ⁽⁴⁾	2-3 gallons ⁽⁴⁾
Acute Tests, 2 Species		
48 hour <u>Ceriodaphnia dubia</u> and 96 hour fathead minnow Test conditions as above	2-3 gallons ⁽⁴⁾	2-3 gallons ⁽⁴⁾
Reduced Acute Screen		
48 hour <u>Ceriodaphnia dubia</u> OR 96 hour fathead minnow 1 concentration + control 4 replicates (<u>Ceriodaphnia dubia</u>) 4 replicates (fathead minnow) daily renewal	1 gallon	1 gallon
As above with CO₂ headspace pH control, additional fee may apply		
Non-renewal acute toxicity tests are one-half of the base price		
If Dissolved Oxygen is <4.00 mg/L Aeration is required, additional fee applies		

2. CHRONIC TOXICITY

TEST	AMOUNT OF EFFLUENT	AMOUNT OF RECEIVING WATER ⁽¹⁾
Short-term Chronic Tests, Single Species ⁽²⁾		
7 day fathead minnow 5 concentrations + control 4 replicates per concentration daily renewal and chemistries	3-7 gallons total ⁽⁶⁾	3-8 gallons total ⁽⁶⁾
7 day <u>Ceriodaphnia dubia</u> 5 concentrations + control 10 replicates per concentration daily renewal and chemistries	3 gallons total	2 gallons total
Short-term Chronic Tests, 2 Species ⁽²⁾		
7 day fathead minnow and <u>Ceriodaphnia dubia</u> test conditions same as 7 day fathead	3-7 gallons total ⁽⁶⁾	3-8 gallons total ⁽⁶⁾
As above with CO₂ headspace pH control, additional fee applies		

AQUATIC TOXICITY

3. Wyoming CBNG Toxicity

TEST	AMOUNT OF EFFLUENT
Acute Tests, Single Species	
48 hour Daphnia Magna 5 concentrations + control 5 replicates per concentration daily renewal	1 gallon
96-hour fathead minnow 5 concentrations + control 5 replicates per concentration daily renewal.	4 gallons
Acute Tests, 2 Species	
48 hour Daphnia Magna and 96 hour fathead minnow Test conditions as above	4 gallons
Short-term Chronic Tests, Single Species ⁽²⁾	
7 day fathead minnow 5 concentrations + control 5 replicates per concentration daily renewal	7 gallons total
As above with CO₂ headspace pH control, additional fee applies	

NOTES:

- (1) First priority for diluent should be the receiving waters. If that is unsuitable, then moderately hard (80-100, expressed as mg CaCO₃/L) reconstituted water should be used for diluent.
- (2) Chronic tests require 3 effluent samples delivered every other day. Receiving water sample is taken only once at the beginning of the test.
- (3) Effluent and receiving water demands are determined by the concentration required by NPDES permit.
- (4) Amount of effluent and receiving water determined by evaluations performed
- (5) Because the bulk of the analysis effort for this testing is spent during the first day, tests that need to be cancelled before completion will be charged a minimum of 75% of the fee.
- (6) Amount depends on dilutions/concentrations required by permit

TM

SOILS

List of Acronyms

<i>ABDTPA</i>	<i>Ammonium Bicarbonate Diethylenetriaminepentaacetic Acid</i>	<i>Mg</i>	<i>Magnesium</i>
<i>ABP</i>	<i>Acid Base Potential</i>	<i>N</i>	<i>Nitrogen</i>
<i>AGP</i>	<i>Acid Generating Potential</i>	<i>Na</i>	<i>Sodium</i>
<i>ASA</i>	<i>American Society of Agronomy</i>	<i>NaHCO₃</i>	<i>Sodium Bicarbonate</i>
<i>ASTM</i>	<i>American Society for Testing and Materials</i>	<i>NH₄</i>	<i>Ammonia</i>
<i>Ca</i>	<i>Calcium</i>	<i>NH₄OAC</i>	<i>Ammonium Acetate</i>
<i>COD</i>	<i>Chemical Oxygen Demand</i>	<i>NO₃</i>	<i>Nitrate</i>
<i>DEQ</i>	<i>Department of Environmental Quality</i>	<i>PSA</i>	<i>Particle Size Analysis</i>
<i>DTPA</i>	<i>Diethylenetriaminepentaacetic Acid</i>	<i>SAR</i>	<i>Sodium Adsorption Ratio</i>
<i>EC</i>	<i>Electrical Conductivity</i>	<i>SSSA</i>	<i>Soil Science Society of America</i>
<i>E</i>	<i>U.S. Environmental Protection Agency Agency</i>	<i>TKN</i>	<i>Total Kjeldahl Nitrogen</i>
<i>HCl</i>	<i>Hydrochloric Acid</i>	<i>USDA</i>	<i>U.S. Department of Agriculture</i>
<i>HNO₃</i>	<i>Nitric Acid</i>	<i>WAD</i>	<i>Weak Acid Dissociable</i>
<i>ICP</i>	<i>Inductively Coupled Plasma</i>		
<i>KCl</i>	<i>Potassium Chloride</i>		

TM

SOILS

1. AGRICULTURAL SOILS

ANALYSIS PACKAGE		COST PER SAMPLE
COMPLETE ANALYSIS - Lawns and Gardens (1 depth)		Fertilizer Recommendation and analysis
Upper Depth (0-6")	pH, nitrate, sodium, sulfate, salt hazard (conductivity), texture, lime, potassium, organic matter, available phosphorus, calcium	Contact Lab

2. SOIL AND OVERBURDEN - ACID-BASE ACCOUNTING

ACID-BASE ACCOUNTING	DETECTION LIMIT	UNIT	PRICE
MODIFIED SOBEK METHOD, includes the following:	-	-	Contact Lab
Neutralization Potential	1	T CaCO ₃ /1000 T	Contact Lab
Acid Potential	1	T CaCO ₃ /1000 T	
Acid-Base Potential	1	T CaCO ₃ /1000 T	
Total Sulfur	0.01	%	
Hot Water Soluble Sulfur	0.01	%	
Cold HCl Soluble Sulfur	0.01	%	
Hot HNO ₃ Soluble Sulfur	0.01	%	
Residual Sulfur	0.01	%	
SOBEK METHOD, includes the following:	-	-	Contact Lab
Neutralization Potential	1	T CaCO ₃ /1000 T	Contact Lab
Acid Potential	1	T CaCO ₃ /1000 T	
Acid-Base Potential	1	T CaCO ₃ /1000 T	
Total Sulfur	0.01	%	
Cold HCl Soluble Sulfur	0.01	%	
Hot HNO ₃ Soluble Sulfur	0.01	%	
Residual Sulfur	0.01	%	

3. SOIL AND OVERBURDEN – CYANIDES

PARAMETER	DETECTION LIMIT	UNIT
Cyanide, Total	0.5	mg/Kg
Cyanide, Weak Acid Dissociable	0.5	mg/Kg
Cyanide, Free	2	mg/Kg

SOILS

4. SOIL AND OVERBURDEN - NON-METALS

PARAMETER	DETECTION LIMIT	UNIT
Sample Preparation	-	-
Sample Crushing ⁽¹⁾	-	-
Comon Soil Extractions	-	-
Acid-Base Potential	-	T CaCO ₃ /1000 T
Acid Potential	0.01	T CaCO ₃ /1000 T
Ammonia as N	1	mg/Kg
Base Saturation	0.1	%
Bicarbonate, Saturated Paste	0.01	meq/L
Bromide	0.5	mg/Kg
Bulk Density	0.01	g/cc
Calcium, Saturated Paste	0.1	meq/L
Carbon, Total	0.05	%
Cation Exchange Capacity	0.1	meq/100 g
Chloride	1	mg/Kg
Coarse Fragments + 10 mesh, 2 mm	2	%
Conductivity, paste extract	0.1	mmhos/cm
Exchange Sodium Percentage – includes CEC, soluble sodium, available sodium, saturation %	0.1	%
Exchangeable Acidity	1	meq/100 g
Lime	0.1	%
Lime Requirement, SMP Buffer Method	1	T CaCO ₃ /1000 T
Loss on Ignition	0.1	%
Magnesium, Saturated Paste	0.1	meq/L
Moisture	0.1	%
Neutralization Potential	-	T CaCO ₃ /1000 T
Net Acid Generating Potential with Peroxide (includes pH after reaction)	1	T CaCO ₃ /1000 T
Nitrate as N (NO ₃)	1	mg/Kg
Nitrogen, Total Kjeldahl (TKN)	1	mg/Kg
Nitrogen, Total (TKN+ NO ₃)	1	mg/Kg
Nitrogen, Organic (TKN – NH ₄)	1	mg/Kg
Organic Carbon, Organic Matter - Walkley-Black	0.1	%
pH, saturated paste	0.1	Std. units
Phosphorus, NaHCO ₃ (Olsen)	1	mg/Kg
Phosphorus (Bray)	1	mg/Kg
Potassium	1	mg/Kg

(1) - Up to 50 lbs of sample of larger than 3 inch pieces. There is a \$25.00 minimum

(2) - \$300.00 for the first sample; \$50.00 for subsequent samples in the group.

SOILS

4. SOIL AND OVERBURDEN - NON-METALS, continued

PARAMETER	DETECTION LIMIT	UNIT
Potassium, Saturated Paste	0.1	meq/L
SAR (includes Ca, Mg, Na)	0.01	unitless
Saturation Percentage	0.1	%
Sieve Analysis (Dry)	0.1	%
Sodium, extractable	0.1	meq/100 g
Sodium, available	0.1	meq/100 g
Sodium, sat. paste	0.1	meq/L
Sulfate	1	mg/Kg
Sulfur Forms	0.01	%
Sulfur, Total	0.01	%
Texture (PSA) sand, silt, clay	1	%
Total Carbon or TOC by Leco	0.05	%
Very Fine Sand	0.01	%
Water Holding Capacity	0.1	NA

TM

SOILS

5. SOIL AND OVERBURDEN - METALS

PARAMETER	UNITS
Total Metals Digestion (Method SW 3050)	NA
Total Metals Digestion, Mercury (Method SW 7471)	NA
Aluminum	mg/Kg
Antimony	mg/Kg
Arsenic	mg/Kg
Barium	mg/Kg
Beryllium	mg/Kg
Cadmium	mg/Kg
Calcium	mg/Kg
Chromium	mg/Kg
Cobalt	mg/Kg
Copper	mg/Kg
Iron	mg/Kg
Lead	mg/Kg
Magnesium	mg/Kg
Manganese	mg/Kg
Mercury	mg/Kg
Molybdenum	mg/Kg
Nickel	mg/Kg
Potassium	mg/Kg
Selenium	mg/Kg
Sodium	mg/Kg
Silver	mg/Kg
Thallium	mg/Kg
Vanadium	mg/Kg
Zinc	mg/Kg

ORGANIC CONTAMINANTS - see *Organic Chemistry* section

PETROLEUM CONTAMINATED SOILS – see *Organic Chemistry* section

RADIOCHEMISTRY – see *Radiochemistry* section

SOILS

RECOMMENDATIONS FOR SAMPLING AND METHODS LISTINGS

MEASUREMENT	Extraction Method	Analysis Method	Minimum As Received Sample Required for Analysis
Acid Base Potential (ABP)	Calculated from Acid & Neutralization Potential	Calculation	100 g (soil jar)
Acid Potential	Calculated from Non-Sulfate Sulfur	Calculation	100 g (soil jar)
Alkalinity, saturated paste	ASA Mono. #9, Part 2, Method 10-3.2	A 2320B	1500 g (half of gallon resealable bag)
Ammonia as N, KCl Extract	ASA Mono. #9, Part 2, Method 37-7	E350.1	100 g (soil jar)
Base Saturation	Calculation from NH ₄ Oac Ca, Mg, Na, K, and CEC	Calculation	1500 g (half of gallon resealable bag)
Carbon, Total	NA	LECO SC-832 (203-601-222)	100 g (soil jar)
Cation Exchange Capacity (CEC)	USDA Handbook 60, Method 19	E6010/E6020	100 g (soil jar)
Chloride (H ₂ O Extract)	ASA Mono. #9, Part 2, Method 10-2.3.2	E300.0 (Ion Chromatography)	100 g (soil jar)
Coarse Fragments	ASA Mono. #9, Part 1, Method 15-5	2 mm sieve	1500 g (half of gallon resealable bag)
Conductivity (EC), saturated paste	ASA Mono. #9, Part 2, Method 10-3.3	Conductivity Meter	1500 g (half of gallon resealable bag)
Cyanide, Total	E335.2 (Sed.) Mod.	E335.4 (midi)	100 g (soil jar)
Cyanide, Weak Acid Dissociable	ASTM D2036 Mod.	NA	100 g (soil jar)
Cyanide, Free	ASA Mono. #9, Part 2, Method 10-2.3.1	Electrode Manufacturer's Instructions	100 g (soil jar)
Exchangeable Acidity	ASA Mono. #9, Part 2, Method 9-4.1	Titration	1500 g (half of gallon resealable bag)
Exchangeable Sodium Percentage (ESP)	Calculated from CEC, soluble sodium, & extractable sodium	E6010/E6020	1500 g (half of gallon resealable bag)
Lime as CaCO ₃	USDA Handbook 60, Method 23C	Titration	100 g (soil jar)
Lime Requirement, SMP Single Buffer	ASA Mono. #9, Part 2, Method 12-3.4.4	pH meter	100 g (soil jar)
Moisture (dry basis)	USDA Handbook 60, Method 26	NA	100 g (soil jar)
Net Acid Generating Potential (NAG)	Field & Lab. Methods Applicable to Overburdens & Mine Spoil, Sobek, 1978 pp69-72	Titration	100 g (soil jar)
Neutralization Potential	USDA Handbook 60, Method 23C	NA	100 g (soil jar)
Nitrate as N (NO ₃ + NO ₂)	ASA Mono. #9, Part 2, Method 33-8.1	E353.2	100 g (soil jar)
Minimum Resistivity	-	California 643	1500 g (half of gallon resealable bag)

SOILS

RECOMMENDATIONS FOR SAMPLING AND METHODS LISTINGS, continued

MEASUREMENT	Extraction Method	Analysis Method	Minimum As Received Sample Required for Analysis
Organic Carbon & Organic Matter (Walkley-Black)	ASA Mono. #9, Part 2, Method 29-3.5.2	Spectrophotometer	100 g (soil jar)
Organic Nitrogen	Calculation from TKN-NH ₃	Calculation	100 g (soil jar)
pH, Saturated Paste	ASA Mono. #9, Part 2, Method 10-3.2	pH Meter	1500 g (half of gallon resealable bag)
Particle Size Analysis (PSA) includes % sand, silt, clay	ASA Mono. #9, Part 1, Method 15-5	Hydrometer	1500 g (half of gallon resealable bag)
Phosphorus, NaHCO ₃ (Olsen)	ASA Mono. #9, Part 2, Method 24-5.4	E365.1	100 g (soil jar)
Phosphorus, (Bray)	ASA Mono. #9, Part 2, Method 24-5.1	E365.1	100 g (soil jar)
Potassium, Available (NH ₄ Oac)	ASA Mono. #9, Part 2, Method 13-3.5	E6010/E6020	100 g (soil jar)
Saturated Paste Extracts	ASA Mono. #9, Part 2, Method 10-2.3.1	E6010/E6020	1500 g (half of gallon resealable bag)
Saturation Percentage	USDA Handbook 60, Method 27A	N/A	1500 g (half of gallon resealable bag)
Sieve Analysis	ASA Mono. #9, Part 1, Method 15-2.2	Specified Sieve Sizes	1500 g (half of gallon resealable bag)
Sodium Adsorption Ratio (SAR-Ca, Mg, Na)	ASA Mono. #9, Part 2, Method 10-3.4	E6010/E6020	1500 g (half of gallon resealable bag)
Sodium, extractable (NH ₄ OAc)	ASA Mono. #9, Part 2, Method 13-4.3	E6010/E6020	100 g (soil jar)
Sodium, soluble (saturated paste)	ASA Mono. #9, Part 2, Method 10-3.4	E6010/E6020	100 g (soil jar)
Sulfate, Water Soluble	ASA Mono. #9, Part 2, Method 28-5.1	E300.0	100 g (soil jar)
Sulfur Forms (Modified Sobek)	EPA-600/2-78-054 Method 3.2.6 (Mod)	LECO SC-832 LECO SC-632	100 g (soil jar)
Total Nitrogen	Calculation from TKN & NO ₃	Calculation	100 g (soil jar)
Total Kjeldahl Nitrogen (TKN)	ASA Mono. #9, Part 2, Method 31-3.1	A 4500 N org	100 g (soil jar)
Total Sulfur	EPA-600/2-78-054 Method 3.2.4	LECO SC-832 LECO SC-632	100 g (soil jar)
Very Fine Sands (VFS)	ASA Mono. #9, Part 1, Method 15-5	140 mesh sieve	1500 g (half of gallon resealable bag)
ABDTPA Extraction	ASA Mono. #9, Part 2, Method 3-5.2	E6010/E6020	100 g (soil jar)
DTPA Extraction	ASA Mono. #9, Part 2, Method 19-3.3	E6010/E6020	100 g (soil jar)
Saturated Paste Extraction (H ₂ O)	ASA Mono. #9, Part 2, Method 10-2.3.1	E6010/E6020	1500 g (half of gallon resealable bag)

OTHER SERVICES

List of Acronyms

AOAC	Association of Official Agricultural Chemists	NIOSH	National Institute of Occupational Safety and Health
API	American Petroleum Institute	OSHA	Occupational Safety & Health Administration
ASTM	American Society for Testing Materials	PAHs	Polynuclear Aromatic Hydrocarbons
BS&W	Bottom Sediment and Water	PCM	Phase Contrast Microscopy
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes	PCP	Pentachlorophenol
E or EPA	US Environmental Protection Agency	PLM	Polarized Light Microscopy
GC	Gas Chromatograph	PM-10	Particulate Matter Less than 10 Microns in Diameter
GC-FID	Gas Chromatograph Flame Ionization Detector	PVC	Polyvinyl Chloride
GC-PID	Gas Chromatograph Photo - Ionization Detector	QC	Quality Control
GC/ECD	Gas Chromatograph/Electron Capture Detector	SKC	SKC Incorporated
GC/FID	Gas Chromatograph/Flame Ionization Detector	SW or SW846	Test Methods for Evaluating Solid Waste, Physical & Chemical Methods
GC/MS	Gas Chromatograph/Mass Spectrometer	TDS	Total Dissolved Solids
ICP	Inductively Coupled Plasma	TSP	Total Suspended Particles
ICP-MS	Inductively Coupled Plasma-Mass Spectrometry	UOP	Universal Oil Products Co.
LPG	Liquefied Petroleum Gas	VOA	Volatile Organic Analysis
MA-VPH	Volatile Petroleum Hydrocarbons by Massachusetts Method	VPH	Volatile Petroleum Hydrocarbons
MCEF	Mixed Cellulose Ester Filter	XAD	Amerlite XAD™ (Rohm & Haas)
SDS	Safety Data Sheets		

OTHER SERVICES

1. CRUDE OIL AND PETROLEUM PRODUCTS

PARAMETER	METHOD
Sample cleanup, preparation, and separation of emulsions prior to analysis	-
Complete Crude Oil Analysis: BS & W, Gravity(API & Specific), Hempel Distillation, Pour Point, Sulfur, Viscosity at 100°F and 120°F	-
Ash, Loss at 775°C	ASTM D482
Bottom Sediment and Water (BS&W)	ASTM D1796
Cetane Number	ASTM D976
Chloride, Inorganic (water soluble)	E300.0 Mod
Chloride, Organic (1 ppm detection limit)	SW9076
Cloud Point	ASTM D2500
Engler distillation	ASTM D86
Fingerprint oils by chromatography (Carbon Scan identification of unknowns)	GC-FID– SimDist
Flashpoint, Pensky Martens Closed Cup	SW1010
Glycol (antifreeze) in oil or fuel	ASTM D2982
Gravity, API	ASTM D1298
Gravity, specific	ASTM D1298
Halogens, total (200 ppm detection limit)	SW9076
Hempel Distillation, modified, cuts at 392°F and 500°F	ASTM D285
Metals in oil, digestion	SW3050
Metals in oil, analysis of digestate, per metal	SW6010/ SW6020
Paraffin	UOP 46-64
Pour Point	ASTM D97
Simulated Distillation by GC/FID (carbon scan, product identification or fingerprinting)	GC-FID– SimDist
Sulfur, total in diesel or heavier oils (not available for volatile fuels)	ASTM D1552
Vapor Pressure, Reid	ASTM D323
Viscosity, per temperature	ASTM D445
Water by Karl Fisher	ASTM D1744

OTHER SERVICES

2. OILFIELD WATER ANALYSIS

PARAMETER	PRICE
Sample cleanup, preparation, and separation of emulsions prior to analysis	Contact Lab
Routine Oilfield Water Analysis: Barium, Calcium, Iron, Magnesium, Potassium, Sodium, Strontium, pH, Specific Gravity, Sulfate, Total Dissolved Solids (calculated), Chloride, Carbonate, Bicarbonate, Resistivity	Contact Lab

3. NATURAL GAS AND LIQUEFIED PETROLEUM GAS (LPG) ANALYSIS

PARAMETER	METHOD	PRICE
Natural Gas Analysis: Methane through Hexanes plus, Nitrogen, Carbon Dioxide, Hydrogen Sulfide, BTU, Specific Gravity, Pseudo-critical temperature and pressure, Compressibility Factor, Molecular Weight (Oxygen available upon request).	GPA 2261-95	Contact Lab
Natural Gas Analysis plus Carbon Monoxide	GPA 2286-95	Contact Lab
Extended Natural Gas, C1 thru C10+ including Nitrogen, CO2 and Oxygen	GPA 2286-95	Contact Lab
Extended Natural Gas, C1 thru C10+ with BTEX including Nitrogen, CO2 and Oxygen	GPA 2286-95	Contact Lab
LPG Analysis: Ethane through Hexanes plus, Volume Ratio, Molecular Weight, Specific Gravity, Vapor Pressure, BTU.	ASTM D2163-87.	Contact Lab
Extended Natural Gas or Extended LPG analysis to include Heptanes thru Decanes Plus	GPA 2286-95	Contact Lab
Methane, Ethane, Propane in air at ppm concentrations.	GC-FID	Contact Lab

4. FEEDS

PARAMETER	METHOD	PRICE
Moisture	Loss at 40°C	Contact Lab
Nitrate	MSU Feed Laboratory Method-CuSO ₄ Extraction	Contact Lab
Protein	AOAC 7.033	Contact Lab
Sulfur	ASTM D1552	Contact Lab

OTHER SERVICES

5. SPECIAL SERVICES

SERVICE	PRICE
Scale Analysis: Identification of unknown materials i.e. scale, deposits, or other inorganic substances, semi-quantitative analysis (does not include quantitative analysis for organic chemicals)	Contact Lab
Sample filtering/preservation in the lab, per sample bottle or fraction	
Clerical services, per hour	
Sampling or courier services, per hour	
Staff chemist, per hour	
Senior chemist, per hour	
Overtime, evening, weekend, holidays – Could apply under certain circumstances	
Mileage, per mile	
3 rd Party/Electronic Invoicing Submissions	

6. INDUSTRIAL HYGIENE LABORATORY SERVICES

PARTICULATES	METHOD	PRICE
Particulates, Total*	NIOSH 0500	Contact Lab
Particulates, Respirable*	NIOSH 0600	Contact Lab
Silica, Crystalline Respirable - X-ray Diffraction*	NIOSH 7500	Contact Lab
NOTES: *Cost includes pre-weighed PVC cassettes.		

METALS			METHOD	PRICE
Metals by ICP/ICP-MS - Digestion of 37 mm mixed cellulose ester filter (MCEF)			NIOSH 7300	Contact Lab
Metals by ICP/ICP-MS – Digestion of wipe samples			NIOSH 9100/ SW3050	Contact Lab
Metals by ICP/ICP-MS – Analysis of digestate, per metal			SW6010/SW6020	Contact Lab
Metals available by ICP Scan			NIOSH 7300	Contact Lab
Aluminum	Cobalt	Manganese	Sodium	
Beryllium	Copper	Molybdenum	Thallium	
Cadmium	Iron	Nickel	Titanium	
Calcium	Lead	Phosphorus	Vanadium	
Chromium	Magnesium	Silver	Zinc	
Lead in paint			SW3050/ SW6010/SW6020	Contact Lab
NOTES: Other metals available on request – see <i>Waters</i> sections				

OTHER SERVICES

6. INDUSTRIAL HYGIENE LABORATORY SERVICES (Continued)

PARAMETER	METHOD
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) - Charcoal tube or passive diffusion monitor ¹ .	NIOSH 1501 SW8015C
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) – Tedlar Bag ¹	SW8021B / GC
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) – Tedlar Bag ¹	SW8260B GC/MS
Formaldehyde – 3M passive diffusion monitor ¹	NIOSH 3500M Colorimetric
Gasoline Range Organics (GRO) – Charcoal Tube or Tedlar Bag ¹	SW8015C / GC
Methane in air, ppm concentrations – Tedlar Bag ¹	SW8015M
Organic Vapor Scan – Single compound	SW8260B Mod.
Organic Vapor Scan – Short list	SW8260B Mod.
Organic Vapor Scan – Long list	SW8260B Mod.
Compounds Available For Analysis by Organic Vapor Scan (by sorbent tube, passive diffusion monitor ¹ or tedlar bag ¹)	
Acetone	1,2-Dichlorobenzene
Benzene	1,3-Dichlorobenzene
Bromobenzene	1,4-Dichlorobenzene
Bromochloromethane	1,2-Dichloroethane
Bromodichloromethane	cis-1,2-Dichloroethene
Bromoform	1,2-Dichloropropane
n-Butylbenzene	1,3-Dichloropropane
sec-Butylbenzene	2,2-Dichloropropane
tert-Butylbenzene	1,1-Dichloropropene
Carbon Tetrachloride	cis-1,3-Dichloropropene
Chlorobenzene	trans-1,3-Dichloropropene
Chloroform	Ethylbenzene
2-Chlorotoluene	Hexachlorobutadiene
4-Chlorotoluene	2-Hexanone
Chlorodibromomethane	Isopropylbenzene
1,2-Dibromo-3-chloropropane	p-Isopropyltoluene
1,2-Dibromoethane	Methyl ethyl ketone
Dibromomethane	Methyl isobutyl ketone
Radon in indoor air, Charcoal canister	Gamma Spec.
Volatile Petroleum Hydrocarbons (VPH) – Tedlar Bag ¹	MA-VPH GC/FID

(1). Additional charge for media - See "Other Services" Section 10 "Supplies"

OTHER SERVICES

7. AIR SAMPLING EQUIPMENT RENTAL

EQUIPMENT	RENTAL RATE	
	3 DAY	WEEK
Pump - Low or High Flow (0.2 to 3.5 LPM)	Contact Lab	Contact Lab
Pumps are pre- and post-calibrated. Personal and area sampling accessories and battery chargers are included.		
Cyclone Sampler (SKC) or Calibration Sleeve - respirable particulates monitoring	Contact Lab	Contact Lab
Sensidyne Gas Sampling Pump with Flow Finish Indicator	Contact Lab	Contact Lab
Sensidyne Colorimetric Indicator Tubes, Box of 10	Cost + 20%	

8. AMBIENT AIR QUALITY LABORATORY SERVICES

SERVICE	PRICE
Conditioning and pre-weighing of a quartz filter (PM-10) - includes filter	Contact Lab
Conditioning and pre-weighing of glass fiber filter (TSP) – includes filter	Contact Lab
Conditioning and post - weighing, concentration calculation of PM-10 or TSP filters	Contact Lab
Metals analysis on quartz or glass fiber filter – digestion	Contact Lab
Metals by ICP/ICP-MS – analysis of digestate, per metal	Contact Lab

9. MEDIA SUPPLIES

Sample collection media such as charcoal tubes, pre-weighed filter cassettes for particulates and cassettes for metals analysis are provided at no cost. There will be a nominal charge for specialized sorbent tubes and passive diffusion monitor badges. Because of QC, there will be a surcharge for media not supplied by our laboratory if it requires desorption efficiency determinations.	Per Quote
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