SPECTRUM ANALYTICAL, INC.
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Hanibal Technology

Recommended Containers, Preservation, Storage, & Holding Times

Sample Integrity

Spectrum Analytical is committed to maintaining the integrity of all samples submitted for laboratory analyses. Spectrum has a set criterion that all samples must pass in order to be considered to be of satisfactory condition. The Sample Department will notify the client of any samples that may be considered to be of unsatisfactory condition. Analysis of unsatisfactory samples will be conducted only with the written authorization from the client.

Collection of Samples in Duplicate

The collection of a sample in duplicate is requested when submitting a series of five or more samples per Chain of Custody. Collecting double the volume of a sample will enable us to perform additional quality control procedures in the laboratory. This practice may also be utilized when submitting samples for a project requiring additional quality control information.

Cooling of Samples

Samples must be chilled to 4°C immediately following collection and packed with a sufficient amount of ice to maintain that temperature until receipt at laboratory facility. EPA protocols do not allow the use of icepacks or ice substitutes because they are unable to reach a cold enough temperature.

Laboratories are required to maintain a record of sample temperature as received. Spectrum utilizes infrared temperature recorder to monitor temperature. A notation of the temperature is made on the Chain of Custody. Samples received on ice will be noted as such.

Table 1
Recommended Containers, Preservation, Storage, & Holding Times
For Water and Wastewater

Description	Method	Matrix	Sample Container[1]	Preservative[2]	Prep/Analysis Holding Time	Volume
Volatile/Semivolatile Analyses						
EDB, DBCP	504.1	H_2O	G (b) Tef Sep	Cool 4^0 C 75µL $Na_2S_2O_3$ Solution	14 days	40 ml [3,4]
GCMS-Purgeables	524.2	H_2O	G (b) Tef Sep	Cool 4^0 C Ascorbic acid & HCl to pH<2 [2,5]	14 days	40 ml [3,4]
GCMS-Purgeables	624, 8260B	H_2O	G (b) Tef Sep	Cool 4^0 C HCl to pH<2 [2,5]	14 days [5]	40 ml [3,4]
GC-Pesticides & PCBs	608	H_2O	AG (a) Tef Cap	Cool 4^0 C NaOH or H_2SO_4 to pH 5-9 [2]	7/40 days [6]	I L [3,4]
GC/MS-Semivolatiles – PAHs Base Neutral/Acid Extractable	625, 8270C	H_2O	AG (a) Tef Cap	Cool 4^0 C [2]	7/40 days [6]	1 L [2,3]

Petroleum Hydrocarbon Analyses						
Oil & Grease	413.1, 413.2, 1664	H_2O	AG (a) Tef Cap	Cool 4^0C H_2SO_4 to pH<2	28 days [7]	1 L [3]
Total Recoverable Petroleum Hydrocarbons by IR	418.1	H_2O	AG (a) Tef Cap	Cool 4^0 C HCl to pH<2	28 days [7]	1 L [3]
Diesel Range Organics (DRO)	Modified 8015B	H_20	G (b) Tef Cap	Cool 4^O C HCl to pH <2	14/40 days [6]	1 L [3]
Gasoline Range Organics (GRO)	Modified 8015B	H_2O	G (b) Tef Sep	Cool 4^0 C HCl to pH <2	14 days	40 ml [3,4]
Total Petroleum Hydrocarbons by GC	Modified 8100	H_2O	G (a) Tef Cap	Cool 4^0 C HCl to pH <2	14/40 days [6]	1 L [3]
Total Petroleum Hydrocarbons by GC	Florida Pro	H_2O	G (a) Tef Cap	Cool 4^0 C HCl to pH <2	14/40 days [6]	1 L [3]
MA DEP EPH	98-1	H_2O	See Table 3			
MA DEP VPH	97-12	H_2O	See Table 4			
CT DPH ETPH	CT ETPH	H_2O	See Table 5			
Metal Analyses						
ICP/ICPMS Metals	200.7/200.8	H_2O	P or G (c)	Cool 4^0 C HNO_3 to pH<2 [8]	6 months	250 ml
Mercury	245.2/7470A	H_2O	P or G (c)	Cool 4^0 C HNO_3 to pH<2 [8]	28 days [9]	250 ml
Chromium VI	SM 3500 Cr D[11]	H_2O	P or G	Cool 4^0 C	24 hours	200 ml
Lead, Organic	CA LUFT	H_2O	G (a) Tef Cap	Cool 4^0 C	Analyze immediately	1 L [3]
Inorganic/Wet Chemistry Analyses						
Ion Chromatography Anions	300.0	H_2O	P or G	Cool 4^0 C	28 days [10]	500 ml
Acidity	305.1	H_2O	P or G	Cool 4^0 C	14 days	150 ml
Alkalinity	SM 2320B[11]	H_2O	P or G	Cool 4^0 C	14 days	150 ml
BOD	SM 5210 B[11]	H_2O	P or G	Cool 4^0 C	48 hours	1 L
Bromide	320.1	H_2O	P or G	Cool 4^0 C	28 days	100 ml
BTU	ASTMD 240	H_2O	P or G	Cool 4^0 C	28 days	50 ml
Chloride	SM 4500 Cl B[11]	H_2O	P or G	None Required	28 days	150 ml
Chlorine, Total Residual	SM 4500 Cl-G[11]	H_2O	P or G	None Required	Analyze immediately	200 ml
COD	410.4/Hach 8000	H_2O	P or G	Cool 4^0 C H_2SO_4 to pH<2	28 days	50 ml
Coliform, Fecal	SM 9222D[11]	H_2O	Sterile Plastic	Cool 4^0 C[2]	6 hours	100 ml
Coliform, Fecal Strep	SM9230A/B[11]	H_2O	Sterile Plastic	Cool 4^0 C[2]	6 hours	100 ml
Coliform, Total	SM 9222B[11]	H_2O	Sterile Plastic	Cool 4^0 C[2]	30 hours	100 ml
E. Coli (confirmation only)	SM 9222 G[11]	H_2O	Sterile Plastic	Cool 4^0 C[2]	30 hours	100 ml

Heterotrophic Plate Count	SM 9215B[11]	H_2O	Sterile Plastic	Cool 4^0 C[2]	8 hours	100 ml
Color	SM 2120 B[11]	H_2O	Sterile Plastic	Cool 4^0 C	48 hours	200 ml
Conductance, Specific	SM 2510 B[11]	H_2O	P or G	Cool 4^0 C	28 days	100 ml
Cyanide, Amenable	SM 4500 Cn-C,E[11]	H_2O	P or G (a)	Cool 4^0 C NaOH to pH>12 [2]	14 days	500 ml
Cyanide, Free	SM 4500 Cn-C,E[11]	H_2O	P or G (a)	Cool 4^0 C NaOH to pH>12 [2]	14 days	500 ml
Cyanide, Total	SM 4500 Cn-C,E[11]	H_2O	P or G (a)	Cool 4^0 C NaOH to pH>12 [2]	14 days	500 ml
Flash Point	SW 846 1010	H_2O	P or G	Cool 4^0 C	ASAP	50 ml
Fluoride	SM 4500F-C[11]	H_2O	P or G	None Required	28 days	200 ml
Hardness	SM 2340C[11]	H_2O	P or G	Cool 4^0 C HNO_3 to pH<2	6 months	100 ml
Iodide	345.1	H_2O	P or G	Cool 4^0 C	24 hours	100 ml
MBAS (Surfactants)	425.1	H_2O	P or G	Cool 4^0 C	48 hours	250 ml
Nitrogen, Ammonia	SM 4500 NH3-B, E[11]	H_2O	P or G	Cool 4^0 C H_2SO_4 to pH<2	28 days	400 ml
Nitrogen, Total Kjeldahl	SM 4500 NH3 B, E[11]	H_2O	P or G	Cool 4^0 C H_2SO_4 to pH<2	28 days	500 ml
Nitrogen, Nitrate	SM 4500 NO3-E[11]	H_2O	P or G	Cool 4^0 C	48 hours	250 ml
Nitrogen, Nitrate plus Nitrite	SM 4500 NO2/3[11]	H_2O	P or G	Cool 4^0 C H_2SO_4 to pH<2	28 days	100 ml
Nitrogen, Nitrite	SM 4500 NO2-B[11]	H_2O	P or G	Cool 4^0 C	48 hours	100 ml
Odor	SM 2150B[11]	H_2O	G	Cool 4^0 C	24 hours	500 ml
Orthophosphate	365.2	H_2O	P or G	Filter immediately Cool 4^0 C	48 hours	100 ml
Oxygen, Dissolved	360.1 360.2	H_2O	P or G Bottle with G Top	None Required	Analyze immediately	300 ml
pH , Hydrogen ion	150.1	H_2O	P or G	None Required	Analyze immediately	25 ml
Phenolics	420.1	H_2O	G	Cool 4^0 C H_2SO_4 to pH<2	28 days	1 L [3]
Phosphorous, Total	365.2	H_2O	P or G	Cool 4^0 C H_2SO_4 to pH<2	28 days	500 ml
Phosphorous, Dissolved	365.2	H_2O	P or G	Filter immediately Cool 4^0 C H_2SO_4 to pH<2	24 hours	500 ml
Residue, Filterable (TDS)	160.1/ SM 2540C[11]	H_2O	P or G	Cool 4^0 C	7 days	300 ml
Residue, Non-filterable (TSS)	160.2/ SM 2540 B[11]	H_2O	P or G	Cool 4^0 C	7 days	300 ml
Residue, Total	160.3	H_2O	P or G	Cool 4^0 C	7 days	300 ml

Residue, Volatile	160.4	H_2O	P or G	Cool 4^0 C	7 days	100 ml
Salinity	S210A	H_2O	P or G	Cool 4^0 C	28 days	100 ml
Silica	200.7	H_2O	P	Cool 4^0 C	28 days	200 ml
Settleable Solids	160.5/ SM 2540 F[11]	H_2O	P or G	Cool 4^0 C	48 hours	1 L
Specific Gravity	ASTM D1298	H_2O	P or G	Cool 4^0 C	28 days	500 ml
Sulfate	375.4	H_2O	P or G	Cool 4^0 C	28 days	300 ml
Sulfide	376.1/ SM 4500 S2,E[11]	H_2O	P or G Bottle with G Top	Cool 4^0 C ZnAce/NaOH	Analyze immediately	500 ml
Sulfite	377.1/SM 4500 SO3[11]	H_2O	P or G	None Required	Analyze immediately	100 ml
Temperature	170.1	H_2O	P or G	None Required	Analyze immediately	1 L
Total Organic Carbon (TOC)	415.1	H_2O	AG (a)	Cool 4^0 C H_3PO_4 to pH<2	28 days	40 ml
Total Organic Halogens (TOX)	SW 9020B	H_2O	AG	Cool 4^0 C	28 days	200 ml
Turbidity	180.1/ SM 2130 B[11]	H_2O	P or G	Cool 4^0 C	48 hours	100 ml

Notes:

1 G (x) = glass; AG (x) = amber glass; P (x) = plastic; Tef Sep = Teflon septum; Tef Cap = Teflon lined cap; x = cleaning protocol as follows: a = acid wash + solvent wash + oven dry; b = oven dry; c = acid wash.

2 For organics and bacteriological analysis, sodium thiosulfate is required for all chlorinated waters. One exception to this recommendation is ascorbic acid must be used when vinyl chloride and other gases are measured with a mass spectrometer. For cyanide, use 0.6g ascorbic acid. Dechlorination must be performed prior to the addition of any necessary preservative.

3 Samples must be provided in duplicate to cover for breakage and provide sufficient sample for QC procedures. Extractable organics with matrix spike/matrix spike duplicate QC protocols require a triplicate sample.

4 Fill completely to avoid volatile loss.

5 Samples with purgeable aromatics must be acidified with HCl to pH<2 in order to have a 14-day holding time.

6 Holding time is seven days from sample collection date for extraction, 40 days from extraction date for analysis of the extract. Holding time is fourteen days for extraction if listed as 14/40.

7 The EPA has not recommended petroleum hydrocarbon holding times. The holding time given is the laboratory practice by analogy with Oil and Grease standards. State of New Jersey holding time is 7 days. California LUFT is 14 days.

8 For the determination of dissolved elements, the sample must be filtered through a 0.45 µm pore diameter membrane filter (prior to acidification) at the time of collection or as soon thereafter as practically possible and acidified immediately thereafter.

9 The EPA allows only 14 days holding time for mercury in plastic bottles for drinking water analysis.

10 Certain anions require special handling. Holding times and preservation for a particular sample will be determined by the requirement for the anion of interest with the shortest holding time; e.g., nitrate and nitrite - 48 hours; orthophosphate-filter and 48 hours.

11 Standard Methods 18th Edition

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Table 2
Recommended Containers, Preservation, Storage, & Holding Times
For Soil, Solids, and Wastes

Description	Method	Matrix	Sample Container[1]	Preservative	Prep/Analysis Holding Time	Volume
Volatile/Semivolatile Analyses						
GCMS- Purgeables	8260B	Soil/Waste	G (b) Tef Sep	See Memo [9]	14 days	See Memo [9]
GC-Pesticides & PCBs	8081A/8082	Soil/Waste	AG (a) Tef Cap	Cool 4^0 C	14/40 days [3]	100 g or 8 oz Jar
GC/MS-Semivolatiles – PAHs Base Neutral/Acid Extractable	8270C	Soil/Waste	AG (a) Tef Cap	Cool 4^0 C	14/40 days [3]	100 g or 8 oz Jar
Petroleum Hydrocarbon Analyses						
Oil & Grease	413.2, 1664	Soil	G (a) Tef Cap	Cool 4^0 C	14/40 days [3,4]	100 g or 8 oz Jar
Total Recoverable Petroleum Hydrocarbons	418.1	Soil	G (a) Tef Cap	Cool 4^0 C	14/40 days [3,4]	100 g or 8 oz Jar
Diesel Range Organics (DRO)	Modified 8015B	Soil	G (a) Tef Cap	Cool 4^0 C	14/40 days [3,4]	100 g or 8 oz Jar
Gasoline Range Organics (GRO)	Modified 8015B	Soil	G (b) Tef Sep	Cool 4^0 C 15 ml CH_3OH	14 days	15 g[2]
Total Hydrocarbons by GC	Modified 8100	Soil	G (a) Tef Cap	Cool 4^0 C	14/40 days [3,4]	100 g or 8 oz Jar
Total Hydrocarbons by GC	Florida Pro	Soil	G (a) Tef Cap	Cool 4^0 C	14/40 days [3,4]	100 g or 8 oz Jar
MA DEP EPH	98-1	Soil	See Table 3			
MA DEP VPH	97-12	Soil	See Table 4			
CT DPH ETPH	CT ETPH	Soil	See Table 5			
Metal Analyses						
ICP/ICPMS Metals	200.7/6010B/ 6020	Soil	P or G (c)	Cool 4^0 C	6 months	100 g or 8 oz Jar
Mercury	7471A	Soil	P or G (c)	Cool 4^0 C	28 days	100 g or 8 oz Jar
Lead, Organic	CA LUFT	Soil	G (a) Tef Cap	Cool 4^0 C	Analyze immediately	200 g or 8 oz Jar
General Inorganic Analyses						
General Inorganics	9000 Series	Soil	P or G (c) [5]	Cool 4^0 C	Not to exceed Table 1 specifications	100 g or 8 oz Jar
Asbestos (PLM)	EPA 600R	Bulk	G (a) Tef Cap	None	Indefinite	50 g minimum
BTU	ASTMD 240	Soil	P or G	Cool 4^0 C	28 days	50 g

Table 2
Recommended Containers, Preservation, Storage, & Holding Times
For Soil, Solids, and Wastes

Description	Method	Matrix	Sample Container[1]	Preservative	Prep/Analysis Holding Time	Volume
Flashpoint/Ignitability	1010	Soil	G (b) Tef Sep or G (a) Tef Cap	Cool 4^0 C	ASAP	100 g or 8 oz Jar [6]
pH/Corrosivity	9045C	Soil/Waste	P or G	Cool 4^0 C	ASAP [7]	100 g or 2 oz Jar [2]
Reactivity	SW 846 Section 7.3	Soil/Waste	P or G	Cool 4^0 C	ASAP [7]	100 g or 8 oz Jar
Standard Plate Count	SM 9215 B[10]	Soil/Solid/ Waste	Sterile Plastic	Cool 4^0 C	24 hours	100 g
TCLP/SPLP	1311/1312	Soil/Waste	Inorganics - P or G (c) or (a) Organics - G (a)	Cool 4^0 C if appropriate	varies by method	500 g or 32oz Jar[2,8]
Total Organic Carbon (TOC)	9060	Soil	G (a) Tef Cap	Cool 4^0 C	28 days	100g or 8 oz Jar
Total Organic Halogens (TOX)	9020B	Soil	G (a) Tef Cap	Cool 4^0 C	14 days	100g or 8 oz Jar

Notes:

1 G (x) = glass; AG (x) = amber glass; P (x) = plastic; Tef Sep = Teflon septum; Tef Cap = Teflon lined cap; x = cleaning protocol as follows: a = acid wash + solvent wash + oven dry; b = oven dry; c = acid wash.

2 Fill completely to avoid volatile loss; if pre-weighted VOA vials are used, sample cannot exceed half volume of the vial.

3 Holding time is fourteen days from sample collection date for extraction, 40 days from extraction date for analysis of extract.

4 EPA has not recommended oil and grease, petroleum hydrocarbons or EDB holding times in soil. The holding time is given by analogy to extractable organics.

5 Acid washed containers are not appropriate for nitrate and other N analysis. Use glass container ordered with cleaning protocol (1-Chem V220-0250, or equivalent).

6 Fill completely to avoid volatile loss. If vials are used, a minimum of 4 is required.

7 Holding time is not to exceed 14 days. If sulfide reactivity is sought, then not to exceed 7 days.

8 TCLP samples with liquid require more sample volume. For example, a sample with 10% solids requires a minimum of 2000g. Aqueous samples should routinely be provided as 3 liters in order to cover for breakage and provide enough sample for laboratory QC.

9 Refer to Spectrum Analytical Memorandum (M-020) sample collection techniques for VOC soils.

10 Standard Methods 18th Edition

Table 3
Recommended Containers, Preservation, Storage, & Holding Times
For EPH Samples

Matrix	Container	Preservative	Holding Time
Aqueous	1 liter amber glass bottle with Teflon-lined screw cap	Add 5 ml of 1:1 HCl; Cool to 4^0 C	Samples must be extracted within 14 days and analyzed within 40 days
Soil/Sediment	4-oz (120 ml) wide mouth amber glass jar with Teflon-lined screw cap	Cool to 4^0 C	Samples must be extracted within 14 days and analyzed within 40 days

Table 4
Recommended Containers, Preservation, Storage, & Holding Times
For VPH Samples

Matrix	Container	Preservative	Holding Time
Aqueous	2 - 40 ml VOA vials with Teflon-lined screw caps	Add 3 to 4 drops of 1:1 HCl; Cool to 4^0 C	14 days
Soil/Sediment	2 - 40 ml VOA vials with Teflon-lined screw caps	Add 15 g of soil to pre-weighed, laboratory preserved VOA vials on site; additional sample without preservative is needed to figure dry weight calculation; Cool to 4^0 C	28 days

Table 5
Recommended Containers, Preservation, Storage, & Holding Times
For CT DPH ETPH Samples

Matrix	Container	Preservative	Holding Time
Concentrated Waste Sample	125 ml wide mouth glass container with Teflon lined lid	None	Samples must be extracted within 14 days and analyzed within 40 days
Water Samples with No Residual Chlorine Present	1 L amber glass containers with Teflon lined lids	Add 3 to 4 drops of 1:1 HCl; Cool to 4^0 C	Samples must be extracted within 7 days and analyzed within 40 days
Water Samples with Residual Chlorine Present	1 L amber glass containers with Teflon lined lids	Add 3 ml 10% $Na_2S_2O_3$ solution per gallon. Add 3 to 4 drops of 1:1 HCl; Cool to 4^0 C*	Samples must be extracted within 7 days and analyzed within 40 days
Soil/Sediment and Sludge	250mL wide mouth glass container with Teflon lined lid	Cool to 4^0 C	Samples must be extracted within 14 days and analyzed within 40 days

* Dechlorination must be performed prior to the addition of any necessary preservative.