



**TGM for the Implementation of the Hawai'i State Contingency Plan  
Appendix 11-A  
Laboratory Methods for Soil Samples**

## Appendix 11-A

**Laboratory Methods, Containers, Preservation, and Holding Times for Multi Increment Soil Samples**

Parameter	Method <sup>7</sup>	Container	Preservation	Holding Time <sup>1</sup>
TPH-G	5035/8015 LUFT	<sup>2</sup> 1 L Glass jar containing combined increments	Methanol and $\leq 6^{\circ}\text{C}$	14 days
		Individual soil plugs in sealable airtight coring tool or sealable airtight vial	<sup>3</sup> Immediately freeze to $< -7^{\circ}\text{C}$	Within 14 days, combine in methanol at lab and test
		<sup>4</sup> Individual soil plugs in sealable airtight coring tool or sealable airtight vial	$\leq 6^{\circ}\text{C}$	<u>Within 48 hours</u> , combine in methanol at lab or freeze to $< -7^{\circ}\text{C}$ in lab, and test within 14 days
		<sup>5</sup> 1 L Glass jar containing combined increments	$\text{Na}_2\text{SO}_4$ in reagent water, $\leq 6^{\circ}\text{C}$	14 days
TPH-D	3550/8015 3550/8270 3540/8270 LUFT	Dedicated heavy-duty, sealable plastic bag	$\leq 6^{\circ}\text{C}$	E: 14 days A: 40 days
BTEX, MTBE	5035/8015 5035/8021 5035/8260	<sup>2</sup> 1 L Glass jar containing combined increments	Methanol and $\leq 6^{\circ}\text{C}$	14 days
		Individual soil plugs in sealable airtight coring tool or sealable airtight vial	<sup>3</sup> Immediately freeze to $< -7^{\circ}\text{C}$	Within 14 days, combine in methanol at lab and test
		<sup>4</sup> Individual soil plugs in sealable airtight coring tool or sealable airtight vial	$\leq 6^{\circ}\text{C}$	<u>Within 48 hours</u> , combine in methanol at lab or freeze to $< -7^{\circ}\text{C}$ in lab, and test within 14 days
		<sup>5</sup> 1 L Glass jar containing combined increments	$\text{Na}_2\text{SO}_4$ in reagent water, $\leq 6^{\circ}\text{C}$	14 days
<sup>6</sup> PAHs, SVOCs	3540/8310 3550/8310 3540/8270 3550/8270 8100	Dedicated heavy-duty, sealable plastic bag	$\leq 6^{\circ}\text{C}$	E: 14 days A: 40 days

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Parameter	Method <sup>7</sup>	Container	Preservation	Holding Time <sup>1</sup>
HVOCs	5035/8021	<sup>2</sup> 1 L Glass jar containing combined increments	Methanol and $\leq 6^{\circ}\text{C}$	14 days
		Individual soil plugs in sealable airtight coring tool or sealable airtight vial	<sup>3</sup> Immediately freeze to $< -7^{\circ}\text{C}$	Within 14 days, combine in methanol at lab and test
		<sup>4</sup> Individual soil plugs in sealable airtight coring tool or sealable airtight vial	$\leq 6^{\circ}\text{C}$	<u>Within 48 hours</u> , combine in methanol at lab or freeze to $< -7^{\circ}\text{C}$ in lab, and test within 14 days
		<sup>5</sup> 1 L Glass jar containing combined increments	$\text{Na}_2\text{SO}_4$ in reagent water, $\leq 6^{\circ}\text{C}$	14 days
VOCs	5035/8260	<sup>2</sup> 1 L Glass jar containing combined increments	Methanol and $\leq 6^{\circ}\text{C}$	14 days
		Individual soil plugs in sealable airtight coring tool or sealable airtight vial	<sup>3</sup> Immediately freeze to $< -7^{\circ}\text{C}$	Within 14 days, combine in methanol at lab and test
		<sup>4</sup> Individual soil plugs in sealable airtight coring tool or sealable airtight vial	$\leq 6^{\circ}\text{C}$	<u>Within 48 hours</u> , combine in methanol at lab or freeze to $< -7^{\circ}\text{C}$ in lab, and test within 14 days
		<sup>5</sup> 1 L Glass jar containing combined increments	$\text{Na}_2\text{SO}_4$ in reagent water, $\leq 6^{\circ}\text{C}$	14 days
<sup>6</sup> SVOCs	3550/8270	Dedicated heavy-duty, sealable plastic bag	$\leq 6^{\circ}\text{C}$	14 days
Metals (except Mercury and Chromium VI)	3050/6010 3050/6020	Dedicated heavy-duty, sealable plastic bag	None	6 months
Mercury	7471	Dedicated heavy-duty, sealable plastic bag	$\leq 6^{\circ}\text{C}$	28 days
Chromium VI	7196	Dedicated heavy-duty, sealable plastic bag	$\leq 6^{\circ}\text{C}$	E: 30 days A: 7 days
PCBs	3540/8082 3550/8082 8081 (Aroclors Only)	Dedicated heavy-duty, sealable plastic bag	$\leq 6^{\circ}\text{C}$	none
Chlorinated Herbicides	8151	Dedicated heavy-duty, sealable plastic bag	$\leq 6^{\circ}\text{C}$	E: 14 days A: 40 days
Organochlorine Pesticides	8081	Dedicated heavy-duty, sealable plastic bag	$\leq 6^{\circ}\text{C}$	E: 14 days A: 40 days
Triazine Pesticides	8141	Dedicated heavy-duty, sealable plastic bag	$\leq 6^{\circ}\text{C}$	E: 14 days A: 40 days

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Parameter	Method <sup>7</sup>	Container	Preservation	Holding Time <sup>1</sup>
Organophosphorus Pesticides	8141	Dedicated heavy-duty, sealable plastic bag	≤6°C	E: 14 days A: 40 days
Carbamates	8321	Dedicated heavy-duty, sealable plastic bag	≤6°C	E: 14 days A: 40 days
Fumigants	5035/8260	<sup>2</sup> 1 L Glass jar containing combined increments	Methanol and ≤6°C	14 days
		Individual soil plugs in sealable airtight coring tool or sealable airtight vial	<sup>3</sup> Immediately freeze to <-7°C	Within 14 days, combine in methanol at lab and test
		<sup>4</sup> Individual soil plugs in sealable airtight coring tool or sealable airtight vial	≤6°C	<u>Within 48 hours</u> , combine in methanol at lab or freeze to <-7°C in lab, and test within 14 days
		<sup>5</sup> 1 L Glass jar containing combined increments	Na <sub>2</sub> SO <sub>4</sub> in reagent water, ≤6°C	14 days
Pentachlorophenol	8270 8151	Dedicated heavy-duty, sealable plastic bag	≤6°C	E: 14 days A: 40 days
Glyphosate	EPA 547	Dedicated heavy-duty, sealable plastic bag	≤6°C	14 days
Cyanide	9013 EPA 335.3	Dedicated heavy-duty, sealable plastic bag	≤6°C	14 days
Dioxins/Furans	8290 8280	Dedicated heavy-duty, sealable plastic bag	≤6°C	none

Notes:

1. Holding times begin from the time of sample collection in the field
2. A methodology for the collection of *Multi-increment* samples for volatile analysis is discussed in [Section 4.2.8](#). The sample container must be large enough to accommodate 30 to 50 soil increments, preserved with 1 milliliter of methanol per 1 gram of soil, and additional methanol to cover the sample as needed. Since methanol is toxic and flammable, DOT and IATA transportation regulations apply and must be considered in the selection of this preservation method, especially if samples need to be shipped by air to a laboratory for testing. Small quantity exemptions for shipping (where specific hazardous material containers, specific shipping containers, labelling, or other requirements do not apply) may be appropriate if the volume of methanol in each individual container inside a shipping package is limited (typically 30 mL), and the total quantity of methanol in each shipping package for air transport is limited (typically 500 mL). Always check with current DOT and IATA hazardous material shipping regulations to ensure compliance.
3. However, do not freeze samples below -20°C due to potential problems with seals on coring tool or vials. and subsequent VOC loss upon thawing samples.
4. Not recommended for aromatic hydrocarbons (e.g. BTEX) in biologically active soils (e.g. garden soils, fertilized soils).

5. Work with lab on appropriate ratio of Na<sub>2</sub>SO<sub>4</sub> in reagent water for mass of multiple soil increments to be collected. Should be used only for non-calcareous soils (calcareous soils may be commonly encountered in coastal areas). Check with lab on other precautions for this acid preservation method, as some compounds within the olefins, ketones, esters, ethers, and sulfide classes may react and therefore results may not be representative of the soil sampled (e.g. generally not recommended for VOCs such as styrene, TCE, or vinyl chloride). Sodium bisulfate is also a strong mineral acid, so there are associated shipping restrictions by DOT and/or IATA that must be considered.
6. Refer to [Section 4.2.8](#), [Appendix 4-B](#) and [Section 5](#) for discussions of soil samples to be tested for VOCs and SVOCs. Include naphthalene in VOC analyses. Subsample bulk multi increment sample immediately upon receipt without drying for testing of SVOCs.
7. Where the term "EPA" is used with a given method number the prefix indicates that the method comes from United States Environmental Protection Agency (EPA) wastewater and drinking water standards, both published and maintained by the EPA Safe Drinking Water Act (SDWA) and/or Clean Water Act (CWA). For methods that are presented without the "EPA" notation, the methods come from the guidance document "Test Methods for Evaluating Solid Waste Physical/Chemical Methods" (SW-846). Although SW-846 was written by the EPA originally, they are guidance documents and not prescriptive as the EPA prefix methods. Holding times are from SW-846 ([USEPA 2007](#)). A longer holding time may be appropriate if it can be demonstrated that the reported analyte concentrations are not adversely affected from preservation, storage and analyses performed outside the recommended holding times.

BTEX	Benzene, toluene, ethylbenzene, and xylene
Dioxins	Polychlorinated dibenzodioxins
DOT	Department of Transportation
Furans	Polychlorinated dibenzofurans
HVOCs	Halogenated volatile organic compounds
IATA	International Air Transportation Association
MTBE	Methyl-tert butyl ether
PAHs	Polynuclear aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
SVOCs	Semi-volatile organic compounds
TPH-G	Total petroleum hydrocarbons as gasoline
TPH-D	Total petroleum hydrocarbons as diesel
TPH-O	Total petroleum hydrocarbons as oil
VOCs	Volatile organic compounds
≤	Less than or equal to
°C	Degree Celsius
g	Gram
L	Liter
mL	Milliliter
Na <sub>2</sub> SO <sub>4</sub>	Sodium bisulfate
MIS	<i>Multi-Increment</i> sample
E	Hold time to extraction
A	Hold time after extraction until analysis

References:

USEPA, 2007, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (Revision 5)* : U.S. Environmental Protection Agency, Office of Solid Waste, SW-846 Manual, Washington, D.C., February 2007 (and updates).