

Vermont Agency of Natural Resources
Department of Environmental Conservation

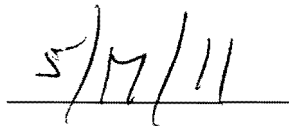
Procedure Designating Methods for Chemical and Biological Analyses
for Residual Waste Management

This procedure establishes the acceptable test methods for the chemical and biological analysis of residual solid wastes, groundwater, soil, and plant tissue as may be required under Subchapter 14 of the Vermont Solid Waste Management Rules. Alternative test methods may be used for any analysis required by Subchapter 14 only with prior written approval by the Secretary of the Vermont Agency of Natural Resources or his/her designee.

For the purposes of Table 1 of this Procedure, "sludges" is defined to include wastewater treatment sludge and/or biosolids, septage, composted and heat dried biosolids products, and any other biosolids derived products.



David K. Mears, Commissioner – VTDEC



date

TABLE 1**Methods for the Analysis of Sludges, Short Paper Fiber,
Wood Ash, and Water Treatment Residual Wastes**

Analyte	CAS #	Required Analytical Method(s)	Sample Container	Preservation	Reporting Units
Total Metals					
Arsenic	7440-38-2	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Barium	7440-39-3	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Cadmium	7440-43-9	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Calcium	7440-70-2	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Chromium	7440-47-3	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Cobalt	7440-48-4	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Copper	7440-50-8	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Lead	7439-92-1	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Magnesium	7439-95-4	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Mercury	7439-97-6	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Molybdenum	7439-98-7	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Nickel	7440-02-0	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Selenium	7782-49-2	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Silver	7440-22-4	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Zinc	7440-66-6	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
TCLP	multiple	SW-846, Method 1311	amber glass	cool to 4°C	mg/l
Volatile Organics	multiple	SW-846, Method 8260	amber glass	cool to 4°C	mg/kg dry wt.
Semi-volatile Organics	multiple	SW-846, Method 8270	amber glass	cool to 4°C	mg/kg dry wt.
Polychlorinated aromatics					
PCB-1242	53469-21-9	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1254	11097-69-1	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1221	11104-28-2	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1232	11141-16-5	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1248	12672-29-6	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1260	11096-82-5	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1016	12674-11-2	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
Chlorinated dibenzodioxins and dibenzofurans	multiple	SW-846, Method 1613B	amber glass w/ Teflon lined cap	cool to 4°C	pg/kg and parts per trillion TEQ
PCBs in short paper fiber	multiple	SW-846, Method 1668A	amber glass w/ Teflon lined cap	cool to 4°C	pg/kg and parts per trillion TEQ

TABLE 1 (con't.)

**Methods for the Analysis of Sludges, Short Paper Fiber,
Wood Ash, and Water Treatment Residual Wastes**

<u>Analyte</u>	<u>CAS #</u>	<u>Required Analytical Method(s)</u>	<u>Sample Container</u>	<u>Preservation</u>	<u>Reporting Units</u>
<u>Pathogen Indicators</u>					
Fecal Coliform	na	SW-846, Method 1681	sterile glass or sterile plastic	cool to 4°C	MPN / g
Salmonella	na	SW-846, Method 1682	sterile glass or sterile plastic	cool to 4°C	MPN / 4 g
Helminth Ova	na	EPA 600/1-87-014	sterile glass or sterile plastic	cool to 4°C	viable ova / 4 g
Enteric Viruses	na	ASTM D 4994-89	sterile glass or sterile plastic	cool to 4°C	PFU / 4 g
<u>Nutrients</u>					
Nitrate/Nitrite	NO ₃ 1479-76-50 NO ₂ 7697-37-2	SW-4500-NO ₃ or SW-846 Method 9210 or EPA 353, 3000 series	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
TKN	na	SM-4500-N _{org} or EPA 351.3	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Ammonia	na	SM-4500-NH ₃ or EPA 350	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Total Organic Nitrogen	na	calculation	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Total Phosphorus	7723-14-0	SM-4500-P or EPA 365	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Water Extractable phosphorus	7723-14-0	Universal Water Extractable P Test for Manure and Biosolids (see note below)	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Total Potassium	7440-97	SM-3500K or SW-846 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
<u>Compost Stability</u>					
	na	TBD			
<u>Other</u>					
pH	na	SM-4500H	glass or plastic	cool to 4°C	Standard Units (S.U.)
Total Solids	na	SM-2540G	glass or plastic	cool to 4°C	%

Note:

Determining water extractable P in animal manure and biosolids

Ann Wolf, Pennsylvania State University

Philip Moore, Jr., USDA-ARS, Fayetteville, AR

Peter Kleinman, USDA-ARS, University Park, PA

Dan Sullivan, University of Oregon

http://www.aasl.psu.edu/Water-soluble%20P%20Test%201_100%20ratio.pdf

TABLE 2**Methods for the Analysis of Soils**

Analyte	CAS #	Required Analytical Method(s)	Sample Container	Preservation	Reporting Units
Total Metals					
Aluminum	7429-90-5	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Arsenic	7440-38-2	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Barium	7440-39-3	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Cadmium	7440-43-9	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Calcium	7440-70-2	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Chromium	7440-47-3	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Cobalt	7440-48-4	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Copper	7440-50-8	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Lead	7439-92-1	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Magnesium	7439-95-4	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Mercury	7439-97-6	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Molybdenum	7439-98-7	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Nickel	7440-02-0	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Selenium	7782-49-2	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Zinc	7440-66-6	SW-846, 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt.
Polychlorinated aromatics					
PCB-1242	53469-21-9	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1254	11097-69-1	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1221	11104-28-2	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1232	11141-16-5	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1248	12672-29-6	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1260	11096-82-5	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.
PCB-1016	12674-11-2	SW-846, Method 8081/8082	amber glass	cool to 4°C	mg/kg dry wt.

TABLE 2 (con't.)**Methods for the Analysis of Soils**

<u>Analyte</u>	<u>CAS #</u>	<u>Required Analytical Method(s)</u>	<u>Sample Container</u>	<u>Preservation</u>	<u>Reporting Units</u>
<u>Nutrients</u>					
Nitrate/Nitrite	NO ₃ 1479-76-50 NO ₂ 7697-37-2	SW-4500-NO ₃ or SW-846 Method 9210 or EPA 353, 3000 series	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
TKN	na	EPA 351.3/350.1	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Ammonia	na	EPA 351.3/350.1	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Total Organic Nitrogen	na	calculation	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Total Phosphorus	7723-14-0	SM-4500-P or EPA 365.1	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Water Extractable phosphorus	7723-14-0	Modified Morgan Extraction	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Reactive Aluminum	NA	Modified Morgan Extraction	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
Total Potassium	7440-09-7	SM-3500K or SW- 846 6000/7000 series	glass or plastic	cool to 4°C	mg/kg dry wt. (or %)
<u>Other</u>					
pH	na	EPA 150.1	glass or plastic	cool to 4°C	Standard Units (S.U.)

TABLE 3**Methods for the Analysis of Groundwater**

Analyte	CAS #	Required Analytical Method(s)	Sample Container	Preservation	Reporting Units
<u>Dissolved Metals</u>					
Arsenic	7440-38-2	SM 18 3113	glass or plastic	cool to 4°C	mg/l
Barium	7440-39-3	SM 3111D	glass or plastic	cool to 4°C	mg/l
Cadmium	7440-43-9	SM 18 3113	glass or plastic	cool to 4°C	mg/l
Chromium	7440-47-3	SM 18 3113	glass or plastic	cool to 4°C	mg/l
Copper	7440-50-8	SM 18 3113	glass or plastic	cool to 4°C	mg/l
Lead	7439-92-1	SM 18 3113	glass or plastic	cool to 4°C	mg/l
Mercury	7439-97-6	EPA 245.1	glass or plastic	cool to 4°C	mg/l
Molybdenum	7439-98-7	SM 18 3113	glass or plastic	cool to 4°C	mg/l
Nickel	7440-02-0	SM 18 3113	glass or plastic	cool to 4°C	mg/l
Selenium	7782-49-2	SM 18 3113	glass or plastic	cool to 4°C	mg/l
Zinc	7440-66-6	SM 18 3113	glass or plastic	cool to 4°C	mg/l
<u>Nutrients</u>					
Nitrate	1479-76-50	EPA 352.2	glass or plastic	cool to 4°C	mg/l
TKN	na	EPA 351.3/350.1	glass or plastic	cool to 4°C	mg/l
Ammonia	na	EPA 350.3/350.1	glass or plastic	cool to 4°C	mg/l
Total Organic Carbon	na	EPA 9060	glass or plastic	cool to 4°C	mg/l
Total Phosphorus	7723-14-0	EPA 365.1	glass or plastic	cool to 4°C	mg/l
Chloride	na	EPA 325.2	glass or plastic	cool to 4°C	mg/l
<u>Other</u>					
pH	na	EPA 150.1	glass or plastic	cool to 4°C	Standard Units (S.U.)
Total Dissolved Solids	na	SM 18 2540C	glass or plastic	cool to 4°C	mg/l

TABLE 4**Methods for the Analysis of Plant Tissue**

<u>Analyte</u>	<u>CAS #</u>	<u>Required Analytical Method(s)</u>	<u>Sample Container</u>	<u>Preservation</u>	<u>Reporting Units</u>
<u>Total Metals</u>					
Arsenic	7440-38-2	EPA 6010	glass or plastic	cool to 4°C	mg/kg
Barium	7440-39-3	EPA 6010	glass or plastic	cool to 4°C	mg/kg
Cadmium	7440-43-9	EPA 6010	glass or plastic	cool to 4°C	mg/kg
Chromium	7440-47-3	EPA 6010	glass or plastic	cool to 4°C	mg/kg
Copper	7440-50-8	EPA 6010	glass or plastic	cool to 4°C	mg/kg
Lead	7439-92-1	EPA 6010	glass or plastic	cool to 4°C	mg/kg
Mercury	7439-97-6	EPA 7471	glass or plastic	cool to 4°C	mg/kg
Molybdenum	7439-98-7	EPA 6010	glass or plastic	cool to 4°C	mg/kg
Nickel	7440-02-0	EPA 6010	glass or plastic	cool to 4°C	mg/kg
Selenium	7782-49-2	EPA 6010	glass or plastic	cool to 4°C	mg/kg
Zinc	7440-66-6	EPA 6010	glass or plastic	cool to 4°C	mg/kg
<u>Other</u>					
Total Nitrogen	7727-37-9	EPA 351.3	glass or plastic	cool to 4°C	mg/kg
Total Phosphorus	7723-14-0	EPA 365.1	glass or plastic	cool to 4°C	%
Total Potassium	7440-09-7	EPA 6010	glass or plastic	cool to 4°C	mg/kg