

**Solid Waste Management Facility
Certification Renewal
10 V.S.A. 6605**

PERMITTEE/OPERATOR:	Entergy Nuclear Vermont Yankee, LLC
AUTHORIZED REPRESENTATIVE:	Chris Wamser, Site Vice President
SOLID WASTE I.D. NUMBER:	253
CERTIFICATION NUMBER:	F1402
PROJECT I.D. NUMBER:	NS75-0006
FIELD DESIGNATIONS:	MONITORING WELL DESIGNATIONS:
North Field FVN0101	WVN0101
	WVN0102
	WVN0103
South Field FVN0102	WVN0201
	WVN0202
	WVN0203
	WVN0204
STORAGE FACILITY DESIGNATIONS:	SVN0101 COB Holding Tank

CERTIFICATION PERIOD: Date of signature through June 30, 2024

PURPOSE OF CERTIFICATION: The purpose of this Certification is to ensure that the solid waste management facility (Facility) owned and operated by Entergy Nuclear Vermont Yankee, LLC (Permittee), for the management of stabilized septage via land application, operates in accordance with the conditions set forth herein to protect the public health and safety and the environment.

FACILITY DESCRIPTION & LOCATION: The Facility includes two land application sites located on the property of Vermont Yankee Nuclear Power Plant in Vernon, Vermont, one temporary septage storage tank, and any vehicles and equipment necessary for the proper operation of the facility, which are identified in this Certification and described in the submitted management plan entitled, "Application for Renewal of Entergy Nuclear Vermont Yankee's Residual Waste Management Program", dated March 30, 2009 and received by the Department of Environmental Conservation on March 31, 2009. The operation of the Facility was previously recertified in 2004 and pursuant to the provisions of 3 V.S.A. §814, Vermont Yankee continued to operate its biosolids management program under the terms and conditions of the 2004 certification until the Department reaches a final determination of the 2009 pending application.

FACILITY OPERATION: Stabilized septage is permitted for use by land application during times of the year when the ground is not frozen or snow covered, and when saturated soil is at a depth greater than thirty-six (36) inches below the bottom of the zone of incorporation. During periods when land application is not permitted, any septage collected from the on-site septic systems that serve buildings located within the Station's Protected Area must be managed on site until conditions allow for land application, in accordance with Condition C of this certification.

Septage is required to be stabilized for pathogen and vector attraction reduction prior to land application, according to the Vermont Solid Waste Management Rules and 40 CFR Part 503. Stabilization will be achieved by the addition of hydrated lime $[Ca(OH)_2]$, or its equivalent, as provided in this certification.

Land application rates of septage shall be established by the Permittee prior to application based upon crop nutrient requirements, contribution of nutrients from other sources, and an average nutrient content for septage.

APPLICATION REVIEW: The application for recertification of the Facility was reviewed Vermont Department of Environmental Conservation's Residuals Management Section (Department) in accordance with the Vermont Solid Waste Management Act, 10 V.S.A. §6601 et seq. and the Vermont Solid Waste Management Rules, amended March 15, 2012 (Rules). The application is on file with the Department, in Montpelier, Vermont.

FINDINGS

1. Certification for the Permittee's solid waste management facility (Facility) is required by 10 V.S.A. §6605 and Section 6-303 of the Rules.
2. On March 31, 2009, the Permittee submitted an application to the Department for a recertification of a solid waste management facility for a septage management system utilizing land application as the management strategy.
3. The application consisted of a plan for the management of stabilized septage via land application entitled, "Application for Renewal of Entergy Nuclear Vermont Yankee's Residual Waste Management Program" prepared by Lynn DeWald, Environmental Specialist, Entergy Nuclear Vermont Yankee, LLC, that also included a Facility Management Plan "Vermont Yankee Site Procedure RP 41615 Revision 14", dated March 24, 2005.
4. In accordance with 10 V.S.A. §6605(f), the Permittee provided notice of the application to the Town of Vernon on March 30, 2009.
5. Upon receipt of supplemental application information from the Permittee on September 24, 2009, the application was determined to be administratively complete.
6. On October 7, 2010, the Department notified the Permittee that pursuant to the provisions of 3 V.S.A. §814, Vermont Yankee may continue to operate its biosolids management program

under the terms and conditions of the existing certification until the Department has reached a final determination of your pending application.

7. The Permittee fulfilled the public notice requirements of §6-305(a)(2) of the Rules by advertisement in two area newspapers, the Brattleboro Reformer and "The Commons", and via direct mail to all parties stipulated in the Rules. The public comment period ran from March 19 through April 3, 2014 with none received.
8. The application was reviewed on its technical merits and was determined to be technically complete on April 8, 2014.
9. A draft certification and fact sheet were developed by the Department for the application in April 2014. Public comment regarding the draft certification and fact sheet was actively solicited by the Department via the Brattleboro Reformer and "The Commons" from April 30 to May 21, 2014, in accordance with §6-305(7) of the Rules. No comments were received.

CONDITIONS AND REQUIREMENTS FOR OPERATION

- A. The Permittee shall perform all actions necessary for the proper management of septage in accordance with the Plan and the conditions of this Certification.
- B. The Permittee shall comply with the provisions, requirements and standards set forth in 10 V.S.A. §§6601 et seq. and the Rules, except as expressly provided herein.
- C. The land application sites identified in the Plan at the Vermont Yankee Nuclear Power Plant in Vernon, Vermont are the only facilities authorized under this Certification for management of septage collected from the on-site septic systems that serve buildings located within the Station's Protected Area. Septage collected from the on-site septic systems that serve buildings located outside of the Station's Protected Area may be managed on these land application sites or it may be hauled off site to suitable and certified alternative facilities. Use of other sites for septage management via land application without prior written approval from the Secretary shall constitute grounds for revocation of this Certification.
- D. The Construction Office Building (COB) tank is the only authorized storage and treatment facility. Use of other facilities for treatment or storage without prior written approval from the Secretary shall constitute grounds for revocation of this Certification.
- E. Septage generated by the Permittee's on-site wastewater disposal systems is the only waste authorized for management via land application. Management via land application of other regulated solid wastes without prior written approval from the Secretary shall constitute grounds for revocation of this Certification.

COMPLIANCE SCHEDULE

- F. On or before December 31, 2023, the Permittee shall either submit an application for renewal of this certification or submit a plan documenting the strategy for closure of the Facility. If use of the Facility ceases prior to December 31, 2023, the Permittee shall submit a plan for closure of the Facility no later than 60 days prior to that action.

MATERIALS, MONITORING, AND OPERATING REQUIREMENTS

- G. The Permittee shall comply with all the siting conditions specified for diffuse disposal facilities in Subchapter 5 of the Rules and with all the facility operation standards, requirements, and conditions specified in Subchapter 7 of the Rules.
- H. The following actions are specifically prohibited:
- (1) application of solid wastes on frozen or snow covered ground; and
 - (2) application of solid wastes at times when saturated soil is within thirty-six (36) inches of the bottom of the zone of incorporation.
- I. The Permittee shall not land apply septage during a precipitation event when there is readily observable overland flow of rain water.
- J. The Permittee shall prepare the septage for land application as follows:
- 1) For septage generated within the Station's Protected Area (Main Building, Construction Office Building, and New Office Building), the Permittee shall remove septage from each of the on-site wastewater systems and transfer it to the COB tank for storage until the laboratory results confirm that the septage is of suitable quality for land application.
 - 2) For septage generated outside of the Station's Protected Area (Governor Hunt House, Gatehouse 1, Plant Support Building, and Power Uprate Building), the Permittee may choose not to place the material in the COB Holding Tank as testing of septage from each of these tanks is not required as established in Table 2 of this Certification. If any of the septage generated outside the Station's Protected Area is combined with any of the septage generated within the Station's Protected Area, all of the material must be managed in accordance with Condition J.1 above.
- K. When conditions do not allow for land application of stabilized septage, the Permittee shall manage septage as follows :
- 1) For septage generated within the Station's Protected Area (Main Building, Construction Office Building, and New Warehouse Building), the Permittee shall manage the septage on-site until conditions allow for the land application of the stabilized septage.
 - 2) For septage generated outside of the Station's Protected Area (Governor Hunt

House, Gatehouse 1, Plant Support Building, and Power Uprate Building), the Permittee shall utilize certified municipal wastewater treatment plants and/or other suitable and certified facilities for septage management.

- L. The Permittee shall ensure that any vegetation grown on the certified land application sites remains on those sites and is not harvested for feed.
- M. The Permittee shall ensure that all septage is treated with lime to reduce pathogen content and vector attraction prior to land application. Treatment will be achieved by adding sufficient hydrated lime, $[\text{Ca}(\text{OH})_2]$ or its equivalent, to raise the pH to greater than or equal to 12 S.U. and to maintain the pH at greater than or equal to 12 S.U. for a period of two (2) hours without the addition of more lime. Direct monitoring of septage pH to demonstrate that the pH and hold time requirements are being met shall be conducted and documented. Documentation of compliance with this requirement shall be submitted with the appropriate quarterly report.
- N. Application of septage by "straight piping" from the application vehicle is prohibited. The use of a diffuser bar, splash plate, or other appropriate device or equipment is required so as to provide for even dispersal of the waste.
- O. The Permittee shall continue the liming program to raise and/or maintain the soil pH of all land application sites to within the required range of 6.5 to 8.0 S.U. (aqueous). Use of the fields for septage management is specifically prohibited at times when the soil's pH is not in the specified range.
- P. The Permittee shall comply with the following annual site capacities when land applying septage during the first year of Certification, except that any change in site management including, but not limited to, the addition of other sources of nutrients, crop rotations, or any evidence of environmental impacts, shall be cause for changing the application rates for the sites.

<u>SITE</u>	<u>CROP</u>	<u>ACREAGE</u>	<u>CAPACITY</u>
South Field	hay/grass	1.90 acres	109,600 gal/yr
North Field*	hay/grass	2.26 acres	130,400 gal/yr
Total	---	4.16 acres	240,000 gal/yr

* To date, all land application of stabilized septage has been on the South Field. The North Field is considered a contingency management option. If the North Field requires utilization, pH and other site characterization parameters must be determined and shown to meet all applicable standards prior to septage application.

- Q. The Permittee shall conduct sampling and analysis of the septage, soil, plant tissue and groundwater in accordance with the parameters and frequencies set forth in Table 2 of this certification and as follows:
- (1) Testing for metals in the septage shall be for the total form, and shall be reported in units of milligrams per kilogram (mg/kg), dry weight basis. Testing for radionuclides in septage shall be reported in units of microCuries per kilogram, dry weight basis.

- (2) Testing of the septage shall be done on a sample obtained before the waste has been lime stabilized.
- (3) Testing for metals in the soil and plant tissue should be for the available form, and shall be reported in units of milligrams per kilogram (mg/kg), dry weight basis. Testing for radionuclides in soil shall be reported in units of microCuries per acre.
- (4) Testing for metals in the groundwater shall be for total dissolved metals and shall be reported in units of milligrams per liter (mg/l) or micrograms per liter (µg/l).

The results of this testing shall be included with the appropriate quarterly report.

- R. For any exceedence of a trigger value established in Table 1 of this certification, with the exception of Total Dissolved Solids and Chloride, that is detected in groundwater monitoring conducted under Condition Q and Table 2 of this certification, the Permittee shall resample the affected well(s) and submit the sample to an independent laboratory for a confirmatory analysis of the parameter(s) involved within thirty (30) days of receiving the analytical results reporting the exceedences.
- S. The entire content of the application that the Permittee submitted to the Nuclear Regulatory Commission (NRC), and the cover letter dated June 28, 1989 is referenced and adopted as conditions that must be met. Specifically, the application contains waste standards and sets maximum allowable accumulations of radionuclides in the soil (site life).

To ensure that the intent of the application to NRC is met, in addition to gamma spectroscopic analyses of the samples, analyses of the septage and soil shall be conducted for Strontium-89, Strontium-90, and Tritium (H-3) in accordance with Table 2.

- T. Prior to land application of stabilized septage, the Permittee shall verify there is at least thirty-six (36) inches of separation between the bottom of the zone of incorporation and saturated soil by checking the depth to saturated soil. The results of the depth to saturated soil measurements shall be submitted to the Department with the appropriate quarterly report.
- U. Prior to land application of stabilized septage, the Permittee shall mark the edge of the useable acreage with temporary stakes or field flagging to identify the boundaries for spreading. The Permittee shall properly post the sites to ensure that access to the sites certified herein is restricted, providing notice to individuals, such as employees, for the duration of any septage land application event and for a minimum period of twelve (12) months beyond the last disposal episode.

RECORD KEEPING AND REPORTING

- V. The Permittee shall submit quarterly reports to the Department by the 15th day of the month following the end of each quarter (April 15, July 15, October 15, and January 15) on forms provided by the Secretary.

- W. The results of the testing required in Condition Q and Table 2 of this Certification as well as the volume of lime applied to the sites for soil pH control shall be included with the appropriate quarterly report.
- X. If the results of any of the required septage monitoring shows an exceedence of a regulatory standard established in the Rules, the Permittee shall notify the Secretary in writing of this fact and reasons for the non-compliance within five (5) days of when the exceedence is detected, together with a proposed strategy for remediation of conditions resulting in the exceedence. If such an exceedence occurs, the Secretary reserves the right to require the Permittee to:
- (1) conduct studies necessary to determine the source(s) and/or cause(s) of contamination;
 - (2) take actions necessary to control or repair the cause of any impacts; and
 - (3) take actions necessary to remediate any impacts.
- Y. If the results of any of the required groundwater monitoring shows an exceedence of a trigger value specified in Table 1 of this certification, the Permittee shall notify the Secretary in writing of this fact and reasons for the non-compliance within ten (10) days of when the exceedence is detected, together with a proposed strategy for remediation of conditions resulting in the exceedence. If such an exceedence occurs, the Secretary reserves the right to require the Permittee to:
- (1) install additional sampling locations and/or require expanded water quality analyses;
 - (2) conduct studies necessary to determine the source of contamination;
 - (3) take actions necessary to control or repair the cause of any impacts;
 - (4) take actions necessary to remediate any impacts; and
 - (5) determine and specify the response(s) to be implemented, as authorized in Subchapter 7 of the Groundwater Rules.
- Z. If the results of any of the required monitoring shows an exceedence of a standard, the Permittee shall notify the Secretary in writing of this fact and reasons for the non-compliance within five (5) days of when the exceedence is detected, together with a proposed strategy for remediation of conditions resulting in the exceedence.
- AA. At least thirty (30) days prior to land application for each year of the certification period, the Permittee shall notify the Department of the volume of septage it intends to land apply and when.
- BB. Complaints regarding odors or other emissions or discharges from the Facility received by the Permittee shall be reported to the Department within twenty-four (24) hours, or on the next business day, with a report of the measures taken to resolve the situation. The

Secretary reserves the right to require the Permittee to utilize reasonable measures including, but not limited to, those measures set forth in this Certification and the management plan, to remediate problems associated with odors or other nuisance conditions resulting from the operation of any of the facilities certified herein.

- CC. Any discharge or emission from the Facility not expressly authorized under the terms and conditions of this Certification shall be reported by the Permittee within twenty-four (24) hours of its occurrence, or on the next business day, to the Department, the local health officer, and the select person(s) of the affected municipalities.
- DD. The Permittee shall maintain all records regarding activities, management practices, complaints, and observations in a secure, dry place from the date on which the application for initial certification is signed through the date of closure of the facility.
- EE. The Permittee shall make any other reports that may be reasonably required by the Secretary during the term of this Certification.

CLOSURE AND POST-CLOSURE REQUIREMENTS

- FF. Upon determination by the Secretary that no further land application will be conducted at the Facility, or upon the Permittee's notice that site use is no longer occurring, the Permittee shall comply with the following post-closure requirements:
 - (1) Provide for control of public access to the facility for a period of twelve (12) months following the last application of septage;
 - (2) Prohibit grazing of domestic food source animals for a period of six (6) months following the last application of septage;
 - (3) Prohibit production of crops for direct human consumption for a period of thirty-eight (38) months following the last application of septage;
 - (4) Prohibit the harvest of fiber and feed crops (including silage) for a period of five (5) weeks beyond the last disposal episode;
 - (5) Prohibit the harvest of turf for 12 months after the last disposal episode;
 - (6) Test the groundwater annually, in the spring after the thaw, for a minimum of two years if the site has received seventy-five percent (75%) of the maximum allowable cumulative level based on soil type for any of the metals monitored, or if the Secretary determines a need. The required parameters are listed in this Certification in Table 2. The results shall be submitted to the Department; and,
 - (7) Test the soils biannually for a minimum of two years if the site has received seventy-five percent (75%) of the maximum allowable cumulative level based on soil type for any of the metals monitored, or if the Secretary determines a need. The required parameters are listed in this Certification in Table 2. The results shall be submitted to the Department.

GENERAL CONDITIONS

- GG. This Certification does not convey property rights of any sort or any exclusive privilege, nor does it authorize any injury to private property or any invasion of personal rights.
- HH. This Certification is not alienable, transferable, or assignable without prior written approval from the Secretary. Requests for such approval shall include an application for reissuance under the new name and a written agreement which specifies the date of transfer and includes the signatures of the authorized representatives.
- II. The Permittee shall comply with all existing federal laws, rules and regulations that apply to septage use and management practices and with the technical standards set forth in Section 405(d) of the federal Clean Water Act and 40 CFR Part 503. If an applicable management practice or numerical limitation for pollutants in septage more stringent than existing federal and state regulations is promulgated under Section 405(d) of the Clean Water Act or 40 CFR Part 503, this certification shall be modified or revoked and reissued to conform to the promulgated regulations. The Permittee shall comply with the limitations no later than the compliance date specified in the applicable regulations as required by Section 405(d) of the Clean Water Act or 40 CFR Part 503.
- JJ. If the Permittee anticipates that any compliance date or operating condition will not be met, the Permittee shall notify the Secretary in writing of this fact and reasons for the anticipated non-compliance at least five (5) days prior to the compliance date or conditions in question.
- KK. This Certification may be modified or amended for cause during its term with the written approval of the Secretary. If the Secretary determines modification is appropriate, only the conditions subject to modifications are reopened. Until a modification or amendment is granted, all conditions set forth in the Certification remain in full force and effect, pursuant to Section 6-307(a) of the Rules.
- LL. This Certification may be revoked, in whole or in part, at any time during its effective term in accordance with the Rules.
- KK. The Permittee agrees to allow Agency personnel access to the Facility during normal business hours to perform such inspections or other activities pursuant to 10 V.S.A. §8005 as may be required to ensure compliance with this Certification, with all applicable statutes, and with the Rules.
- LL. The Secretary retains the right to require the Permittee to perform any other action deemed necessary in accordance with 10 V.S.A. §6610a.

Table 1

**RESPONSE TRIGGER VALUES FOR CONCENTRATIONS
OF COMPOUNDS IN GROUNDWATER**

Parameter	Concentration (µg / L)
Arsenic	5.0
Barium	1000.0
Cadmium	2.5
Chloride	125,000.0
Chromium	50.0
Copper	650.0
Lead	5.0
Mercury	1.0
Molybdenum	20.0
Nickel	50.0
Selenium	25.0
Silver	50.0
Sulfate	125,000.0
Zinc	2500.0
Polychlorinated Biphenyls (PCBs)	0.25
Nitrate Nitrogen	5000.0
Total Dissolved Solids (TDS)	250,000.0

NOTES:

All concentrations are in micrograms per liter (µg / L)

Concentration levels of other parameters are of concern for determining application rates and monitoring impacts upon the sites used for septage management. Levels of the other parameters will be evaluated on a case-by-case basis.

An analysis for Total Organic Halides (TOX) may be conducted in lieu of analyzing for PCBs. However, if TOX is detected in concentrations equal to or greater than the applicable regulatory standard, then an analysis specific for PCBs shall be conducted.

Table 2
MINIMUM REQUIRED SAMPLING AND TESTING FREQUENCIES

<u>PARAMETER</u>	<u>SEPTAGE</u>	<u>SOIL</u>	<u>GROUNDWATER</u>	<u>PLANT TISSUE</u>
Arsenic	Annual	EOC	Annual	EOC
Barium	None	EOC	Annual	None
Cadmium	Annual	EOC	Annual	EOC
Chromium	Annual	EOC	Annual	EOC
Copper	Annual	EOC	Annual	EOC
Lead	Annual	EOC	Annual	EOC
Mercury	Annual	EOC	Annual	EOC
Molybdenum	Annual	EOC	Annual	EOC
Nickel	Annual	EOC	Annual	EOC
Selenium	Annual	EOC	Annual	EOC
Silver	None	EOC	Annual	None
Zinc	Annual	EOC	Annual	EOC
Total Kjeldahl Nitrogen	Annual	Biannual	Biannual	None
Ammonia Nitrogen	Annual	Biannual	Biannual	None
Nitrate Nitrogen	Annual	Biannual	Biannual	None
Total Phosphorus	Annual	None	Biannual	EOC
Total Potassium	Annual	None	Biannual	EOC
Total Nitrogen	None	None	None	EOC
Chloride	None	None	Biannual	None
Total Organic Carbon	None	None	Biannual	None
Percent Total Dissolved Solids	None	None	Biannual	None
Polychlorinated Biphenyls(PCB)	EOC ¹	EOC	EOC	None
Percent Solids	Annual	None	None	None
pH	See Note #2	Biannual	Biannual	None
Liming Requirement	None	Biannual	None	None
Available Potassium	None	Biannual	None	None
Available Magnesium	None	Biannual	None	None
Available Phosphorus	None	Biannual	None	None
Reserve Phosphorus	None	Biannual	None	None
CEC	None	EOC	None	None
Radionuclides	Annual	EOC	None	None
TCLP	See Note #3	None	None	None

NOTES

Annual (Septage): Once per year, prior to land application, in accordance with Condition J.

Biannual (Soil): Once in the spring, once in the fall if septage is land applied more than once per year.

Annual (Groundwater): Once in the spring after the thaw.

Biannual (Groundwater): Once in the spring after the thaw, once in the fall if septage is land applied more than once per year.

EOC: Sampling prior to the end of the certification (EOC), such that the results may be submitted with the application required in the Compliance Schedule of this Certification.

None: No sampling or testing is required for that parameter in the specific media.

1: An analysis for Total Organic Halides (TOX) may be conducted in lieu of analyzing for PCBs in septage. However, if TOX is detected in concentrations greater than or equal to 10.0 mg/kg (dry wt.) in the septage, then an analysis specific for PCBs shall be conducted.

2: The pH of septage shall be tested in accordance with Condition M of this certification.

3.: Once every five years, the septage shall be sampled and subjected to the Toxicity Characteristic Leaching Procedure (TCLP) and analysis for all parameters regulated under §7-207 of the Vermont Hazardous Waste Management Regulations. A mathematical demonstration of compliance may be performed for the regulated metals only; all other parameters shall be subjected to the full extraction and analysis procedure.

Analysis for parameters in the septage shall be for the total form, and shall be reported in units of milligrams per kilogram (mg/kg), dry weight basis. Analysis for radionuclides in septage shall be reported in units of microCuries per kilogram, dry weight basis. Analysis of septage shall be done on a sample obtained before the waste has been lime stabilized. Analysis for parameters in the soil and plant tissue shall be for the available form, and shall be reported in units of milligrams per kilogram (mg/kg), dry weight basis. Analysis for radionuclides in soil shall be reported in units of microCuries per acre. Analysis for parameters in the groundwater shall be for total dissolved metals and shall be reported in units of milligrams per liter (mg/l) or micrograms per liter (µg/l).

The Department's issuance of this Solid Waste Management Facility Certification relies upon the data, judgement, and other information supplied by the Permittee, hired professional consultants, and other experts who have participated in the preparation of the application.

The Department makes no assurances that the system certified herein will meet performance objectives of the Permittee, and no warranties or guarantees are given or implied.


The Department staff has reviewed the above project and application and finds it to conform with current technical standards. It is recommended that the foregoing findings be made and the Solid Waste Management Facility Certification be issued.

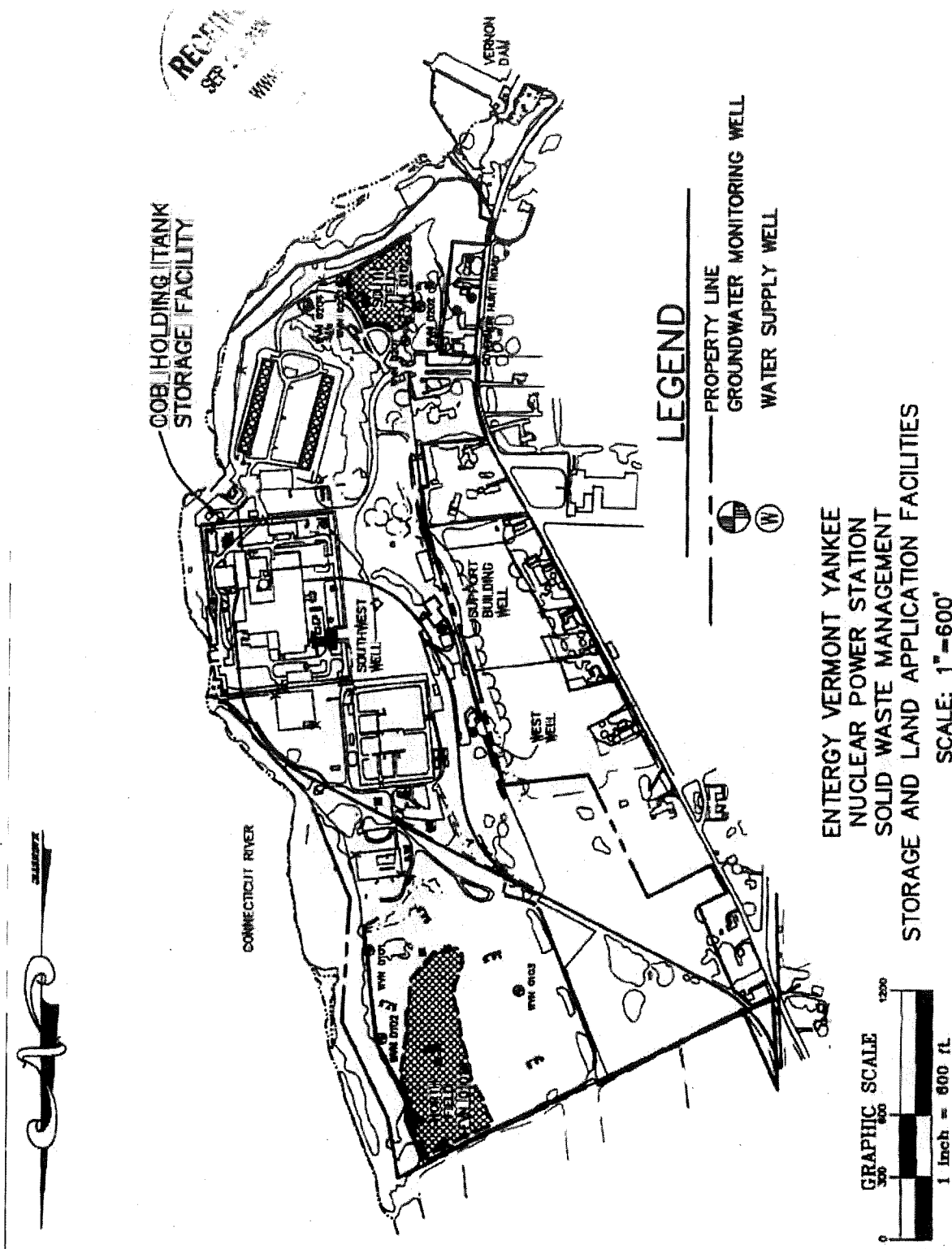
I do affirmatively make the findings as recommended by the staff and approve this Certification.

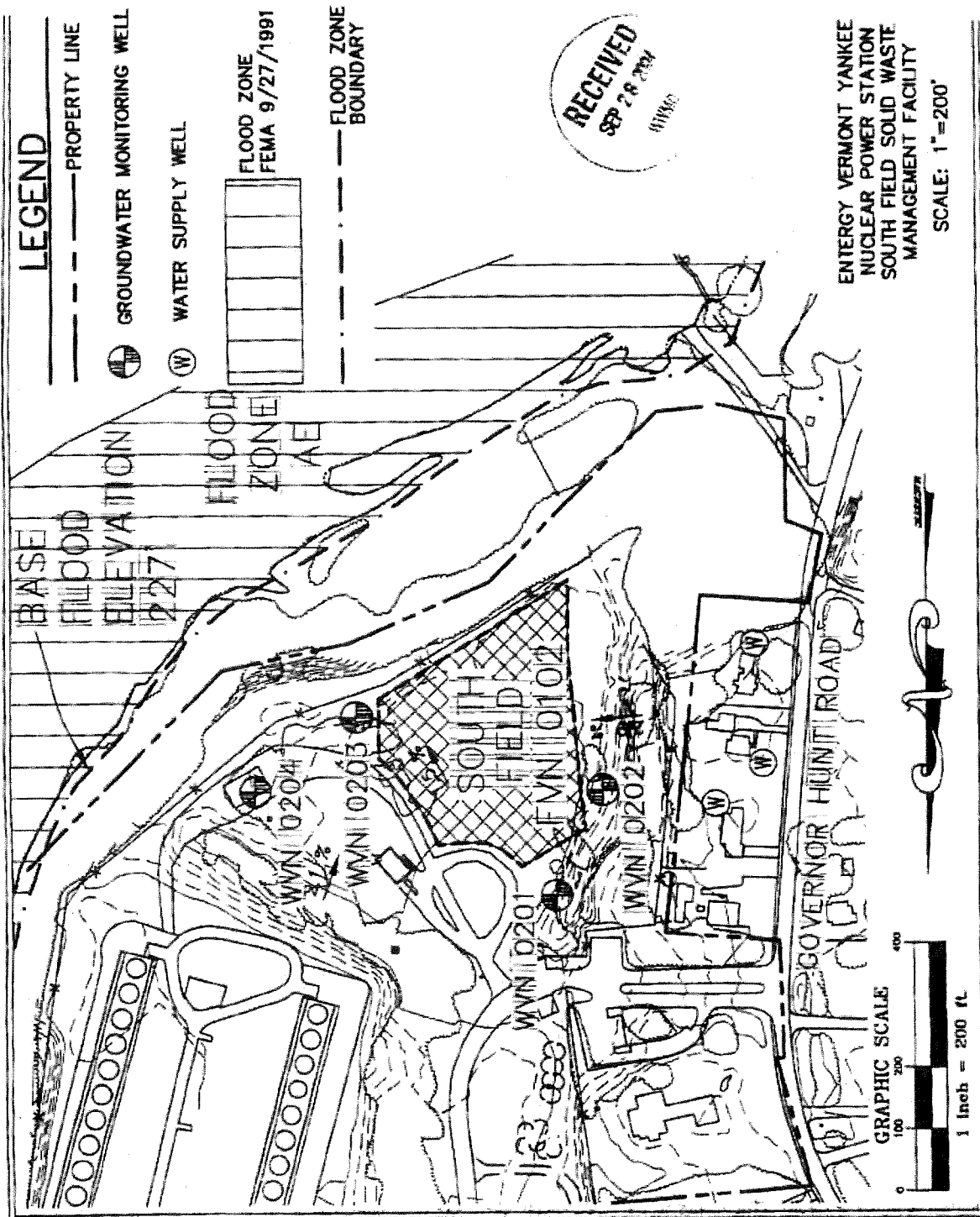
Dated this 21st day of August, 2014, at Montpelier, Vermont.

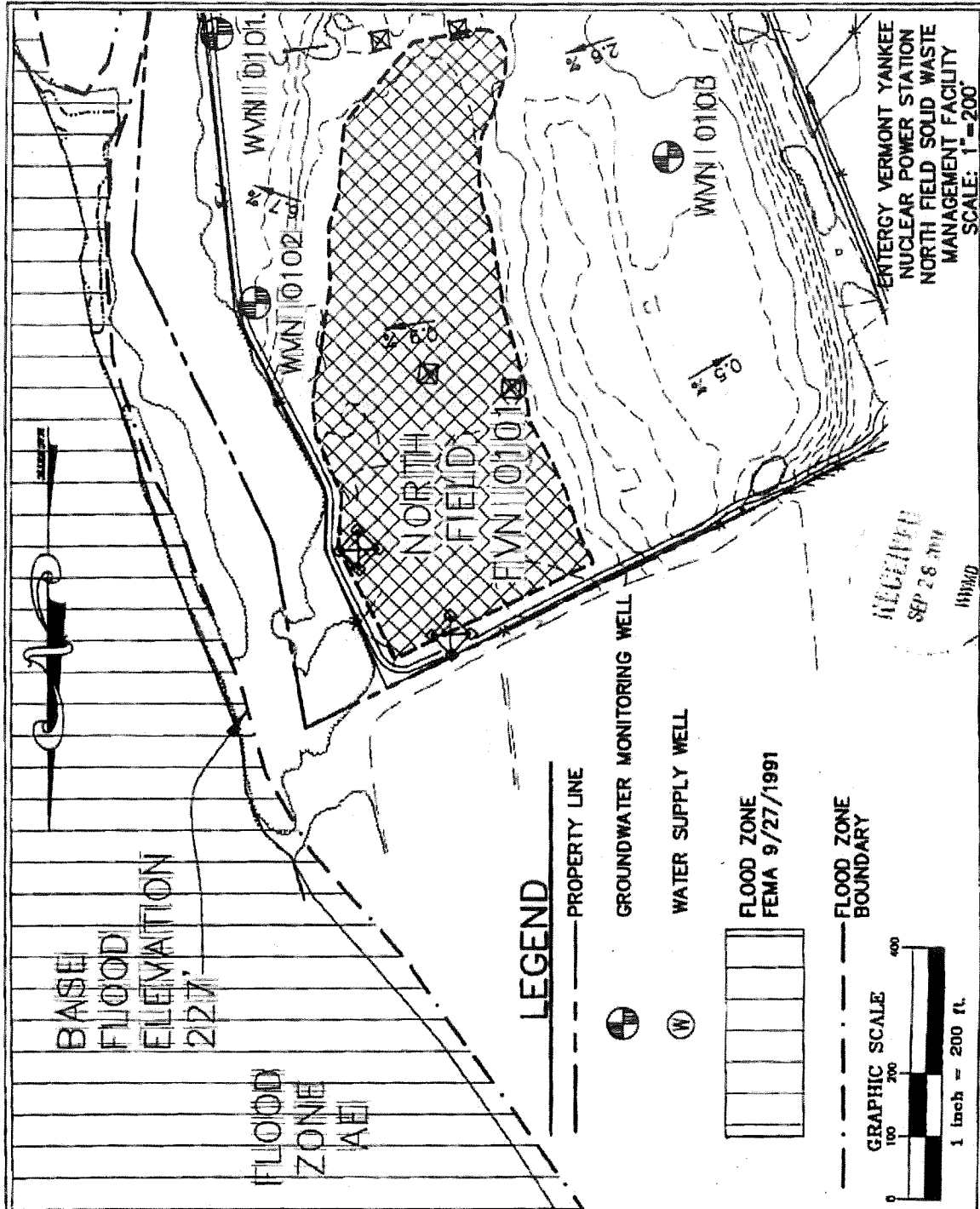
AGENCY OF NATURAL RESOURCES

David Mears, Commissioner
Department of Environmental Conservation

BY: 
Ernest F. Kelley, Program Manager
Wastewater Management Program
Department of Environmental Conservation







APPENDIX I

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

Updates to this Procedure will be posted to the Residuals Management Section web
page at:

<http://www.watershedmanagement.vt.gov/ww/htm/residuals.htm>

Vermont Agency of Natural Resources
Department of Environmental Conservation

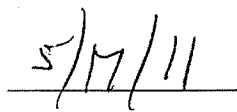
Procedure Designating Methods for Chemical and Biological Analyses
for Residual Waste Management

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 A-1
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>Total Metals</u>					
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.
<u>TCLP</u>	multiple	SW-846, Method 1311	amber glass	cool to 4°C	mg/l
<u>Volatile Organics</u>	multiple	SW-846, Method 8260	amber glass	cool to 4°C	mg/kg dry wt.
<u>Semi-volatile Organics</u>	multiple	SW-846, Method 8270	amber glass	cool to 4°C	mg/kg dry wt.
<u>Polychlorinated aromatics</u>					
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 A1 (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 Phosphorus 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 A-2
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>Total Metals</u>					
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.
<u>Polychlorinated aromatics</u>					
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 A-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 A-3
Methods for the Analysis of Groundwater

<u>Analyte</u>	<u>CAS #</u>	<u>Required Analytical Method(s)</u>	<u>Sample Container</u>	<u>Preservation</u>	<u>Reporting Units</u>
<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 A-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

