

STATE OF VERMONT
PUBLIC SERVICE BOARD

Petition of Entergy Nuclear Vermont Yankee,)	Docket No. 8300
LLC, and Entergy Nuclear Operations, Inc., For a)	
Certificate of Public Good Pursuant to 30 V.S.A.)	
§ 248 and 10 V.S.A. § 6522 to Construct a Second)	
Independent Spent Fuel Storage Installation)	
("ISFSI") at the Vermont Yankee Nuclear Power)	
Station)	
)	
)	
)	
)	

PREFILED TESTIMONY OF STEVE SIMOES

On Behalf of the Vermont Agency of Natural Resources, Department of Environmental
Conservation, Hazardous Waste Management Program

Summary of Testimony

Mr. Simoes is an Environmental Analyst with the Hazardous Waste Management Program of the Waste Management and Prevention Division and provides an overview of the applicable Vermont Hazardous Waste Management Regulations and procedures for non-radiological hazardous waste determinations and steps required to comply with these regulations and procedures and Criterion 1B – Waste Disposal. The recommendations in this testimony are not intended to and should not affect the timeline for any work on this project if the Board issues the Certificate of Public Good.

1 **Q1. Please state your name, place of employment, and position.**

2 A1. My name is Steve Simoes, I am employed by the Vermont Agency of Natural Resources,
3 Department of Environmental Conservation, Waste Management & Prevention Division,
4 Hazardous Waste Program, 1 National Life Drive – Davis 1, Montpelier, Vermont 05620.
5 My title is Environmental Analyst VII.

6 **Q2. Please describe your education, professional background, and tenure at the Agency**
7 **of Natural Resources.**

8 A2. I have a Bachelor of Science degree from Johnson State College for both Environmental
9 Science and Ecology. I have worked in the State of Vermont's Hazardous Waste
10 Program for almost 25 years. Prior to working for the State of Vermont, I worked for a
11 Vermont-based environmental testing laboratory for six years. During my career with
12 Vermont's Hazardous Waste Program, I have been involved in all aspects of program
13 implementation such as inspection and permitting of regulated entities, enforcement, rule
14 and policy development, and program authorization. During my career, I have also been
15 involved with both regional and national associations of state hazardous waste program
16 officials that work together to ensure consistent regional and national program
17 implementation of hazardous waste regulations and standards.

18
19 My resume is attached as **Exhibit ANR-SS-1.**

20 A description of my current job duties are attached as **Exhibit ANR-SS-2.**

21

1 **Q3. While at the Agency, have you engaged in any training or classes related to your**
2 **work with non-radiological hazardous wastes?**

3 A3. See Answer to Question 2 and **Exhibit ANR-SS-2.**

5 **Q4. Have you previously provided testimony to the Public Service Board, the**
6 **Environmental Court, or the District Commissions?**

7 A4. No.

9 **Q5. What is the purpose of your testimony?**

10 A5. The purpose of my testimony is to provide the Agency's perspective on non-radiological
11 hazardous waste management issues related to the Project and Criterion 1(B) – Waste
12 Disposal, and to raise concerns the Agency has with regard to the Project meeting the
13 Agency's Hazardous Waste Management Regulations (VHWMR) and procedures and
14 Criterion 1(B), specifically with respect to requirements to conduct a non-radiological
15 hazardous waste determination and requirements for management and disposal of non-
16 radiological hazardous waste generated during demolition and removal of the North
17 Warehouse. Additionally, my testimony provides recommendations the Agency has for
18 addressing those concerns. These recommendations are not intended to and should not
19 affect the timeline for any work by Petitioner on this project if the Board issues the
20 Certificate of Public Good.

1 **Q6. Please describe the scope of your review of the proposed Project.**

2 A6. My direct review of the proposed Project is limited. I have reviewed Petitioner testimony
3 regarding the North Warehouse demolition and characterization and materials stored or
4 managed in the North Warehouse. I have also performed a site inspection that included a
5 limited evaluation of the North Warehouse, which is currently located where the
6 proposed Project is to occur.

7
8 **Q7. Please describe the Agency regulations regarding non-radiological hazardous waste**
9 **disposal and management that are applicable to the Project.**

10 A7. The Agency is authorized by federal law to administer the Vermont Hazardous Waste
11 Management Regulations (VHWMR) in lieu of a federal hazardous waste program under
12 the federal Resource Conservation and Recovery Act Subtitle C hazardous waste
13 regulations. The VHWMR govern the management of non-radiological hazardous wastes
14 generated, transported, treated, stored, or disposed of in the State. In addition to the
15 VHWMR, the Hazardous Waste Program maintains a variety of procedures and guidance
16 documents to assist with implementation of the VHWMR. Specifically related to lead,
17 the Agency maintains an Environmental Fact Sheet for Managing Lead-Containing Paint
18 Waste, attached hereto as **Exhibit ANR-SS-3**.

**Q8. How do these regulations and procedures apply to wastes generated by the
Petitioner during the Project?**

A8. Pursuant to VHWMR § 7-303, Petitioner is required to make a non-radiological hazardous waste determination of any wastes generated by Project activities. This includes evaluation of any demolition waste or debris created as a result of the deconstruction and demolition of the North Warehouse. A non-radiological hazardous waste determination must be made in accordance with the process set forth in VHWMR § 7-202.

For any demolition waste and building debris identified as containing PCBs or lead, Petitioner must determine whether such wastes exhibit any of the characteristics of hazardous wastes (e.g., the characteristic of toxicity for lead) or meet the criterion for the Vermont VT01 hazardous waste listing for wastes containing PCBs in concentrations equal to or greater than 50 ppm.

Q9. What is the process for making a non-radiological hazardous waste determination?

A9. VHWMR § 7-202(b) requires that a generator first determine if a waste is excluded from regulation under VHWMR §§ 7-203 and 7-204. If the waste is not excluded, a generator then must determine if a hazardous waste listing in VHWMR in §§ 7-210 through 7-215 applies. If the waste is not listed, the generator must determine if the waste exhibits the non-radiological hazardous waste characteristic of ignitability (§ 7-205), corrosivity (§ 7-206), reactivity (§ 7-207), and/or toxicity (§ 7-208) based on the specific properties of

1 that waste. If a waste is listed or found to exhibit one or more of the non-radiological
2 hazardous waste characteristics using the methods specified in the respective sections of
3 the regulations, the waste is determined to be “hazardous waste”.

4
5 Based on the properties of lead, any waste containing lead must be evaluated to
6 determine if its exhibits the characteristic for toxicity.

7
8 **Q10. What analysis is used for determining whether a waste exhibits the hazardous**
9 **characteristic of toxicity?**

10 A10. When a waste is known to contain a contaminant identified in VHWMR § 7-208 Table 1
11 (Maximum Concentration of Contaminants for the Characteristic of Toxicity) (“Table
12 1”), the generator of the waste must conduct either a Toxicity Characteristic Leaching
13 Procedure (TCLP) to determine if the waste exhibits the toxicity characteristic or use a
14 total waste analysis to determine if a waste potentially could exhibit the toxicity
15 characteristic.

16
17 The TCLP (EPA Test Method 1311 in “Test Methods for Evaluating Solid Waste,
18 Physical/Chemical Methods”, EPA Publication SW-846”) is a method intended to
19 simulate leaching that occurs in a landfill setting. Simply stated, the TCLP subjects a
20 waste to extraction using an aqueous-based pH-adjusted leaching fluid. The resulting
21 extract of a representative sample of the waste is analyzed to determine the concentration,
22 in mg/L, of the contaminant(s) of concern in the extract. If the contaminant(s) of concern

1 is/are found to meet or exceed the regulatory level(s) specified in Table 1, the waste is
2 subject to regulation as hazardous waste.

3
4 A copy of EPA Test Method 1311 in “Test Methods for Evaluating Solid Waste,
5 Physical/Chemical Methods”, EPA Publication SW-846 is attached hereto as **Exhibit**
6 **ANR-SS-3.**

7
8 The “total waste analysis” approach may be used in lieu of the TCLP as described in EPA
9 RCRA Online document RO 13647. This approach may be used to make a preliminary
10 determination of whether the waste could exhibit the toxicity characteristics and therefore
11 whether a TCLP analysis will be required to determine toxicity. Total waste analysis
12 identifies the actual concentration of a contaminant in a waste. For a solid phase waste
13 analyzed under this approach, the results are conveyed in mg/Kg.

14
15 A copy of RCRA Online Document RO 13647 is attached hereto as **Exhibit ANR-SS-4.**
16

17 **Q11. What qualifies as a “representative sample”?**

18 A11. The methods used for sampling waste materials will vary with the form and consistency
19 of the waste materials to be sampled. Samples must be representative of the waste being
20 evaluated and the contaminant(s) of concern. Given the difficulty of sampling structural
21 debris representatively following demolition, it is best to obtain samples from a structure
22 prior to demolition. Either a core sample or cross sectional piece of the structure to be

1 demolished that contains an amount of the contaminants of concern (i.e., lead paint) that
2 is representative of the structure would be considered representative.

3
4 **Q12. When is a waste containing lead determined to be a “hazardous waste”?**

5 A12. Any waste found to meet or exceed the toxicity characteristic “regulatory level” of 5.0
6 mg/L for lead as identified in Table 1 is subject to regulation as hazardous waste.

7
8 **Q13. Does the Project involve the creation of waste that will require the Petitioner to**
9 **make a hazardous waste determination?**

10 A13. Yes. Based on totals analysis testing results of a single “paint chip” sample included with
11 the Petitioner testimony regarding the North Warehouse (see Attachment A.ANR:EN.2-
12 4), the “total” concentration of lead contained in paint currently applied within the North
13 Warehouse was measured at 3,600 mg/Kg, or “ppm.” The Petitioner did not indicate
14 how the paint chip sample was obtained and whether the sample is representative of the
15 demolition debris waste. Based on the concentration of lead in the paint chip sample, a
16 representative sample of the debris would potentially exceeds the toxicity characteristic
17 regulatory threshold for lead, which is identified in the VHWMR Table 1 as 5 mg/L, or
18 “ppm”. Based on this potential exceedance, Petitioner must make a determination as to
19 whether wastes generated from demolition of the North Warehouse, including debris, is
20 considered a non-radiological “hazardous waste” due to the lead paint.

1 **Q14. What is the process Petitioner must use to make a non-radiological hazardous waste**
2 **determination of the debris containing lead paint?**

3 A14. The Petitioner should obtain at least one representative sample of the North Warehouse
4 structural components that are coated with lead paint. The sample(s) should consist of a
5 core or cross-sectional portions of the structure that contain lead paint. The method used
6 to collect the sample(s) should be documented. The sample(s) should be analyzed using
7 the TCLP to determine if the segregated debris that contains lead paint exhibits the
8 toxicity characteristics for lead, and is therefore a non-radiological hazardous waste. The
9 total waste analysis approach for determining whether the waste exhibit the characteristic
10 of toxicity for lead is not appropriate in this case due to the relatively high concentration
11 of lead in the paint chip sample and the likelihood that a TCLP analysis will be required
12 to determine the actual toxicity anyway.

13
14 **Q15. If the debris is determined to be a non-radiological hazardous waste, what**
15 **requirements regarding management and disposal of non-radiological hazardous**
16 **waste will apply?**

17 A15. The debris will be subject to management as non-radiological hazardous waste while on-
18 site and must be shipped off-site using a uniform hazardous waste manifest (and
19 Vermont-permitted transporter) to a permitted hazardous waste treatment, storage, or
20 disposal facility pursuant to the applicable requirements of VHWMR subchapters 3 and
21 7.

22

Q16. Does the Agency have any additional regulatory concerns under Criterion 1B-Waste Disposal?

A16. Yes. The Petitioner did not indicate either how the paint chip sample it tested was collected. Analytical testing results of that sample, referenced in the Petitioner's testimony (see Attachment A.ANR:EN.2-4), indicated that PCBs are a contaminant in the paint but at a concentration below the 50 ppm regulatory level as indicated in the § 7-211 VT01 listing. Without additional information about how the paint chip sample was taken, there is no way to know if the PCB testing result is representative of all paint within the North Warehouse structure (PCBs may be present elsewhere within the structure in concentrations that could cause a representative sample of demolition debris to exceed the regulatory level). The Petitioner has also not indicated whether any other materials within the North Warehouse structure have been analyzed for PCBs (e.g., caulk).

Additionally, is the Agency is aware of other nuclear reactor facility sites (i.e., Maine Yankee) where sheathing on underground cable was found to contain high levels of PCBs. The Agency is concerned that such underground cable containing PCBs could also be present on the site. If sheathed cable is excavated and removed as a part of the Project activities, the Petitioner must conduct a non-radiological waste determination of the cable for PCBs.

1 Lastly, prior to the demolition or work on any on pre-1978 structure, the Petitioner must
2 contact the Vermont Department of Health (VDH) in order to understand its obligations
3 under 18. V.S.A. Chapter 38 and VDH's "Vermont Regulations for Lead Control."
4

5 **Q17. Do you have any recommendations to the Board for conditions to be included in any**
6 **CPG issued for this project?**

7 A17. The Agency recommends that conditions be added requiring that, prior to demolition of
8 the North Warehouse, that representative sampling of the North Warehouse structure be
9 conducted to ensure that a proper non-radiological hazardous waste determination is
10 made of demolition debris. The sample should be analyzed for both lead and PCBs.
11

12 In addition, a condition should be added to require that any materials (e.g., sheathed
13 cable) that are excavated or removed as part of the Project activities must be evaluated to
14 determine if they are subject to regulation as a non-radiological hazardous waste.
15

16 The Petitioner must ensure that no contamination of the site occurs during or as a result
17 of the building demolition process.
18

19 **Q18. Does this conclude your testimony?**

20 A18. Yes.

Stephen Simoes

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 (802) 244-5816 (home) (802) 279-8784 (cell)
simoes57@hotmail.com

Experience

Environmental Analyst VII

July 1999 - Present

State of Vermont, Hazardous Waste Management Program

Revised Vermont's Hazardous Waste Management Regulations (VHWMR) in 2000, 2001, 2004, 2006 and 2013 to incorporate new federal Resource Conservation and Recovery Act (RCRA) regulations, incorporate program policy, and include alternative/flexible state regulations determined by the Environmental Protection Agency (EPA) to be "functionally equivalent" to federal Resource Conservation and Recovery Act (RCRA) regulations.

Prepared the last six applications for EPA authorization of Vermont's hazardous waste program. In addition to revising the VHWMR, each application required working collaboratively across multiple agencies to prepare:

- A Memorandum of Understanding (MOU) between the Vermont Department of Environmental Conservation (DEC) and the Agency of Agriculture, Food & Markets regarding the management of waste economic poisons (pesticides)
- A MOU between the DEC and the Department of Health regarding the management of mixed hazardous and radioactive wastes
- A Memorandum of Agreement between Vermont and EPA Region 1 regarding the implementation of Vermont's Hazardous Waste Management Program
- A statement of statutory authority for signature by the Vermont Attorney General

Vermont leads all EPA Region 1 states (RI, CT, MA, VT, NH and ME) in keeping its hazardous waste program current with the federal RCRA program.

Responsible for preparing comments on proposed federal RCRA hazardous waste regulations.

Responsible for drafting hazardous waste program policy and interpretative documents.

Permit writer for IBM, CVPS (now GMP), UVM and ENPRO Services of Vermont, Inc., hazardous waste storage facilities. State and federal RCRA regulations require hazardous waste facility permits to address contingency planning, hazard prevention, waste analysis, employee training, closure planning, financial assurance for closure, and corrective action.

Lead Vermont hazardous waste program staff person responsible for the development and implementation of the federal University Laboratories XL Project. This pilot project implemented alternative/flexible waste management standards in University of Vermont, University of Massachusetts - Boston, and Boston College laboratories, and provided the basis for EPA's Academic Laboratories Rule. Vermont adopted the Academic Laboratories Rule in 2013.

Routinely coordinate with Vermont's Environmental Assistance Office; Air Pollution Control Division; Compliance & Enforcement Division; Office of the Attorney General; Agency of Agriculture, Food & Markets; Department of Health; Solid Waste Program; Underground Storage Tank Program; as well as the EPA (Region I and Headquarters) and other states.

Collaborate with hazardous waste program and Environmental Assistance Office staff to develop compliance assistance materials (e.g., fact sheets, newsletters, compliance guides); drafted Vermont's Conditionally Exempt Generator Handbook (a comprehensive hazardous waste compliance assistance guide for Vermont small businesses).

Developed "one-size-fits-all" hazardous waste and used oil compliance evaluation checklists for use by Vermont Environmental Enforcement Officers and Vermont's Salvage Yard Program.

Lead program inspector for large quantity generator and permitted hazardous waste storage facility inspections.

WM&PD Hazardous Materials Spill Response Team Member

May 2013 – Present

Association of State and Territorial Solid Waste Management Officials (ASTSWMO)
Hazardous Waste Subcommittee, Compliance Monitoring and Enforcement Task Force

- Current Vice-Chair of the Compliance Monitoring and Enforcement Task Force; representative for EPA Region 1 States (January 2011 – Present); Task Force member since January 2009
- Took a lead role in drafting ASTSWMO position paper proposing an alternative approach to regulating pharmaceutical waste (April 2013)
- Commented on EPA's new RCRA Compliance Monitoring Strategy (CMS); worked with EPA to develop implementation guidance for "flexibilities" allowed under the RCRA CMS
- Presented at national ASTSWMO meetings on the topics of waste analysis and pharmaceutical waste
- Organized national ASTSWMO meeting sessions on the topics of waste analysis, pharmaceutical waste, and alternative compliance monitoring strategies
- Helped develop ASTSWMO's first-ever web-based training (on the topic of civil vs. criminal enforcement; January 2013)

Northeast Waste Management Officials' Association (NEWMOA)

- Current Vermont representative on NEWMOA's Hazardous Waste Program Steering Committee (January 2012 – Present)
- Took lead role in drafting NEWMOA letter sent to EPA headquarters proposing an alternative approach to regulating pharmaceutical waste (February 21, 2012)
- Vermont Hazardous Waste Program lead for NEWMOA's pharmaceutical waste workgroup formed in June 2013
- Vermont Hazardous Waste Program lead for NEWMOA's alternative compliance monitoring Common Measures Project (May 2006 – May 2009)
- Active participant on monthly NEWMOA Hazardous Waste Program topic calls

Vermont Hazardous Waste Network

- Current Hazardous waste program representative since 2005 for network comprised primarily of Vermont Solid Waste Management District (SWMD) managers tasked with facilitating the collection and proper management of hazardous wastes generated by households and small businesses.

- Worked directly with the Chittenden SWMD to develop a "facility management plan" (FMP) to address hazardous waste management at its fixed Environmental Depot facility (April 2013); that FMP is being used by other Districts as a template.

EPA Workgroups

Active participant in EPA Headquarters-led workgroups charged with:

- Developing a checklist to help federal/state RCRA inspectors distinguish between "commercial chemical products" and waste (completed May 2013)
- Revising EPA's 1994 Waste Analysis Plan guidance (on-going)
- Developing web-based training on waste analysis (on-going)

Hazardous Materials Coordinator

April 1993 – July 1999

State of Vermont, Hazardous Waste Management Program

Supervised hazardous waste program inspection staff and planned inspections to meet federal grant commitments. Permit writer for the Safety-Kleen Corporation hazardous waste storage facility. Revised the VHWMR (1998). Responded to questions from the regulated community about the VHWMR. Participated in a NEWMOA workgroup convened to ensure consistent implementation of the Universal Waste Rule in the EPA Region 1 and 2 states.

Hazardous Materials Specialist

November 1990 – April 1993

State of Vermont, Hazardous Waste Management Program

Conducted program inspections and investigated citizen complaints. Responded to questions from the regulated community

Lab Supervisor

October 1984 – November 1990

Aquatec, Inc., South Burlington, Vermont

Supervised the sample preparation laboratory (1984-1986), the gas chromatography laboratory, and the "volatiles" laboratory (1986 – 1990) for Vermont-based environmental services company.

Education

Johnson State College (JSC), Bachelor of Science – Environmental Science, Ecology (May 1984); received JSC Departmental Award in Environmental Science (presented April 1984)

Performance Evaluations and Recognition

All performance evaluations rated as "outstanding" or "excellent" – copies available upon request; received three merit awards while employed by the Vermont DEC.

Received letter of commendation from John DeVillars, EPA Region I Regional Administrator for program authorization work.

Community Involvement

Waterbury Town Health Officer (April 2008 - Present)

References

Matt Chapman, Vermont DEC, General Counsel	802-249-4393
Jeff Fowley, US EPA Region 1, Senior Assistant Regional Counsel	617-918-1094
Elizabeth Deabay, US EPA Region 1, Chief, RCRA & UST Section	617-918-1343
Kenneth B. Rota, US EPA Region 1, Senior Enforcement Coordinator	617-918-1751

Related Links

Vermont Hazardous Waste Program

Regulations: <http://www.anr.state.vt.us/dec/wastediv/rcra/regs.htm>

Facility Permits: <http://www.anr.state.vt.us/dec/wastediv/rcra/TSDfpermit.htm>

CEG Handbook: http://www.anr.state.vt.us/dec/wastediv/rcra/pubs/CEG_Hndbk.pdf

EPA

University Laboratories XL Project: <http://www.epa.gov/fedrgstr/EPA-WASTE/1999/September/Day-28/f25137.htm>

Academic Labs Rule: <http://www.epa.gov/waste/hazard/generation/labwaste/index.htm>

Draft Waste Analysis Plan Guidance: <http://www.epa.gov/wastes/hazard/tsd/permit/tsd-regs/tsdf-wap-guide.pdf> WAP guidance

Commercial Chemical Product Checklist:
[http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/E9670455E5F3A91585257BE20049E22D/\\$file/14837.pdf](http://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/E9670455E5F3A91585257BE20049E22D/$file/14837.pdf)

ASTSWMO

HW Subcommittee: http://www.astswmo.org/programs_hazardouswaste.htm

Pharmaceutical Waste Position Paper:
http://www.astswmo.org/Files/Policies_and_Publications/Hazardous_Waste/2013-04-Pharmaceutical_Waste_Position_Paper-Board_Approved.pdf

NEWMOA

Pharmaceutical Waste Letter to EPA:
<http://www.newmoa.org/publications/letters/FinalPharmaceuticalLetteronLetterhead2-21-12.pdf>

Common Measures Project: <http://www.newmoa.org/erp/projects/commeas.cfm>

VERMONT DEPARTMENT OF PERSONNEL

Request for Classification Review Position Description Form A

- **This form is to be used by managers and supervisors to request classification of a position (filled or vacant) when the duties have changed, and by managers and supervisors to request the creation of a new job class/title (for a filled, vacant, or new position), and by employees to request classification of their position.**
- This form was designed in Microsoft Word to download and complete on your computer. This is a form-protected document, so information can only be entered in the shaded areas of the form.
- If you prefer to fill out a hard copy of the form, contact your Personnel Officer.
- To move from field to field use your mouse, the arrow keys or press Tab. Each form field has a limited number of characters. Use your mouse or the spacebar to mark and unmark a checkbox.
- Where additional space is needed to respond to a question, you might need to attach a separate page, and number the responses to correspond with the numbers of the questions on the form. Please contact your Personnel Officer if you have difficulty completing the form.
- The form must be complete, including required attachments and signatures or it will be returned to the department's personnel office. All sections of this form are required to be completed unless otherwise stated.

INSTRUCTIONS: Tell us about the job. The information you provide will be used to evaluate the position. It will not be used in any way to evaluate an employee's performance or qualifications.

Answer the questions carefully. The information you give will help ensure that the position is fairly evaluated. Here are some suggestions to consider in completing this questionnaire:

- Tell the **facts** about what an employee in this position is actually expected to do.
- Give **specific examples** to make it clear.
- Write in a way so a person unfamiliar with the job will be able to understand it.
- Describe the job **as it is now**; not the way it was or will become.
- Before answering each question, read it carefully.

To Submit this Request for Classification Review: If this is a filled position, the employee must sign the original* and forward to the supervisor for the supervisor's review and signature. The Personnel Officer and the Appointing Authority must also review and sign this request before it is considered complete. The effective date of review is the beginning of the first pay period following the date the complete Request for Classification Review is date stamped by the Classification Division of the Department of Personnel.

*An employee may choose to sign the form, make a copy, submit original to supervisor as noted above, while concurrently sending the copy to the Classification Division, 144 State Street, Montpelier, with a cover note indicating that the employee has submitted the original to the supervisor and is submitting the copy as a **Concurrent** filing.

If this is a request (initiated by employees, VSEA, or management) for review of all positions in a class/title please contact the appropriate Classification Analyst or the Classification Manager to discuss the request prior to submitting.

Request for Classification Review Position Description Form A

For Department of Personnel Use Only

Notice of Action # _____		Date Received (Stamp) _____
Action Taken: _____		
New Job Title _____		
Current Class Code _____	New Class Code _____	
Current Pay Grade _____	New Pay Grade _____	
Current Mgt Level _____ B/U _____ OT Cat. _____ EEO Cat. _____ FLSA _____		
New Mgt Level _____ B/U _____ OT Cat. _____ EEO Cat. _____ FLSA _____		
Classification Analyst _____	Date _____	Effective Date: _____
Comments: _____		Date Processed: _____
Willis Rating/Components: _____	Knowledge & Skills: _____	Mental Demands: _____
	Working Conditions: _____	Accountability: _____
	Total: _____	

Incumbent Information:

Employee Name: Stephen W. Simoes Employee Number: 85236
Position Number: 660151 Current Job/Class Title: Environmental Analyst V
Agency/Department/Unit: ANR/DEC/WMPD Work Station: Montpelier Zip Code: 05620 - 3704
Supervisor's Name, Title, and Phone Number: Lynn Metcalf, Hazardous Waste Program Supervisor; (802) 522-0469
How should the notification to the employee be sent: ☒ employee's work location WMPD, 1 National Life Drive - Davis 1 or ☐ other address, please provide mailing address: _____

New Position/Vacant Position Information:

New Position Authorization: ☐ Request Job/Class Title: Environmental Analyst VII
Position Type: ☐ Permanent or ☐ Limited / Funding Source: ☐ Core, ☐ Partnership, or ☐ Sponsored
Vacant Position Number: ☐ Current Job/Class Title: ☐
Agency/Department/Unit: ☐ Work Station: ☐ Zip Code: ☐
Supervisor's Name, Title and Phone Number: ☐

Type of Request:

- ☐ **Management:** A management request to review the classification of an existing position, class, or create a new job class.
- ☒ **Employee:** An employee's request to review the classification of his/her current position.

1. Job Duties

This is the **most critical** part of the form. Describe the activities and duties required in your job, **noting changes (new duties, duties no longer required, etc.) since the last review**. Place them in order of importance, beginning with the single most important activity or responsibility required in your job. The importance of the duties and expected end results should be clear, including the tolerance that may be permitted for error. Describe each job duty or activity as follows:

- **What** it is: The nature of the activity.
- **How** you do it: The steps you go through to perform the activity. Be specific so the reader can understand the steps.
- **Why** it is done: What you are attempting to accomplish and the end result of the activity.

For example a Tax Examiner might respond as follows: **(What)** *Audits tax returns and/or taxpayer records.* **(How)** *By developing investigation strategy; reviewing materials submitted; when appropriate interviewing people, other than the taxpayer, who have information about the taxpayer's business or residency.* **(Why)** *To determine actual tax liabilities.*

In general, this position requires: strong writing, organization and project management skills; the ability to work independently; in-depth understanding of both the federal Resource Conservation and Recovery Act (RCRA) hazardous waste program (administered by the U.S. Environmental Protection Agency (EPA)) and Vermont's authorized hazardous waste program (implemented in Vermont in lieu of the federal RCRA program); and the ability to work with high level federal and state officials to ensure common understanding of hazardous waste management issues and set common direction.

Revision of the Vermont Hazardous Waste Management Regulations (Vermont Regulations):

This position works independently (in coordination with Department of Environmental Conservation (DEC) management) to revise the Vermont Regulations as necessary to ensure that Vermont's Hazardous Waste Program remains equivalent to/no less stringent than the federal RCRA hazardous waste program. Revisions are typically made to: 1) incorporate new federal RCRA rules; 2) incorporate changes suggested by program inspectors and the regulated community; 3) incorporate flexibility; and 4) improve overall readability/clarity of the rule. In general, the Vermont Regulations must be revised every two to five years.

While many states adopt the complex federal RCRA rules either verbatim or by reference, Vermont strives to maintain regulations that are more user-friendly and clear. In addition, where possible, the Vermont Regulations include flexibilities that address the needs of the Vermont program and the regulated community. All proposed flexibilities must be approved by the EPA Region 1 office to ensure the Vermont Regulations remain "functionally equivalent" to (no less stringent than) the federal RCRA rules.

This position is expected to maintain working knowledge of DEC policies/procedures on rulemaking and the Secretary of State's rules on rulemaking; manage all aspects of the rulemaking process; and work with DEC legal staff, EPA Region 1 technical staff and legal counsel, and the Vermont Attorney General's office to ensure all proposed rule changes are equivalent to the federal RCRA rules for program authorization purposes (see "Prepare Applications for EPA Authorization..." below). This position is expected to seek stakeholder input early in the rulemaking process, and provide opportunity for DEC staff

review of proposed changes. During the rulemaking process, this position is expected to coordinate as appropriate with other DEC programs; the Department of Health; the Agency of Agriculture, Food & Markets; the Vermont Secretary of State's Office; and the Vermont Legislative Council.

Prepare Applications for EPA Authorization of Vermont's Hazardous Waste Program:

This position works independently to prepare applications for re-authorization of the Vermont hazardous waste program. Re-authorization occurs every two to five years following adoption of revised Vermont Regulations and ensures that the Vermont program remains equivalent to/no less stringent than the federal RCRA program. Applications consist of the revised Vermont Regulations; updated Memorandum of Understanding documents between the DEC and both the Agency of Agriculture, Food & Markets and the Department of Health; a Memorandum of Agreement with the EPA Region 1 office; a statement from the Vermont Attorney General certifying that the revised Vermont Regulations are no less stringent than the federal RCRA rules; checklists that compare the revised Vermont Regulations to the federal RCRA rules on a line-by-line basis to verify equivalency; and a Vermont program description. This position must coordinate extensively with DEC legal staff; EPA Region 1 technical staff and legal counsel; the Vermont Attorney General's office; the Vermont Agency of Agriculture, Food & Markets; and the Vermont Department of Health.

Program Development and Coordination:

This position is expected to be an expert in the federal RCRA rules and Vermont Regulations, and to have thorough knowledge of Vermont's authorized hazardous waste program. This position works independently (in consultation with the program supervisor) in all aspects of program development and coordination work.

Program development and coordination activities include: 1) development, in consultation with the program supervisor and DEC management, of the Vermont Regulations and program policies and procedures; 2) interpretation of the Vermont Regulations and the federal RCRA rules; 3) coordination/collaboration with other DEC programs and Vermont state government offices, departments and agencies on hazardous waste program implementation matters; 4) coordination/collaboration with, and timely reporting to, EPA Region 1 on program implementation matters; 5) coordination/collaboration with the other New England states, New Jersey and New York through the Northeast Waste Management Officials Association (NEWMOA) on program implementation matters; 6) coordination/collaboration on a national level (e.g., all states, EPA Headquarters, EPA Regions) through the Association of State and Territorial Waste Management Officials (ASTSWMO) on program implementation matters; 7) participation on NEWMOA and ASTSWMO committees and task forces as assigned; 8) participation on EPA Region 1- and EPA Headquarters-led workgroups as assigned; 9) providing assistance to other DEC programs with development of regulations, policies and procedures (e.g., Underground Storage Tanks, Aboveground Storage Tanks, Salvage Yards, Solid Waste, Air Pollution Control); 10) providing comment (in coordination with DEC management and other DEC programs) on proposed federal RCRA rules; 11) coordination and tracking of technical training for Vermont hazardous waste program staff; 12) participation in the Performance Partnership Grant/Agreement process as assigned; 13) participation in regular enforcement meetings between EPA Region 1 and the New England state hazardous waste programs; and (8) special projects as assigned (see below).

Program development and coordination activities routinely requires preparation of briefing

memos on program implementation matters, recommendations for course of action to DEC management, and drafting of correspondence describing program or Agency positions. This is done according to schedules established in consultation with the program supervisor and DEC management.

Hazardous Waste Facility Permitting:

This position is expected to be an expert in all aspects of hazardous waste treatment, storage and disposal facility (TSDF) permitting. This position works independently (in consultation with the program supervisor) in all aspects of TSDF permitting work. This position is expected to complete TSDF permitting activities, mentor/assist other hazardous waste program staff in all aspects of the permitting process, and develop/maintain program implementation documents related to hazardous waste facility permitting.

Hazardous waste facility permitting activities include: 1) review of TSDF permit applications for administrative and technical completeness in accordance with EPA and Vermont procedures; 2) tracking timeliness of application review and permit issuance; 3) communication of permit application deficiencies and the information necessary for completeness to the applicant; 4) development of facility-specific permit requirements/conditions necessary to ensure protection of human health and the environment; 5) preparing draft facility permits and coordinating/completing all aspects of the public participation process (e.g., public notice, public hearing, response to public comment); 6) drafting final TSDF permits and ensuring permit issuance within established timeframes; 7) functioning as the DEC point of contact for permittees; 8) tracking compliance with permit-specific requirements (e.g., scheduled reporting, annual submittal of financial assurance documents); 9) reviewing and processing requests to modify existing facility permits in accordance with EPA and Vermont regulations/procedures; 10) processing emergency permit applications in accordance with the Vermont Regulations, as appropriate; 11) either conducting inspections or coordinating with program inspection staff to ensure that permitted facilities maintain compliance with the Vermont Regulations and permit requirements; and 12) coordination/collaboration with EPA Regional and Headquarters staff on TSDF permitting matters.

Compliance Monitoring, Enforcement and Response to Complaints:

This position is expected to be an expert in all aspects of monitoring compliance of hazardous waste generators, transporters and permitted treatment, storage and disposal facilities, and enforcement of the Vermont Regulations. This position works independently (in consultation with the program supervisor) and is expected to mentor/assist hazardous waste program inspection staff in compliance monitoring and enforcement activities, develop/implement innovative compliance monitoring strategies (in lieu of traditional inspections), and develop/maintain program implementation documents related to compliance monitoring and enforcement.

In addition, this position is expected to: 1) conduct thorough initial and follow-up inspections to evaluate compliance with the Vermont Regulations; 2) draft detailed inspection reports that meet established program criteria; 3) draft post-inspection letters and/or Notices of Alleged Violation, as appropriate; 4) as appropriate, initiate and coordinate formal enforcement actions (e.g., administrative order, assurance of discontinuance, attorney general referral) in accordance with Agency of Natural Resources (Agency) procedures, including the calculation of penalty amounts; 5) provide testimony in civil or criminal proceedings; 6) provide assistance to the Agency's Compliance and Enforcement Division and the Vermont Attorney General's Office in cases related to

hazardous waste management; 7) assist in determining program compliance monitoring priorities in consultation with the program supervisor; 8) coordinate with EPA Region 1 enforcement staff to ensure that, when conducting inspections in Vermont, EPA interprets the Vermont Regulations properly; and 9) coordinate/collaborate with EPA Regional and Headquarters staff and with other state hazardous waste programs on hazardous waste compliance monitoring and enforcement matters.

With respect to citizen complaints, this position is expected to: 1) respond to complaints in a timely manner; 2) document complaints received by entering them into the Agency's complaint database; direct complaints to other regulatory program(s) with potential jurisdiction or the Agency's Compliance and Enforcement Division, as appropriate; 3) assess the priority of complaints in terms of potential threat posed to human health and/or the environment; and 4) coordinate site visits (which may involve interviews and/or sampling), assess site visit findings and either resolve the complaint or coordinate further investigation.

Compliance Assistance:

As an expert on the Vermont Regulations and authorized hazardous waste program, this position is expected to: 1) respond (in writing, as appropriate) to requests for information related to hazardous waste management, and interpretation of the Vermont Regulations and federal RCRA rules; 2) take a lead role in developing hazardous waste program assistance documents (in collaboration with the program supervisor and the Environmental Assistance Office); 3) participate/present at meetings and workshops designed to assist the regulated community with understanding/implementing the Vermont Regulations and other hazardous waste program requirements; 4) maintain sufficient working knowledge of other DEC regulatory programs (e.g., Underground Storage Tanks, Aboveground Storage Tanks, Salvage Yards, Solid Waste, Air Pollution Control, Wastewater) to ensure that program conflicts are avoided and persons requesting information/regulatory interpretation/assistance are directed to other DEC programs as appropriate; 5) assess sampling/laboratory results to determine potential hazardous waste program jurisdiction; and 6) organize/archive written regulatory interpretations in the hazardous waste program's regulatory interpretation compendium.

DEC Hazardous Materials Spill Response Team (Spill Team):

This position serves as a member of the DEC spill team and the team expert on the Vermont Regulations. This position acts as an on-call/standby spill responder one week out of every nine and is expected to take spill calls and enter them into the DEC Spills database in a timely manner. Incidents can range from minor fuel spills to major accidents that result in the release of large quantities of hazardous material. Most spills are handled over the phone, but large spills require traveling to the incident scene and require coordination/collaboration with local police, fire departments, the Vermont Hazardous Materials Response Team, other agencies and spill clean-up contractors to coordinate response and clean-up. This position is expected assess the environmental impacts of spills and ensure that the responsible party hires a qualified clean-up contractor when needed. This position is expected to review/approve spill clean-up work plans (and all associated costs) submitted by clean-up contractors in accordance with established DEC procedures and current DEC spill response contracts, and if a spill clean-up qualifies for coverage by Vermont's Petroleum Clean-up Fund or Environmental Contingency Fund, coordinate the payment process. This position is also expected to provide guidance/assistance to responsible parties and property owners.

Special Projects as Assigned:

This position works independently to manage special projects (in consulting with the program supervisor, as appropriate). This position is expected to complete projects within established timeframes and coordinate projects with daily workload. Recent examples of special projects include (project status indicated within parentheses):

- Participating in NEWMOA and DEC workgroups tasked with identifying and addressing environmental impacts of pharmaceutical waste management (on-going projects)
- Participated in a NEWMOA workgroup tasked with drafting a letter to the Director of the EPA Headquarters Office of Resource Conservation and Recovery on the (currently inadequate) regulation of pharmaceutical waste under RCRA (completed, 2012)
- Preparation (by ASTSWMO's Compliance Monitoring and Enforcement Task Force) of an ASTSWMO position paper on the (currently inadequate) EPA regulation of pharmaceutical waste under RCRA (completed, 2013)
- Participation in various EPA Headquarters-led workgroups tasked with: 1) revising EPA's "Waste Analysis Plan" guidance (on-going project); 2) developing guidance and checklist to assist EPA and state inspectors in distinguishing "commercial chemical products" from waste when conducting RCRA inspections (completed 2012); and 3) developing web-based RCRA inspector training on Waste Analysis and Data Evaluation (on-going project)
- Developed a Waste Analysis Plan for a Vermont hazardous waste storage facility that is currently being used by EPA Region 1 as a model and that has been incorporated into EPA's revised (draft) Waste Analysis Plan guidance (completed, 2010)
- For the purpose of determining applicability of the federal RCRA Subpart BB air emission standards, clarified the "boundary" of IBM's permitted hazardous waste storage/treatment facility operations (within the IBM site in Essex Junction); this required in-depth review of federal RCRA policy and regulatory background documents, and collaboration with EPA Region 1, EPA Headquarters, and hazardous waste programs in other states (completed, 2014)
- Processed IBM's request for a variance from the Vermont Regulations for lead-contaminated scrap wafers (the IBM variance petition is currently out to public comment); coordinated with DEC management and the DEC general counsel to revise the DEC's Variance Procedure to address problems with the procedure's public participation requirements (variance procedure revised, 2014)
- Addressed regulatory concern identified by Green Mountain Coffee Roasters regarding the applicability of the Vermont Regulations to "waste food products" that are reclaimed by developing an interim program policy (consistent with the federal RCRA rules) until such time that the Vermont Regulations can be revised (completed, 2014)
- Participated in an EPA Region 1-led workgroup tasked with developing a proposal (for review/approval by the EPA Headquarters Office of Enforcement and Compliance Assurance) requesting flexibility from the federal RCRA statutory requirement for state programs to inspect 20% of their Large Quantity Generator (LQG) universe, as that requirement applies to retail pharmacies recently notified as LQGs; this first-ever EPA Region-wide flexibility proposal was approved (completed, 2014)
- Participated in a NEWMOA workgroup tasked with drafting a letter to the Director of the EPA Headquarters Office of Resource Conservation and Recovery on the currently conflicting EPA policies about how "zero discharge units" (e.g., evaporators) are regulated under RCRA (completed, 2014)

- Developing (in collaboration with the program supervisor and the Environmental Assistance Office) a self-certification compliance monitoring program for Vermont Small Quantity Generators (modeled after a Colorado program) (on-going project)
- Collaborated (through ASTSWMO's Compliance Monitoring and Enforcement Task Force) with the EPA Headquarters Office of Enforcement and Compliance Assurance on the development of EPA's Compliance Monitoring Strategy (CMS) for RCRA and corresponding guidance for flexibilities allowed under the CMS (completed, 2012)
- Collaborated with the DEC's Solid Waste Program and the Chittenden and Addison County Solid Waste District Managers to develop a model "Facility Management Plan" for fixed solid waste management facilities that accept hazardous waste from households and conditionally exempt hazardous waste generators to identify specific "points of compliance" for applicability of the Vermont (hazardous waste) Regulations (completed, 2013)
- Collaborating with DEC's Solid Waste Program, the Department of Public Safety, and Solid Waste District Managers to identify/implement safe and compliant management practices for accepting/storing/treating explosive wastes brought to Solid Waste Districts collection events and fixed facilities (on-going project)
- Participating in the DEC workgroup tasked with overseeing aspects of decommissioning the Vermont Yankee Nuclear Power Plant related to known/potential chemical contamination at the Vermont Yankee site (on-going project)

2. Key Contacts

This question deals with the personal contacts and interactions that occur in this job. Provide brief typical examples indicating your primary contacts (**not** an exhaustive or all-inclusive list of contacts) other than those persons to whom you report or who report to you. If you work as part of a team, or if your primary contacts are with other agencies or groups outside State government describe those interactions, and what your role is. For example: you may *collaborate, monitor, guide, or facilitate change*.

Vermont DEC:

Matt Chapman, DEC, General Counsel

Gary Gulka, Director, DEC Environmental Assistance Office

Various program managers throughout the DEC

Other Vermont State Departments/Agencies:

Jeff Comstock, Agency of Agriculture, Food & Markets (Collaborate; waste "economic poisons"/pesticides)

William Irwin, Radiological & Toxicological Sciences Chief, Vermont Department of Health (Collaborate; Vermont Yankee, mixed radiological/hazardous wastes)

Vermont Attorney General's Office:

Scot Kline, Environmental Protection Division Chief, Vermont Office of the Attorney General (Collaborate, Assist)

Kyle Landis-Marinello, Assistant Attorney General, Environmental Protection Division,

Vermont Office of the Attorney General (Collaborate, Assist)

Regional/National Organizations of State Waste Management Officials:

Terri Goldberg, Executive Director, Northeast Waste Management Officials' Association (Collaborate)

Dania Rodriguez, Executive Director, Association of State and Territorial Waste Management Officials (Collaborate)

U.S. Environmental Protection Agency (Region 1 and Headquarters):

Beth Deabay, RCRA Waste Management & UST Section Chief, EPA Region 1 (Collaborate)

Jeff Fowley, Regional Counsel, EPA Region 1 (Collaborate)

Lisa Papetti, Senior Enforcement Coordinator, EPA Region 1 (Collaborate)

Sharon Leitch, RCRA Waste Management & UST Section, EPA Region 1 (Collaborate)

Emily Chow, RCRA Team Leader, Office of Enforcement & Compliance Assurance, EPA Headquarters (Collaborate)

Gail Hansen, Health Scientist, Office of Resource Conservation & Recovery, EPA Headquarters (Collaborate)

Jim O'Leary, Office of Resource Conservation & Recovery, EPA Headquarters (Collaborate)

Hazardous Waste Program managers and staff in many other states (Collaborate)

Vermont Permitted Hazardous Waste Facilities:

Candice Callahan, Environmental Compliance Program Manager, IBM Burlington (Collaborate, Guide)

Jeffrey Baker, Facility Manager, ENPRO Services of Vermont, Inc. (Collaborate Guide)

Eric Bailey, Facility Manager, Safety-Kleen, Inc.

John Greenan / Tim Upton, Environmental Program Managers, Green Mountain Power Corporation

Francis Churchill, Assistant Director for Health & Safety, University of Vermont - Environmental Safety Facility

Designated environmental compliance managers in businesses throughout Vermont (i.e., hazardous waste generators)

3. Are there licensing, registration, or certification requirements; or special or unusual skills necessary to perform this job?

Include any special licenses, registrations, certifications, skills; (such as counseling, engineering, computer programming, graphic design, strategic planning, keyboarding) including skills with specific equipment, tools,

technology, etc. (such as mainframe computers, power tools, trucks, road equipment, specific software packages). Be specific, if you must be able to drive a commercial vehicle, or must know Visual Basic, indicate so.

OSHA 1910.120 Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) 40 hour training and annual 8 hour HAZWOPER refresher training
Strong organic and analytical chemistry background
CAMEO (Computer-Aided Management of Emergency Operations)
Defensive driver training
Keyboarding, Word, Outlook, etc.

4. Do you supervise?

In this question "supervise" means if you direct the work of others where you are held **directly** responsible for assigning work; performance ratings; training; reward and discipline or effectively recommend such action; and other personnel matters. List the names, titles, and position numbers of the classified employees reporting to you:

No

5. In what way does your supervisor provide you with work assignments and review your work?

This question deals with how you are supervised. Explain how you receive work assignments, how priorities are determined, and how your work is reviewed. There are a wide variety of ways a job can be supervised, so there may not be just one answer to this question. For example, some aspects of your work may be reviewed on a regular basis and in others you may operate within general guidelines with much independence in determining how you accomplish tasks.

This position works independently to accomplish the goals and commitments of the hazardous waste program. Priorities and work product timelines are established in consultation with the program supervisor. This position operates within general guidelines established with the program supervisor but has considerable independence in determining how tasks are accomplished.

6. Mental Effort

This section addresses the mental demands associated with this job. Describe the most mentally challenging part of your job or the most difficult typical problems you are expected to solve. Be sure to give a specific response and describe the situation(s) by example.

- For example, a purchasing clerk might respond: *In pricing purchase orders, I frequently must find the cost of materials not listed in the pricing guides. This involves locating vendors or other sources of pricing information for a great variety of materials.*
- Or, a systems developer might say: *Understanding the ways in which a database or program will be used, and what the users must accomplish and then developing a system to meet their needs, often with limited time and resources.*

Considerable mental effort is necessary to maintain a thorough understanding of the complex state and federal hazardous waste laws and regulations, as well as the federal rulemaking background documents (e.g., Federal Register notices) and state and federal policies/procedures that support the laws and regulations (the federal RCRA rules alone are over 1,300 pages long). This position must have the ability to apply these regulations to real

life situations and be able to communicate the rationale for these applicability determinations to the regulated community, attorneys, consultants, and other state/federal regulators (in Vermont, the regulated community includes businesses that range in size from very small one person shops to large manufacturing facilities such as IBM and General Electric, municipalities, and any other non-household entity that generates/handles hazardous waste). In addition, a strong chemistry background is necessary in order to evaluate analytical testing data and waste constituent information (e.g., Material Safety Data sheets, chemical product labels) to determine the applicability of the regulations to wastes generated/handled by the regulated community.

Other challenging aspects of this position include:

- Drafting state regulations that are legally equivalent/no less stringent than the federal RCRA rules and corresponding policies
- Dealing with members of the regulated community (e.g., business owners, subjects of citizen complaints) who are angry about having to deal with a regulatory program (inspections are typically unannounced), being told that their facility is not in compliance with the Vermont Regulations, or having to spend money to achieve compliance
- Managing unexpected events and/or requests from DEC management or the regulated community in addition to planned daily work load/priorities; such events/requests can require a significant time commitment and alter established short-term priorities and timelines
- Managing extremely complicated projects that must be completed within specified timeframes in order to meet federal grant commitments

7. Accountability

This section evaluates the job's expected results. In weighing the importance of results, consideration should be given to responsibility for the safety and well-being of people, protection of confidential information and protection of resources.

What is needed here is information not already presented about the job's scope of responsibility. What is the job's most significant influence upon the organization, or in what way does the job contribute to the organization's mission?

Provide annualized dollar figures if it makes sense to do so, explaining what the amount(s) represent.

For example:

- A social worker might respond: *To promote permanence for children through coordination and delivery of services;*
- A financial officer might state: *Overseeing preparation and ongoing management of division budget: \$2M Operating/Personal Services, \$1.5M Federal Grants.*

The primary goals of the hazardous waste program is to prevent the mismanagement of hazardous waste, to protect public health and the environment, and to educate the general public and regulated community about proper waste management.

There are over 3,000 regulated hazardous waste generators and six permitted hazardous waste treatment, storage, and disposal facilities currently operating in Vermont. To prevent mismanagement of hazardous waste, generators and permitted facilities are subject to routine (unannounced) compliance monitoring inspections; in addition, the review and issuance of hazardous waste facility permits ensures that each hazardous waste

treatment, storage or disposal facility operates in an environmentally sound manner and is held financially accountable for proper closure of the facility. My work (see the job duties described in Section 1) directly supports the regulation and oversight of all these hazardous waste handlers.

Vermont's hazardous waste program receives an annual federal grant (from EPA Region 1) of approximately \$314,000. I am directly responsible for meeting some grant commitments (e.g., rulemaking, program authorization, permitting) and supporting the program in meeting the remaining commitments (e.g., permitting, inspections) as the program expert/mentor. Permitting aspects of the program generate between \$8,000 - \$10,000 annually, hazardous waste generators submit annual fees totaling approximately \$250,000 annually, and hazardous waste generator taxes typically exceed \$200,000 annually. Hazardous waste transporters also pay annual licensing fees which generate approximately \$50,000 per year.

Finally, with respect to my work with the Spills Team, for spill clean-up activities that qualify for coverage under Vermont's Petroleum Clean-up Fund, I must review and approve invoices submitted by clean-up contractors for amounts up to \$25,000 per clean-up.

8. Working Conditions

The intent of this question is to describe any adverse conditions that are routine and expected in your job. It is not to identify special situations such as overcrowded conditions or understaffing.

- a) What significant mental stress are you exposed to? All jobs contain some amount of stress. If your job stands out as having a significant degree of mental or emotional pressure or tension associated with it, this should be described.

Type	How Much of the Time?
Significant mental stress is associated with managing a large work load, changing short-term priorities, and the need to produce thorough briefing documents to DEC managers within typically fast turnaround times	Frequent
Dealing with members of the regulated community (e.g., business owners, subjects of citizen complaints) who are angry about having to deal with a regulatory program (inspections are typically unannounced), being told that their facility is not in compliance with the Vermont Regulations, or having to spend money to achieve compliance	Occasional
Presenting complex regulations, concepts and policies to members of the (not always receptive) regulated community	Frequent

- b) What hazards, special conditions or discomfort are you exposed to? (Clarification of terms: **hazards** include such things as potential accidents, illness, chronic health conditions or other harm. Typical examples might involve exposure to dangerous persons, including potentially violent customers and clients, fumes, toxic waste, contaminated materials, vehicle accident, disease, cuts, falls, etc.; and **discomfort** includes exposure to such things as cold, dirt, dust, rain or snow, heat, etc.)

Type	How Much of the Time?
------	-----------------------

Potential chemical exposures (i.e., hazardous waste, contaminated materials), physical hazards (e.g., cuts, slips/trips/falls) and discomfort when conducting facility inspections, complaint investigations and hazardous material spill response activities	Occasional
Exposure to potentially violent persons (i.e., members of the regulated community who are angry about having to deal with a regulatory program)	Occasional

- c) What weights do you lift; how much do they weigh and how much time per day/week do you spend lifting?

Type	How Heavy?	How Much of the Time?
Handling spill clean-up materials (e.g., clay absorbents)	50 lbs	Infrequent

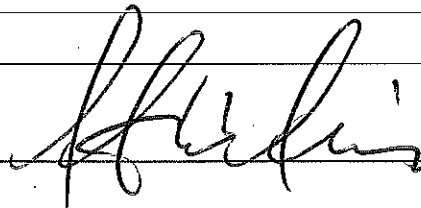
- d) What working positions (sitting, standing, bending, reaching) or types of effort (hiking, walking, driving) are required?

Type	How Much of the Time?
This position is primarily office-based and requires sitting, standing, bending and reaching	Frequent
Inspections, complaint investigations and spill response activities require walking (in some cases, to remote locations) and driving	Occasional

Additional Information:

Carefully review your job description responses so far. If there is anything that you feel is important in understanding your job that you haven't clearly described, use this space for that purpose. Perhaps your job has some unique aspects or characteristics that weren't brought out by your answers to the previous questions. In this space, add any additional comments that you feel will add to a clear understanding of the requirements of your job.

Employee's Signature (required):



Date:

9/24/14

Supervisor's Section:

Carefully review this completed job description, but **do not** alter or eliminate any portion of the original response. Please answer the questions listed below.

1. What do you consider the most important duties of this job and why?

Rule writing and authorization; Interpretation of our regulations and policies and communication to regulated community and other stakeholders; Coordination with other state and federal agencies in the application and interpretation of our regulations; Permit application review; Projects as assigned that involve the above

2. What do you consider the most important knowledge, skills, and abilities of an employee in this job (not necessarily the qualifications of the present employee) and why?

Ability to understand and interpret complex regulations (including the code of federal regulations) and policy documents; Ability to research complex regulatory and technical questions and synthesize a variety of information from multiple sources to arrive at policy recommendations; Ability to communicate complex subjects clearly in person, on the phone and in writing; Ability to understand nuances of regulatory and legal language; Ability to coordinate with multiple parties and agencies to arrive at an interpretation or recommendation; Ability to pay close attention to detail in drafting rules and permits and completing authorization checklists;

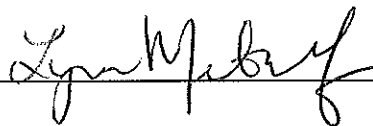
3. Comment on the accuracy and completeness of the responses by the employee. List below any missing items and/or differences where appropriate.

The employees responses are thorough, complete and accurate

4. Suggested Title and/or Pay Grade:

Environmental Analyst VII

Supervisor's Signature (required):



Date:

9/24/14

Personnel Administrator's Section:

Please complete any missing information on the front page of this form before submitting it for review.

Are there other changes to this position, for example: Change of supervisor, GUC, work station?

☐ Yes ☐ No If yes, please provide detailed information.

Attachments:

☐ Organizational charts are **required** and must indicate where the position reports.

☐ Draft job specification is **required** for proposed new job classes.

Will this change affect other positions within the organization? If so, describe how, (for example, have duties been shifted within the unit requiring review of other positions; or are there other issues relevant to the classification review process).

Suggested Title and/or Pay Grade:

Personnel Administrator's Signature (**required**): _____ Date: _____

Appointing Authority's Section:

Please review this completed job description but **do not alter** or eliminate any of the entries. Add any clarifying information and/or additional comments (if necessary) in the space below.

Suggested Title and/or Pay Grade:

Appointing Authority or Authorized Representative Signature (**required**)

Date

Environmental Fact Sheet



Managing Lead-Containing Paint Waste

Background

Lead poisoning in children is one of the most common and preventable pediatric environmental health problems in the United States today, and lead-containing paint (LCP) has proven to be a primary source of exposure. Many buildings (both public and private), especially those built before 1978, contain LCP on interior and exterior walls, window sills, and other surfaces accessible to children. Although lead is found in other materials commonly used in and around households and businesses (e.g., flashing, pipes, and lead-acid batteries), the primary focus of this fact sheet is LCP and how to properly manage LCP waste.

How are LCP activities and LCP wastes regulated?

The Vermont Department of Health (DoH), which is the state's lead agency for public health policy and advocacy, maintains a Lead Surveillance Program that can be reached at (802) 865-7786 (or toll-free within Vermont at 1-800-439-8550) for information about the health effects of lead, or to report high lead levels. A "Lead Resource Guide" is also available on-line at:

<http://healthvermont.gov/enviro/lead/lead.aspx>

The Vermont DoH maintains Lead Control Regulations which cover LCP activities such as LCP removal or "abatement."

The Vermont Department of Environmental Conservation (DEC) regulates the disposal of LCP wastes as either solid or hazardous wastes. LCP waste can be generated when a building undergoes routine maintenance, remodeling, lead abatement activity, or demolition. Examples of LCP wastes include painted architectural components (e.g., painted doors, window frames, and woodwork), chips, dust, and sludge. The regulatory requirements that apply to LCP wastes are determined based on the source of the waste, and the quantity of lead in the paint. As discussed below, while LCP wastes from households and residences are only subject to limited requirements, LCP wastes from businesses or that are removed from public and commercial buildings are potentially subject to regulation as hazardous waste.

Painted architectural components that are salvaged and reused are not considered waste and therefore are not regulated as solid or hazardous waste. Nonetheless, anyone handling these items should determine if the paint contains lead, take appropriate safety precautions, and notify any subsequent purchaser of the presence of LCP.

Continued ►

Environmental Fact Sheet: Managing Lead-Containing Paint Waste

How is LCP waste from households regulated?

Any LCP waste generated by a homeowner or contractor working at a household (e.g., general, painting, or lead abatement contractors) is classified as "household waste" and therefore exempt from regulation under the Vermont Hazardous Waste Management Regulations (VHWMR). By definition, household waste is any waste material derived from a household (e.g., single and multiple residences, apartment buildings, college dormitories, hotels and motels, and public housing units) provided the waste is not generated through a business activity conducted within the household. Although LCP waste from a household is exempt from regulation as hazardous waste, it still must be disposed of properly.

How can LCP waste from households be managed and disposed?

The DEC encourages homeowners and contractors alike to use the following Best Management Practices when managing LCP wastes:

- ✓ Store LCP waste in a safe place away from children.
- ✓ Collect LCP waste in heavy plastic trash bags for disposal.
- ✓ Any processing of LCP waste (e.g., chipping, grinding, shredding) in the work area should be conducted in an enclosure, and with appropriate worker safety protection, to contain any fugitive lead dust emissions.
- ✓ Use of LCP waste as mulch is not allowed.
- ✓ Contact your local municipality or Solid Waste Management District for information about where LCP waste can be disposed.

In general, there are two ways to dispose of household LCP waste:

1. LCP wastes that fall in the category of painted architectural components can be disposed of at a certified municipal solid waste or construction and demolition waste landfill. Contact the DEC's Solid Waste Program at (802) 828-1138 for information about solid waste landfills that can accept LCP waste (and for potential reuse opportunities).
2. Although LCP waste such as chips, dust, caustic paste waste, and other sludges (i.e., lead abatement wastes) can also be disposed of in a permitted solid waste landfill, the DEC recommends that these wastes be collected in secure containers like empty paint cans or heavy plastic bags, and disposed of through a local household hazardous waste collection event. To find out when a collection event will be held near you, contact your municipality or Solid Waste Management District. A list of Vermont Solid Waste Districts is provided on-line at:

<http://www.anr.state.vt.us/dec/wastediv/solid/swmdlist.htm>

Continued ►

Environmental Fact Sheet: Managing Lead-Containing Paint Waste

How can LCP waste from businesses be managed and disposed?

Some LCP wastes generated as a result of business activity, or that are removed from non-residential public or commercial buildings, are subject to regulation under the VHWMR (i.e., they are not exempted as a "household waste"). A public building is any building used by the general public, such as a school, store, or hospital. A commercial building is any building not intended for occupancy by the public, such as an office complex, industrial building, or factory.

Since most painted architectural components (not paint chips and dust from abatement activities) do not contain enough lead to be regulated as hazardous waste, it is both the U.S. Environmental Protection Agency's and Vermont DEC's policy to allow these wastes to be disposed of at a certified municipal solid waste or construction and demolition waste landfill even if they are generated by a business.

If a business that generates lead abatement waste (such as dust, paint chips, and sludges) cannot, based on knowledge of the waste, rule out the possibility that lead is present in the waste above regulatory limits, then the business must test a representative sample of the waste for lead using the Toxicity Characteristic Leaching Procedure (TCLP). If the concentration of lead is found to exceed the 5.0 milligrams/liter TCLP limit, the waste exhibits the hazardous waste characteristic of toxicity for lead and is subject to regulation as hazardous waste.

LCP wastes generated from the routine maintenance, renovation, construction, or demolition of non-residential structures, such as bridges, water towers, or tanks (e.g., sandblast grit) also must be evaluated to determine if they are subject to regulation as hazardous waste. Depending on the makeup of the structure, other metals, such as chromium, cadmium, and arsenic, may need to be included in the TCLP analysis.

For more information contact:

VTDEC-Waste Mgmt. & Prevention Division
1 National Life Drive, Davis 1
Montpelier VT 05620-3704
802-828-1138

VTDEC-Environmental Assistance Office
1 National Life Drive, Davis 1
Montpelier VT 05620-3704
1-800-974-9559

METHOD 1311

TOXICITY CHARACTERISTIC LEACHING PROCEDURE

1.0 SCOPE AND APPLICATION

1.1 The TCLP is designed to determine the mobility of both organic and inorganic analytes present in liquid, solid, and multiphasic wastes.

1.2 If a total analysis of the waste demonstrates that individual analytes are not present in the waste, or that they are present but at such low concentrations that the appropriate regulatory levels could not possibly be exceeded, the TCLP need not be run.

1.3 If an analysis of any one of the liquid fractions of the TCLP extract indicates that a regulated compound is present at such high concentrations that, even after accounting for dilution from the other fractions of the extract, the concentration would be above the regulatory level for that compound, then the waste is hazardous and it is not necessary to analyze the remaining fractions of the extract.

1.4 If an analysis of extract obtained using a bottle extractor shows that the concentration of any regulated volatile analyte exceeds the regulatory level for that compound, then the waste is hazardous and extraction using the ZHE is not necessary. However, extract from a bottle extractor cannot be used to demonstrate that the concentration of volatile compounds is below the regulatory level.

2.0 SUMMARY OF METHOD

2.1 For liquid wastes (i.e., those containing less than 0.5% dry solid material), the waste, after filtration through a 0.6 to 0.8 μm glass fiber filter, is defined as the TCLP extract.

2.2 For wastes containing greater than or equal to 0.5% solids, the liquid, if any, is separated from the solid phase and stored for later analysis; the particle size of the solid phase is reduced, if necessary. The solid phase is extracted with an amount of extraction fluid equal to 20 times the weight of the solid phase. The extraction fluid employed is a function of the alkalinity of the solid phase of the waste. A special extractor vessel is used when testing for volatile analytes (see Table 1 for a list of volatile compounds). Following extraction, the liquid extract is separated from the solid phase by filtration through a 0.6 to 0.8 μm glass fiber filter.

2.3 If compatible (i.e., multiple phases will not form on combination), the initial liquid phase of the waste is added to the liquid extract, and these are analyzed together. If incompatible, the liquids are analyzed separately and the results are mathematically combined to yield a volume-weighted average concentration.

3.0 INTERFERENCES

3.1 Potential interferences that may be encountered during analysis are discussed in the individual analytical methods.

4.0 APPARATUS AND MATERIALS

4.1 Agitation apparatus: The agitation apparatus must be capable of rotating the extraction vessel in an end-over-end fashion (see Figure 1) at 30 ± 2 rpm. Suitable devices known to EPA are identified in Table 2.

4.2 Extraction Vessels

4.2.1 Zero-Headspace Extraction Vessel (ZHE). This device is for use only when the waste is being tested for the mobility of volatile analytes (i.e., those listed in Table 1). The ZHE (depicted in Figure 2) allows for liquid/solid separation within the device, and effectively precludes headspace. This type of vessel allows for initial liquid/solid separation, extraction, and final extract filtration without opening the vessel (see Section 4.3.1). The vessels shall have an internal volume of 500-600 mL, and be equipped to accommodate a 90-110 mm filter. The devices contain VITON^{®1} O-rings which should be replaced frequently. Suitable ZHE devices known to EPA are identified in Table 3.

For the ZHE to be acceptable for use, the piston within the ZHE should be able to be moved with approximately 15 psi or less. If it takes more pressure to move the piston, the O-rings in the device should be replaced. If this does not solve the problem, the ZHE is unacceptable for TCLP analyses and the manufacturer should be contacted.

The ZHE should be checked for leaks after every extraction. If the device contains a built-in pressure gauge, pressurize the device to 50 psi, allow it to stand unattended for 1 hour, and recheck the pressure. If the device does not have a built-in pressure gauge, pressurize the device to 50 psi, submerge it in water, and check for the presence of air bubbles escaping from any of the fittings. If pressure is lost, check all fittings and inspect and replace O-rings, if necessary. Retest the device. If leakage problems cannot be solved, the manufacturer should be contacted.

Some ZHEs use gas pressure to actuate the ZHE piston, while others use mechanical pressure (see Table 3). Whereas the volatiles procedure (see Section 7.3) refers to pounds per square inch (psi), for the mechanically actuated piston, the pressure applied is measured in torque-inch-pounds. Refer to the manufacturer's instructions as to the proper conversion.

¹ VITON[®] is a trademark of Du Pont.

4.2.2 Bottle Extraction Vessel. When the waste is being evaluated using the nonvolatile extraction, a jar with sufficient capacity to hold the sample and the extraction fluid is needed. Headspace is allowed in this vessel.

The extraction bottles may be constructed from various materials, depending on the analytes to be analyzed and the nature of the waste (see Section 4.3.3). It is recommended that borosilicate glass bottles be used instead of other types of glass, especially when inorganics are of concern. Plastic bottles, other than polytetrafluoroethylene, shall not be used if organics are to be investigated. Bottles are available from a number of laboratory suppliers. When this type of extraction vessel is used, the filtration device discussed in Section 4.3.2 is used for initial liquid/solid separation and final extract filtration.

4.3 Filtration Devices: It is recommended that all filtrations be performed in a hood.

4.3.1 Zero-Headspace Extractor Vessel (ZHE): When the waste is evaluated for volatiles, the zero-headspace extraction vessel described in Section 4.2.1 is used for filtration. The device shall be capable of supporting and keeping in place the glass fiber filter and be able to withstand the pressure needed to accomplish separation (50 psi).

NOTE: When it is suspected that the glass fiber filter has been ruptured, an in-line glass fiber filter may be used to filter the material within the ZHE.

4.3.2 Filter Holder: When the waste is evaluated for other than volatile analytes, any filter holder capable of supporting a glass fiber filter and able to withstand the pressure needed to accomplish separation may be used. Suitable filter holders range from simple vacuum units to relatively complex systems capable of exerting pressures of up to 50 psi or more. The type of filter holder used depends on the properties of the material to be filtered (see Section 4.3.3). These devices shall have a minimum internal volume of 300 mL and be equipped to accommodate a minimum filter size of 47 mm (filter holders having an internal capacity of 1.5 L or greater, and equipped to accommodate a 142 mm diameter filter, are recommended). Vacuum filtration can only be used for wastes with low solids content (<10%) and for highly granular, liquid-containing wastes. All other types of wastes should be filtered using positive pressure filtration. Suitable filter holders known to EPA are shown in Table 4.

4.3.3 Materials of Construction: Extraction vessels and filtration devices shall be made of inert materials which will not leach or absorb waste components. Glass, polytetrafluoroethylene (PTFE), or type 316 stainless steel equipment may be used when evaluating the mobility of both organic and inorganic components. Devices made of high density polyethylene (HDPE), polypropylene (PP), or polyvinyl chloride (PVC) may be used only when evaluating the mobility of metals. Borosili-

cate glass bottles are recommended for use over other types of glass bottles, especially when inorganics are analytes of concern.

4.4 Filters: Filters shall be made of borosilicate glass fiber, shall contain no binder materials, and shall have an effective pore size of 0.6 to 0.8 μm , or equivalent. Filters known to EPA which meet these specifications are identified in Table 5. Pre-filters must not be used. When evaluating the mobility of metals, filters shall be acid-washed prior to use by rinsing with 1N nitric acid followed by three consecutive rinses with deionized distilled water (a minimum of 1 L per rinse is recommended). Glass fiber filters are fragile and should be handled with care.

4.5 pH Meters: The meter should be accurate to ± 0.05 units at 25 °C.

4.6 ZHE Extract Collection Devices: TEDLAR^{®2} bags or glass, stainless steel or PTFE gas-tight syringes are used to collect the initial liquid phase and the final extract of the waste when using the ZHE device. The devices listed are recommended for use under the following conditions:

4.6.1 If a waste contains an aqueous liquid phase or if a waste does not contain a significant amount of nonaqueous liquid (i.e., <1% of total waste), the TEDLAR[®] bag or a 600 mL syringe should be used to collect and combine the initial liquid and solid extract.

4.6.2 If a waste contains a significant amount of nonaqueous liquid in the initial liquid phase (i.e., >1% of total waste), the syringe or the TEDLAR[®] bag may be used for both the initial solid/liquid separation and the final extract filtration. However, analysts should use one or the other, not both.

4.6.3 If the waste contains no initial liquid phase (is 100% solid) or has no significant solid phase (is 100% liquid), either the TEDLAR[®] bag or the syringe may be used. If the syringe is used, discard the first 5 mL of liquid expressed from the device. The remaining aliquots are used for analysis.

4.7 ZHE Extraction Fluid Transfer Devices: Any device capable of transferring the extraction fluid into the ZHE without changing the nature of the extraction fluid is acceptable (e.g., a positive displacement or peristaltic pump, a gas tight syringe, pressure filtration unit (see Section 4.3.2), or other ZHE device).

4.8 Laboratory Balance: Any laboratory balance accurate to within ± 0.01 grams may be used (all weight measurements are to be within ± 0.1 grams).

4.9 Beaker or Erlenmeyer flask, glass, 500 mL.

² TEDLAR[®] is a registered trademark of Du Pont.

4.10 Watchglass, appropriate diameter to cover beaker or Erlenmeyer flask.

4.11 Magnetic stirrer.

5.0 REAGENTS

5.1 Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents shall conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

5.2 Reagent Water. Reagent water is defined as water in which an interferant is not observed at or above the method's detection limit of the analyte(s) of interest. For nonvolatile extractions, ASTM Type II water or equivalent meets the definition of reagent water. For volatile extractions, it is recommended that reagent water be generated by any of the following methods. Reagent water should be monitored periodically for impurities.

5.2.1 Reagent water for volatile extractions may be generated by passing tap water through a carbon filter bed containing about 500 grams of activated carbon (Calgon Corp., Filtrasorb-300 or equivalent).

5.2.2 A water purification system (Millipore Super-Q or equivalent) may also be used to generate reagent water for volatile extractions.

5.2.3 Reagent water for volatile extractions may also be prepared by boiling water for 15 minutes. Subsequently, while maintaining the water temperature at 90 ± 5 degrees C, bubble a contaminant-free inert gas (e.g. nitrogen) through the water for 1 hour. While still hot, transfer the water to a narrow mouth screw-cap bottle under zero-headspace and seal with a Teflon-lined septum and cap.

5.3 Hydrochloric acid (1N), HCl, made from ACS reagent grade.

5.4 Nitric acid (1N), HNO₃, made from ACS reagent grade.

5.5 Sodium hydroxide (1N), NaOH, made from ACS reagent grade.

5.6 Glacial acetic acid, CH₃CH₂OOH, ACS reagent grade.

5.7 Extraction fluid.

5.7.1 Extraction fluid # 1: Add 5.7 mL glacial CH₃CH₂OOH to 500 mL of reagent water (See Section 5.2), add 64.3 mL of 1N NaOH, and dilute to a volume of 1 liter. When correctly prepared, the pH of this fluid will be 4.93 ± 0.05 .

5.7.2 Extraction fluid # 2: Dilute 5.7 mL glacial $\text{CH}_3\text{CH}_2\text{OOH}$ with reagent water (See Section 5.2) to a volume of 1 liter. When correctly prepared, the pH of this fluid will be 2.88 ± 0.05 .

NOTE: These extraction fluids should be monitored frequently for impurities. The pH should be checked prior to use to ensure that these fluids are made up accurately. If impurities are found or the pH is not within the above specifications, the fluid shall be discarded and fresh extraction fluid prepared.

5.8 Analytical standards shall be prepared according to the appropriate analytical method.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples shall be collected using an appropriate sampling plan.

6.2 The TCLP may place requirements on the minimal size of the field sample, depending upon the physical state or states of the waste and the analytes of concern. An aliquot is needed for preliminary evaluation of which extraction fluid is to be used for the nonvolatile analyte extraction procedure. Another aliquot may be needed to actually conduct the nonvolatile extraction (see Section 1.4 concerning the use of this extract for volatile organics). If volatile organics are of concern, another aliquot may be needed. Quality control measures may require additional aliquots. Further, it is always wise to collect more sample just in case something goes wrong with the initial attempt to conduct the test.

6.3 Preservatives shall not be added to samples before extraction.

6.4 Samples may be refrigerated unless refrigeration results in irreversible physical change to the waste. If precipitation occurs, the entire sample (including precipitate) should be extracted.

6.5 When the waste is to be evaluated for volatile analytes, care shall be taken to minimize the loss of volatiles. Samples shall be collected and stored in a manner intended to prevent the loss of volatile analytes (e.g., samples should be collected in Teflon-lined septum capped vials and stored at 4 °C. Samples should be opened only immediately prior to extraction).

6.6 TCLP extracts should be prepared for analysis and analyzed as soon as possible following extraction. Extracts or portions of extracts for metallic analyte determinations must be acidified with nitric acid to a $\text{pH} < 2$, unless precipitation occurs (see Section 7.2.14 if precipitation occurs). Extracts should be preserved for other analytes according to the guidance given in the individual analysis methods. Extracts or portions of extracts for organic analyte determinations shall not be allowed to come into contact with the atmosphere (i.e., no headspace) to prevent losses. See Section 8.0 (QA requirements) for acceptable sample and extract holding times.

7.0 PROCEDURE

7.1 Preliminary Evaluations

Perform preliminary TCLP evaluations on a minimum 100 gram aliquot of waste. This aliquot may not actually undergo TCLP extraction. These preliminary evaluations include: (1) determination of the percent solids (Section 7.1.1); (2) determination of whether the waste contains insignificant solids and is, therefore, its own extract after filtration (Section 7.1.2); (3) determination of whether the solid portion of the waste requires particle size reduction (Section 7.1.3); and (4) determination of which of the two extraction fluids are to be used for the nonvolatile TCLP extraction of the waste (Section 7.1.4).

7.1.1 Preliminary determination of percent solids: Percent solids is defined as that fraction of a waste sample (as a percentage of the total sample) from which no liquid may be forced out by an applied pressure, as described below.

7.1.1.1 If the waste will obviously yield no liquid when subjected to pressure filtration (i.e., is 100% solids) proceed to Section 7.1.3.

7.1.1.2 If the sample is liquid or multiphasic, liquid/solid separation to make a preliminary determination of percent solids is required. This involves the filtration device described in Section 4.3.2 and is outlined in Sections 7.1.1.3 through 7.1.1.9.

7.1.1.3 Pre-weigh the filter and the container that will receive the filtrate.

7.1.1.4 Assemble the filter holder and filter following the manufacturer's instructions. Place the filter on the support screen and secure.

7.1.1.5 Weigh out a subsample of the waste (100 gram minimum) and record the weight.

7.1.1.6 Allow slurries to stand to permit the solid phase to settle. Wastes that settle slowly may be centrifuged prior to filtration. Centrifugation is to be used only as an aid to filtration. If used, the liquid should be decanted and filtered followed by filtration of the solid portion of the waste through the same filtration system.

7.1.1.7 Quantitatively transfer the waste sample to the filter holder (liquid and solid phases). Spread the waste sample evenly over the surface of the filter. If filtration of the waste at 4 °C reduces the amount of expressed liquid over what would be expressed at room temperature then allow the sample to warm up to room temperature in the device before filtering.

NOTE: If waste material (>1% of original sample weight) has obviously adhered to the container used to transfer the sample to the filtration apparatus, determine the weight of this residue and subtract it from the sample weight determined in Section 7.1.1.5 to determine the weight of the waste sample that will be filtered.

Gradually apply vacuum or gentle pressure of 1-10 psi, until air or pressurizing gas moves through the filter. If this point is not reached under 10 psi, and if no additional liquid has passed through the filter in any 2 minute interval, slowly increase the pressure in 10 psi increments to a maximum of 50 psi. After each incremental increase of 10 psi, if the pressurizing gas has not moved through the filter, and if no additional liquid has passed through the filter in any 2 minute interval, proceed to the next 10 psi increment. When the pressurizing gas begins to move through the filter, or when liquid flow has ceased at 50 psi (i.e., filtration does not result in any additional filtrate within any 2 minute period), stop the filtration.

NOTE: Instantaneous application of high pressure can degrade the glass fiber filter and may cause premature plugging.

7.1.1.8 The material in the filter holder is defined as the solid phase of the waste, and the filtrate is defined as the liquid phase.

NOTE: Some wastes, such as oily wastes and some paint wastes, will obviously contain some material that appears to be a liquid. Even after applying vacuum or pressure filtration, as outlined in Section 7.1.1.7, this material may not filter. If this is the case, the material within the filtration device is defined as a solid. Do not replace the original filter with a fresh filter under any circumstances. Use only one filter.

7.1.1.9 Determine the weight of the liquid phase by subtracting the weight of the filtrate container (see Section 7.1.1.3) from the total weight of the filtrate-filled container. Determine the weight of the solid phase of the waste sample by subtracting the weight of the liquid phase from the weight of the total waste sample, as determined in Section 7.1.1.5 or 7.1.1.7.

Record the weight of the liquid and solid phases. Calculate the percent solids as follows:

$$\text{Percent solids} = \frac{\text{Weight of solid (Section 7.1.1.9)}}{\text{Total weight of waste (Section 7.1.1.5 or 7.1.1.7)}} \times 100$$

7.1.2 If the percent solids determined in Section 7.1.1.9 is equal to or greater than 0.5%, then proceed either to Section 7.1.3 to

determine whether the solid material requires particle size reduction or to Section 7.1.2.1 if it is noticed that a small amount of the filtrate is entrained in wetting of the filter. If the percent solids determined in Section 7.1.1.9 is less than 0.5%, then proceed to Section 7.2.9 if the nonvolatile TCLP is to be performed and to Section 7.3 with a fresh portion of the waste if the volatile TCLP is to be performed.

7.1.2.1 Remove the solid phase and filter from the filtration apparatus.

7.1.2.2 Dry the filter and solid phase at 100 ± 20 °C until two successive weighing yield the same value within $\pm 1\%$. Record the final weight.

NOTE: Caution should be taken to ensure that the subject solid will not flash upon heating. It is recommended that the drying oven be vented to a hood or other appropriate device.

7.1.2.3 Calculate the percent dry solids as follows:

$$\text{Percent dry solids} = \frac{(\text{Wt. of dry waste + filter}) - \text{tared wt. of filter}}{\text{Initial wt. of waste (Section 7.1.1.5 or 7.1.1.7)}} \times 100$$

7.1.2.4 If the percent dry solids is less than 0.5%, then proceed to Section 7.2.9 if the nonvolatile TCLP is to be performed, and to Section 7.3 if the volatile TCLP is to be performed. If the percent dry solids is greater than or equal to 0.5%, and if the nonvolatile TCLP is to be performed, return to the beginning of this Section (7.1) and, with a fresh portion of waste, determine whether particle size reduction is necessary (Section 7.1.3) and determine the appropriate extraction fluid (Section 7.1.4). If only the volatile TCLP is to be performed, see the note in Section 7.1.4.

7.1.3 Determination of whether the waste requires particle size reduction (particle size is reduced during this step): Using the solid portion of the waste, evaluate the solid for particle size. Particle size reduction is required, unless the solid has a surface area per gram of material equal to or greater than 3.1 cm², or is smaller than 1 cm in its narrowest dimension (i.e., is capable of passing through a 9.5 mm (0.375 inch) standard sieve). If the surface area is smaller or the particle size larger than described above, prepare the solid portion of the waste for extraction by crushing, cutting, or grinding the waste to a surface area or particle size as described above. If the solids are prepared for organic volatiles extraction, special precautions must be taken (see Section 7.3.6).

NOTE: Surface area criteria are meant for filamentous (e.g., paper, cloth, and similar) waste materials. Actual measurement of surface area is not required, nor is it recommended. For materials that do not obviously meet

the criteria, sample specific methods would need to be developed and employed to measure the surface area. Such methodology is currently not available.

7.1.4 Determination of appropriate extraction fluid: If the solid content of the waste is greater than or equal to 0.5% and if the sample will be extracted for nonvolatile constituents (Section 7.2), determine the appropriate fluid (Section 5.7) for the nonvolatiles extraction as follows:

NOTE: TCLP extraction for volatile constituents uses only extraction fluid #1 (Section 5.7.1). Therefore, if TCLP extraction for nonvolatiles is not required, proceed to Section 7.3.

7.1.4.1 Weigh out a small subsample of the solid phase of the waste, reduce the solid (if necessary) to a particle size of approximately 1 mm in diameter or less, and transfer 5.0 grams of the solid phase of the waste to a 500 mL beaker or Erlenmeyer flask.

7.1.4.2 Add 96.5 mL of reagent water to the beaker, cover with a watchglass, and stir vigorously for 5 minutes using a magnetic stirrer. Measure and record the pH. If the pH is <5.0, use extraction fluid #1. Proceed to Section 7.2.

7.1.4.3 If the pH from Section 7.1.4.2 is >5.0, add 3.5 mL 1N HCl, slurry briefly, cover with a watchglass, heat to 50 °C, and hold at 50 °C for 10 minutes.

7.1.4.4 Let the solution cool to room temperature and record the pH. If the pH is <5.0, use extraction fluid #1. If the pH is >5.0, use extraction fluid #2. Proceed to Section 7.2.

7.1.5 If the aliquot of the waste used for the preliminary evaluation (Sections 7.1.1 - 7.1.4) was determined to be 100% solid at Section 7.1.1.1, then it can be used for the Section 7.2 extraction (assuming at least 100 grams remain), and the Section 7.3 extraction (assuming at least 25 grams remain). If the aliquot was subjected to the procedure in Section 7.1.1.7, then another aliquot shall be used for the volatile extraction procedure in Section 7.3. The aliquot of the waste subjected to the procedure in Section 7.1.1.7 might be appropriate for use for the Section 7.2 extraction if an adequate amount of solid (as determined by Section 7.1.1.9) was obtained. The amount of solid necessary is dependent upon whether a sufficient amount of extract will be produced to support the analyses. If an adequate amount of solid remains, proceed to Section 7.2.10 of the nonvolatile TCLP extraction.

7.2 Procedure When Volatiles are not Involved

A minimum sample size of 100 grams (solid and liquid phases) is recommended. In some cases, a larger sample size may be appropriate, depending on the

solids content of the waste sample (percent solids, See Section 7.1.1), whether the initial liquid phase of the waste will be miscible with the aqueous extract of the solid, and whether inorganics, semivolatile organics, pesticides, and herbicides are all analytes of concern. Enough solids should be generated for extraction such that the volume of TCLP extract will be sufficient to support all of the analyses required. If the amount of extract generated by a single TCLP extraction will not be sufficient to perform all of the analyses, more than one extraction may be performed and the extracts from each combined and aliquoted for analysis.

7.2.1 If the waste will obviously yield no liquid when subjected to pressure filtration (i.e., is 100% solid, see Section 7.1.1), weigh out a subsample of the waste (100 gram minimum) and proceed to Section 7.2.9.

7.2.2 If the sample is liquid or multiphasic, liquid/solid separation is required. This involves the filtration device described in Section 4.3.2 and is outlined in Sections 7.2.3 to 7.2.8.

7.2.3 Pre-weigh the container that will receive the filtrate.

7.2.4 Assemble the filter holder and filter following the manufacturer's instructions. Place the filter on the support screen and secure. Acid wash the filter if evaluating the mobility of metals (see Section 4.4).

NOTE: Acid washed filters may be used for all nonvolatile extractions even when metals are not of concern.

7.2.5 Weigh out a subsample of the waste (100 gram minimum) and record the weight. If the waste contains <0.5% dry solids (Section 7.1.2), the liquid portion of the waste, after filtration, is defined as the TCLP extract. Therefore, enough of the sample should be filtered so that the amount of filtered liquid will support all of the analyses required of the TCLP extract. For wastes containing >0.5% dry solids (Sections 7.1.1 or 7.1.2), use the percent solids information obtained in Section 7.1.1 to determine the optimum sample size (100 gram minimum) for filtration. Enough solids should be generated by filtration to support the analyses to be performed on the TCLP extract.

7.2.6 Allow slurries to stand to permit the solid phase to settle. Wastes that settle slowly may be centrifuged prior to filtration. Use centrifugation only as an aid to filtration. If the waste is centrifuged, the liquid should be decanted and filtered followed by filtration of the solid portion of the waste through the same filtration system.

7.2.7 Quantitatively transfer the waste sample (liquid and solid phases) to the filter holder (see Section 4.3.2). Spread the waste sample evenly over the surface of the filter. If filtration of the waste at 4 °C reduces the amount of expressed liquid over what would be expressed at

room temperature, then allow the sample to warm up to room temperature in the device before filtering.

NOTE: If waste material (>1% of the original sample weight) has obviously adhered to the container used to transfer the sample to the filtration apparatus, determine the weight of this residue and subtract it from the sample weight determined in Section 7.2.5, to determine the weight of the waste sample that will be filtered.

Gradually apply vacuum or gentle pressure of 1-10 psi, until air or pressurizing gas moves through the filter. If this point is not reached under 10 psi, and if no additional liquid has passed through the filter in any 2 minute interval, slowly increase the pressure in 10 psi increments to a maximum of 50 psi. After each incremental increase of 10 psi, if the pressurizing gas has not moved through the filter, and if no additional liquid has passed through the filter in any 2 minute interval, proceed to the next 10 psi increment. When the pressurizing gas begins to move through the filter, or when the liquid flow has ceased at 50 psi (i.e., filtration does not result in any additional filtrate within a 2 minute period), stop the filtration.

NOTE: Instantaneous application of high pressure can degrade the glass fiber filter and may cause premature plugging.

7.2.8 The material in the filter holder is defined as the solid phase of the waste, and the filtrate is defined as the liquid phase. Weigh the filtrate. The liquid phase may now be either analyzed (See Section 7.2.12) or stored at 4 °C until time of analysis.

NOTE: Some wastes, such as oily wastes and some paint wastes, will obviously contain some material that appears to be a liquid. Even after applying vacuum or pressure filtration, as outlined in Section 7.2.7, this material may not filter. If this is the case, the material within the filtration device is defined as a solid and is carried through the extraction as a solid. Do not replace the original filter with a fresh filter under any circumstances. Use only one filter.

7.2.9 If the waste contains <0.5% dry solids (see Section 7.1.2), proceed to Section 7.2.13. If the waste contains >0.5% dry solids (see Section 7.1.1 or 7.1.2), and if particle size reduction of the solid was needed in Section 7.1.3, proceed to Section 7.2.10. If the waste as received passes a 9.5 mm sieve, quantitatively transfer the solid material into the extractor bottle along with the filter used to separate the initial liquid from the solid phase, and proceed to Section 7.2.11.

7.2.10 Prepare the solid portion of the waste for extraction by crushing, cutting, or grinding the waste to a surface area or particle size as described in Section 7.1.3. When the surface area or particle size has been appropriately altered, quantitatively transfer the solid

material into an extractor bottle. Include the filter used to separate the initial liquid from the solid phase.

NOTE: Sieving of the waste is not normally required. Surface area requirements are meant for filamentous (e.g., paper, cloth) and similar waste materials. Actual measurement of surface area is not recommended. If sieving is necessary, a Teflon coated sieve should be used to avoid contamination of the sample.

7.2.11 Determine the amount of extraction fluid to add to the extractor vessel as follows:

$$\text{Weight of extraction fluid} = \frac{20 \times \text{percent solids (Section 7.1.1)} \times \text{weight of waste filtered (Section 7.2.5 or 7.2.7)}}{100}$$

Slowly add this amount of appropriate extraction fluid (see Section 7.1.4) to the extractor vessel. Close the extractor bottle tightly (it is recommended that Teflon tape be used to ensure a tight seal), secure in rotary agitation device, and rotate at 30 ± 2 rpm for 18 ± 2 hours. Ambient temperature (i.e., temperature of room in which extraction takes place) shall be maintained at 23 ± 2 °C during the extraction period.

NOTE: As agitation continues, pressure may build up within the extractor bottle for some types of wastes (e.g., limed or calcium carbonate containing waste may evolve gases such as carbon dioxide). To relieve excess pressure, the extractor bottle may be periodically opened (e.g., after 15 minutes, 30 minutes, and 1 hour) and vented into a hood.

7.2.12 Following the 18 ± 2 hour extraction, separate the material in the extractor vessel into its component liquid and solid phases by filtering through a new glass fiber filter, as outlined in Section 7.2.7. For final filtration of the TCLP extract, the glass fiber filter may be changed, if necessary, to facilitate filtration. Filter(s) shall be acid-washed (see Section 4.4) if evaluating the mobility of metals.

7.2.13 Prepare the TCLP extract as follows:

7.2.13.1 If the waste contained no initial liquid phase, the filtered liquid material obtained from Section 7.2.12 is defined as the TCLP extract. Proceed to Section 7.2.14.

7.2.13.2 If compatible (e.g., multiple phases will not result on combination), combine the filtered liquid resulting from Section 7.2.12 with the initial liquid phase of the waste obtained in Section 7.2.7. This combined liquid is defined as the TCLP extract. Proceed to Section 7.2.14.

7.2.13.3 If the initial liquid phase of the waste, as obtained from Section 7.2.7, is not or may not be compatible with the filtered liquid resulting from Section 7.2.12, do not combine these liquids. Analyze these liquids, collectively defined as the TCLP extract, and combine the results mathematically, as described in Section 7.2.14.

7.2.14 Following collection of the TCLP extract, the pH of the extract should be recorded. Immediately aliquot and preserve the extract for analysis. Metals aliquots must be acidified with nitric acid to pH <2. If precipitation is observed upon addition of nitric acid to a small aliquot of the extract, then the remaining portion of the extract for metals analyses shall not be acidified and the extract shall be analyzed as soon as possible. All other aliquots must be stored under refrigeration (4 °C) until analyzed. The TCLP extract shall be prepared and analyzed according to appropriate analytical methods. TCLP extracts to be analyzed for metals shall be acid digested except in those instances where digestion causes loss of metallic analytes. If an analysis of the undigested extract shows that the concentration of any regulated metallic analyte exceeds the regulatory level, then the waste is hazardous and digestion of the extract is not necessary. However, data on undigested extracts alone cannot be used to demonstrate that the waste is not hazardous. If the individual phases are to be analyzed separately, determine the volume of the individual phases (to $\pm 0.5\%$), conduct the appropriate analyses, and combine the results mathematically by using a simple volume-weighted average:

$$\text{Final Analyte Concentration} = \frac{(V_1) (C_1) + (V_2) (C_2)}{V_1 + V_2}$$

where:

V_1 = The volume of the first phase (L).

C_1 = The concentration of the analyte of concern in the first phase (mg/L).

V_2 = The volume of the second phase (L).

C_2 = The concentration of the analyte of concern in the second phase (mg/L).

7.2.15 Compare the analyte concentrations in the TCLP extract with the levels identified in the appropriate regulations. Refer to Section 8.0 for quality assurance requirements.

7.3 Procedure When Volatiles are Involved

Use the ZHE device to obtain TCLP extract for analysis of volatile compounds only. Extract resulting from the use of the ZHE shall not be used to evaluate the mobility of nonvolatile analytes (e.g., metals, pesticides, etc.).

The ZHE device has approximately a 500 mL internal capacity. The ZHE can thus accommodate a maximum of 25 grams of solid (defined as that fraction of a

sample from which no additional liquid may be forced out by an applied pressure of 50 psi), due to the need to add an amount of extraction fluid equal to 20 times the weight of the solid phase.

Charge the ZHE with sample only once and do not open the device until the final extract (of the solid) has been collected. Repeated filling of the ZHE to obtain 25 grams of solid is not permitted.

Do not allow the waste, the initial liquid phase, or the extract to be exposed to the atmosphere for any more time than is absolutely necessary. Any manipulation of these materials should be done when cold (4 °C) to minimize loss of volatiles.

7.3.1 Pre-weigh the (evacuated) filtrate collection container (See Section 4.6) and set aside. If using a TEDLAR® bag, express all liquid from the ZHE device into the bag, whether for the initial or final liquid/solid separation, and take an aliquot from the liquid in the bag for analysis. The containers listed in Section 4.6 are recommended for use under the conditions stated in Sections 4.6.1 - 4.6.3.

7.3.2 Place the ZHE piston within the body of the ZHE (it may be helpful first to moisten the piston O-rings slightly with extraction fluid). Adjust the piston within the ZHE body to a height that will minimize the distance the piston will have to move once the ZHE is charged with sample (based upon sample size requirements determined from Section 7.3, Section 7.1.1 and/or 7.1.2). Secure the gas inlet/outlet flange (bottom flange) onto the ZHE body in accordance with the manufacturer's instructions. Secure the glass fiber filter between the support screens and set aside. Set liquid inlet/outlet flange (top flange) aside.

7.3.3 If the waste is 100% solid (see Section 7.1.1), weigh out a subsample (25 gram maximum) of the waste, record weight, and proceed to Section 7.3.5.

7.3.4 If the waste contains < 0.5% dry solids (Section 7.1.2), the liquid portion of waste, after filtration, is defined as the TCLP extract. Filter enough of the sample so that the amount of filtered liquid will support all of the volatile analyses required. For wastes containing \geq 0.5% dry solids (Sections 7.1.1 and/or 7.1.2), use the percent solids information obtained in Section 7.1.1 to determine the optimum sample size to charge into the ZHE. The recommended sample size is as follows:

7.3.4.1 For wastes containing < 5% solids (see Section 7.1.1), weigh out a 500 gram subsample of waste and record the weight.

7.3.4.2 For wastes containing \geq 5% solids (see Section 7.1.1), determine the amount of waste to charge into the ZHE as follows:

$$\text{Weight of waste to charge ZHE} = \frac{25}{\text{percent solids (Section 7.1.1)}} \times 100$$

Weigh out a subsample of the waste of the appropriate size and record the weight.

7.3.5 If particle size reduction of the solid portion of the waste was required in Section 7.1.3, proceed to Section 7.3.6. If particle size reduction was not required in Section 7.1.3, proceed to Section 7.3.7.

7.3.6 Prepare the waste for extraction by crushing, cutting, or grinding the solid portion of the waste to a surface area or particle size as described in Section 7.1.3. Wastes and appropriate reduction equipment should be refrigerated, if possible, to 4 °C prior to particle size reduction. The means used to effect particle size reduction must not generate heat in and of itself. If reduction of the solid phase of the waste is necessary, exposure of the waste to the atmosphere should be avoided to the extent possible.

NOTE: Sieving of the waste is not recommended due to the possibility that volatiles may be lost. The use of an appropriately graduated ruler is recommended as an acceptable alternative. Surface area requirements are meant for filamentous (e.g., paper, cloth) and similar waste materials. Actual measurement of surface area is not recommended.

When the surface area or particle size has been appropriately altered, proceed to Section 7.3.7.

7.3.7 Waste slurries need not be allowed to stand to permit the solid phase to settle. Do not centrifuge wastes prior to filtration.

7.3.8 Quantitatively transfer the entire sample (liquid and solid phases) quickly to the ZHE. Secure the filter and support screens onto the top flange of the device and secure the top flange to the ZHE body in accordance with the manufacturer's instructions. Tighten all ZHE fittings and place the device in the vertical position (gas inlet/outlet flange on the bottom). Do not attach the extract collection device to the top plate.

NOTE: If waste material (>1% of original sample weight) has obviously adhered to the container used to transfer the sample to the ZHE, determine the weight of this residue and subtract it from the sample weight determined in Section 7.3.4 to determine the weight of the waste sample that will be filtered.

Attach a gas line to the gas inlet/outlet valve (bottom flange) and, with the liquid inlet/outlet valve (top flange) open, begin applying gentle pressure of 1-10 psi (or more if necessary) to force all headspace

slowly out of the ZHE device into a hood. At the first appearance of liquid from the liquid inlet/outlet valve, quickly close the valve and discontinue pressure. If filtration of the waste at 4 °C reduces the amount of expressed liquid over what would be expressed at room temperature, then allow the sample to warm up to room temperature in the device before filtering. If the waste is 100% solid (see Section 7.1.1), slowly increase the pressure to a maximum of 50 psi to force most of the headspace out of the device and proceed to Section 7.3.12.

7.3.9 Attach the evacuated pre-weighed filtrate collection container to the liquid inlet/outlet valve and open the valve. Begin applying gentle pressure of 1-10 psi to force the liquid phase of the sample into the filtrate collection container. If no additional liquid has passed through the filter in any 2 minute interval, slowly increase the pressure in 10 psi increments to a maximum of 50 psi. After each incremental increase of 10 psi, if no additional liquid has passed through the filter in any 2 minute interval, proceed to the next 10 psi increment. When liquid flow has ceased such that continued pressure filtration at 50 psi does not result in any additional filtrate within a 2 minute period, stop the filtration. Close the liquid inlet/outlet valve, discontinue pressure to the piston, and disconnect and weigh the filtrate collection container.

NOTE: Instantaneous application of high pressure can degrade the glass fiber filter and may cause premature plugging.

7.3.10 The material in the ZHE is defined as the solid phase of the waste and the filtrate is defined as the liquid phase.

NOTE: Some wastes, such as oily wastes and some paint wastes, will obviously contain some material that appears to be a liquid. Even after applying pressure filtration, this material will not filter. If this is the case, the material within the filtration device is defined as a solid and is carried through the TCLP extraction as a solid.

If the original waste contained <0.5% dry solids (see Section 7.1.2), this filtrate is defined as the TCLP extract and is analyzed directly. Proceed to Section 7.3.15.

7.3.11 The liquid phase may now be either analyzed immediately (See Sections 7.3.13 through 7.3.15) or stored at 4 °C under minimal headspace conditions until time of analysis. Determine the weight of extraction fluid #1 to add to the ZHE as follows:

$$\text{Weight of extraction fluid} = \frac{20 \times \text{percent solids (Section 7.1.1)} \times \text{weight of waste filtered (Section 7.3.4 or 7.3.8)}}{100}$$

7.3.12 The following Sections detail how to add the appropriate amount of extraction fluid to the solid material within the ZHE and agitation of the ZHE vessel. Extraction fluid #1 is used in all cases (See Section 5.7).

7.3.12.1 With the ZHE in the vertical position, attach a line from the extraction fluid reservoir to the liquid inlet/outlet valve. The line used shall contain fresh extraction fluid and should be preflushed with fluid to eliminate any air pockets in the line. Release gas pressure on the ZHE piston (from the gas inlet/outlet valve), open the liquid inlet/outlet valve, and begin transferring extraction fluid (by pumping or similar means) into the ZHE. Continue pumping extraction fluid into the ZHE until the appropriate amount of fluid has been introduced into the device.

7.3.12.2 After the extraction fluid has been added, immediately close the liquid inlet/outlet valve and disconnect the extraction fluid line. Check the ZHE to ensure that all valves are in their closed positions. Manually rotate the device in an end-over-end fashion 2 or 3 times. Reposition the ZHE in the vertical position with the liquid inlet/outlet valve on top. Pressurize the ZHE to 5-10 psi (if necessary) and slowly open the liquid inlet/outlet valve to bleed out any headspace (into a hood) that may have been introduced due to the addition of extraction fluid. This bleeding shall be done quickly and shall be stopped at the first appearance of liquid from the valve. Re-pressurize the ZHE with 5-10 psi and check all ZHE fittings to ensure that they are closed.

7.3.12.3 Place the ZHE in the rotary agitation apparatus (if it is not already there) and rotate at 30 ± 2 rpm for 18 ± 2 hours. Ambient temperature (i.e., temperature of room in which extraction occurs) shall be maintained at 23 ± 2 °C during agitation.

7.3.13 Following the 18 ± 2 hour agitation period, check the pressure behind the ZHE piston by quickly opening and closing the gas inlet/outlet valve and noting the escape of gas. If the pressure has not been maintained (i.e., no gas release observed), the device is leaking. Check the ZHE for leaking as specified in Section 4.2.1, and perform the extraction again with a new sample of waste. If the pressure within the device has been maintained, the material in the extractor vessel is once again separated into its component liquid and solid phases. If the waste contained an initial liquid phase, the liquid may be filtered directly into the same filtrate collection container (i.e., TEDLAR® bag) holding the initial liquid phase of the waste. A separate filtrate collection container must be used if combining would create multiple phases, or there is not enough volume left within the filtrate collection container. Filter through the glass fiber filter, using the ZHE device as discussed in Section 7.3.9. All extract shall be filtered and collected if the

TEDLAR® bag is used, if the extract is multiphasic, or if the waste contained an initial liquid phase (see Sections 4.6 and 7.3.1).

NOTE: An in-line glass fiber filter may be used to filter the material within the ZHE if it is suspected that the glass fiber filter has been ruptured.

7.3.14 If the original waste contained no initial liquid phase, the filtered liquid material obtained from Section 7.3.13 is defined as the TCLP extract. If the waste contained an initial liquid phase, the filtered liquid material obtained from Section 7.3.13 and the initial liquid phase (Section 7.3.9) are collectively defined as the TCLP extract.

7.3.15 Following collection of the TCLP extract, immediately prepare the extract for analysis and store with minimal headspace at 4 °C until analyzed. Analyze the TCLP extract according to the appropriate analytical methods. If the individual phases are to be analyzed separately (i.e., are not miscible), determine the volume of the individual phases (to 0.5%), conduct the appropriate analyses, and combine the results mathematically by using a simple volume-weighted average:

$$\text{Final Analyte Concentration} = \frac{(V_1) (C_1) + (V_2) (C_2)}{V_1 + V_2}$$

where:

V_1 = The volume of the first phases (L).

C_1 = The concentration of the analyte of concern in the first phase (mg/L).

V_2 = The volume of the second phase (L).

C_2 = The concentration of the analyte of concern in the second phase (mg/L).

7.3.16 Compare the analyte concentrations in the TCLP extract with the levels identified in the appropriate regulations. Refer to Section 8.0 for quality assurance requirements.

8.0 QUALITY ASSURANCE

8.1 A minimum of one blank (using the same extraction fluid as used for the samples) must be analyzed for every 20 extractions that have been conducted in an extraction vessel.

8.2 A matrix spike shall be performed for each waste type (e.g., wastewater treatment sludge, contaminated soil, etc.) unless the result exceeds the regulatory level and the data are being used solely to demonstrate that the waste property exceeds the regulatory level. A minimum of one matrix spike must be analyzed for each analytical batch. As a minimum, follow the matrix spike addition guidance provided in each analytical method.

8.2.1 Matrix spikes are to be added after filtration of the TCLP extract and before preservation. Matrix spikes should not be added prior to TCLP extraction of the sample.

8.2.2 In most cases, matrix spikes should be added at a concentration equivalent to the corresponding regulatory level. If the analyte concentration is less than one half the regulatory level, the spike concentration may be as low as one half of the analyte concentration, but may not be not less than five times the method detection limit. In order to avoid differences in matrix effects, the matrix spikes must be added to the same nominal volume of TCLP extract as that which was analyzed for the unspiked sample.

8.2.3 The purpose of the matrix spike is to monitor the performance of the analytical methods used, and to determine whether matrix interferences exist. Use of other internal calibration methods, modification of the analytical methods, or use of alternate analytical methods may be needed to accurately measure the analyte concentration in the TCLP extract when the recovery of the matrix spike is below the expected analytical method performance.

8.2.4 Matrix spike recoveries are calculated by the following formula:

$$\%R (\% \text{Recovery}) = 100 (X_s - X_u)/K$$

where:

X_s = measured value for the spiked sample,

X_u = measured value for the unspiked sample, and

K = known value of the spike in the sample.

8.3 All quality control measures described in the appropriate analytical methods shall be followed.

8.4 The use of internal calibration quantitation methods shall be employed for a metallic contaminant if: (1) Recovery of the contaminant from the TCLP extract is not at least 50% and the concentration does not exceed the regulatory level, and (2) The concentration of the contaminant measured in the extract is within 20% of the appropriate regulatory level.

8.4.1. The method of standard additions shall be employed as the internal calibration quantitation method for each metallic contaminant.

8.4.2 The method of standard additions requires preparing calibration standards in the sample matrix rather than reagent water or blank solution. It requires taking four identical aliquots of the solution and adding known amounts of standard to three of these aliquots. The fourth aliquot is the unknown. Preferably, the first addition should be prepared so that the resulting concentration is approximately 50% of the expected concentration of the sample. The second and third additions should be prepared so that the concentrations are approximately 100% and

150% of the expected concentration of the sample. All four aliquots are maintained at the same final volume by adding reagent water or a blank solution, and may need dilution adjustment to maintain the signals in the linear range of the instrument technique. All four aliquots are analyzed.

8.4.3 Prepare a plot, or subject data to linear regression, of instrument signals or external-calibration-derived concentrations as the dependant variable (y-axis) versus concentrations of the additions of standard as the independent variable (x-axis). Solve for the intercept of the abscissa (the independent variable, x-axis) which is the concentration in the unknown.

8.4.4 Alternately, subtract the instrumental signal or external-calibration-derived concentration of the unknown (unspiked) sample from the instrumental signals or external-calibration-derived concentrations of the standard additions. Plot or subject to linear regression of the corrected instrument signals or external-calibration-derived concentrations as the dependant variable versus the independent variable. Derive concentrations for unknowns using the internal calibration curve as if it were an external calibration curve.

8.5 Samples must undergo TCLP extraction within the following time periods:

SAMPLE MAXIMUM HOLDING TIMES [DAYS]				
	From: Field collection To: TCLP extraction	From: TCLP extraction To: Preparative extraction	From: Preparative extraction To: Determinative analysis	Total elapsed time
Volatiles	14	NA	14	28
Semi-volatiles	14	7	40	61
Mercury	28	NA	28	56
Metals, except mercury	180	NA	180	360

NA = Not applicable

If sample holding times are exceeded, the values obtained will be considered minimal concentrations. Exceeding the holding time is not acceptable in establishing that a waste does not exceed the regulatory level. Exceeding the holding time will not invalidate characterization if the waste exceeds the regulatory level.

9.0 METHOD PERFORMANCE

9.1 Ruggedness. Two ruggedness studies have been performed to determine the effect of various perturbations on specific elements of the TCLP protocol. Ruggedness testing determines the sensitivity of small procedural variations which might be expected to occur during routine laboratory application.

9.1.1 Metals - The following conditions were used when leaching a waste for metals analysis:

Varying Conditions	
Liquid/Solid ratio	19:1 vs. 21:1
Extraction time	16 hours vs. 18 hours
Headspace	20% vs. 60%
Buffer #2 acidity	190 meq vs. 210 meq
Acid-washed filters	yes vs. no
Filter type	0.7 μ m glass fiber vs. 0.45 μ m vs. polycarbonate
Bottle type	borosilicate vs. flint glass

Of the seven method variations examined, acidity of the extraction fluid had the greatest impact on the results. Four of 13 metals from an API separator sludge/electroplating waste (API/EW) mixture and two of three metals from an ammonia lime still bottom waste were extracted at higher levels by the more acidic buffer. Because of the sensitivity to pH changes, the method requires that the extraction fluids be prepared so that the final pH is within ± 0.05 units as specified.

9.1.2 Volatile Organic Compounds - The following conditions were used when leaching a waste for VOC analysis:

Varying Conditions	
Liquid/Solid ratio	19:1 vs. 21:1
Headspace	0% vs. 5%
Buffer #1 acidity	60 meq vs. 80 meq
Method of storing extract	Syringe vs. Tedlar® bag
Aliquotting	yes vs. no
Pressure behind piston	0 psi vs. 20 psi

None of the parameters had a significant effect on the results of the ruggedness test.

9.2 Precision. Many TCLP precision (reproducibility) studies have been performed, and have shown that, in general, the precision of the TCLP is comparable to or exceeds that of the EP toxicity test and that method precision is adequate. One of the more significant contributions to poor precision appears to be related to sample homogeneity and inter-laboratory variation (due to the nature of waste materials).

9.2.1 Metals - The results of a multi-laboratory study are shown in Table 6, and indicate that a single analysis of a waste may not be adequate for waste characterization and identification requirements.

9.2.2 Semi-Volatile Organic Compounds - The results of two studies are shown in Tables 7 and 8. Single laboratory precision was excellent with greater than 90 percent of the results exhibiting an RSD less than 25 percent. Over 85 percent of all individual compounds in the multi-laboratory study fell in the RSD range of 20 - 120 percent. Both studies concluded that the TCLP provides adequate precision. It was also determined that the high acetate content of the extraction fluid did not present problems (i.e., column degradation of the gas chromatograph) for the analytical conditions used.

9.2.3 Volatile Organic Compounds - Eleven laboratories participated in a collaborative study of the use of the ZHE with two waste types which were fortified with a mixture of VOCs. The results of the collaborative study are shown in Table 9. Precision results for VOCs tend to occur over a considerable range. However, the range and mean RSD compared very closely to the same collaborative study metals results in Table 6. Blackburn and Show concluded that at the 95% level of significance: 1) recoveries among laboratories were statistically similar, 2) recoveries did not vary significantly between the two sample types, and 3) each laboratory showed the same pattern of recovery for each of the two samples.

10.0 REFERENCES

1. Blackburn, W.B. and Show, I. "Collaborative Study of the Toxicity Characteristics Leaching Procedure (TCLP)." Draft Final Report, Contract No. 68-03-1958, S-Cubed, November 1986.
2. Newcomer, L.R., Blackburn, W.B., Kimmell, T.A. "Performance of the Toxicity Characteristic Leaching Procedure." Wilson Laboratories, S-Cubed, U.S. EPA, December 1986.
3. Williams, L.R., Francis, C.W.; Maskarinec, M.P., Taylor D.R., and Rothman, N. "Single-Laboratory Evaluation of Mobility Procedure for Solid Waste." EMSL, ORNL, S-Cubed, ENSECO.

Table 1.
Volatile Analytes^{1,2}

Compound	CAS No.
Acetone	67-64-1
Benzene	71-43-2
n-Butyl alcohol	71-36-3
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chloroform	67-66-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethylene	75-35-4
Ethyl acetate	141-78-6
Ethyl benzene	100-41-4
Ethyl ether	60-29-7
Isobutanol	78-83-1
Methanol	67-56-1
Methylene chloride	75-09-2
Methyl ethyl ketone	78-93-3
Methyl isobutyl ketone	108-10-1
Tetrachloroethylene	127-18-4
Toluene	108-88-3
1,1,1,-Trichloroethane	71-55-6
Trichloroethylene	79-01-6
Trichlorofluoromethane	75-69-4
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1
Vinyl chloride	75-01-4
Xylene	1330-20-7

¹ When testing for any or all of these analytes, the zero-headspace extractor vessel shall be used instead of the bottle extractor.

² Benzene, carbon tetrachloride, chlorobenzene, chloroform, 1,2-dichloroethane, 1,1-dichloroethylene, methyl ethyl ketone, tetrachloroethylene, and vinyl chloride are toxicity characteristic constituents.

Table 2.
Suitable Rotary Agitation Apparatus¹

Company	Location	Model No.
Analytical Testing and Consulting Services, Inc.	Warrington, PA (215) 343-4490	4-vessel extractor (DC20S) 8-vessel extractor (DC20) 12-vessel extractor (DC20B) 24-vessel extractor (DC24C)
Associated Design and Manufacturing Company	Alexandria, VA (703) 549-5999	2-vessel (3740-2-BRE) 4-vessel (3740-4-BRE) 6-vessel (3740-6-BRE) 8-vessel (3740-8-BRE) 12-vessel (3740-12-BRE) 24-vessel (3740-24-BRE)
Environmental Machine and Design, Inc.	Lynchburg, VA (804) 845-6424	8-vessel (08-00-00) 4-vessel (04-00-00)
IRA Machine Shop and Laboratory	Santurce, PR (809) 752-4004	8-vessel (011001)
Lars Lande Manufacturing	Whitmore Lake, MI (313) 449-4116	10-vessel (10VRE) 5-vessel (5VRE) 6-vessel (6VRE)
Millipore Corp.	Bedford, MA (800) 225-3384	4-ZHE or 4 2-liter bottle extractor (YT310RAHW)

¹ Any device that rotates the extraction vessel in an end-over-end fashion at 30 ± 2 rpm is acceptable.

Table 3.
Suitable Zero-Headspace Extractor Vessels¹

Company	Location	Model No.
Analytical Testing & Consulting Services, Inc.	Warrington, PA (215) 343-4490	C102, Mechanical Pressure Device
Associated Design and Manufacturing Company	Alexandria, VA (703) 549-5999	3745-ZHE, Gas Pressure Device
Lars Lande Manufacturing ²	Whitmore Lake, MI (313) 449-4116	ZHE-11, Gas Pressure Device
Millipore Corporation	Bedford, MA (800) 225-3384	YT30090HW, Gas Pressure Device
Environmental Machine and Design, Inc.	Lynchburg, VA (804) 845-6424	VOLA-TOX1, Gas Pressure Device
Gelman Science	Ann Arbor, MI (800) 521-1520	15400 Gas Pressure Device

¹ Any device that meets the specifications listed in Section 4.2.1 of the method is suitable.

² This device uses a 110 mm filter.

Table 4.
Suitable Filter Holders¹

Company	Location	Model/ Catalogue No.	Size
Nucleopore Corporation	Pleasanton, CA (800) 882-7711	425910 410400	142 mm 47 mm
Micro Filtration Systems	Dublin, CA (800) 334-7132 (415) 828-6010	302400 311400	142 mm 47 mm
Millipore Corporation	Bedford, MA (800) 225-3384	YT30142HW XX1004700	142 mm 47 mm

¹ Any device capable of separating the liquid from the solid phase of the waste is suitable, providing that it is chemically compatible with the waste and the constituents to be analyzed. Plastic devices (not listed above) may be used when only inorganic analytes are of concern. The 142 mm size filter holder is recommended.

Table 5.
Suitable Filter Media¹

Company	Location	Model	Pore Size (µm)
Millipore Corporation	Bedford, MA (800) 225-3384	AP40	0.7
Nucleopore Corporation	Pleasanton, CA (415) 463-2530	211625	0.7
Whatman Laboratory Products, Inc.	Clifton, NJ (201) 773-5800	GFF	0.7
Micro Filtration Systems	Dublin, CA (800) 334-7132 (415) 828-6010	GF75	0.7
Gelman Science	Ann Arbor, MI (800) 521-1520	66256 (90mm) 66257 (142mm)	0.7

¹ Any filter that meets the specifications in Section 4.4 of the Method is suitable.

Table 6. Multi-Laboratory TCLP Metals, Precision

Waste	Extraction Fluid	Metal	\bar{X}	S	%RSD
Ammonia Lime Still Bottoms	#1	Cadmium	0.053	0.031	60
	#2		0.023	0.017	76
	#1	Chromium	0.015	0.0014	93
	#2		0.0032	0.0037	118
	#1	Lead	0.0030	0.0027	90
	#2		0.0032	0.0028	87
API/EW Mixture	#1	Cadmium	0.0046	0.0028	61
	#2		0.0005	0.0004	77
	#1	Chromium	0.0561	0.0227	40
	#2		0.105	0.018	17
	#1	Lead	0.0031	0.0031	100
	#2		0.0124	0.0136	110
Fossil Fuel Fly Ash	#1	Cadmium	0.080	0.069	86
	#2		0.093	0.067	72
	#1	Chromium	0.017	0.014	85
	#2		0.070	0.040	57
	#1	Lead	0.0087	0.0074	85
	#2		0.0457	0.0083	18
%RSD Range = 17 - 118 Mean %RSD = 74					

NOTE: \bar{X} = Mean results from 6 - 12 different laboratories
 Units = mg/L
 Extraction Fluid #1 = pH 4.9
 #2 = pH 2.9

Table 7. Single-Laboratory Semi-Volatiles, Precision

Waste	Compound	Extraction Fluid	\bar{X}	S	%RSD
Ammonia Lime Still Bottoms	Phenol	#1	19000	2230	11.6
		#2	19400	929	4.8
	2-Methylphenol	#1	2000	297	14.9
		#2	1860	52.9	2.8
	4-Methylphenol	#1	7940	1380	17.4
		#2	7490	200	2.7
	2,4-Dimethylphenol	#1	321	46.8	14.6
		#2	307	45.8	14.9
	Naphthalene	#1	3920	413	10.5
		#2	3827	176	4.6
	2-Methylnaphthalene	#1	290	44.8	15.5
		#2	273	19.3	7.1
	Dibenzofuran	#1	187	22.7	12.1
		#2	187	7.2	3.9
	Acenaphthylene	#1	703	89.2	12.7
		#2	663	20.1	3.0
	Fluorene	#1	151	17.6	11.7
		#2	156	2.1	1.3
	Phenanthrene	#1	241	22.7	9.4
		#2	243	7.9	3.3
	Anthracene	#1	33.2	6.19	18.6
		#2	34.6	1.55	4.5
	Fluoranthrene	#1	25.3	1.8	7.1
		#2	26.0	1.8	7.1
API/EW Mixture	Phenol	#1	40.7	13.5	33.0
		#2	19.0	1.76	9.3
	2,4-Dimethylphenol	#1	33.0	9.35	28.3
		#2	43.3	8.61	19.9
	Naphthalene	#1	185	29.4	15.8
		#2	165	24.8	15.0
	2-Methylnaphthalene	#1	265	61.2	23.1
		#2	200	18.9	9.5
			%RSD Range = 1 - 33		
			Mean %RSD = 12		

NOTE: Units = $\mu\text{g/L}$

Extractions were performed in triplicate

All results were at least 2x the detection limit

Extraction Fluid #1 = pH 4.9

#2 = pH 2.9

Table 8. Multi-Laboratory Semi-Volatiles, Precision

Waste	Compound	Extraction Fluid	\bar{X}	S	%RSD
Ammonia Lime Still Bottoms (A)	BNAs	#1	10043	7680	76.5
		#2	10376	6552	63.1
API/EW Mixture (B)	BNAs	#1	1624	675	41.6
		#2	2074	1463	70.5
Fossil Fuel	BNAs	#1	750	175	23.4
Fly Ash (C)		#2	739	342	46.3
Mean %RSD = 54					

NOTE: Units = $\mu\text{g/L}$

\bar{X} = Mean results from 3 - 10 labs

Extraction Fluid #1 = pH 4.9

#2 = pH 2.9

%RSD Range for Individual Compounds

A, #1 0 - 113

A, #2 28 - 108

B, #1 20 - 156

B, #2 49 - 128

C, #1 36 - 143

C, #2 61 - 164

Table 9. Multi-Laboratory (11 Labs) VOCs, Precision

Waste	Compound	\bar{X}	S	%RSD
Mine Tailings	Vinyl chloride	6.36	6.36	100
	Methylene chloride	12.1	11.8	98
	Carbon disulfide	5.57	2.83	51
	1,1-Dichloroethene	21.9	27.7	127
	1,1-Dichloroethane	31.4	25.4	81
	Chloroform	46.6	29.2	63
	1,2-Dichloroethane	47.8	33.6	70
	2-Butanone	43.5	36.9	85
	1,1,1-Trichloroethane	20.9	20.9	100
	Carbon tetrachloride	12.0	8.2	68
	Trichloroethene	24.7	21.2	86
	1,1,2-Trichloroethene	19.6	10.9	56
	Benzene	37.9	28.7	76
	1,1,2,2-Tetrachloroethane	34.9	25.6	73
	Toluene	29.3	11.2	38
	Chlorobenzene	35.6	19.3	54
	Ethylbenzene	4.27	2.80	66
	Trichlorofluoromethane	3.82	4.40	115
	Acrylonitrile	76.7	110.8	144
Ammonia Lime Still Bottoms	Vinyl chloride	5.00	4.71	94
	Methylene chloride	14.3	13.1	92
	Carbon disulfide	3.37	2.07	61
	1,1-Dichloroethene	52.1	38.8	75
	1,1-Dichloroethane	52.8	25.6	49
	Chloroform	64.7	28.4	44
	1,2-Dichloroethane	43.1	31.5	73
	2-Butanone	59.0	39.6	67
	1,1,1-Trichloroethane	53.6	40.9	76
	Carbon tetrachloride	7.10	6.1	86
	Trichloroethene	57.3	34.2	60
	1,1,2-Trichloroethene	6.7	4.7	70
	Benzene	61.3	26.8	44
	1,1,2,2-Tetrachloroethane	3.16	2.1	66
	Toluene	69.0	18.5	27
	Chlorobenzene	71.8	12.0	17
	Ethylbenzene	3.70	2.2	58
	Trichlorofluoromethane	4.05	4.8	119
	Acrylonitrile	29.4	34.8	118
				%RSD Range = 17 - 144
				Mean %RSD = 75

NOTE: Units = $\mu\text{g/L}$

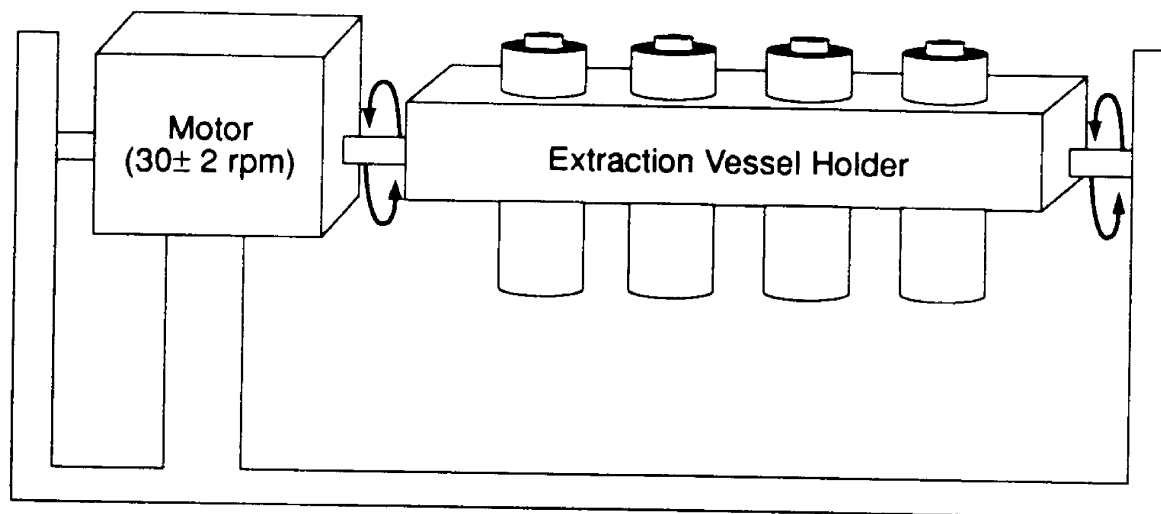


Figure 1. Rotary Agitation Apparatus

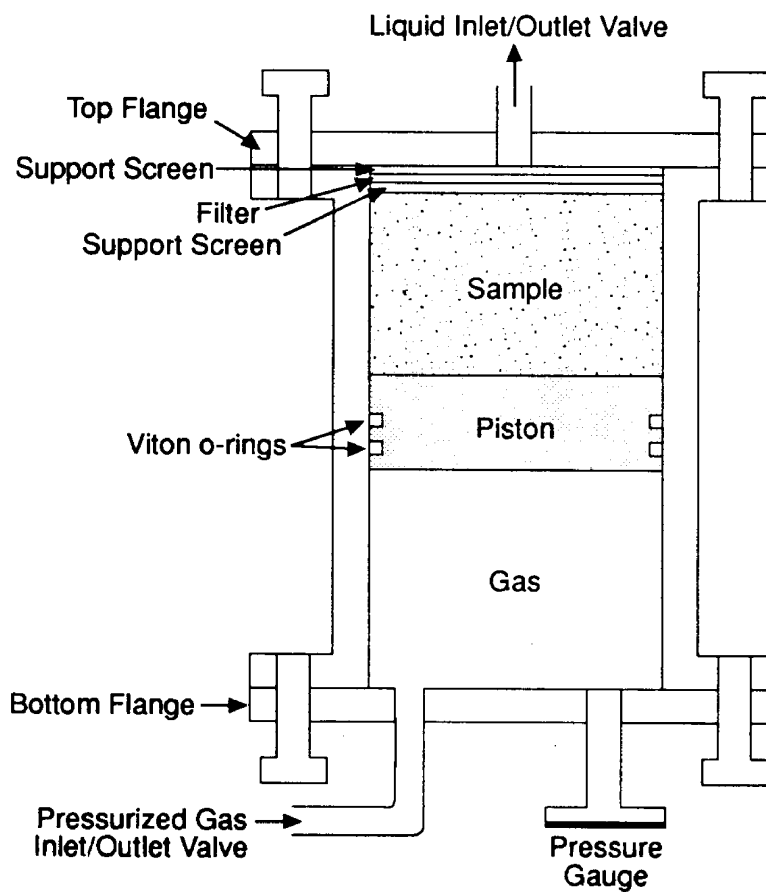
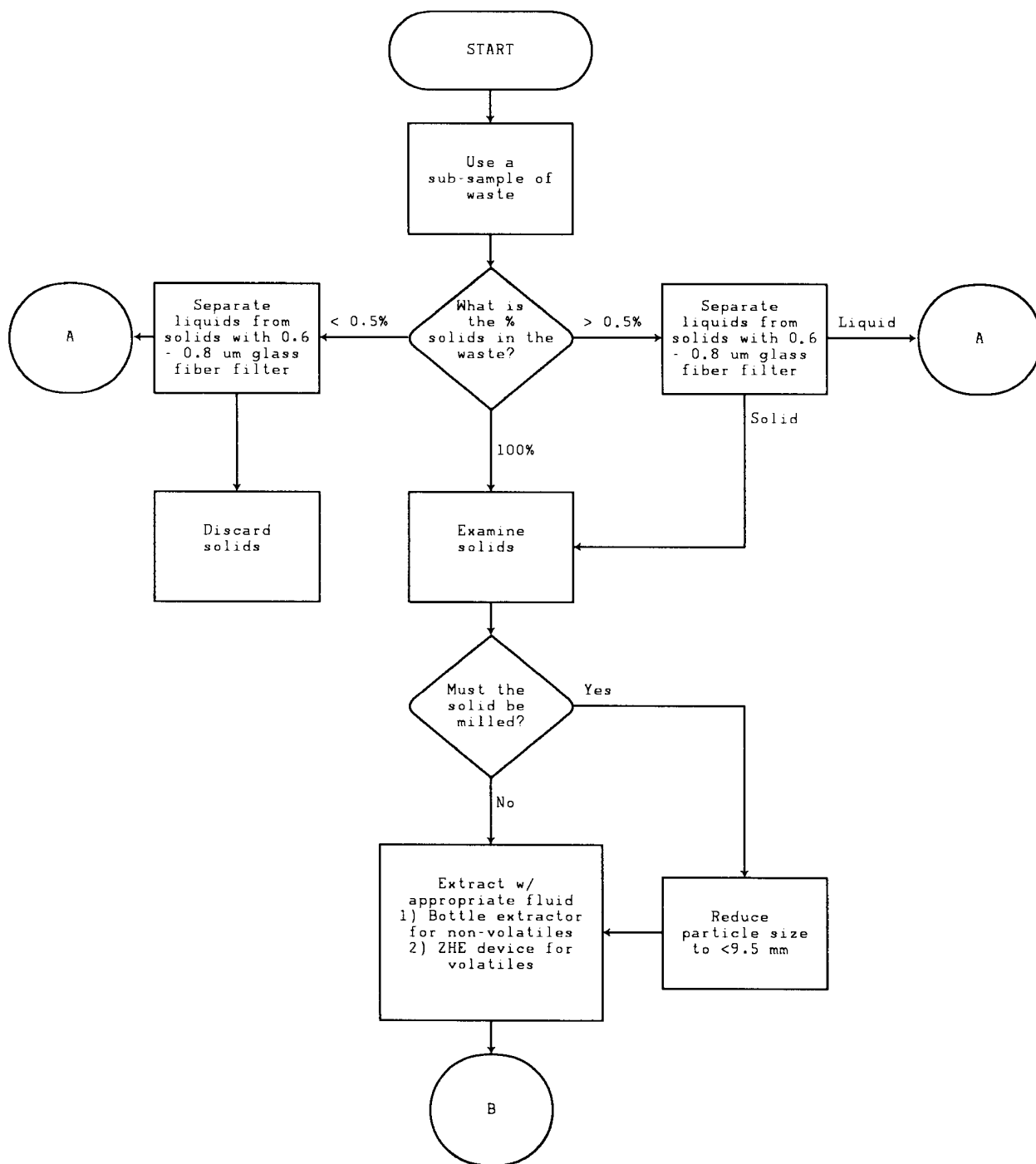


Figure 2. Zero-Headspace Extractor (ZHE)

METHOD 1311

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE



METHOD 1311 (CONTINUED)

TOXICITY CHARACTERISTIC LEACHATE PROCEDURE

