FINAL PROPOSED RULE # _____

Administrative Procedures – Final Proposed Rule Filing

Instructions:

In accordance with Title 3 Chapter 25 of the Vermont Statutes Annotated and the "Rule on Rulemaking" adopted by the Office of the Secretary of State, this filing will be considered complete upon filing and acceptance of these forms with the Office of the Secretary of State, and the Legislative Committee on Administrative Rules.

All forms requiring a signature shall be original signatures of the appropriate adopting authority or authorized person, and all filings are to be submitted at the Office of the Secretary of State, no later than 3:30 pm on the last scheduled day of the work week.

The data provided in text areas of these forms will be used to generate a notice of rulemaking in the portal of "Proposed Rule Postings" online, and the newspapers of record if the rule is marked for publication. Publication of notices will be charged back to the promulgating agency.

PLEASE REMOVE ANY COVERSHEET OR FORM NOT REQUIRED WITH THE CURRENT FILING BEFORE DELIVERY!

Certification Statement: As the adopting Authority of this rule (see 3 V.S.A. § 801 (b) (11) for a definition), I approve the contents of this filing entitled:

Wastewater and Potable Water Supply Rules

_____, on 01/28/19.
(signature) (date)

Printed Name and Title:
Julie S. Moore, Secretary
Agency of Natural Resources

RECEIVED BY: _____

- ☐ Coversheet
- ☐ Adopting Page
- ☐ Economic Impact Analysis
- ☐ Environmental Impact Analysis
- ☐ Strategy for Maximizing Public Input
- ☐ Scientific Information Statement (if applicable)
- ☐ Incorporated by Reference Statement (if applicable)
- ☐ Clean text of the rule (Amended text without annotation)
- ☐ Annotated text (Clearly marking changes from previous rule)
- ☐ ICAR Minutes
- ☐ Copy of Comments
- ☐ Responsiveness Summary

1. TITLE OF RULE FILING:
   Wastewater and Potable Water Supply Rules
2. PROPOSED NUMBER ASSIGNED BY THE SECRETARY OF STATE
   18P—051
3. ADOPTING AGENCY:
   Agency of Natural Resources
4. PRIMARY CONTACT PERSON:
   (A PERSON WHO IS ABLE TO ANSWER QUESTIONS ABOUT THE CONTENT OF THE RULE).

   Name: Ernest Christianson

   Agency: Agency of Natural Resources

   Mailing Address: 1 National Life Drive, Main 2, Montpelier, Vermont 05620-3521

   Telephone: 802 585 - 4884 Fax: 802 828 - 1541

   E-Mail: ernest.christianson@vermont.gov

   Web URL*(WHERE THE RULE WILL BE POSTED)*:
   http://dec.vermont.gov/water/ww-systems
5. SECONDARY CONTACT PERSON:
   (A SPECIFIC PERSON FROM WHOM COPIES OF FILINGS MAY BE REQUESTED OR WHO MAY ANSWER QUESTIONS ABOUT FORMS SUBMITTED FOR FILING IF DIFFERENT FROM THE PRIMARY CONTACT PERSON).

   Name: Diane Sherman

   Agency: Agency of Natural Resources

   Mailing Address: 1 National Life Drive, Davis 2, Montpelier, Vermont 05620-3521

   Telephone: 802 505 - 0125 Fax: -

   E-Mail: diane.sherman@vermont.gov
6. RECORDS EXEMPTION INCLUDED WITHIN RULE:
   (DOES THE RULE CONTAIN ANY PROVISION DESIGNATING INFORMATION AS CONFIDENTIAL; LIMITING ITS PUBLIC RELEASE; OR OTHERWISE EXEMPTING IT FROM INSPECTION AND COPYING?) No

   IF YES, CITE THE STATUTORY AUTHORITY FOR THE EXEMPTION:

   PLEASE SUMMARIZE THE REASON FOR THE EXEMPTION:

7. LEGAL AUTHORITY / ENABLING LEGISLATION:

(THE SPECIFIC STATUTORY OR LEGAL CITATION FROM SESSION LAW INDICATING WHO THE ADOPTING ENTITY IS AND THUS WHO THE SIGNATORY SHOULD BE. THIS SHOULD BE A SPECIFIC CITATION NOT A CHAPTER CITATION).

10 V.S.A. § 1978

8. EXPLANATION OF HOW THE RULE IS WITHIN THE AUTHORITY OF THE AGENCY:
Section 1978 of Title 10 of the Vermont Statutes Annotated vests the Agency of Natural Resources with the responsibility of adopting rules for regulating and permitting the construction, replacement, modification, operation, and maintenance of wastewater systems and potable water supplies for the protection of human health and the environment. The Wastewater System and Potable Water Supply Rules satisfy this responsibility by establishing a set of technical standards and permitting processes for wastewater systems and potable water supplies that protects human health and the environment while incorporating flexibility where possible.

9. THE FILING HAS CHANGED SINCE THE FILING OF THE PROPOSED RULE.

10. THE AGENCY HAS INCLUDED WITH THIS FILING A LETTER EXPLAINING IN DETAIL WHAT CHANGES WERE MADE, CITING CHAPTER AND SECTION WHERE APPLICABLE.

11. SUBSTANTIAL ARGUMENTS AND CONSIDERATIONS WERE NOT RAISED FOR OR AGAINST THE ORIGINAL PROPOSAL.

12. THE AGENCY HAS INCLUDED COPIES OF ALL WRITTEN SUBMISSIONS AND SYNOPSES OF ORAL COMMENTS RECEIVED.

13. THE AGENCY HAS INCLUDED A LETTER EXPLAINING IN DETAIL THE REASONS FOR THE AGENCY'S DECISION TO REJECT OR ADOPT THEM.

14. CONCISE SUMMARY (**150 WORDS OR LESS**):

The Wastewater System and Potable Water Supply Rules were last updated in 2007. This rule amendment incorporates legislative directives adopted subsequent to the last rule update, including but not limited to requirements that permit applicants notify other landowners of pending applications, that groundwater potable water sources be tested for water quality prior

to use, and that surface water can be used as a source for potable water supplies serving single-family residences. The amendment also consolidates the standards for potable water supplies into one rule; establishes new water quality sampling requirements; expands the options for the design of wastewater systems to include technologies and practices that have been proven effective in the field; and creates additional permitting exemptions to reduce administrative burdens on the public. The amendment also comprehensively reorganizes and revises the rule to increase clarity and promote understanding.

15. EXPLANATION OF WHY THE RULE IS NECESSARY:

Revisions to the Wastewater System and Potable Water Supply Rules ("WWPWS Rules") are necessary to incorporate legislative changes to 10 V.S.A., Chapter 64; to consolidate into one rule and update technical standards for potable water supplies; to update technical standards for wastewater systems to include proven technologies and practices; and to clarify permitting requirements and technical standards for wastewater systems and potable water supplies.

16. EXPLANATION OF HOW THE RULE IS NOT ARBITRARY:

Extensive work, over the course of multiple years, was completed by Agency of Natural Resources' ("Agency") staff to review and update the technical standards to include proven technologies and practices. The Technical Advisory Committee was regularly engaged in reviewing the technical standards and permitting requirements due to their breadth of scientific and practical expertise. Additionally, the Agency reached out to several other Vermont State agencies for input on the rule amendment, including the Agency of Human Services, the Agency of Agriculture, Food and Markets, and the Agency of Transportation.

17. LIST OF PEOPLE, ENTERPRISES AND GOVERNMENT ENTITIES AFFECTED BY THIS RULE:

A vast majority of Vermonters will be directly affected by, and may benefit from, this rule amendment. Members of the public, as consumers of drinking water in the State, and prospective home buyers, will be affected by

the updated standards for testing the water quality of potable water sources. Individual or entity landowners who seek to construct or modify buildings for living, conducting business, or pursuing recreation will be affected by the updated and clarified technical standards and permitting requirements for potable water supplies and wastewater systems serving the buildings.

18. BRIEF SUMMARY OF ECONOMIC IMPACT (150 WORDS OR LESS):

Members of the public as consumers of drinking water in the State, and prospective home buyers, will benefit from the updated standards for testing the water quality of groundwater potable water sources. Individual and entity landowners who seek to construct or modify buildings for living, conducting business, or pursuing recreation may experience reduced costs from the availability of expanded options for the design of wastewater systems, more predictable permitting requirements, and additional permitting exemptions. New water quality sampling requirements for potable water sources may have minimal costs for landowners. Estimated cost, if a landowner uses the Vermont Department of Health Laboratory to test water quality, is $180 to $190, based on the Laboratory's existing fees established pursuant to statute.

19. A HEARING WAS HELD.

20. HEARING INFORMATION
(THE FIRST HEARING SHALL BE NO SOONER THAN 30 DAYS FOLLOWING THE POSTING OF NOTICES ONLINE).

IF THIS FORM IS INSUFFICIENT TO LIST THE INFORMATION FOR EACH HEARING PLEASE ATTACH A SEPARATE SHEET TO COMPLETE THE HEARING INFORMATION.

Date: 10/31/2018

Time: AM

Street Address: Department of Environmental Conservation, Springfield Regional Office, 100 Mineral Street, Springfield, Vermont

Zip Code: 05156

Date: 11/1/2018

Time: 02:00 PM

Street Address: Department of Environmental Conservation, Rutland Regional Office, 450 Asa Bloomer State Office Building, 88 Merchants Row, Rutland, Vermont

Zip Code: 05701

Date: 11/1/2018

Time: 06:00 PM

Street Address: Rutland Town Office, 181 US 4 Business Route, Rutland, Vermont

Zip Code:

Date: 11/7/2018

Time: 01:00 PM

Street Address: Department of Environmental Conservation, Essex Regional Office, Fish & Wildlife Building, 111 West Street Essex Junction, Vermont

Zip Code: 05452

21. DEADLINE FOR COMMENT (NO EARLIER THAN 7 DAYS FOLLOWING LAST HEARING):

    11/23/2018

    KEYWORDS (PLEASE PROVIDE AT LEAST 3 KEYWORDS OR PHRASES TO AID IN THE SEARCHABILITY OF THE RULE NOTICE ONLINE).

wastewater

potable water

surface water

groundwater

drinking water

septic

leachfield

sewage

Additional Public Hearings:

Date:	11/8/18
Time:	1:00 PM
Street Address:	Environmental Conservation, St. Johnsbury Regional Office, 374 Emerson Falls Road, St. Johnsbury, Vermont
Zip Code:	05819

Date:	11/14/18
Time:	2:00 PM
Street Address:	Agency of Natural Resources Annex Building, 190 Junction Road, Berlin, Vermont
Zip Code:	05602

Date:	11/14/18
Time:	6:00 PM
Street Address:	Agency of Natural Resources Annex Building, 190 Junction Road, Berlin, Vermont
Zip Code:	05602

Administrative Procedures – Adopting Page

Instructions:

This form must accompany each filing made during the rulemaking process:

Note: To satisfy the requirement for an annotated text, an agency must submit the entire rule in annotated form with proposed and final proposed filings. Filing an annotated paragraph or page of a larger rule is not sufficient. Annotation must clearly show the changes to the rule.

When possible, the agency shall file the annotated text, using the appropriate page or pages from the Code of Vermont Rules as a basis for the annotated version. New rules need not be accompanied by an annotated text.

---

1. TITLE OF RULE FILING:
   Wastewater and Potable Water Supply Rules
2. ADOPTING AGENCY:
   Agency of Natural Resources
3. TYPE OF FILING (*PLEASE CHOOSE THE TYPE OF FILING FROM THE DROPDOWN MENU BASED ON THE DEFINITIONS PROVIDED BELOW*):
   - **AMENDMENT -** Any change to an already existing rule, even if it is a complete rewrite of the rule, it is considered an amendment as long as the rule is replaced with other text.
   - **NEW RULE -** A rule that did not previously exist even under a different name.
   - **REPEAL** - The removal of a rule in its entirety, without replacing it with other text.

   This filing is **AN AMENDMENT OF AN EXISTING RULE** .

4. LAST ADOPTED (*PLEASE PROVIDE THE SOS LOG#, TITLE AND EFFECTIVE DATE OF THE LAST ADOPTION FOR THE EXISTING RULE*):

   Secretary of State Rule Log #07-040, Wastewater System and Potable Water Supply Rules, September 29, 2007

Administrative Procedures – Economic Impact Analysis

Instructions:

In completing the economic impact analysis, an agency analyzes and evaluates the anticipated costs and benefits to be expected from adoption of the rule; estimates the costs and benefits for each category of people enterprises and government entities affected by the rule; compares alternatives to adopting the rule; and explains their analysis concluding that rulemaking is the most appropriate method of achieving the regulatory purpose.

Rules affecting or regulating schools or school districts must include cost implications to local school districts and taxpayers in the impact statement, a clear statement of associated costs, and consideration of alternatives to the rule to reduce or ameliorate costs to local school districts while still achieving the objectives of the rule (see 3 V.S.A. § 832b for details).

Rules affecting small businesses (excluding impacts incidental to the purchase and payment of goods and services by the State or an agency thereof), must include ways that a business can reduce the cost or burden of compliance or an explanation of why the agency determines that such evaluation isn't appropriate, and an evaluation of creative, innovative or flexible methods of compliance that would not significantly impair the effectiveness of the rule or increase the risk to the health, safety, or welfare of the public or those affected by the rule.

---

1. TITLE OF RULE FILING:

   Wastewater and Potable Water Supply Rules

2. ADOPTING AGENCY:

   Agency of Natural Resources

3. CATEGORY OF AFFECTED PARTIES:

   LIST CATEGORIES OF PEOPLE, ENTERPRISES, AND GOVERNMENTAL ENTITIES POTENTIALLY AFFECTED BY THE ADOPTION OF THIS RULE AND THE ESTIMATED COSTS AND BENEFITS ANTICIPATED:

   Members of the public, as consumers of drinking water in the State, and prospective home buyers, will benefit from the updated standards for testing the water quality of groundwater potable water supplies.

   Individual and entity landowners who seek to construct or modify buildings for living, conducting business, or pursuing recreation may experience reduced costs from

the availability of expanded options for the design of wastewater systems, more predictable technical and permitting requirements, and additional permitting exemptions. New water quality sampling requirements for potable water sources may have minimal costs for landowners. Estimated cost, if a landowner uses the Vermont Department of Health Laboratory to test water quality, is $180 to $190, based on the Laboratory's existing fees established pursuant to statute.

4. IMPACT ON SCHOOLS:
INDICATE ANY IMPACT THAT THE RULE WILL HAVE ON PUBLIC EDUCATION, PUBLIC SCHOOLS, LOCAL SCHOOL DISTRICTS AND/OR TAXPAYERS CLEARLY STATING ANY ASSOCIATED COSTS:

Schools that are landowners will be impacted similar to other landowners and may experience reduced costs from the availability of expanded options for the design of wastewater systems, more predictable technical and permitting requirement, and additional permitting exemptions. Due to their populations, schools are generally served by public water sources rather than potable water sources and will not be affected by the new water quality sampling requirements.

5. ALTERNATIVES: *CONSIDERATION OF ALTERNATIVES TO THE RULE TO REDUCE OR AMELIORATE COSTS TO LOCAL SCHOOL DISTRICTS WHILE STILL ACHIEVING THE OBJECTIVE OF THE RULE*.

As schools are anticipated to experience a reduction in compliance costs as a result of this rule amendment, alternatives are not necessary.

6. IMPACT ON SMALL BUSINESSES:
INDICATE ANY IMPACT THAT THE RULE WILL HAVE ON SMALL BUSINESSES (EXCLUDING IMPACTS INCIDENTAL TO THE PURCHASE AND PAYMENT OF GOODS AND SERVICES BY THE STATE OR AN AGENCY THEREOF):

Small businesses that are landowners will be impacted similar to other landowners and may experience reduced costs from the availability of expanded options for the design of wastewater systems and more predictable technical and permitting requirements. Small businesses may also benefit from additional permitting exemptions, including exemptions for buildings with minimal or seasonal usage. Small businesses with their own on-site

potable water source may experience minimal costs for new water quality sampling requirements.

7. SMALL BUSINESS COMPLIANCE: *EXPLAIN WAYS A BUSINESS CAN REDUCE THE COST/BURDEN OF COMPLIANCE OR AN EXPLANATION OF WHY THE AGENCY DETERMINES THAT SUCH EVALUATION ISN'T APPROPRIATE.*

   As small businesses are anticipated to experience a reduction in compliance costs as a result of this rule amendment, identifying ways to reduce the cost of compliance from the rule is not necessary.

8. COMPARISON:

   COMPARE THE IMPACT OF THE RULE WITH THE ECONOMIC IMPACT OF OTHER ALTERNATIVES TO THE RULE, INCLUDING NO RULE ON THE SUBJECT OR A RULE HAVING SEPARATE REQUIREMENTS FOR SMALL BUSINESS:

   While the economic impact of this rule amendment on a specific landowner depends on the conditions that exist on that landowner's property, the overall economic impact of this rule amendment on many landowners is expected to be positive due to the availability of expanded options for the design of wastewater systems, more predictable technical and permitting requirement, and additional permitting exemptions. Not adopting this rule amendment would not yield these positive benefits. Additionally, incorporating changes into rule that are required by legislative directive creates no additional economic impacts in comparison to not incorporating them into rule.

9. SUFFICIENCY: *EXPLAIN THE SUFFICIENCY OF THIS ECONOMIC IMPACT ANALYSIS.*

   This economic impact analysis provides the Agency's best assessment of the economic impact of this rule amendment based on the information available.

Administrative Procedures – Environmental Impact Analysis

Instructions:

In completing the environmental impact analysis, an agency analyzes and evaluates the anticipated environmental impacts (positive or negative) to be expected from adoption of the rule; compares alternatives to adopting the rule; explains the sufficiency of the environmental impact analysis.

Examples of Environmental Impacts include but are not limited to:

- Impacts on the emission of greenhouse gases
- Impacts on the discharge of pollutants to water
- Impacts on the arability of land
- Impacts on the climate
- Impacts on the flow of water
- Impacts on recreation
- Or other environmental impacts

---

1. TITLE OF RULE FILING:

   Wastewater and Potable Water Supply Rules

2. ADOPTING AGENCY:

   Agency of Natural Resources

3. GREENHOUSE GAS: *EXPLAIN HOW THE RULE IMPACTS THE EMISSION OF GREENHOUSE GASES (E.G. TRANSPORTATION OF PEOPLE OR GOODS; BUILDING INFRASTRUCTURE; LAND USE AND DEVELOPMENT, WASTE GENERATION, ETC.):*
   None anticipated

4. WATER: *EXPLAIN HOW THE RULE IMPACTS WATER (E.G. DISCHARGE / ELIMINATION OF POLLUTION INTO VERMONT WATERS, THE FLOW OF WATER IN THE STATE, WATER QUALITY ETC.):*
   The WWPWS Rules establish technical standards and permitting requirements for the construction, replacement, modification, operation, and maintenance of wastewater systems and potable water supplies for the protection of human health and the environment. The WWPWS Rules include requirements for the treatment of wastewater through soils prior to reaching groundwater or surface water. This rule amendment does not alter the existing protections for groundwater or surface water contained in the WWPWS Rules. It

maintains the required vertical separation between wastewater systems and groundwater and horizontal separation between wastewater systems and surface water. The rule amendment provides clarification that certain wastewater that is high strength requires additional treatment and that wastewater systems cannot be used to dispose of wastes that would adversely affect the biological action within a septic tank or leachfield or wastes prohibited from disposal via an injection well or requiring an injection well permit.

5. LAND: *EXPLAIN HOW THE RULE IMPACTS LAND (E.G. IMPACTS ON FORESTRY, AGRICULTURE ETC.):*
   None anticipated

6. RECREATION: *EXPLAIN HOW THE RULE IMPACT RECREATION IN THE STATE:*
   This rule amendment retains and adds permitting exemptions that reduce administrative burden on the public for some recreational activities including remote camping and recreation associated with buildings with minimal or seasonal usage.

7. CLIMATE: *EXPLAIN HOW THE RULE IMPACTS THE CLIMATE IN THE STATE:*
   None anticipated

8. OTHER: *EXPLAIN HOW THE RULE IMPACT OTHER ASPECTS OF VERMONT'S ENVIRONMENT:*
   The WWPWS Rules also protect the environment by establishing technical standards that prohibit and prevent the surfacing of wastewater and potential exposure of wildlife and humans to pathogens and other components of wastewater.

9. SUFFICIENCY: *EXPLAIN THE SUFFICIENCY OF THIS ENVIRONMENTAL IMPACT ANALYSIS.*
   This environmental impact analysis provides the Agency's best assessment of the environmental impact of this rule amendment based on the information available.

Administrative Procedures – Public Input

Instructions:

In completing the public input statement, an agency describes the strategy prescribed by ICAR to maximize public input, what it did do, or will do to comply with that plan to maximize the involvement of the public in the development of the rule.

This form must accompany each filing made during the rulemaking process:

---

1. TITLE OF RULE FILING:

   Wastewater and Potable Water Supply Rules

2. ADOPTING AGENCY:

   Agency of Natural Resources

3. PLEASE DESCRIBE THE STRATEGY PRESCRIBED BY ICAR TO MAXIMIZE PUBLIC INVOLVEMENT IN THE DEVELOPMENT OF THE PROPOSED RULE:

   During drafting of this rule amendment, the Agency sought input from the Technical Advisory Committee, which is comprised of wastewater system designers, well drillers, hydrogeologists, Vermont Department of Health staff, Vermont League of Cities and Town staff, water treatment specialist, a municipal representative, and Agency staff. Additionally, during drafting, the Agency reached out to several other Vermont State agencies for input on the rule amendment, including the Agency of Human Services, the Agency of Agriculture, Food and Markets, and the Agency of Transportation.

   During the 7 public hearings and the formal public comment period that were held on the rule amendment, the Agency engaged with a variety of stakeholders including wastewater system designers, architects, service providers, well drillers, realtors, lawyers, municipalities, Regional Planning Commissions, and a number of Vermont State agencies and non-governmental organizations.

4. PLEASE LIST THE STEPS THAT HAVE BEEN OR WILL BE TAKEN TO COMPLY WITH THAT STRATEGY:

The Technical Advisory Committee was consulted while drafting the rule amendment, prior to initiating rulemaking, and following receipt of public comments. During rulemaking, 7 public hearings were held, the rule amendment was posted on the Agency's website, and prior to the first hearing the rule amendment was directly distributed to all of the entities and categories of individuals listed below.

5. BEYOND GENERAL ADVERTISEMENTS, PLEASE LIST THE PEOPLE AND ORGANIZATIONS THAT HAVE BEEN OR WILL BE INVOLVED IN THE DEVELOPMENT OF THE PROPOSED RULE:

* Technical Advisory Committee

* Professional engineers and environmental consultants

* Vermont Board of Professional Engineers

* Wastewater system designers, using a list provided by the Office of Professional Regulation within the Secretary of State

* American Institute of Architects Vermont

* Service providers who inspect and repair wastewater pre-treatment units, using a list maintained by the Agency

* Associated General Contractors of Vermont

* Licensed well drillers, using a list maintained by the Agency

* Vermont Association of Realtors

* Vermont Bar Association

* Municipalities, using a list obtained from the Vermont League of Cities and Towns

* Vermont League of Cities and Town

* Regional Planning Commissions

* Vermont Agency of Transportation; Vermont Agency of Commerce and Community Development; Vermont Agency of Agriculture, Food and Markets; Division of Fire Safety within the Department of Public Safety; Department of Buildings and General Services within the Agency of Administration; and Vermont Department of Health within the Agency of Human Services

* Non-governmental organizations including Vermont Natural Resources Council; Conservation Law Foundation; Vermont River Conservancy; Lake Champlain Committee; Vermont Rural Water Association

Administrative Procedures – Scientific Information

THIS FORM IS ONLY REQUIRED WHEN INCORPORATING MATERIALS BY REFERENCE. PLEASE REMOVE PRIOR TO DELIVERY IF IT DOES NOT APPLY TO THIS RULE FILING:

Instructions:

In completing the Scientific Information Statement, an agency shall provide a brief summary of the scientific information including reference to any scientific studies upon which the proposed rule is based, for the purpose of validity.

---

1. TITLE OF RULE FILING:

   Wastewater and Potable Water Supply Rules

2. ADOPTING AGENCY:

   Agency of Natural Resources

3. BRIEF EXPLANATION OF SCIENTIFIC INFORMATION:

   Two documents are incorporated by reference, the Vermont Plumbing Rules and the Natural Resources Conservation Service's Field Book for Describing and Sampling Soils.

   The Vermont Plumbing Rules are rules adopted by the Department of Public Safety for the design and installation of plumbing in buildings.

   The Field Book for Describing and Sampling Soil is a publication of the Natural Resources Conservation Service within the U.S. Department of Agriculture that provides a uniform method for describing soil and soil limitations, such as redoximorphic features and consistence, for the design of wastewater systems.

4. CITATION OF SOURCE DOCUMENTATION OF SCIENTIFIC INFORMATION:

5. INSTRUCTIONS ON HOW TO OBTAIN COPIES OF THE SOURCE DOCUMENTS OF THE SCIENTIFIC INFORMATION FROM THE AGENCY OR OTHER PUBLISHING ENTITY:

Administrative Procedures – Incorporation by Reference

THIS FORM IS ONLY REQUIRED WHEN INCORPORATING MATERIALS BY REFERENCE. PLEASE REMOVE PRIOR TO DELIVERY IF IT DOES NOT APPLY TO THIS RULE FILING:

Instructions:

In completing the incorporation by reference statement, an agency describes any materials that are incorporated into the rule by reference and how to obtain copies.

This form is only required when a rule incorporates materials by referencing another source without reproducing the text within the rule itself (e.g. federal or national standards, or regulations).

Incorporated materials will be maintained and available for inspection by the Agency.

1. TITLE OF RULE FILING:

   Wastewater and Potable Water Supply Rules

2. ADOPTING AGENCY:

   Agency of Natural Resources

3. DESCRIPTION (*DESCRIBE THE MATERIALS INCORPORATED BY REFERENCE*):

   Two documents are incorporated by reference, the Vermont Plumbing Rules and the Natural Resources Conservation Service's Field Book for Describing and Sampling Soils.

   The Vermont Plumbing Rules are rules adopted by the Department of Public Safety for the design and installation of plumbing in buildings.

   The Field Book for Describing and Sampling Soil is a publication of the Natural Resources Conservation Service within the U.S. Department of Agriculture that provides a uniform method for describing soil and soil limitations, such as redoximorphic features and consistence, for the design of wastewater systems.

4. FORMAL CITATION OF MATERIALS INCORPORATED BY REFERENCE:
   * Vermont Plumbing Rules (August 1, 2015) * Field Book for Describing and

Sampling Soils, version 3.0 (Schoeneberger, Wysocki, Benham, and Soil Survey Staff, 2012)

5. OBTAINING COPIES: *(EXPLAIN WHERE THE PUBLIC MAY OBTAIN THE MATERIAL(S) IN WRITTEN OR ELECTRONIC FORM , AND AT WHAT COST)*:

   The Vermont Plumbing Rules are available for no cost from the Department of Public Safety, Division of Fire Safety's website identifying codes and standards, currently located here: http://firesafety.vermont.gov/buildingcode/codes

   The Field Book for Describing and Sampling Soil is available for no cost on the Natural Resources Conservation Service's website identifying methods and guides, currently located here: https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/research/guide/

   Copies are also available from the Agency of Natural Resources by contacting the Drinking Water and Groundwater Protection Division at 802-585-4884.

6. MODIFICATIONS (*PLEASE EXPLAIN ANY MODIFICATION TO THE INCORPORATED MATERIALS E.G., WHETHER ONLY PART OF THE MATERIAL IS ADOPTED AND IF SO, WHICH PART(S)ARE MODIFIED)*:

   No modifications made

Run Spell Check

State of Vermont
Agency of Natural Resources
Department of Environmental Conservation
Drinking Water and Groundwater Protection Division

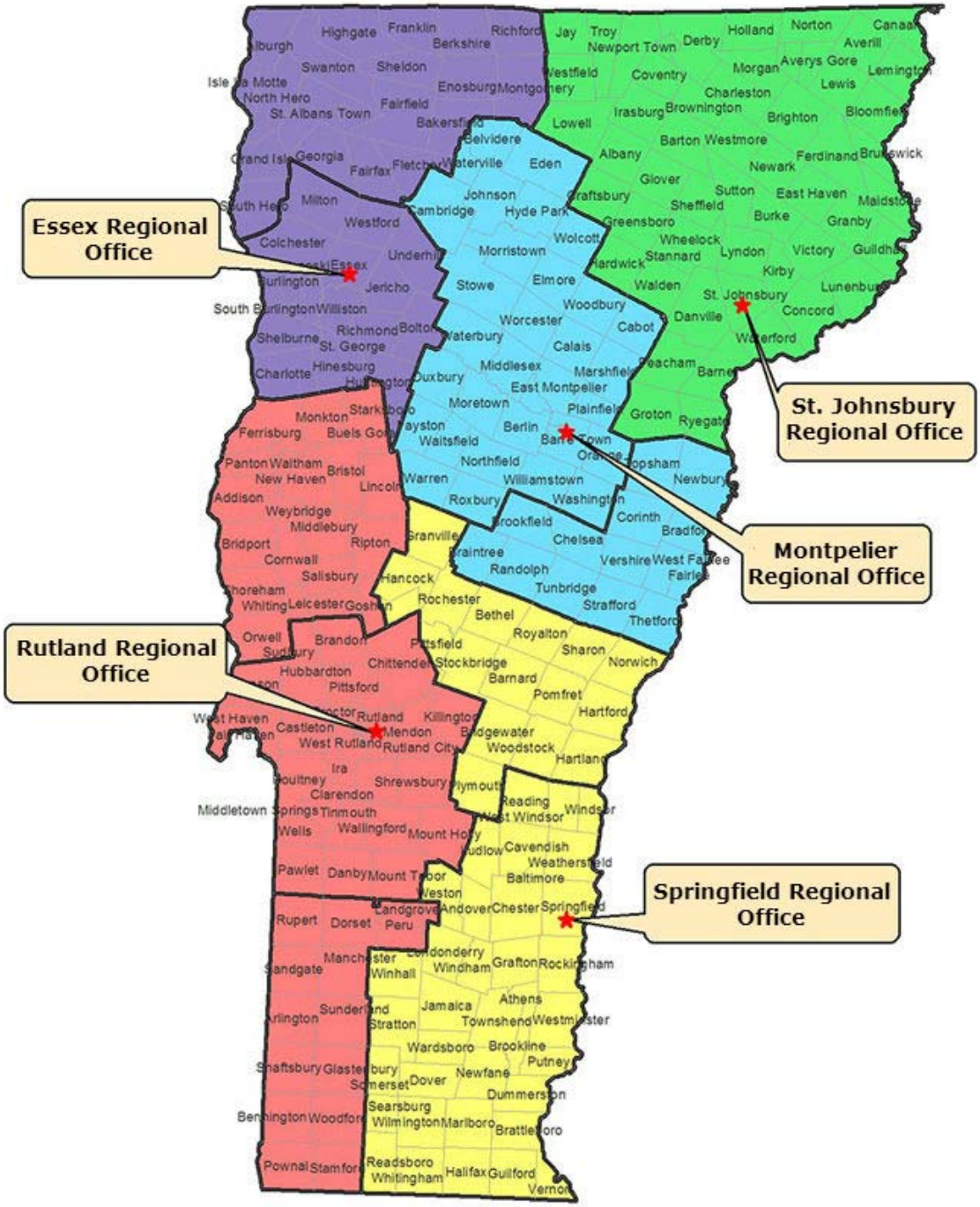
Environmental Protection Rules

Chapter 1

Wastewater System and Potable Water Supply Rules

Adopted: _____

Department of Environmental Conservation (DEC)
Wastewater System and Potable Water Supply Regions and Regional Office Locations
http://dec.vermont.gov/water/ww-systems



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Subchapter 1 – Purpose and Authority

§ 1-101 Purpose

The purpose of these Rules is to:

(1) establish a comprehensive program to regulate the design, construction, replacement, modification, operation, and maintenance of potable water supplies and wastewater systems in order to protect human health and the environment including protecting potable water supplies, public water systems, surface water, and groundwater;

(2) prevent the creation of health hazards or unsanitary conditions;

(3) ensure adequate effluent dispersal and drainage for the proper functioning of wastewater systems;

(4) ensure that potable water supplies and wastewater systems are designed, constructed, operated, and maintained in a manner that supports the intended use of the supplies and systems with respect to reliability, incremental costs, and sustainability;

(5) ensure that owners of potable water supplies and wastewater systems permitted under these Rules have knowledge of their systems' design, the operation and maintenance requirements, and their responsibilities for the satisfactory functioning of the supplies and systems;

(6) allow the use of alternative, innovative, and experimental technologies for the treatment and disposal of wastewater in the appropriate circumstances;

(7) protect the investment of homeowners through a flexible remediation process for failed potable water supplies and wastewater systems; and

(8) increase reliance on and the accountability of the private sector for the design and installation of potable water supplies and wastewater systems through licensing and enforcement.

§ 1-102 Authority

(a) These Rules are adopted by the Secretary under the authority of the Secretary granted by 10 V.S.A., Chapters 47, 56, and 64, and 10 V.S.A. §§ 901, 905b, 1390, 6616.

(b) These Rules supersede the existing Wastewater System and Potable Water Supply Rules which were effective on September 29, 2007.

(c) The provisions of these Rules that regulate potable water supplies supersede all provisions of the Water Supply Rule, effective December 1, 2010, that apply to potable water supplies insofar as they apply to such supplies.

(d) These Rules do not supersede or otherwise affect other existing regulations, including Vermont Department of Health regulations and the Vermont Plumbing Rules. No provision in these Rules limits the authority of the Vermont Department of Health to license facilities under its jurisdiction.

(e) These Rules do not limit the powers of state or local authorities to control existing or potential threats to human health or the environment or limit the exercise of other authorities to regulate human health, safety, and welfare, except as provided in § 1-103.

§ 1-103 Statewide Uniform Technical Standards

(a) After June 30, 2007, those provisions of existing municipal ordinances and zoning bylaws that establish technical standards for the design, construction, operation, and maintenance of potable water supplies and wastewater systems are superseded (i.e. no longer in effect) by the technical standards of these Rules.

(b) Municipalities may continue to have ordinances or bylaws that do not establish technical standards, for example, ordinances or bylaws that:
- (1) are not specifically regulating potable water supplies or wastewater systems but rather regulating development in general (e.g., setbacks);
- (2) require submission to the municipality of copies of plans and documents used to obtain a state permit under these Rules;
- (3) require a certificate of occupancy that is based on full compliance with a state permit issued under these Rules;
- (4) require notice of, and have the option to observe, any soil testing such as the digging of test pits conducted in support of a permit application;
- (5) require notice of, and have the option to observe, construction of a permitted wastewater system or potable water supply;
- (6) determine where connections can be made to wastewater treatment facilities and public water systems; and
- (7) require time of sale inspections.

§ 1-104 Existing Municipal Permits Remain in Effect

Notwithstanding the fact that local ordinances and bylaws are superseded after June 30, 2007 as described in § 1-103, all permits issued under those municipal ordinances or bylaws, provided the ordinances or bylaws established specific technical standards for the design, construction, operation, and maintenance of the permitted potable water supplies and wastewater systems, shall remain in effect unless and until such permit is superseded by another permit issued under the provisions of these Rules.

§ 1-105 Severability

The provisions of these Rule are severable. If any provision of these Rules is found to be invalid, or if any application of these Rules to any person or circumstance is found to be invalid, the invalidity shall not affect other provisions that can be given effect in the absence of the invalid provision or application.

Subchapter 2 – Definitions

§ 1-201 Definitions

As used in these Rules, the following terms shall have the specified meaning.

(1) **Aquifer** – means a water bearing stratum of permeable bedrock, sand, gravel, or other soil.

(2) **Agency** – means the Agency of Natural Resources.

(3) **Alternative Hand Washing Supplies** – means pre-moistened towlettes, hand sprays, or hand sanitizer gels.

(4) **Alternative Toilet** – means a unit that has a toilet and is self-contained (i.e., includes a holding tank to store the wastewater generated by use of the unit), is portable, is brought to a site for temporary use, and meets one of the following descriptions:

(A) a unit that contains a waterless toilet and a holding tank to capture waste from the toilet and either contains alternative hand washing supplies or is located near a portable sink brought to the site for temporary use with a water tank to supply water to the sink and a holding tank to capture waste from the sink;

(B) a unit that contains one or more waterless toilets, sinks, water tanks to supply water to the sinks, and holding tanks to capture waste from the sinks and toilets; or

(C) a unit that contains one or more toilets, sinks, water tanks to supply water to the sinks and toilets, and holding tanks to capture the waste from the sinks and toilets.

(5) **Applicant** – means a person who owns the lot on which is or will be located the building or structure or campground that is or will be served by the wastewater system and potable water supply for which a permit or permit amendment is sought.

(6) **Artesian Well** – means a well that penetrates a confined aquifer such that the water level in the well rises above the top of the aquifer.

(7) **Base Flood** – means base flood as defined in the Vermont Flood Hazard Area and River Corridor Rule.

(8) **Base Flood Elevation** – means base flood elevation as defined in the Vermont Flood Hazard Area and River Corridor Rule.

(9) **Bed** – means a leachfield that is a shallow excavation in the ground, or mound fill material, more than 48 inches wide that is lined with leachfield stone, contains chambers, or utilizes other dispersal method, and that releases wastewater into the soil through perforated distribution pipes.

(10) **Bedrock** – means igneous, metamorphic, or sedimentary rock regardless of whether it underlies soil or is exposed at ground surface. For the purpose of wastewater system design, bedrock includes weathered rock that is not soil.

(11) **Bedroom** – except where otherwise specified in these Rules, means any room within a building or structure that is permitted, used, or serves as sleeping quarters.

(12) **Biochemical Oxygen Demand (BOD_5)** – means the quantity of oxygen used in the biochemical oxidation of organic matter in five days at 20 degrees Celsius under specified conditions and reported as milligrams per liter (mg/L).

(13) **Building or Structure** – means a building or structure whose use or useful occupancy requires the construction or modification of a potable water supply or wastewater system.

(A) For the purposes of these Rules, the following are buildings or structures:

(i) A primitive camp.

(ii) A recreational vehicle, or vehicle used for commercial purposes, and modified in one of the following ways, unless the vehicle is on a campsite in a campground:

(I) placing skirting or insulation around the base of the vehicle;

(II) placing the vehicle unit on a foundation or removing the wheels;

(III) attaching a deck or stairs to the vehicle;

(IV) making the vehicle immobile in any way that inhibits the vehicle from being driven off the lot in order to fill the water holding tank and empty the wastewater holding tank;

(V) connecting the vehicle to a potable water supply or wastewater system;

(VI) the vehicle, although qualifying as a vehicle, cannot travel over Vermont roads without a special permit; or

(VII) occupying a vehicle that is not registered and inspected to travel on the roads.

(B) For the purposes of these Rules, a cabin located on a campsite in a campground is not a building or structure.

(C) For the purposes of these Rules, a remote hut used by outdoor recreationists with no connection to a water source, no connection to a wastewater system (other than a composting or incinerating toilet that does not yield a liquid, provided its contents are disposed of in compliance with § 1-929), and accessible only by foot or water, is not a building or structure.

(D) Examples of other buildings or structures: single-family residences; accessory apartments; duplexes; yurts; yomes; cabins; multi-unit buildings; condominiums; apartments; mobile homes; hospitals; nursing homes; motels; hotels; restaurants; filling stations; boarding houses; rooming houses; dormitories; stores or shops; buildings or structures used as places of public assembly, places of employment, or home occupations;

offices; manufacturing facilities; industrial facilities; and farm buildings or structures.

(14) **Campground** – means 4 or more campsites on a lot that are occupied or made available to be occupied for vacation or recreational purposes by camping units, such as tents, yurts, tepees, lean-tos, camping cabins, and recreational vehicles. There shall be no distinction made between non-commercial (no charge, no service) and commercial operations.

(15) **Campsite** – means an area that is occupied or made available to be occupied for vacation or recreational purposes by a camping unit, such as a tent, yurt, tepee, lean-to, cabin, or recreational vehicle, but does not include an area used only for primitive camping. For the purposes of this definition "primitive camping" means camping that involves temporary overnight occupancy in a natural environmental setting without a potable water supply, a wastewater system, picnic tables, or other developed structures or facilities and that is left in its original condition upon vacancy such that there is no, or minimal, evidence of human visitation. A campsite may rely on water faucets, central toilet facilities, or a dumping station or may have individual water service lines and sanitary sewer service lines.

(16) **Child Care Facility** – means a child care facility registered or licensed by the Vermont Agency of Human Services, Department for Children and Families pursuant to 33 V.S.A., Chapter 35. Child care facilities include registered or licensed family child care homes.

(17) **Change in Use** – means converting to a different type of use, such as from a residence to a restaurant or office space or from a restaurant to a residence; change from seasonal to year-round use; or scaling up a use, such as increasing the number of employees or adding bedrooms. Change of use does not include the addition of a home occupation to a living unit.

(18) **Commissioner** – means the Commissioner of the Department or her or his designated representative.

(19) **Confined Surficial Aquifer** – means an aquifer that is not in bedrock, is overlain by a low permeability layer, and contains groundwater under pressure such that the water level in a well that penetrates the aquifer rises above the top of the aquifer.

(20) **Constant Rate Discharge Test** – means a test of a water source that is pumped for a specified duration at one flow rate, expressed in gallons per minute, to determine the yield of the source, aquifer characteristics, or source interference.

(21) **Department** – means the Department of Environmental Conservation.

(22) **Dependent Campsite** – means a campsite that does not provide for the ability of a camping unit or recreational vehicle to physically connect to a wastewater system and a potable water supply.

(23) **Design Flow** – in reference to a particular component of a wastewater system or potable water supply, means the quantity of wastewater or water, calculated in gallons per day, that is required for all uses of each building or structure or campground to be served by the component and which, in total, dictates the sizing of the component. Individual components of a wastewater system or potable water supply can have design flows distinct from other components' design flows.

(24) **Design Rate** – means the rate of flow, calculated in gallons per minute, that needs to be delivered by a potable water supply. Design rate is determined by dividing the design flow by 720 minutes.

(25) **Designer** – means a person licensed by the Office of Professional Regulation under 26 V.S.A., Chapter 97 as a wastewater system and potable water supply designer or professional engineers who are Class 1 Designers.

(26) **Director** – means the Director of the Division or her or his designated representative.

(27) **Division** – means the Drinking Water and Groundwater Protection Division of the Department.

(28) **Effective Basal Area** – means the area of naturally occurring soil that is directly beneath and downslope of the leachfield within the mound.

(29) **Elevation** – means the vertical position of a specified object or geologic feature relative to an established vertical benchmark. The benchmark may be established by the designer, or may be established by others, such as the U.S. Geological Survey datums. When working with plans or maps prepared by others, the related benchmark must be used to interpret those plans or maps.

(30) **Employee** – means paid or unpaid staff including volunteers that regularly constitute a portion of the staff.

(31) **Failed Supply** – means:

(A) a potable water supply:

(i) that has been tested for the following contaminants, in accordance with the protocols approved by the Secretary, and is found not to comply with the specified standard for one or more of the contaminants:

(I)	Arsenic	0.010 mg/L;
(II)	Escherichia coli (E.coli)	None (absent or less than 1);
(III)	Total Coliform	None (absent or less than 1);
(IV)	Fluoride	4 mg/L;
(V)	Lead	0.015 mg/L;
(VI)	Manganese	0.3 mg/L;
(VII)	Nitrate	10 mg/L;
(VIII)	Nitrite	1 mg/L;

(IX)	Uranium	20 ug/L (0.02 mg/L); and
(X)	Adjusted Gross Alpha Particle Activity (including radium 226 but excluding radon and uranium)	15 pCi/L

(ii) that the Secretary affirmatively determines is not potable due to the presence of a contaminated site, a leaking underground storage tank, or other known sources of groundwater contamination or naturally occurring contaminants, and such determination has been posted on the Agency website; or

(iii) that the Secretary affirmatively determines is providing an insufficient quantity of water to maintain the usual and customary uses of a building or structure or campground or to maintain its uses permitted in a wastewater system and potable water supply permit, and such determination has been posted on the Agency website.

(B) Notwithstanding the provisions above, a potable water supply shall not be a failed supply if:

(i) these effects can be and are remedied solely by a minor repair or minor replacement; or

(ii) these effects have lasted for only a brief period of time, the cause of the failure has been determined to be an unusual and non-recurring event, and the supply has recovered from the state of failure. Supplies which have recurring, continuing, or seasonal failures shall be considered to be failed supplies.

(32) **Failed System** – means:

(A) a wastewater system that is functioning in a manner:

(i) that allows wastewater to be exposed to the open air, to pool on the surface of the ground, to discharge directly to surface water, or to back up into a building or structure, unless in any of these instances the approved design of the system specifically requires the system to function in such a manner; or

(ii) that results in a potable water supply being affirmatively determined by the Secretary to be a failed supply and such determination has been posted on the Agency website.

(B) Notwithstanding the provisions above, a system shall not be a failed system if:

(i) these effects can be and are remedied solely by a minor repair or minor replacement; or

(ii) these effects have lasted for only a brief period of time, the cause of the failure has been determined to be an unusual and non-recurring event, and the system has recovered from the state of failure. Systems that have recurring, continuing, or seasonal failures shall be considered to be failed systems.

(33) **Family Child Care Home** – means a child care facility registered or licensed by the Vermont Agency of Human Services, Department for Children and Families as a family child care home.

(34) **Filtrate Effluent** – means effluent that has been treated to reduce BOD_5 to 30 mg/L or less and total suspended solids (TSS) to 30 mg/L or less.

(35) **Floodway** – means floodway as defined in the Vermont Flood Hazard Area and River Corridor Rule.

(36) **Flood Hazard Area** – means flood hazard area as defined in the Vermont Flood Hazard Area and River Corridor Rule.

(37) **Flowing Artesian Well** – means an artesian well that penetrates a confined bedrock aquifer or surficial aquifer such that the water level in the well rises above ground surface.

(38) **Food Processing Waste** – means wastewater that is generated from the manufacturing of a food or beverage product and that consists of washwater or residual food or beverage waste from food processing facilities making such products as dairy products, beer, wine, spirits, maple syrup and candy, and microwave dinners. "Food processing waste" does not include waste from slaughterhouse facilities or rendering operations, wastewater associated with the washing of unaltered fruits, vegetables or other farm produce, or food or food preparation wastewater from food markets, grocery stores, food store, delis or restaurants.

(39) **Ground Slope** – means the slope of the ground surface.

(40) **Ground Surface** – means the elevation of the naturally occurring soil.

(41) **Groundwater** – means water below the ground surface in a zone of saturation.

(42) **Home Occupation** – means a business, profession, occupation, or trade conducted for gain or support within a living unit, or in a detached structure located on the same lot as the living unit, provided the home occupation is incidental and secondary to the residential use of the living unit; is conducted by an occupant of the living unit; has no employees except for family members who are occupants of the living unit; does not provide clients, customers, or other members of the public access to the potable water supply or wastewater system serving the living unit; and is not required by any state or federal agency to provide clients, customers, or other members of the public with access to a potable water supply or wastewater system. A child care facility is not a home occupation.

(43) **Hydrofracturing** – means a method of bedrock well development used to increase the yield of wells in which high pressures are generated in the well to open fractures. Propping agents may be introduced to keep the fractures open.

(44) **Hydrogeologist** – means a person with training or experience in bedrock geology, surficial geology, and groundwater hydrology sufficient to prepare the hydrogeologic studies and analyses required by these Rules.

(45) **Impeding Soil Layer** – means a naturally occurring soil layer with a thickness of at least 8 feet and a soil texture of sandy clay, silty clay, or clay with any structure, or, sandy clay loam, silty clay loam, or clay loam with massive or platy structure.

(46) **Improved Lot** – means a lot on which exists a campground or a substantially completed building or structure and an associated substantially completed potable water supply and wastewater system that may or may not be located on the lot.

(47) **Indirect Discharge System** – means an indirect discharge, as defined in the Indirect Discharge Rules, that is issued a discharge permit pursuant to the Indirect Discharge Rules. Indirect discharge systems include pollution abatement facilities that engage in the indirect discharges of waste.

(48) **Induced Water Table** – means the rise in the seasonal high-water table caused by the discharge of wastewater into a soil-based wastewater system. For the purposes of this definition, "seasonal high-water table" means the seasonal high-water table prior to use of a curtain drain except when the curtain drain complies with the requirements of § 1-906(a) and the water table is monitored pursuant to § 1-905.

(49) **Injection well** – means an injection well as defined in the Underground Injection Control Regulations, the discharge to which is issued a discharge permit, or is otherwise permitted, pursuant to the Underground Injection Control Regulations.

(50) **Installer** – means a person who constructs a potable water supply or wastewater system serving or intended to serve a building or structure, or campground.

(51) **Instantaneous Peak Demand** – means the maximum rate of water that needs to be supplied to meet the fixture unit demand, based on the load values assigned to plumbing fixtures determined by the Vermont Plumbing Rules or determined by these Rules, of a potable water supply. The rate is expressed in gallons per minute.

(52) **Inverted Siphon** – means a depressed sanitary sewer collection line designed to flow full and under pressure.

(53) **Kitchen** – means the common plumbing fixtures and appliances normally expected in the food preparation area of a living unit. This includes, at a minimum, the combination of a sink, a refrigerator, and cooking facilities. Cooking facilities include stoves, built-in ovens, counter top ovens, microwave ovens, and similar appliances.

(54) **Land Surveyor** – means a land surveyor licensed by the Board of Land Surveyors under 26 V.S.A., Chapter 45.

(55) **Leachfield** – means that portion of a soil-based wastewater system used to disperse wastewater into the soil.

(56) **Leachfield Stone** – means clean, screened, durable stone no smaller than ¾ inch and no larger than 1-1/2 inch in diameter. For the purposes of this definition, "clean stone" means stone with no more than 1.5 percent of fines passing the #200 sieve as determined using the AASHTO test method T 11-85 and "durable stone" means stone that has a hardness value of three or greater on the Moh's Scale of Hardness.

(57) **Linear Loading Rate** – means the amount of wastewater measured in gallons per day that may be applied to each linear foot of the overall length of a leachfield as measured along the ground contour.

(58) **Living Unit** – means a building or structure or a portion of a building or structure that has a toilet, sink, kitchen, and one or more bedrooms, and that is reasonably private and separated from other living units. A second, detached building or structure that contains a toilet, sink, or one or more bedrooms, but does not contain a kitchen, is not a separate living unit. Examples of buildings or structures that contain more than one living unit are duplexes and single-family residences with an accessory apartment.

(59) **Long-Term Yield** – means the quantity of water that may flow or be pumped continuously from a source over a specified length of time.

(60) **Lot** – means a tract or portion of land with defined boundaries created by the act of subdivision. A deed may describe one or more lots. Multiple lots described in a single deed remain separate lots provided that they are described as having separate and distinct boundaries and that any subsequent deed describing the lots does not specifically eliminate the separate and distinct boundaries.

(61) **Mean Water Level** – means mean water level as defined in the Rules Determining Mean Water Levels**.**

(62) **Minimum Site Conditions** – means those naturally occurring conditions related to soil permeability, soil depth, depth to seasonal high-water table, soil depth to bedrock and slope that must exist in order to construct any soil-based wastewater system. This definition also means the limits for siting in a floodway or floodplain.

(63) **Minor Repair or Minor Replacement** – means:

(A) For wastewater systems, the:

(i) repair or replacement of a pipe leading from a building or structure or campground to the septic tank or from the septic tank to the

leachfield, not including piping within the leachfield, in the same approximate location;

(ii) replacement of a portion of a distribution pipe in a leachfield when a designer concludes the leachfield is not a failed system, there is no removal of leachfield stone beneath the distribution pipe, and the pipe is crushed or otherwise preventing wastewater from flowing to other portions of the leachfield;

(iii) replacement of a sanitary sewer service line or sanitary sewer collection line in the same approximate location;

(iv) replacement of a septic tank;

(v) replacement of a distribution box;

(vi) repair or replacement of a pump or associated valves, switches and controls; or

(vii) any other repair or replacement that the Secretary, on a case by case basis, determines to be a minor repair or minor replacement.

For the purposes of this definition, "same approximate location" means within 10 feet of its original location and no closer horizontally to a public water source, a potable water source, water service line, or water service pipe, or water main. The addition of an innovative/alternative component to a wastewater system or the removal of an existing or permitted innovative/alternative component and replacement with a different innovative/alternative component is not a minor repair or minor replacement.

(B) For potable water supplies:

(i) the repair or replacement of a water service pipe in the same approximate location;

(ii) replacement of a water service line in the same approximate location;

(iii) repair or replacement of a pump;

(iv) repair or replacement of filters or screens;

(v) repair or replacement of a mechanical component;

(vi) repair or reconstruction of a driven well point in approximately the same location;

(vii) hydrofracturing a potable water source;
or

(viii) any other repair that the Secretary, on a case by case basis, determines to be a minor repair or minor replacement.

For the purpose of this definition, "same approximate location" means within 10 feet of its original location and no closer horizontally or vertically to a sanitary sewer service line, sanitary sewer collection line, or any other portion of a wastewater system.

(C) The following are not minor repairs or replacements:

(i) installation of a water treatment system;

(ii) replacement of a distribution system; and

(iii) any action, including replacement of piping related to a change in use, that increases design flow or modifies other operational requirements of the potable water supply or wastewater system.

(64) **Mobile Home** – means a living unit that:

(A) is designed for long term and continuous residential occupancy;

(B) is designed to be moved on wheels, as a whole or in sections;

(C) on arrival at the site, is complete and ready for occupancy, except for incidental unpacking, assembly, connections with utilities, and placing on supports or a permanent foundation, or installation as a unit in a previously prepared structure; and

(D) contains the same type of interior plumbing fixtures as immovable housing (not recreational vehicle-type fixtures).

(65) **Modifies Operational Requirements –** means the need to apply new technical standards from these Rules. Examples of actions that modify operational requirements:

(A) Installation and use of a water treatment system to a potable water supply unless exempt under § 1-304(19) or (20).

(B) Installation and use of an innovative/alternative system or component for a potable water supply or wastewater system that has or requires approval pursuant to Subchapter 4.

(C) Installation of a flush toilet to replace a composting or incinerator toilet.

(D) Conversion to a restaurant or food preparation business requiring the installation of a grease tank.

(E) Conversion to a brewery from a different use identified in Table 8-3.

(F) Addition of a fire suppression system that requires upgrading of the water service line.

(G) Change in use of a single-family residence from seasonal to year-round.

(H) Change in the use of a building or structure when the proposed use does not appear on Table 8-3 and the proposed wastewater does not meet the specifications for low strength wastewater pursuant to § 1-805(b).

(I) Change in the use of a building or structure that produces a waste or wastewater identified in § 1-301(e) which will be treated and disposed of via a wastewater system serving the building or structure.

(J) Adding plumbing fixtures that increase the demand on the potable water supply that is not connected to a public water system by more than 10 fixture units, using the load values assigned to plumbing fixtures determined by the Vermont Plumbing Rules, to a building or structure thereby increasing the project's instantaneous peak demand.

(K) Installation of a pump station, dosing siphon, or floating outlet dosing system to a wastewater system.

(L) Installation of an atmospheric water storage tank to serve one single-family residence that is served by a potable water source that serves no other buildings or structures and no campground.

(66) **Municipality** – means a city, town, fire district, school district, consolidated water district, incorporated village, or unorganized town or gore.

(67) **Naturally Occurring Soil** – means soil that does not contain evidence of human-alteration or human-transport other than wide-area, uniform, shallow modification such as tilling.

(68) **Normal High-Water Elevation** – means the boundary of any surface water that delineates the highest water elevation that has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly the point where the natural vegetation changes from predominantly aquatic or no vegetation to predominantly terrestrial. For streams, the normal high-water elevation is the elevation of the top of the bank of the channel that is not the floodway. For reservoirs, the normal high-water elevation is the operating elevation of the normal summer pool. For streams, when the normal high-water elevation shows signs of eroding, the normal high-water elevation for the purposes of these Rules shall be the limits of erosion.

(69) **Permanent Legal Access** – means an easement, right of way, deed, or other legal document that creates an enforceable permanent property interest of access to and use of land for a designated purpose.

(70) **Perched Water Table** – means the upper surface of a zone of saturation held above a less permeable layer which is underlain by an unsaturated zone and the main water table.

(71) **Person** – means any individual, partnership, company, corporation, association, unincorporated association, joint venture, trust, municipality, the state of Vermont or any agency, department or subdivision of the state, federal agency, or any other legal or commercial entity.

(72) **Potable Water Source** – means a component of a potable water supply that withdraws or collects water from soil or bedrock. Potable water sources include springs; drilled, driven, or dug wells; and surface water.

(73) **Potable Water Supply** – means the source, treatment, and conveyance equipment used to provide water used or intended to be used for human consumption, including drinking, washing, bathing, the preparation of food, or laundering. This definition does not include any internal piping or plumbing except for mechanical systems, such as pump stations and storage tanks or lavatories, that are located inside a building or structure and that are integral to the operation of a potable water supply. This definition also does not include a potable water supply that is subject to regulation under 10 V.S.A. Chapter 56 (Public Water Systems). For the purposes of these Rules, water service lines are potable water supplies.

(74) **Potable Water Supply Presumptive Isolation Zone –** means an area delineated around a potable water source in which a component of a leachfield with a design flow of less than 2000 gallons per day is presumed to be unable to be located. It takes the size and shape identified in § 1-1105(a).

(75) **Primitive Camp** – means a living unit, the occupancy of which neither exceeds 3 consecutive weeks per calendar year nor exceeds a total of 60 days per calendar year, that has no interior plumbing except for one sink with water. Primitive camps may contain a composting or incinerating toilet that does not yield a liquid provided its contents are disposed of in compliance with § 1-929.

(76) **Professional Engineer** – means an engineer licensed by the Board of Professional Engineering under 26 V.S.A., Chapter 20.

(77) **Prospective Applicant –** means a person who owns the lot on which is or will be located the building or structure or campground that is or will be served by the wastewater system and potable water supply for which a permit or permit amendment will be sought in the future.

(78) **Public Water Source** – means a public water source as defined in the Water Supply Rule.

(79) **Public Water System** – means a public water system as defined in the Water Supply Rule.

(80) **Recreational Vehicles** – means motor homes, folding camping trailers, conventional travel trailers, fifth wheel travel trailers, truck campers, van campers, conversion vehicles, park model recreational vehicle, and other similar vehicles designed for travel and camping.

(81) **Replacement Area** – means a portion of land that can accommodate a wastewater system.

(82) **Replacement System** – means a wastewater system that is proposed to replace a failed system, to replace an operating wastewater system, or to replace a wastewater system proposed in an application when included in lieu of a replacement area in the same application as the wastewater system it would replace, provided that, in none of these scenarios, there is a request or need for an increase in design flow from the wastewater system it would replace. An application involving a request or need for an increase in design flow shall not be construed as seeking approval for a replacement system.

(83) **Replacement Supply –** means a potable water system that is proposed to replace a failed supply or to replace an operating potable water supply, provided that, in neither of these scenarios, there is a request or need for an increase in design flow from the potable water supply it would replace. An application involving a request or need for an increase in design flow shall not be construed as seeking approval for a replacement supply.

(84) **Sanitary Sewer Collection Line** – means piping and associated components that collects wastewater from two or more sanitary sewer service lines and conveys it to a wastewater treatment facility, to an indirect discharge system, or to the leachfield of a soil-based wastewater system of less than 6500 gallons per day. A sanitary sewer collection line begins, and a sanitary sewer service line ends, at the joint where multiple sanitary sewer service lines converge.

(85) **Sanitary Sewer Service Line** – means piping and associated components that conveys wastewater from a building or structure or campground to a wastewater treatment facility, to an indirect discharge system, or to the leachfield of a soil-

based wastewater system of less than 6500 gallons per day. Sanitary sewer service lines also include piping that conveys wastewater from a building or structure or campground to a sanitary sewer collection line.

(86) **Seasonal** – in reference to the use of a single-family residence, means occupancy of the residence for less than 180 days in each calendar year; as used elsewhere in these Rules means of, relating to, or characteristic of a particular season of the year.

(87) **Seasonal High-Water Table** – means the highest elevation that the water table reaches as determined by soil examination pursuant to § 1-910(g) or determined by monitoring the water table pursuant to § 1-905.

(88) **Secretary** – means the Secretary of the Agency or a duly authorized representative of the Secretary. A duly authorized representative of the Secretary includes a municipality that has received delegation to implement provisions of these Rules in lieu of the Secretary pursuant to Subchapter 6.

(89) **Septic Tank Effluent** – means wastewater that discharges from a septic tank.

(90) **Sewage Officer** – means a person appointed or employed by a municipality to administer these Rules when the municipality has received delegation to implement provisions of these Rules pursuant to Subchapter 6.

(91) **Single-family Residence** – means a building or a structure that contains only one living unit.

(92) **Sleeping Space** – means a space that is designed or designated to sleep one person. For example, a single or twin bed equals one sleeping space, and a double bed equals two sleeping spaces.

(93) **Soil-Based Wastewater System** – means a wastewater system that depends on naturally occurring soil to absorb the effluent from the system and to transmit the wastewater away from the site without any overland flow.

(94) **Stream –** means the full length and width, including the bed and banks, of any watercourse, including rivers, streams, creeks, brooks, and branches, which experience intermittent or perennial flow. "Stream" does not include ditches or other constructed channels primarily associated with land drainage or water conveyance through or around private or public infrastructure.

(95) **Subdivide** – means to divide land by sale, gift, lease, mortgage foreclosure, court-ordered partition or decree, or filing of a plat, plan, or deed in the town records where the act of division creates one or more lots. Subdivision shall be deemed to have occurred on the conveyance of the first lot or the filing of a plat, plan, or deed in the town records, whichever first occurs. A subdivision of land shall also be deemed to have taken place when a lot is divided by a state or municipal highway, road or right-of-way or when a lot is divided by surface waters with a

drainage area of greater than ten square miles. A municipal boundary does not create a subdivision. A mortgage deed does not create a subdivision unless a foreclosure occurs that results in the division of land. A lease will not be considered a subdivision unless the lease is effectuated by filing of plat, plan, lease agreement, or deed in the town records.

(96) **Substantially Completed** – means a building or structure, potable water supply, or wastewater system that is sufficiently constructed for it to be used for its intended purpose.

(97) **Subsurface Drip Distribution** – means a pressurized wastewater distribution system that delivers small, precise doses of effluent through small diameter, flexible polyethylene tubing (i.e., drip line) with small in-line emitters (orifices that can discharge effluent at slow, controlled rates, usually specified in gallons per hour).

(98) **Surface Water** – means all streams, reservoirs, ponds, lakes, springs and all bodies of surface waters, artificial or natural, which are contained within, flow through, or border upon the State or any portion of it.

(99) **Trench** – means a leachfield that is a shallow excavation in the ground, or mound fill material, 48 inches or less in width that is lined with leachfield stone, contains chambers, or utilizes other dispersal method, and that releases wastewater into the soil through perforated distribution pipes.

(100) **Unconfined Surficial Aquifer** – means an aquifer that is not in bedrock and is not a confined surficial aquifer. An unconfined surficial aquifer is also known as a water table aquifer.

(101) **Unimproved Lot** – means a lot that is not an improved lot.

(102) **Wastewater** – means sanitary waste or used water from any building or structure or campground, including, but not limited to, carriage water, toilet water, shower and wash water, food processing wastewater, and process wastewater. Wastewater does not include stormwater.

(103) **Wastewater System Presumptive Isolation Zone –** means an area delineated around leachfields, replacement areas, and wastewater tanks in which a potable water source with a design rate of less than or equal to 2.0 gallons per minute, assuming it would be located in bedrock or confined surficial aquifer, is presumed to be unable to be located. It takes the size and shape identified in § 1-913(a).

(104) **Wastewater System** – means any piping, pumping, treatment, or disposal system used for the conveyance and treatment of sanitary waste or used water (i.e., wastewater), including, but not limited to, carriage water, shower and wash water, and process wastewater. This definition does not include any internal piping or plumbing except for mechanical systems such as pump stations and storage tanks or toilets that are located inside a building or structure and that are integral to the

operation of a wastewater system. This definition also does not include wastewater systems that are used exclusively for the treatment and disposal of animal manure. For the purposes of these Rules, "wastewater system" is limited to soil-based wastewater systems of less than 6500 gallons per day, sanitary sewer service lines, and sanitary sewer collection lines. Sanitary sewer service lines and sanitary sewer collection lines may be permitted as part of a soil-based wastewater system.

(105) **Wastewater Treatment Facility** – means a pollution abatement facility issued a NPDES or federal pretreatment permit pursuant to 10 V.S.A. § 1263 or § 1265 that is not an indirect discharge system or a discharge to an injection well.

(106) **Water Main** – means water piping, such as a transmission main or distribution main, that is part of a public water system as defined in the Water Supply Rule. This includes piping leading to fire hydrants.

(107) **Water Service Line** – means the piping that is not a water main and extends from the water main to a building or structure or campground.

(108) **Water Service Pipe** – means the piping that extends from a potable water source to a building or structure, campground, or water outlet (such as drinking fountains and hose bibbs).

(109) **Year-round** – in reference to the year-round use of a residence, means occupancy that is equal to or more than 180 days in a calendar year.

Subchapter 3 – Wastewater System and Potable Water Supply Permits

§ 1-301 Permit Required

(a) Except as provided in this Section and in § 1-302, § 1-303, and § 1-304, no person shall take or cause to be taken any of the following actions without first obtaining a permit or permit amendment from the Secretary for the construction and operation of a potable water supply and wastewater system:

(1) the subdivision of a lot or lots;
(2) the construction of a new potable water supply or wastewater system;
(3) the physical modification or replacement of an existing potable water supply or wastewater system;
(4) the construction of a new building or structure, including when reconstruction or replacement;
(5) the connection of an existing potable water supply or wastewater system to a building or structure;
(6) the modification of an existing building or structure in a manner that increases the design flow of any component of the potable water supply or wastewater system or modifies other operational requirements of a potable water supply or wastewater system;
(7) the change in use of a building or structure in a manner that increases the design flow of any component of the potable water supply or wastewater system or modifies other operational requirements of a potable water supply or wastewater system;
(8) the conversion of an existing public water system to a potable water supply;
(9) the conversion of an indirect discharge system to a wastewater system;
(10) the creation of a campground;
(11) the modification of a campground, including the creation, modification or relocation of one or more individual campsites, in a manner that increases the design flow of any component of the potable water supply or wastewater system or modifies other operational requirements of a potable water supply or wastewater system;
(12) the use or operation of a failed supply or failed system; or
(13) the commencement of construction of any of the above. For the purposes of this Section, the "commencement of construction" means any work involving the physical construction or modification of a building or structure and its associated potable water supply or wastewater system, for example, foundation excavation, foundation construction, and site work that involves or may affect any portion of the existing or proposed potable water supply or wastewater system.

(b) When an application proposes to utilize all of, or a portion of, an existing potable water supply or wastewater system and does not involve an increase in design flow of any component of the potable water supply or wastewater system or involve a modification of other operational requirements of the potable water supply or wastewater system, the Secretary may issue a permit or permit amendment authorizing the use of the existing portions of the potable water supply and wastewater system even if those portions are not in full compliance with the technical standards in Chapters 8, 9, 10, 11, and 12, provided:

(1) The existing portions of the potable water supply and wastewater system are:

(A) exempt from the permitting requirements of this Subchapter under § 1-303; or

(B) if the application proposes only the subdivision of an improved lot and no other activities requiring a permit, permitted and in compliance with the permit.

(2) A designer certifies that the existing portions of the potable water supply are not a failed supply and the existing portions of the wastewater system are not a failed system.

(3) The existing portions of the potable water supply and wastewater system comply with the horizontal isolation distances required pursuant to § 1-912 and § 1-1104 for distances to new portions of the building or structure or campground that:

(A) will be constructed outside of the footprint of the existing or replaced building or structure or campground; and

(B) will be served by the wastewater system and potable water supply.

(4) The existing portions of the potable water supply and wastewater system are connected to a building or structure or campground or were disconnected not more than 4 years prior to the application to utilize the existing supply or system.

(5) The new portions of the potable water supply and wastewater system proposed in the application comply with the technical standards in Chapters 8, 9, 10, 11, and 12 of these Rules.

(6) If the application involves the subdivision of land:

(A) a replacement area, or a replacement system proposed in lieu of a replacement area, is designated for the resulting complete wastewater system, and other existing wastewater systems on the subdivided lot, unless the conditions of § 1-902(b) are met; and

(B) the existing portions of the potable water supply and wastewater system comply with the horizontal isolation distances required pursuant to § 1-912 and § 1-1104 for distances to new property lines.

(c) A person may seek a permit pursuant to Subsection (a)(3) despite not intending to immediately construct the replacement system.

(d) The use or operation of a failed supply or failed system is prohibited except in the following situations:

(1) The Secretary authorizes the continued use of the failed system or failed supply while the landowner is actively pursuing the cause of, and resolution to, correcting the failed system or failed supply.

(2) For a failed supply, a water treatment system is installed in compliance with § 1-1113 that achieves an elimination or reduction in the concentration of primary contaminants in the potable water source to below the standard in Table 11-5.

(3) For a failed supply, the potable water supply serves only one single-family residence.

(e) Neither soil-based wastewater systems nor sanitary sewer service lines that convey wastewater to indirect discharge systems shall be permitted for the treatment and disposal of any of the following wastewater or wastes:

(1) Wastewater or waste prohibited from discharge to an injection well pursuant to the prohibition in the Underground Injection Control Regulations against Class I, II, and III, and all but a limited number of Class IV, injection wells.
(2) Wastewater or waste prohibited from discharge to a Class V injection well pursuant to the Underground Injection Control Regulations.
(3) Wastewater or waste requiring an UIC permit from the Secretary prior to their discharge to a Class V injection well pursuant to the Underground Injection Control Regulations.
(4) Any wastewater or waste determined by the Secretary to adversely affect the biological action within a septic tank or leachfield which will not receive pretreatment prior to discharge to the septic tank or leachfield to prevent adverse effects. The Secretary, in making this determination, shall consider pH, dissolved oxygen, alkalinity, temperature, and chemical constituents of the wastewater or waste.

(f) For the purpose of determining, pursuant to Subsection (a), whether an action will result in an increase in design flow of any component of a wastewater system or potable water supply, the proposed design flow shall be calculated pursuant to § 1-803 and the baseline design flow from which a potential increase is measured shall be calculated pursuant to § 1-806.

(g) The following actions are presumed to not increase the design flow of any component of the potable water supply or wastewater system or modify other operational requirements of a potable water supply or wastewater system:
(1) The addition of a home occupation to a living unit.
(2) The construction of a new building or structure used solely for a home occupation conducted by the occupants of a living unit that is located on the same lot.
(3) The addition of plumbing fixtures in a single-family residence.
(4) The addition of a water storage tank for a single-family residence that is served by a potable water source that serves no other buildings or structures and no campground.
(5) The addition of one or more bedrooms to a single-family residence with 3 or more bedrooms, that is served by a water service line that serves no other buildings or structures, or campgrounds, and that is served by a sanitary sewer service line that serves no other buildings or structures, or campgrounds, that discharges to a municipal sanitary sewer collection line that conveys wastewater to a wastewater treatment facility.

§ 1-302 Permit Exemption for Reconstruction

(a) A building or structure that is exempt from the permitting requirements of this Subchapter under § 1-303, or that has an associated potable water supply or wastewater system which was permitted by the Secretary on or after January 1, 2007, that has been voluntarily removed or destroyed by fire, flooding, or other force majeure may be reconstructed without obtaining a permit or permit amendment provided all of the following are met:
(1) The replacement building or structure is in compliance with all conditions of permits issued under these Rules on or after January 1, 2007;

(2) If the building or structure is exempt pursuant to § 1-303, it shall be reconstructed within 4 years of its removal or destruction. On a case by case basis, this period may be extended for 1 year by the Secretary if:
   (A) the request for the extension is submitted in writing before the end of the 4-year period; and
   (B) the Secretary determines there is good cause for the extension, such as delays in reconstruction due to difficulties resolving insurance claims, insufficient financing, or unresolved municipal permitting issues.
(3) The replacement building or structure connects to the existing water service line or water service pipe and existing sanitary sewer service line that were connected to the previously existing building or structure;
(4) The replacement building or structure does not increase design flow or modify other operational requirements of the existing potable water supply or wastewater system;
(5) The entire footprint of the replacement building or structure, except for that portion of a building or structure that is a deck or porch, is constructed within 50 feet of any outside wall of the previously existing building or structure that is being replaced; and
(6) No other actions are taken or caused to be taken that under these Rules requires the issuance of a permit or permit amendment.

(b) For the purposes of this Section, a building or structure is "destroyed" if the building or structure is in ruins, the roof has collapsed, the walls or foundation have collapsed or are collapsing, or the building or structure is condemned by a municipality or the State.

Note: Appendix C, Figure C-1, depicts an example for calculating the 50 feet from an outside wall for reconstruction.

§ 1-303 "Clean Slate" Permit Exemption

(a) The following are exempt from the permitting requirements of this Subchapter:
   (1) All buildings or structures, campgrounds, and their associated potable water supplies and waste water systems that were substantially completed before January 1, 2007 and all improved and unimproved lots that were in existence before January 1, 2007. This exemption shall remain in effect provided:
      (A) No action for which a permit is required under these Rules is taken or caused to be taken on or after January 1, 2007, unless such action is exempt under one of the other permitting exemptions listed in § 1-302 or § 1-304.
      (B) If a permit has been issued under these Rules before January 1, 2007 that contained conditions that required actions to be taken on or after January 1, 2007, including conditions concerning operation and maintenance and transfer of ownership, the permittee shall continue to comply with those permit conditions.
   (2) An owner of a single-family residence that qualified on January 1, 2007 for this exemption shall not be subject to administrative or civil penalties under 10 V.S.A. chapters 201 and 211 for a violation of these Rules when the owner believes the

supply or system meets the definition of a failed water supply or failed system provided the owner:

(A) conducts or contracts for an inspection of the supply or system;
(B) notifies the Secretary of the results of the inspection; and
(C) has not taken or caused to be taken any other action on or after January 1, 2007 for which a permit would be required under these Rules.

(b) The use of a single-family residence served by a wastewater system or potable water supply for which the exemption in Subsection (a) is in effect shall be considered year-round unless the single-family residence was occupied for fewer than 180 days in each calendar year between and including December 31, 1986 and December 31, 2006.

§ 1-304 Permit Exemptions

The following actions are exempt from the permitting requirements of this Subchapter, provided no other action is taken or caused to be taken that under these Rules requires the issuance of a permit or permit amendment:

(1) The modification, completed between January 1, 2007 and July 1, 2007, of an existing single-family residence.

(2) The construction, substantially completed between January 1, 2007 and July 1, 2007, of a single-family residence and its associated potable water supply or wastewater system, provided:

(A) the only building or structure on the lot is the single-family residence;
(B) the potable water supply and wastewater system complies with the technical standards in Subchapters 8, 9, 10, 11, and 12, except for the requirement to identify a replacement area;
(C) a designer completes a design certification for the potable water supply or wastewater system that complies with § 1-306;
(D) a designer or, when allowed by these Rules, an installer completes an installation certification for the potable water supply or wastewater system that complies with § 1-311; and
(E) copies of the design and installation certifications required pursuant to Subsections (C) and (D) are submitted to the Secretary and recorded and indexed in the land records for the municipality where the building or structure, and, if different, where the wastewater system and potable water supply is located.

(3) The construction of a primitive camp, provided:

(A) the primitive camp is on a lot with no other buildings or structures and with no campground; or
(B) the primitive camp is on a lot with a single-family residence but no other buildings or structures and no campground.

(4) The subdivision of an unimproved lot on or after January 1, 2007, provided:

(A) the deed, that is recorded and indexed, that describes the affected property contains the following language:

"Notice of permit requirements. In order to comply with applicable state Rules concerning potable water supplies and wastewater systems, a person shall not construct or erect any structure or building on the lot of land described in this deed if the use or useful occupancy of that structure or building will require the installation of or connection to a potable water supply or wastewater system, without first complying with the applicable rules and obtaining any required permit. Any person who owns this property acknowledges that this lot may not be able to meet state standards for a potable water supply or wastewater system and therefore this lot may not be able to be improved."; or

(B) if there is no deed for the lot that is created by the act of subdivision, the owner of the unimproved lot shall record and index a copy of the notice language described in Subsection (4)(A) in the land records for the municipality where the unimproved lot is located.

(5) The addition of land to a lot.

(6) The subdivision of an improved lot by a lease for the sole purpose to develop a cell tower, solar panel, wind turbine, or telephone switching station provided:

(A) the horizontal isolation distance between the footprint of the cell tower, solar panel, wind turbine, or telephone switching station and any wastewater system or potable supply shall be a minimum of 10 feet, unless there is a foundation drain, in which case the horizontal isolation distance shall be 20 feet between the wastewater system and upslope drains and 75 feet between the wastewater system and downslope drains;

(B) a plan, drawn to scale, and prepared by a designer or land surveyor, of the subdivided lot is prepared showing the location of the existing building or structure and the existing and proposed boundary lines of the subdivided lot;

(C) the plan is recorded and indexed in the land records of the municipality where the lot is located within 30 days of the date of the subdivision; and

(D) upon termination of the lease, the land subject to the lease reverts to the original lot.

(7) The subdivision of an improved lot, provided:

(A) the lot is improved with either:

(i) up to two single-family residences or one duplex; or

(ii) up to two buildings or structures, two campgrounds, or one building or structure and one campground, where the total design flow for the uses is 560 gallons per day or less;

(B) if the buildings or structures or campgrounds are served by soil-based wastewater systems, the new lot boundary for any resulting improved lot is 500 feet or more from the footprint of each building or structure and campground;

(C) a plan, drawn to scale and prepared by a designer or land surveyor, of the subdivided lot is prepared, showing the location of the building or structure and the existing and proposed boundary lines of the subdivided lot; and

(D) the plan is recorded and indexed in the land records of the municipality where the lot is located.

(8) The subdivision of a lot where the subdivision results from a transfer of property for a highway or other transportation project that is authorized under the State's enacted Transportation Program or is an emergency project within the meaning of 19 V.S.A. § 10g(h) regardless of whether the State or the municipality has commenced any condemnation proceedings in connection with the project.

(9) The boundary line adjustment of improved or unimproved lots, provided:
- (A) each lot being adjusted meets one or more of the following standards:
  - (i) the lot is reduced in size by no more than 2 percent;
  - (ii) the lot is increased in size;
  - (iii) the boundary, after adjustment, is 500 feet or more from the footprint of each building or structure or campground on an improved lot; or
  - (iv) the Secretary makes a written determination that the proposed adjustment will not have an adverse effect on any existing potable water supply or wastewater system on the affected lots. In making the determination, the Secretary shall consider:
    - (I) whether the land being removed from a lot is more suitable for a replacement wastewater system than the land being retained with the lot or land being added to the lot; and
    - (II) whether there is a natural land feature, such as bedrock, that prevents a lot that is being reduced in size from accessing the land being conveyed for a wastewater system;
- (B) a plan, drawn to scale and prepared by a designer or land surveyor, of the boundary line adjustment is prepared; and
- (C) the plan and, if applicable, the Secretary's written determination, is recorded and indexed in the land records of the municipality where the lots are located.

(10) The minor repair or minor replacement of a potable water supply or wastewater system.

(11) The construction of a municipal sanitary sewer collection line, the connection of a building or structure to the collection line via a new sanitary sewer service line, and the construction of the service line, at the time of initial construction and operation of the municipal sanitary sewer collection line, provided:
- (A) the sanitary sewer collection line and associated sanitary sewer service lines are part of a project approved by the Facilities Engineering Division of the Department;
- (B) the sanitary sewer service lines comply with the technical standards in Subchapters 8, 9, and 10;
- (C) a designer completes a design certification for the sanitary sewer service lines that complies with § 1-306;

(D) a designer or, when allowed by these Rules, an installer, completes an installation certification for the sanitary sewer service lines that complies with § 1-311; and

(E) copies of the design and installation certifications required pursuant to Subsection (B) and (C) are submitted to the Secretary and recorded and indexed in the land records of the municipality where the building or structure is located.

(12) The connection of an existing building or structure to a water main via a new water service line, and the construction of the water service line, at the time of initial construction and operation of the portion of the municipal water main to which the water service line connects, provided:

(A) the associated water service lines are included on the plans that are approved as part of a public water system construction permit;

(B) the water service line complies with the technical standards in Subchapters 8, 11, and 12;

(B) a designer completes a design certification for the water service line that complies with § 1-306;

(C) a designer or, when allowed by these Rules, an installer, completes an installation certification for the potable water supply that complies with § 1-311; and

(D) copies of the design and installation certifications required pursuant to Subsection (B) and (C) are submitted to the Secretary and recorded and indexed in the land records of the municipality where the building or structure is located.

(13) The modification of an existing building or structure, the change in use of a building or structure, or the modification of a campground, in a manner that increases the design flow of any component of a sanitary sewer service line, and any associated sanitary sewer collection line, that conveys wastewater to a wastewater treatment facility, or in a manner that modifies any operational requirements of such a sanitary sewer service line, and any associated sanitary sewer collection line, provided:

(A) the building or structure or campground is served by a water service line that connects to a public water system;

(B) a designer certifies that the design capacity of the existing sanitary sewer service line and sanitary sewer collection line can accommodate the increase in design flow or modification of operational requirements;

(C) the landowner obtains a letter from the wastewater treatment facility confirming the facility has capacity to treat the constituents of the wastewater and dispose of the design flow identified in § 1-803 for each building or structure or campground to be served by the sanitary sewer service line and any associated sanitary sewer collection line; and

(D) a copy of the certification required pursuant to Subsection (13)(B) is recorded and indexed in the land records for the municipality where the building or structure or campground is located.

(14) The modification of an existing building or structure, the change in use of a building or structure, or the modification of a campground, in a manner that increases the design flow of any component of a water service line, or in a manner that modifies any operational requirements of a water service line, provided:

(A) the building or structure or campground is served by a sanitary sewer service line, and any associated sanitary sewer collection line, that conveys wastewater to a wastewater treatment facility;

(B) no booster pump is added to the potable water supply;

(C) a designer certifies that the design capacity of the existing water service line can accommodate the increase in design flow or modification of operational requirements;

(D) the landowner obtains a letter from the public water system confirming the public water system has the capability to supply the design flow identified in § 1-803 for each building or structure or campground to be served by the water service line; and

(E) a copy of the certification required pursuant to Subsection (14)(C) is recorded and indexed in the land records for the municipality where the building or structure or campground is located.

(15) The construction of a replacement supply serving only one single-family residence on a lot with no other buildings or structures and with no campground, provided:

(A) the replacement supply will not be located in an area classified by the Secretary as a Class IV groundwater area;

(B) the replacement supply does not utilize surface water as the potable water source;

(C) there is not a change in use of the single-family residence to include a child care facility;

(D) if the replacement supply is a water service line and a booster pump will be installed in the single-family residence, the technical standards for the booster pump design in § 1-1111(d) are met (Secretary approval for the installation of the booster pump is not required);

(E) a form provided by the Secretary that corresponds to the type of replacement supply is recorded and indexed in the land records of the municipality where the single-family residence is located, and, if different, where the replacement supply will be located; and

(F) water sampling that complies with § 1-1113(b) and (c) is conducted prior to any consumptive use of the water from the replacement supply.

(16) The development of a potable water source to supplement an existing potable water source serving only one single-family residence on a lot with no other buildings or structures and with no campground, provided:

(A) the supplemental potable water source will not be located in an area classified by the Secretary as a Class IV groundwater area;

(B) the supplemental potable water source is not a surface water source;

(C) there is not a change in use of the single-family residence to also be a child care facility;

(D) the potable water supply presumptive isolation zone for the supplemental potable water source does not extend onto land owned by a person different than the owner of the single-family residence;

(E) a plan, with contours, drawn to scale prepared by a designer, showing the location of the existing and supplemental potable water sources, the location of the potable water supply presumptive isolation zone for the supplemental potable water source, and the boundary lines for the lot on which the single-family residence is located;

(F) a form provided by the Secretary, which includes the plan, is recorded and indexed in the land records of the municipality where the single-family residence is located, and, if different, the existing and supplemental potable water sources will be located; and

(G) water sampling that complies with § 1-1113(b) and (c) is conducted prior to any consumptive use of the water from the additional potable water supply.

(17) The deepening of an existing potable water source, provided that water sampling that complies with § 1-1113(b) and (c) is conducted prior to any consumptive use of the water from the deepened potable water source.

(18) The use or operation of a failed supply or failed system that is identified in § 1-301(d).

(19) The installation and use of a water treatment system for a potable water supply where the treatment system is designed to:

(A) reduce or eliminate water hardness;

(B) reduce or eliminate properties or constituents on the list of secondary standards in the Vermont Water Supply Rule;

(C) reduce or eliminate arsenic, fluoride, lead, manganese, nitrate, nitrite, gross alpha, uranium, or a combination of these, provided the treatment system treats all of the water used for drinking and the preparation of food; or

(D) eliminate bacteria, pathogenic organisms, radon, or radium, provided the treatment system treats all of the water used for drinking, washing, bathing, the preparation of food, and laundering.

(20) The installation and use of a water treatment system when authorized by the Secretary in a corrective action plan required pursuant to 10 V.S.A. § 6615b, in a remediation plan required pursuant to the Groundwater Protection Rule and Strategy, or in any other response action required to address contamination or the threat of contamination of a potable water supply.

(21) The increase in flow to a wastewater system through the connection to the wastewater system of a water treatment system identified in Subsection (18).

(22) The increase in flow to an existing wastewater system as a result of the use of a water treatment system identified in Subsection (19).

(23) The change in use of a single-family residence, on a lot with no other buildings or structures and with no campground, to include a family child care home registered by the Vermont Agency of Human Services, Department for Children and Families, provided the potable water supply does not utilize surface water as the potable water source.

(24) The installation of a water service pipe from a potable water source serving only one single-family residence, to provide water to an outside hose bibb that is located on the same lot as the residence.

(25) The construction of a wastewater system for purposes of serving only State or Federally owned remote campsites, provided:
- (A) each campsite is served by a waterless alternative toilet or a waterless pit privy that complies with the horizontal isolation distances contained in Table 9-5 without a reduction by the Secretary, except horizontal isolation distances from trees; and
- (B) if a waterless pit privy is used, the bottom of the excavation for the pit privy maintains a minimum of 36 inches above the seasonal high-water table, a minimum of 36 inches above a soil that with a percolation rate slower than 120 minutes per inch or that has a soil texture of sandy clay, clay, or silty clay, and a minimum of 48 inches above bedrock.

For the purposes of this Subsection, "remote campsites" means campsites regarded as remote campsites by the state or federal agency that makes the campsite available.

(26) A periodic and temporary change in use of a building or structure for events, provided:
- (A) the building or structure is served by a potable water supply and wastewater system;
- (B) each event lasts no more than 4 consecutive days;
- (C) there are no more than 12 days of events per year;
- (D) the owner of the building or structure retains records of the dates of each event for at least 3 years following each event and provides them to the Secretary if requested by the Secretary.

Examples include the periodic and temporary change in use of a hotel, motel, or restaurant for holding weddings; of an arena for holding horse shows; or of a building or structure for holding auctions, vehicle shows, or periodic concerts, provided the changes in use meets the criteria in this Subsection. The provision of an adequate number of alternative toilets and alternative hand washing supplies to accommodate everyone on site for the event is encouraged.

(27) The construction and use of a building or structure that will be used for events, provided:
- (A) the building or structure is not connected to a water service line, water service pipe, or sanitary sewer service line;
- (B) there are no more than 28 days of events per year;
- (C) there is no food preparation or dishwashing on site for the events unless the food preparation or dish washing is:

(i) fully completed within a mobile unit licensed by the Vermont Department of Health as a Temporary Food Stand or motorized or push cart type mobile unit; and
(ii) does not require on site water or waste disposal;

(D) the events do not require water, including for food preparation, dish washing, or clean-up, other than:
(i) for hand washing that is accommodated by alternative hand washing supplies; and
(ii) the disposal of wastewater that is accommodated by the use of alternative toilets;

(E) an adequate number of alternative toilets and alternative hand washing supplies are provided to accommodate everyone on site;

(F) there is no discharge of wastewater to the ground surface;

(G) the owner of the building or structure retains records of the following actions for at least 3 years following each event and provides them to the Secretary if requested by the Secretary:
(i) dates of each event;
(ii) the frequency of the pumping of the alternative toilets;
(iii) the number of gallons pumped from the alternative toilets; and
(iv) the dates on which alternative toilets and alternative hand washing supplies were delivered to the lot and removed from the lot.

(28) The periodic and temporary creation of a campground provided:
(A) The campground is not connected to a water service line, water service pipe, or sanitary sewer service line;
(B) there are no more than 12 nights of camping per year; and
(C) there is no discharge of wastewater to the ground surface.

(29) The construction and use of a building or structure for seasonal outdoor activities (e.g., outdoor archery, gun range, golf driving range, farm stand, Christmas tree farm), provided:
(A) the use does not require water for operation or clean-up, including employee wash up, other than for:
(i) hand washing that is accommodated by alternative hand washing supplies; and
(ii) the disposal of wastewater that is accommodated by the use of alternative toilets; and
(iii) the building or structure is not connected to a water service line, water service pipe, or sanitary sewer service line.

(30) The construction of a building or structure associated with quarries, sand and gravel pits, and rock crushing operations, where site conditions prevent the installation of a soil-based wastewater system, provided:
(A) a designer submits a written certification to the Secretary stating that based on his or her site investigations no soil-based wastewater system that complies with these Rules can be located within a 500-foot radius of the building or structure;

(B) the use does not require water for operation or clean-up, including employee wash up, other than for:
  (i) hand washing that is accommodated by alternative hand washing supplies; and
  (ii) the disposal of wastewater that is accommodated by the use of alternative toilets; and
(C) the building or structure is not connected to a water service line or water service pipe.

(31) The placement and use of a mobile home or recreational vehicle at a construction site as temporary office space occupied by employees, provided:
(A) the mobile home or recreational vehicle is removed immediately upon completion of construction;
(B) the use does not require water for operation or clean-up, including employee wash-up, other than for:
  (i) hand washing that is accommodated by alternative hand washing supplies; and
  (ii) the disposal of wastewater that is accommodated by the use of alternative toilets; and
(C) the mobile home or recreational vehicle is not connected to a water service line, water service pipe, or sanitary sewer service line.

(32) The use of telephone switching stations, electrical substations, hydroelectric dam operation stations, and similar buildings or structures, for their intended purposes, provided:
(A) the use involves no more than 4 employees that enter or visit the building or structure for less than 2 hours each in any day;
(B) the use does not involve access to the building or structure by non-employees;
(C) the use does not require water for operation or clean-up, including employee wash-up; and
(D) the building or structure is not connected to a water service line, water service pipe, or sanitary sewer service line.

(33) The use of rental storage units as rental storage units, provided:
(A) the use involves no more than 4 employees that enter or visit the building or structure for less than 2 hours each in any day;
(B) the use does not require water for operation or clean-up, including employee wash-up; and
(C) the building or structure is not connected to a water service line, water service pipe, or sanitary sewer service line;

§ 1-305 Applications for Permits

(a) Applications for permits or permit amendments required pursuant to § 1-301 shall be:
(1) submitted using the application form provided by the Secretary and be completed in accordance with the instructions provided with the application form;

(2) contain the information required in this Section and Appendix A and all other information necessary to demonstrate compliance with requirements in these Rules that apply to the application;
(3) signed by the person who owns the lot on which is or will be located the building or structure or campground that is or will be served by the wastewater system and potable water supply for which a permit or permit amendment is sought (i.e., the applicant); and
(4) submitted to the Regional Office that processes applications for the location the application concerns.

(b) Applications involving a wastewater system, potable water supply, or replacement area that is or will be located on a lot other than the lot where the building or structure or campground served or to be served by the system or supply is located, shall include:
(1) documentation that demonstrates the applicant has permanent legal access to the current or proposed off-lot potable water supply, wastewater system, or replacement area for the purposes of construction, operation, and maintenance of, as applicable, a potable water supply or wastewater system; or
(2) a signed and dated document from the owner of the lot on which the off-lot potable water supply, wastewater system, or replacement area is or will be located, provided the owner is not the applicant, indicating that:
(A) the owner will convey to the applicant permanent legal access to the current or proposed off-lot potable water supply, wastewater system, or replacement area shown on the site plan for the purposes of construction, operation, and maintenance of, as applicable, a potable water supply or wastewater system; and
(B) the owner will record and index the documents establishing such permanent legal access in the municipality where the building or structure or campground is or will be located, and, if different, where the wastewater system and potable water supply is or will be located, within 30 days of the date of the permit.

(c) An application seeking a variance pursuant to § 1-802 shall include a written request for the variance that meets the requirements of § 1-802(d).

(d) The perimeter of each proposed in-ground leachfield, at-grade leachfield, mound, and bottomless sand filter, and the center of each proposed potable water source, except when the potable water supply utilizes a surface water source, shall be flagged in the field prior to filing an application and the flagging maintained by the landowner until the Secretary issues a permit or denial, or the landowner withdraws the application from consideration.

(e) An application for the construction and operation of only a wastewater system or only a potable water supply needs a site plan, detail sheets, and any accompanying narrative and supporting data and design certification for only the system or the supply that is to be permitted.

(f) The Secretary may waive the submission, otherwise identified in Appendix A, of detail sheets for existing components of a wastewater system or potable water supply included in an application that the application does not propose to change.

(g) An application for a sanitary sewer service line, and any associated sanitary sewer collection line, that conveys wastewater to a wastewater treatment facility or an indirect discharge system, shall include a letter from the wastewater treatment facility or indirect discharge system confirming the facility or system has capacity to treat the constituents of the wastewater and dispose of the design flow identified in § 1-803 for each building or structure or campground to be served by the sanitary sewer service line and any associated sanitary sewer collection line.

(h) An application for a water service line shall include a letter from the public water system confirming the public water system has the capability to supply the design flow identified in § 1-803 for each building or structure or campground to be served by the water service line.

(i) An application to use surface water as the potable water source serving one single-family residence shall include the following statement signed by the applicant:
"I understand that a surface water source may not provide the same water quality as a groundwater source and that a surface water source will require constant treatment of the water including monitoring, proper operation, and maintenance of the water treatment system. I understand that the use of a treatment system will not ensure the water will meet drinking water standards. I understand I may not be notified when chemicals, such as lampricide, are applied to the surface water that serves my residence. I understand and accept the potential risk to human health and the liability for use of the surface water source and treatment system to provide potable water to my residence."

(j) The Secretary shall not commence a technical review of a permit application under these Rules until he or she deems the application is administratively complete, meaning the application includes a complete application form; application fee; connection approval letters, when required by Subsections (g) or (h); signed statement concerning a surface water source, when required by Subsection (i); documentation of permanent legal access, when required by Subsection (b); and a site plan and detail sheets, when required for the wastewater system or potable water supply for which the permit or permit amendment is required.

(k) An applicant may withdraw an application without prejudice at any time until the Secretary renders a decision on the project. The application fee will be refunded only when the request for withdrawal of the application is made prior to the initiation of a technical review.

(l) The Secretary shall give deference to a design certification included in an application, with respect to engineering design or judgment exercised by the designer, for the following aspects of the design:
(1) calculations used to size grease interceptors;
(2) calculations used to size septic tanks;
(3) calculations used to determine dosing volumes and pressure distribution;
(4) calculations used to determine cleansing velocities of sanitary sewer collection lines;
(5) slopes of sanitary sewer service lines or sanitary sewer collection lines;
(6) calculations for sizing wastewater and water pumps and pump selections;

(7) calculations for sizing water service lines, water service pipes, and sanitary sewer service lines;
(8) calculations for sizing water storage; and
(9) specifications for quality of workmanship.

(m) Nothing in Subsection (l) shall limit the responsibility of the designer to comply with these Rules with respect to the design of, and design certification for, a wastewater system or potable water supply.

(n) Nothing in Subsection (l) shall limit the authority of the Secretary to review and comment on design aspects of an application or to enforce these Rules with respect to the design or the design certification. The Secretary retains the authority to deny an application that includes a design that is out of compliance with these Rules.

§ 1-306 Site Plans, Supporting Information, and Design Certification

(a) All site plans, detail sheets, accompanying narrative, and other supporting data for the design of a wastewater system or potable water supply submitted with a permit application shall be prepared, signed and dated by a designer.

(b) All site plans, detail sheets, accompanying narrative, and other supporting data for the design of a wastewater system or potable water supply that is required in a permit application shall be accompanied by a design certification, signed and dated by a designer, that states:
"I hereby certify that, in the exercise of my reasonable professional judgment, the design-related information submitted with this application is true and correct and the design included in this application for a permit complies with the Vermont Wastewater System and Potable Water Supply Rules."

§ 1-307 Required Notification of Presumptive Isolation Zones

(a) When an applicant for a permit or permit amendment proposes a potable water supply or wastewater system with a wastewater system presumptive isolation zone or potable water supply presumptive isolation zone that extends onto property other than the property for which the permit is sought, the permit applicant shall send by certified mail, on a form provided by the Secretary, a notice of an intent to file a permit application, with the site plan that will be included with the permit application and that accurately depicts the presumptive isolation zone, to any landowner affected by the presumptive isolation zone at least 7 calendar days prior to the date that the permit application is submitted to the Secretary.

(b) If, during the course of the Secretary's review of an application for a permit or permit amendment, the location of a wastewater system and potable water supply is revised, and the revised wastewater system presumptive isolation zone or potable water supply presumptive isolation zone extends onto property other than the property for which the permit is sought, the permit applicant shall send by certified mail, on a form provided by the Secretary, a notice of filing a revised site plan, with the revised site plan that

accurately depicts the revised presumptive isolation zone, to any landowner affected by the revised presumptive isolation zone.

(c) If, after a permit or permit amendment has been issued under this Section, a water supply or wastewater system is not installed in accordance with the permit and if the record drawings indicate that the wastewater system presumptive isolation zone or potable water supply presumptive isolation zone as constructed extends onto property other than the property on which the system is located, the permittee shall send by certified mail a notification form provided by the Secretary with a copy of the record drawings showing the presumptive isolation zone to any landowner affected by the presumptive isolation zone.

(d) An applicant or permittee subject to the requirements of Subsections (a) through (c) shall submit a copy of the certified mail receipts to the Secretary demonstrating that the notices and information required by this Section have been sent by certified mail to affected landowners and shall include in the certification the name and address of all affected landowners. If the Secretary approves a permit or permit amendment application, the permit shall not be issued to an applicant subject to the requirements of Subsection (b) prior to 7 calendar days after the applicant certifies to the Secretary that the notice required under this Section has been sent to affected landowners.

(e) Notwithstanding Subsections (a) through (c), the notifications identified in this Section are not required for wastewater system presumptive isolation zones or potable water supply presumptive isolation zones that fall under one of the following descriptions:
(1) the presumptive isolation zone extends only onto property owned by the applicant;
(2) the presumptive isolation zone extends only onto a Town or State highway;
(3) the presumptive isolation zone does not differ in location from that which existed prior to the pending application or record drawings, provided the potable water supply or wastewater system existing prior to the application or record drawings was exempt from the permitting requirements of this Subchapter under § 1-303 or was permitted and in compliance with the permit;
(4) the potable water supply presumptive isolation zone is for a replacement supply;
(5) the wastewater system presumptive isolation zone is for a replacement system, provided the replacement system is not proposed in lieu of a replacement area in the same application as the wastewater system it would replace;
(6) the potable water supply presumptive isolation zone exists only in a municipality that prohibits the installation of a soil-based wastewater system; or
(7) the wastewater system presumptive isolation zone exists only in a municipality that prohibits the installation of a potable water supply other than a connection to the municipal water supply.

§ 1-308 Denial of an Application for a Permit

The Secretary shall deny, in writing, an application if the Secretary reaches one of the following conclusions:
(1) the owner of a wastewater treatment facility, indirect discharge system, or public water system has approved the physical connection of a sanitary sewer service

line, sanitary sewer connection line, or water service line to the wastewater treatment facility, indirect discharge system, or water main when the Secretary has prohibited the allocation of additional capacity from the facility or system;

(2) the proposed project does not comply with the technical standards in Subchapters 8, 9, 10, 11, and 12 or is otherwise not able to be developed in compliance with these Rules;

(3) the information submitted is not sufficient to make a determination that the proposed project can be developed in compliance with these Rules;

(4) the information submitted is determined to be false or misleading; or

(5) the application proposes the treatment and disposal of wastewater or wastes identified in § 1-301(e).

§ 1-309 Permit Conditions

(a) The Secretary may include any condition in a permit that he or she deems necessary to protect human health and the environment or to otherwise satisfy the purposes and requirements of these Rules, including requirements addressing operation and maintenance of a wastewater system or potable water supply.

(b) A permit for a wastewater system may be conditioned on the completion of a groundwater sampling, effluent sampling, water metering, and water quality sampling program when the Secretary determines a program is necessary to detect potential contamination and degradation of groundwater or surface water.

(c) A permit that approves a sanitary sewer service line, and any associated sanitary sewer collection line, that conveys wastewater to a wastewater treatment facility or an indirect discharge system, shall be conditioned on the existence, at the time of construction of the permitted wastewater system, of capacity in the wastewater treatment facility or indirect discharge system to treat the constituents of the wastewater and dispose of the design flow identified in § 1-803 for each building or structure or campground to be served by the sanitary sewer service line and any associated sanitary sewer collection line.

(d) A permit that approves a water service line shall be conditioned on the existence, at the time of construction of the permitted potable water supply, of capability of the public water system to supply the design flow identified in § 1-803 for each building or structure or campground to be served by the water service line.

(e) A permit that approves a potable water supply with a surface water potable water source shall contain conditions that require the landowner, prior to a change of ownership of the lot on which the building or structure or campground served by the supply is located, to submit the following documents to the Secretary:

(1) An inspection report, completed by a professional engineer practicing within the scope of his or her engineer specialty, that:

(A) confirms all approved components of the water treatment system exist and are functioning properly pursuant to the approved design; or

(B) if one or more components are not in existence or functioning properly, identifies corrective actions needed to bring the design into compliance

with the approved design, and identifies those components that are in existence and functioning properly pursuant to the approved design.

(2) Documentation demonstrating that the inspection report was provided to the prospective landowner.

(3) If the inspection report required corrective action, a second inspection report completed by a professional engineer, practicing within the scope of his or her engineering specialty, certifying the corrective actions have been taken and all approved components of the water treatment system exist and are functioning properly per the approved design.

(4) The following statement signed by the prospective landowner:

"I understand that a surface water source may not provide the same water quality as a groundwater source and that a surface water source will require constant treatment of the water including monitoring, proper operation, and maintenance of the water treatment system. I understand that the use of a treatment system will not ensure the water will meet drinking water standards. I understand I may not be notified when chemicals, such as lampricide, are applied to the surface water that serves my residence. I understand and accept the potential risk to human health and the liability for use of the surface water source and treatment system to provide potable water to my residence."

(f) A permit that approves a wastewater system that includes a constructed wetland shall contain conditions addressing:

(1) the operation and maintenance of the constructed wetland that are specific to the particular design and site; and

(2) reporting requirements to ensure compliance with the operational and maintenance requirements.

§ 1-310 Filing of Permit

(a) Except where otherwise specified in these Rules, permits issued under these Rules shall run with the land.

(b) Within 30 days of permit issuance, the permitee shall ensure the permit is recorded and indexed in accordance with the provisions of 24 V.S.A. §§ 1154 and 1161 in the land records of the municipality where the building or structure or campground is or will be located, and, if different, where the wastewater system and potable water supply is or will be located.

§ 1-311 Construction and Installation Certification

(a) A designer shall flag each of the following prior to construction or site work on the lot on which the wastewater system and potable water source approved in a permit is, or will be, located and the flags shall be maintained by the landowner until commencement of construction of the wastewater system component or potable water source:

(1) Perimeter of the approved leachfield, or, if the leachfield is within a bottomless sand filter or a mound, perimeter of the bottomless sand filter or mound.

(2) Perimeter of the approved replacement area; and

(3) Center of the approved potable water source.

(b) Subsequent to the substantial completion of a potable water supply or wastewater system and prior to the use and operation of the wastewater system or potable water supply, a signed and dated installation certification from an installer, or a designer if required in Subsection (f), shall be submitted to the Secretary that states:

"I hereby certify that, in the exercise of my reasonable professional judgment, the installation-related information submitted is true and correct and the potable water supply and wastewater system:

(A) *were installed in accordance with:*

(i) *the permitted design and all permit conditions; or*

(ii) *record drawings and such record drawings are in compliance with the Vermont Wastewater and Potable Water Supply Rules, were filed with the Secretary, and are in accordance with all other permit conditions;*

(B) *were inspected;*

(C) *were properly tested; and*

(D) *have successfully met those performance tests."*

(c) If any deviations to a permitted design for a wastewater system or potable water supply occur during the construction or installation of the system or supply, the permittee shall submit one of the following to the Secretary:

(1) An application for a permit amendment if, pursuant to Subsection (d), any deviation constitutes a significant modification of the design of the wastewater system or potable water supply that was approved; or

(2) Each of the following if no deviation constitutes a significant modification of the design of the wastewater system and potable water supply that was approved:

(A) record drawings prepared by a designer for the constructed and installed wastewater system or potable water supply that specify all deviations from the permitted design; and

(B) a design certification, signed and dated by the designer, that states:
"I hereby certify that, in the exercise of my reasonable professional judgment, the record drawings are true and correct and the design shown on the record drawing complies with the Vermont Wastewater System and Potable Water Supply Rules."

(d) For the purposes of this Section, a significant modification of the design of the wastewater system or potable water supply is one or more of the following:

(1) 50 percent or more of the leachfield is not located within the footprint of the leachfield as depicted on the approved site plan;

(2) portions of the leachfield are in an area for which no soil testing was submitted in the application or for which existing soil testing indicates the soil may not be suitable for the type of leachfield designed;

(3) the wastewater system includes a pump station that is not part of the approved design;

(4) the location of the leachfield is changed from the location depicted on the approved site plan so that a new or revised hydrogeologic analysis is necessary;

(5) the wastewater system is a different type of system from the type that was approved, such as the installation of a mound or at grade system when an in-ground system was permitted;

(6) the installation of a different innovative/alternative system or component, or the installation of a different manufacturer's model of an innovative/alternative system or component, than is part of the approved design;
(7) the failure to install an innovative/alternative system or component that is part of the approved design;
(8) the design of the sanitary sewer service line is modified so that manholes are required;
(9) the potable water supply is modified by the addition of water storage or pressure tanks, except for such modifications at a single-family residence served by a potable water supply that serves no other building or structure and no campground;
(10) the potable water supply includes a booster pump that is not part of the approved design;
(11) the wastewater system or potable water supply includes a modification that creates non-compliance with a technical standard in Subchapters 8, 9, 10, 11, or 12;
(12) the wastewater system or potable water supply includes a modification involving an action or design for which these Rules require a Secretary determination;
(13) the wastewater system or potable water supply includes a modification that would otherwise require a permit amendment pursuant to § 1-301; or
(14) any other modification that the Secretary determines is a significant modification.

(e) Applications for permit amendments required pursuant to Subsection (c)(1) shall be subject to the same review process as other permit amendment applications.

(f) A designer shall submit the installation certification required pursuant to Subsection (b) when any of the following circumstances exist:
(1) the installation is completed in accordance with record drawings;
(2) the Secretary determines that the proposed wastewater system or potable water supply is of a type, complexity, or size that requires the expertise and knowledge of a specific class of designer and includes as a condition of the permit that a designer of a specified class submit the installation certification; or
(3) when otherwise required by these Rules.

(g) A permit issued by the Secretary shall be invalid for the use and operation of a substantially completed potable water supply or wastewater system unless and until an installation certification meeting the requirements of Subsection (b) is received by the Secretary.

(h) Notwithstanding Subsection (b), an installation certification need not be submitted for a substantially complete potable water supply or wastewater system when the authorizing permit or permit amendment does not contain a condition requiring an installation certification for the potable water supply or wastewater system.

§ 1-312 Authorization to Commence with Site Work or Foundation Construction

(a) Following submission of an administratively complete application for a permit under this Subchapter, but prior to the issuance of a permit, an applicant may request authorization

from the Secretary to commence site work for the proposed wastewater system or potable water supply or site work or foundation construction for a building or structure to be served by the wastewater system or potable water supply.

(b) Within 30 days of receipt of a request made pursuant to Subsection (a), the Secretary shall grant or deny the request or request additional information from the applicant necessary to make a determination under Subsection (c).

(c) The Secretary shall grant authorization when the Secretary determines that the soil and other conditions of the site of the proposed leachfield, sanitary sewer service line, sanitary sewer collection line, or potable water source complies with these Rules.

(d) An authorization may limit the work that may be done prior to issuance of the permit and shall not be construed to mean that the applicant does not have to obtain any other permits prior to engaging in the site work or foundation construction.

§ 1-313 Additional Requirement for Replacement Systems and Replacement Supplies Permitted by Variance

Replacement systems or replacement supplies that are permitted by a variance granted under § 1-802 shall only be connected to buildings or structures or campgrounds that are located on the same lot as the buildings or structures and campgrounds that were served by the system or supply being replaced at the time the variance is granted.

Subchapter 4 – Approval of Innovative/Alternative Systems and Components

§ 1-401 Purpose and Decisions

(a) This Subchapter authorizes the Secretary to review and approve the following innovative/alternative systems and components for their use and inclusion in designs for wastewater systems:
- (1) alternative materials used in the construction or fabrication of tankage that is part of a wastewater system;
- (2) a component used for the treatment of wastewater prior to disposal including filter units;
- (3) a component that is substituted for conventional wastewater distribution systems to a leachfield;
- (4) a component or alternative method that substitutes for conventional wastewater dispersal in a leachfield; and
- (5) a new wastewater system design or a new design for a portion of a wastewater system.

(b) The Secretary may require manufacturers of innovative/alternative systems and components to provide the following information either as part of their applications for approval or as a condition of their approval:
- (1) component manuals;
- (2) design instructions;
- (3) installation instructions;
- (4) required operation and maintenance activities and the frequency at which they must occur;
- (5) instructions for the owner of the system; and
- (6) a list of representatives and manufacturer trained and approved designers, installers and service providers.

(c) All decisions by the Secretary on applications for approval of the use and inclusion of innovative/alternative systems or components shall specify the type of approval granted (general use, pilot, or experimental), be in writing, and include conditions related to the following:
- (1) the obligations of the system or component owner to operate and maintain the system or component;
- (2) requirements for inspections to be completed and inspections reports be submitted to the Secretary to confirm the system or component is functioning in a manner that meets the manufacturer's specifications; and
- (3) prohibiting any change or modification to the design of the innovative/alternative system or component without prior review and approval by the Secretary.

(d) Denials of requests for approval shall be in writing and state the basis for the denial.

(e) Approvals may have an expiration date. Manufacturers granted approval may seek renewal of approvals.

(f) Following expiration or revocation of an approval, a wastewater system and potable water supply permit authorizing installation of the previously approved innovative/alternative systems and components remains valid.

(g) Notwithstanding any condition in a permit authorizing the use or inclusion of an innovative/alternative system or component which has an approval requiring inspection of that system or component to be completed by a manufacturer-approved designer, the inspection may be completed by:
- (1) a manufacturer-approved service provider; or
- (2) if the manufacturer is no longer in business in Vermont:
  - (A) a designer; or
  - (B) a person authorized by the Secretary when that person demonstrates knowledge for properly maintaining and repairing the system or component to operate in a manner that meets the manufacturers requirements.

(h) The Secretary may revoke an authorization for a system or component when the Secretary determines:
- (1) the authorization was granted on the basis of incorrect, false, or misleading information;
- (2) the system or component fails to perform in compliance with any performance standard established for the system;
- (3) the system or component does not function with the expectations for reliability and protection of health and the environment upon which the authorization was based on; or
- (4) the company, manufacturer, or vendor fails to comply with conditions in the authorization including conditions concerning:
  - (A) maintaining records of sale or installation of a component;
  - (B) sale of a component when a permit requires the use of a different component;
  - (C) filing required reports;
  - (D) maintaining a required supply of repair or replacement parts; or
  - (E) ensuring an adequate supply of trained individuals to operate and maintain the system or component, if required.

§ 1-402 General Use Approval

(a) The Secretary shall authorize the general use of an innovative/alternative system or component proposed by a manufacturer seeking approval when the Secretary determines that the manufacturer has demonstrated the following:
- (1) the design of the innovative/alternative system or component protects human health and the environment;
- (2) the design of the innovative/alternative system or component satisfies the particular purposes served by the specific technical standards in Subchapters 8, 9, 10, 11, and 12 for which the system or component is intended to substitute; and
- (3) the innovative/alternative system or component is of demonstrated reliability and performance for its proposed use in soil and climate found in Vermont, based on its use elsewhere, such as other States or Canadian Provinces.

(b) An application for general use approval shall contain documentation demonstrating each of the above determinations, including documentation of bench or field testing of the system or component at a certified laboratory and testing facility by a third party or the manufacturer that meets the requirements of § 1-407.

§ 1-403 Pilot Approval

(a) The Secretary shall authorize the pilot use of an innovative/alternative system or component proposed by a manufacturer seeking approval when the Secretary determines that the manufacturer has demonstrated the following:
   (1) the design of the innovative/alternative system or component protects human health and the environment;
   (2) the design of the innovative/alternative system or component satisfies the particular purposes served by the specific technical standards in Subchapters 8, 9, 10, 11, and 12 for which the system or component is intended to substitute; and
   (3) the proposal is designed to measure and report data related to reliability and performance of the innovative/alternative system or component in soil and climate found in Vermont.

(b) An application for pilot approval shall contain documentation demonstrating each of the above determinations, including documentation of bench or field testing of the system or component at a certified laboratory and testing facility by a third party or the manufacturer that meets the requirements of § 1-407.

(c) Up to 25 installations or uses of each specific innovative/alternative system or component may be authorized in the pilot approval.

§ 1-404 Experimental Approval

(a) The Secretary may authorize the use of an experimental innovative/alternative system or component intended to try a new technology, application of technology, or methods proposed by a manufacturer seeking approval when the Secretary determines that the manufacturer has demonstrated the following:
   (1) the design of the innovative/alternative system or component protects human health and the environment; and
   (2) the design of the innovative/alternative system or component satisfies the particular purposes served by the specific technical standards in Subchapters 8, 9, 10, 11, and 12 for which the system or component is intended to substitute.

(b) An application for experimental approval shall contain documentation demonstrating each of the above determinations, including, if it exists, documentation of bench or field testing of the system or component at a certified laboratory and testing facility by a third party or the manufacturer that meets the requirements of § 1-407.

(c) Up to 5 installations or uses of each specific innovative/alternative system or component may be authorized in the experimental approval.

(d) The Secretary, as a condition of the wastewater system and potable water supply permit authorizing the installation of an experimental innovative/alternative system or component, shall require the owner of the installed system or component to perform monitoring of the system's or component's operation and submit monitoring reports to the Secretary.

(1) The type and frequency of monitoring shall be the monitoring necessary to demonstrate that the specific approved system or component is functioning as intended.

(2) If the system or component is to treat the wastewater, the condition shall include a requirement to sample the discharge from the system or component and to the submit testing results to demonstrate the system or component is meeting the expected level of treatment.

§ 1-405 Application Process for Innovative/Alternative Systems and Components

An application for approval of the use and inclusion of an innovative/alternative system or component in wastewater system and potable water supply permits shall be submitted on a form prepared by the Secretary. The application form shall require the following information.

(1) General information:

(A) Company, manufacturer, vendor, or designer name.

(B) Mailing address of company, manufacturer, vendor, or designer.

(C) Administrative contact's name, address, phone number, and e-mail address.

(2) System or component information:

(A) System trade name and model(s)/number(s), if any.

(B) Description of theory of operation.

(3) Statement of claim:

(A) Advantages related to prevention of health hazards, surface and groundwater pollution, environmental damage, or other similar advantages from the use of the innovative/alternative system or component.

(B) Treatment performance claims, if any, expressed in mg/L or in appropriate units for biologic constituents.

(C) Type of authorization (general, pilot, or experimental) requested and justification why the system or component belongs in the requested class.

(D) Possible causes of or reasons for failure and an assessment of the risks to public health, owners/operators of the system or component, and the environment from such failure.

(E) Documentation demonstrating the authorization-type specific determinations included in the proceeding sections that the Secretary must make prior to authorizing use.

(4) Authorization and denial history:

(A) Authorizations from other States or Provinces, including copies of all authorizations, and the contact person for each State or Province.

(B) Denials from other States or Provinces, including copies of all denials, and the contact person for each State or Province.

(5) Information related to the system or component:

(A) Copies of all operational reports, patent information, technical reports, and laboratory reports on the proposed innovative/alternative system or component, even if the information might in whole or part reflect negatively on the system or component.

(B) Documentation of all bench or field testing conducted of the system or component at a certified laboratory and testing facility by a third party or the manufacturer that meets the requirements of § 1-407.

(C) The number of systems or components installed and their jurisdictional location.

(D) Reports of any component or system that was found to not properly function or operate, or to not meet the manufacturer's performance expectation, with the cause, if determined, and any corrections or modifications to the system or component that were made to correct or prevent future functioning or operational problems or non-compliance with performance expectations.

(E) Reports that demonstrate the design of the innovative/alternative system or component satisfies the particular purposes served by the specific technical standards in Subchapters 8, 9, 10, 11, and 12 for which the system or component is intended to substitute.

(6) Design criteria:

(A) Design and material requirements.

(B) Plans and cross sections for the innovative/alternative system or component.

(C) Design limitations or restriction, including sizing, siting, and wastewater strength and characteristics.

(D) Leachfield sizing and justification.

(E) Construction requirements and limitations.

(F) For systems and components intended for treating of wastewater, the location of sampling ports for samples for analysis of the treated wastewater.

(7) Operation requirements:

(A) Technical qualifications for operators.

(B) Specific actions required to operate the system or component.

(8) Maintenance requirements:

(A) Technical qualifications for service providers.

(B) Specific actions and their frequency required to maintain the system or component.

(C) Information that will be provided to owner of the system or component regarding maintenance requirements.

(9) Monitoring and analysis requirements:

(A) Proposed schedule for monitoring, including frequency and constituents, if any is proposed.

(B) The method for collection, delivery, and analyses of the effluent from the system or component that meets the requirements of 40 C.F.R. Part 136, unless an alternative method is approved by the Secretary.

(C) Results of the effluent analysis performed by:

(i) a laboratory certified by the NELAC Institute (TNI) to test for the parameters of concern; or

(ii) a laboratory accepted by the Bureau de Normalization du Quebec or the European Committee for Standardization.

(10) Cost estimates:
- (A) Design cost estimates.
- (B) Construction and installation costs.
- (C) Operation and maintenance costs.
- (D) Energy costs.

§ 1-406 Renewal Application Process for Innovative/Alternative Systems and Components

An application for renewal of an approval shall be submitted on a form prepared by the Secretary. The application form shall require the following information:

(1) Results of any tests not submitted with the original application for approval of the system or component.

(2) Any approvals or denials by a State or Province not submitted with the original application for approval of the system or component.

(3) A statement as to whether there were design changes or modifications to the innovative/alternative system or component since the last approval.
- (A) If there was a change or modification to the design of the innovative/alternative system or component, the manufacturer shall include a full description of the changes.
- (B) If the change or modification affects performance of the system or component, the manufacturer or designer must submit a new application for approval of the system or component.

(4) Any updates needed for Vermont-specific manuals and design drawings so that they are in compliance with these Rules.

(5) Confirmation of manufacturer contact information.

(6) Confirmation of the availability of the system or component, parts, and trained and approved service providers for the system or component.

(7) Confirmation that the manufacturer met the conditions of the approval letter including the monitoring of the distribution of the innovative/alternative system or component and the annual reporting requirements.

§ 1-407 Standards and Protocols for Testing Innovative/Alternative Systems and Components

(a) Bench testing or field testing of innovative/alternative systems or component shall comply with the following standards or protocols:
- (1) ANSI/NSF Standard 40 – Residential Wastewater Treatment Systems;
- (2) ANSI/NSF Standard 24-5 – Wastewater Treatment Systems; Nitrogen Reduction;
- (3) Canadian BNQ Standard NO 3680-910;
- (4) European (EU) Standard EN 12566-3; or
- (5) other standards and protocols developed by independent standards organizations and approved by the Secretary.

(b) Field testing shall be conducted by a testing facility that complies with the following standards or protocols:

(1) EPA/NSF – Protocol for the Verification of Wastewater Treatment Technologies; or

(2) EPA Environmental Technology Verification Program protocol for the Verification of Residential wastewater treatment technologies for nutrient reduction.

Subchapter 5 – Administrative Reconsiderations; Appeals; Enforcement

§ 1-501 Administrative Reconsideration

(a) An applicant for a permit or permit amendment, a person requesting a determination of the Secretary pursuant to a provision in these Rules that allows for such a determination, or a permittee, may request that a decision made in a Regional Office be reviewed and reconsidered by the Regional Office Programs Manager by submitting such request in writing within 60 days of the date of the decision to the Regional Office Programs Manager.

(1) The request shall specify which aspects of the decision are at issue, the reasons why the person believes the decision to be in error, and the decision requested of the Regional Office Programs Manager.

(2) The Regional Office Programs Manager may call on other individuals within or outside the Department who have expertise appropriate to the case to assist in his or her review including the Regional Office personnel. The Regional Office Programs Manager shall issue a written decision in writing within 60 days of receipt of a request made pursuant to Subsection (a), unless the requester and Regional Office Programs Manager mutually agree to an extension of this time period.

(3) The decision of the Regional Office Programs Manager shall constitute the final decision by the Secretary if reconsideration of the decision is not requested pursuant to Subsection (b).

(b) Any person who requested a reconsideration under Subsection (a) may, within 30 days of the date of the decision by the Regional Office Programs Manager, request that Regional Office Programs Manager's decision be reviewed and reconsidered by the Director by submitting such request in writing to the Director.

(1) The request shall specify which aspects of the decision are at issue, the reasons why the person believes the decision to be in error, and the decision requested of the Director.

(2) Within 30 days of receipt of the request, the Director shall convene a meeting with the requester and Division personnel. The Director may call on other individuals within or outside the Department who have expertise appropriate to the case to assist in his or her review including the Regional Office Programs Manager and Regional Office personnel.

(3) The Director shall issue a written decision within 30 days of the meeting. This time period may be extended by mutual agreement of the requester and Director. This written decision shall constitute the final decision by the Secretary.

§ 1-502 Appeal of Final Agency Decision

(a) A person aggrieved by a final act or decision of the Secretary under these Rules may appeal to the Environmental Division of the Vermont Superior Court in accordance with 10 V.S.A., Chapter 220.

(b) The period for appealing a decision to the Environmental Division is stayed if, within the appeal period, a request is received by the Secretary seeking reconsideration of the

decision pursuant to § 1-501 and the decision is one for which reconsideration is available pursuant to § 1-501. The full appeal period shall be available following the Secretary's final decision in response to the request for reconsideration.

§ 1-503 Enforcement

(a) The Secretary may initiate an enforcement action against a person, in accordance with the provisions of 10 V.S.A., Chapter 201 or 10 V.S.A. Chapter 211, if the Secretary determines that such person:

(1) has taken, or caused to be taken, an action that requires a permit or permit amendment under these Rules without first obtaining the required permit or permit amendment;

(2) has taken, or caused to be taken, an action that is in non-compliance with a permit or permit amendment issued under these Rules;

(3) is, or has been, in non-compliance with any order or assurance of discontinuance which addresses compliance with these Rules; or

(4) has otherwise not complied with the provisions of these Rules.

(b) If the Secretary determines that a licensed professional engineer or a Class A, B, or BW designer, as a result of the person's failure to exercise reasonable professional judgment, submits design or installation information that is untrue or incorrect, the Secretary may notify the Office of Professional Regulation.

Subchapter 6 – Delegation

§ 1-601 Full or Partial Delegation

(a) A municipality may request that it be delegated the authority to implement the provisions of 10 V.S.A., Chapter 64, except §§ 1975, 1976 and 1978, in lieu of the Agency, through administration of the permitting program set forth in these Rules for all types of wastewater systems and potable water supplies located within the municipality. This is called full delegation.

(b) A municipality may alternatively request that it be partially delegated, called partial delegation, the authority to implement the provisions of 10 V.S.A., Chapter 64, except §§ 1975, 1976 and 1978, in lieu of the Agency, through administration of the permitting program set forth in these Rules for only those projects that consist of buildings or structures or campgrounds that are served by both:

(1) sanitary sewer service lines connected to or that will connect to a sanitary sewer collection line owned and controlled by the municipality; and

(2) water service lines connected or that will connect to a water main owned and controlled by the municipality.

§ 1-602 Process for Delegation

(a) A municipality requesting the full or partial delegation shall submit the following information to the Agency in writing:

(1) A request for delegation indicating if full or partial delegation is sought.

(2) The name, mailing address, and phone number of the chair of the local legislative body of the municipality submitting the request;

(3) The name, mailing address, phone number, and license number of the designer or professional engineer who will be responsible for reviewing applications and issuing permits pursuant to these Rules;

(4) A description of the process the municipality will use for accepting and reviewing applications and for issuing permits;

(5) A statement signed by the chair of the local legislative body committing to administer the program in accordance with these Rules;

(6) For municipalities cooperating to manage the program, separate requests from each municipality for delegation of authority plus a copy of an inter-municipal agreement signed by the chair of each local body indicating the process agreed upon and the roles and responsibilities of the member municipalities; and

(7) Authority for the Secretary or his or her designee to enter the municipal property during normal working hours to review records related to the municipality's administration of these Rules.

(b) The delegation of authority from the Agency to the municipality shall be executed through a written agreement signed by the chair of the local legislative body on behalf of the municipality and the Commissioner that identifies the scope of the delegation and the parties' obligations.

§ 1-603 Performance Expectations for a Delegated Municipality

Municipalities receiving delegation under this Subchapter shall:

(1) Administer the program in conformance with these Rules and with the procedures and practices adopted by the Secretary that interpret these Rules.

(2) If receiving full delegation, employ a designer to review applications and issue permits pursuant to these Rules.

(3) If receiving partial delegation, employ a designer or employ a professional engineer practicing within the scope of their engineering specialty to review applications and issue permits pursuant to these Rules.

(4) Require the designer or a professional engineer employed to review applications and issue permits pursuant to these Rules to attend Department training programs, seminars, and meetings related to the administration of these Rules that the Agency requires staff administering these Rules to attend.

(5) Issue permits for sanitary sewer service lines and sanitary sewer collection lines that convey wastewater to a wastewater treatment facility or indirect discharge system only if there is capacity in the facility or system to treat the constituents of the wastewater and dispose of the design flow identified in § 1-803 for each building or structure or campground to be served by the sanitary sewer service line or sanitary sewer collection line.

(6) Issue permits for water service lines connecting to water mains only if there is capacity in the public water system to supply the design flow identified in § 1-803 for each building or structure or campground to be served by the water service line.

(7) Include in each permit standard conditions that are provided by the Agency.

(8) Act as the custodian of all records obtained or created in administering these Rules and maintain the records in conformance with the Agency's records schedules that would control the disposition of such records were the Agency the custodian of such records.

(9) Make electronic copies of all documents received or prepared during the course of an application review that were used to make a decision on the particular application available in a web-based format so that they may be examined from remote locations by Agency staff and members of the public.

(10) Maintain and operate an electronic tracking system for applications and permitting decisions that includes the applicant's name, address, and phone number; a project description; design flow for the potable water supply and wastewater system; application receipt date; the date the municipality deems the application to be administratively complete; dates of correspondence from municipal personnel to the applicant seeking additional application information during the review of an administratively complete application; dates for the receipt of additional information from the applicant; and date of the final decision.

(11) Submit an annual report to the Agency by February 15 of each calendar year that lists the number of applications received, the number of permits or denials issued, the number of permits issued that include the use of innovative/alternative systems or components, the number of annual inspections reports received for permits issued that include innovative/alternative systems or components, the average in-house application processing time, and the average application

processing time from the date of receipt of an administratively complete application to the date of the final decision.

(12) Take timely and appropriate enforcement for violations of municipality-issued permits and for violations of these Rules within the municipality's boundaries pursuant to 10 V.S.A., Chapter 201.

(13) Be responsible for all costs of administering these Rules pursuant to their delegation agreement and establish permit review fees in an amount sufficient to support the municipal services. If delegation is revoked pursuant to § 1-606, promptly provide copies of all documents and required permit tracking data related to the permits processed during the period of delegation to the Secretary. Electronic or microfilm copies will be acceptable.

§ 1-604 Agency Responsibilities

(a) Upon delegating the authority to implement these Rules to a municipality, the Secretary shall deliver the following to the municipality:

(1) Procedures and practices adopted by the Secretary that interpret these Rules.

(2) A list of standard conditions to be included in permits issued pursuant to these Rules.

(3) The record schedules adopted by the Agency that control the disposition of records obtained or created in administering these Rules.

(4) Electronic copies of the historical permitting documents for permits issued by the State for projects in the municipality for use in administering the permit program.

(b) The Secretary may audit a delegated municipality's administration of these Rules to assure the municipality's administration complies with the Rules, to perform quality control and ensure a level of consistency between the municipality's review and the review by a Regional Office, to gather information, or to investigate a complaint received in reference to the municipality's administration of these Rules.

(c) Notwithstanding delegation to a municipality pursuant to § 1-602, the Secretary, after consultation with the municipality, may institute enforcement proceedings against a person for violations of these Rules within the municipalities' municipal boundaries when the delegated municipality does not or cannot address non-compliance, or when the Secretary determines that enforcement is necessary to protect human health and the environment.

(d) The administrative reconsideration process established in § 1-501 is not available for permitting decisions by delegated municipalities made pursuant to their delegation agreement. Municipalities may develop a process for administrative reconsideration of such permitting decision.

§ 1-605 Permit Fees and Enforcement Penalties

(a) Delegated municipalities shall retain permit review fees for all municipal-issued permits except as indicated in Subsection (b) and shall retain all penalties collected from enforcement actions taken by the municipality within the scope of their delegated authority.

(b) Municipalities whose delegation authority is revoked or who work with the Agency to terminate their delegation shall remit to the Agency the application fees for any permit application that reverts to the Agency for issuance.

§ 1-606 Revocation of Delegation

(a) The Secretary may revoke delegation to a municipality for one or more of the following reasons:
- (1) violation of the delegation agreement;
- (2) false or misleading information submitted in support of an application for delegation;
- (3) issuance of permits for sanitary sewer service lines, sanitary sewer collection lines, or water service lines when the receiving facility or system has insufficient capacity for the design flow approved in the permits;
- (4) issuing permits that do not comply with these Rules; or
- (5) failure to take timely and appropriate enforcement actions under these Rules.

(b) Process for revocation
- (1) Prior to commencing revocation proceedings, the Secretary shall work with the delegated municipality to achieve compliance with these Rules.
- (2) Upon investigation of a complaint leading the Secretary to conclude that revocation is warranted, or on his or her own motion, the Secretary shall schedule a hearing for revocation and issue a notice of pending revocation to the municipality at least two weeks prior to the hearing.
- (3) A notice of pending revocation shall include the following:
  - (A) the legal authority for revocation;
  - (B) a brief statement of the proposed basis for revocation;
  - (C) notice that the Secretary will hold a hearing for the purpose of determining whether delegation shall be revoked; and
  - (D) the date, time, and place the hearing will be held.
- (4) A hearing shall be conducted in accordance with Subsection (c) and the Secretary shall issue a written decision within 30 days of conclusion of the hearing. If the decision is to revoke authority, the decision shall establish a timeline for transfer of records to the Agency.

(c) Hearing
- (1) A hearing for revocation shall be conducted in the Regional Office within closest driving distance to the delegated municipality's municipal offices, unless an alternative location is agreed to by the Secretary and delegated municipality.
- (2) The hearing for revocation shall be treated as a contested case and conducted in accordance with the provisions of 3 V.S.A. §§ 809–813, and this section.
- (3) The local legislative body of the municipality that is the subject of the proposed revocation is a party by right. Other persons who demonstrate to the Secretary that their interests are directly affected by delegation revocation shall be afforded party status to participate in the proceedings.
- (4) Any party to the revocation proceedings shall either appear in person or shall be represented by an attorney.

(5) The burden of proving that the delegation should be revoked shall be upon the Secretary.

(6) Upon the written request of a party filed at least 10 days before the hearing, the hearing shall be transcribed by a qualified stenographer or recorded on an electronic sound device. Costs shall be borne by the requesting party. The requesting party shall provide one copy of the transcript to the Secretary without cost; other parties wishing a copy shall reimburse the requesting party on a prorated basis.

(d) In response to a notice of pending revocation, the delegated municipality may waive the right to have a hearing and agree to revocation initiated by the Secretary.

(e) Applications in Process

(1) No additional applications shall be accepted by a municipality following the municipality's submission of a request for voluntary revocation.

(2) Applications in process by a municipality that has received a Notice of Pending Revocation shall continue to be processed by the municipality until such time as delegation is revoked.

(f) Appeal of a decision to revoke delegation shall be to the Environmental Court in accordance with 10 V.S.A., Chapter 220.

Subchapter 7 – Designer Scope of Authority, Examination, and Continuing Education

§ 1-701 General Requirements

(a) No person, except professional engineers, shall submit a design to the Secretary for a wastewater system or potable water supply without first obtaining a Class A, B, or BW wastewater and potable water supply designer license from the Office of Professional Regulation.

(b) A designer or professional engineer employed to review applications and issue permits pursuant to these Rules by a municipality with delegated authority pursuant to Subchapter 6, and other employees from the designer's or professional engineer's firm or business, shall not complete a design, any part of an application, an installation certificate, or other certification for a wastewater system or potable water supply located, or proposed to be located, within the municipality employing them.

§ 1-702 Scope of Authority for Class 1 Designers and Professional Engineers

(a) Class 1 Designers are licensed professional engineers who:
- (1) are practicing within the scope of his or her engineering specialty; and
- (2) if designing soil-based wastewater systems:
  - (A) received from the Vermont Board of Professional Engineering designation that he or she passed a college-level soil identification course with specific instruction in the areas of soil morphology, genesis, texture, permeability, color, and redoximorphic features; or
  - (B) passed a soil identification exam administered or approved by the Secretary.

(b) Class 1 Designers may perform the site evaluation, application preparation, and design and installation certifications required under these Rules for the design of all wastewater systems and potable water supplies.

(c) Professional engineers practicing within the scope of their engineering specialty who are not Class 1 Designers may:
- (1) perform the site evaluation, application preparation, and certification required under these Rules for the design of water service piping, water service lines, sanitary sewer service lines, and sanitary sewer collection lines.
- (2) perform the site evaluation, application preparation, and certification required under these Rules for the design of a soil-based wastewater system if the engineer retains one or more designers who are Class 1, Class A, Class B, or Class BW to perform all aspects of site evaluation, application preparation, and certification under these Rules for soil evaluation. In such cases, the name of the designer responsible for the soil evaluation for the application shall be included as a part of the permit application and certification.

§ 1-703 Scope of Authority for Class A Designers

(a) Class A Designers may perform the site evaluation, application preparation, and design and installation certifications required under these Rules for the design of the following wastewater systems and potable water supplies:

(1) a soil-based wastewater system with a design flow of 1350 gallons per day or less, including a system with a wastewater pump station that discharges to a gravity flow sanitary sewer collection line, gravity flow sanitary sewer service line, or distribution box;

(2) a sanitary sewer service line with a design flow of 1350 gallons per day or less, including a sanitary sewer service line that uses a wastewater pump station that discharges to a gravity flow sanitary sewer collection line or gravity flow sanitary sewer service line; and

(3) a potable water supply that serves only one single-family residence with a design flow of 1350 gallons per day or less, including a water service line with a fire suppression system with no more than 2 sprinkler heads.

(b) Notwithstanding Subsection (a), a Class A designer shall not perform the site evaluation, application preparation, and design and installation certifications required under these Rules for the design of a wastewater system or potable water supply that includes or falls within one of the following:

(1) a soil-based wastewater system that uses pressure distribution;

(2) a soil-based wastewater system that uses subsurface drip distribution;

(3) a soil-based wastewater system with a leachfield in a mound or bottomless sand filter;

(4) a soil-based wastewater system with a leachfield disposing of filtrate effluent;

(5) a soil-based wastewater system designed using the 2-year time of travel management zone;

(6) a soil-based wastewater system that includes a constructed wetland;

(7) a soil-based wastewater system that uses a storage and dose approach;

(8) a soil-based wastewater system that disposes of high strength wastewater, and for which design flow is determined pursuant to § 1-803(f)(2) or (3);

(9) a soil-based wastewater system that disposes of high strength wastewater and serves a building or structure with a use as a brewery;

(10) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received pilot or experimental approval pursuant to Subchapter 4;

(11) an innovative/alternative system, or wastewater system that uses innovative/alternative components that has received general use approval pursuant to Subchapter 4, unless the approval authorizes a Class A designer to design such systems;

(12) a sanitary sewer service line that includes manholes or connects to a pressure sanitary sewer collection line;

(13) a sanitary sewer collection line;

(14) a potable water supply that serves any building or structure or campground other than a single-family residence;

(15) a potable water supply that includes a water treatment system, the installation and use of which is not exempt under § 1-304(19);
(16) a potable water supply with a surface water potable water source; or
(17) a water service line that includes a fire hydrant or fire suppression system except as provided in Subsection (a)(3).

(c) Class A designers shall not complete design or installation certifications for wastewater systems and potable water supplies they are not authorized to design.

§ 1-704 Scope of Authority for Class B Designers

(a) Class B designers may perform the work within a Class A designer's scope of authority and the site evaluation, application preparation, and design and installation certifications required under these Rules for the design of the following wastewater systems:
(1) a soil-based wastewater system that uses pressure distribution;
(2) a soil-based wastewater system that uses subsurface drip distribution;
(3) soil-based wastewater systems with a leachfield in a mound or bottomless sand filter;
(4) a soil-based wastewater system with a leachfield disposing of filtrate effluent;
(5) a soil-based wastewater system designed using the 2-year time of travel management zone;
(6) a soil-based wastewater system that includes a constructed wetland;
(7) a soil-based wastewater system that disposes of high strength wastewater and does not include the use of treatment or innovative/alternative components to reduce the strength to low;
(8) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received general use approval pursuant to Subchapter 4, unless the approval requires a Class 1 designer to design such systems; and
(9) a sanitary sewer collection line that meets the following:
(A) the total design flow into the collection line is 1350 gallons per day or less;
(B) the collection line is less than 400 feet in length; and
(C) the collection line does not have a manhole and is not required to have a manhole under § 1-1002(j).

(b) Notwithstanding Subsection (a), a Class B designer shall not perform the site evaluation, application preparation, and design and installation certification required under these Rules for the design of a wastewater system or potable water supply that includes or falls within one of the following:
(1) a soil-based wastewater system that uses a storage and dose approach;
(2) a soil-based wastewater system that disposes of high strength wastewater and includes the use of treatment or innovative/alternative components to reduce the strength to low strength;
(3) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received general use approval

pursuant to Subchapter 4, when the approval requires a Class 1 designer to design such systems;

(4) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received pilot or experimental approval pursuant to Subchapter 4;

(5) a sanitary sewer service line or sanitary sewer collection line that includes manholes;

(6) a sanitary sewer service line or sanitary sewer collection line that connects to a pressure sanitary sewer collection line;

(7) a potable water supply that serves any building or structure or campground other than a single-family residence;

(8) a potable water supply that includes a water treatment system the installation and use of which is not exempt under § 1-304(19);

(9) a potable water supply with a surface water potable water source; or

(10) a water service line that includes a fire hydrant or fire suppression system except as provided in § 1-703(a)(3).

(c) Class B designers shall not complete design or installation certifications for wastewater systems and potable water supplies they are not authorized to design.

§ 1-705 Scope of Authority for Class BW Designers

(a) Class BW designers may perform the work within a Class A or Class B designer's scope of authority and the site evaluation, application preparation, and design and installation certifications required under these Rules for the design of a potable water supply with a total design flow of 1350 gallons per day or less regardless of the number of buildings or structures or campgrounds served.

(b) Notwithstanding Subsection (a), a Class BW designer shall not perform the site evaluation, application preparation, and design and installation certification required under these Rules for the design of a wastewater system or potable water supply that includes or falls within one of the following:

(1) a soil-based wastewater system that uses a storage and dose approach;

(2) a soil-based wastewater system that disposes of high strength wastewater and includes the use of pre-treatment or innovative/alternative components to decrease the strength of the wastewater;

(3) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received general use approval pursuant to Subchapter 4, when the approval requires a Class 1 designer to design such systems;

(4) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received pilot or experimental approval pursuant to Subchapter 4;

(5) a sanitary sewer service line or sanitary sewer collection line that includes manholes;

(6) a sanitary sewer service line or sanitary sewer collection line that connects to a pressure sanitary sewer collection line;

(7) a potable water supply that includes a water treatment system the installation and use of which is not exempt under § 1-304(19);
(8) a potable water supply with a surface water potable water source; or
(9) a water service line that includes a fire hydrant or fire suppression system except as provided in § 1-703(a)(3).

(c) Class BW designers shall not complete design or installation certifications for wastewater systems and potable water supplies they are not authorized to design.

§ 1-706 Examinations

(a) Examinations to become a Class A designer shall consist of both written and field exams prepared and approved by the Secretary that test the individual's knowledge of soil identification and the requirements of these Rules for those wastewater systems and potable water supplies that a Class A designer is authorized by these Rules to design.

(b) Examinations to become a Class B designer shall consist of the Class A examinations and a written exam prepared and approved by the Secretary that tests the individual's knowledge of the requirements of these Rules for those wastewater systems and potable water supplies that a Class B designer is authorized by these Rules to design.

(c) Examinations to become a Class BW designer shall consist of the Class A and Class B examinations and a written exam prepared and approved by the Secretary that tests the individual's knowledge of designing potable water supplies that a Class BW designer is authorized by these Rules to design.

§ 1-707 Continuing Education for Class A, B, and BW Designers

(a) To provide continuing education hours toward a designer's license renewal, a course must be Secretary approved as either relevant to the siting and design of a wastewater system or potable water supply or in-field or laboratory related courses pertaining to soil.

(b) Any person may request that the Secretary review a course to determine whether to approve the course for continuing education hours.
(1) When approving a course, the Secretary shall identify the:
(A) type of the course;
(B) whether in-field, laboratory, or interactive distance learning;
(C) the number of hours completion of the course provides;
(D) whether the hours qualify as general hours or soil hours; and
(E) whether the provider is able to verify attendance and participation.
(2) Courses that consist of passive listening or viewing of recorded matter shall not be approved for continuing education hours.

(c) The Secretary shall provide at least one soil course each year to assist designers fulfilling their continuing education hours.

§ 1-708 Audit of Designers

(a) The Secretary may review, on a random basis, or in response to a complaint, or on his or her own motion, the performance of a designer, including the following and any work completed by the designer in association with the following:
   (1) soil analysis and testing procedures employed by the designer;
   (2) systems designed by the designer; and
   (3) designs approved or recommended for approval by the designer.

(b) The Secretary may use the results to work with a designer to reduce the number of administratively and technically incomplete or deficient applications.

(c) The Secretary may provide the results of the audit to the Office of Professional Regulation.

Subchapter 8 – General Technical Standards for Wastewater Systems and Potable Water Supplies

§ 1-801 Basic Requirements

(a) All buildings or structures or campgrounds shall have a wastewater system that complies with the technical standards in this Subchapter and Subchapters 9 and 10 except as provided in § 1-301(b), § 1-802, or an approval for an innovative/alternative system or component.

(1) Except as provided in Subsection (a)(2), the wastewater system shall be physically connected to the building or structure it serves.

(2) The wastewater system serving a building or structure may be a wastewater system that is not physically connected to the building or structure provided the wastewater system is physically connected to a separate building or structure and the buildings or structures are on the same lot and not more than 500 feet apart.

(b) A wastewater system shall be maintained to ensure that the components of the wastewater system meet the technical standards in this Subchapter and Subchapters 9 and 10 and do not operate improperly.

(c) All buildings or structures or campgrounds shall have a potable water supply that complies with the technical standards in this Subchapter and Subchapters 11 and 12 except as provided in § 1-301(b), § 1-802, or an approval for an innovative/alternative system or component.

(1) Except as provided in Subsection (c)(2), the potable water supply shall be physically connected to the building or structure it serves.

(2) The potable water supply serving a building or structure may be a potable water supply that is not physically connected to the building or structure provided the potable water supply is physically connected to a separate building or structure and the buildings or structures are on the same lot and not more than 500 feet apart.

(d) A potable water supply shall be maintained to ensure that the components of the potable water supply meet the technical standards in this Subchapter and Subchapters 11 and 12 and do not operate improperly.

(e) All dependent campsites in a campground shall be within 400 feet of a toilet facility. The toilet facility may consist of water carried toilets, vault privies, composting toilets, or incinerating toilets.

(f) There shall be at least 1 toilet to serve each group of 10 or fewer dependent campsites in a campground.

(g) Each component of a wastewater system shall be sized to convey, treat, or dispose of the design flow associated with the component and identified in § 1-803.

(h) Each component of a potable water supply shall be sized to supply or convey the design flow associated with the component and identified in § 1-803.

(i) A water faucet shall be provided within 400 feet of any dependent campsite in a campground. Common drinking vessels at faucets are prohibited.

(j) At least one dumping station shall be provided per campground unless:
- (1) all campsites have individual sanitary sewer service lines; or
- (2) the campground consists entirely of tent sites and the campground prohibits the use of camping units with interior plumbing.

(k) Each dumping station in a campground shall:
- (1) serve no more than 100 dependent campsites;
- (2) be designed with a concrete apron that slopes to the sanitary sewer service line inlet; and
- (3) be supplied with piped water under pressure for flushing and cleaning of the concrete apron after each use.

§ 1-802 Variances

(a) An application for a permit or permit amendment may include a request, prepared by a designer, for a variance from one or more technical standards in this Subchapter and Subchapters 9, 10, 11, and 12 if the application meets one of the following:
- (1) involves the construction of a replacement system or replacement supply and the variance is sought for the replacement system or replacement supply, provided the replacement system is not proposed in lieu of a replacement area and in the same application as the wastewater system it would replace;
- (2) involves the change in use of a single-family residence from seasonal to year-round use and the variance is sought for the wastewater system or potable water supply proposed to serve the single-family residence, provided no holding tank is proposed as part of the wastewater system;
- (3) involves the subdivision of an improved lot, and, if desired, the construction of a replacement system in lieu of a replacement area, and the variance is sought for the replacement area or replacement system, provided the lot is improved with, and the replacement area or replacement system is proposed to serve, either:
  - (A) up to two single-family residences or one duplex; or
  - (B) up to two buildings or structures, two campgrounds, or one building or structure and one campground, where the total design flow for the uses is 560 gallons per day or less.

(b) Variances are not available in circumstances other than those identified in Subsection (a).

(c) Notwithstanding Subsection (a), a variance from a technical standard in these Rules shall not be granted when an increase in design flow is sought for the wastewater system or potable water supply.

(d) An application that includes a request for a variance shall identify the specific provision and technical standard in these Rules for which the applicant is requesting a variance,

identify the alternative design standard requested, and contain the site plan, detail sheets, narrative, or data that supports the grant of such a variance pursuant to the standard identified in Subsection (e) or (f).

(1) The burden shall be on the person requesting the variance to provide information that would enable the Secretary to reach each conclusion identified in Subsection (e) or (f).

(2) The Secretary may request additional information that he or she deems necessary to determine whether to grant a variance pursuant to Subsection (e) or (f).

(e) The Secretary shall grant a variance from a technical standard in these Rules only when the Secretary reaches each of the following conclusions:

(1) Full compliance with the technical standard cannot be achieved.

(2) The variance is the minimum necessary considering both cost and the potential impacts on human health and the environment. In reaching this determination, the Secretary shall presume that the following designs are the minimum necessary considering the cost and impacts on human health and the environment:

(A) For the design of a soil-based wastewater system, when it is determined that a reduction of no more than 4 inches in the depths of naturally occurring soil required pursuant to § 1-903 is not needed to protect the water table, a variance from one or more technical standards in § 1-903 is available and the following variances are available:

(i) Variances from the requirement for a pump station and that allow the development of an in-ground leachfield.

(ii) Variances that allow an in-ground leachfield instead of a pump station and an at-grade leachfield.

(iii) Variances that allow an at-grade leachfield instead of a leachfield in a mound or bottomless sand filter.

(B) For the design of a potable water supply, when a proposed groundwater potable water source cannot meet the isolation required pursuant to § 1-1104(e) from an existing leachfield or septic tank, and the proposed potable water source is designed to include casing that exceeds the casing required pursuant to § 1-1206 or to include grouting of any annular space of the proposed potable water source, a variance from § 1-1104(e) for isolation from the existing leachfield or septic tank is available.

(3) The variance will not allow the wastewater system or potable water supply to function as a failed supply or failed system.

(4) If sought for a replacement system or replacement supply, the replacement system or replacement supply will provide equal to or better protection to human health or the environment than the wastewater system or potable water supply it is replacing. In reaching this determination the Secretary shall consider, among other factors, if the replacement system or replacement supply will provide equal or better protection of the groundwater, will provide equal or better protection of surface water, and will provide equal or better protection for potable water sources and public water sources.

(f) Notwithstanding Subsection (e):

(1) When a variance is sought for a replacement system or replacement supply that will replace a wastewater system or potable water supply exempt from the permitting requirements of this Subchapter under § 1-303, the conclusion in Subsection (e)(1) is not applicable, and the Secretary shall grant a variance from a technical standard in these Rules when the Secretary reaches the conclusions in Subsection (e)(2), (3), and (4).

(2) When a variance is sought in the circumstance identified in Subsection (a)(3), the conclusion in Subsection (e)(1) is not applicable, and the Secretary shall grant a variance from a technical standard in these Rules when the Secretary reaches the conclusions in Subsection (e)(2), (3), and (4) and concludes that full compliance with the technical standard cannot be achieved within 500 feet of each building or structure or campground proposed to be served by the replacement area or replacement system.

(g) The grant of a variance by the Secretary shall be in writing in the permit for the wastewater system or potable water supply for which the variance was requested by identifying that the permit includes the grant of a variance and by identifying both the technical standard for which the variance is granted and the design modification or alternative design standard approved.

(h) The grant of a variance shall not relieve the applicant of the responsibility to comply with all other provisions of these Rules and applicable State and local laws.

§ 1-803 Design Flows

(a) For the purposes of this Section, the term "employee," when associated with a non-residential use of a residence, does not include employees residing in the residence whose water usage is included as part of a residential use.

(b) For the purposes of this Section, the term "meal" means any food service that includes more than coffee, tea, water, other beverages, and pre-packaged food. Meals include any food service that the Vermont Department of Health determines to be a meal or requires a Health License to be prepared on the premises.

(c) The design flow for individual components of a wastewater system and potable water supply, and the design flow for a replacement area, that will serve a single-family residence on a lot with no other buildings or structures and with no campground, shall be calculated based on a minimum of 2 bedrooms, regardless of whether the residence will contain only one bedroom.

(d) The design flow for individual components of a wastewater system and a potable water supply, and the design flow for a replacement area, that will serve buildings or structures with a residential use shall be calculated using one of the following methods for the total living units served:

(1) The design flow of 70 gallons per day per person at the maximum residential occupancy proposed for each living unit, provided the resulting design flow is not

less than the design flow calculated using the following minimum design standards:

(A) a living unit contains at least 1 bedroom, except as provided in Subsection (c);

(B) the first 3 bedrooms in a living unit contain a minimum occupancy of 2 persons per bedroom; and

(C) each additional bedroom beyond 3 contains a minimum occupancy of 1 person per bedroom.

(2) The design flow specified in Table 8-1.

(e) The design flow for individual components of a wastewater system and potable water supply, and the design flow for a replacement area, that will serve campgrounds shall be calculated using the design flow specified in Table 8-2.

(f) The design flow for individual components of a wastewater system and potable water supply, and the design flow for a replacement area, that will serve buildings or structures with a non-residential use shall be calculated using one of the following methods:

(1) The design flow specified in Table 8-3 for the maximum quantity of each unit proposed.

(2) A Secretary approved design flow using water meter data authorized pursuant to § 1-804.

(3) For uses not appearing in Table 8-3:

(A) when the wastewater system is a soil-based wastewater system, or a sanitary sewer service line that conveys wastewater to an indirect discharge system, a design flow approved by the Secretary following receipt of the designer's proposal for a design flow that will accommodate the wastewater strength and characteristics and the amount of water necessary for the proposed use, taking into account:

(i) the design flows for uses in Table 8-3 with similar water usage and wastewater strength and characteristics;

(ii) the submission of water use data that meets the requirements in § 1-804(d) and (e) and the submission of wastewater strength and characteristics that meets the requirements of § 805(c), accompanied by a request to establish a design flow for the proposed use that includes the information identified in § 1-804(a) and (c); or

(iii) for commercial, industrial, manufacturing, or agricultural uses, the design flow determined by other methods approved by the Secretary. Other methods may include manufacturer's specifications and method used to determine design flow and wastewater strength and characteristics; flows and wastewater strength and characteristics from other States or the Environmental Protection Agency; or published and peer review studies by States, Colleges, or Universities that include flows and wastewater strength and characteristics.

(B) when the wastewater system is a sanitary sewer service line that conveys wastewater to a wastewater treatment facility, a design flow approved by

the Secretary following receipt of the designer's proposal for a design flow that will accommodate the wastewater strength and the amount of water necessary for the proposed use, taking into account:

(i) the design flows for uses in Table 8-3 with similar water usage and wastewater strength;

(ii) the submission of water use data that meets the requirements in § 1-804(d) and accompanied by a request to establish a design flow for the proposed use that includes the information identified in § 1-804(b) and (c); or

(iii) for commercial, industrial, manufacturing, or agricultural uses, the design flow determined by other methods approved by the Secretary. Other methods may include manufacturer's specifications and method used to determine design flow and wastewater strength and characteristics; flows and wastewater strength and characteristics from other States or the Environmental Protection Agency; or published and peer review studies by States, Colleges, or Universities that include flows and wastewater strength and characteristics.

(g) In the following situations, a designer may reduce, by the reduction indicated as follows, the design flow calculated pursuant to Subsection (d), (e), and (f) for individual components of a wastewater system or potable water supply:

(1) If the living unit served is senior housing but does not include assisted living or nursing care associated with the senior housing, the design flow for a component that will serve the living unit may be reduced to 105 gallons per day (based on 1.5 persons per living unit).

(2) If not more than four living units will be served by a component and each living unit contains only composting or incinerating toilets, the design flow for the component may be reduced by 25 percent.

(3) If a building or structure, other than in a living unit, or a campground, that will be served by a component contains only composting or incinerating toilets and the Secretary determines that a reduction in design flow proposed by the applicant's designer for the component will not increase the probability the system or supply will fail, the design flow for the component may be the design flow approved by the Secretary.

(h) The design flow for individual components of a wastewater system or potable water supply, and the design flow for a replacement area, that will serve a building or structure or campground with multiple uses, whether residential or non-residential, shall be determined by calculating the maximum sum of the design flows for each use of the building or structure or campground in any 24-hour period.

(i) When a wastewater system includes a gravity sanitary sewer service line or gravity sanitary sewer collection line exceeding 500 feet in total length, individually or in combination, the following infiltration design flow shall be added to the design flow identified in Subsection (c) through (h) for individual components of the wastewater system that receive flow from the service or collection line:

(1) 300 gallons per inch of diameter per mile of pipe per day; or
(2) 200 gallons per inch of diameter per mile of pipe per day when the Secretary approves the reduction based on a request and specific information provided by a designer in the application.

Table 8-1
Design Flows for the Residential Use of Buildings or Structures With 5 or More Living Units

Number of Living Units	Wastewater System (Gallons Per Day)	Potable Water Supply (Gallons Per Day)
5	1575	1800
6	1830	2160
7	2065	2520
8	2280	2880
9	2565	3240
10	2800	3600
11	3036	3960
12	3264	4320
13	3848	4680
14	3696	5040
15	3900	5400
16	4112	5760
17	4369	6120
18	4518	6480
19	4712	6840
20 or more	245 per living unit*	360 per living unit

* Provided the individual component of the wastewater system is receiving less than 50,000 gallons per day. When the component is receiving 50,000 gallons per day or more, the design flow for the component decreases to 210 per day per living unit.

Table 8-2
Design Flows for Campsites

Use of Campsite		
Type or description of campsite use	**Units**	**Gallons Per Day Per Unit**
Campsites for Tents and Other Camping Units with No Interior Plumbing		
central toilets with showers	site	75
central toilets without showers	site	50

Use of Campsite		
Type or description of campsite use	**Units**	**Gallons Per Day Per Unit**
Campsites for Camping Units with Interior Plumbing but No Sewer Hook-Up		
central toilets facilities	site	50
dumping station	site	25
Campsites for Camping Units with Sewer Hook-Up		
with or without central toilet facilities serving the units	site	75
Cabins with Plumbing; Park Model Recreational Vehicles		
with or without kitchen but without laundry facilities	sleeping space*	50
with or without kitchen but with laundry facilities	sleeping space*	70

* Design flow shall be calculated based on a minimum of four sleeping spaces.

Table 8-3
Design Flows for Non-Residential Uses of Buildings or Structures

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
Animal, Dog, or Small Animal Grooming; Kennels		
for each use	employee	13
grooming station	station	400
kennels cages or enclosures	cage or enclosure	25
Airport		
airport	passenger	4
with restaurant licensed by the Department of Health	seat licensed by the Department of Health	use ***Restaurant***

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
Assembly Area; Conference Room with no food service		
for each use	seat	4
Assembly Area; Banquet Hall; Conference Room with catered food service prepared off the lot		
for each use	seat per meal	8
Assembly Area; Banquet Hall; Conference Room with food service for one meal (food prepared in a kitchen on the lot) (if more than one meal is served, use Restaurant)		
for each use	seat	14
Barber Shop; Hair Salon		
no hair washing	chair	50
hair washing	chair	150
hair salon	stylist, operator	32
barber shop; hair salon	employee (not a barber, stylist or operator)	13
Beer, Wine, or Spirits Tasting Room		
no public toilets, may have seats but no meal served	tasting room	100
no public toilets, may have seats but no meal served	employee	13
with public toilets and seats but no meal served	tasting room	300
with public toilets and seats if meal served	seat licensed by the Department of Health	use ***Restaurant*** or 300, whichever is greater
Brewery		
brewery	gallon of beer brewed	4.5
brewery	employee	13
Bowling Alley		

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
bowling alley	lane	67
restaurant	seat licensed by the Department of Health	use ***Restaurant***
Car Wash		
car wash	car	based on the manufacturer's specifications for per vehicle wash
with employees	employee	13
providing public toilets	patron	4
Care Facilities		
correctional facility	sleeping space	125
assisted living facility	sleeping space licensed by the Agency of Human Services	85
hospitals	sleeping space	250
nursing care home	sleeping space	125
residential care homes or disabled housing	bedroom	105
rehabilitation or therapeutic community residence and shelters	sleeping space licensed by the Agency of Human Services	70
rehabilitation or therapeutic community residence and shelters	non-resident staff per shift	13
other care facilities	sleeping space	125
Catering or Take-Out Facility (no on-premise public seating)		
limited operation – serving coffee, steamed or roto-grilled frankfurters	N/A	0
commercial catering within a residence	N/A	100
commercial catering within a residence	employee	13
commercial caterer not in a residence	N/A	100

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
commercial catering not in a residence	employee	13
ice cream shop	N/A	100
ice cream shop	employee	13
bakery	N/A	100
bakery	employee	13
deli	N/A	100
deli	employee	13
with seafood license	N/A	100**
with seafood license	employee	13**
Child Care Facility		
without meals	child, employee	13
with 1 meal	child, employee	16
with 2 meals	child, employee	19
Children's Summer Camp		
overnight camp	person	45
day camp (no meals served)	person	13
day camp (meals served)	person	use ***Child Care Facility***
Church; Temples; Mosques; Other Places of Worship		
sanctuary	seat	1
other areas of assembly	seat	4
meals prepared off site	seat per meal	8
Dentist Office		
dentist office	dentist, hygienist, other medical employee	32
dentist office	non-medical employee	13
dentist office	chair	based on manufacturer's specifications; if no specifications, 100
dentist office	patient	4, unless using 100 gallons or more per chair (then 0)

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
Doctor Office		
doctor office	doctor, nurse, other medical employee	32
doctor office	non-medical employee	13
doctor office	patient	4
Food Markets; Grocery Stores; Food Stores		
with bakery	N/A	100
with deli	N/A	100
with meat department but without garbage grinder	100 square feet	7.5
with meat department with garbage grinder	100 square feet	11
with seafood license	N/A	100**
with public seating	seat licensed by the Department of Health	15
Hotels; Motels; Inns; Bed & Breakfasts; Extended Stay Hotels		
for each use	sleeping space	50
meals served only to guests	meal per sleeping space	5
kitchen in room	sleeping space	5
staff, manager, or owner bedroom	bedroom	140
on premise laundry	machine	use ***Laundromat; Laundry Services***
Laundromat; Laundry Services		
laundromat or laundry service	top or front-loading machine	450
laundromat or laundry service	machine	case by case based on type of operation, hours of operation, and manufacturer's specifications
laundromat or laundry service	employee	13

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
Marina		
with no showers	slip, mooring	4
with showers	slip, mooring	10
holding tank pump-out	boat	25 with a minimum size on-shore holding tank of 500 gallons
marina	employee	13
Nail Salon		
nail salon	manicurist or pedicurist	32
nail salon	employee (non-manicurist or pedicurist)	13
nail salon	manicure station	50
nail salon	pedicure station	100
Office, Factory, Welcome Center, and Place of Employment		
without showers	employee per shift	15
with showers	employee per shift	20
with cafeteria	seat	use ***Restaurant***
with public toilet	patron or client (non-employee)	4
Restaurant		
restaurant serving a max. of 2 meals per day	seat licensed by the Department of Health	27
restaurant serving a max. of 3 meals per day	seat licensed by the Department of Health	40
restaurant with 9 or fewer seats	restaurant	300
School		
boarding; includes dormitories with staff, cafeterias, and showers	student	90
grades pre-school through 8 w/o cafeterias or showers	student, employee	5

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
grades 9 through 12 w/o cafeterias or showers	student, employee	12
grades pre-school through 8 with cafeteria and w/o showers	student, employee	8
grades 9 through 12 with cafeteria and w/o showers	student, employee	15
grades pre-school through 8 with cafeteria and showers	student, employee	11
grades 9 through 12 with cafeteria and showers	student, employee	18
Service Station		
service station	employee per shift	13
with public toilets	gas or diesel fueling hose	125
Sports Arena; Skating Rink; Soccer Field; Tennis Court; Pools; Hot Tubs; Saunas; Spas; Health Club; Exercise Gym; Dance Studio; Similar Facility		
for each use	trainer	32
for each use	employee (non-trainer)	13
for each use	spectator	3
without showers	participant	4
with showers	participant	8
restaurant or cafeteria	seat licensed by the Department of Health	15
water treatment backwash	case by case	case by case based on quantity of backwash per cycle and frequency of cycle
rink, pool, spa discharge	case by case	case by case based on the quantity of discharge and frequency of discharge
Store not otherwise identified in this Table		
store in a shopping center, mall, or on an individual lot	varies	4 gpd/100 sq. ft. or 90 gpd/store, whichever is greater

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
Therapist Office (massage, physical therapy, acupuncturist, chiropractor)		
therapist office	therapist	32
therapist office	employee (non-therapist)	13
without showers	client	4
with showers	client	8
Therapist Office (mental health counseling)		
therapist office	therapist, employee	13
therapist office	client	4
Toilet Buildings associated with Outside Activities such as Picnic Areas and Recreational Fields		
toilet and handwashing	person	3
showers, toilet, and handwashing	person	8
Theatre		
drive-in	car space	3
indoor	seat	3
with food concession	concession area	100
Veterinary Clinic		
veterinary clinic	veterinarian	200
veterinary clinic	employee (non-veterinarian)	13
with animal boarding	animal	25

* Design flows for each use take into account the water use of employees and toilets available to the public, unless separately addressed for a use.

** Design flow does not include disposal of ice used for storing and displaying seafood. If the ice is disposed of by spraying with water to melt the ice, the design flow needs to include the quantity of water needed to melt the ice.

Note: A use identified in Table 8-3 may generate high strength wastewater. Examples include restaurant use, convenience store use particularly with coffee sale, bar use, and coffee and donut shop use.

§ 1-804 Water Meter Data

(a) An applicant or prospective applicant may submit a written request prepared by a designer that the Secretary determine that the wastewater strength and quantity of water necessary for a proposed non-residential use of a building or structure does not require the design flows specified in Table 8-3 for individual components of a soil-based wastewater system or of a sanitary sewer service line that conveys wastewater to an indirect discharge system, for individual components of a potable water supply, and for the replacement area, and that the Secretary assign a design flow for the use based on the following factors:

(1) the nature and design of the proposed use, including equipment that may be part of the use and any manufacturing process;
(2) daily water use data, as further described in Subsection (c);
(3) daily wastewater discharge collected and recorded using a method approved by the Secretary prior to collection;
(4) seasonal variations known or anticipated in occupancy or water usage of the building or structure;
(5) wastewater strength and characteristics analysis data, including BOD and TSS, that may be required to adjust the sizing of the leachfield according to § 1-904, as further described in Subsection (e); and
(6) other information the Secretary deems necessary based on the specific proposed use and request.

(b) An applicant or prospective applicant may submit a written request prepared by a designer that the Secretary determine that the quantity of water necessary for a proposed non-residential use of a building or structure does not require the design flows specified in Table 8-3 for individual components of a sanitary sewer service line that conveys wastewater to a wastewater treatment facility and individual components of a potable water supply and that the Secretary assign a design flow for the use based on the following factors:

(1) the nature and design of the proposed use, including equipment that may be part of the use and any manufacturing process;
(2) daily water use data, as further described in Subsection (c);
(3) daily wastewater discharge collected and recorded using a method approved by the Secretary prior to collection;
(4) seasonal variations known or anticipated in occupancy or water usage of the building or structure; and
(5) other information the Secretary deems necessary based on the specific proposed use and request.

(c) The burden shall be on the applicant or prospective applicant requesting the determination pursuant to Subsection (a) or (b) to satisfy the following requirements with information from a designer:

(1) Propose a design flow for the wastewater system based on:
    (A) the 90th percentile of all daily water meter readings; and
    (B) a proposed safety factor that accounts for fluctuations in metered flows. Considerations for determining a safety factor include:

(i) the number of days the water meter readings exceeds the average flow calculated based on the water meter readings for the year;
(ii) the number of days the water meter readings exceed the average flow calculated based on the water meter readings during the 3 consecutive months representing the highest water usage; and
(iii) the 90th percentile of the water meter readings representing the highest water usage for 3 consecutive months.

(2) Propose a design flow for the potable water supply based on the peak recorded daily water meter reading.

(3) Demonstrate that the wastewater system and potable water supply comply with technical standards in this Subchapter and Subchapters 9, 10, 11, and 12;

(4) Provide information that addresses each factor in Subsection (a) or (b) and enables the Secretary to reach a determination and assign a design flow.

(d) Water use data shall include the following:

(1) A minimum of daily water meter readings for a year, unless:

(A) the wastewater system and potable water supply will be operated for less than 180 days of days, in which case, daily water meter readings shall be taken for each day in operation; or

(B) the wastewater system and potable water supply will be operated for 180 days or more and the Secretary concludes that 1 year of daily water meter readings is not necessary to demonstrate the wastewater strength and quantity of water necessary for the proposed use and the Secretary provides approval, prior to the collection of water meter readings, for daily water meter readings to be taken for 180 consecutive days. An applicant seeking such approval shall submit the following information:

(i) the nature the existing use of the building or structure, including equipment that may be part of the use and any manufacturing process, that will be in use when meter readings will not be taken;
(ii) seasonal variations in occupancy or water usage of the building or structure demonstrating that all variations will be recorded during the 180 days;
(iii) wastewater strength and characteristics, including BOD and TSS, that may be required to adjust the sizing of the leachfield according to § 1-904 and as further described in Subsection (e), for the days when meter readings will not be taken; and
(iv) other information the Secretary deems necessary based on the specific proposed use and request.

(2) Daily record of the number of occupants, employees, or other users of the building or structure, unless approval is provided by the Secretary, prior to collection of water meter readings and based in information submitted by the applicant, of an alternative basis for recording the intensity of the daily use of the building or structure.

(3) The quantity of process water used for industrial or manufacturing facilities.

(4) The quantity of water for domestic type use.

(5) The quantity of water that comes from the potable water supply serving the building or structure that will not discharge to the wastewater system.

(e) Wastewater strength and characteristics analysis data shall include 8-hour composite samples or other sampling method approved by the Secretary during the period of recording the water meter readings, taken at the following intervals:
  (1) 1 sample during each 3-month period of use of the building or structure, provided that, if the building or structure is in use for fewer than 6 months, a minimum of 2 samples are taken;
  (2) at least 2 of the samples shall be taken during the normal peak use of the building or structure or campground; and
  (3) more frequent sampling when the Secretary determines that the sampling results may not be representative of the use of the building or structure.

(f) The approval by the Secretary of a design flow different than that specified in Table 8-3 shall not be used for the purposes of determining, pursuant to § 1-301(a), whether an action will result in an increase in design flow of any component of a wastewater system or potable water supply.

(g) The approval by the Secretary of a design flow different than that specified in Table 8-3 for a proposed non-residential use of a building or structure shall:
  (1) be issued in writing in the permit for the wastewater system or potable water supply that will serve the building or structure; and
  (2) state that a reduction from the design flow specified in Table 8-3 was approved and identify the approved design flow.

§ 1-805 Wastewater Strength

(a) A leachfield for which design flow is determined pursuant to § 1-803(f)(2) or (3) or that will dispose of food processing waste, including a leachfield that will serve a building or structure with a use as a brewery, shall comply with the following requirements:
  (1) Septic tank effluent that is low strength may be discharged to the leachfield.
  (2) Septic tank effluent that is high strength but treated to reduce the strength to low strength may be discharged to the leachfield after such treatment.
  (3) Septic tank effluent that is high strength is prohibited from being discharged to the leachfield unless the leachfield is sized pursuant to Subsection (d).

(b) Wastewater strength of septic tank effluent shall be categorized based on the following standards:
  (1) Septic tank effluent is low strength when it meets the following standards:
    (A) $BOD_5 \leq 300$ mg/L;
    (B) TSS ≤ 150 mg/L; and
    (C) Fats, Oil & Grease (FOG) ≤ 50 mg/L.
  (2) Septic tank effluent that exceeds any one of the standards for BOD_5, TSS, or FOG specified in Subsection (b)(1) is high strength.

(c) When wastewater strength is determined for septic tank effluent, it shall be determined using one of the following methods:
  (1) sampling of BOD_5, TSS, and Fats, Oil, & Grease as an 8-hour composite or other sampling method approved by the Secretary;

(2) sampling of BOD_5, TSS, and Fats, Oil, & Grease from a wastewater system serving buildings or structures or campground with similar uses as an 8-hour composite or other sampling method approved by the Secretary; or

(3) literature review of BOD_5, TSS, and Fats, Oil, & Grease from buildings or structures, or campgrounds with similar uses, using the highest strength value identified for the particular uses.

(d) When a leachfield is proposed to dispose of high strength wastewater and is proposed using a Secretary-assigned design flow based on the submission of water use data and wastewater strength calculations pursuant to § 1-803(f)(3)(A) or § 1-804, the leachfield shall be sized using one of the following formulas in lieu of any formula or method for sizing the particular type of leachfield specified in Subchapter 9 that would otherwise apply:

(1) The formula SQLF = (BOD_5 ÷ 300 mg/L) x (DF ÷ AR) where

(A) SQLF = the minimum required square footage of leachfield in square feet;

(B) DF = the design flow in gallons per day; and

(C) AR = the application rate for the soil in gallons per square foot per day identified in § 1-911.

(2) Another formula proposed by an applicant's designer and accepted by the Secretary.

§ 1-806 Determining Baseline Design Flow for Increases in Design Flow

(a) For the purpose of this Section, the term "bedroom" means:

(1) a room identified as a bedroom on a lister card applicable between January 1, 2006 and December 31, 2006; or

(2) a room the owner of the building or structure between January 1, 2006 and December 31, 2006 certifies under oath was:

(A) occupied as sleeping quarters for a minimum of 90 days between January 1, 2006 and December 31, 2006; and

(B) contained one window or door that leads directly to the outside and one door that separates the room from the other living space.

(b) For the purpose of determining, pursuant to § 1-301(a), whether an action will result in an increase in design flow of any component of a wastewater system or potable water supply for which the clean slate permit exemption in § 1-303 is in effect, the baseline design flow from which a potential increase is measured shall be calculated according to the following:

(1) For living units:

(A) The maximum number of bedrooms in the living unit between January 1, 2006 and December 31, 2006, and the following standards:

(i) that the first 3 bedrooms in a living unit contains 2 persons per bedroom, unless Subsection (B) or (C) applies;

(ii) that each additional bedroom beyond 3 contains 1 person per bedroom, unless Subsection (B) or (C) applies; and

(iii) that each person uses 70 gallons of water per day.

(B) If a bedroom contains built-in beds providing sleeping space for more than 2 persons, the number of persons assumed for that bedroom shall be based on the number of sleeping spaces.

(C) If an applicant certifies under oath that more than 2 persons were living in a bedroom at the same time between January 1, 2006 and December 31, 2006, the number of persons assumed for that bedroom shall be based on the number certified to.

(2) For campsites, the maximum number and the use of campsites that existed between January 1, 2006 and December 31, 2006, and the design flow specified in Table 8-2.

(3) For buildings or structures or portions of building or structure other than living units, the use, or combination of uses in a 24-hour period, of the building or structure between January 1, 2006 and December 31, 2006 with the highest design flow, and the design flow specified in Table 8-3.

(c) For the purpose of determining, pursuant to § 1-301(a), whether an action will result in an increase in design flow of any component of a wastewater system or potable water supply for which the clean slate permit exemption in § 1-303 is not in effect, the baseline design flow from which a potential increase is measured shall be calculated by reference to the permit authorizing the operation of the component, the approved site plan, and the design flows specified in § 1-803.

(d) A baseline design flow shall not be calculated using a Secretary approved design flow authorized pursuant to § 1-804 except pursuant to § 1-803(f)(3) for uses not appearing in Table 8-3.

Subchapter 9 – Specific Technical Standards for Wastewater Systems

§ 1-901 Use of Term Wastewater System

Except as used in § 1-928, the term wastewater system as used in this Subchapter shall mean soil-based wastewater system.

§ 1-902 Replacement Area

(a) All existing and proposed wastewater systems on a lot on which one or more of the following actions is proposed in an application shall have designated replacement areas:
- (1) the construction of a new building or structure or the creation of a campground;
- (2) an increase in the design flow of the leachfield;
- (3) the subdivision of the lot; or
- (4) the construction of a wastewater system that is an innovative/alternative system with experimental approval.

(b) Notwithstanding Subsection (a), a replacement area is not necessary for a wastewater system in any of the following circumstances:
- (1) The wastewater system:
  - (A) includes a leachfield or combination of leachfields sized to dispose of 150 percent or more of the design flow;
  - (B) is designed to use pressure distribution; and
  - (C) meets the other technical standards in this Subchapter and Subchapters 8 and 10.
- (2) The wastewater system includes a mound that:
  - (A) includes a leachfield or combination of leachfields sized to dispose of 100 percent or more of the design flow; and
  - (B) meets the other technical standards in the September 10, 1982 version of these Rules, or a later version.
- (3) The wastewater system includes a bottomless sand filter that:
  - (A) includes a leachfield or combination of leachfields sized to dispose of 100 percent or more of the design flow;
  - (B) a hydrogeological analysis which demonstrates a minimum of 12 inches of unsaturated naturally occurring soil exists beneath the bottomless sand filter fill material to the induced water table; and
  - (C) meets the other technical standards in this Subchapter and Subchapters 8 and 10.

(c) A wastewater system that is required to have a designated replacement area can alternatively have a designated replacement system in lieu of the replacement area.

(d) A replacement area shall be an area that is able to comply with:
- (1) the technical standards in this Subchapter to support the type of leachfield, required naturally occurring soil around the perimeter of the leachfield, and fill material for the particular type of leachfield that is intended to be placed in the replacement area;

(2) if the wastewater system to be replaced is an innovative/alternative system with general use approval or pilot approval pursuant to Subchapter 4, the requirements of the approval to support a leachfield of the same type to be placed in the replacement area; or

(3) if the wastewater system to be replaced is an innovative/alternative system with experimental approval, the technical standards in this Subchapter to support a type of leachfield, required naturally occurring soil around the perimeter of the leachfield, and fill material for a leachfield that complies with the technical standards in this Subchapter to be placed in the replacement area.

§ 1-903 General Requirements for Soil-Based Wastewater Systems

(a) Except where otherwise specified in these Rules, a wastewater system shall include a leachfield, or combination of leachfields, that are sized to dispose of at least 100 percent of the design flow and that comply with all other technical standards in this Subchapter.

(1) The leachfields shall be in-ground leachfields, at-grade leachfields, leachfields in mounds, or leachfields in bottomless sand filters that comply with the technical standards in this Subchapter.

(2) Cesspools and dry wells (i.e., seepage pits) are prohibited from inclusion in a wastewater system.

(b) A wastewater system shall include a septic tank that complies with § 1-908 unless this requirement is waived by the Secretary following determination by the Secretary that a septic tank is unnecessary for the separation of grease, scum, and solids associated with the wastewater, based on information provided by an applicant's or prospective applicant's designer.

(c) When a hydrogeological analysis is performed to demonstrate compliance with a requirement in these Rules, the minimum length of the leachfield shall be the length determined from the hydrogeological analysis if this length is greater than that the minimum length required for the particular type of leachfield found in other provisions of these Rules.

(d) Ground slope requirements for leachfields

(1) The average ground slope of the naturally occurring soil across the entire width and length of the area where an in-ground leachfield is proposed to be constructed, or where the limits of the mound fill material for a leachfield to be constructed in a mound is proposed, or where the infiltrative surface for an at-grade leachfield is proposed to be constructed, shall not exceed 20 percent.

(2) When the design of an in-ground leachfield is less than 10 feet in width or length, the average slope shall not exceed 20 percent in the area measured beginning at the upslope edge of the trench or bed and continuing 10 feet horizontal distance in the downslope direction.

(3) Notwithstanding Subsections (d)(1) and (2), when the lot on which the building or structure or campground to be served by a proposed wastewater system was created before June 14, 2002:

(A) The average ground slope of the naturally occurring soil across the entire width and length of the area where an in-ground leachfield is proposed to

be constructed, or where the limits of the mound fill material for a leachfield to be constructed in a mound is proposed, or where the infiltrative surface for an at-grade leachfield is proposed to be constructed, shall not exceed 30 percent; and

(B) when the design of an in-ground leachfield is less than 10 feet in width or length, the average slope shall not exceed 30 percent in the area measured beginning at the upslope edge of the trench or bed and continuing 10 feet horizontal distance in the downslope direction.

(4) The average ground slope of the naturally occurring soil across the entire width and length of the area where a bottomless sand filter is proposed to be constructed shall not exceed 5 percent.

(5) When the average ground slope of the naturally occurring soil across the entire width and length of the area where an in-ground leachfield is proposed to be constructed, or where the limits of the mound fill material for a leachfield to be constructed in a mound is proposed, or where the infiltrative surface for an at-grade leachfield is proposed to be constructed, exceeds 20 percent, the design shall include the following:

(A) Methods for site stability in the area of the leachfield before, during, and after construction with specific attention to erosion prevention and sediment control.

(B) Specifications for:

(i) construction of the wastewater system;

(ii) stormwater diversions if needed to prevent stormwater from eroding soil in the area of the leachfield; and

(iii) re-vegetation to prevent soil erosion.

(6) The long dimension of distribution piping in a leachfield shall be laid parallel to the ground slope or contours.

(7) No leachfield shall be constructed in an area where the ground slope or contours create a depression that will act as a natural surface or groundwater collection area.

(e) No portion of a wastewater system, except a sanitary sewer service line or sanitary sewer collection line, shall be located in a floodway.

(f) A wastewater system shall be located, designed, and constructed in a manner that avoids impairment to the system and contamination from the system during flooding if the site is located in a mapped flood hazard area.

(g) No portion of a wastewater system shall be located in a Zone 1 of a Public Community Water System Source Protection Area, except a replacement system that replaces an existing wastewater system located in the same Zone 1.

(h) For wastewater systems in Class A watersheds, except a replacement system that is not proposed in lieu of a replacement area in the same application as the wastewater system it would replace, the following requirements apply:

(1) No wastewater system with a design flow that exceeds 1000 gallons per day shall be approved.

(2) The maximum cumulative design flow for multiple wastewater systems on the same lot shall not exceed 1000 gallons.

(i) The following are the required depths of naturally occurring soil for in-ground leachfields and at-grade leachfields.

(1) Except where Subsection (i)(2) applies and where otherwise specified in these Rules, the minimum depth of naturally occurring soil below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be:

(A) 36 inches to the seasonal high-water table;

(B) 36 inches to a soil with:

(i) a percolation slower than 60 minutes per inch; or

(ii) a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(C) 36 inches to a soil with a consistence of firm or denser regardless of texture;

(D) 48 inches to bedrock; and

(E) for a leachfield disposing of 2000 gallons or more per day of effluent, 36 inches to the induced water table, as demonstrated through a hydrogeological analysis.

(2) When the leachfield disposes of filtrate effluent and is designed in accordance with § 1-904(c), the minimum depth of naturally occurring soil below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be:

(A) 18 inches to a soil with:

(i) a percolation slower than 120 minutes per inch; or

(ii) a texture of sandy clay, silty clay, or clay;

(B) 18 inches to a soil with a consistence of firm or denser, regardless of texture;

(C) 24 inches to bedrock; and

(D) 18 inches to the induced water table, as demonstrated through a hydrogeological analysis.

(3) For in-ground leachfields, the minimum depths of naturally occurring soil shall be met for a distance of 10 feet beyond the edge of the leachfield stone or other infiltrative surface.

(4) For at-grade leachfields, the minimum soil depths of naturally occurring soil shall be met for a distance of:

(A) 25 feet beyond the limits of the fill material in the downslope direction; and

(B) 10 feet beyond the limits of the fill material on all other sides.

(j) The following are the required depths of naturally occurring soil and fill material for a leachfield in a mound.

(1) The minimum depth of naturally occurring soil below ground surface to site the leachfield, shall be:

(A) 24 inches to the seasonal high-water table;

(B) 24 inches to a soil with:

(i) a percolation rate slower than 120 minutes per inch; or

(ii) a texture of sandy clay, silty clay, or clay;

(C) 24 inches to a soil with a consistence of firm or denser, regardless of texture; and

(D) 24 inches to bedrock.

(2) The minimum depths of naturally occurring soil shall be met:

(A) for a distance of 25 feet beyond the limits of the fill material of the mound in the downslope direction;

(B) for a distance of 10 feet beyond the limits of the fill material at each end of the mound; and

(C) at the limits of the fill material of the mound in the upslope direction.

(3) The depth of mound fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(A) 36 inches to the seasonal high-water table;

(B) 36 inches to a soil with:

(i) a percolation rate slower than 120 minutes per inch; or

(ii) a texture of sandy clay, silty clay, or clay; and

(C) 48 inches to bedrock.

(4) The minimum depth of mound fill material between the bottom of the leachfield stone or other infiltrative surface of the leachfield and ground surface shall be 12 inches.

(k) Notwithstanding Subsection (j), the following are the required depths of naturally occurring soil and mound fill material for a leachfield in a mound when a hydrogeological analysis is performed.

(1) The minimum depth of naturally occurring soil below ground surface to site the leachfield shall be 24 inches to bedrock.

(2) The minimum depth of naturally occurring soil beneath the mound fill material to site the leachfield shall be:

(A) 6 inches to the induced water table, as demonstrated through a hydrogeological analysis; or

(B) 6 inches to the induced water table at the limits of the fill material, as demonstrated through a hydrogeological analysis completed through a method identified in Subsection (r)(1)(B) or (C), regardless of whether the induced water table rises to less than 6 inches beneath the mound fill material or rises into the mound fill material beneath the leachfield.

(3) The minimum depths of naturally occurring soil shall be met:

(A) for a distance of 25 feet beyond the limits of the fill material of the mound in the downslope direction; and

(B) for a distance of 10 feet beyond the limits of the fill material of the mound at each end of the mound; and

(C) at the limits of the fill material of the mound in the upslope direction.

(4) The depth of mound fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(A) 36 inches to the induced water table, as demonstrated through a hydrogeological analysis;

(B) 36 inches to a soil with:

(i) a percolation rate slower than 120 minutes per inch; or

(ii) a texture of sandy clay, silty clay, or clay; and

(C) 48 inches to bedrock.

(5) The minimum depth of mound fill material between the bottom of the leachfield stone or other infiltrative surface of the leachfield and ground surface shall be 12 inches.

(l) Notwithstanding Subsection (j), the following are the required depths of naturally occurring soil and mound fill material for a leachfield in a mound that disposes of filtrate effluent and is designed in accordance with § 1-904(c).

(1) The minimum depth of naturally occurring soil below ground surface to site the leachfield shall be 18 inches to bedrock.

(2) The minimum depth of naturally occurring soil beneath the mound fill material to site the leachfield shall be:

(A) 6 inches to the induced water table, as demonstrated through a hydrogeological analysis; or

(B) 6 inches to the induced water table at the limits of the mound fill material, as demonstrated through a hydrogeological analysis completed through a method identified in Subsection (r)(1)(B) or (C), regardless of whether the induced water table rises to less than 6 inches beneath the fill material or rises into the mound fill material beneath the leachfield.

(3) The minimum depths of naturally occurring soil shall be met:

(A) for a distance of 25 feet beyond the limits of the fill material of the mound in the downslope direction;

(B) for a distance of 10 feet beyond the limits of the fill material of the mound at each end of the mound: and

(C) at the limits of the fill material of the mound in the upslope direction.

(4) The depth of mound fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(A) 18 inches to the induced water table, as demonstrated through a hydrogeological analysis;

(B) 18 inches to a soil with:

(i) a percolation rate slower than 120 minutes per inch; or

(ii) a texture of sandy clay, silty clay, or clay; and

(C) 24 inches to bedrock.

(5) The minimum depth of mound fill material between the bottom of the leachfield stone or other infiltrative surface of the leachfield and ground surface shall be 12 inches.

(m) The following are the required depths of naturally occurring soil and bottomless sand filter fill material for a leachfield in a bottomless sand filter.

(1) The minimum depth of naturally occurring soil below ground surface to site the leachfield shall be:

(A) 24 inches to a soil with:

(i) a percolation rate slower than 60 minutes per inch; or

(ii) a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(B) 24 inches to a soil with a consistence of firm or denser, regardless of texture; and

(C) 24 inches to bedrock.

(2) The minimum depth of naturally occurring soil beneath the bottom of the enclosure to site the leachfield shall be 6 inches to the induced water table, as demonstrated through a hydrogeological analysis.

(3) The minimum depths of naturally occurring soil shall be met for a distance of:

(A) 25 feet from the edge of the enclosure for the bottomless sand filter in the downslope direction; and

(B) 10 feet from the edge of the enclosure for the bottomless sand filter on all other sides.

(4) Except where Subsection (m)(5) applies, the depth of bottomless sand filter fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(A) 36 inches to the induced water table, as demonstrated through a hydrogeological analysis;

(B) 36 inches to a soil with:

(i) a percolation rate slower than 60 minutes per inch; or

(ii) a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(C) 36 inches to a soil with a consistence of firm or denser, regardless of texture; and

(D) 48 inches to bedrock.

(5) When a leachfield in a bottomless sand filter disposes of filtrate effluent and is designed in accordance with § 1-904(c), the depth of bottomless sand filter fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(A) 18 inches to the induced water table, as demonstrated through a hydrogeological analysis;

(B) 18 inches to a soil with:

(i) a percolation rate slower than 60 minutes per inch; or

(ii) a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(C) 18 inches to a soil with a consistence of firm or denser, regardless of texture; and

(D) 24 inches to bedrock.

(6) The minimum depth of bottomless sand filter fill material between the bottom of the leachfield stone or other infiltrative surface of the leachfield and ground surface shall be 12 inches.

(n) Except as allowed by (p) or (q) of this Subsection, a hydrogeological analysis shall be completed in each of the following circumstances:

(1) An in-ground leachfield, or at-grade leachfield, has a design flow of 2000 gallons per day or more.

(2) A leachfield in a mound with a design flow of 1000 gallons per day or more.

(3) The leachfield is constructed in a bottomless sand filter.

(4) There is a potential hydraulic connection between the leachfield or replacement area and a separate leachfield or replacement area because all of the following are true:

(A) the leachfield or replacement area is located 25 feet or closer upslope or downslope to another leachfield or another replacement area as measured from the following points:

(i) for in-ground leachfields, the limits of the leachfield stone or other infiltrative surface of the leachfield;

(ii) for at-grade leachfields, the limits of the fill material;

(iii) for leachfields in mounds, the limits of the fill material for the mound; and

(iv) for leachfields in bottomless sand filters, the edge of the enclosure.

(B) the downslope leachfield is located partially or entirely in the same flow path of the upslope leachfield as determined by ground slope or groundwater flow; and

(C) one of the following exist:

(i) the combined design flow for an in-ground leachfield, or at-grade leachfield, and any upslope leachfield is 2000 gallons per day or more;

(ii) the combined design flow for a leachfield in a mound and any upslope leachfield is 1000 gallons per day or more;

(iii) the downslope leachfield is in a bottomless sand filter; or

(iv) the downslope leachfield is unable to comply with the depth of naturally occurring soil required pursuant to this Section, regardless of the design flow of the proposed leachfield.

(o) The hydrogeological analysis required pursuant to Subsection (n) shall demonstrate that:

(1) the leachfield will maintain the depths of naturally occurring soil and fill material for the leachfield required by this Section; and

(2) any leachfield located downslope of a proposed wastewater system or replacement area will maintain the depths of naturally occurring soil and fill material for the leachfield required by this Section; or

(3) if the downslope leachfield is unable to comply with the depth of naturally occurring soil required pursuant to this Section, the induced water table does not rise closer to the bottom of the leachfield.

(p) The Secretary may waive the hydrogeological analysis required pursuant to Subsection (n)(1) or (4) when an applicant or prospective applicant requests a waiver and provides information from a designer demonstrating that any hydraulic interference will not reduce the depths of naturally occurring soil and fill material for each leachfield to less than that required by this Section.

(q) The Secretary may waive the hydrogeological analysis required under Subsection (n)(2), when an applicant or prospective applicant requests a waiver and provides information from a designer demonstrating that:

(1) the leachfield will dispose of filtrate effluent and is designed in accordance with § 1-904(c);

(2) the leachfield will be designed using a linear loading rate not exceeding 4.5 gallons per day per linear foot;
(3) there is a minimum of 24 inches of naturally occurring soil below ground surface to the seasonal high-water table, impermeable soil layer, and bedrock; and
(4) the limits of the fill material for the mound will be a minimum of 25 feet to an in-ground leachfield, a leachfield in a mound, and a leachfield in a bottomless sand filter.

(r) When a hydrogeological analysis is performed to demonstrate compliance with a requirement in these Rules, the hydrogeological analysis shall:
(1) Be completed through one of following methods:
(A) the simplified method described in § 1-927, performed by a hydrogeologist or a designer authorized to design the wastewater system for which the hydrogeological analysis is performed, provided the soil does not have a consistence of firm or denser and the leachfield is one of the following:
(i) an in-ground leachfield or at-grade leachfield with a design flow of less than 2000 gallons per day;
(ii) a leachfield in a mound with a design flow of less than 1000 gallons per day; or
(iii) a leachfield in a bottomless sand filter with a design flow of less than 1000 gallons per day;
(B) a method, performed by a hydrogeologist, approved by the Secretary based on using site specific soil descriptions and conservative hydraulic conductive assumptions; or
(C) a method, performed by a hydrogeologist, approved by the Secretary based on site specific hydraulic conductivity testing.
(2) Determine the minimum length of the leachfield based on the height of the induced water table.

(s) When a 2-year time of travel is calculated to demonstrate compliance with a requirement in these Rules, the 2-year time of travel shall be determined by:
(1) a hydrogeologist; and
(2) taking into consideration:
(A) the hydraulic gradient;
(B) porosity; and
(C) the saturated hydraulic conductivities in the materials with the largest saturated hydraulic conductivity.

(t) The distances over which naturally occurring soil is required to be met pursuant to § 1-903(i), (j), (k), (l), and (m) may overlap for different wastewater systems, but no portions of a wastewater system shall be located within the distance over which naturally occurring soil is required for a different wastewater system.

(u) When a wastewater system is designed to dispose only of food processing waste that does not contain pathogens and of wastewater from hand-washing fixtures located in the food processing area, the leachfield shall comply with the minimum depths of naturally occurring soil and fill material identified in Subsections (i)(2), (l), (m)(5) that are

otherwise reserved only for leachfields that dispose of filtrate effluent designed in accordance with § 1-904(c).

§ 1-904 Filtrate Effluent

(a) Wastewater systems designed to dispose of filtrate effluent shall:
- (1) be designed using pressure distribution pursuant to § 1-914; and
- (2) comply with all other technical standards in this Subchapter, except that a wastewater system designed to dispose of filtrate effluent may use up to twice the application rate of soil for sizing the leachfield required by § 1-911.

(b) A Class 1, Class B, or Class BW designer is required to submit the installation certification for the installation of a wastewater system designed to dispose of filtrate effluent.

§ 1-905 Water Table Monitoring

(a) Except for a leachfield designed in a mound using a curtain drain pursuant to § 1-921(c), monitoring of the water table shall be used to establish the seasonal high-water table for a site where a curtain drain is used to lower the seasonal high-water table.

(b) Monitoring of the water table may be used to establish the seasonal high-water table in lieu of determining the seasonal high-water table using soil evaluation pursuant to § 1-910(g).

(c) By March 1 of the year during which monitoring of the water table is to be conducted, the prospective applicant shall submit to the Secretary a proposal for water table monitoring prepared by a designer or hydrogeologist which meets the following requirements:
- (1) Takes into account:
  - (A) the site-specific drainage area;
  - (B) regional drainage that may affect the area being monitored;
  - (C) soil evaluation; and
  - (D) spacing of monitoring wells to sufficiently establish the water table level to site a leachfield.
- (2) Includes the following information:
  - (A) permit number if the project has a permit application submitted to the Secretary or the project has a permit;
  - (B) site location map;
  - (C) 911 address of the property on which monitoring wells will be located;
  - (D) landowner name, phone number, and mailing address;
  - (E) signed property access form;
  - (F) calculations for sizing the leachfield if the proposed use is known.
- (3) Includes a site plan showing, at a minimum:
  - (A) boundary lines and dimensions for the lot;
  - (B) anticipated footprint of any proposed wastewater systems if calculated;
  - (C) locations of all monitoring wells with corresponding identification number or letter;
  - (D) location of existing diversion ditches and curtain drains;

(E) location and construction details for proposed diversion ditches and curtain drains to be authorized by the Secretary;
(F) location and results of soil test pits and percolation tests; and
(G) any other existing or proposed features that may affect the leachfield area.

(4) Includes a detail sheet for the design of the monitor wells including:
(A) depth of the bottom of each well below ground surface;
(B) height of each well above ground surface;
(C) pipe material including:
(i) perforation spacing; and
(ii) filter fabric or method to prevent clogging or siltation of the monitoring pipes. The designer may propose to the Secretary alternatives to filter fabric when the designer concludes wells will not be subject to clogging or siltation.

(5) Includes a monitoring schedule and plan which meets the following requirements:
(A) A minimum of 4 water table monitoring wells shall be installed for each leachfield and replacement area, except in the following circumstances:
(i) The Secretary authorizes fewer monitoring wells to determine site suitability in the following situation:
(I) the area to be monitored is 75 feet or less in length;
(II) the area to be monitored is 75 feet or less in width;
(III) the area to be monitored is for an in-ground leachfield; and
(IV) soil evaluations indicate consistent soil depths to the anticipated seasonal high-water table
(ii) The Secretary requires additional monitoring wells to determine site suitability in the following situations:
(I) the length or width of the area intended for a leachfield or downslope receiving soil to be monitored exceeds 75 feet; or
(II) soil evaluations indicate highly varied soil depths to the anticipated seasonal high-water table.
(B) Monitoring shall occur between March 1 and May 31.
(C) Water table readings shall be taken at each well at least once every 5 days during the monitoring period by a designer or hydrogeologist.
(D) Each water table reading shall represent the water elevation for the 2 ½ days before and the 2 ½ days after a particular reading, or 1 ½ days if readings occur more frequently than every 5 five days.
(E) The recorded water table shall be based on the elevation of the ground surface at each monitoring well to the water table.

(d) Monitoring of the water table shall be completed in conformance with the water table monitoring proposal.
(1) Water table monitoring may begin prior to the Secretary's approval of the proposal, but the Secretary reserves the ability to ultimately determine that some or all of the monitoring does not meet the requirements of Subsection (a).
(2) The Secretary may conduct site visits and record the water table on a site undergoing monitoring.

(e) Data collected from monitoring of the water table shall be analyzed to determine the seasonal high-water table.

(1) The analysis shall be completed by:

(A) a Class 1, Class B, or Class BW designer authorized to design the wastewater system for which the analysis is being completed; or

(B) a hydrogeologist.

(2) A perched water table shall be analyzed in the same manner as any other type of water table.

(3) Except where Subsection (e)(4) applies, the analysis shall demonstrate that the water table did not:

(A) For more than 30 total days during the monitoring period, rise above the depth of naturally occurring soil required pursuant to § 1-903 to the seasonal high-water table.

(B) For more than 20 total days during the monitoring period, rise more than 6 inches above the depth of naturally occurring soil required pursuant to § 1-903 to the seasonal high-water table.

(C) For more than 10 total days during the monitoring period, rise more than 12 inches above the depth of naturally occurring soil required pursuant to § 1-903 to the seasonal high-water table.

(D) For any day during the monitoring period, rise more than 18 inches above the depth of naturally occurring soil required pursuant to § 1-903 to the seasonal high-water table.

(4) When a hydrogeological analysis is or will be performed for calculating the induced water table, the following requirements shall be met:

(A) The hydrogeological analysis:

(i) shall calculate the induced water table using the shallowest water level reading measured in the monitoring wells within the area for the leachfield or replacement area; or

(ii) if completed by a hydrogeologist, may identify the interpreted form of the induced water table within the area of the leachfield or replacement area using data acquired from each monitoring well.

(B) The analysis of the water level monitoring data shall demonstrate that the induced water table will not:

(i) For in-ground leachfields or at-grade leachfields that do not comply with the requirements of § 1-904(c), rise to less than 36 inches below the bottom of the leachfield stone or other infiltrative surface.

(ii) For in-ground leachfields or at-grade leachfields that dispose of filtrate effluent and are designed in accordance with § 1-904(c), rise to less than 18 inches below the bottom of the leachfield stone or other infiltrative surface.

(iii) For all other leachfields, rise to less than 6 inches below ground surface.

(f) Following completion of water table monitoring, all water table monitoring data collected shall be submitted to the Secretary.

(g) For sites on which the water table is monitored for more than 1 year, the seasonal high-water table shall be based on the year that recorded the most restrictive water table monitoring readings.

(h) The Secretary may allow sites on which the water table was previously monitored to be re-monitored when a physical change is planned for the site that is anticipated to affect the water table.

(1) Examples of physical changes the Secretary will consider include the installation of a curtain drain and the installation of a groundwater diversion that did not exist during the first monitoring of the site, provided these changes have Secretary approval if required by these Rules.

(2) When the Secretary has allowed re-monitoring, calculation of the seasonal high-water table shall be based on water table monitoring readings taken during the year of re-monitoring and shall not take into account prior years' readings.

Note: Appendix C, Figure C-2, depicts a detail of a typical groundwater monitoring well.

§ 1-906 Site Modifications

(a) Requirements for curtain drains.

(1) Except for a leachfield designed in a mound pursuant to § 1-921(c), if the area in which a leachfield is proposed to be located does not comply with depth of naturally occurring soil required pursuant to § 1-903 to the seasonal high-water table, the design of a wastewater system may, in the following circumstances only, rely on curtain drains to lower the seasonal high-water table in order to comply with § 1-903:

(A) The Secretary has pre-authorized the installation and use of such drains pursuant to Subsection (a)(3) and monitoring of the water table has been conducted pursuant to § 1-905 to demonstrate the drain's effectiveness.

(B) In conjunction with an application, the Secretary approves the installation of and use of such drains, provided the following requirements are met:

(i) The curtain drain is designed in compliance with a plan that conforms with the requirements in Subsection (a)(2)(C).

(ii) The bottom of the curtain drain is designed to be a minimum of 12 inches into a soil with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay.

(iii) The curtain drain is designed to lower the seasonal high-water table 6 inches or less.

(iv) The area in which the leachfield is proposed to be located and the area 100 feet upslope meet the following requirements:

(I) has permeable soil or soil that does not have soil with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(II) is underlain by a low permeable soil with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(III) has a slope of 5 percent or greater with a seasonal high-water table 24 inches or greater below ground surface

where the low permeable soil layer is 12 inches or more below the seasonal high-water table; and

(IV) has a recharge area extending 100 feet or more upslope of the curtain drain.

(v) Unless the seasonal high-water table is determined by water table monitoring conducted pursuant to § 1-905, when a hydrogeological analysis is completed, the seasonal high-water table is determined by soil evaluation conducted pursuant to § 1-910(g).

(2) To seek pre-authorization to install and use a curtain drain, a prospective applicant, prior to submitting an application, shall submit the following to the Secretary:

(A) A letter requesting authorization to install and use a curtain drain.

(B) A signed property access form.

(C) A plan prepared by a Class I, Class B, or Class BW designer or hydrogeologist that:

(i) shows the location and point of discharge of the drain;

(ii) depicts construction details for the drain including a profile and typical sections;

(iii) specifies the type of construction material to be used that is sufficient to transmit the water from the site and to prevent clogging of the drain that will decrease its effectiveness. Acceptable material shall be:

(I) leachfield stone;

(II) perforated or other porous pipe; and

(III) filter fabric wrapped around the leachfield stone to prevent clogging;

(iv) depicts the design of the outlet of the drain to prevent erosion and clogging;

(v) depicts cleanouts to grade;

(vi) depicts rodent guards at the outlet of the drain; and

(vii) demonstrates compliance with all isolation distances required pursuant to § 1-912.

(D) Supporting information required by the Secretary, including permeability and sieve analysis of the soil at the site, when necessary to establish the effectiveness of the proposed drain.

(3) The Secretary, upon determining that the plan and any supporting information provided by the designer or hydrogeologist complies with Subsection (a)(2)(C) and (D), shall issue an authorization letter with conditions to install and use the drain.

(b) Requirements for sites following re-grading.

(1) When a site is re-graded for the purpose of constructing a leachfield, the following requirements shall be met:

(A) Soil excavations required and percolation tests completed pursuant to § 1-910 shall be performed after re-grading.

(B) There shall be a minimum of 6 feet of naturally occurring soil between the downslope side of any area that has been re-graded and either the edge of

a leachfield or limits of the fill material for the particular type of leachfield that is intended, whichever is larger.

(2) It is acceptable to add soil to an area in order to comply with the isolation distance required pursuant to § 1-912 between slopes greater than 30 percent and the edge of the leachfield or limits of the fill material for the particular type of leachfield that is intended.

(3) Cuts and fills of 1 foot or less do not constitute re-grading.

Note: Appendix C, Figure C-3, depicts a detail of a typical site that was re-graded.

§ 1-907 2-year Time of Travel Management Zone

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification for the installation of a wastewater system designed using a 2-year time of travel management zone.

(b) The required depths of naturally occurring soil and fill material between the bottom of a leachfield and the seasonal high-water table required pursuant to § 1-903 may be reduced or eliminated provided:

(1) the permittee owns or controls all of the property that is located within the 2-year time of travel management zone;

(2) there are no public water system or potable water sources within the 2-year time of travel management zone;

(3) the design flow for the wastewater system is 700 gallons per day or less; and

(4) a hydrogeologist delineates the 2-year time of travel management zone pursuant to Subsection (c).

(c) The 2-year time of travel management zone shall meet the following requirements:

(1) The naturally occurring soil throughout the management zone shall be consistent and horizontally extensive.

(2) The naturally occurring soil shall be of sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay texture.

(3) The management zone shall extend a minimum of 50 feet uphill and to the sides of the leachfield and a distance downslope of the leachfield equal to the 2-year time of travel.

(4) The 2-year time of travel calculation shall account for effluent movement in both shallow and more permeable layers and the deeper less permeable layers. The assumptions must include movement through the shallow layers when the induced water table formed by the combination of the effluent and the seasonal high-water table is present within the shallow layers.

(d) A leachfield designed using a 2-year time of travel management zone shall demonstrate:

(1) that the induced water table shall remain at least 6 inches below the surface of the naturally occurring soil throughout the management zone; and

(2) through site specific permeability testing and hydrogeological analysis, that includes any seasonal pathways such as drying cracks, that there will be at least a 2-year time of travel within the management zone from the bottom of the leachfield to bedrock.

§ 1-908 Septic Tanks

(a) A septic tank shall be sized for the minimum capacity established in Table 9-1, except in the following circumstances:

(1) Multiple tanks placed in series provide the minimum tank capacity established in Table 9-1.

(2) The Secretary determines that a smaller tank will retain the wastewater for a minimum of one day prior to discharge, based on information submitted by an applicant's or prospective applicant's designer.

(3) When a pump is installed within the septic tank, the capacity of the tank shall be increased above the capacities in Table 9-1 to provide required capacity for the dose volume and required emergency storage capacity.

(4) The septic tank capacity shall be increased by a minimum of 50 percent above the capacities in Table 9-1 if the building or structure to be served by the wastewater system will include a garbage disposal.

(5) If a pump station discharges wastewater to a septic tank, the capacity of the septic tank shall be increased above the capacities in Table 9-1 to provide adequate retention time to retain settleable solids, and to allow the formation of the scum layer.

Table 9-1
Minimum Capacities for Septic Tanks

Design Flow, Gallons Per Day	Liquid Capacity Below the Bottom of the Outlet
560 or less	1000 gallons
Greater than 560 – less than 6500	2 times design flow

(b) The design of each septic tank shall meet the following requirements:

(1) Septic tanks shall be structurally sound and constructed of materials that are not subject to extensive corrosion or decay, such as the following:

(A) Reinforced precast concrete tanks that comply with ASTM standards and have a minimum wall thickness of 3 inches and adequate reinforcing to facilitate handling.

(B) Fiberglass and plastic tanks that have approval by the National Sanitation Foundation (NSF), the American Society of Testing and Materials (ASTM), International Association of Plumbing and Mechanical Officials (IAPMO), Canadian Standards Association (CSA), or the American Water Works Association (AWWA).

(2) There shall be access to each compartment of the septic tank for inspection and cleaning. Access to each compartment of a tank shall:

(A) be available by means of either a removable cover or a manhole of at least 18 inches in diameter; and

(B) allow access to both inlet and outlet devices.

(3) Septic tanks shall have at least one manhole access to grade. If only one access to grade is provided, it shall provide access to the effluent filter. The access riser shall:

(A) be of sufficient diameter to allow removal of any septic tank covers; and

(B) have covers that are be tight fitting and designed to prevent entry by children.

(4) Inlets shall enter the tank at least 3 inches above the liquid level in the tank to allow for momentary rises in liquid level during discharges to the tank.

(5) Inlets consisting of a vented inlet tee or baffle to direct the incoming wastewater downward. The tee or baffle shall penetrate at least 6 inches below the liquid level but, in no case, shall the penetration be greater than that allowed for the outlet device.

(6) Outlet devices shall retain scum in the tank and limit the amount of sludge that can be accommodated without the scouring that causes sludge to discharge in the effluent from the tank. The outlet device should generally extend to a distance below the surface equal to:

(A) 40 percent of the liquid depth; or

(B) 35 percent of the liquid depth for horizontal cylindrical tanks.

(7) An effluent filter shall be placed on the outlet pipe that:

(A) prevents the passage of solids larger in size than 1/8th inch; and

(B) received NSF/ANSI 46 certification or other similar third-party testing results that is accepted by the Secretary on a case-by-case basis.

(8) When multiple septic tanks are proposed in a series to provide the required tank capacity, the following requirements apply:

(A) If the tanks are of unequal capacity, the design shall place the largest capacity tank upstream of tanks of lessor capacity.

(B) Only the outlet pipe of the final tank is required to have an effluent filter although optional effluent filters, if provided, shall meet the requirements of Subsection (b)(7) and manhole access for each filter shall be provided and shall meet the requirements of Subsection (b)(3).

(9) When a septic tank is located in the seasonal high groundwater, the tank shall be provided proper anchors when necessary to prevent movement of the tank.

(10) No portion of a septic tank shall be placed under a porch, deck, or other type structure.

(c) The septic tank shall be pumped to prevent settleable solids and scum from exiting the tank that may cause a downstream component of the wastewater system to improperly operate.

(d) Effluent filters shall be cleaned to prevent solids from clogging the filter.

(e) The excavation for installing a septic tank shall not be located within:

(1) 10 feet of the edge of the leachfield stone or other infiltrative surface for an in-ground trench or in-ground bed;

(2) 25 feet of the limits of the fill material in the downslope direction, and 10 feet of the limits of the fill material in all other directions, for an at-grade leachfield;

(3) 25 feet of the limits of the fill material in the downslope direction, and 10 feet of the limits of the fill material in all other directions for a mound; and

(4) 25 feet of the edge of the enclosure in the downslope direction, and 10 feet from the edge of the enclosure in all other directions for a bottomless sand filter.

§ 1-909 Grease Tanks

(a) A grease tank shall be installed in the sanitary sewer service line serving only plumbing fixtures within a building or structure with non-residential uses where wastewater from the fixtures, such as kitchen sinks and dishwashers in restaurants, cafeterias, and school kitchens, may include grease.

(1) A grease tank shall not be installed in other sanitary sewer service lines.

(2) The installation of an interior grease trap or interceptor shall not substitute for the grease tank.

(b) The grease tank shall discharge to a septic tank prior to discharging to a leachfield.

(c) The grease tank shall have a minimum capacity of 1000 gallons and shall be sized based on the method described below derived from the 1997 Uniform Plumbing Code.

(1) Meals per peak hour (A) X Wastewater Flow Rate (B) X Retention Time (C) X Storage Factor (D) = Size Requirement in liquid capacity in gallons.

(A) Meals per peak hour = Number of meals served at peak operating hour (Seating Capacity) X Peak Factor or maximum number of seats, where Peak Factor is:

(i) Peak Factor for fast food restaurants ..……1.33

(ii) Peak Factor for all other food service types …1.0

(B) Wastewater Flow Rates:

(i) With dishwasher …… 6-gallon flow

(ii) Without dishwasher …….. 5-gallon flow

(iii) Single Service kitchen ……... 2-gallon flow

(iv) Garbage Grinder (Food waste disposer) …… 1-gallon flow

(C) Retention Times:

(i) Commercial kitchen waste/dishwasher …..… 2.5 hours

(ii) Single service kitchen …… 1.5 hours

(D) Storage Factors:

(i) Fully equipped commercial kitchen ….8 hour operation ...1

(ii) Fully equipped commercial kitchen …16 hour operation ..2

(iii) Fully equipped commercial kitchen ....24 hour operation ..3

(iv) Single service kitchen ……..1.5

(2) For the purposes of this Subsection, "single service kitchen" means a kitchen:

(A) where the food preparation consists of only heat and serve;

(B) that uses service items not expected to be used again on the premises; and

(C) where service items that are reused are not washed on the premises.

The operation of grills, frying machines, or cooking devices other than those used to heat food does not constitute a single service kitchen.

(3) The Secretary shall accept alternative designs when the applicant provides information from a designer demonstrating that the alternative design provides equal or greater grease removal. The information shall include consideration of grease removal when transported by ultra-hot water.

(d) The design of the grease tank shall meet the following requirements:

(1) Grease tanks shall be structurally sound and constructed of materials that are not subject to extensive corrosion or decay, such as the following materials:

(A) heavy gauge steel tanks with continuous welds;
(B) reinforced precast concrete tanks that comply with ASTM standards with a minimum wall thickness of 3 inches and adequate reinforcing to facilitate handling; and
(C) fiberglass and plastic tanks that have approval by the National Sanitation Foundation (NSF) , the American Society of Testing and Materials (ASTM), International Association of Plumbing and Mechanical Officials (IAPMO), Canadian Standards Association (CSA) or the American Water Works Association (AWWA).

(2) Tanks shall have the inlet and outlet baffles extend from 12 inches above the bottom of the tank and to well above the waterline to allow airflow back into the building plumbing system.

(3) There shall be access to each compartment of the grease tank for inspection and cleaning. Access to each compartment of a tank shall:
(A) be available by means of either a removable cover or a manhole of at least 18 inches in diameter;
(B) allow access to both inlet and outlet devices; and
(C) have covers that are tight fitting and designed to prevent entry by children.

(4) When the grease tank is located in the seasonal high groundwater, the tank shall be provided proper anchors when necessary to prevent movement of the tank.

(e) Grease tanks shall be pumped to prevent grease from exiting the tank that may cause a downstream component of the wastewater system to improperly operate.

§ 1-910 Soil Evaluation

(a) For all wastewater systems, soil conditions within the area in which a leachfield or a replacement area is proposed to be located shall be evaluated to determine the design of the leachfield that may be used.

(b) Soil conditions within the area in which a leachfield or a replacement area is proposed to be located shall be evaluated by completing the number of soil excavations necessary to demonstrate, and describing soil to a depth necessary to demonstrate, that the area complies with the depths of naturally occurring soil required pursuant to § 1-903**.**

(c) The minimum number of soil excavations for specific leachfields.

(1) For in-ground leachfields and at-grade leachfields that dispose of 600 gallons of effluent per day or less, a minimum of 2 soil excavations shall be performed in the area in which each leachfield and replacement area is proposed to be located.

(2) For a leachfield in a mound or in a bottomless sand filter that dispose of 600 gallons of effluent per day or less, a minimum of 3 soil excavations shall be performed in the area in which each leachfield and replacement area is proposed to be located. The excavations shall be spaced to confirm the soil under the leachfield and 25 feet downslope of the limits of the fill material for the mound or filter.

(3) The Secretary may allow fewer soil excavations, upon an applicant's request, when the applicant's designer provides information demonstrating that soil is uniform throughout the area for the leachfield or replacement area.

(4) The Secretary may require additional soil excavations to confirm complying soil conditions within the area in which a leachfield or a replacement area is proposed to be located.

(d) Soil excavations shall be conducted using a backhoe or similar equipment unless an alternative method to evaluate the soil is authorized by the Secretary.

(e) Soil shall be described and recorded for each soil horizon from ground surface according to the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Field Book for Describing and Sampling Soil. The description shall include the following:

(1) color based on a description with Munsell® Soil Color notation, e.g. 10YR 4/3 (Brown);
(2) redoximorphic features and mottling;
(3) texture, as identified by the full name or the following acronyms:
    (A) COS = coarse sand
    (B) S = sand
    (C) FS = fine sand
    (D) VFS = very fine sand
    (E) LCOS = loamy coarse sand
    (F) LS = loamy sand
    (G) LFS = Loamy fine sand
    (H) LVFS = loamy very fine sand
    (I) COSL = coarse sandy loam
    (J) SL = sandy loam
    (K) FSL = fine sandy loam
    (L) VFSL = very fine sandy loam
    (M) L = loam
    (N) SIL = silt loam
    (O) SI = silt
    (P) SC = sandy clay
    (Q) SCL = sandy clay loam
    (R) CL = clay loam
    (S) SICL = silty clay loam
    (T) SIC = silty clay
    (U) C = clay;
(4) structure according to the structure types identified on Table 9-3; and
(5) consistence determined by rupture resistance or excavation difficulty.

(f) Notwithstanding Subsection (e), soil descriptions and recordings completed on or after January 1, 2007 and completed prior to the effective date of these Rules may be accepted by the Secretary when the descriptions and recordings identify:

(1) the soil texture corresponding to the name or acronym in Subsection (e)(3); and
(2) soil structure corresponding to the structure types identified on Table 9-3 or, in the absence of identifying structure, the soil evaluation shall be based on the most limiting soil structure identified in Table 9-3 for the reported soil texture.

(g) The Secretary may require an applicant to submit the results of a sieve analysis using the USDA method of analysis to confirm the texture of the soil identified pursuant to Subsection (e).

(h) Evidence of the seasonal high-water table and evidence of soil saturation below ground surface shall be determined by observation within each soil horizon of each soil excavations of:
- (1) sidewall seepage;
- (2) standing water; and
- (3) the presence of redoximorphic features or color patterns indicative of soil saturation.

(i) Percolation testing may be conducted for the purpose of establishing application rates that will be based on more than soil excavations.
- (1) When percolation tests are performed to establish the soil application rate a minimum of 2 percolation tests shall be performed in the area in which each leachfield and replacement area is proposed to be located.
  - (A) The Secretary may require additional percolation tests when the design flow to the wastewater system is greater than 600 gallons per day;
  - (B) The Secretary may allow fewer percolation tests when the soil is demonstrated to be uniform throughout the area for the leachfield or replacement area.
- (2) When percolation tests are completed, they shall be performed in the following manner.
  - (A) Tests shall be conducted entirely within the most-dense, least permeable soil identified:
    - (i) within 1 to 3 feet of naturally occurring soil below the bottom of the leachfield stone or other infiltrative surface of an in-ground leachfield or at-grade leachfield; or
    - (ii) in the upper 24 inches of naturally occurring soil below the proposed fill material and 25 feet downslope of the fill material for a leachfield in a mound or bottomless sand filter.
  - (B) The test hole shall be unlined, shaped like a vertically oriented cylinder, with a diameter of 6 to 8 inches and a depth of 10 inches within the layer being tested.
  - (C) The test hole shall be prepared as follows:
    - (i) carefully scrape the sidewalls of the hole using a sharp instrument to remove any smeared soil surface (this is particularly important in soil that has a significant silt or clay content);
    - (ii) place 1 inch of clean leachfield stone in the bottom of the hole to reduce scouring; and
    - (iii) when possible use a hose to siphon water out of a suitably located reservoir to provide a high degree of control over the rate of water entering the hole instead of pouring water directly from a bucket into the hole to minimize scouring.
  - (D) Percolation test measurements shall be obtained by:

(i) filling the hole with water up to a level 6 inches above the leachfield stone and allowing it to drop the distance specified in Table 9-2 for 7 consecutive runs;
(ii) bringing the water up to the 6-inch level after each run; and
(iii) accurately recording the time of each run, the refill time between each run, and the total elapsed time.

(E) To determine the percolation rate:
(i) plot the rate of drop for each run on graph paper with logarithmic scales on both axes (log/log graph paper) against the cumulative time of the seven runs including the refill times;
(ii) fit the best straight line to the seven data points and extrapolate out to 1 day (1440 minutes) of cumulative time; and
(iii) the percolation rate is the rate of drop at 1440 minutes.

Table 9-2
Percolation Test Water Level Drops

Soil Texture	Anticipated Percolation Rate (minutes per inch)	Drop in Inches
Course Sand to Loamy Sand	1 – 10	2
Fine Sand to Very Fine Sandy Loam	10 – 60	1
Loam to Silty Clay	60 – 120	0.5

§ 1-911 Maximum Application Rates for Leachfields

(a) The maximum application rate for sizing a leachfield in a mound shall be 1.0 gallon per square foot per day.

(b) The maximum application rate for sizing a leachfield in a bottomless sand filter system shall be determined based on the following.
(1) The maximum application rate shall be determined using one of the following methods:
(A) Table 9-3, using the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below ground surface identified from soil excavations; or
(B) Table 9-4, using the results of the percolation tests conducted pursuant to § 1-910 in the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below the bottom of the leachfield stone or other infiltrative surface of the leachfield.
(2) If using the method in Subsection (b)(1)(B) results in a higher application rate than using the method in Subsection (b)(1)(A), the maximum application rate for sizing a leachfield in a bottomless sand filter shall be determined using the method in Subsection (b)(1)(A).

(c) The maximum application rate for sizing an in-ground leachfield or an at-grade leachfield shall be determined based on the following:

(1) The maximum application rate shall be determined using one of the following methods:

(A) Table 9-3, using the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below the bottom of the leachfield stone or other infiltrative surface of the leachfield identified from soil excavations; or

(B) Table 9-4, using the results of the percolation tests conducted pursuant to § 1-910 in the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below the bottom of the leachfield stone or other infiltrative surface of the leachfield.

(2) If using the method in Subsection (c)(1)(B) results in a higher application rate than using the method in Subsection (c)(1)(A), the maximum application rate for sizing an in-ground leachfield or an at-grade leachfield shall be determined using the method in Subsection (c)(1)(A).

Table 9-3
Application Rates Established Using Soil Excavation

Soil Characteristics		**Application Rates (gallons per square foot per day)**			
Texture	**Structure Type[1]**	**In-Ground Trench**	**In-ground Bed**	**At-Grade Leachfield**	**Leachfield in a Bottomless Sand Filter**
Very Coarse Sand or Coarser	SG	See § 1-919(b)	See § 1-919(b)	1.00	1.00
Coarse Sand, Sand	SG	1.50	1.20	1.00	1.00
Loamy Coarse Sand, Loamy Sand	SG	1.50	1.20	1.00	1.00
Fine Sand, Very Fine Sand, Loamy Fine Sand, Loamy Very Fine Sand	SG	1.00	0.80	0.80	0.80
	MA/PL	0.50	0.40	0.40	0.40
	PR/ABK/ SBK/GR	0.70	0.60	0.60	0.60
Coarse Sandy Loam, Sandy Loam	MA/PL	0.50	0.40	0.40	0.40
	PR/ABK/ SBK/GR	0.70	0.60	0.60	0.60
Fine Sandy Loam, Very Fine Sandy Loam	MA/PL	0.50	0.40	0.40	0.40
	PR/ABK/ SBK/GR	0.60	0.50	0.50	0.50
Loam	MA/PL	0.50	0.40	0.40	0.40
	PR/ABK/ SBK/GR	0.60	0.50	0.50	0.50
Silt Loam, Silt	MA/PL	0.30	0.20	0.20	N/A

Soil Characteristics		Application Rates (gallons per square foot per day)			
Texture	**Structure Type[1]**	**In-Ground Trench**	**In-ground Bed**	**At-Grade Leachfield**	**Leachfield in a Bottomless Sand Filter**
	PR/ABK/ SBK/GR	0.40	0.30	0.30	N/A
Sandy Clay Loam, Clay Loam, Silty Clay Loam	MA/PL	0.25	0.20	0.20	N/A
	PR/SBK/ GR	0.30	0.20	0.20	N/A
Sandy Clay, Clay, Silty Clay	N/A (See § 1-926)				

Adapted from J. Tyler, 2000.

[1] The abbreviations used for structure are: SG = single grain; GR = granular; MA = massive; PL = platy; PR = prismatic; ABK = angular blocky; SBK = subangular blocky.

Table 9-4
Application Rates Established Using Soil Excavations and Percolation Tests

In-ground Trenches	In-ground Beds	At-grade Leachfields
$AR = 3 \div \sqrt{t}$ where: AR is the application rate in gallons per square foot of trench per day with a maximum allowable application rate of 1.5 gallons per square foot per day; and t equals the second slowest percolation rate in minutes per inch for the site where the maximum acceptable value for t is 60 minutes per inch.	$AR = 0.8(3 \div \sqrt{t})$ where: AR is the application rate in gallons per square foot of bed per day with a maximum allowable application rate of 1.2 gallons per square foot per day; and t equals the second slowest percolation rate in minutes per inch for the site where the maximum acceptable value for t is 60 minutes per inch.	$AR = 0.8(3 \div \sqrt{t})$ where: AR is the application rate in gallons per square foot of bed per day with a maximum allowable application rate of 1.0 gallons per square foot per day; and t equals the second slowest percolation rate in minutes per inch for the site where the maximum acceptable value for t is 60 minutes per inch.

§ 1-912 Horizontal Isolation Distances and Isolation Zones for Components of Wastewater Systems

(a) Table 9-5 identifies the minimum horizontal isolation distance that each identified component of a wastewater system, and that each replacement area, shall be located from all portions of the identified features and objects, unless the Secretary has authorized a reduction to the isolation distance or increased the isolation distance pursuant to

Subsections (e) or (f), or unless an isolation zone is required in lieu of an isolation distance for the particular feature or object.

Table 9-5
Horizontal Isolation Distances, in Feet, for Features and Objects

Features and Objects	Sanitary Sewer Collection Line, Sanitary Sewer Service Line and Manholes	Wastewater Tanks[1]	In-Ground Leachfields and Replacement Areas
	Closest Portion of the Collection Line, Service Line, or Manhole	Outside Edge of the Tanks	Edge of Leachfield Stone, Other Infiltrative Surface , or Replacement Areas
Curtain drains (located downslope of a leachfield)	N/A	10	75
Curtain drains (located upslope of a leachfield)	N/A	10	35
Drainage swales and ditches with seeps, including seasonal seeps (located downslope of a leachfield)	N/A	25	75
Drainage swales and ditches with seeps, including seasonal seeps (located upslope of a leachfield)	N/A	25	35
Drainage swales and ditches without seeps	N/A	N/A	25
Foundation, footing, or perimeter of a building or structure with a drain (located downslope of a leachfield)	N/A	10	75
Foundation, footing, or perimeter of a building or structure with a drain (located upslope of a leachfield)	N/A	10	20
Foundation, footing, or perimeter of a building or structure without drains (located downslope of a leachfield)	N/A	10	20
Foundation, footing, or perimeter of a building or structure without a drain (located upslope of a leachfield)	N/A	10	20

Features and Objects	Sanitary Sewer Collection Line, Sanitary Sewer Service Line and Manholes	Wastewater Tanks[1]	In-Ground Leachfields and Replacement Areas
	Closest Portion of the Collection Line, Service Line, or Manhole	Outside Edge of the Tanks	Edge of Leachfield Stone, Other Infiltrative Surface , or Replacement Areas
Potable water sources in bedrock or confined surficial aquifer, (proposed, existing, or permitted)	50	Requires isolation zone (See Table 9-6)	
Potable water sources in an unconfined surficial aquifer (proposed, existing, or permitted)	75	Requires isolation zone (See Table 9-6)	
Property lines	10	10	25
Public water sources (proposed, existing, or permitted)	50	Requires isolation zone (See Table 9-6)	
Roadways, driveways, parking lots	N/A	5	10
Slopes exceeding 30 percent	N/A	10	25
Surface water, normal high-water elevation[2]	10	25	50
Stormwater conveyance/treatment/control practice	10	25	50
Trees	10	10	10
Water mains (proposed, existing, or permitted)	Distances and requirements established in § 1-1007 apply in lieu of this Section	50	5020
Water service lines and water service pipes (pressure) (proposed, existing, or permitted)	Distances and requirements established in § 1-1007 apply in lieu of this Section	25	25
Water service lines and water service pipes (suction) (proposed, existing, or permitted)	Distances and requirements established in	50	100

Features and Objects	Sanitary Sewer Collection Line, Sanitary Sewer Service Line and Manholes	Wastewater Tanks[1]	In-Ground Leachfields and Replacement Areas
	Closest Portion of the Collection Line, Service Line, or Manhole	Outside Edge of the Tanks	Edge of Leachfield Stone, Other Infiltrative Surface , or Replacement Areas
	§ 1-1007 apply in lieu of this Section		
Water sources that are not a potable water source or public water source	10	50	100
Water storage tanks (atmospheric tank located below ground surface) (proposed, existing, or permitted)	50	50	50

Table 9-5 (continued)
Horizontal Isolation Distances, in Feet, for Features and Objects

Features and Objects	At-Grade Leachfields		Leachfields in Mounds			Leachfields in Bottomless Sand Filters
	Edge of Leachfield Stone	Limits of Fill Material	Leach-field	Effective Basal Area	Limits of Fill Material	Enclosure
Curtain drains (located upslope of a leachfield)	35	35	35	35	35	35
Drainage swales and ditches with seeps, including seasonal seeps (located downslope of a leachfield)	75	50	75	75	50	75
Drainage swales and ditches with seeps, including seasonal	35	10	35	35	10	35

Features and Objects	At-Grade Leachfields		Leachfields in Mounds			Leachfields in Bottomless Sand Filters
	Edge of Leachfield Stone	Limits of Fill Material	Leach-field	Effective Basal Area	Limits of Fill Material	Enclosure
seeps (located upslope of a leachfield)						
Drainage swales and ditches without seeps	25	10	25	25	10	25
Curtain drain, foundation, footing, or perimeter of a building or structure with a drain (located downslope of a leachfield)	75	50	75	75	50	75
Foundation, footing, or perimeter of a building or structure with a drain (located upslope of a leachfield)	20	10	20	20	10	20
Foundation, footing, or perimeter of a building or structure without drains (located downslope of a leachfield)	35	35	35	35	35	35
Foundation, footing, or perimeter of a building or structure without a drain (located upslope of a leachfield)	20	20	20	20	20	20
Potable water sources in bedrock or confined surficial aquifer, (proposed, existing, or permitted)	Requires isolation zone (See Table 9-6)					
Potable water sources in an unconfined surficial	Requires isolation zone (See Table 9-6)					

Features and Objects	At-Grade Leachfields		Leachfields in Mounds			Leachfields in Bottomless Sand Filters
	Edge of Leachfield Stone	Limits of Fill Material	Leach-field	Effective Basal Area	Limits of Fill Material	Enclosure
aquifer (proposed, existing, or permitted)						
Property lines	25	10 for upslope and sides, 25 for downslope	25	25	10 for upslope and sides, 25 for downslope	25
Public water sources (proposed, existing, or permitted)	Requires isolation zone (See Table 9-6)					
Roadways, driveways, parking lots	10	10 for upslope and sides, 25 for downslope	10	10	10 for upslope and sides, 25 for downslope	10 for upslope and sides, 25 for downslope
Slopes exceeding 30 percent	25	25	25	25	25	25
Stormwater conveyance/ treatment/ control practice	50	50	50	50	50	50
Surface water, normal high-water elevation[2]	50	50	50	50	50	50
Trees	10	0	10	10	0	10
Water mains (proposed, existing, or permitted)	50	10 for upslope and sides, 25 for downslope	50	50	10 for upslope and sides, 25 for downslope	50
Water service lines or water service pipes (pressure) (proposed, existing, or permitted)	25	10 for upslope and sides, 25 for downslope	25	25	10 for upslope and sides, 25 for downslope	25
Water service lines or water service pipes (suction)	100	25	100	100	10 for upslope and sides,	100

Features and Objects	At-Grade Leachfields		Leachfields in Mounds			Leachfields in Bottomless Sand Filters
	Edge of Leachfield Stone	Limits of Fill Material	Leach-field	Effective Basal Area	Limits of Fill Material	Enclosure
(proposed, existing, or permitted)					25 for downslope	
Water sources that are not potable water sources or public water sources	100	10 for upslope and sides, 25 for downslope	100	100	10 for upslope and sides 25 for downslope	100
Water storage tanks (atmospheric tank located below ground surface) (proposed, existing, or permitted)	50	25	50	50	25	50

[1] Wastewater Tanks include septic tanks, pump stations, dosing siphons, holding tanks, wastewater storage tanks, wastewater treatment tanks, sand filters, constructed wetlands, and grease tanks.
[2] The horizontal location to surface water shall allow for possible future widening of the surface water due to bank erosion.

(b) Subsections (c) and (d), in conjunction with Table 9-6, identify the size and shape of the isolation zone around the identified proposed, existing, or permitted drinking water sources in which no portion of each identified component of a wastewater system, and of each replacement area, shall be located, unless the Secretary has authorized a reduction to the isolation zone or required a larger isolation zone pursuant to Subsections (e) or (f).

Table 9-6
Distances, in Feet, Used to Create Isolation Zones Around Drinking Water Sources

<table>
<tr><th colspan="2">Proposed, Existing, or Permitted Drinking Water Sources (by gallons per minutes design rate)</th><th>Leachfields[1] and Replacement Areas (< 2000 gallons per day design flow)</th><th>Leachfields[1] and Replacement Areas (≥ 2000 to < 6500 gallons per day design flow)</th><th>Wastewater Tanks[2]</th></tr>
<tr><td rowspan="4">Potable water sources or Public water sources for community water systems, non-community non-transient water systems, and transient non-community water systems (in bedrock or confined surficial aquifer)</td><td>≤ 2.0</td><td>X = 100
Y = 200</td><td>X = 150
Y = 300</td><td rowspan="4">X = 50
Y = 50</td></tr>
<tr><td>> 2.0 and ≤ 5.0</td><td>X = 150
Y = 300</td><td>X = 150
Y = 300</td></tr>
<tr><td>> 5.0 and ≤ 8.0</td><td>X = 200
Y = 400</td><td>X = 200
Y = 400</td></tr>
<tr><td>> 8.0</td><td colspan="2">X = 200
Y = 1000</td></tr>
<tr><td rowspan="2">Potable water sources or Public water sources for community water systems, non-community non-transient water systems, and transient non-community water systems (in an unconfined surficial aquifer)</td><td>≤ 8.0</td><td>X = 150
Y = 500</td><td>X = 150
Y = 1000</td><td rowspan="2">X = 75
Y = 75</td></tr>
<tr><td>> 8.0</td><td colspan="2">X = 200
Y = 1000</td></tr>
</table>

[1] For the purposes of this table, the term "leachfields" includes the edge of the leachfield stone or other infiltrative surface for in-ground leachfields; the edge of leachfield stone for at-grade leachfields; the leachfield and effective basal area for leachfields in mounds; and the enclosure for leachfields in bottomless sand filters. It does not include the limits of fill material for in-ground leachfields, at-grade leachfields, or a leachfields in mounds.
[2] Wastewater Tanks include septic tanks, pump stations, dosing siphons, holding tanks, wastewater storage tanks, wastewater treatment tanks, sand filters, constructed wetlands, and grease tanks.

Note: See § 1-903(g) for additional restrictions concerning the location of a wastewater system components in proximity of a Public Community Water System.

(c) One of the following methods shall be used to determine the size and shape of the required isolation zone around proposed, existing, or permitted drinking water sources, with X and Y equaling the numbers identified in Table 9-6:

(1) When drawing a size and shape around a source and detailed topographical data is not available, the shape around the source shall be Y from the source.

(2) When drawing the size and shape around a source, and all points of the shape are at the same or lower elevation than the elevation of the source, the shape around the source shall be X from the source.

(3) When drawing the size and shape around a source, and all points of the shape are at a higher elevation than the elevation of the source, the shape around the source shall be Y from the source.

(4) When drawing the size and shape around a source, and not all points of the shape are at a higher elevation than the elevation of the source, the shape around the source shall be:

(A) a circle with a radius of Y from the source;

(B) when Y is variable, a shape around the source so that all points in the shape are Y from the source;

(C) a circle around the source so that all points are X from the source and, from the points on either side of the source where the circle intersects the contour elevation that the source is on, draw lines beginning at these intersections extending upslope and perpendicular to the contours until these lines intersect an arc with a radius equal to Y; or

(D) when drawing the shape in (c)(4)(C), the lines continuing upslope and perpendicular to the contours reach a crest less than Y from the source and, from the crest, the contours continue to decrease a distance Y from the source, the distance upslope of the source shall be Y and the points along the crest, or X if the crest is less than X, where those points intersect with Y.

(d) Notwithstanding Subsection (c), when a 2-year time of travel management zone is determined for a leachfield, the size and shape of the required isolation zone around proposed, existing, or permitted drinking water sources to be isolated from the leachfield shall be identified pursuant to Subsection (c) except that the portion of the isolation zone overlapping the leachfield's 2-year time of travel management zone shall be replaced with the leachfield's 2-year time of travel management zone, provided:

(1) When the drinking water source is grouted, in no case shall any point along the isolation zone be less than 50 feet from the drinking water source.

(2) When the drinking water source is not grouted, in no case shall any point along the isolation zone be less than 100 feet from the drinking water source.

(e) An applicant or prospective applicant may submit a written request to the Secretary for a reduction in the required isolation distance or isolation zone for a particular feature or object.

(1) The Secretary shall authorize the use of a reduced isolation distance or isolation zone for a particular feature or object when the Secretary determines that the isolation distance specified in Table 9-6 or isolation zone identified pursuant to Subsection (c) is unnecessary to protect human health and the environment because the specific site conditions, or the construction techniques and pipe materials, will prevent the potential subsurface flow of effluent from impacting the feature or object and will prevent the performance of the wastewater system from being impacted by the feature or object.

(2) In determining whether to authorize the use of a reduced isolation distance or isolation zone, the Secretary shall consider the following factors:
   (A) the ground slope;
   (B) groundwater flow;
   (C) depth to the seasonal high groundwater and the induced water table;
   (D) depth of the impeding soil layer;
   (E) soil texture and structure;
   (F) travel time for effluent from a component of a wastewater system to reach a feature or object; and
   (G) construction techniques or pipe materials that provides equal or greater protection to the wastewater system or feature or object than afforded by the isolation distance or isolation zone.

(3) The Secretary shall not authorize a reduction to the distances used to create an isolation zone around a drinking water source pursuant to Subsection (c) to less than the following:
   (A) When there is a continuous impeding soil layer from the leachfield to the source, and it is demonstrated the source is grouted, has no annular space, or soil sealed the source casing to prevent contaminant migration along the casing, X and Y shall not be less than 100 feet.
   (B) When groundwater flow from beneath the leachfield is not towards a drinking water source, X and Y shall not be less than 100 feet.
   (C) When a hydrogeological investigation is completed that reveals that groundwater flow from beneath the leachfield does not flow toward a drinking water source under pumping conditions, X and Y shall not be less than 100 feet.
   (D) When a 2-year time of travel management zone is determined, X and Y shall not be less than 50 feet when the drinking water source is grouted.
   (E) When a 2-year time of travel management zone is determined, X and Y shall not be less than 100 feet when the drinking water source is not grouted.

(4) The burden shall be on the applicant or prospective applicant to provide information from a designer that addresses the factors in Subsection (e)(2) and enables the Secretary to reach a determination.

(5) The Secretary's determination shall be in writing and indicate the reduced isolation distance or isolation zone.

(f) The Secretary shall require a greater isolation distance or larger isolation zone for a particular feature or object when the Secretary determines that, based on the specific site conditions described in an application, a greater isolation distance or larger isolation zone is necessary to prevent the potential subsurface flow of effluent from impacting the feature or object or to prevent the feature or object from impacting the performance of the wastewater system.

Note: Appendix C, Figure C-4, depicts an example for drawing an isolation zone around a drinking water source.

§ 1-913 Wastewater System Presumptive Isolation Zone

(a) A presumptive isolation zone shall be identified, using the methods identified in § 1-1104, around proposed leachfields, replacement areas, and wastewater tanks in which a potable water source with a design rate of less than or equal to 2.0 gallons per minute, assuming it would be located in bedrock or confined surficial aquifer, cannot be located.

(b) Each wastewater system presumptive isolation zone identified pursuant to Subsection (a) shall be considered in conjunction with the requirements of § 1-307 to determine if notification to adjacent landowners is required pursuant to § 1-307 and considered in conjunction with the requirements of Appendix A to determine if the wastewater system presumptive isolation zone is required to be shown on the site plan.

§ 1-914 Dosing and Pressure Distribution

(a) A wastewater system is required to use dosing when:
- (1) the design proposes more than 500 linear feet of distribution piping within a leachfield or combination of leachfields; or
- (2) the wastewater system uses pressure distribution.

(b) The use of dosing, including pressure distribution, in the design of a wastewater system is otherwise optional, but it is recommended for all wastewater systems.

(c) Dosing shall be accomplished by pumps, dosing siphons, or other devices that can provide sufficient flow and pressure to meet the design requirements of the distribution system.

(d) Requirements for pressure distribution
- (1) Except where otherwise specified in these Rules, wastewater systems using pressure distribution shall meet the following additional requirements:
  - (A) maintain a minimum pressure of 1 pound per square inch (or 2.3 feet of head) at the end of each distribution line;
  - (B) maintain a maximum of a 10 percent difference in the per-square foot application rate between any 2 trenches or beds within a system;
  - (C) prevent any trench or bed from being loaded at a rate exceeding that allowed based on the application rate for the soil and factors associated with advanced treatment except when approved as an innovative/alternative system;
  - (D) maintain a maximum 10 percent difference in the discharge rate between any 2 orifices in a single trench or bed;
  - (E) maintain a minimum dose volume 5 times the volume of the distribution network that must be filled during each dose cycle;
  - (F) maintain a minimum of 4 dosing cycles per day based on the design flow of the wastewater system, although the Secretary may allow a lower number of dosing cycles when the design flow is low and 4 doses per day are impractical for pump sizing and operation (examples include when the dose volume, based on 4 doses per day, for a low design flow, cannot fill

the laterals and maintain proper pressure at each orifice or the pump run time is less than the recommended run time); and

(G) maintain at least one orifice for each 25 square feet of leachfield area unless there is a specific requirement in these Rules for additional orifices.

(2) Pressure distribution pipe shall:

(A) be smooth, rigid pipe;

(B) have the ends of each lateral within the piping network designed with a flushing cleanout to allow for periodic cleaning;

(C) be constructed so that there is access to the piping system for flushing of the piping system;

(D) be designed so the distribution pipe within a trench or bed is laid level;

(E) be designed so that pipes serving separate trenches or beds that are at different elevations have even distribution; and

(F) have orifices that:

(i) have a minimum diameter of 1/8 inch;

(ii) may face up when the orifices are protected by orifice shields; and

(iii) may face down without an orifice shield.

(e) Notwithstanding Subsection (d), the Secretary may approve alternative designs of pressure distribution provided the design achieves distribution of the effluent in a leachfield that equals the distribution of effluent in a leachfield that would be obtained by the application of Subsection (d).

(f) During operation, settled solids shall be periodically removed from pump stations, dosing siphons, or other devices used to pressurize a leachfield to prevent passage of solids to downstream components.

§ 1-915 Time Dosing

(a) A Class 1, Class A, Class B, or Class BW designer is required to submit the installation certification for the installation of wastewater systems using time dosing.

(b) A wastewater system is required to use time dosing where specified in these Rules. The use of time dosing in the design of a wastewater system is otherwise optional.

(c) General requirements for time dosing.

(1) Wastewater systems that are time dosed:

(A) shall distribute the design flow to a leachfield in small equal doses distributed evenly over 24 hours.

(B) shall be designed using pressure distribution that uses a pump and complies with § 1-914(d)(1)(A)-(E) and (G) and § 1-914(d)(2).

(2) Unless otherwise authorized by the Secretary, the dose volume shall not exceed 10 percent of the design flow.

(3) A leachfield shall not be dosed more than once in a 30-minute period.

(d) Pump stations shall:

(1) be sized to achieve storage equal to 150 percent of the design flow;

(2) have an adjustable timer to control the pump run/rest times/dose volume;

(3) have an alarm float;
(4) have a cycle counter; and
(5) have the following additional floats:
    (A) a redundant off float (the redundant off float can be controlled by the same float used for the timer enabler); and
    (B) a peak enabler float between the timer enabler float and the high-water alarm float (the peak enabler float and the high-water alarm can be controlled by the same float).

(e) When a wastewater system using time dosing includes a pretreatment unit with a discharge pump that is designed using time dosing and discharges to a pump station or dosing siphon, the discharge pump shall either:
(1) discharge to a pump station that has the pump on level set to discharge an equal quantity of effluent as being pumped from the pretreatment unit; or
(2) discharge to a dosing siphon that discharges an equal quantity of effluent as being pumped from the pretreatment unit.

Note: Appendix C, Figure C-5, depicts a detail of a typical time dosing pump station.

§ 1-916 Flow Equalization

(a) A Class 1, Class A, Class B, or Class BW designer is required to submit the installation certification for the installation of a wastewater system using flow equalization.

(b) The use of flow equalization in the design of a wastewater system is optional.

(c) General requirements for flow equalization
(1) Notwithstanding § 1-803(h), the use of flow equalization allows a leachfield serving a building or structure or campground with multiple uses to be sized to dispose of the quantity of wastewater calculated by adding together the sum of the design flows for each use of the building or structure or campground in each 24-hour period for a week and dividing by the number of days when effluent will be distributed to the leachfield, provided:
    (A) The leachfield can be expanded to dispose of the design flow calculated pursuant to § 1-803(h); and
    (B) If a replacement area is required by §1-902, the replacement area can accommodate the design flow calculated pursuant to § 1-803(h).
(2) Wastewater systems that use flow equalization shall:
    (A) Distribute the wastewater to a leachfield over 7 days when the flows vary greatly by the day of the week (examples include marinas, campgrounds, day use facilities, and places of worship when there are no other uses or activities of the building or facility during the off-peak days such as a daycare or preschool).
    (B) Be designed using pressure distribution pursuant to § 1-914.
    (C) Include pump stations that comply with § 1-915(d) to time dose the leachfield except when a treatment unit uses a pump designed to comply with §-915(e) to discharge to a pump station or dosing siphon that discharges to the leachfield.

(D) Include storage tanks for flow equalization (also referred to as surge tanks) that are sized to enable the wastewater system to meet the following requirements:
  (i) when the flow into the system on a particular day exceeds the flow pumped to the leachfield, the remaining volume must be stored in flow equalization storage tanks;
  (ii) when a following day also results in more flow into the system than is discharged, the remaining volume is added to that from the previous day or days;
  (iii) based on an analysis of the weekly cycle, the maximum volume that must be stored at any point in time is calculated; and
  (iv) the storage capacity of the flow equalization storage tanks is 150 percent of the calculated volume with no reduction allowed based on the required storage provided in the pump station.

(E) Include water meters to record the daily total quantity of water entering the building or structure or campground served by the wastewater system.

(3) When the design for a wastewater system using flow equalization includes a pretreatment unit, the pretreatment unit shall:
  (A) be located between the flow equalization storage tanks and the pump station that discharges to the leachfield; and
  (B) be sized based on the amount of effluent derived in Subsection (c)(1).

(4) A flow equalization storage tank shall:
  (A) have a high-water alarm set at an elevation that equals 1.1 times the calculated storage volume; and
  (B) include a cycle counter to record the number of times the alarm float in the flow equalization tank is activated.

(d) An annual inspection shall be performed by a designer during April or May of each year; and a report from the annual inspection shall be submitted to the Secretary by July 1 of the year of the inspection, which includes:
  (1) the recorded daily meter readings and an analysis of the daily water meters to determine if any adjustment to the sizing of the wastewater system is needed; and
  (2) a description of whether there is a need for changes to the pump station float settings based on the daily flow and dose cycle for the wastewater system.

Note: Examples for designing a flow equalization tank are included in Appendix B, Examples B-1.

§ 1-917 In-ground Trenches and Trenches in Mounds

(a) An in-ground trench or a trench in a mound shall be sized according to the following requirements:
  (1) Trenches shall have a maximum width of 48 inches.
  (2) The minimum required square footage shall be calculated using the formula TA = DF ÷ AR where:
    (A) TA is the minimum required bottom trench area in square feet;
    (B) DF is the design flow in gallons per day; and

(C) AR is the application rate in gallons per day per square foot identified in § 1-911.

(3) When the minimum linear loading rate is calculated, the minimum length of a trench shall equal the length derived by dividing the DF by the linear loading rate.

(4) Where the depth of leachfield stone exceeds 12 inches below the distribution pipe, the size of a trench calculated pursuant to Subsection (a)(2) may be reduced to the percentage indicated in Table 9-7, except for:

(A) trenches that do not use leachfield stone;

(B) trenches in leachfields disposing of filtrate effluent that are designed in accordance with § 1-904(c);

(C) trenches in mounds;

(D) innovative and alternative dispersal systems; and

(E) systems designed to dispose of high strength wastewater that do not include pre-treatment to reduce the BOD_5 and TSS to low strength.

Table 9-7
Percentage of Standard Trench Leachfield Area Required

Depth of Leachfield Stone Below Distribution Pipe	Trench Width 12 inches	Trench Width 18 inches	Trench Width 24 inches	Trench Width 36 inches	Trench Width 48 inches
18 inches	60%	64%	66%	71%	75%
24 inches (max)	50%	54%	57%	62%	66%

(b) The design of an in-ground trench or a trench in a mound shall meet the following additional requirements:

(1) Trenches shall not be constructed in fill material except when trenches are constructed in mounds or constructed pursuant to the requirements in § 1-919.

(2) Trenches in mounds shall be horizontally separated by at least 4 feet of fill material.

(3) In-ground trenches shall be horizontally separated by at least 4 feet of naturally occurring soil.

(4) The bottom of each trench shall be level.

(5) Trenches shall have one of the following designs:

(A) Leachfield stone that complies with the following requirements:

(i) Leachfield stone shall extend a minimum of 2 inches above the distribution pipe and either:

(I) 12 inches below the distribution pipe; or

(II) 6 inches below the distribution pipe if the trench design uses the application rate for beds.

(ii) A layer of filter fabric shall be placed over the top of the leachfield stone.

(B) Prefabricated chambers that have a minimum H-10 structural loading rating and are laid level in the trench.

(C) Subsurface drip distribution that complies with § 1-923.

(c) The design of an in-ground trench shall meet the following additional requirements:

(1) A primary in-ground leachfield with trenches shall be at least 10 feet from a replacement in-ground leachfield with trenches, unless the trenches of the primary in-ground leachfield are interfingered with the trenches of the replacement in-ground leachfield.

(2) When the number of primary trenches does not equal the number of replacement trenches, the design shall maximize the number of primary and replacement trenches that are interfingered.

(3) In-ground trenches shall not be constructed in soil:

(A) with a percolation rate that is slower than 60 minutes per inch; or

(B) that have a soil texture of sandy clay, silty clay, or clay.

(4) The design of an in-ground trench shall comply with § 1-919(b) when the soil has a:

(A) percolation rate that is faster than 1 minute per inch; or

(B) a soil texture of coarse sand or sand.

(5) The bottom of any portion of the leachfield or other infiltrative surface shall be no greater than 36 inches below ground surface.

(6) The distribution piping shall be:

(A) 4-inch rigid perforated pipe that is laid level;

(B) when chambers are used, 4-inch rigid perforated pipe; or

(C) when the wastewater system is designed to use pressure distribution, piping sized appropriately to achieve the requirements § 1-914.

(7) The ends of all pipes must be capped except pipes that are laid at the same elevation may be connected.

(8) When the design of the in-ground trench does not use pressure distribution and the design includes multiple trenches, a distribution box shall be part of the design and shall be:

(A) equipped with flow equalization devices for each distribution pipe that can be adjusted to maintain equal distribution;

(B) designed with an at-grade access; and

(C) protected against freezing.

(9) Any length of pipe within an in-ground trench that exceeds 100 feet in length shall be dosed pursuant to the requirements of § 1-914.

(10) In-ground trenches shall extend a minimum of 6 inches, or the required depth of the leachfield stone below the distribution pipe, whichever is greater, below ground surface on the downslope edge of the trench when constructed in naturally occurring soil.

(11) The bottom of an in-ground trench shall extend no deeper than 36 inches below ground surface. When the trench is constructed in naturally occurring soil and on a sloping site, the vertical measurements shall be taken from the deepest portion of the trench below the surface of the naturally occurring soil.

(12) Each in-ground trench shall be covered with a minimum of 6 inches and a maximum of 12 inches of permeable soil, the top 2 to 4 inches of which shall be topsoil.

(d) The construction of an in-ground trench or a trench in a mound shall meet the following requirements:
  (1) Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes.
  (2) After excavation of each trench, any smeared surface of the trench area including sidewalls shall be scarified with a rake.
  (3) To prevent undesirable compaction of the scarified soil, construction equipment not needed to construct the leachfield shall be kept off the leachfield area.

(e) During operation of distribution boxes:
  (1) Flow equalization devices shall periodically be adjusted to maintain equal distribution.
  (2) Settled solids shall periodically be removed to prevent passage of solids to downstream components.

§ 1-918 In-ground Beds and Beds in Mounds and Beds in Bottomless Sand Filters

(a) An in-ground bed, a bed in a mound, or a bed in a bottomless sand filter shall be sized according to the following requirements:
  (1) The minimum required square footage shall be calculated using the formula BA = DF ÷ AR where:
    (A) BA is the minimum required bed area in square feet;
    (B) DF is the design flow in gallons per day; and
    (C) AR is the application rate in gallons per day per square foot identified in § 1-911.
  (2) When the minimum linear loading rate is calculated, the minimum length of a bed shall equal the length derived by dividing the DF by the linear loading rate.

(b) The design of an in-ground bed, a bed in a mound, or a bed in a bottomless sand filter shall meet the following additional requirements:
  (1) Beds shall not be constructed in fill material except when beds are constructed in mounds or bottomless sand filters.
  (2) Beds in mounds shall be horizontally separated by at least 10 feet of fill material.
  (3) In-ground beds shall be horizontally separated by at least 10 feet of naturally occurring soil.
  (4) All distribution pipes within the bed shall be uniformly spaced no more than 6 feet apart.
  (5) The maximum distance from a distribution pipe and the edge of the bed shall be 3 feet.
  (6) Beds shall have one of the following designs:
    (A) Leachfield stone that complies with the following requirements:
      (i) Leachfield stone shall extend a minimum of 2 inches above the distribution pipe and 6 inches below the distribution pipe.
      (ii) A layer of filter fabric shall be placed over the top of the leachfield stone.
    (B) Prefabricated chambers that have a minimum H-10 structural loading rating that are laid level in the bed.

(C) Subsurface drip distribution that complies with § 1-923.

(7) The maximum capacity for any single bed is 2000 gallons per day.

(c) In-ground beds shall meet the following additional requirements:

(1) In-ground beds shall not be constructed in soil:

(A) with a percolation rate slower than 60 minutes per inch; or

(B) that have a soil texture of sandy clay, silty clay or clay.

(2) The design of an in-ground bed shall comply with § 1-919(b) when the soil has:

(A) a percolation rate faster than 1 minute per inch; or

(B) a soil texture of coarse sand or sand.

(3) The bottom of any portion of the leachfield or other infiltrative surface shall be no greater than 36 inches below ground surface.

(4) When the design of the in-ground bed does not use pressure distribution, a distribution box shall be part of the design and shall be:

(A) equipped with flow equalization devices for each distribution pipe that can be adjusted to maintain equal distribution;

(B) designed with an at-grade access; and

(C) protected against freezing.

(5) When the design of the in-ground bed does not use pressure distribution and the design includes multiple beds, a distribution box that complies with Subsection (c)(4) shall be part of the design to equally distribute effluent to each distribution box serving each bed.

(6) The distribution piping shall be:

(A) 4-inch rigid perforated pipe that is laid level;

(B) when chambers are used, 4-inch rigid perforated pipe; or

(C) when the wastewater system is designed to use pressure distribution, piping sized appropriately to achieve the requirements § 1-914.

(7) The ends of all pipes must be capped except pipes that are laid at the same elevation may be connected.

(8) Any length of pipe within an in-ground bed that exceeds 100 feet in length shall be dosed pursuant to the requirements of § 1-914.

(9) In-ground beds shall extend a minimum of 6 inches, or the required depth of the leachfield stone below the distribution piping, whichever is greater, below ground surface.

(10) The bottom of a portion of an in-ground bed shall extend no deeper than 36 inches below ground surface. On a site that has a slope, the vertical measurements shall be taken from the deepest portion of the bed below the surface of the naturally occurring soil.

(11) Each in-ground bed shall be covered with a minimum of 6 inches and a maximum of 12 inches of permeable soil, the top 2 to 4 inches of which shall be topsoil.

(d) The construction of an in-ground bed, bed in a mound, and bed in a bottomless sand filter shall meet the following requirements:

(1) Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes.

(2) After excavation of the bed, any smeared surfaces of the bed area, including sidewalls, shall be scarified with a rake.

(3) To prevent undesirable compaction of the scarified soil, construction equipment not needed to construct the leachfield shall be kept off the leachfield area.

(e) During operation of distribution boxes:
(1) Flow equalization devices shall periodically be adjusted to maintain equal distribution.
(2) Settled solids shall periodically be removed to prevent passage of solids to downstream components.

§ 1-919 Additional Design Requirements for In-Ground Leachfields

(a) Except as provided in Subsection (d), in-ground leachfields shall be located on sites that comply with the depths of naturally occurring soil required pursuant to § 1-903(i) and any additional requirements in this Section.

(b) For sites where the soil that will be directly beneath the proposed infiltrative surface of an in-ground leachfield has a percolation rate faster than 1 minute per inch or a soil texture of very coarse sand or coarser, and there is no soil with a thickness of 1 foot or greater with a percolation rate 1 minute per inch or slower or a soil texture of coarse sand or finer between the bottom of the proposed infiltrative surface of the leachfield and the seasonal high groundwater table or bedrock:
(1) The in-ground leachfield shall be a trench or bed with a minimum of 12 inches and a maximum of 18 inches of fill material meeting the specifications in § 1-921(g) placed below the bottom of the leachfield stone, piping for subsurface drip distribution, or other infiltrative surface.
(2) Notwithstanding § 1-911(c), the maximum application rate for sizing the in-ground leachfield shall be 1.0 gallon per square foot per day.

Note: An alternative to constructing an in-ground leachfield in conformance with Subsection (b) is to construct the leachfield in a mound in compliance with these Rules.

(c) For sites with 42 inches or greater depths of soil required pursuant to § 1-903 (i.e., complying soil), over a soil with redoximorphic features, with indicators of seasonal high-water table, with a percolation rate slower than 60 minutes per inch, or with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay (i.e., limiting soil), and 54 inches or greater depths of soil required pursuant to § 1-903 over bedrock, an in-ground leachfield shall meet the following requirements.
(1) The required depth of leachfield stone below the distribution pipe as required for an in-ground trench or bed shall be located entirely in naturally occurring soil that complies with § 1-903.
(2) If the design of the leachfield uses subsurface drip distribution that is in a trench or bed that does not use leachfield stone below the bottom of the drip distribution pipe, the drip distribution pipe shall be located entirely on naturally occurring soil that complies with § 1-903.
(3) The maximum application rate for sizing the in-ground leachfield that uses leachfield stone shall be based on the complying soil below the limiting soil.
(4) Naturally occurring soil from the site is suitable to cover the leachfield stone, but the top 2 to 4 inches of the cover shall be topsoil.

Note: Appendix C, Figure C-6, depicts a detail of a typical shallow trench wastewater system.

(d) For sites with soil with redoximorphic features, with indicators of seasonal high-water table, with a percolation rate slower than 60 minutes per inch, or with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay (i.e., limiting soil), and where the limiting soil terminates 24 inches or less below ground surface, provided the soil below the limiting soil comply with the depths of naturally occurring soil required pursuant to § 1-903 (i.e., complying soil), the in-ground leachfield shall meet the following requirements.

(1) The required depth of leachfield stone below the distribution pipe as required for an in-ground trench or bed shall be located entirely in naturally occurring soil that complies with § 1-903.

(2) If the design of the leachfield uses subsurface drip distribution that is in a trench or bed that does not use leachfield stone below the bottom of the drip distribution pipe, the drip distribution pipe shall be located entirely on naturally occurring soil that complies with § 1-903.

(3) The maximum application rate for sizing the in-ground leachfield that uses leachfield stone shall be based on the complying soil below the limiting soil.

(4) For sites where there is a soil directly beneath the infiltrative surface of an in-ground leachfield with a percolation rate of faster than 1 minute per inch or with a soil texture of coarse sand or sand, and the design of the leachfield uses leachfield stone below the distribution pipes, or the design is a subsurface drip distribution with less than 1 foot of fill below the distribution line, the design shall comply with Subsection (b)(1).

(5) A stormwater diversion swale to divert stormwater away from the leachfield shall be located upslope of the leachfield with the bottom of the drain or swale cut into, but not through, the soil with redoximorphic features.

Note: Appendix C, Figure C-7, depicts a detail of a typical trench wastewater system with 24 inches of limiting soil.

(e) For sites with soil with redoximorphic features, with indicators of seasonal high-water table, with a percolation rate slower than 60 minutes per inch, or with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay (i.e., limiting soil), and where the limiting soil terminates 5 feet or less below ground surface, the in-ground leachfield shall meet the following requirements:

(1) The in-ground leachfield shall be designed using pressure distribution.

(2) Notwithstanding § 1-911(c), the maximum application rate for sizing the in-ground leachfield shall be 1.0 gallon per square foot per day.

(3) Except as provided in Subsection (e)(5), the required depths of naturally occurring soil for the in-ground leachfield shall be:

(A) The minimum depth of naturally occurring soil (i.e., complying soil) below the limiting soil shall be:

(i) 24 inches to the seasonal high-water table;

(ii) 24 inches to a soil with:

(I) a percolation rate slower than 60 minutes per inch; or

(II) a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay; and

(iii) 24 inches to bedrock.

(B) The minimum depth of the naturally occurring soil below the limiting soil shall be met for a distance of:

(i) 25 feet in the downslope direction beyond the limits of the excavation for the leachfield; and

(ii) 10 feet on all other sides, beyond the limits of the excavation for the leachfield.

(C) The depth of fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(i) 36 inches to the seasonal high-water table;

(ii) 36 inches to a soil with:

(I) a percolation rate slower than 120 minutes per inch; or

(II) a texture of sandy clay, silty clay, or clay; and

(iii) 48 inches to bedrock.

(4) For an in-ground leachfield with a design flow of 1000 gallons per day or more, a hydrogeological analysis shall be completed that demonstrates the induced water table is a minimum of:

(A) 6 inches below the bottom of the limiting soil; and

(B) 36 inches below the bottom of the leachfield stone or other infiltrative surface of the leachfield.

(5) Notwithstanding Subsection (e)(3), when the in-ground leachfield disposes of filtrate effluent and is designed in accordance with § 1-904(c):

(A) The minimum depth of naturally occurring soil (i.e., complying soil) below the limiting soil shall be:

(i) 18 inches to a soil with a percolation slower than 120 minutes per inch;

(ii) 18 inches to a soil that has a texture of sandy clay, silty clay, or clay; and

(iii) 18 inches to bedrock.

(B) The depth of fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(i) 18 inches to the induced water table, as demonstrated through a hydrogeological analysis;

(ii) 18 inches to a soil with:

(I) a percolation rate slower than 120 minutes per inch; or

(II) a texture of sandy clay, silty clay, or clay; and

(iii) 24 inches to bedrock.

(6) The limiting soil shall be removed to the depth of the complying soil and replaced with fill material that meets the specifications in § 1-921(g) and:

(A) The complying soil shall be scarified prior to placement of the fill material.

(B) The fill material shall extend a minimum of 1 foot beyond the outside edge of the leachfield stone or other infiltrative surface of the in-ground trench or bed.

(C) The fill material shall extend at least 1 foot beyond the outside area of the calculated actual wetted area around the emitters when the design of the

leachfield uses subsurface drip distribution that is not in a trench or bed and does not use leachfield stone as the infiltrative surface.

(7) A curtain drain or drainage swale to divert groundwater and stormwater away from the leachfield area shall be installed up-slope of the leachfield. The bottom of the drain or swale shall cut into the limiting soil but shall be no deeper than 80 percent of the limiting soil.

Note: Appendix C, Figure C-8, depicts a detail of a typical trench wastewater system with 24 inches to 5 feet of limiting soil.

§ 1-920 At-grade Leachfields

(a) For the purposes of this Section, "effective infiltration area" means the area of naturally occurring soil upon which at least 6 inches of leachfield stone is placed. It does not include:
- (1) the downslope area of the leachfield stone that is less than 6 inches thick;
- (2) the side slope fill areas; or
- (3) the portion of the leachfield stone that is upslope of the distribution pipe on sites with a slope of greater than 3 percent.

(b) A Class 1, Class B, or Class BW designer is required to submit the installation certification required pursuant to § 1-311(b) for the installation of an at-grade leachfield.

(c) At-grade leachfields shall be located on sites that comply with the following requirements:
- (1) At-grade leachfields shall be located on sites that comply with the depths of naturally occurring soil required pursuant to § 1-903(i); and
- (2) At-grade leachfields shall not be constructed on soil with a percolation rate of faster than 1 minute per inch or a soil texture of very coarse sand or coarser, unless there is soil with a thickness of 1 foot or greater with a percolation rate 1 minute per inch or slower or a soil texture of coarse sand or finer between the bottom of the proposed infiltrative surface of the leachfield and the seasonal high groundwater table or bedrock.

(d) An at-grade leachfield shall be sized according to the following requirements:
- (1) The minimum required square footage shall be calculated using the formula BA = DF ÷ AR where:
  - (A) BA is the minimum required stone area in square feet;
  - (B) DF is the design flow in gallons per day; and
  - (C) AR is the application rate in gallons per day per square foot identified in § 1-911 or Subsection (e)(2).
- (2) When the minimum linear loading rate is calculated, the minimum length of a leachfield shall equal the length derived by dividing the DF by the linear loading rate.
- (3) When tree stumps or boulders are left in place within the area for the leachfield, the size of the leachfield and replacement area shall be increased approximately equal to the percentage of soil surface lost due to tree stumps or boulders.

(e) At-grade leachfields can be located on an area that has non-naturally occurring soil over naturally occurring soil, provided the site complies with Subsection (c) and the following:

(1) The non-naturally occurring soil:

(A) is clean mineral soil free of wood, leaves, and other debris;

(B) has a percolation rate of 60 minutes per inch or faster and does not have a soil texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(C) will not cause horizontal flows that could lead to surfacing of the effluent; and

(D) is of sufficient size and consistency to place an at-grade leachfield.

(2) Notwithstanding § 1-911(c), the maximum application rate for sizing the at-grade leachfield shall be determined based on the following:

(A) The maximum application rate shall be determined using one of the following methods:

(i) Table 9-3, using the texture and structure of the non-naturally occurring soil, or the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below the non-naturally occurring soil, identified from soil excavations, whichever results in the lower application rate; or

(ii) Table 9-4, using the results of the percolation tests conducted pursuant to § 1-910 in the non-naturally occurring soil, or in the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below the non-naturally occurring soil, whichever results in the lower application rate.

(B) If using the method in Subsection (e)(2)(A)(ii) results in a higher application rate than the using the method in Subsection (e)(2)(A)(i), the maximum application rate for sizing the at-grade leachfield shall be determined using the method in Subsection (e)(2)(A)(i).

(f) The design of an at-grade leachfield shall meet the following requirements:

(1) When an at-grade leachfield has two or more infiltrative surfaces placed end to end, the infiltrative areas shall be a separated a minimum of 10 feet as measured from the edge of the leachfield stone.

(2) When an at-grade leachfield has two or more infiltrative areas placed in the same flow path, the infiltrative areas shall:

(A) be separated a minimum of 6 feet as measured from the edge of the leachfield stone; and

(B) comply with § 1-903(i)(4)(A) from the most downslope infiltrative area.

(3) The infiltrative areas of a primary at-grade leachfield and a replacement at-grade leachfield may interfinger provided:

(A) there is maintained a minimum of 6 feet of naturally occurring soil between infiltrative areas as measured from the edge of the fill material over each infiltrative area; and

(B) the infiltrative areas comply with § 1-903(i)(4)(A) from the most downslope infiltrative area.

(4) When a primary at-grade leachfield and a replacement at-grade leachfield are placed in the same flow path but the infiltrative areas of the primary at-grade leachfield and the replacement at-grade leachfield are not interfingered, the

primary at-grade leachfield and replacement at-grade leachfield shall be separated by 10 feet of naturally occurring soil measured from the edge of the fill material for the primary and replacement at-grade leachfields.

(5) Notwithstanding Subsection (f)(1), (2), (3) and (4), when the primary and replacement at-grade leachfields are designed on an area that has non-naturally occurring soil over naturally occurring soil pursuant to Subsection (e), there shall be an equal distance of undisturbed non-naturally occurring soil between infiltrative areas as would be required for naturally occurring soil pursuant to § 1-903(i)(4).

(6) At-grade leachfields shall utilize pressure distribution pursuant to § 1-914.

(7) At-grade leachfields receiving 3000 gallons per day or more of design flow shall consist of dual alternating at-grade leachfields.

(8) The maximum width of the effective infiltration area shall be 6 feet.

(9) The minimum width of the effective infiltration area shall be 3 feet.

(10) A minimum length to width ratio of 2 to1 shall be provided for at-grade leachfields.

(A) The system length and width shall be determined by measuring from the outer edges from the 6-inch depth of the leachfield stone.

(B) The width dimension includes the separation distance (6 feet minimum) between individual infiltration areas for at-grade leachfields having more than one infiltration area.

(C) The width does not include the 2 feet of leachfield stone upslope from the distribution pipe for at-grade leachfields on a slope of greater than 3 percent.

(11) Force mains shall connect to the distribution pipe from:

(A) the ends of the leachfield; or

(B) from the upslope side of the leachfield.

(12) The distribution pipe shall:

(A) be placed in the center of the effective infiltration area on sites with less than or equal to a 3 percent slope; and

(B) placed at the upper side of the effective infiltration area on sites with a slope that is greater than 3 percent.

(13) A minimum of 6 inches of leachfield stone shall be placed under the distribution pipe and at least 2 inches of leachfield stone shall be placed above the top of the distribution pipe.

(14) Filter fabric shall be placed over the top of the leachfield stone. The leachfield stone shall be covered with a minimum of 12 inches of permeable fill material, with a maximum of 18 inches of soil, the top 2 to 4 inches of which shall be topsoil and the remainder a fine sandy loam to medium sand texture.

(15) All four sides of the fill material shall be designed to slope away at a pitch that is not steeper than 1-foot rise for every 3-foot run.

(16) The design shall indicate that a vegetated cover shall be maintained over all portions of the system.

(17) A swale shall be designed, or the area surrounding the at-grade leachfield shall be graded, to divert stormwater away from the at-grade.

(g) The construction of an at-grade leachfield shall meet the following requirements:

(1) The stormwater diversion swale, if part of the design, shall be installed prior to constructing the at-grade leachfield to keep stormwater away from the system while it is under construction.

(2) Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes.

(3) To prevent compaction, construction equipment shall not move across the plowed or tilled surface or the effluent dispersal area for a distance of 25 feet downslope of the fill material except for equipment required for placing the leachfield stone or fill material.

(4) Vegetation shall be cut close to the ground and removed from the area to be plowed or tilled.

(5) Tree stumps shall be cut flush with the ground and the roots left in place.

(6) On wooded sites, the forest litter shall be raked off the infiltrative area if more than an inch thick.

(7) The infiltrative area for an at-grade leachfield and the area beneath the non-naturally occurring soil shall be plowed, preferably by mold board or chisel plow, to a depth of 6 to 8 inches, parallel to the ground contour. If the site cannot be plowed, a backhoe bucket fitted with chisel teeth may be used to "till" the site by creating furrows that are parallel to the ground contours.

(8) During plowing, the soil shall be thrown downslope to provide a proper interface between the soil and the leachfield stone.

(9) The force main may be installed before or after plowing or tilling.

(10) Construction shall begin immediately after the plowing or tilling by placing the leachfield stone.

(11) Upon completion of the distribution piping, pressure test the system with clean water.

(12) After successful testing of the distribution piping, the distribution pipe shall be covered with at least 2 inches of clean leachfield stone.

(13) The leachfield stone shall be covered completely with filter fabric.

(14) The filter fabric shall be covered with a minimum of 12 inches but not more than 18 inches of soil, the top 2 to 4 inches of which must be topsoil and the remainder a fine sandy loam to medium sand texture.

(15) The entire at-grade leachfield shall be seeded and mulched or sodded to assure stability of the installation.

(16) The area surrounding the at-grade leachfield shall be graded to divert stormwater away from the at-grade leachfield.

Note: Appendix C, Figure C-9, depicts a detail of a typical at-grade leachfield with one infiltration area (0-3 % site slope). Figure C-10, depicts a detail of a typical at-grade leachfield with two infiltration areas (> 3 % site slope). Appendix C, Figure C-11, depicts a detail of a typical at-grade leachfield with interfingering infiltration areas (> 3 % site slope).

§ 1-921 Leachfields in Mounds

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification required pursuant to § 1-311(b) for the installation of a leachfield in a mound.

(b) Leachfields in mounds shall be located on sites that comply with the depths of naturally occurring soil required pursuant to § 1-903.

(c) The design of a leachfield in a mound may rely on curtain drains to lower the seasonal high-water table to 24 inches or more in order to comply with § 1-903(j) without complying with the requirements of § 1-906(a) when:
- (1) the leachfield disposes of 600 gallons or less per day of effluent;
- (2) the leachfield is sited on ground which has a slope;
- (3) the leachfield consists of a maximum of either 2 trenches or a bed that has a maximum width of 10 feet;
- (4) the seasonal high-water table is 18 inches or more below the naturally occurring soil prior to use of the curtain drain;
- (5) the bottom of the curtain drain is designed to be a minimum of 12 inches into the soil with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, clay, and silty clay;
- (6) any hydrogeological analysis performed for the leachfield is based on an assumed seasonal high-water table of 18 inches below the ground surface; and
- (7) the Secretary agrees the curtain drain will lower the seasonal high-water table to 24 inches or more.

(d) A leachfield in a mound shall be one of the following:
- (1) a trench provided, when there are 2 or more trenches:
  - (A) for designs not including a hydrogeological analysis, the minimum trench length shall be twice the width across the top of the mound as measured from the outside to outside of the trenches; or
  - (B) for designs including a hydrogeological analysis, the trench length equals or exceeds the combined width of the trenches; or
- (2) a bed, provided the bed has a maximum width of 10 feet and the bed length equals or exceeds the bed width.

(e) Leachfields in mounds shall be sized according to the following requirements:
- (1) Trenches shall be sized according to the requirements of § 1-917(a).
- (2) Beds shall be sized according to the requirements of § 1-918(a).
- (3) When tree stumps or boulders are left in place within the area for the leachfield, the size of the leachfield shall be increased approximately equal to the percentage of soil surface lost due to tree stumps or boulders.

(f) Leachfields in mounds can be located on an area that has non-naturally occurring soil over naturally occurring soil, provided
- (1) The non-naturally occurring soil:
  - (A) is clean mineral soil free of wood, leaves, and other debris;
  - (B) has a percolation rate of 120 minutes per inch or faster and does not have a soil texture of sandy clay, silty clay, or clay;

(C) will not cause horizontal flows that could lead to surfacing of the effluent; and

(D) is of sufficient size and consistency to place a mound;

(2) The maximum application rate for sizing the effective basal area is based on the following requirements:

(A) The maximum application rate shall be 1 gallon per square foot or determined using one of the following methods if the methods result in a lower application rate:

(i) Table 9-3, using the texture and structure of the non-naturally occurring soil, or the most limiting naturally occurring soil texture and structure identified within 0 to 2 feet below the non-naturally occurring soil identified from soil excavations, whichever results in the lower application rate; or

(ii) Table 9-4, using the results of the percolation tests conducted pursuant to § 1-910 in the non-naturally occurring soil, or in the most limiting naturally occurring soil texture and structure identified within 0 to 2 feet below the non-naturally occurring soil, whichever results in the lower application rate.

(B) If using the method in Subsection (f)(2)(A)(ii) results in a higher application rate than the using the method in Subsection (f)(2)(A)(i), the maximum application rate for sizing the mound shall be determined using the method in Subsection (f)(2)(A)(i).

(3) The design includes a minimum of 12 inches of mound fill above the non-naturally occurring soil.

(g) The fill material to be used in a mound shall meet the following requirements:

(1) The mound fill material from the plowed ground surface, or the top of the non-naturally occurring soil identified in Subsection (f), to the top of the trench or bed in the mound fill material shall be clean silica sand meeting the sieve requirements in Table 9-8, Table 9-9, or Table 9-10. Interpolation of any fill analyses is not permitted.

Table 9-8
Mound Fill Material #1

Sieve Number	Opening (mm)	Percent Passing, by Weight
3/8	9.500	85 - 100
40	0.420	25 - 75
60	0.240	0 - 30
100	0.149	0 - 10
200	0.074	0 - 5

Table 9-9
Mound Fill Material #2[1]

Sieve Number	Opening (mm)	Percent Passing, by Weight
4	4.750	95 - 100
8	2.380	80 - 100
16	1.190	50 - 85
30	0.590	25 - 60
50	0.297	10 - 30
100	0.149	2 - 10

[1] Mound Fill Material #2 is ASTM Specification C 33 and is intended for manufactured material.

Table 9-10
Mound Fill Material #3

Sieve Number	Opening (mm)	Percent Passing, by Weight
3/8	9.500	85 - 100
40	0.420	30 - 50
200	0.074	0 - 5

(2) The Secretary may approve other fill material that is proposed by the designer when the designer submits information demonstrating that the fill material will provide the same treatment of effluent as using the mound fill material identified in Subsection (g)(1) and will provide the same life expectancy for a mound as using the mound fill material identified in Subsection (g)(1).

(3) Notwithstanding any condition in a permit issued under the September 10, 1982 Environmental Protection Rules authorizing a leachfield in a mound requiring the use of fill material that differs from the mound fill material identified in Subsection (g)(1), a wastewater system not yet constructed pursuant to the permit may use the mound fill material identified in Subsection (g)(1).

(h) The effective basal area for a mound shall be sized according to one of the following methods:

(1) The minimum required square footage calculated using the formula EBA = DF ÷ AR where:

(A) EBA is the minimum required square footage of effective basal area in square feet;

(B) DF is the design flow in gallons per day; and

(C) AR is the maximum application rate in gallons per day per square foot identified in Subsection (i) or (f)(2).

(2) The minimum required square footage determined through a hydrogeological analysis, but in no case less than that equal to the length and width required for the leachfield pursuant to these Rules.

(i) Except where Subsection (f)(2) applies, the maximum application rate for sizing the effective basal area shall be:

(1) 0.74 gallons per day per square foot when it is determined through soil excavations or a percolation test that the most limiting naturally occurring soil texture and structure identified within 0 to 2 feet below the ground surface has:
  (A) soil textures of coarse sand, sand, fine sand, very fine sand, sand, loamy coarse sand, loamy sand, loamy fine sand, loamy very fine sand, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, and loam; or
  (B) a percolation rate of 0 to 60 minutes per inch.
(2) 0.24 gallons per day per square foot when it is determined through soil excavations or a percolation test that the most limiting naturally occurring soil texture and structure identified within 0 to 2 feet below the ground surface has:
  (A) soil textures of silt loam, silt, sandy clay loam, clay loam, silty clay loam; or
  (B) a percolation rate of more than 60 to 120 minutes per inch.

(j) The design of a mound shall meet the following requirements:
(1) There shall be a minimum of 1 foot of mound fill material between the bottom elevation of the leachfield and the naturally occurring soil.
(2) The mound fill material shall extend a minimum of 1 foot beyond the effective basal area.
(3) Mounds shall utilize pressure distribution pursuant to § 1-914.
(4) Mounds shall be designed with the long dimension of the system parallel to the land contour.
(5) Force mains shall connect to the distribution pipe in the leachfield from:
  (A) the ends of the leachfield in the mound; or
  (B) from the upslope side of the leachfield in the mound.
(6) The area of mound fill material shall be sufficient to extend 1 foot beyond the edge of the required trenches or the bed before the sides are shaped to the acceptable slope.
(7) The maximum acceptable side slope for mounds shall be:
  (A) 1-foot rise for every 3-foot run; or
  (B) 1-foot rise for every 2-foot run when the design:
    (i) includes instructions for construction; and
    (ii) includes one of the following erosion prevention design measures to protect side slope stability following seeding or sodding:
      (I) placing rolled erosion control product along the entire side slopes; or
      (II) other erosion prevention measures acceptable to the Secretary.
(8) A swale shall be designed, or the area surrounding the mound shall be graded, to divert stormwater away from the mound.
(9) The area 25 feet downgradient of the mound, as measured from the edge of the mound fill material, is the effluent dispersal area and shall not be disturbed by removal of soil or any development, including building construction, swimming pools, roadways, and parking areas.

(k) The construction of a mound shall meet the following requirements:

(1) Vegetation shall be closely cut and removed from the ground surface throughout the area to be used for the placement of the mound fill material. Tree stumps shall be cut flush with the surface of the ground and roots shall not be pulled.
(2) Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes.
(3) The area shall be plowed to a depth of 7 to 8 inches.
(4) If the site cannot be plowed, a backhoe bucket fitted with chisel teeth may be used to "till" the site by creating furrows that are parallel to the ground contours.
(5) To prevent compaction, construction equipment shall not move across the plowed or tilled surface or the effluent dispersal area for a distance of 25 feet downslope of the mound fill material except for equipment required for placing the mound fill material.
(6) Construction shall commence immediately after preparation of the soil interface by placing the mound fill material in a minimum of 6-inch lifts at which point construction equipment may drive over the mound fill material.
(7) After construction of the distribution system, but prior to covering the distribution system, the distribution system shall be pressure tested.
(8) After successful testing of the distribution system, any necessary additional leachfield stone and the filter fabric shall be installed and the system completed.
(9) The entire mound shall be covered with topsoil native to the site, or of similar characteristics, to support vegetation found in the area.
(10) The entire mound shall be covered with 12 inches of soil that is less permeable than the mound fill material with the top of the mound being covered. Naturally occurring soil from the site is normally suitable for cover material but the top 2 to 4 inches of the cover shall be topsoil.
(11) The entire mound shall be seeded and mulched or sodded to assure stability of the installation.
(12) Install the swale, or the area surrounding the mound shall be graded, to divert stormwater away from the mound.

Note: Appendix C, Figure C-12, depicts a detail of a typical bed in a mound.

§ 1-922 Leachfields in Bottomless Sand Filters

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification for the installation of a leachfield in a bottomless sand filter and the results of all sieve analysis completed pursuant to Subsection (d).

(b) Bottomless sand filters shall be located on sites that comply with the following requirements:
(1) Bottomless sand filters shall only be located on sites that comply with the depths of naturally occurring soil required pursuant to § 1-903.
(2) Bottomless sand filters shall not be located on sites with tree stumps or boulders.

(c) A leachfield in a bottomless sand filter shall be a bed and shall be sized according to the requirements of § 1-918(a).

(d) The fill material to be used in a bottomless sand filter shall meet the following requirements:

(1) The bottomless sand filter fill material from the plowed ground surface to the bottom of the cover stone in the filter shall be clean silica sand meeting the sieve requirements in Table 9-11.

Table 9-11
Bottomless Sand Filter Fill Material

Sieve Number	Opening (mm)	Percent Passing, by Weight
4	4.750	95 - 100
8	2.380	80 - 100
16	1.190	50 - 85
30	0.590	25 - 60
50	0.297	10 - 30
100	0.149	2 - 10
200	0.074	0 - 1

(2) All bottomless sand filter fill material within the enclosure below the cover stone shall have:

(A) an effective size (D10) of 0.33 mm (+/-); and

(B) uniformity coefficient (D60 ÷ D10) of 3.0 to 4.0.

(i) Uniformity coefficient (U.C.) is a numeric quantity which is calculated by dividing the size of a sieve opening which will pass 60 percent by weight of a sand media sample by the size of the sieve opening which will pass 10 percent by weight of the same sand media sample. Note that 50 percent of the sample is retained between the two. The uniformity coefficient is a measure of the degree of size uniformity of the sand particles in a sand media sample. As the U.C. value approaches 1, the more uniform in particle size the sand media is. The larger the U.C., the less uniform the particle size.

(ii) U.C. = Particle Diameter 60 percent divided by Particle Diameter10 percent (D60 ÷ D10).

(3) The designer shall complete at least one sieve analysis of the bottomless sand filter fill material as it is being installed to demonstrate compliance with the requirements of Subsections (d)(1) and (2). When the bottomless sand filter is designed to dispose of 1000 gallons per day or more, the Secretary may require additional sieve analyses to be taken from different sections of the bottomless sand filter.

(e) The design of a leachfield in a bottomless sand filter shall meet the following requirements:

(1) The design of a bottomless sand filter shall use time dosing that complies with § 1-915.

(2) When the design uses a subsurface drip distribution system:

(A) the laterals shall be placed on the stone or bottomless sand filter fill material; and

(B) the laterals shall have a maximum of 2 inches of sand that extends above the top of the lateral with stone to the required height above the lateral above the sand.

(3) The stone to be used in a bottomless sand filter shall meet the following requirements:

(A) Stone shall be 3/8-inch round or sub-rounded, screened or crushed, uniform in size so that no more than 5 percent of the sample is greater than ½ inch and no more than 5 percent shall pass a 3/8-inch sieve, not to be shale or other soft stone.

(B) Stone shall be double washed prior to placement on the bottomless sand filter fill material so it contains little or no fines.

(C) Total depth of the stone shall be 8 to 9 inches depending on the size of the lateral.

(4) Laterals within the bottomless sand filter shall provide lateral spacing and orifice spacing that:

(A) is as square as possible;

(B) has the liner approximately one half the lateral spacing to the closest lateral; and

(C) has a space between the ends of the laterals to the liner approximately equal to one half the orifice spacing that is able to accommodate the fittings (i.e.: 45-degree elbow, threaded end adapter and cap). Regardless of the lateral spacing, there shall be sufficient space between the end of the lateral and liner for maintenance activities.

(5) Orifices shall comply with § 1-914(d) except:

(A) there must be 2 orifices facing up spaced 1/3 and 2/3 respectively along each lateral;

(B) all other orifices must face down; and

(C) there must be a shield for all orifices. Shields for down facing holes shall contain slots or holes to provide free draining.

(f) Pump stations used with a bottomless sand filter shall include pumps that meet one of the following requirements unless they are following an approved treatment unit:

(1) Pumps shall be housed in a screened basket and have an in-line effluent filter on the pump's discharge piping that is located accessible within the pump station; or

(2) Pumps shall be designed in a manner that the Secretary concludes provides equal or greater protection as Subsection (f)(1) in preventing the passage of suspended solids to the leachfield.

(g) Force mains used with a bottomless sand filter shall meet the following requirements:

(1) Force mains shall drain back to the pump station unless:

(A) the design provides insulation of the force main; or

(B) the force main is sufficiently deep to prevent freezing.

(2) Force mains shall connect to the distribution pipe in the leachfield from:

(A) the ends of the bottomless sand filter; or

(B) from the upslope side of the bottomless sand filter.

(h) The design of the bottomless sand filter shall meet the following requirements:

(1) The maximum inside width of a bottomless sand filter shall be 10 feet.

(2) The area 25 feet downgradient of the bottomless sand filter, as measured from the edge of the enclosure, is the effluent dispersal area and shall not be disturbed by removal of soil or any development, including building construction, swimming pools, roadways, and parking areas

(3) The effluent dispersal area may be plowed and covered with a maximum of 6 inches of soil, the top 2 to 4 inches of which shall be topsoil.

(4) Sod, vegetation, or dead or decaying organic litter or any organic soil horizon shall be removed from inside the footprint of the enclosure for the bottomless sand filter. Stripping of the topsoil layer under or outside the footprint for the bottomless sand filter is prohibited except as needed to lay the bottom of the enclosure level.

(5) The walls of bottomless sand filters must be lined with a 30-mil flexible PVC liner with all boots, patches, repairs, and seams having the same physical properties as the liner material. The designer shall inspect the liner as part of the installation certification to ensure all seams or tears of the liner were properly repaired and all boots are properly installed to prevent leakage of effluent through the side wall structure.

(6) The designer shall determine if the design needs to include insulation, such as foam board, inside the enclosure to prevent freezing within the enclosure.

(7) The design shall identify the location and type of cross bracing to ensure structural integrity and prevent bowing of the sides of the enclosure. The Secretary may request a designer provide calculations to show where there needs to be cross bracing particularly when the total height of the bottomless sand filter exceeds 24 inches above finished grade.

(8) Stainless steel or galvanized rods may be used for cross bracing inside the bottomless sand filter to minimize bowing of the sides of the structure. The bolt heads and nuts holding the rods in place shall be recessed into the bottomless sand filter exterior structure to minimize risks of injury from sharp edges.

(9) Penetration through the PVC liner shall be done with a PVC boot attachment glued to the liner with appropriate resilient sealer.

(10) A permanent top frame structure (such as pressure treated 6 inch by 6-inch timbers, or other suitable structural support) must be provided on any portion of the above grade bottomless sand filter.

(11) The perimeter of the bottomless sand filter below the required minimal structural support may be bermed with naturally occurring soil or other material such as landscape stone or other non-degrading material. In areas where slope is a consideration, a concrete structure may be considered by the designer to minimize damage to the bottomless sand filter.

(12) A swale shall be designed, or the area surrounding the bottomless sand filter shall be graded, to divert stormwater away from the bottomless sand filter.

(13) One inspection well shall be installed in the approximate center of the filter that extends through the bottomless sand filter fill material terminating at the interface with the naturally occurring soil.

(14) Bottomless sand filters that have multiple zones shall have at least one inspection well per zone.

(15) The inspection well shall be PVC pipe (SDR 35 minimum) with a minimum diameter of 2 inches that is perforated or slotted, wrapped in filter fabric, and topped with a removable cap positioned slightly below the finished elevation of the cover stone.

(16) The area around the enclosure of the bottomless sand filter shall:

(A) extend level for a minimum horizontal isolation distance of 5 feet from the enclosure; and

(B) from each point 5 feet from the enclosure, be graded a minimum of 1-foot rise for every 3-foot run until the slope intersects the naturally occurring soil.

(i) The construction of a bottomless sand filter shall meet the following requirements:

(1) Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes.

(2) Excavation of naturally occurring soil beneath the bottomless sand filter is prohibited, except as required by Subsection (h)(3).

(3) Once the proper elevation for the base of the bottomless sand filter is reached, construct the enclosure of the bottomless sand filter.

(4) Upon completion of the enclosure, place 3 inches of the approved bottomless sand filter fill material in the enclosure and thoroughly mix with the upper 3 inches of the naturally occurring soil.

(5) Placement of the remaining bottomless sand filter fill material to the necessary elevation shall be completed by:

(A) an excavator/backhoe bucket that is thoroughly washed prior to placement of the bottomless sand filter fill material to remove any soil in or on the bucket;

(B) placing the bottomless sand filter fill material in 8-inch lifts with the fill material wetted during installation to promote even settling (do not over wet the fill material as particle stratification may occur);

(C) using a hand rake or equivalent, to spread each 8-inch lift of bottomless sand filter fill material within the enclosure;

(D) "walking down" each 8-inch lift using only foot pressure by a person or persons wearing clean shoes free of soil with a texture of loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay (no compaction equipment shall be used); and

(E) inspecting each placement, wetting, and "walk down" of the fill material, by the installer or designer to be certain the filter liner is not stretched or punctured during the filling of the enclosure.

(6) Placement of the stone over the bottomless sand filter fill material shall be as follows:

(A) place 3 inches of 3/8-inch stone over the fill material;

(B) place the laterals on the stone and pressure test the laterals;

(C) after successful testing of the distribution system, cover the laterals with stone or ¼ inch mesh plastic fabric;

(D) add a maximum of 6 inches of 3/8-inch stone over the lateral. If desired, place 1 to 2 inches of stone over the laterals, place a ¼ inch mesh plastic

fabric over the top of the stone, and add the remaining stone over the fabric;

(E) maintain the top of the stone to prevent plants with roots that can penetrate more than 2 inches; and

(F) if desired, place bark mulch pellets to cover the stone or other material acceptable to the Secretary that will not limit the air movement into and out of the filter. Do not place topsoil over the stone.

Note: Appendix C, Figure C-13, depicts a detail of a typical leachfield in a bottomless sand filter.

§ 1-923 Leachfields Using Subsurface Drip Distribution

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification for the installation of a wastewater system with subsurface drip distribution.

(b) The use of subsurface drip distribution in the design of a wastewater system is optional.

(c) General requirements for subsurface drip distribution

(1) A wastewater system using subsurface drip distribution shall be designed to dispose of filtrate effluent in accordance with § 1-904(c).

(2) The bottom of the drip line shall be:

(A) a minimum of 6 inches below finished ground surface when placed on naturally occurring soil;

(B) a minimum of 6 inches into naturally occurring soil below ground surface or O soil horizon;

(C) a minimum of 6 inches below finished ground surface when used in place of leachfield stone and pipe for mounds; or

(D) placed on leachfield stone when used with designs using leachfield stone as the infiltrative area.

(3) The required length of the subsurface drip distribution line shall be determined by:

(A) the linear loading rate determined by a hydrogeological analysis;

(B) the soil application rate; and

(C) the actual wetted area around the drip emitters.

(4) Designs of subsurface drip distribution shall:

(A) use time dosing that complies with § 1-915;

(B) ensure that the system will function in all weather conditions;

(C) ensure that the transport and distribution piping within the systems be designed to “drain-back” to the pump station between dose cycles;

(D) specify the manufacturer of the piping, emitter, and pumping system (only one manufacturer may be specified per design);

(E) include the design, installation and maintenance instructions of the manufacturer; and

(F) include design calculations and details that demonstrate compliance with the manufacturer’s requirements and these Rules.

(d) Subsurface drip distribution shall be constructed according to the following:

(1) Subsurface drip distribution shall be installed, operated, and maintained in accordance with the current design, installation, and maintenance instruction of the manufacturer.
(2) Drip line, when placed in naturally occurring soil, shall be trenched by hand or with a trenching machine into narrow, shallow trenches or plowed (with a vibratory plow or other insertion tool) directly into the soil and backfilled without gravel or leachfield stone.
(3) After construction of the subsurface drip distribution, but prior to covering the distribution piping, a designer shall direct the testing of the distribution system.
(4) After successful testing of the distribution system, the distribution piping shall be covered.

Note: Appendix C, Figure C-14, depicts a detail of a typical leachfield using subsurface drip distribution.

§ 1-924 Intermittent and Recirculating Sand Filters

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification required for the installation of wastewater system that includes an intermittent or recirculating sand filter.

(b) The use of intermittent and recirculating sand filters in the design of a wastewater system is optional and may be proposed as a treatment component of a wastewater system.
(1) The wastewater existing after filtration by an intermittent sand filter shall be presumed to be filtrate effluent when the septic tank effluent being discharged to the sand filter is low strength prior to filtration.
(2) The wastewater existing after filtration by a recirculating sand filter shall be presumed to be filtrate effluent when the septic tank effluent being discharged to the sand filter is low strength prior to filtration.

(c) General requirements for intermittent and recirculating sand filters
(1) Container Design & Construction
(A) The filter container shall be watertight to prevent groundwater from infiltrating into the filter container and to prevent wastewater exfiltration from the sand filter container. The container material shall be:
(i) reinforced concrete;
(ii) flexible membrane liner materials, provided they comply with the following requirements:
(I) they have properties that are at least equivalent to 30-mil un-reinforced polyvinyl chloride;
(II) they have field repair instructions and extra liner material that are provided to the purchaser with the liner;
(III) they have factory fabricated “boots” suitable for field bonding onto the liner to facilitate the passage of piping through the liner in a waterproof manner; and
(IV) they are compatible with the wastewater being treated; or
(iii) other materials having equivalent function, workmanship, watertightness and at least a 20-year service life.

(B) All tanks associated with a sand filter, including septic and dosing tanks and any pumping vaults, shall:
  (i) be watertight;
  (ii) have an at-grade access provided by a watertight manhole or riser not less than 18 inches in diameter, unless otherwise approved by the Secretary; and
  (iii) be designed to prevent entry by children.

(C) Upon completion of installation of a sand filter, the recirculation tank and sand filter container shall be tested for watertightness by filling the recirculation tank and sand filter to a point at least 2 inches but not more than 3 inches above the point of riser connection to the top of the tank, chamber, or container. During the test, there shall not be a measurable leakage over a 24-hour period.

(D) Notwithstanding Subsection (c)(1)(C), the Secretary may approve other leakage testing methods.

(2) Siting Requirements

(A) The sand filters shall be protected from both groundwater and stormwater infiltration.

(B) For the purpose of determining the minimum isolation distance to other site features, the sand filter container shall comply with the isolation distances set forth in § 1-912 for septic tanks.

(3) Monitoring

(A) The sand filter shall be designed for wastewater sample collection before and after the sand filter.

(B) The sand filter shall have the capability of measuring and recording the wastewater flow from buildings or structures or campgrounds to the sand filter.

(4) Annual inspections of each sand filter by a Class 1, Class B, or Class BW designer are required. A written report shall be submitted to the Secretary within 30 days of the inspection. At a minimum, the following items shall be addressed in the inspection report:

(A) use and age of system including the average daily flows;

(B) the recirculation ratio for recirculating sand filters;

(C) mechanical or electrical malfunctions;

(D) neglect or improper use; and

(E) flushing of the laterals.

(5) Operation & Maintenance Manuals

(A) A user's manual for the sand filter shall be developed or provided along with record drawing(s) at the time that the sand filter installation is complete. These manuals, at a minimum, shall contain the following information:
  (i) diagrams of the components and their location;
  (ii) an explanation of how the sand filter functions, operational expectations, and owner responsibility;
  (iii) specifications of the electrical and mechanical components installed (occasionally components other than those specified on the plan and detail sheets are used);

(iv) names and telephone numbers of the designer, the local health authority, the supplier/installer, or the management entity to be contacted in the event of a failure;

(v) information on the periodic maintenance requirements of the sand filter, including the septic tank, the dosing and recirculating/mixing tanks, the sand filter unit, the pumps, the switches, the alarms, the leachfield, and other information as appropriate;

(vi) information on “trouble shooting" common operational problems that might occur. This information should be detailed and complete as needed to assist the system owner to make accurate decisions about when and how to attempt corrections of operational problems and when to call for professional assistance;

(vii) information on the disposal of discarded sand filter media in accord with state and local requirements; and

(viii) for proprietary sand filter units, a complete operation and maintenance document shall be developed and provided by the manufacturer. This document shall include all the appropriate items mentioned above plus any additional general and site-specific information useful to the system owner or the service provider.

(d) Additional requirements for the design and construction of intermittent sand filters.

(1) Underdrain System

(A) The base of the sand filter container shall be level or constructed at a grade of 1 percent or less towards the underdrain piping.

(B) The underdrain piping shall be installed in the interior of the sand filter container at the lowest elevation. The piping shall be on a grade of 1 percent or less to the point of passage through the sand filter container.

(C) The underdrain piping and sand filter container bottom shall be covered with a minimum of 6 inches of clean washed ¾ inch to 1½ inch stone.

(D) Other types of underdrain systems may be proposed and approved after review by the Secretary.

(2) Sand Filter Media

(A) A minimum of 24 inches of approved sand filter soil media shall be placed over the underdrain system.

(B) The sand filter media shall be soil material meeting the sieve requirements in Table 9-12.

Table 9-12
Intermittent Sand Filter Media

Sieve Number	Opening (mm)	Percent Passing, by Weight
3/8	9.500	100
4	4.750	95 - 100
8	2.380	80 - 100
16	1.190	45 - 85
30	0.590	15 - 60
50	0.297	3 - 15
100	0.149	0 - 4

(C) Other sand filter media may be proposed, provided a designer submits to the Secretary technical justification for the substitution of materials. The Secretary shall review and may approve the proposed substitution.

(D) The size of the sand filter shall be based on a maximum application rate of 1.25 gallons per day per square foot.

(3) Distribution System

(A) A pressurized distribution system shall be constructed in accord with the following requirements:

(i) above the sand filter media there shall be a minimum of 3 inches of washed, clean ¾ inch to 1½ inch stone below the distribution laterals, and sufficient stone above the laterals equal to or covering the orifice shields to provide a smooth even cover;

(ii) distribution laterals shall be spaced on maximum 30-inch centers. Orifices shall be placed such that there is at least one orifice for each 6 square feet of sand surface area;

(iii) the ends of the distribution laterals shall be designed and constructed with a means to perform flushing of the piping, collectively or individually, through the operation of a non-corroding and accessible valve. The flushed wastewater must be discharged to the septic tank or into the sand filter;

(iv) the diameters of the distribution manifold and laterals shall not be less than ½ inch diameter and shall be constructed of schedule 40 or 80 (or equivalent) piping;

(v) the orifices shall not be less than 1/8-inch in diameter. All orifices shall be covered by a removable, protective, durable, non-corroding shield; and

(vi) other types of distribution systems may be proposed by a designer and used upon approval by the Secretary.

(4) Sand Filter Dosing

(A) The dose volume shall not exceed 10 percent of the daily design flow.

(B) The system shall not dose more than once in a 30-minute period.

(C) Head calculation shall include maximum static lift, pipe friction and a residual head of 5 feet at the furthest orifice.

(D) There shall be no more than a 10 percent flow variation between any 2 orifices.

(E) The pumping system shall be protected from solids by a filter apparatus that will not allow the passage of solids larger in size than 1/8 inch.

(F) The pump station designed to dose the sand filter shall be designed with storage equal to the 1-day design flow above the high-water alarm.

(5) Internal Pump Option

(A) Where the effluent from a sand filter is to be discharged by means of a pump to another treatment unit, a distribution unit, or to a leachfield, the design and construction of the sand filter may include provisions for an internal pump station, providing the following conditions are met:

(i) the location, design, and construction of the pump station do not conflict with the requirements of these Rules for the design, construction, and operation of a sand filter system;

(ii) the pump and related apparatus shall be housed in a corrosion resistant vault designed to withstand the stresses placed upon it so that it will not allow the migration of drain media, sand, or underdrain media to its interior. The vault shall:

(I) have a durable, attached floor; and

(II) provide watertight access to finished grade with a diameter large enough to remove, replace, or service any equipment in the vault and be designed to receive treated effluent from an elevation equal to that of a gravity discharging sand filter;

(iii) the depth of underdrain media and the operating level of the pump cycle and alarm shall not allow effluent to come within 2 inches of the bottom of the sand filter media. The pump off level shall not be lower than the bottom of the perforations of the underdrain piping; and

(iv) an internal sand filter pump shall be electronically linked to the sand filter dosing apparatus in such a manner as to prevent wastewater from entering the sand filter in the event the internal sand filter pump fails.

(e) Additional requirements for the design and construction of recirculating sand filters.

(1) Recirculating sand filters are not recommended for seasonal residences or projects designed for periodic use. Projects that will experience periodic shut downs should take into consideration the cooling effect on the recirculating effluent and the effect of the sand filters going anaerobic and becoming odoriferous.

(2) Underdrain System

(A) The base of the sand filter container shall be level or constructed at a grade of 1 percent or less towards the underdrain piping.

(B) The underdrain piping shall be installed in the interior of the sand filter container at the lowest elevation. The piping shall be on a grade of 1 percent or less to the point of passage through the sand filter container.

(C) The underdrain piping and sand filter container bottom shall be covered with a minimum of 6 inches of clean washed ¾ inch to 1½ inch stone.

(D) Other types of underdrain systems may be proposed and approved after review by the Secretary.

(3) Sand Filter Media

(A) A minimum of 36 inches of approved sand filter media shall be placed above the underdrain system.

(B) The sand filter media shall be soil material meeting the sieve requirements in Table 9-13.

Table 9-13
Recirculating Sand Filter Media

Sieve Number	Opening (mm)	Percent Passing, by Weight
3/8	9.500	100
4	4.750	60 - 100
8	2.380	7 - 75
16	1.190	0 - 5
30	0.590	0 - 3
50	0.297	0 - 2

(C) The Secretary shall review and may approve other sand filter media when a designer submits technical justification for substitution.

(D) The maximum application rate to size the recirculating sand filter shall be the lesser of:

(i) 5 gallons per day per square foot; and

(ii) the waste strength, expressed as gallons per square foot per day, using the formula:
AR = 5 gallons per square foot per day x 230 milligrams per liter ÷ BOD_5 where:

(I) AR is the application rate in gallons per day per square foot

(II) BOD_5 is the wastewater strength of the septic tank effluent in milligrams per liter.

(4) Distribution System

(A) A pressurized distribution system shall be constructed in accordance with the following requirements:

(i) there shall be a minimum of 3 inches of clean washed ¾ inch to 1½ inch stone that is below the distribution laterals and above the sand filter media, and sufficient stone covering the orifice shields to provide a smooth even cover;

(ii) distribution laterals shall be spaced on maximum 24-inch centers. Orifices shall be placed such that there is at least 1 orifice for each 4 square feet of sand surface area;

(iii) the ends of the distribution laterals shall be designed and constructed with a means to perform flushing of the piping, collectively or individually, through the operation of a non-corroding and accessible valve. The flushed wastewater must be discharged to the septic tank, recirculating tank or into the sand filter;

(iv) the diameters of the distribution manifold and laterals shall not be less than ½ inch diameter and shall be constructed of schedule 40 or 80 (or equivalent) piping;

(v) the orifices shall not be less than 1/8 inch in diameter. All orifices shall be covered by a removable, protective, durable, non-corroding shield; and

(vi) other types of distribution systems proposed by a designer may be approved by the Secretary.

(B) Recirculation/Dilution Tank and Dosing

(i) The recirculation tank receives septic tank effluent and overflow from the sand filter. The recirculation tank shall have sufficient capacity to provide 1 day's emergency storage above a high-water alarm level. The recirculation tank and dosing system shall comply with the following requirements:

(I) The system shall be designed with a minimum recirculation ratio of not less than 4. The recirculation ratio is the daily volume of recycled effluent divided by the design flow.

(II) The sand filter shall be wetted 48 times per day. The minimum resting period between doses shall be 20 minutes.

(III) The minimum wet volume in the recirculation tank shall be at least 80 percent of the design flow.

(IV) The system shall be designed so that 100 percent of the sand filter effluent returns to the recirculation tank when the liquid volume of the tank is less than 80 percent of the project design flow.

(V) There shall be a high-water alarm, and a low water alarm designed and installed to shut down the pump and notify the owner of the system when the liquid level of the recirculation tank is less than 50 percent of the project design flow.

(VI) Head calculations shall include maximum static lift, pipe friction and a residual head of 5 feet at the furthest orifice.

(VII) There shall be no more than a 10 percent flow variation between any 2 orifices.

(VIII) The pumping system shall be protected from solids by a filter apparatus that will not allow the passage of solids larger than 1/8 inch in diameter.

§ 1-925 Constructed Wetlands

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification required for the installation of a wastewater system that includes a constructed wetland.

(b) The use of constructed wetlands in the design of a wastewater system is optional and may be proposed as a treatment component of a wastewater system.

(c) General requirements for constructed wetlands

(1) A constructed wetland shall include a wetland container that is watertight to prevent wastewater from exfiltrating the filter container and be made of one of the following materials:

(A) reinforced concrete;
(B) flexible membrane liner materials, provided they comply with the following requirements:
(i) they have properties that are at least equivalent to 30-mil un-reinforced polyvinyl chloride;
(ii) they have field repair instructions and extra liner material that are provided to the purchaser with the liner;
(iii) they have factory fabricated "boots" suitable for field bonding onto the liner to facilitate the passage of piping through the liner in a waterproof manner; and
(iv) they are compatible with the wastewater being treated; or
(C) other materials having equivalent function and watertightness for the life of the wetland.

(2) The design of a constructed wetland shall be based on an industry accepted publication that identifies construction requirements, test requirements, and wastewater strength sampling results. Publications shall include wetlands constructed and monitored for wastewater strength in a climate like Vermont.

(3) The design of a wetland shall include plant species that are demonstrated by the applicant's designer to treat septic tank effluent.

(4) Constructed wetlands shall include only plant species that are native to Vermont and plants that will not adversely impact existing wetland species.

(d) Prior to submitting an application for a wastewater system that includes a constructed wetland, the prospective applicant shall have their designer contact the Secretary to review the basic principles on which the design will be based.

Note: The effluent resulting from a constructed wetland may be filtrate effluent.

§ 1-926 Storage and Dose Approach to Wastewater Systems

(a) A Class 1 designer is required to submit the installation certification required for the installation of a wastewater system that uses a storage and dose approach.

(b) Notwithstanding the depths of naturally occurring soil required pursuant to § 1-903 to site a leachfield on sites where the height of the seasonal high-water table would otherwise preclude the construction of a wastewater system, wastewater systems with a design flow of 700 gallons per day or less that use a storage and dose approach can be permitted.

(c) Minimum requirements for a wastewater system using a storage and dose approach:

(1) Wastewater may be stored without discharging to the leachfield for a maximum of 3 months.

(2) The wastewater system shall be designed so that the induced water table will remain at least 6 inches below ground surface when wastewater, including that which was stored, is discharged to the leachfield.

(3) The wastewater system shall be designed using the 2-year time of travel management zone specified in § 1-907.

(4) The wastewater system shall include storage tanks that are sized to store the average water use of the building or structure or campground to be served by the

wastewater system, taking into account the expected occupancy of the building or structure or campground, for the expected duration of the storage period.

(A) If the wastewater system will serve a building or structure with a residential use, the storage tanks shall be sized to store, for a 30-day storage period, a minimum of 150 gallons per day per living unit plus an additional 50 gallons per day per person above three for a living unit with a proposed maximum residential occupancy over three persons.

(B) The wastewater system shall provide space for additional storage tanks to be added to accommodate the design flow identified in § 1-803.

(C) The storage tanks shall include a high-water alarm system and space for 5 days of storage shall be provided above the alarm level.

(5) The design of the wastewater system shall incorporate a groundwater monitoring control system that allows discharge of wastewater to the leachfield only when the induced water table remains at least 6 inches below ground surface.

§ 1-927 Simplified Method of Completing a Hydrogeological Analysis

The simplified method for calculating the minimum length of a leachfield.

(1) The linear loading rate shall be calculated using the formula LLR = (h) x (f) where:

(A) LLR = linear loading rate, in gallons per day per linear foot of leachfield, measured parallel to the natural ground contours;

(B) h = the soil thickness available for groundwater mounding, measured in feet; and

(C) f = the LLR factor from Table 9-14, based on soil texture and ground slope.

(i) Unless Subsection (1)(C)(ii) or (iii) apply, the value of the f-factor from Table 9-14 shall be determined using the finest textured soil within the thickness available for groundwater mounding.

(ii) When any overlying soil layer that is within the thickness available for groundwater mounding has an f-factor that is less than the f-factor of any underlying soil layer that is within the thickness available for groundwater mounding, the lowest f-factor shall be used to calculate the total LLR of all soil layers.

(iii) When the f-factor of each overlying soil layer that is within the thickness available for groundwater mounding is greater than the f-factor of any underlying soil layer that is within the thickness available for groundwater mounding, the LLR may be calculated for the overlying soil layer and underlying soil layer separately for each thickness and the two numbers shall be added together to obtain the allowable LLR for the wastewaters system.

(2) The minimum leachfield length shall be calculated using the formula SL = DF ÷ LLR where:

(A) SL is the system length; and

(B) DF is the design flow.

Table 9-14
Linear Loading Rate Factors Based on Soil Texture and Ground Slope

Soil Texture	LINEAR LOADING RATE FACTORS (f)						
	Ground Slope						
	0 - 2%	> 2 - 4%	> 4 - 6%	> 6 - 8%	> 8 - 10%	> 10 - 15%	> 15 - 20%
Coarse Sand, Sand, Loamy Coarse Sand, Loamy Sand	7.5	22.4	37.4	52.4	52.4	52.4	52.4
Coarse Sandy Loam, Sandy Loam, Fine Sand, Very Fine Sand, Loamy Fine Sand, Loamy Very Fine Sand	3.7	11.2	18.7	26.2	33.7	33.7	33.7
Fine Sandy Loam, Very Fine Sandy Loam	1.5	4.4	7.5	10.5	13.5	18.7	26.2
Loam	1.1	3.4	5.6	7.9	10.1	14.0	19.6
Silt Loam	0.7	2.2	3.7	5.2	6.7	9.4	13.1
Sandy Clay Loam, Silty Clay Loam, Clay Loam	0.4	1.1	1.9	2.6	3.4	4.7	6.5
Sandy Clay, Silty Clay, Clay	0.2	0.7	1.1	1.6	2.0	2.8	3.9

Note: Completion of the simplified method does not preclude the design of a wastewater system from being based on the use of a different method for completing the hydrogeological analysis which may result in a lower linear loading rate.

Note: Examples for calculating the induced water table using the simplified method are included in Appendix B, Examples B-2.

§ 1-928 Holding Tanks

(a) The Secretary shall approve the use of holding and pump out tanks as a wastewater system serving a building or structure in lieu of a soil-based wastewater system or sanitary sewer service line that conveys wastewater to a wastewater treatment facility or indirect discharge system when all of the following requirements are met:
- (1) The building or structure:
  - (A) is existing or proposed and is publicly owned; or
  - (B) is existing and owned by a charitable, religious, or nonprofit organization.
- (2) The plan for construction and operation of the holding and pump out tank shall not result in a public health hazard or environmental damage.
- (3) A designer demonstrates that an economically feasible means of meeting current standards is significantly costlier than wastewater holding and pump out tanks, based on a projected 20-year life of the project.
- (4) The design flows do not exceed 600 gallons per day.
- (5) If the building or structure is owned by a charitable, religious, or nonprofit organization, the applicant agrees to post a bond or other financial surety, prior to construction of the holding and pump out tank, sufficient to finance maintenance

of the holding and pump out tank for the life of the system which shall be at least 20 years.

(b) The Secretary may approve the use of holding and pump out tanks as a wastewater system serving a building or structure or campground in lieu of a soil-based wastewater system or sanitary sewer service line that conveys wastewater to a wastewater treatment facility or indirect discharge system when all of the wastewater to be treated does not, and is unlikely in the future to, contain pathogens. In reaching this determination the Secretary shall consider:
(1) the nature of the wastewater;
(2) the ultimate point of disposal of the wastewater; and
(3) the risks associated with the failure of the system to operate, or to be operated, as permitted.

(c) The Secretary may approve a holding and pump out tank as a wastewater system serving a building or structure in lieu of a soil-based wastewater system or sanitary sewer service line that conveys wastewater to a wastewater treatment facility or indirect discharge system, whether or not the building or structure is publicly owned, when:
(1) the building or structure is served by an existing wastewater system that has failed, or is expected to fail;
(2) there is no other cost feasible alternative; and
(3) a variance is sought and granted pursuant to § 1-802 from all technical standards in this Subchapter and Subchapter 10 that would otherwise apply.

(d) The Secretary shall approve the use of a marine holding and pump out tank as a wastewater system, where it is not feasible to discharge the contents of marine wastewater holding and pump out tanks to a soil-based wastewater system or to a sanitary sewer service line that conveys wastewater to a wastewater treatment facility or indirect discharge system.

(e) A holding and pump out tank shall:
(1) be capable of holding at least 14 days of the expected flow from the building or structure or campground;
(2) be constructed of durable materials that are appropriate for the site conditions and the nature of the wastewater to be stored;
(3) be watertight, and any piping connected to the tank, and all access structures connected to the tank shall be watertight;
(4) prior to being placed in service, be tested for watertightness using the same method as identified in § 1-1010;
(5) be designed to protect against floatation when the tank is empty, such as when it is pumped;
(6) be equipped with audio and visual alarms that are triggered when the tank is filled to 75 percent of its design capacity;
(7) be located so that it can be reached by tank pumping vehicles at all times when the building or structure or campground is occupied.

(f) Any building or structure or campground served by a holding and pump out tank, other than a marine holding and pump out tank, shall have a water meter, or meters, installed

that measures all water that will be discharged as wastewater from the building or structure or campground.

(g) A permit issued for the use of a holding and pump out tank shall require a designer to periodically inspect the tank, visible piping, and alarms and meet the following requirements:
- (1) A designer shall submit a written report to the Secretary detailing the results of the inspection and any repairs or changes in operation that are required.
- (2) The report shall also detail the pumping history since the previous report, giving the dates of pumping and the volume of wastewater removed.
- (3) The frequency of inspections and reports shall be stated in the permit issued for the use of the tank, but shall be no less frequent than once per year.
- (4) Unless permitting a marine holding and pump out tank, the designer shall also inspect the water meter or meters and verify that they are installed, calibrated, and measuring all water that is discharged as wastewater.
- (5) Unless permitting a marine holding and pump out tank, the designer shall read the meters and compare the metered flow to the pumping records.
- (6) Any significant deviation shall be noted in the report and explained to the extent possible.

(h) A permit authorizing a holding and pump out tank as a wastewater system pursuant to Section (a) shall not run with the land, unless it is issued to a charitable, religious, or non-profit organization.
- (1) When a permit is issued to a charitable, religious, or non-profit organization it shall apply to all subsequent owners of the property being served by the holding tank for the duration of the permit regardless of whether the owner is a charitable, religious, or non-profit organization.
  - (A) A subsequent owner shall not increase the design flow of the holding and pump out tank system, or, take any other action which requires the issuance of a permit or permit amendment without seeking a permit or permit amendment.
  - (B) All permit conditions, including the financial surety requirement of Subsection (a)(5), shall apply to a subsequent owner.

(i) A permit authorizing a holding and pump out tank as a wastewater system under a provision of this Section shall require the owner of a holding and pump out tank to maintain a valid contract with a licensed wastewater hauler at all times.
- (1) The contract shall require the licensed wastewater hauler to provide written notice of dates of pumping and volume of wastewater pumped.
- (2) Copies of all such notices shall be submitted with the written inspection reports.

§ 1-929 Disposal of Contents of Composting or Incinerating Toilets

(a) The contents of a composting or incinerating toilet, provided the toilet does not yield a liquid, may be disposed of as directed in Subsection (c).

(b) The installation and use of composting or incinerating toilets does not create an exemption from any requirement of these Rules, including the requirement that all

buildings or structures have wastewater systems that comply with the technical standards in this Subchapter and Subchapters 8 and 10, for the disposal of all other wastewater from the building or structure.

(c) The contents removed from a composting or incinerating toilet shall be disposed of in the following manner:
  (1) If disposed of on the same lot on which the toilet is located, the contents shall be disposed of by shallow burial at a location approved by the Secretary in a permit, provided the location meets the following requirements:
    (A) complies with the isolation distances and isolation zones required pursuant to § 1-912 for locating an in-ground leachfield; and
    (B) maintains a 3-foot separation between the bottom of the excavation for the contents to the seasonal high-water table and a 4-foot separation between the bottom of excavation for the contents to bedrock.
  (2) If not disposed of on the same lot on which the toilet is located, the contents shall be disposed of:
    (A) at a certified landfill; or
    (B) in accordance with the Vermont Solid Waste Management Rules.

§ 1-930 Discontinuing Use and Removal of a Wastewater System

(a) A wastewater system that is no longer serving a building or structure or campground, may remain in place, provided all tanks, including the septic tanks, pump stations, and dosing siphons, are:
  (1) pumped; and
  (2) broken in-place or filled with soil.

(b) When a leachfield is removed, the stone, fill material, and soil removed from in and around the components, shall be disposed of in the following manner:
  (1) If disposed of on the same lot on which the wastewater system is located, the material shall be disposed of in a location approved by the Secretary in a permit, provided the location meets the following requirements:
    (A) Complies with the isolation distances and isolation zones required pursuant to § 1-912 for locating an in-ground leachfield; and
    (B) Maintains a 3-foot separation between the bottom of the burial to the seasonal high-water table and 4-foot separation between the bottom of the burial to bedrock.
  (2) If not disposed of on the same lot on which the wastewater system is located, the material shall be disposed of:
    (A) at a certified landfill; or
    (B) in accordance with the Vermont Solid Waste Management Rules.

Subchapter 10 – Flexible Specific Technical Standards for Wastewater Systems

§ 1-1001 Request for Alternative Technical Standard

(a) The Secretary may accept, in an application for a permit or permit amendment, the use of an alternative technical standard to a technical standard included in this Subchapter when the Secretary concludes that the alternative technical standard:
- (1) will meet the purpose served by the technical standard in this Subchapter;
- (2) has been adopted and published by one of the following organizations:
  - (A) American Association of the State Highway and Transportation Officials (AASHTO);
  - (B) National Science Foundation (NSF);
  - (C) American National Standards Institute, Inc. (ANSI);
  - (D) American Society of Civil Engineers (ASCE);
  - (E) American Public Works Association (APWA);
  - (F) American Society for Testing and Materials (ASTM);
  - (G) American Water Works Association (AWWA);
  - (H) Cast Iron Soil Pipe Institute (CISPI);
  - (I) Ductile Iron Pipe Research Association;
  - (J) New England Interstate Water Pollution Control Commission (NEIWPCC); and
  - (K) 10 States Standards – Recommended Standards for Wastewater Facilities;
- (3) incorporates more current technology than included in the technical standard in this Subchapter; and
- (4) will not adversely affect the maintainability, operation, or safety of the wastewater system; and
- (5) where specified, meets any additional criteria required by these Rules for a Secretary approved alternative technical standard.

(b) An application that seeks to use an alternative technical standard shall include a written request that includes:
- (1) the specific technical standard in this Subchapter for which approval of an alternative technical standard is sought; and
- (2) supporting documentation demonstrating each of the findings included in Subsection (a).

§ 1-1002 General Requirements for Sanitary Sewer Service Lines

(a) Groundwater or stormwater drains including roof drains, area drains, foundation drains, and cellar drains shall not connect to sanitary sewer service lines.

(b) Sanitary sewer service lines shall be sized for the design flow and, for gravity sewers, shall be a minimum of 4 inches in diameter.

(c) Sanitary sewer service lines shall comply with the following requirements.
- (1) Pipes from a building or structure to a septic tank, from a septic tank to a distribution box or leachfield, and from a septic tank to a pump or siphon chamber:

(A) shall be non-perforated rigid pipe; and
(B) shall have all pipe penetrations to tanks, chambers, or boxes sealed to prevent leakage.

(d) Sanitary sewer service lines shall be constructed of one of the following materials:
(1) rubber ring jointed or solvent welded polyvinyl chloride SDR 35 with oil-resistant gasket joints complying with standard ASTM D-1869;
(2) cast iron (CI) or other sewer pipe that complies with the Vermont Plumbing Rules or ASTM standards;
(3) Ductile iron gravity sewer pipe, ASTM A746; or
(4) extra heavy cast iron where sanitary sewer service lines are designed or anticipated to be installed at a depth of less than 3 feet under driveways.

(e) Sanitary sewer service lines carrying raw or untreated wastewater shall maintain a minimum slope of 1/4 inch per foot.

(f) Sanitary sewer service lines carrying septic tank effluent shall maintain a minimum slope of 1/8 inch per foot.

(g) Sanitary sewer service lines shall:
(1) be buried sufficiently deep to prevent freezing; and
(2) have a minimum bury depth of:
(A) 4 feet;
(B) in areas subject to plowing or snow removal, 5 feet; or
(C) a number approved by the Secretary when a designer demonstrates that a shallower bury depth will protect the sanitary sewer service line from frost and other superimposed loads.

(h) Connection of a sanitary sewer service line to a sanitary sewer collection line shall be:
(1) through a manhole; or
(2) with a wye fitting so as to direct flow and minimize in line turbulence.

(i) Cleanouts or manholes shall be provided on a sanitary sewer service line carrying raw or untreated wastewater at:
(1) each horizontal change in direction greater than 45 degrees and at intervals of not more than 100 feet; or
(2) at intervals of 40 feet of length where more than one change of direction of less than 45 degrees occurs in a run of piping.

(j) Sanitary sewer service lines with changes in direction that exceed 45 degrees shall be made with two 45-degree ells or long sweep fittings or made with a manhole.

(k) A sanitary sewer collection line that conveys wastewater from two or more buildings or structures may be considered a sanitary sewer service line under these Rules and comply with the requirements for a sanitary sewer service line in lieu of the requirements for a sanitary sewer collection line when:
(1) the total length of the sanitary sewer collection line and each sanitary sewer service line is less than 300 feet;

(2) cleanouts, not manholes, are provided where the sanitary sewer service lines join; and
(3) the distance between cleanouts does not exceed 100 feet.

(l) When a design for a sanitary sewer service line or sanitary sewer collection line contains a septic tank or a grease tank, the design of the septic tank or the grease tank shall comply with the requirements in § 1-908 and § 1-909(c) and (d).

§ 1-1003 General Requirements for Sanitary Sewer Collection Lines

(a) Groundwater or stormwater drains, including roof drains, area drains, foundation drains, and cellar drains, shall not connect to sanitary sewer collection lines.

(b) Sanitary sewer collection lines shall be sized for the design flow even when the diameter of the receiving collection line is less than the diameter of the proposed line. The Agency may require a schedule for future downstream sewer relief.

(c) Sanitary sewer collection lines carrying raw or untreated wastewater shall:
(1) be a minimum of 6 inches in diameter for gravity sewers;
(2) be sized to transport the peak hourly flow rate, calculated using the design flows listed in § 1-803 for buildings or structures or campgrounds multiplied by the peaking factors listed in Table 10-1, in order to provide:
(A) a minimum velocity of 2.0 feet per second when flowing full using the Manning equation and roughness coefficients appropriate for the pipe materials proposed considering surface deterioration over the expected useful life of the pipe; or
(B) have the pipe diameter and slope selected to obtain the greatest practical velocities to minimize settling problems when maintaining 2.0 feet per second is not attainable. Oversize sewers will not be approved to justify using flatter slopes. If the proposed slope is less than the minimum slope of the smallest pipe which can accommodate the peak hourly flow rate, the designer shall provide calculations to justify solids deposition will not be an issue using the smallest pipe; and
(3) where velocities greater than 15 feet per second are attained, have special provisions made to protect against displacement by erosion and shock.

Table 10-1
Peaking Factors

Design Flow in gallons per day	Peaking Factor
less than 10,000	5.0
10,000 to less than 100,000	4.2
100,000 to less than 500,000	3.8
500,000 to less than 1,000,000	3.2
1,000,000 or greater	3.0

(d) Sanitary sewer collection lines shall be designed:

(1) with the minimum slopes shown in Table 10-2 regardless of the formula used or friction factors used in the design of the lines; and
(2) when a smaller sanitary sewer collection line joins a larger sanitary sewer collection line, the bottom of the larger sanitary sewer collection line shall be lowered sufficiently to maintain the same energy gradient. A method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

Table 10-2
Minimum Slopes

Size (inches Pipe)	Slope (feet/l00 feet)
6	0.60
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12

(e) Sanitary sewer collection lines shall:
(1) be sufficiently deep to prevent freezing; and
(2) have a bury depth:
(A) of at least 4 feet; or
(B) at least 5 feet in areas subject to plowing or snow removal that allows for deeper frost penetration, unless Subsection (f) applies.

(f) When the depths in Subsection (e)(2)(B) cannot be maintained without significant expense and when the design demonstrates the collection line will be protected from frost or other superimposed loads, the Secretary may approve a sanitary sewer collection line placed at shallower depths.

(g) Sanitary sewer collection lines shall be laid with uniform slope and straight alignment between manholes.

(h) Sanitary sewer collection lines on 20 percent slopes or greater shall be anchored securely with concrete anchors or equal spaced as follows:
(1) not over 36 feet center to center on grades 20 percent and less than 35 percent;
(2) not over 24 feet center to center on grades 35 percent and less than 50 percent; and
(3) not over 16 feet center to center on grades 50 percent and over.

(i) Sanitary sewer collection lines and fittings shall be constructed of one of the following materials:
(1) rubber ring jointed polyvinyl chloride pipe, meeting the requirements of ASTM 3034 for SDR 35 or heavier;
(2) fused HDPE;
(3) ductile iron (DI) gravity sewer pipe of the proper class; or
(4) other materials approved by the Secretary.

(A) In determining if the pipe material is appropriate for the specific use, the Secretary shall consider:
  (i) the character of the waste (domestic, commercial or industrial);
  (ii) soil characteristics;
  (iii) exceptionally heavy external loadings;
  (iv) abrasion; and
  (v) corrosion.

(B) The Secretary may require the designer to submit information from the pipe manufacturer certifying that the materials are acceptable for the specific use.

(j) Sanitary sewer collection line joints shall:
  (1) have couplings complying with ASTM specifications, including oil resistant joints that comply with ASTM D-1869;
  (2) be designed to minimize infiltration and to prevent the entrance of roots throughout the life of the system; and
  (3) be of similar materials as the collection line.

(k) Sanitary sewer collection lines shall be designed to prevent damage from superimposed, live, dead, and frost induced loads.
  (1) Proper allowance loads on the sewer shall be made based on the soil characteristics and potential groundwater conditions as well as the width and depth of trench.
  (2) Where necessary, special bedding, haunching and initial backfill, concrete cradle, or special construction shall be used to withstand the anticipated potential superimposed loading or loss of trench wall stability.

(l) Sanitary sewer collection line trenching shall comply with the following requirements:
  (1) Ledge, rock, boulders, and large stones shall be removed to provide a minimum clearance of four inches below and on each side of all pipes.
  (2) All water entering the excavations or other parts of the work shall be removed until all the work is complete.

(m) Sanitary sewer collection line bedding shall comply with the following requirements:
  (1) Bedding Class A, B, C, or crushed stone as described in ASTM C 12 or bedding that complies with the Vermont Agency of Transportation's 2011 Standard Specifications for Construction shall be used and carefully compacted for all rigid pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load based on the soil type encountered and potential water table.
  (2) Embedment materials for bedding, haunching and initial backfill shall be Classes I, II, or III as described in ASTM D 2321 and shall be carefully compacted for all flexible pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load based on the soil type encountered and potential water table.
  (3) Backfill shall be of a suitable material removed from the excavation except where other material is specified. Debris, frozen material, large clods or stones, organic

matter, or other unstable materials shall not be used for backfill within 2 feet of the top of the pipe.

(4) Final backfill shall be placed in such a manner as not to disturb the alignment of the pipe.

(n) Trenchless technologies that may be used in lieu of open-trenching include:

(1) jack and bore and pipe jacking;

(2) micro-tunneling; and

(3) horizontal directional drilling.

(o) Upon completion of construction of a sanitary sewer collection line and prior to backfilling over the collection line, leakage testing shall be performed in accordance with one of the following procedures:

(1) Water (Hydrostatic) Leakage Testing

(A) Plug or cap all service laterals, stubs, and fittings. Place adequate bracing to withstand thrust forces.

(B) A tapped plumber's plug shall be inserted in the downstream manhole inlet sewer. The water supply connection is made at this point, but never directly from a water main, including the fire hydrant, unless a backflow preventer is used.

(C) A stand pipe is tightly connected at the upstream end of the sanitary sewer service line or sanitary sewer collection line. The height of the stand pipe shall be at least 2 feet higher than any point in the line or 2 feet higher than the highest known water table, whichever is higher. A manhole may be used as a stand pipe.

(D) Water is added at the downstream connection in order to avoid trapping air bubbles or pockets. The line shall be filled to the elevation designated in the stand pipe.

(E) Allow the line to stand with water for at least a 2-hour stabilization period or such shorter period as may be required to achieve stabilized readings of water loss over three consecutive 15-minute periods. This allows air to escape and absorption to take place.

(F) Fill the sanitary sewer service line or sanitary sewer collection line to the reference mark and continue the test for at least 1 hour. Maintain the minimum head throughout the test, adding any volume of water required and including that volume in the leakage.

(G) Convert the calculated leakage to gallons per inch of pipe diameter per mile per day.

(H) Gravity sanitary sewer collection lines including manholes shall not exceed leakage of 200 gallons per inch of pipe diameter per mile per day.

(2) Air Testing

(A) Procedures

(i) Determine the test time for the section of line to be tested using Table 10-3 or Table 10-4 or the formulas in Chart 10-1.

(ii) Plug all openings in the test section.

(iii) Add air until the internal pressure of the line is raised to approximately 4.0 pounds per square inch (psi) greater than the average pressure of any groundwater. After this pressure is

reached, allow the pressure to stabilize. The pressure will normally drop as the air temperature stabilizes. This usually takes 2 to 5 minutes depending on the pipe size. The pressure may be reduced to 3.5 psi before starting the test.

(iv) When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi above the pipe start the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test. If a 1.0 psi drop does not occur within the test time, the line has passed the test.

(B) Test Time

(i) Table 10-3 shows the required test time, T, in minutes per 100 feet of pipe for each nominal pipe size. Test times are for a 1.0 psi pressure drop from 3.5 to 2.5 psi. Table 10-3 has been established using the formulas contained in Chart 10-1.

(ii) If the section of line to be tested includes more than 1 pipe size, calculate the test time for each size and add the test times to arrive at the total test time for the section.

(iii) It is not necessary to hold the test for the whole period when it is clearly evident that the rate of air loss is less than the allowable.

Table 10-3
Minimum Test Time for Various Pipe Sizes

Nominal Pipe Size in inches	T (time) minutes per 100 feet	Nominal Pipe Size in inches	T (time) minutes per 100 feet
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8
10	1.5	33	5.4
12	1.8	36	6.0
15	2.1	39	6.6
18	2.4	42	7.3

Chart 10-1
Formulas and Allowable Air Loss Standards

Calculate the required test time at a given allowable air loss as follows:

$$T = (K)[(D^2)(L) \div (Q)]$$

Calculate air loss with a timed pressure drop as follows:

$$Q = (K)[(D^2)(L) \div T]$$

Where:
D = nominal size in inches;
L = length of line of 1 pipe size in feet;
K = 0.534×10^6 for S.I. units (International Standard of Units) or 0.371×10^3 for inch pound units;
Q = air loss in cubic feet per minute; and
T = time for pressure to drop 1.0 pound per square inch in minutes

(C) An appropriate allowable air loss, Q, in cubic feet per minute, has been established for each nominal pipe size. Based on field experience, the Q value that has been selected will enable detection of any significant leak. Table 10-4 lists the Q established for each pipe size.

Table 10-4
Allowable Air Loss for Various Pipe Sizes

Nominal Pipe Size in Inches	Q ft^3/min	Nominal Pipe Size in Inches	Q ft^3/min
3	2.0	21	5.5
4	2.0	24	6.0
6	2.0	27	6.5
8	2.0	30	7.0
10	2.5	33	7.5
12	3.0	36	8.0
15	4.0	39	8.5
18	5.0	42	9.0

(D) The air test shall, at a minimum, conform to the test procedure described in ASTM C 828-86 for clay pipe, ASTM C 924 for concrete pipe, and ASTM F 1417 for plastic pipe.

(3) A designer may present other methods for conducting leakage testing to the Secretary for approval prior to conducting the test.

(p) Thirty or more days following final backfill of the sanitary sewer collection line, the following tests shall be performed:

(1) Deflection tests shall be performed on all flexible sanitary sewer collection lines to verify the following requirements are met:
   (A) No pipe shall exceed a deflection of 5 percent. If deflection exceeds 5 percent, the pipe shall be excavated. Replacement or correction shall be accomplished in accordance with requirements in the approved specifications.
   (B) The rigid ball or mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which diameter is specified in the ASTM Specification, including the appendix, to which the pipe is manufactured. The test shall be performed without mechanical pulling devices.
(2) The sanitary sewer collection line shall be tested for alignment to verify the following requirements are met:
   (A) Each segment of pipe between manholes shall pass a lamp test for correctness of horizontal and vertical alignment.
   (B) Water shall be introduced into each pipe segment with no standing water observed during the test.
   (C) If the collection line fails the alignment test, the pipe shall be excavated. Replacement or correction shall be accomplished in accordance with requirements in the approved specifications.

§ 1-1004 Requirements for Sanitary Sewer Manholes

(a) Required locations for manholes in sanitary sewer collection lines
   (1) Manholes shall be installed:
      (A) at the end of each sanitary sewer collection line;
      (B) at all changes in grade, size or alignment;
      (C) at all intersections; and
      (D) at distances not greater than 400 feet except manholes may be spaced at distances of 600 feet:
         (i) for municipal sanitary sewer collection lines, when the municipality has the equipment capable of cleaning the sewer for 600 feet and submits a letter to the Secretary verifying ownership of the equipment: or
         (ii) for a privately owned sanitary sewer collection line, if a municipality submits a letter to the Secretary indicating its intent to take over ownership or control of the line upon completion of construction and verifying that it has the equipment capable of cleaning the sewer for 600 feet.
   (2) Notwithstanding Subsection (a)(1), when the sanitary sewer service line or sanitary sewer collection line is carrying only effluent, the Secretary may approve greater distances between manholes than that specified in Subsection (a)(1). In determining whether to authorize greater distances the Secretary shall consider the following factors:
      (A) the diameter of the sanitary sewer collection line; and
      (B) availability of cleaning equipment.

(b) Required diameter of manholes
  (1) The minimum diameter of manholes shall be 48 inches; large diameters are preferred for connection to large diameter sewers.
  (2) A minimum access diameter of 24 inches shall be provided.
  (3) Larger access diameters may be required by VOSHA to meet confined space entry procedures.

(c) Requirements for drop manholes:
  (1) A drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole bottom.
  (2) Where the difference in elevation between the incoming sanitary sewer collection line or sanitary sewer service line and the manhole bottom is less than 24 inches, the bottom shall be filleted to prevent deposition of solids.
  (3) Outside drop connections, due to the unequal earth pressures that would result from the backfilling operation in the vicinity of the manhole, shall have the entire outside drop connection encased in concrete.
  (4) Inside drop connections, when necessary, shall be secured to the interior wall of the manhole. Where inside drops are used, the manhole diameter shall be increased to 60 inches to allow adequate access for cleaning and maintenance except when a municipality requests an inside drop to an existing manhole that has a minimum diameter of 4 feet.

(d) Flow channels shall be provided in the base of all manholes. The flow channel through manholes shall:
  (1) conform in shape and slope to that of the sanitary sewer collection line or sanitary sewer service line entering and exiting the manhole;
  (2) be constructed so that the flow at peak conditions will remain in the flow channel; and
  (3) for curved flow channels, slope through the manhole shall be increased to maintain the necessary velocities.

(e) Manholes shall include a bench that meets the following requirements:
  (1) A bench shall be provided on each side of a manhole flow channel.
  (2) The bench shall have a slope of:
    (A) no less than 0.5 inch per foot; and
    (B) no greater than 1.0 inch per foot.
  (3) No sewer shall discharge onto the surface of the bench.

(f) Manholes shall be constructed using the following material.
  (1) Manholes shall be of the precast concrete or poured in place concrete type.
  (2) Manholes shall be waterproofed on the exterior.
  (3) Inlet and outlet pipes shall be joined to the manhole with a flexible watertight gasket that allows differential settlement of the pipe and manhole wall to take place.
  (4) A watertight connection using non-shrink mortar that allows differential settlement of the pipe and manhole wall to take place is acceptable when connecting a new sanitary sewer service line or sanitary sewer collection line to

an existing manhole when it is impractical to make the connection using a gasketed flexible watertight connection.

(5) Watertight manhole covers shall be used wherever the manhole tops may be flooded by street runoff or high-water.

(6) After the manhole has been assembled in place, all lifting holes, whether or not the holes penetrate through the manhole, depressions and exterior joints shall be filled and pointed with non-shrinking mortar or other comparable material.

(g) Where groundwater may affect the buoyancy of a manhole, appropriate construction specifications to prevent movement of the manhole shall be provided.

(h) Upon completion of construction of a manhole, leakage testing of manholes shall be performed in accordance with one of the following procedures.

(1) Water (Hydrostatic) Leakage Testing

(A) All pipes and other openings into the manhole shall be suitably plugged to prevent blowout.

(B) Each manhole shall be checked for exfiltration by filling with water to the top of the cone section.

(i) A stabilization period of 1 hour shall be provided to allow for absorption.

(ii) At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and the measuring time of at least 6 hours begins.

(iii) At the end of the test period, the manhole shall be refilled to the top of the cone measuring the volume of water added.

(C) The volume of water in (B) needed to refill the manhole shall be converted to a 24-hour rate and the leakage determined on the basis of depth.

(D) The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period for exfiltration and there shall be no visible infiltration.

(E) If more than 1 gallon per vertical foot for a 24-hour period for exfiltration occurs or there is visible infiltration within the test period, the manhole failed the test and shall be repaired or reconstructed and retested.

(2) Vacuum Leakage Testing

(A) Manholes that have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing.

(B) All pipes and other openings in the manhole shall be plugged in a manner to prevent displacement.

(C) A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to a pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

(D) Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of the air shall then be stopped and the test time begun. The vacuum drop shall not exceed 1 inch of mercury over the period of time as follows:

(i) 0 to 10-foot deep manholes – 2 minutes;

(ii) greater than 10 feet to 15-foot deep manholes – 2.5 minutes; or

(iii) greater than 15-foot deep manholes – 3 minutes.

(E) If more than 1 inch of drop in vacuum occurs within the test period, the manhole failed the test and shall be repaired or reconstructed and retested.

(F) Air testing of concrete sewer manholes may conform to the test procedures described in ASTM C 1244.

(3) Following satisfactory test results, the manhole may be backfilled.

§ 1-1005 Requirements for Inverted Siphons

Inverted siphons shall:

(1) Have not less than 2 barrels with a minimum pipe size of 6 inches.

(2) Have inlet and discharge structures

(A) with adequate clearances for cleaning equipment, inspection, and flushing (vented manholes are recommended); and

(B) that are arranged so that the design flow is diverted to 1 barrel and so that either barrel may be cut out of service for cleaning.

(3) Provide sufficient head and appropriate pipe sizes to secure re-suspension velocities of at least 3.0 feet per second for design average flows to prevent settling in pipes.

(4) Have a vertical alignment that allows cleaning and maintenance.

§ 1-1006 Design Standards for Sanitary Sewer Collection Lines and Sanitary Sewer Service Lines Under and Over Surface Waters

(a) Sanitary sewer collection lines and sanitary sewer service lines shall:

(1) be designed to avoid stream crossings when possible;

(2) minimize the number of stream crossings when stream crossings are needed; and

(3) when crossing a stream, be designed to cross under the stream as nearly perpendicular to the stream flow as possible.

(b) The horizontal location of sanitary sewer collection lines and sanitary sewer service lines along streams shall be sufficiently far from the stream to:

(1) allow for meander belt of the stream as required by the Watershed Management Division;

(2) allow for possible future widening of the stream due to bank erosion;

(3) prevent discharges into the stream of dirt, silt or other substances during construction; and

(4) allow future access for repair and maintenance of the line without entering the stream.

(c) Sanitary sewer collection lines and sanitary sewer service lines crossing under streams shall meet the following requirements:

(1) Sanitary sewer collection lines and sanitary sewer service lines shall be at a sufficient depth below the natural bottom of the stream bed to protect the lines.

(2) When the line is located in bedrock beneath a stream, a minimum of 1 foot of cover is required.

(3) When the line is not located in bedrock beneath a stream a minimum of 3 feet of cover is required.

(4) When the line is under a paved stream channel, the top of the line shall be placed below the bottom of the channel pavement.

(d) Construction materials for sanitary sewer collection lines and sanitary sewer service lines crossing under streams shall be:
(1) ductile iron pipe with restrained joints constructed so the line will remain watertight and free from changes in alignment or grade; and
(2) stone, coarse aggregate, washed gravel, or other materials for the backfill of the sewer trench that will not readily erode, cause discharges of dirt, silt or other materials, damage pipe during placement, or corrode the line.

(e) Manholes for sanitary sewer service lines or sanitary sewer collection lines crossing under or over streams shall:
(1) not be located within the stream channel; and
(2) be located so they do not interfere with the free discharge of flood flows of the stream.

(f) Sanitary sewer service lines or sanitary sewer collection lines crossing aerially over streams shall meet the following requirements.
(1) Ductile iron pipe with restrained mechanical joints is required for all aerial sanitary sewer collection line crossings.
(2) Support shall be provided for all joints in pipes utilized for aerial crossings. The supports shall be designed to prevent thermal expansion, vibration, frost heave, overturning, settlement or loads that may adversely affect the structural integrity of the support.
(3) Precautions against freezing, such as insulation and increased slope, shall be included with the design of an aerial crossing.
(4) Expansion jointing shall be used between above ground and below ground sanitary sewer collection lines.
(5) The impact of flood waters and debris shall be considered.
(A) When the line is not attached to a road, highway, or railroad bridge, the bottom of the pipe shall be placed no lower than the elevation of the 100-year flood.
(B) When the line is attached to a road, highway, or railroad bridge:
(i) the bottom of the pipe shall be placed above the required bottom elevation of the bridge; and
(ii) the pipe shall be attached to a support beam that is the least exposed to the flow of the flood waters.

§ 1-1007 Separation of Sanitary Sewer Service Lines and Sanitary Sewer Collection Lines from Water Mains, Water Service Lines and Water Service Pipes

(a) Horizontal Isolation Distances from Water Mains, Water Service Lines, and Water Service Pipes
(1) All portions of a sanitary sewer collection line and sanitary sewer service line shall be at least 10 feet horizontally from all portions of a proposed, existing, or permitted water mains, except where site conditions prevent obtaining the 10-foot separation and one of the following requirements is met:

(A) The sanitary sewer collection line or sanitary sewer service line shall be water works grade 150 pounds per square inch pressure rated pipe meeting AWWA standard C-900 or equivalent pipe and pressure tested to 150 pounds per square inch to assure watertightness.

(B) The bottom of the water main shall be at least 18 inches above the top of the sanitary sewer collection line or sanitary sewer service line and the water main is in a separate trench or on an undisturbed soil shelf in the sewer trench.

(2) All portions of a sanitary sewer collection line and sanitary sewer service line shall be at least 10 feet horizontally from all portions of a proposed, existing, or permitted water service line or water service pipe, except when one of the following requirements is met:

(A) The water service line or water service pipe shall be sleeved with pipe materials approved by the Vermont Plumbing Rules, and:

(i) if the sleeves terminate below ground, the ends of the sleeve are sealed to be watertight; or

(ii) if the sleeves terminate above finished slab or in a basement, the ends of the sleeve are sealed to be watertight or left open.

(B) The water service line or water service pipe shall be in a separate trench or an undisturbed soil shelf in the sewer trench and one of the following requirements is met:

(i) the bottom of the water service line or water service pipe shall be at least 18 inches above the top of the sanitary sewer collection line or sanitary sewer service line; or

(ii) the sanitary sewer collection line or sanitary sewer service line shall be water works grade 150 pounds per square inch pressure rated pipe meeting AWWA standard C-900 or equivalent pipe and pressure tested to 150 pounds per square inch to assure watertightness.

(b) Vertical Separation and Crossings for Water Mains, Water Service Lines, and Water Service Pipes

(1) Sanitary sewer collection lines and sanitary sewer service lines crossing above proposed, existing, or permitted water mains shall be laid so the bottom of the collection line or service line is 18 inches above the top of the water main with the joints of the collection line or service line equal distance from the crossing, except where site conditions prevent obtaining the 18-inch separation and one of the following requirements is met:

(A) The sanitary sewer collection line or sanitary sewer service line shall be sleeved to a point 10 horizontal feet from the center line of the crossing.

(B) The sanitary sewer collection lines and sanitary sewer service lines shall:

(i) be water works grade 50 pounds per square inch pressure rated pipe meeting AWWA standard C-600 or equivalent pipe and be pressure tested to 150 pounds per square inch to assure watertightness; and

(ii) the sanitary sewer collection line shall be provided structural support, such as sleeving of the sanitary sewer, that will extend

beyond the trench excavation for the water service line or water service pipe.

(2) Sanitary sewer collection lines and sanitary sewer service lines crossing below proposed, existing, or permitted water mains shall be laid so the top of the collection line or service line is 18 inches below the bottom of the water main, except when one of the following requirements are met:

(A) The sanitary sewer collection lines and sanitary sewer service lines shall: be water works grade 150 pounds per square inch pressure rated pipe meeting AWWA standard C-600 or equivalent pipe and pressure tested to 50 pounds per square inch to assure watertightness.

(B) The sanitary sewer collection line or sanitary sewer service line shall be sleeved to a point 10 horizontal feet from the center line of the crossing.

§ 1-1008 Requirements for Wastewater Pump Stations

(a) General requirements for wastewater pump stations:

(1) There shall be no physical connection between any potable water supply and a wastewater pump station.

(2) Pump stations with a design flow of 2000 gallons per day or larger shall be readily accessible by maintenance vehicles during all weather conditions.

(3) Pump station structures and electrical and mechanical equipment shall be protected from physical damage from a 100-year flood.

(4) Pump stations shall remain fully operational and accessible during a 25-year flood.

(5) Exterior access hatches shall be provided with locks.

(6) Where it is necessary to pump wastewater prior to grit removal, the wet well and pump station piping shall be designed to avoid operational problems from the accumulation of grit.

(7) Pump stations shall not be located within a building or structure except when the pump station is considered interior plumbing by the Vermont Plumbing Rules.

(b) The design of a combination wet and dry well pump station, a submersible pump station, and a suction lift wastewater pump station shall meet the following additional requirements:

(1) Wastewater Pump Station Construction Materials

(A) Materials shall be selected that are appropriate under conditions of exposure to hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in wastewater. This is particularly important in the selection of metals and paints.

(B) Contact between dissimilar metals should be avoided. If contact cannot be avoided the design shall include provisions to minimize galvanic action.

(C) Pump stations shall be watertight. All inlet and outlet pipes penetrations shall:

(i) for concrete tanks, be made with flexible rubber boots; or

(ii) for plastic or fiberglass tanks, be made with watertight rubber grommets.

(2) The designer is responsible for ensuring the pump station, when it is located in the seasonal high groundwater, is provided proper anchors to prevent movement of the station.

(3) Dry wells

(A) Dry wells, including their superstructure, shall:

(i) be completely separate from the wet well;

(ii) have all common walls with the wet well be water and gas tight;

(iii) not provide access to the wet well; and

(iv) for the pump equipment compartment dry well, be above grade or offset to the wet well.

(B) Dry wells shall have a sump with a sump pump to remove leakage or drainage. Dry wells shall be designed so that the sump pump:

(i) is equipped with dual check valves;

(ii) discharges the contents of the sump to the wet well;

(iii) has a pump discharge pipe terminating above the maximum high-water elevation of the wet well;

(iv) discharges all seal leakage via a pipe or channel directly to the sump; and

(v) is sized to remove the maximum pump seal water discharge that would occur in the event of a pump seal failure.

(4) Wet Wells

(A) Size

(i) The design fill time and minimum pump cycle time shall be taken into account when sizing the wet well.

(ii) The effective volume of the wet well shall be based on design flow and a filling time not to exceed 30 minutes unless the facility uses flow equalization.

(iii) The pump manufacturer's duty cycle recommendations shall be used to determine the minimum cycle time.

(B) Access openings to the wet well:

(i) shall be at least 24 inches in diameter; and

(ii) shall have gasketed replacement plates maintained on site to cover the access opening to the wet well in the event that the existing cover plate needs replacing after its removal.

(C) Floor Slope

(i) The wet well floor shall have a minimum slope of 1 to 1 to the hopper bottom.

(ii) The horizontal area of the hopper bottom shall be not greater than necessary for proper installation and function of the inlet.

(D) Air Displacement (Venting)

(i) Covered wet wells shall have provisions for air displacement to the atmosphere such as an inverted "j" tube or similar means.

(5) Ventilation

(A) General

(i) Adequate ventilation shall be provided for all pump stations. Where the dry well is below ground surface, mechanical ventilation is required.

(ii) If screens or mechanical equipment requiring maintenance or inspection are located in the wet well, permanently installed ventilation is required.

(iii) There shall be no interconnection between the wet well and dry well ventilation systems.

(B) Air Inlets and Outlets

(i) In dry wells over 15 feet deep, multiple inlets and outlets are desirable.

(ii) Dampers shall not be used on exhaust or fresh air ducts.

(iii) Fine screens or other obstructions in air ducts shall be avoided to prevent clogging.

(C) Electrical Controls

(i) All intermittently operated ventilation equipment shall be interconnected with the respective pit lighting system.

(ii) The manual lighting/ventilation switch shall override the automatic controls.

(D) Fans, Heating, and Dehumidification

(i) The fan wheel shall be fabricated from non-sparking material.

(ii) Automatic heating and dehumidification equipment shall be provided in all dry wells.

(iii) The electrical equipment and components shall meet the requirements in Subsection (f)(1) and (2).

(E) Dry Well Ventilation

(i) Ventilation may be either continuous or intermittent.

(I) If continuous, there shall be at least 6 complete air changes per hour.

(II) If intermittent, there shall be at least 30 complete air changes per hour.

(ii) A system of 2 speed ventilation with an initial ventilation rate of 30 changes per hour for 10 minutes.

(iii) The air change requirements shall be based on 100 percent fresh air.

(F) Wet Well Ventilation

(i) Ventilation may be either continuous or intermittent.

(I) If continuous, it shall provide at least 12 complete air changes per hour.

(II) If intermittent, it shall provide at least 30 complete air changes per hour.

(ii) Air shall be forced into the wet well by mechanical means rather than solely exhausted from the wet well.

(iii) The air change requirements shall be based on 100 percent fresh air.

(iv) Portable ventilation equipment shall be provided for use at submersible pump stations and wet wells with no permanently installed ventilation equipment.

(v) For submersible pump stations receiving less than 2000 gallons per day design flow, gravity ventilation is acceptable.

(vi) All wet wells shall have provisions for air displacement to the atmosphere such as an inverted "j" tube or similar means. Vents shall:
(I) open downward;
(II) terminate 24 inches above ground surface; and
(III) have a 24 mesh non-corrodible screen covering the vent opening.

(c) The design of pumps shall meet the following requirements:
(1) Protection Against Clogging
(A) Sanitary sewer collection lines that accept wastewater and stormwater shall have:
(i) pumps capable of handling the combined wastewater and stormwater;
(ii) pump screening;
(iii) trash racks;
(iv) grinders; or
(v) a combination of the components described in Subsection (c)(1)(A)(ii), (iii) and (iv) to protect the pumps.
(B) Sanitary sewer collection lines that are 30-inch or larger in diameter that accept only wastewater shall include the components identified in Subsection (1)(A)(ii), (iii), (iv) or (v).
(2) Wastewater pump stations receiving a design flow of less than 2000 gallons per day:
(A) may be equipped with a single pump provided that replacement pumps are readily available; and
(B) shall have one day's emergency storage above the high-water alarm level in the wet well.
(3) Multiple Pumps
(A) Wastewater pump stations receiving an average design flow of 2000 gallons per day or more shall have multiple pumping units.
(B) Multiple pumping units shall have the capacity so that, if any single unit is out of service, the remaining units will have the capacity to handle the peak hourly flow rate.
(4) For pumps handling raw or untreated wastewater, except where grinder pumps are used:
(A) the pumps shall be solid handling capable of passing spheres of at least 3 inches in diameter; and
(B) pump suction and discharge piping shall be at least 4 inches in diameter.
(5) Pumps handling only settled wastewater shall be capable of passing 1½ inch spheres.
(6) The pump shall be placed so that, under normal operating conditions, it will operate under a positive suction head except as specified in Subsection (c)(12).
(7) Intake
(A) Each pump shall have an individual intake.
(B) Wet wells shall be designed to avoid turbulence near the intake and to prevent vortex formation.
(C) Piping shall be as straight and short as possible.

(D) Where turned down bellmouth inlets or submersible pumps are used, the bottom of the intake shall be placed a sufficient distance above the wet well floor to minimize inlet head losses but close enough to the wet well floor to assure inlet velocities sufficient to prevent solids deposition.

(8) Pumping Rates for Pump Stations Receiving 2000 gallons or more of Wastewater Per Day

(A) The pumps and controls of main pump stations shall be selected to operate at varying delivery rates.

(B) When possible, such stations shall be designed to deliver as uniform a flow as is technically practical in order to minimize hydraulic surges.

(C) The station design capacity shall be based on the peak hourly flow rate as determined by § 1-1003(c)(2) and be adequate to maintain a minimum velocity of 2 feet per second in the force main.

(9) Pump Controls

(A) Bubbler type level monitoring systems shall include dual air compressors.

(B) Provision shall be made to automatically alternate the pumps when there are multiple pumps in use.

(C) The second pump "on" level and "alarm on" level shall be at the same elevation when there are multiple pumps in use.

(10) Valves

(A) Suction Line

(i) Suitable shutoff valves shall be placed on the suction line of dry pit pumps.

(B) Discharge Line

(i) Suitable shutoff and check valves shall be placed on the discharge line of each pump.

(ii) The check valve shall be located between the shutoff valve and the pump.

(iii) Valves shall be capable of withstanding normal pressure and water hammer.

(C) Location of Valves

(i) All shutoff and check valves shall be operable from the floor level and accessible for maintenance. Outside levers are recommended on swing check valves.

(ii) Valves, except for valves associated with pump stations with a single pump, shall not be located in the wet well but shall be in a separate valve pit adjacent to the wet well. The valve pit shall:

(I) contain a valve connection to allow the use of a portable pump for the pump station; and

(II) be designed to remove or drain accumulated water from the valve chamber. The valve pit shall be dewatered to the wet well through a drain line with a gas and watertight valve or be dewatered using a sump pump that discharges the water to the wet well. The design shall include an effective method of preventing wastewater from entering the pit during surcharged wet well conditions.

(III) Valves associated with a pump station with a single pump shall be accessible without needing to enter the station.

(iii) Check valves that are integral to the pump and would be removed from the wet well with the pump do not need to be located in a separate valve chamber.

(iv) Valves may be located in wet wells only where single pump units are allowed. Valves shall be accessible without entering the wet well.

(11) Submersible Pumps – Special Requirements

(A) Submersible pumps shall be easily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well except when allowed for pump stations with a single pump.

(B) Submersible pumps and motors in a pump station not receiving septic tank effluent shall be designed specifically for raw or untreated wastewater use including totally submerged operation during a portion of each pumping cycle and shall meet the requirements of the National Electrical Code for such units. An effective method to detect shaft seal failure or potential seal failure shall be included in the design.

(C) Submersible pumps shall have a minimum pump run time of 5 minutes except when the Rules allow or require a pump time of less than 5 minutes, such as in § 1-914, § 1-915, § 1-916, and § 1-923.

(12) Suction-Lift Pumps – Special Pump Priming and Lift Requirements

(A) Suction-lift pumps shall be either self-priming or vacuum-primed.

(B) Calculations must include:

(i) static suction-lift as measured from "lead pump off" elevation to center line of pump suction;

(ii) friction and other hydraulic losses of the suction piping;

(iii) vapor pressure of the liquid;

(iv) altitude correction;

(v) required net positive suction head; and

(vi) an additional 6 feet of head.

(C) Self-Priming Pumps

(i) Self-priming pumps shall be capable of rapid priming and re-priming at the "lead pump on" elevation.

(ii) Such self-priming and re-priming shall be accomplished automatically under design flow operating conditions.

(iii) Suction piping shall not exceed the size of the pump suction and shall not exceed 25 feet in total length.

(iv) Priming lift at the "lead pump on" elevation shall include a minimum of 4 additional feet from the maximum allowable priming lift for the specific equipment at design flow operating conditions.

(v) The combined total of dynamic suction-lift at the "pump off" elevation and required net positive suction head at design flow operating conditions shall not exceed 22 feet.

(D) Vacuum-Priming Pumps

(i) Vacuum-priming pump stations shall be equipped with dual vacuum pumps capable of automatically and completely removing air from the suction-lift pump.

(ii) The vacuum pumps shall be adequately protected from damage due to wastewater.

(iii) The combined total of dynamic suction-lift at the "pump off" elevation and required net positive suction head at design flow operating conditions shall not exceed 22 feet.

(E) Suction-lift pump stations using dynamic suction lifts exceeding the limits outlined in Subsection (c)(12)(C) and (D) may be used when the designer has the manufacturer's certification of pump performance and made calculations that indicate satisfactory performance under the proposed design flow operating conditions.

(d) Requirements for Flow Measurement

(1) Suitable devices for measuring wastewater flow shall be provided at all pump stations except as provided in Subsection (d)(3). Indicating, totalizing, and recording flow measurement meters shall be provided at pump stations with a peak hourly flow rate of 1200 gallons per minute or greater.

(2) Elapsed time meters used in conjunction with annual pumping rate tests may be acceptable for pump stations with a peak hourly flow rate up to 1200 gallons per minute, provided sufficient metering is configured to measure the duration of individual and simultaneous pump operation.

(3) Pump stations with a single pump receiving less than 2000 gallons of wastewater per day are exempt from the requirements of this Subsection.

(e) Requirements for Equipment Removal

(1) The design shall facilitate removal of pumps, motors, and other mechanical and electrical equipment.

(2) When there are multiple pumps, individual pump and motor removal shall not interfere with the continued operation of remaining pumps.

(3) Submersible pumps shall be easily removable and replaceable without personnel entering or dewatering the wet well or, for pump stations with multiple pumps, disconnecting any piping in the wet well.

(4) Pump stations with a single pump may allow pump removal using the discharge pipe from the pump, provided the coupling that allows the disconnection to the force main is accessible without entering the wet well.

(5) For suction-lift or vacuum primed pump stations, the following requirements shall be met:

(A) The pump equipment compartment shall be above grade or offset and shall be isolated from the wet well to prevent a hazardous and corrosive sewer atmosphere from entering the equipment compartment.

(B) Wet well access shall not be through the equipment compartment and shall be at least 24 inches in diameter.

(C) Gasketed replacement plates shall be maintained on site to cover the opening to the wet well in the event that the existing cover plate needs replacing when a pump unit is removed for servicing.

(f) Requirements for Electrical Equipment

(1) Electrical systems and components (e.g. motors, lights, cables, conduits, switchboxes, control circuits, etc.) in raw or untreated wastewater wet wells, or in

enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present shall comply with the National Electrical Code® for Class I, Division 1, Group D, locations.

(2) Equipment located in the wet well shall be suitable for use under corrosive conditions.

(A) Each flexible cable shall be provided with a watertight seal and separate strain relief.

(B) A fused disconnect switch located above ground shall be provided for all pump stations.

(C) Lightning and surge protection systems shall be provided.

(D) A 110-volt power receptacle to facilitate maintenance shall be located inside the control panel for pump stations that have control panels outdoors.

(E) Ground Fault Circuit Interruption (GFCI) protection shall be provided for all outdoor outlets.

(3) Submersible Pump Stations – Special Requirements

(A) Power Supply and Control Circuitry

(i) Electrical supply, control, and alarm circuits shall be designed to provide strain relief and to allow disconnection from outside the wet well.

(ii) Terminals and connectors shall be protected from corrosion by location outside the wet well or through use of watertight seals.

(B) Controls

(i) The motor control center shall be:

(I) located outside the wet well;

(II) easily accessible; and

(III) protected by a conduit seal or other appropriate measures meeting the requirements of the National Electrical Code to prevent the atmosphere of the wet well from entering the control center.

(ii) The conduit seal shall be located so that the pump may be removed and electrically disconnected without disturbing the conduit seal.

(iii) When the control center is exposed to weather, it shall meet the requirements of weatherproof equipment of NEMA 3R or 4.

(C) Power Cord

(i) Pump motor power cords shall be designed for flexibility and serviceability under conditions of extra hard usage and shall meet the requirements of the National Electrical Code standards for flexible cords in wastewater pump stations.

(ii) Ground fault interruption protection shall be used to de-energize the circuit in the event of any failure in the electrical integrity of the cord.

(iii) Power cord terminal fittings shall be:

(I) corrosion-resistant;

(II) constructed in a manner to prevent the entry of moisture into the cord;

(III) include strain relief appurtenances; and

(IV) designed to facilitate field connecting.

(g) Requirements for Emergency Storage

(1) Emergency storage shall be provided for all pump stations except for pump stations:

(A) that have:

(i) a permanent independent engine generator that has sufficient capacity to start up and maintain the total rated running capacity of the pumps when the generator automatically starts up when there is a power outage; or

(ii) alternate electrical power source for electrically driven pumps; and

(B) where there are no down-stream pump stations that rely on storage.

(2) Storage shall be provided above the high-water alarm level of the wet well.

(A) Storage may be provided in the wet well, or in an adjacent tank that is designed to drain back into the wet well.

(B) For pump stations with multiple pumps, the volume of storage shall equal the design flow for a period in excess of the longest power outage in the last 5 years that would have affected the pump station or the design flow based on a 16-hour delivery rate divided by 4 hours, whichever is greater.

(C) Emergency storage shall be a minimum of one day of the design flow for all pump stations with a single pump.

(D) The emergency storage volume may overflow into the connecting sanitary sewer service line or sanitary sewer collection line provided the wastewater does not:

(i) back up into building basements or fixtures;

(ii) back up into septic tanks; or

(iii) flow over the top of manholes or the wet well.

(h) Requirements for Alarm Systems

(1) Pump station alarm systems shall have a backup power source.

(2) The alarm, at a minimum, shall be activated in cases of:

(A) power failure;

(B) dry well sump high-water elevation;

(C) wet well high-water elevation;

(D) low water wet well level;

(E) pump failure;

(F) other causes of pump station malfunction;

(G) standby power failure; and

(H) except for a pump station with a single pump, unauthorized entry.

(3) Audio and visual alarms shall be located outside the pump station.

(4) Pump stations with a single pump shall be provided an audio and visual alarm located at the pump station that is activated by the high-water elevation.

§ 1-1009 Requirements for Force Mains

(a) Force mains shall meet the following requirements:

(1) Layout:

(A) Looping force main piping is prohibited.

(B) Pipe routing shall include long radius sweeps no less than those recommended by the pipe manufacturer.

(2) The force main shall be sized to maintain a minimum hydraulic velocity of 2.0 feet per second with one pump on.

(3) The minimum force main size shall be 1½ inch diameter when using a grinder pump.

(4) The minimum force main diameter for raw or untreated wastewater shall be 4 inches.

(5) An automatic air relief valve shall be placed at high points in the force main to prevent air locking.

(6) Vacuum relief valves may be necessary to relieve negative pressures on force mains. The force main configuration and head conditions shall be evaluated as to the need for and placement of vacuum relief valves.

(7) Air or vacuum relief valves shall be located in a manhole or structure to allow access for repair and maintenance.

(8) Maintenance Valves, Cleanouts, Isolation Valves, and Check Valves

(A) Isolation valves shall be installed where one force main connects into a second force main.

(B) Cleanouts shall be installed every 1500 to 2000 feet in all force mains.

(C) A valve box with a redundant check valve or equivalent shall be located:

(i) at the property line to protect buildings or structures from flooding when the building or structure connects to a pressure force main; or

(ii) on each force main upstream of the connection where 2 force mains join together.

(D) Isolation valves shall be provided on either side of a check valve so that the check valve can be removed for maintenance, repair or replacement.

(9) Force mains shall enter a gravity sanitary sewer manhole:

(A) at a point not more than 1 foot above the flow line of the receiving manhole: and

(B) so that flow is directed in a manner that protects the manhole and sewer line from scouring.

(10) Pipe Material

(A) Acceptable pipe material includes Class 200, SDR 21 PVC ; Class 160, SDR 26 or greater; or HDPE SDR 11 or equivalent.

(B) Pipe and joints shall be equal to piping and joints used for water mains.

(11) Force mains and fittings, reaction blocking, and pump station piping shall be designed to withstand water hammer pressures and associated cyclic reversal of stresses that are expected with the cycling of wastewater pump stations.

(12) Friction losses in force mains shall be based on the Hazen Williams formula or other acceptable method. When the Hazen and Williams formula is used, the value for "C" shall be:

(A) 100 for unlined iron or steel pipe for design; and

(B) for other smooth pipe materials, such as PVC, polyethylene, lined ductile iron, etc., a higher "C" value not to exceed 120 may be allowed for design.

(13) Force mains shall comply with § 1-1007 for separation to water services lines, water service pipes, or water mains.

(14) Where force mains are constructed of material which might cause the force main to be confused with water services lines, water service pipes, or water mains, the force main shall be appropriately identified.

(b) Upon completion of construction of a force main, the force main shall be pressure and leakage tested to ensure there are no leaks.

(1) Pressure Test

(A) All newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the highest working pressure in the section in accordance with the following procedure:

(i) Test pressures shall:

(I) not be less than 50 pounds per square inch at the highest point along the test section;

(II) not exceed pipe or thrust restraint design pressures;

(III) be of at least 2-hour duration;

(IV) not vary by more than 5 pounds per square inch; and

(V) not exceed twice the rated pressure of the valves when the pressure boundary of the test section includes closed gate valves.

(B) Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to test gauge, shall be applied by means of a pump connected to the pipe.

(C) Before applying the specified test pressure, air shall be expelled completely from the pipe and valves.

(D) All exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, or valves that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated.

(2) Leakage Test

(A) A leakage test shall be conducted concurrently with the pressure test.

(B) Leakage shall be determined by the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 pounds per square inch of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled.

(C) No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$L = (N)(D)(\sqrt{P}) \div 7400$

where:

L is the allowable leakage, in gallons per hour;

N is the number of joints in the length of pipeline tested;

D is the nominal diameter of the pipe, in inches; and

P is the average test pressure during the leakage test, in pounds per square inch gauge.

(c) Force mains shall be covered with sufficient earth or other insulation to prevent freezing.

§ 1-1010 Requirements for Testing of Tanks for Watertightness

(a) Septic tanks, dosing siphons, holding tanks, pump stations, wastewater storage tanks, wet wells, and grease tanks shall be watertight.

(b) When required to be tested for watertightness by a permit, tanks shall be tested using the ASTM for testing of tanks or the following:

(1) For concrete tanks, complete one of the following tests:

(A) Using a water pressure test, seal the tank and risers, fill with water to the top of the risers, and let stand for 24 hours. Refill the tank. The tank is considered watertight if the water level is held for 1 hour.

(B) Using a vacuum test, seal the empty tank and risers and apply a vacuum to 2 inches (50 mm) of mercury. The tank is considered watertight if 90 percent of the vacuum is held for 2 minutes.

(2) For plastic or fiberglass tanks, fill the tank up to the top of the risers with water for 1 hour. The tank is considered watertight if there is no drop in the water level.

(3) For steel tanks, fill the tank up to the top of the risers with water for 1 hour. The tank is considered watertight if there is no drop in the water level.

Subchapter 11 – Specific Technical Standards for Potable Water Supplies

§ 1-1101 Use of Term Potable Water Supply

The term potable water supply as used in this Subchapter shall mean a potable water supply that includes a potable water source (i.e., as used in this Subchapter, the term potable water supply shall not include water service lines).

§ 1-1102 General Requirements for Potable Water Supplies and Water Service Lines

(a) Except when the potable water supply serves only one single-family residence, a potable water supply shall include a potable water source with a long-term yield that is capable of supplying the design rate necessary to accommodate the design flow associated with each component of the potable water supply.

(b) A building or structure shall be served by no more than one potable water source unless:
- (1) the Secretary determines, based on information provided by the applicant's designer, that more than one source is required to meet the design flow for the building or structure; or
- (2) none of the potable water supply presumptive isolation zones for the potable water sources serving the building or structure extend onto land owned by a person different than the owner of the building or structure.

(c) A potable water source shall either:
- (1) be demonstrated to have sufficient yield to meet the design rate without adversely interfering with existing or permitted public water sources or potable water sources through a long-term yield analysis conducted pursuant to the requirements of § 1-1107 and interference testing and analysis, if required, conducted pursuant to the requirements of § 1-1108; or
- (2) be demonstrated to have a high probability of yielding a sufficient quantity of water to meet the design rate without adversely interfering with existing or permitted public water sources or potable water sources based on the yields of surrounding wells.

(d) A surface water potable water source shall meet the following requirements:
- (1) A surface water potable water source shall serve only one building or structure that is a single-family residence occupied by the owner of record. The single-family residence may include a home occupation as that term is defined in these Rules but the residence may not be used in any other way, including uses that employ persons other than family members and involve visits by the public in a manner or duration that would presume the need for use of a potable water supply.
- (2) The only surface waters that may be used as potable water sources are lakes and ponds that the Watershed Management Division has determined to be not impaired and Lake Champlain, excluding St. Albans Bay, Missisquoi Bay, and portions from the Lake Champlain Bridge south. Streams shall not be used.

(e) The construction, installation, or hydrofracturing of a groundwater potable water source,

except the construction of a potable water supply using surface water, that is equal to or greater than 20 feet deep shall be performed by a well driller.

(f) The minimal working pressure in water service lines and water service pipes shall be:
(1) 35 pounds per square inch at the main if connecting to a public water system;
(2) 20 pounds per square inch at the ground level at the foundation wall; and
(3) 8 pounds per square inch at the highest elevation fixture.

§ 1-1103 Source Siting Requirements

(a) A potable water source shall not be located:
(1) In a floodway.
(2) In Zone 1 of a Public Community Water System Source Protection Area.
(3) In an area classified by the Secretary as a Class IV groundwater area unless the Secretary has authorized use of the groundwater as a source for a potable water supply under a reclassification order.

(b) A potable water source, located in a flood hazard area, shall be located, designed, and constructed in a manner that avoids impairment to the source and contamination of the source during flooding.

§ 1-1104 Horizontal Isolation Distances and Isolation Zones for Components of Potable Water Supplies

(a) Table 11-1 identifies the minimum horizontal isolation distance that all portions of each identified component of a potable water supply shall be located from all portions of the identified potential sources of contamination, unless the Secretary has authorized a reduction to the isolation distance or increased the isolation distance pursuant to Subsections (k) or (l).

(b) Isolation distances between potable water sources and injection wells required to have a permit that are within 1000 feet of each other shall be established on a case-by-case basis taking into consideration the following information provided by a designer:
(1) the contaminants expected from the injection well and their constituents;
(2) expected soil treatment; and
(3) site specific conditions including ground slope and groundwater flow direction.

(c) Isolation distances between potable water sources and a site listed on the hazardous sites list maintained by the Waste Management and Prevention Division of the Department that are within one third of a mile of each other shall be established on a case-by-case basis.

(d) Isolation distances between potable water sources, water service pipes, water service lines, and water storage tanks and potential sources of contamination not identified in Table 11-1 or in Subsections (b) or (c) shall be established on a case-by-case basis taking into consideration the following information provided by a designer:
(1) the potential contaminants and their constituents;
(2) expected soil treatment;

(3) site specific conditions including ground slope and groundwater flow direction; and

(4) design standards that may protect the source or service from contamination.

Table 11-1
Horizontal Isolation Distances, in Feet for Potential Sources of Contamination

Potential Source of Contamination	Potable Water Sources in Bedrock or Confined Surficial Aquifer	Potable Water Sources in Unconfined Surficial Aquifer	Water Service Lines and Water Service Pipes (Pressure)	Water Service Lines and Water Service Pipes (Suction)	Water Storage Tanks (Atmospheric Below Ground Surface)
Agriculture cropland	100	200	25	100	50
Buildings or structures, porches, foundations of buildings or structures	5	5	N/A	N/A	N/A
Cemeteries	100	150	25	100	50
Composting sites (commercial or agricultural)[1]	200	300	25	300	50
Concentrated livestock holding areas barnyard [2]	200	500	25	100	50
Driveways (fewer than 3 residences)	5	10	N/A	N/A	10
Driveways (3 or more residences), roadways, parking lots	25	25	N/A	N/A	25
Fertilizer or pesticide storage structures (buried tank of any size; above ground tank >1,500 gallons; dry or liquid; and piping serving a non-residential facility)	100	200	50	200	50
Fuel oil, gasoline & other petroleum tanks and piping (not including liquefied petroleum gas tank)	25	100	25	100	50
Herbicide or pesticide application on utility right of way where herbicides or pesticides either have been applied in the last 12 months or may be applied within the next 12 months[3]	100	200	25	200	100

Potential Source of Contamination	Potable Water Sources in Bedrock or Confined Surficial Aquifer	Potable Water Sources in Unconfined Surficial Aquifer	Water Service Lines and Water Service Pipes (Pressure)	Water Service Lines and Water Service Pipes (Suction)	Water Storage Tanks (Atmospheric Below Ground Surface)
Leachfields (proposed, existing, or permitted)	Requires isolation zone (See Table 11-2)		25	100	100
Manure storage systems, above ground[2]	50	100	25	50	50
Manure storage systems, in-ground concrete or geosynthetic lined[2]	100	200	25	200	100
Manure storage system, earthen lined[2]	200	500	25	200	200
Property lines	10	10	N/A	N/A	10
Salvage yards[4]	300[8]	300[8]	25	300	100
Sanitary sewer collection lines and sanitary sewer service lines	50	75	Distances and requirements established in § 1-1204 apply in lieu of this Section		50
Silage storages	50	75	25	75	50
Solid waste transfer facilities[5]	100	200	25	200	100
Stormwater conveyance/treatment/control practice (lined)	10	10	10	10	10
Stormwater conveyance/treatment/control practice (unlined and subsurface systems)	100	150	10	150	25
Storm sewers	10	50	Distances and requirements established in § 1-1204 apply in lieu of this Section	Distances and requirements established in § 1-1204 apply in lieu of this Section	10
Surface water, normal high water elevation[6]	10	25	N/A	N/A	25
Wastewater disposal spray area and lagoons	200	300	50	300	100
Wastewater tanks (proposed, existing, or permitted)[7]	Requires isolation zone (See Table 11-2)		25	50	50

Potential Source of Contamination	Potable Water Sources in Bedrock or Confined Surficial Aquifer	Potable Water Sources in Unconfined Surficial Aquifer	Water Service Lines and Water Service Pipes (Pressure)	Water Service Lines and Water Service Pipes (Suction)	Water Storage Tanks (Atmospheric Below Ground Surface)
Wells that are not potable water sources (e.g., irrigation wells, geothermal wells)	100	100	N/A	N/A	N/A

[1] Isolation distances for composting sites (commercial or agricultural) shall be measured from the perimeter of the composting area or area used for storage of composted material.
[2] Isolation distances for concentrated livestock holding areas and manure storage systems shall be measured from the perimeter of the holding area or outside perimeter of the manure storage system.
[3] Isolation distances for herbicide or pesticide application on utility right of way where herbicides or pesticides either have been applied in the last 12 months or may be applied within the next 12 months shall be measured from points of application of the herbicide or pesticide.
[4] Isolation distances for salvage yards shall be measured from the perimeter of the area used for the storage of salvaged materials to the component.
[5] Isolation distances for solid waste transfer facilities shall be measured from points within the transfer facility used for storing solid waste.
[6] The horizontal location to surface water shall allow for possible future widening of the surface water due to bank erosion.
[7] Wastewater Tanks include septic tanks, pump stations, dosing siphons, holding tanks, wastewater storage tanks, wastewater treatment tanks, sand filters, constructed wetlands, and grease tanks.
[8] If the applicant's designer demonstrates that the groundwater flow from the salvage yard is not in the direction of the potable water source, the isolation distance shall be 100 feet rather than 300 feet.

(e) Subsections (f), (g), (h), and (i), in conjunction with Table 11-2, identify the size and shape of the isolation zone around the identified components of proposed, existing, or permitted wastewater systems, and proposed or permitted replacement areas, in which no portion of a potable water source shall be located, unless the Secretary has authorized a reduction to the isolation zone or required a larger isolation zone pursuant to Subsections (k) or (l).

Table 11-2
Distances, in Feet, Used to Create Isolation Zones Around Components of Wastewater Systems and Replacement Areas

<table>
<tr><th colspan="2">Drinking Water Sources (by gallons per minutes design rate)</th><th>Proposed, Existing, or Permitted Leachfields and Proposed or Permitted Replacement Areas (< 2000 gallons per day design flow)</th><th>Proposed, Existing, or Permitted Leachfields and Proposed or Permitted Replacement Areas (≥ 2000 to < 6500 gallons per day design flow)</th><th>Proposed, Existing, or Permitted Leachfields and Proposed or Permitted Replacement Areas (≥ 6500 gallons per day or more design flow)</th><th>Proposed, Existing, or Permitted Wastewater Tanks[1]</th></tr>
<tr><td rowspan="4">Potable water sources in bedrock or confined surficial aquifer</td><td>≤ 2.0</td><td>X = 100
Y = 200</td><td>X = 150
Y = 300</td><td>X = 200
Y = 1000</td><td rowspan="4">X = 50
Y = 50</td></tr>
<tr><td>> 2.0 and ≤ 5.0</td><td>X = 150
Y = 300</td><td>X = 150
Y = 300</td><td>X = 200
Y = 1000</td></tr>
<tr><td>> 5.0 and ≤ 8.0</td><td>X = 200
Y = 400</td><td>X = 200
Y = 400</td><td>X = 200
Y = 1000</td></tr>
<tr><td>> 8.0</td><td colspan="3">X = 200
Y = 1000</td></tr>
<tr><td rowspan="2">Potable water sources in an unconfined surficial aquifer</td><td>≤ 8.0</td><td>X = 150
Y = 500</td><td>X = 150
Y = 1000</td><td>X = 200
Y = 1000</td><td rowspan="2">X = 75
Y = 75</td></tr>
<tr><td>> 8.0</td><td colspan="3">X = 200
Y = 1000</td></tr>
</table>

[1] Wastewater Tanks include septic tanks, pump stations, dosing siphons, holding tanks, wastewater storage tanks, wastewater treatment tanks, sand filters, constructed wetlands, and grease tanks.

(f) One of the following methods shall be used in conjunction with the points identified in Subsection (h) to determine the size and shape of the required isolation zone around proposed, existing, or permitted leachfields, and proposed or permitted replacement areas, with X and Y equaling the numbers identified in Table 11-2:

(1) Draw an arc so that all points of the arc are Y from all portions of the component.

(2) Use the ground surface contours (not artificial modifications, such as roadways, filled areas, or retaining walls) to draw the following arcs to create a complete zone around all portions of the component:

(A) Beginning at the 2 upslope corners of the component, swing an arc to the outside of the system with a radius of X to create a point where the arcs intersect with the same contour as the 2 upslope corners of the component.

(B) Continue the 2 arcs in the upslope direction to a point that is X upslope of each corner of the component.

(C) Connect the 2 arcs with a tangent line so that no portion of the arcs or tangent line are less than X from the component.

(D) Beginning at the 2 downslope corners of the component, swing an arc to the outside of the system with a radius of X to a point where the arcs intersect with the same contour as the 2 lowermost corners of the component.

(E) Connect the 2 points derived in Subsections (f)(2)(A) and (D) with a line so that the tangent line maintains a minimum of X beyond either side of the component.

(F) From each of the 2 downslope corners of the component, draw a "fall line," a line oriented perpendicular to the topographic contours, to a point that is a minimum of Y from each corner.

(G) Beginning at the 2 points derived in Subsections (f)(2)(D), draw lines that are X from and parallel to the 2 fall lines.

(H) From each of the 2 downslope corners of the component and in the downslope direction, draw an arc with a radius of Y to connect the farthest downslope lines drawn in Subsections (f)(2)(F) and (G).

(I) Connect the 2 points derived in Subsections (f)(2)(F) with a tangent line so that no point of the tangent line is less than Y from the downslope side of the component.

(J) If the component is irregularly shaped, no portion of component shall be less than X in the upslope direction or along the same contour of the component, and, Y in the downslope direction of the component.

(g) Notwithstanding Subsection (f), when a 2-year time of travel management zone is determined for a proposed, existing, or permitted leachfield, the size and shape of the required isolation zone around the leachfield shall be the 2-year time of travel management zone, provided:

(1) When the drinking water source to be isolated from the leachfield is grouted, in no case shall any point along the isolation zone be less than 50 feet from the drinking water source.

(2) When the drinking water source to be isolated from the leachfield is not grouted, in no case shall any point along the isolation zone be less than 100 feet from the drinking water source.

(h) Notwithstanding Subsection (f), where detailed topographical data is not available, the size and shape of the required isolation zone around proposed, existing, or permitted leachfields shall be determined using the method described in Subsection (f)(1).

(i) The following points shall be used in conjunction with Subsection (f), (g), and (h) to identify the required isolation zones around proposed, existing, or permitted leachfields:

(1) For in-ground leachfields, the corners of the outermost edges of the leachfield.

(2) For a leachfield in a mound, the corners of the effective basal area of the mound.

(3) For at-grade leachfields, the corners of the leachfield stone or other application surface.

(4) For leachfield in a bottomless sand filter, the corners of the enclosure for a bottomless sand filter system.

(j) The method to determine the size and shape of the required isolation zone around proposed, existing, or permitted wastewater tanks shall be to draw an arc around each tank so that all points of the arc are X, identified in Table 11-2, or greater from all portions of the tank.

(k) An applicant or prospective applicant may submit a written request to the Secretary for a reduction in the required isolation distances or isolation zone for a particular potential source of contamination.

(1) The Secretary shall authorize the use of a reduced isolation distance or isolation zone between a potable water source and a particular potential source of contamination when the Secretary determines that the isolation distance specified in Table 11-1 or the isolation zone identified pursuant to Subsection (f) is unnecessary to protect human health because the specific site conditions, or the construction techniques and pipe materials for the potable water supply or wastewater system will prevent the performance of the potable water supply from being impacted by the potential source of contamination.

(2) In determining whether to authorize the use of a reduced isolation distance or isolation zone between a potable water source and a potential source of contamination specified in Table 11-1, the Secretary shall consider the following factors:

(A) the constituents of the potential contamination;

(B) the expected soil treatment; and

(C) site specific conditions.

(3) The Secretary may authorize the use of a reduced isolation distance between a water service line or water service pipe and a potential source of contamination listed in Table 11-1 when one or more of the following conditions exist:

(A) The water service line or water service pipe is installed in a sleeve that is determined to be watertight to prevent the introduction of the contaminant into the sleeve.

(B) The site-specific conditions indicate that the groundwater flow direction is from the water service line or water service pipe to the potential source of contamination.

(C) The site-specific conditions indicate that the seasonal high-water table is a minimum of 18 inches below the bottom of the water service line or water service pipe.

(4) The Secretary shall not authorize a reduction to the distances used to create an isolation zone around a leachfield pursuant to Subsection (f) to less than the following:

(A) When a hydrogeological analysis is not completed, the groundwater flow is not analyzed, and the water source is not grouted, X and Y shall not be reduced.

(B) When a hydrogeological analysis is not completed and when there is a continuous impeding layer from the leachfield to the potable water source, and the water source is grouted, X and Y shall not be less than 100 feet.

(C) When groundwater flow from beneath a leachfield is not towards the potable water source, Y shall not be less than X.

(D) When a hydrogeological analysis is completed that reveals that groundwater flow from beneath a leachfield does not flow toward the potable water source under pumping conditions, Y shall be not less than 100 feet.

(E) When a hydrogeological analysis is completed that demonstrates there is at least a 2-year time of travel between a leachfield and the potable water source and the source is not grouted, Y shall not be less than 100 feet.

(F) When a hydrogeological analysis is completed that demonstrates there is at least a 2-year time of travel between a leachfield and the potable water source and the source is grouted, X and Y shall not be less than 50 feet.

(5) The burden shall be on the applicant or prospective applicant to provide information from a designer that addresses the factors in Subsection (k)(2) or the conditions in (k)(3) and enables the Secretary to reach a determination.

(6) The Secretary's determination shall be in writing and indicate the reduced isolation distance or isolation zone.

(l) The Secretary shall require a greater isolation distance or larger isolation zone for a particular potential source of contamination when the Secretary determines that, based on the specific site conditions described in an application, a greater isolation distance or larger isolation zone is necessary to prevent the potential subsurface flow of contaminant from impacting the performance of the potable water supply.

Note: Appendix C, Figure C-15, depicts an example for drawing an isolation zone around a leachfield.

§ 1-1105 Potable Water Supply Presumptive Isolation Zone

(a) A presumptive isolation zone shall be identified, using the methods identified in § 1-912, around proposed potable water sources in which a leachfield with a design flow of less than 2000 gallons per day is presumed to be unable to be located.

(b) Each potable water supply's presumptive isolation zone identified pursuant to Subsection (a) shall be considered in conjunction with the requirements of § 1-307 to determine if notification to adjacent landowners is required pursuant to § 1-307 and considered in conjunction with the requirements of Appendix A to determine if the potable water supply presumptive isolation zone is required to be shown on the site plan.

§ 1-1106 Grouting Annular Space

(a) The annular space around the casing or well tile of a groundwater potable water source shall be grouted using the methods identified in § 1-1205(j) when:

(1) A reduction in the isolation zone between a leachfield and the potable water source is granted pursuant to § 1-1104(k) or § 1-912(e) and the Secretary requires grouting as a condition of the reduction.

(2) The Secretary determines there are site factors that require grouting to protect the potable water source from possible contamination.

(b) Grouting is recommended if a potable water source may, in the future, require a public water system source permit under the Vermont Water Supply Rule.

(c) When grouting is not required, the annular space of a potable water source shall be filled with native materials such as drill cuttings except for wells that do not have annular space, including concentric, dual rotary, eccentric, and drill and drive wells when the pilot hole is no larger than the drill hole for the casing.

§ 1-1107 Long-Term Yield Analysis

(a) Except as provided in Subsection (b), the long-term yield for a potable water source with a design rate of 5 gallons per minute or less equals 50 percent of the well driller's estimated yield.

(b) A long-term yield analysis of a potable water source shall be conducted for the following sources to establish the long-term yield:
- (1) potable water sources with a design rate of more than 5 gallons per minute;
- (2) potable water sources with a design rate greater than 50 percent of the well driller's estimated yield, except when the potable water supply serves only one single-family residence;
- (3) potable water sources that gravity flow to a potable water pipe, except when the potable water supply serves only one single-family residence;
- (4) potable water sources, including a potable water source serving only one single-family residence, that are required to conduct interference testing and analysis pursuant to § 1-1108.

(c) A long-term yield analysis conducted for the potable water sources identified in Subsection (b)(1), (2), and (4) shall comply with the following requirements:
- (1) The long-term yield analysis shall consist of a constant discharge pumping test and recovery completed and analyzed by a hydrogeologist or a Class 1 designer.
- (2) The duration of the constant discharge pumping test shall comply with Table 11-3 at a pumping rate greater than or equal to the required design rate of the source.
- (3) The hydrogeologist or Class 1 designer shall:
  - (A) During the constant discharge pumping test, measure and record the water elevation drawdown and rate of discharge using accepted methods at intervals that will plot evenly on a logarithmic scale graph.
  - (B) Continue to measure and record the water elevation into the recovery period for 2 days, or until a minimum of 90 percent recovery is achieved, whichever occurs first.
  - (C) Determine the static water elevation, pump elevation, total available head, predicted drawdown, and remaining available head (the difference between the total available head and predicted drawdown).
  - (D) Estimate a long-term yield that meets or exceeds the following criteria:
    - (i) a constant withdrawal at the design rate for 180 days; and
    - (ii) a drawdown that shall not exceed 90 percent of the total available head.

Table 11-3
Constant Discharge Pumping Test Duration

Design rate of Potable Water Source (gallons per minute)	Minimum Test Length (Hours)
≤ 2.0	24
> 2.0 and ≤ 5.0	36
> 5.0 and ≤ 8.0	48, or 72 if there is unacceptable interference identified in the first 48 hours between the potable water source being tested and the public water source or potable water source
> 8.0 and ≤ 50	72
> 50 and < 100	96
100 gallons per minute or greater	120

(d) A long-term yield analysis conducted for the potable water sources identified in Subsection (b)(3) shall comply with the following requirements:
- (1) The long-term yield analysis shall be conducted by a hydrogeologist or a Class 1 designer and shall include a prediction of the long-term yield based on the monitoring data.
- (2) The method for conducting the long-term yield analysis shall be prepared by a hydrogeologist or Class 1 designer and shall be submitted to and approved by the Secretary prior to conducting the analysis.
- (3) The long-term yield analysis shall be conducted during the lowest flow that may be expected during the calendar year.

§ 1-1108 Interference Testing and Analysis

(a) For the purposes of this Section, "unacceptable interference" means when a potable water source causes:
- (1) an existing or permitted potable water source to be unable to meet the design rate or existing yield, whichever is lower; or
- (2) an existing or permitted public water source to be unable to meet the authorized demand or permitted yield, whichever is greater.

(b) A potable water source shall not create unacceptable interference with an existing or permitted public water source or potable water source.

(c) If a potable water source is located within the distances specified in Table 11-4 to an existing or permitted public water source, interference testing shall be conducted in conformance with the Water Supply Rules to determine whether the potable water source will create unacceptable interference.

(d) If a potable water source is located within the distances specified in Table 11-4 to an existing or permitted potable water source, interference testing shall be conducted that complies with the following requirements:

(1) a hydrogeologist or Class 1 designer shall monitor the existing or permitted potable water sources for interference while conducting a long-term yield analysis on the proposed potable water source conducted pursuant to the requirements of § 1-1107; or

(2) when the owner of the existing or permitted potable water source has refused permission to monitor the source, it is otherwise not feasible to access the source, or, when the source is permitted but not existing, the source shall be analyzed by a hydrogeologist for potential interference using one of the following:

(A) the results of interference testing on other similar sources in the area; or

(B) calculations using text book values for aquifer parameters if no interference testing data is available.

(e) The Secretary may waive the requirement to complete interference testing pursuant to Subsection (c) or (d) for a particular existing or permitted public water source or potable water source when the applicant provides information from a designer that demonstrates:

(1) the yield for the existing or permitted potable water source will not be reduced below its design rate or existing yield, whichever is lower;

(2) the yield for the existing public water source will not be reduced below its authorized demand or permitted yield, whichever is greater; and

(3) well completion information for existing or permitted potable water source and public water sources located within the distances in Table 11-4 of the subject well supports the designer's opinion there is a sufficient quantity of water to supply the project without causing unacceptable interference with the existing potable or public water sources.

Table 11-4
Monitoring Distance from Test Source to a Potable or Public Water Source

Design Rate of Tested Source (gallons per minute)	Monitoring Distance (Feet)
≤ 2	100
> 2 and ≤ 5	300
> 5 and ≤ 20	1000
> 20 and ≤ 50	2000
> 50 < 100	2500
100 or greater	3000

(f) Unacceptable interference identified through interference testing conducted pursuant to Subsection (c) or (d) may be resolved by:

(1) drilling the affected source deeper and re-conducting interference testing;

(2) hydrofracturing the affected source and re-conducting interference testing;

(3) closing of the affected source; or

(4) another method approved by the Secretary.

§ 1-1109 Instantaneous Peak Demand

(a) A potable water supply shall be capable of supplying the instantaneous peak demand associated with each component of the potable water supply, except as provided in Subsection (d).

(b) A potable water supply's instantaneous peak demand shall be calculated using the following methods:
- (1) the methodology in the Vermont Plumbing Rules;
- (2) 5 gallons per minute multiplied by the number of living units; or
- (3) a different methodology approved by the Secretary that is accepted by the AWWA or similar national publication.

(c) A potable water supply with an instantaneous peak demand that is equal to or less than the long-term yield for the potable water source complies with the requirements of Subsection (a).

(d) A potable water supply serving only one of the following is not subject to Subsections (a) and (e) when a pump is provided at the potable water source capable of supplying the potable water supply's instantaneous peak demand:
- (1) a single-family residence;
- (2) a single-family residence with an attached 1 bedroom living unit that uses the same potable water source with a total design flow of 560 gallons per day or less; or
- (3) a building or structure with non-residential uses and a design flow of 560 gallons per day or less with an instantaneous peak demand of less than 15 gallons per minute.

(e) Except as provided in Subsection (d), when a potable water supply's instantaneous peak demand exceeds the long-term yield for the potable water source, and the potable water source is pumped:
- (1) the potable water supply shall include water storage that enables the potable water supply to meet the instantaneous peak demand and that complies with the requirements of § 1-1110; or
- (2) an abbreviated constant discharge pumping test using one of the following methods shall be conducted that demonstrates the potable water source can provide the quantity of water necessary to meet the instantaneous peak demand of the potable water supply:
  - (A) The source is pumped at the potable water supply's instantaneous peak demand rate or greater for a duration where the total volume pumped equals twice the design flow and:
    - (i) the pumping test is supervised by a hydrogeologist, a Class 1 designer, Class BW designer, or well driller; and
    - (ii) the pump discharge rate is measured and recorded at 30-minute intervals with a minimum of 3 readings.
  - (B) A 3-hour blow test with flow measurements at less than or equal to 30-minute intervals is performed by a well driller.

(C) A well driller's estimated yield is determined by methods other than Subsection (e)(2)(A) or (e)(2)(B) that is divided by 2.

(D) Another method for testing the potable water source approved by the Secretary is completed.

(f) When a potable water supply's instantaneous peak demand exceeds the long-term yield for the potable water source, and the potable water source is not pumped (i.e., gravity flow to a potable water pipe), the potable water supply shall include water storage that enables the potable water supply to meet the instantaneous peak demand and that complies with the requirements of § 1-1110.

§ 1-1110 Water Storage and Water Storage Tanks

(a) The base of a water storage tank shall be placed at or above the base flood elevation.

(b) When water storage is required pursuant to § 1-1109:

(1) The required water storage volume shall be identified using the following calculations:

(A) If the long-term yield equals or exceeds 2/3rds of the design rate but is less than the design rate, storage shall equal the design flow.

(B) If the long-term yield equals or exceeds the design rate:

(i) storage shall equal 55 percent of the design flow; or

(ii) storage shall be calculated using the equation $S = D [1 - Y/P]$ where:

(I) S = volume of water storage (gallons);

(II) D = design flow multiplied by 1 day (gallons);

(III) P = potable water supply's instantaneous peak demand (gallons per minute); and

(IV) Y = long-term yield or the results of the abbreviated constant discharge pumping test (gallons per minute).

(2) For drilled or driven wells, all, or a portion of, the required water storage volume may be met through the available casing storage identified using the following calculations:

(A) The total available head shall be calculated using the equation TAH = PCL – SL where:

(i) TAH = total available head (feet);

(ii) PCL = pump cut-off level measured below top of casing (feet); and

(iii) SL = static level measured below top of casing (feet).

(B) The approximate drawdown elevation shall be calculated using the equation $DL = SL + (TAH \times (DR/Y))$ while pumping at the design rate where:

(i) DL = drawdown level measured below top of casing (feet);

(ii) SL = static level measured below top of casing (feet);

(iii) TAH = total available head (feet);

(iv) DR = design rate (gallons per minute); and

(v) Y = Long-term yield (gallons per minute).

(C) The remaining available head shall be calculated using:

(i) In all circumstances other than that in Subsection (b)(2)(C)(ii), the equation RAH = PCL – DL where:
(I) RAH = remaining available head (feet);
(II) PCL = pump cut-off level measured below top of casing (feet); and
(III) DL = drawdown level measured below top of casing (feet).

(ii) When the source is a flowing artesian well and the drawdown elevation remains above the top of casing when pumping at the design rate, the equation RAH = PCL where:
(I) RAH = remaining available head (feet);
(II) PCL = pump cut-off level measured below top of casing (feet).

(D) The available storage in the well shall be calculated using the equation AS $= \pi \times r^2 \times$ RAH $\times$ 7.48 where:
(i) AS = Available storage (gallons);
(ii) $\pi = 3.14$
(i) r = casing inside radius (feet); and
(ii) 7.48 (gallons per cubic foot).

(3) For dug wells or springs, all, or a portion of, the required water storage volume may be met through the available storage in well tiles identified using the following calculations:

(A) For round well tiles, the equation WTS = 1/2 (LWL – PCL)($\pi \times r^2$)(7.48), where:
(i) WTS = available well tile storage (gallons);
(ii) LWL = annual low water level measured below the top of the tile (feet);
(iii) PCL = pump cut-off level or outlet measured below the top of the tile (feet);
(iv) $\pi = 3.14$;
(v) r = radius of the inside dimension of a round tile (feet); and
(vi) 7.48 (gallons per cubic foot).

(B) For square or rectangular well tiles, the equation WTS = 1/2 (LWL – PCL)(L)(W)(7.48) where:
(i) WTS = available well tile storage (gallons);
(ii) LWL = annual low water level measured below the top of the tile (feet);
(iii) PCL = pump cut-off level or outlet measured below the top of the tile (feet);
(iv) L = length of the inside dimension of a rectangular tile (feet);
(v) W = width of the inside dimension of a rectangular tile (feet); and
(vi) 7.48 (gallons per cubic foot).

(c) The portion of the required water storage volume not met by casing storage, if allowed pursuant to Subsection (b)(2), or storage in well tiles if allowed pursuant to Subsection (b)(3), shall be met through a combination of hydropneumatic tanks and other water storage tanks.

(d) The storage volume provided by hydropneumatic tanks, when used to provide all or a portion of the required water storage volume, shall be calculated based on the volume of water available between the pump-on pressure and the minimum operating pressure for the distribution system to supply a minimum of 8 psi to all plumbing fixtures.

(e) Hydropneumatic tanks (i.e., pressure tanks) shall meet the following requirements:
- (1) Hydropneumatic tanks shall meet the requirements of the Vermont Plumbing Rules for hydropneumatics tanks and shall:
  - (A) be located in a building or structure;
  - (B) have the minimum working pressure at the hydropneumatic tank system set at 20 psi;
  - (C) have pressure reducing devices on the distribution system prior to the hydropneumatic tank when static pressures exceed 100 psi;
  - (D) have a drain, pressure gauge, watertight glass if applicable, and automatic or manual means for adding air, air blow-off, and pressure operated start-stop controls for pumps; and
  - (E) have a drain or overflow discharge pipe that:
    - (i) opens downward a minimum of 18 inches above a splash plate when discharging to ground surface; or
    - (ii) has an air-gap between the pipe and a sanitary sewer service line, sanitary sewer collection line, or storm drain when discharging to a line or drain. No drain or overflow pipe shall physically connect to any sanitary sewer service line, sanitary sewer collection line, or storm drain.
- (2) Hydropneumatic tank storage shall be not used for fire protection purposes.

§ 1-1111 Pumps

(a) A potable water supply that does not include an atmospheric water storage tank shall have a pump at the potable water source capable of supplying the instantaneous peak demand, unless the potable water supply is proposed to serve only one single-family residence.

(b) A potable water supply that includes an atmospheric water storage tank shall have a pump at the potable water source capable of supplying the design rate and a pump at the water storage tank capable of supplying the instantaneous peak demand, unless the potable water supply is proposed to serve a single family-residence.

(c) Pumps shall be sized based on a hydraulic analysis that considers flow, demand, and pressure requirements.

(d) Booster pumps shall not be used in a building or structure that is connected to a water service line unless the booster pump design is approved in writing by the Secretary prior to installation. A booster pump design shall include:
- (1) an appropriately sized air gap in the water service line between the booster pump and the water main; or

(2) for buildings and structures other than single-family residences, an appropriately sized back flow prevention device in the water service line between the booster pump and the water main.

§ 1-1112 Cross Connections

(a) There shall be no connection between:
- (1) Any component of a public water system and a potable water source or other components of the potable water supply.
- (2) A well that is not a potable water source (e.g., irrigation wells and wells used for closed loop geothermal systems) and a potable water source or other components of the potable water supply.
- (3) A well used for an open loop geothermal system and a potable water source, unless the requirements in Subsection (b) are met.
- (4) Any pipes, pumps, or tanks that would allow non-potable water or contaminants to be discharged or drawn into a potable water source or other components of the potable water supply.

(b) Open loop geothermal systems intended to circulate groundwater within a potable water supply may be connected to a potable water source provided the following requirements are met:
- (1) No additive is added to the re-circulated groundwater.
- (2) The heat exchange medium in the system is R-410A or a different heat exchange medium approved by the Secretary.
- (3) The system has a low-pressure safety cutout circuit that will turn off the system when there is a pressure leak in the heat exchange medium containment vessel.
- (4) All electrical components of the system are properly grounded to prevent potential electrolysis of metals.
- (5) In the event that the heat exchange unit is disconnected as a heating or cooling source, all piping associated with the unit shall either be capped and labeled or removed.
- (6) Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to a potable water supply.

(c) Water loading stations that are designed to fill potable water vessels, containers, or vehicles with water from a potable water supply shall meet the following requirements:
- (1) There shall be an air gap device between the potable water supply and water vessels being filled to prevent back flow into the supply.
- (2) Hose inlets and outlets used at the station shall not come in contact with the ground, hands, or other sources of contamination.
- (3) The hose bibb for the water loading station shall be equipped with a vacuum breaker or backflow preventer.

(d) Drains from pits containing air relief and blow off valves shall not connect directly to sanitary sewer service or sanitary sewer collection lines nor shall they discharge at a point that will permit possible back-siphonage.

§ 1-1113 Water Quality

(a) When a permit authorizes the construction of a groundwater potable water source, the physical modification of an existing groundwater potable water source, or an action that increases the design flow of, or modifies other operational requirements of, a groundwater potable water source, the potable water source shall be sampled for the following substances, and any water treatment system required pursuant to Subsection (d) installed, prior to any water use authorized in the permit:
   (1) each primary and secondary contaminant listed in Tables 11-5 and 11-6; and
   (2) any substance with a groundwater enforcement standard in the Groundwater Protection Rule and Strategy that the Secretary determines may be present in the source.

(b) Water sampling required pursuant to Subsection (a) in association with the construction of a groundwater potable water source shall be conducted a minimum of 2 days following flushing the permitted water source for a duration sufficient to:
   (1) remove all chlorine odor from the water supply; and
   (2) ensure all additives, source development fluids, native silts and clays, drilling mud, and finer fraction of the gravel pack or rock fracture in the casing or bore hole are removed, to the extent practicable, and at least achieving no visible evidence of the materials, prior to sampling the potable water supply.

(c) Water sampling required pursuant to Subsection (a) shall comply with the following requirements:
   (1) Waters samples shall be taken by the person who owns the lot on which is located the building or structure or campground that is served by the potable water supply, a well driller, a designer, a hydrogeologist, a certified water specialist, a Town health officer, a master plumber, a public water system certified operator, a Vermont State employee responsible for taking water samples prior to licensing a facility or activity, or another person deemed qualified by the Secretary.
   (2) Water samples shall be collected from the cold water tap for a sink or, if the sink is preceded by a water treatment system, at a cold water tap before the treatment system. Water samples taken for lead shall be first draw.
   (3) Water samples shall be submitted to the Vermont Department of Health or a certified laboratory for analysis.
   (4) The results of the analysis shall be submitted to the Vermont Department of Health Laboratory and, when required pursuant to the permit, submitted to the Secretary. Submission of results by a certified laboratory to the respective Agency satisfies this requirement.

(d) If the results of water sampling conducted at any time on a proposed, existing, or permitted groundwater potable water source, except those serving only one single-family residence, identify the presence of a primary contaminant at a concentration that exceeds the standard for the contaminant identified in Table 11-5 or identify the presence of a substance at a level exceeding the groundwater enforcement standards in the Groundwater Protection Rule and Strategy:
   (1) The potable water supply may be re-tested and determined not to require water treatment pursuant to the following process:

(A) Protocol prepared by a designer for re-testing the potable water source shall be submitted to the Secretary.

(B) The potable water source shall be retested pursuant to a Secretary approved protocol and information shall be provided to the Secretary that is sufficient for the Secretary to reach a determination under Subsection (d)(1)(C).

(C) Water treatment shall not be required if the Secretary determines that the concentration of the contaminant has lasted for only a brief period of time, the cause of the exceedance has been determined to be an unusual and non-recurring event, and the contaminant is unlikely to exist in the potable water source at a concentration that exceeds the standard.

(2) Except where the Secretary has reached a determination pursuant to Subsection (d)(1) that no water treatment is necessary, the person who owns the lot on which is located the building or structure or campground that is served by the potable water supply shall:

(A) obtain a permit or permit amendment for the installation of, unless subject to a permit exemption in § 1-304, a water treatment system that eliminates or reduces the concentration of the contaminant in the potable water source to below the standard; or

(B) obtain a permit or permit amendment for a new potable water source.

Note: The presence of a primary contaminant in a potable water supply at a concentration that exceeds the standard for the contaminant identified in Table 11-5, or the presence of a substance at a level exceeding the groundwater enforcement standards in the Groundwater Protection Rule and Strategy, is a health concern for those drinking or otherwise consuming the water. While the Secretary does not require a landowner with a groundwater potable water source serving only one single-family residence to install a water treatment system or to seek a new potable water source when contamination is identified, the Secretary recommends the landowner do so.

(e) A failed supply for which a water treatment system is installed that eliminates or reduces the concentration of a contaminant in the potable water source to below the associated standard remains a failed supply.

Table 11-5
Primary Contaminant Standards for Potable Water Supplies

Primary Contaminants	Standards
Arsenic	0.010 mg/L
Escherichia coli (E.coli)	0 (absent or less than 1)
Fluoride	4 mg/L
Lead	0.015 mg/L
Manganese	0.3 mg/L
Nitrate as N	10 mg/L
Nitrite as N	1.0 mg/L

Primary Contaminants	Standards
Total Coliform Bacteria	0 (absent or less than 1)
Uranium	0.020 ug/L
Adjusted Gross Alpha Particle Activity (including radium 226 but excluding radon and uranium)	15 pCi/L

Note: The Vermont Department of Health also adopts health advisories for substances that may be found in drinking water and may be below the standards identified in Table 11-5. Additionally, the Vermont Department of Health provides recommendations for testing drinking water. Contact the Vermont Department of Health for additional information on testing and treatment options.

Table 11-6
Secondary Contaminant Standards for Potable Water Supplies

Secondary Contaminants	Standards
Chloride	250 mg/L
Sodium	250 mg/L
Iron	0.3 mg/L
Odor	3 threshold odor number
pH	6.5 to 8.5

(f) All surface water potable water sources shall have water treatment systems that comply with the following requirements:
- (1) The treatment components shall achieve the following standards:
  - (A) reduction of turbidity of the raw water to a level compatible with the prescribed treatment;
  - (B) 99.99 percent (4-Log) removal/inactivation of viruses;
  - (C) 99.9 percent (3-Log) removal/inactivation of Giardia lamblia; and
  - (D) 99.9 percent (3-Log) removal/inactivation of Cryptosporidium.
- (2) The sizing of treatment components shall be based on the rate of flow through each treatment component.
- (3) Filtration shall be completed prior to disinfection by:
  - (A) slow sand filtration;
  - (B) cartridge filter that received NSF certification for the intended level of water treatment;
  - (C) a product certified to meet standards established by the NSF/ANSI 60 and 61; or
  - (D) a product certified by one of the following organizations:
    - (i) the Water Quality Association (WQA);
    - (ii) the International Association of Plumbing and Mechanical Officials (IAPMO); or

(iii) an organization certified accreditation by ANSI.

(4) Disinfection shall be completed to achieve the standards identified in Subsection (a)(1) by:

(A) chlorination with a contact time calculated by using the pH; and temperature of the surface water source during the coldest anticipated water temperature; or

(B) ultraviolet light (UV) treatment which:

(i) is capable of treating for adenovirus;

(ii) includes a solenoid valve to prohibit the flow of water when the UV light is not properly functioning; and

(iii) includes an audio alarm system that sounds when the UV unit is not properly functioning (e.g., dosage, lamp-out, lamp age, etc.).

(5) If the water intake is less than 20 feet below the mean water level of the surface water, there shall also be treatment to reduce turbidity and remove cyanobacteria.

(6) An operational and maintenance manual shall be prepared for the water treatment system that includes:

(A) how to maintain the water intake to remove zebra mussels or other species that may grow or reside in the pipe and affect flow rate; and

(B) how to maintain the water treatment system components.

Note: When proposing UV disinfection, an applicant's designer may consider a secondary disinfectant to provide a residual in the water distribution system.

§ 1-1114 Flowing Artesian Well

(a) The Secretary may require an applicant with a known or expected flowing artesian well in bedrock or a confined surficial aquifer to use source construction methods that reduce or stop the overflow of water onto the land surface and that prevent erosion of the aquifer's confining materials.

(b) In making the determination in Subsection (a), the Secretary shall consider:

(1) the cost of the required action;

(2) the safety of the required action; and

(3) whether:

(A) the overflow water poses an undue adverse impact on the environment, including undue erosion of the confining layers of the aquifer; or

(B) the overflow water may interfere with any potable water source or public water source.

(c) Known or expected flowing artesian wells shall have an overflow pipe from the source that:

(1) directs the overflow water from the source away from any soil-based wastewater system;

(2) does not discharge to a wastewater system;

(3) prevents the surface discharge of overflow water to land not owned by the applicant unless the applicant has permanent legal access that allows such discharge;

(4) discharges the overflow water a minimum of 6 inches above the ground surface to

allow water to passively drain away from the well and to prevent the flow of water through the overflow pipe back into the source;

(5) discharges above a splash plate or pad; and

(6) has a 24 mesh non-corrodible screen covering the outlet.

Note: The overflow water from artesian wells may be subject to other Agency rules and permitting requirements.

§ 1-1115 Closure of Potable Water Sources

(a) Potable water sources that are no longer serving a building or structure or campground are recommended to be closed and may be required by the Secretary to be closed to prevent possible contamination of the aquifer or to otherwise protect human health and the environment.

(b) Potable water sources that are failed supplies are recommended to be closed and may be required by the Secretary to be closed to prevent possible contamination of the aquifer or to otherwise protect human health and the environment.

(c) Closure of a groundwater potable water source that is equal to or greater than 20 feet deep shall be performed by a well driller.

(d) Closure of a groundwater potable water source shall be completed by taking the following steps:

(1) Clearing the potable water source of any pumps, wires, and piping.

(2) Removing the cover and all other materials that will interfere with effective closing.

(3) Sealing the potable water source to prevent exchange of water from one aquifer to another or out of the casing.

(4) For a potable water source that is equal to or greater than 20 feet deep, completely filling the casing and bore hole with the following grouting materials:

(A) For potable water sources located at solid waste disposal facilities, hazardous waste facilities, or contaminated sites, bentonite or Portland Type I or III Cement.

(B) For potable water sources at all other locations, acceptable sealing materials based on site specific conditions, such as:

(i) cement grout;

(ii) bentonite grout slurry (15 percent solids by volume);

(iii) bentonite chips;

(iv) a sealing material or other material to render the bore hole as impeding as the surrounding native material; or

(v) alternating 50-foot layers of clean stone, pea stone, or sand and 10-foot sections of bentonite with the last 10-foot layer to just below ground surface filled with neat cement.

(5) For a potable water source that is less than 20 feet deep, completely filling the well tile with soil or other material to ground surface.

(6) Cutting or removing the casing so that the remaining casing terminates below finished ground surface.

(e) Closure of a surface water potable water source shall be completed by taking the following steps:

(1) Removing the water intake pipe and associated infrastructure from the source.

(2) Cutting and capping the pipe located in the source, or sealing it using other methods approved by the Secretary, at a point above the normal high-water elevation.

Subchapter 12 – Flexible Specific Technical Standards for Potable Water Supplies

§ 1-1201 Request for Alternative Technical Standard

(a) The Secretary may accept, in an application for a permit or permit amendment, the use of an alternative technical standard to a technical standard included in this Subchapter when the Secretary concludes that the alternative technical standard:
- (1) will meet the purpose served by the technical standard in this Subchapter;
- (2) has been adopted and published by one of the following organizations:
  - (A) American Association of the State Highway and Transportation Officials (AASHTO);
  - (B) National Sanitation Foundation (NSF);
  - (C) American National Standards Institute, Inc. (ANSI);
  - (D) American Society of Civil Engineers (ASCE);
  - (E) American Public Works Association (APWA);
  - (F) American Society for Testing and Materials (ASTM);
  - (G) American Water Works Association (AWWA);
  - (H) Cast Iron Soil Pipe Institute (CISPI);
  - (I) New England Interstate Water Pollution Control Commission (NEIWPCC);
  - (J) 10 States Standards – Recommended Standards for Water Works;
  - (K) National Groundwater Association (NGWA);
- (3) incorporates more current technology than included in the technical standard in this Subchapter;
- (4) will not adversely affect the maintainability, operation, or safety of the potable water supply; and
- (5) where specified, meets any additional criteria required by these Rules for a Secretary approved alternative technical standard.

(b) An application that seeks to use an alternative technical standard shall include a written request that includes:
- (1) the specific technical standard in this Subchapter for which approval of an alternative technical standard is sought; and
- (2) supporting documentation demonstrating each of the findings included in Subsection (a).

§ 1-1202 General Requirements for Water Service Lines and Water Service Pipes

(a) Water service lines and water service pipes shall be sized based on a hydraulic analysis that considers flow demands and pressure requirements, using the standards in the Vermont Plumbing Rules.

(b) Water service lines and water service pipes shall be constructed of one of the following materials:
- (1) Type K copper tubing complying with standard ASTM B-88;
- (2) materials that comply with the standards in the Vermont Plumbing Rules; or
- (3) other materials approved by the Secretary when it is demonstrated that the pipe material equals or exceeds the requirements in the Plumbing Rules.

(c) Water service lines and water service pipes shall:
  (1) Have watertight joints;
  (2) Have a working pressure rating of not less than 160 psi;
  (3) Be designed to minimize friction loss; and
  (4) Be protected against surge or water hammer.

(d) Water service lines shall not connect to hydrant lead lines.

(e) Connections of a water service line to a water main shall include a water shutoff or curb stop that allows the flow of water from the water main to the water service line to be stopped during repairs.

(f) Packing and jointing materials used in the joints of pipes shall meet the standards of the Vermont Plumbing Rules.

(g) Valves, blow-offs, meters, air relief valves, or other such appurtenances on water service lines or pipes shall not be located in chambers, pits, or manholes, unless the chamber, pit, or manhole has a discharge pipe that terminates at least 18 inches above ground surface, shall passively drain water from the enclosure, and shall remain visible.

(h) Thrust blocks or restrained mechanical joints shall be used at tees or bends of water service pipes and water service lines if necessary to prevent pipe movement.

(i) Water service lines and water service pipes shall not pass through sewer manholes or be submerged in a basin containing wastewater, contaminated material, or hazardous material.

(j) Water service lines and water service pipes shall be covered with at least 5.5 feet of soil or be insulated and covered in a manner that provides an equivalent degree of protection from freezing and damage that 5.5 feet of soil would provide.

§ 1-1203 Design Standards for Water Service Lines and Water Service Pipes Under and Over Surface Water

(a) Water service lines and water service pipes crossing under surface water shall:
  (1) include flexible watertight joints; and
  (2) except for water service pipes of a potable water supply with a surface water source:
    (A) maintain a minimum of 5 feet of soil cover over the water service line or water service pipe, as measured from the lowest point of the surface water bed;
    (B) have accessible valves at both ends of the underwater crossing so the section may be isolated; and
    (C) be placed in a watertight sleeve that extends the full length of the underwater crossing.

(b) Water service lines and water service pipes crossing aerially over surface water shall:
  (1) be adequately supported and anchored;
  (2) be protected from damage from flood waters, floating debris, ice, and freezing;

(3) have accessible valves that are placed in naturally occurring soil at both ends of the lake, pond, or stream crossing so the section exposed to atmosphere may be isolated; and
(4) be accessible for repair or replacement.

(c) A water service pipe that is a surface water intake shall:
(1) be a minimum of 20 feet below the low water elevation of the surface water unless the water treatment system complies with § 1-1113(f);
(2) meet one of the following:
(A) terminate the intake of the water service pipe a minimum of 2 feet above the bottom of the surface water; or
(B) terminate the intake of the water service pipe in a sand infiltrative gallery installed below the bottom of the surface water source with a minimum of 2 feet of sand fill over the water intake;
(3) be sufficiently anchored to prevent movement of the pipe;
(4) be protected from freezing;
(5) not impact a wetland; and
(6) not be located in a Waste Management Zone as determined by the Watershed Management Division for the discharge from a municipal treatment facility.

§ 1-1204 Separation of Water Service Lines and Water Service Pipes from Sanitary Sewer Service Lines, Sanitary Sewer Collection Lines, and Storm Sewers

(a) Horizontal Isolation Distances from Sanitary Sewer Collection Lines, Sanitary Sewer Service Lines, and Storm Sewers
(1) All portions of a water service line and water service pipe shall be at least 10 feet horizontally from all portions of the proposed, existing, or permitted sanitary sewer collection lines and sanitary sewer service lines, including sewer manholes, except when the water service line or water service pipe is:
(A) sleeved with pipe materials approved by the Vermont Plumbing Rules and
(i) if the sleeves terminate below ground, the ends of the sleeve are sealed to be watertight; or
(ii) if the sleeves terminate above finished slab or in a basement, the ends of the sleeve are sealed to be watertight or left open; or
(B) in a separate trench or an undisturbed soil shelf in the sewer trench and one of the following requirements is met:
(i) the bottom of the water service line or water service pipe shall be at least 18 inches above the top of the sanitary sewer collection line or sanitary sewer service line; or
(ii) the sanitary sewer collection line or sanitary sewer service line shall be water works grade 150 pounds per square inch pressure rated pipe meeting AWWA standard C-900 or equivalent pipe and pressure tested to 150 pounds per square inch to assure watertightness.
(2) All portions of water service lines and water service pipes shall be laid at least 5 horizontal feet from all portions of a proposed, existing, or permitted storm sewer.

(b) Vertical Separation and Crossings for Sanitary Sewer Collection Lines, Sanitary Sewer

Service Lines, and Storm Sewers

(1) Water service lines and water service pipes crossing above proposed, existing, or permitted sanitary sewer collection lines or sanitary sewer service lines shall meet one of the following requirements:

(A) The bottom of the water service lines and water service pipes shall be laid 18 inches above the top of the sanitary sewer collection line or sanitary sewer service line.

(B) The water service lines and water service pipes shall be sleeved with pipe materials approved by the Vermont Plumbing Rules to a point 10-horizontal feet from the sanitary sewer collection line or sanitary sewer service line and:

(i) if the sleeves terminate below ground surface, have the ends of the sleeve sealed to be watertight; or

(ii) if the sleeves terminate above finished slab or in a basement, have the ends of the sleeve sealed to be watertight or left open.

(C) The water service lines and water service pipes shall be centered at the crossing, so the water joints will be as far as possible from the sanitary sewer joints and one of the following requirements shall be met:

(i) The water service lines and water service pipes shall be laid to provide a minimum vertical distance of 18 inches between the bottom of the water service line or water service pipe and the top of the sanitary sewer collection line or sanitary sewer service line.

(ii) The sanitary sewer collection lines and sanitary sewer service lines shall be water works grade 150 pounds per square inch pressure rated pipe meeting AWWA standard C-900 or equivalent pipe and pressure tested to 150 pounds per square inch to assure watertightness.

(2) Water service lines and water service pipes crossing below proposed, existing, or permitted sanitary sewer collection lines or sanitary sewer service lines shall meet one of the following requirements:

(A) The water service line or water service pipe shall be sleeved with pipe materials approved by the Vermont Plumbing Rules to a point 10-horizontal feet from the sanitary sewer collection line or sanitary sewer service line and

(i) if the sleeves terminate below ground surface, have the ends of the sleeve sealed to be watertight; or

(ii) if the sleeves terminate above finished slab or in a basement, have the ends of the sleeve sealed to be watertight or left open.

(B) The water service line or water service pipe meets the following requirements:

(i) The top of the water service lines and water service pipes shall be laid 18 inches below the bottom of the sanitary sewer collection line or sanitary sewer service line.

(ii) Water service lines and water service pipes shall be centered at the crossing, so the joints in the water line or water pipe will be a minimum of 10 feet from the center line of the crossing.

(3) Water service lines and water service pipes crossing above or below proposed, existing, or permitted storm sewers shall meet the following requirements:

(A) If the water service line or water service pipe is crossing above, the water service lines and water service pipes shall be laid to provide a minimum vertical distance of 18 inches between the bottom of the water service line or water service pipe and the top of the storm drain.
(B) If the water service line or water service pipe is crossing below, the water service lines and water service pipes shall be laid to provide a minimum vertical distance of 18 inches between the top of the water service line or water service pipe and the bottom of the storm drain.
(C) Water service lines and water service pipes crossing less than 18 inches over a storm drain shall be centered at the crossing so the joints in the line or pipe will be as far as possible from the storm sewer joints.
(D) Water service lines and water service pipes crossing less than 18 inches under a storm sewer, the lines or pipes shall have the joints in the line or pipe a minimum of 10 feet from the center line of the storm drain.

§ 1-1205 Potable Water Source Design and Construction

(a) Design and construction of potable water sources shall:
(1) prevent damage to the casing;
(2) extend casings a minimum of 18 inches above finished grade except as allowed in Subsection (f);
(3) ensure all fluids, muds, and additives have the approval of an ANSI accredited organization;
(4) ensure process water for drilling a source, or injection water for hydrofracturing a water source, is obtained from a potable water source or public water source; however, if such water is unavailable in sufficient quantity, ensure clear, non-potable water that is obtained from a surface water body and is disinfected with an initial dosage of at least 100 mg/L of chlorine prior to using it as the process water;
(5) ensure that any casing, tools, or drilling fluids that may be contaminated shall not be used or reused when constructing or repairing a source; and
(6) include a cap or other protective cover that is:
(A) permanent and tight fitting that cannot be removed or opened without the use of tools or keys;
(B) water-tight designed to shed water and snow;
(C) an overlapping, shoebox-type cover or hatch that is permanently attached to the source structure, or protective structure; and
(D) animal and insect proof.

(b) Requirements for Casing Material
(1) Well casing shall be made of material that will not distort, collapse, crack, or disintegrate during placement or under normal conditions; and
(2) Well casing shall be sized and designed to provide for the installation, removal, and maintenance as appropriate for caps, covers, pitless adapters, screens, pumps, pipes, wires, or other devices.
(3) Well casing extensions shall be of the same material that is, at a minimum, of equal strength and weight as the existing casing.
(A) For steel casing extensions, the extension shall be joined to the original

casing by:
(i) threaded steel coupling;
(ii) welded pipe joint;
(iii) weld to threaded steel slip coupling; or
(iv) mechanical steel bolted restraining coupling, also known as Dresser coupling.

(B) For plastic casing extensions, the extension shall be joined to the original casing by:
(i) solvent welds; or
(ii) threaded couplings.

(4) When steel pipe is used for permanent casing, the steel pipe shall be a new pipe meeting the minimum of AWWA, ASTM, or API specifications for water well construction and:
(A) be Schedule 30 or greater; or
(B) meet all of the following requirements:
(i) have a minimum ¼ inch wall thickness for 7-inch casing;
(ii) be equipped with a drive shoe or equivalent when driven into bedrock; and
(iii) have full circumferential welds or threaded coupling joints.

(5) When nonferrous materials are used for permanent casing, the nonferrous materials shall be:
(A) resistant to the corrosivity of the water and to the stresses that it will be subjected to during installation, grouting, and operation;
(B) PVC pipe, when used as permanent casing, that is Schedule 80, SDR 21, or heavier new pipe that complies with ASTM specification F 480 and NSF or UL standards; and
(C) concrete tiles joined with a watertight material that is ANSI or NSF approved.

(6) Liners set within the uncased bore hole shall:
(A) terminate with a packer or otherwise be secured to the bore hole;
(B) be slotted, screened, or perforated to permit the movement or storage of water; and
(C) when the liner is set to control water movement or contamination, be grouted and watertight.

(7) Packers or well seals placed within the casing or bore hole to prevent the migration of water shall be of material that will not impart taste, odor, toxic substance or bacterial contamination to the source water.

(c) Liner material, when used in a potable water source, shall be of such strength and composition to prevent the movement of water or contaminants into or out of the potable water source in the interval cased.

(d) Potable water sources located in a flood hazard area shall:
(1) if the top of the casing is below the base flood elevation, have a watertight cap or cover (a sanitary seal shall not be used);
(2) have the top of the well casing terminate at least 18 inches above finished grade;
(3) have source vents terminate above the base flood elevation;
(4) be located, designed, and constructed in a manner that avoids impairment to the

supply and contamination to the system during flooding. (Refer to the following guidance from the Department of Homeland Security, Federal Emergency Management Agency FEMA P-348: Protecting Building Utility Systems from Flood Damage); and

(5) have other suitable protection as required by the Secretary to prevent surface or storm water entering the casing.

(e) Potable water sources shall only be located in a structure when:

(1) the floor of the structure terminates a minimum of 12 inches above finished ground surface;

(2) if the structure is located in a flood hazard area, the floor of the structure terminates at or above the base flood elevation;

(3) the source casing extends a minimum of 12 inches above finished floor elevation;

(4) water runoff from the structure floor, roof, and exterior passively drains away from the structure,

(5) the structure is sealed and screened to exclude birds and animals, and is capable of being locked; and

(6) the design of the structure allows for removal of the pump.

(f) Potable water sources shall not be located in an underground enclosure unless approved by the Secretary. When location of a potable water source in an underground enclosure is authorized by the Secretary:

(1) the enclosure shall be watertight with a watertight access cover;

(2) the enclosure shall have a cap or protective cover that terminates 18 inches above finished floor;

(3) construction of the source shall comply with the standards in Subsection (d) when the source is located in flood hazard areas;

(4) the floor of the enclosure shall be made of concrete and shall be sealed to the casing~~;~~

(5) the enclosure shall have all penetrations standard wall castings that are:

(A) poured in place during the forming of the concrete; or

(B) wall sleeves with flexible wall penetrations for concrete tanks joined to the underground enclosure with watertight connections;

(6) the enclosure shall have a minimum of one floor drain within the floor of the enclosure that has a backwater valve on the drain/discharge pipe that complies with the Vermont Plumbing Rules. The discharge pipe shall terminate at least 18 inches above ground surface, shall passively drain away from the enclosure, and shall remain visible;

(7) the wiring for the pump shall be sealed for watertightness where it enters the cap or be contained in a watertight conduit system;

(8) the potable water source and underground enclosure shall be vented to the atmosphere independent of each other, and all vents shall terminate above the base flood elevation;

(9) the enclosure shall be sealed and screened to exclude birds and animals; and

(10) the enclosure shall be capable of being locked.

(g) Requirements for Venting

(1) Venting of the potable water source casing and of an enclosure in which a potable

water source is located shall:
(A) be to atmosphere;
(B) be of adequate size to provide rapid venting of the casing and be corrosion resistant; and
(C) terminate in a downturned position.

(2) Flowing artesian wells are not required to have a vent at the source.

(h) Caps, covers, vents, drains, and overflow pipes shall be covered or inserted with a 24 mesh non-corrodible screen.

(i) One of the following drilling methods shall be used to drill a potable water source:
(1) air rotary;
(2) cable tool (driven);
(3) mud rotary;
(4) reverse circulation;
(5) eccentric and concentric;
(6) dual rotary;
(7) drill and drive; and
(8) other methods allowed by the Secretary.

(j) Grouting shall be designed to allow negligible movement of all fluids in the annular space around well casings and provide negligible shrinkage, breakage, or deterioration of the grout after placement. One of the following grout types and specifications shall be used:
(1) neat cement grout:
(A) consisting of a mixture of API Sec. 10, ASTM C150 type 1 or ASTM C150 type 2, with a maximum of 6 gallons of water per 94-pound sack of cement for 1½ inch or larger annular openings; and
(B) containing additives approved by the Secretary when proposed to increase fluidity;
(2) concrete grout:
(A) consisting of equal parts of ASTM C150, type 1 or 2 Portland cement, and sand, with a maximum of 5 gallons of water per 94-pound sack of cement for annular openings larger than 1½ inches; and
(B) where an annular opening is larger than 4 inches, gravel not larger than ½ inch in size may be added;
(3) bentonite grout that has standard ANSI 60 certification and is installed according to manufacturers' directions;
(4) clay seal/bentonite grout consisting of clay mixed with at least 10 percent swelling bentonite may be used when there is an annular opening greater than 6 inches and approved by the Secretary prior to grout application;
(5) bentonite chips, slurry, or powder shall be placed continuously around the casing during advancement with each of the following drilling methods when no pilot hole is drilled larger than the drill hole for the casing:
(A) concentric drilling;
(B) dual rotary;
(C) drill and drive; or
(D) eccentric; or

(E) other types of grout approved by the Secretary.

§ 1-1206 Potable Water Sources in Bedrock, Confined Surficial Aquifers, and Unconfined Surficial Aquifers

(a) Potable water sources in bedrock shall be constructed with a minimum of:
- (1) 20 feet of watertight casing; and
- (2) a minimum of 10 feet of casing set into competent bedrock.

(b) Drilled wells, driven wells, or well points in unconfined surficial aquifers and confined surficial aquifers shall:
- (1) Provide a bentonite seal between the casing and ground surface if the source is not required to be grouted.
- (2) Have gravel pack that is rounded particles, 95 percent siliceous material; that is smooth and uniform, free of foreign material, properly sized, washed and then disinfected immediately prior to or during placement.
- (3) Have the gravel pack placed in one uniform continuous operation.
- (4) Have screens that:
  - (A) are made of materials capable of withstanding the imposed structural loads;
  - (B) are resistant to damage by chemical action of groundwater or cleaning operations;
  - (C) have openings sized based on the sieve analysis of the formation or gravel pack materials;
  - (D) have sufficient diameter to provide adequate specific capacity and low aperture entrance velocity. The entrance velocity should not exceed 0.1 feet per second.
  - (E) allow the pumping water elevation to remain above the screen under all operating conditions;
  - (F) when applicable, be designed and installed to permit removal or replacement without adversely affecting watertight construction of the well; and
  - (G) have a bottom plate or wash-down bottom fitting of the same material as the screen.
- (5) Provide protection from leakage of grout or fine-grained formation materials into the gravel pack or screen.

Note: Appendix C, Figure C-16, depicts a detail of a typical drilled bedrock well and Appendix C, Figure C-17, depicts a detail of a typical driven well.

(c) Wells using tiles in unconfined surficial aquifers and confined surficial aquifers shall have:
- (1) All joints between concrete tiles and pipe penetrations be watertight using sealant or grout specifically designed for drinking water systems. All sealant or grout used shall be approved by an ANSI accredited organization.
- (2) Bedding that is clean ½ inch washed stone.
- (3) A diversion berm or swale constructed up-gradient from the source to divert runoff and stormwater away from the source.

(4) Backfill from ground surface to the bedding stone of clean native fill or finer textured soil.
(5) Backfill material of high clay content or equal surrounding the well tile and sloping away from the source for a distance of 10 feet to prevent stormwater from ponding around the well or well gallery.
(6) A minimum of 4 inches of topsoil over the clay.
(7) For sources that are pumped:
    (A) dry run protection or a low water shut-off; and
    (B) pumps set above the bottom of the source.
(8) Not be required to have overflow openings. Design of an overflow, when proposed, shall comply with § 1-1114(c).

Note: Appendix C, Figure C-18, depicts a detail of a typical shallow well.

§ 1-1207 Pipes and Pumps

(a) Pipes and fittings that are part of a potable water supply shall meet ANSI standards for potable water.

(b) Pumps shall meet the following requirements:
(1) Pumps shall have a standard pressure gauge in the discharge line for each pump prior to a hydropneumatic tank or other water storage tank.
(2) Pumps shall be designed to alternate when 2 or more pumps are installed.
(3) Pumps shall have a check valve within the casing at an elevation below the calculated drawdown level to prevent backflow for pumps installed in the well and to allow for operation, maintenance, repair, and replacement of the equipment.
(4) If a design includes multiple pumps, each shall have positive-acting check valve on the discharge side between the pump and the shut-off valve.
(5) If a design includes a foot valve, the foot valve shall have a net valve area of at least 1.5 times the area of the suction pipe and be screened.

(c) Suction lift pumps shall also:
(1) be no more than 15 feet above the static water elevation in the source; and
(2) include measures for priming the pump including:
    (A)
    (B) using prime water that is at least the same quality as the water being pumped; and
    (C) provisions to prevent back siphonage.

(d) Potable water sources with submersible pumps shall have:
(1) the electrical cable firmly attached to the riser pipe at 20-foot intervals or less;
(2) torque arresters if needed; and
(3) other appropriate means to properly support and prevent excessive movement of the pumping system or damage to the source.

(e) Wiring inside the potable water source casing shall comply with the Vermont Electrical Safety Rules.

(f) Wiring outside of the potable source casing shall:
- (1) be in a conduit or pipe from the well cap to at least 2 feet below land surface;
- (2) include a frost sleeve if piped with electrical conduit; and
- (3) comply with other requirements in the Vermont Electrical Safety Rules.

§ 1-1208 Requirements for Water Storage Tanks

(a) The bottom of a water storage tank shall be 2 feet above the seasonal high-water table unless the structure is provided proper anchors to prevent movement of the structure. If the structure is plastic or fiberglass, it shall comply with the manufacturers specifications for location within a seasonal high-water table.

(b) Water storage tanks shall be structurally capable of withstanding all external and internal forces exerted on the tank and shall be constructed of one of the following materials:
- (1) steel that complies with ASTM standards for steel tanks, reservoirs, and elevated tanks;
- (2) cast-in place and pre-cast concrete that is reinforced; or
- (3) a material approved by the Secretary, including types of plastic and fiberglass, that:
  - (A) will not decay by ultraviolet light or other causes; and
  - (B) will protect the quality of the stored water.

(c) Water storage tanks shall:
- (1) Be designed to prevent freezing.
- (2) Be designed so that the top of the water storage tank is a minimum of 24 inches above the ground surface.
- (3) Have a watertight access hatch that is elevated at least 18 inches above the top of the structure.
- (4) Have a solid watertight cover that overlaps the hatch frame opening that extends down around the frame at least 2 inches.
- (5) Have a drain to passively empty the tank for cleaning or maintenance.
- (6) Have an overflow of sufficient diameter to permit discharge of water in excess of the filling rate.
- (7) Have the drain and overflow discharge pipe:
  - (A) open downward a minimum of 18 inches above a splash plate when discharging to ground surface; or
  - (B) have an air-gap between the pipe and a sanitary sewer collection line, sanitary sewer service line, or storm drain when discharging to a line or drain.
- (8) The overflow discharge pipe shall have a 24 mesh non-corrodible screen covering the outlet.

(d) Venting shall be provided on all water storage tanks and the venting shall:
- (1) prevent the entrance of stormwater and precipitation;
- (2) open downward;
- (3) terminate 24 inches above finished ground surface; and
- (4) have a 24 mesh non-corrodible screen covering the vent outlet.

(e) Water storage overflow pipes shall not be used as vents.

(f) Roofs and sidewalls of water storage tanks shall meet the following requirements:
- (1) Roofs and sidewalls shall have watertight construction with no openings except properly constructed means of access, vents, manholes, overflows, risers, drains, pump mountings, control ports, and piping for inflow and outflow. Open construction between the sidewall and roof of the structure is not permissible.
- (2) Pipes extending through the roof or sidewall of a finished water storage tank shall:
  - (A) for metal tanks, have welded or properly gasketed sleeves; or
  - (B) for concrete tanks:
    - (i) be connected to standard wall castings that were poured-in-place during the forming or the concrete. The wall castings shall have seepage rings embedded in the concrete for water stoppage on sleeves (castings) in exterior or water-bearing walls; or
    - (ii) have interconnected synthetic rubber links shaped and sized to continuously fill the annular space between the pipe and wall sleeve opening.
- (3) Openings in the roof or top of the water storage tank that accommodate control apparatus or pump columns shall be curbed and sleeved with proper additional shielding to prevent the access of surface or drainage water into the structure.
- (4) Roofs shall be sloped to facilitate draining.
- (5) Valves and controls located outside the water storage tank shall not have valve systems and similar projections pass through the roof or top of the storage structure.
- (6) Materials that will be exposed to the potable water are required to meet the NSF International/American National Standard Institute (NSF/ANSI) Standard 61.

(g) Painting or cathodic protection shall be applied to metal surfaces of water storage tanks.
- (1) Paints or coatings used in the interior of water storage tanks shall be approved for use in drinking water systems by ANSI accredited organizations.
- (2) Samples of the water in a water storage tank shall be analyzed for volatile organic compounds prior to putting the water storage tank into service to establish that the paint or coating properly cured and will not contaminate water held in the structure.

(h) Grading around a ground level water storage tank shall be done in a manner to prevent stormwater from standing within 50 feet of the structure.

§ 1-1209 Leakage and Pressure Testing

(a) Water service lines and water service pipes shall be pressure tested and leakage tested according to one of the following procedures prior to placing the potable water supply into service:
   (1) Vermont Plumbing Rules;
   (2) the AWWA; or
   (3) by pressurizing the lines and pipes with water at the working pressure of the system or greater and hold without a drop in pressure for a minimum of 16 minutes.

(b) Atmospheric storage structures shall be leakage tested according to the following procedure to ensure water loss is equal to or less than 0.05 of 1 percent of the tank capacity prior to placing the structure into service:
   (1) filling the tank with potable water and let stand for 24 hours; and
   (2) measuring the loss of water over 24 hours.

(c) If the water service line, water service pipe, or atmospheric storage structure fails the pressure or leakage test, the cause of the failure shall be repaired, and the line, pipe, or structure retested.

§ 1-1210 Disinfection

(a) A potable water supply shall be disinfected pursuant to the requirements of Subsection (b), (c), and (d) prior to placing the potable water supply into service and after any servicing or repair of the potable water supply, such as installation of new pipes, wires, casing, or pumps.

(b) Disinfection of the potable water source shall be completed pursuant to the recommendations by the Vermont Department of Health for disinfecting a water system, or the following method:
   (1) flush the potable water supply until the water runs clear;
   (2) provide an initial dosage of at least 100 mg/L of chlorine in the potable water source;
   (3) circulate the water in the potable water source; and
   (4) allow the water to rest in the potable water source for a minimum of 12 to 24 hours before disposing of the chlorinated water.

(c) Disinfection of water service lines and water service pipes shall be completed pursuant to the requirements of the Vermont Plumbing Rules or the following method:
   (1) fill the water service line or water service pipe with a water/chlorine solution of 100 mg/L; and
   (2) allow the chlorinated water to rest in the water service line or water service pipe for a minimum of 24 hours before disposing of the chlorinated water.

(d) Disinfection of water storage tanks shall be completed pursuant to AWWA Standard C652.

(e) Chlorinated water used to disinfect or resulting from disinfection of potable water supplies shall not be discharged to a wastewater system or to surface water. Proper disposal of the chlorinated water is to the ground surface through sheet flow that infiltrates into the soil or disposal to a wastewater treatment facility, if authorized by the wastewater treatment facility.

Appendix A – Information for an Application

(a) For the purposes of this appendix, the term "project" means all components of all wastewater systems and potable water supplies that are required to be part of an application.

(b) When the application includes one or more existing or proposed lots, the latitude and longitude for the center of each existing or proposed lot identified in the application shall be reported on the application form using a global positioning system receiver using the NAD 83 coordinate system or a NAD 83 base map. The coordinates shall be reported in decimal degrees to five decimal places with an accuracy of +/- 50 feet. Because many lots are irregularly shaped, the center location can be approximate.

(c) When the application needs to identify proposed or existing buildings or structures or campgrounds, soil-based wastewater systems, sanitary sewer service lines, sanitary sewer collection lines, potable water supplies, or the subdivision of land, a site plan shall be included with the application that includes the following information:

- (1) Preparer's signature, plan title, date, and revision date(s) on all plans.
- (2) Legend or clear identification of all plan features.
- (3) North arrow.
- (4) Plan scale as required by Rules stated on the plans. A graphic representation may be shown but does not replace a stated scale.
  - (A) Except as required by Subsection (c)(4)(C), site plans shall be prepared to a scale not greater than 1-inch equals 100 feet.
  - (B) Site plans shall be prepared to a scale not greater than 1-inch equals 30 feet for those site plans identifying the limits of the infiltrative area for an in-ground leachfield; the limits of the stone and fill material for an at-grade leachfield; the limits of the fill material for a mound; the enclosure for a bottomless sand filter; and the area 25 feet downslope and 10 feet on all other sides from the limits of the stone and fill material for an at-grade leachfield, the limits of the fill material for a mound, and the enclosure for a bottomless sand filter.
  - (C) Notwithstanding Subsection (c)(4)(A), a site plan may have scale greater than 1-inch equals 100 feet, including the use of aerial photographs, for the purposes of:
    - (i) identifying the boundary line locations and dimensions when the size of the lot is greater than 10 acres;
    - (ii) identifying a site listed on the hazardous sites list maintained by the Waste Management Division of the Department that is located greater than 500 feet and within one third of a mile to a potable water supply; or
    - (iii) identification of surface drainage patterns.
- (5) The location and elevation of the permanent benchmark established on the lot.
- (6) All existing and proposed boundary lines and boundary line dimensions.
- (7) For the lot on which a wastewater system or a potable water supply is proposed:
  - (A) Lot numbers or unique lot designations for subdivisions involving 2 or more lots.
  - (B) Campsite numbers or unique campsite designations for campgrounds.

(C) Existing and proposed permanent legal accesses.
(D) Existing and proposed driveways, parking lots, and roadways.
(E) Existing and proposed buildings or structures, or campgrounds.
(F) Designated Well Head Protection Area (WHPA).
(G) Surface water such as streams, lakes, ponds, reservoirs, and other water impoundments.
(H) Stormwater conveyance/treatment/control practices.
(I) Class 1 or Class II wetlands.
(J) Base flood elevation.
(K) Floodways.

(8) Contours shall be provided using the following specifications:
(A) 5-foot contour interval shall be provided for drawing isolation zones around leachfields, wastewater system components, potable water supply sources, and potable water supply components except when the component of the potable water supply is a water service line or a water service pipe, and except when the component of the wastewater system is a sanitary sewer service line connecting to a sanitary sewer collection line.
(B) 2-foot contour intervals shall be provided for that portion of the plan identifying the limits of the stone and fill material for an at-grade leachfield; the limits of the fill material for a mound; the enclosure for a bottomless sand filter; and the area 25 feet downslope and 10 feet on all other sides from the limits of the stone and fill material for an at-grade leachfield, the limits of the fill material for a mound, and the enclosure for a bottomless sand filter.
(C) At least 90 percent of the contours shall be accurate within one half contour interval and no inaccuracies shall exceed one contour interval.
(D) Photogrammetric contour maps may only be used to show the general contour of the land when it is necessary to show ground or groundwater flow to such items as hazardous waste sites and public water sources.

(d) For an application proposing a wastewater system, the following additional information shall be provided:
(1) Required information to be shown on the site plan for a soil-based wastewater system:
(A) Location of all components of the proposed wastewater system and replacement area.
(B) Location of all proposed, existing or permitted potable water sources and public water sources that are on the applicant's property.
(C) Location of all proposed, existing, or permitted potable water sources and public water sources that are off the applicant's property but that have an isolation zone identified in § 1-912(b) that ends 50 feet or less from the proposed leachfield.
(D) Location of any Zone 1 of a Public Community Water System Source Protection Area that are on the applicant's property or are off the applicant's property but within 50 feet of the applicant's nearest property line.

(E) Isolation zones identified in § 1-912(b) drawn around all proposed, existing, or permitted potable water sources and public water sources identified in Subsection (d)(1)(B) and (C).

(F) Location and identification of features and objects identified in Table 9-5 that are on the applicant's property.

(G) All soil test pit locations with corresponding numbers or letter designations conducted within 50 feet of a leachfield.

(H) All percolation test locations with corresponding numbers or letter designations conducted within 50 feet of a leachfield.

(I) Existing and proposed footing drains, curtain drains, and drainage pipes or tiles within 75 feet of a leachfield.

(J) Existing and proposed surface water drainage ditches, and surface water swales within 75 feet of a leachfield.

(K) Ledge outcrops and other site limitations that may interfere with the proper installation of the components of the wastewater system.

(2) Required information to be shown on the site plan for a water main, water service line, or water service pipe:

(A) Location of existing, proposed, or permitted water mains, water service lines, or water service pipes that are on the applicant's property or off the applicant's property but are within 50 feet of the applicant's nearest property line.

(B) Elevations and material specifications of the water main, water service line, or water service pipe when:

(i) a sanitary sewer collection line or sanitary sewer service line crosses a water main, water service line, or water service pipe; or

(ii) a sanitary sewer collection line or sanitary sewer service line is within the horizontal isolation distance to a water main, water service line, or water service pipe.

(3) Plans with details for components of a wastewater system.

(A) Preparer's signature, plan title, date, and revision date(s) on all plans.

(B) Septic tank effluent filter manufacturer and model number identified with the tank detail.

(C) Septic tank size, dimensions, riser to grade, and material specifications.

(D) Grease tank size, dimensions, and material specifications.

(E) Innovative/alternative system or component if the system or component has general, pilot, or experimental approval.

(F) Pump station including float material (mercury floats are prohibited), float elevations, venting, and visual and audio alarm location.

(G) Storage tank size, dimensions, riser to grade, and material specifications.

(H) Dosing siphon.

(I) Sanitary sewer service line, or force main when a component of a sanitary sewer service line, with minimum pipe slope for the service line, invert elevations at the building and at each component of the wastewater system, and pipe sizes and material specifications.

(J) Sanitary sewer collection line plan and profile, pipe invert elevations at each component of the wastewater system, and pipe sizes and material specifications.

(K) Sanitary sewer force main, when a component of a sanitary sewer collection line, plan and profile, pipe sizes and material specifications, and pipe invert elevations at each component of the wastewater system.

(L) Trench detail for a sanitary sewer service line, sanitary sewer collection line, and force main when a component of a sanitary sewer service line or sanitary sewer collection line.

(M) Sewer/water crossover detail with invert elevations of the sanitary sewer service line, sanitary sewer collection line, water service line, water service pipe, or water main.

(N) Manhole or cleanout detail that are included on a sanitary sewer collection line or sanitary sewer service line.

(O) Distribution box detail with flow equalization devices.

(P) Vertical cross-section view of the leachfield with bottom trench or bed, invert elevations for distribution piping, at-grade access and clean out ports, and top of field relative to original and proposed ground surface.

(Q) Sanitary sewer service line or sanitary sewer collection line crossing surface water.

(R) Proposed curtain drain.

(S) Erosion prevention and sediment control measures.

(4) Supporting data and narratives.

(A) Calculations for sizing each component of the wastewater system, when required.

(B) Flow metering and wastewater strength analysis, when required.

(C) Calculations to demonstrate all portions of the bottom of the leachfield maintain the depths of naturally occurring soil and fill material required pursuant to § 1-903 to the seasonal high-water table, induced water table, and bedrock.

(D) Hydrogeologic analysis to calculate the induced water table.

(E) Soil descriptions and percolation test results corresponding to the soil test pit and percolation site identified on the site plan.

(F) An application that includes a design of a leachfield based on monitoring of the water table to establish the seasonal high-water table shall include:

(i) all water table monitoring data; and

(ii) an analysis of the water table monitoring data.

(G) Specifications for mound fill material, fill material for sand filters, and bottomless sand filter fill material.

(H) Leakage testing procedure and required result for each component of a wastewater system.

(I) Innovative/alternative system or component manufacturer and model number, if applicable.

(J) Specifications on methods of installation, performance standards, and quality of workmanship.

(K) Operation and maintenance manuals when required by these Rules.

(L) When a constructed wetlands is a component of the wastewater system, a list of plant species.

(e) For an application proposing a potable water supply, the following additional information shall be provided.

(1) Required information to be shown on the site plan for a potable water supply with a potable water source.
   (A) Location of all components of the proposed potable water system.
   (B) Location of all proposed, existing, or permitted leachfields, replacement areas, and wastewater tanks that are on the applicant's property.
   (C) Location of all proposed, existing, or permitted leachfields and wastewater tanks and replacement areas that are off the applicant's property but that have an isolation zone identified in § 1-1104(e) that ends 50 feet or less from the proposed potable water source.
   (D) Isolation zones identified in § 1-1104(e) drawn around all proposed, existing, or permitted leachfields, replacement areas, and wastewater tanks identified in Subsection (e)(1)(B) and (C).
   (E) Location and identification of all potential sources of contamination identified in Table 11-1 that are on the applicant's property or that are off the applicant's property but have an isolation distance that ends 50 feet or less from the proposed potable water source.
   (F) Ledge outcrops and other site limitations that may interfere with the proper installation of the components of the potable water supply.
   (G) Existing or permitted potable water supplies or public water supplies within the isolation distances for interference testing.

(2) Required information to be shown on the site plan for a potable water supply that is a water service line or a water service pipe.
   (A) Location of sanitary sewer collection lines or sanitary sewer service lines that are on the applicant's property and location of sanitary sewer collection lines or sanitary sewer service lines that are off the applicant's property but within 50 feet of the applicant's nearest property line.
   (B) Elevations and material specifications of the sanitary sewer collection line or sanitary sewer service line when:
      (i) a water service line or water service pipe crosses a sanitary sewer collection line or sanitary sewer service line; or
      (ii) a water service line or water service pipe is within the horizontal isolation distance to a sanitary sewer collection line or sanitary sewer service line.

(3) Plans with details for components of a potable water supply.
   (A) Preparer's signature, plan title, date, and revision date(s) on all plans.
   (B) Well construction and material specifications.
   (C) Water service pipe or water service line size and material specifications.
   (D) Water service pipe or water service line trench and material specifications.
   (E) Potable water system treatment components and material specifications, if treatment is included in the design.
   (F) Storage tank size, dimensions, riser to grade, overflow, and material specifications.
   (G) Water service pipe or water service line crossing surface water.

(4) Supporting data and narratives.
   (A) Calculations for sizing each component of the potable water supply, when required.
   (B) Determining the long-term yield for potable water sources if required for the potable water supply.

(C) Calculations for determining the instantaneous peak demand if required for the potable water supply.
(D) Calculations for determining water storage if determining storage is required for the potable water supply.
(E) Water quality testing results.
(F) Flow metering analysis, when required.
(G) Well yield and method for determining the yield.
(H) Pressure and leakage testing of distribution system.
(I) Disinfection specifications for disinfecting potable water supply.
(J) Water system treatment components with manufacturer's make and model numbers, if treatment is included in the design.
(K) Surrounding well logs to demonstrate availability of water.
(L) Interference testing and analysis when required.
(M) Pump manufacturer with pump capabilities and model number.
(N) Specifications on methods of installation, performance standards, and quality of workmanship.
(O) Operation and maintenance manuals.

Appendix B – Examples

Examples B-1 Examples for Designing a Flow Equalization Tank

Example 1: The project discharges 1000 gallons per day on Friday and Saturday and 200 gallons per day for the other five days. Total flow is 3,000 gallons and is discharged over 7 days at 429 gallons per day.

Example 1 Table

Day	Flow into system	Flow out of system	Storage
1	1000	429	571
2	1000	429	1,142
3	200	429	913
4	200	429	684
5	200	429	455
6	200	429	226
7	200	429	0

The maximum storage per the table is 1142 gallons.
The system needs a storage tank of 1,142 X 1.5 = 1,713 gallons.

Example 2: The project discharges 1000 gallons per day on Monday and on Thursday and 200 gallons per day the other five days. Total flow is 3,000 gallons and is discharged over 7 days at 429 gallons per day.

Example 2 Table

Day	Flow into system	Flow out of system	Storage
1	1000	429	571
2	200	429	342
3	200	429	113
4	1000	429	684
5	200	429	455
6	200	429	226
7	200	429	0

The maximum storage per the table is 684 gallons.
The system needs a storage tank of 684 X 1.5 = 1026 gallons.

Examples B-2 Examples for Calculating the Induced Water Table Using the Simplified Method

Example 1: Calculate the linear loading rate (LLR) for the design of a mound for a 3-bedroom single-family residence with the following basis of design.

The design flow (DF) is 420 gallons per day (gpd). The site has 13 inches of a sandy loam over 10 inches of a silt loam. The sandy loam and silt loam have consistencies less dense than "firm." Seasonal high-water table is at 23 inches. The ground slope where the leachfield is proposed is 5 percent. The designer may use only the 13 inches of the sandy loam (the silt loam becomes the limiting soil condition); use the silt loam if the design is to use the 23 inches above the seasonal high-water table; or use both soil textures. These Rules require 6 inches of naturally occurring soil between ground surface and the induced water table.

(1) Calculate the LLR and System Length Based Solely on the Available Depth of Sandy Loam.

Calculate the LLR:
(h) = (13 inches - 6 inches) ÷ 12 inches per foot = 0.58 feet
(f) = 18.7 (from Table 9-14 for a sandy loam with a 5 percent slope)
LLR = (h)(f) = (0.58)(18.7) = 10.8 gallons per linear foot

Calculate the minimum system length (SL)
SL = DF ÷ LLR
SL = 420 gpd ÷ 10.8 gallons per linear foot
SL = 39 feet

(2) Calculate the LLR and System Length Based on the Most Limiting Soil or Silt Loam.

Calculate the LLR:
(h) = (13 inches + 10 inches - 6 inches) ÷ 12 inches per foot = 1.4 feet
(f) = 3.7 (from Table 9-14 for a silt loam with a 5 percent slope)
LLR = (h)(f) = (1.4)(3.7) = 5.18 gallons per linear foot

Calculate the minimum system length (SL):
SL = DF ÷ LLR
SL = 420 gpd ÷ 5.18 gallons per linear foot
SL = 81 feet

(3) Calculate the LLR and System Length Based on the 2 Textures of Sandy Loam and Silt Loam.

According to § 1-927(j), the LLR using 2 textures is:
LLR for the Sandy Loam + LLR for the Silt Loam
LLR for the Sandy Loam = [(13 inches - 6 inches) ÷ 12 inches](18.7) = 10.8 gallons per linear foot
LLR for the Silt Loam = (10 inches ÷ 12 inches)(3.7)
LLR = 3.1
System LLR = 10.8 gallons per linear foot + 3.1 gallons per linear foot
System LLR = 13.9 gallons per linear foot

Calculate the minimum system length (SL)
SL = DF ÷ LLR

SL = 420 gpd ÷ 13.9 gallons per linear foot
SL = 30 feet

Example 2: Calculate the linear loading rate (LLR) for the design of a mound for a 3-bedroom single-family residence with the following basis of design.

The design flow (DF) is 420 gallons per day (gpd). The site has 10 inches of a silt loam over 13 inches of a sandy loam. The silt loam and sandy loam have consistencies less dense than "firm." Seasonal high-water table is at 23 inches. The ground slope where the leachfield is proposed is 5 percent. The designer may use only the 10 inches of the silt loam (the sandy loam becomes the limiting soil condition); use the silt loam if the design is to use the 23 inches above the seasonal high-water table; or use both soil textures. These Rules require 6 inches of naturally occurring soil between ground surface and the induced water table.

(1) Calculate the LLR and System Length Based Solely on the Available Depth of Silt Loam.

Calculate the LLR:
(h) = (10 inches - 6 inches) ÷ 12 inches per foot = 0.33 feet
(f) = 3.7 (from Table 9-14 for a silt loam with a 5 percent slope)
LLR = (h)(f) = (0.33)(3.7) = 1.2 gallons per linear foot

Calculate the minimum system length (SL)
SL = DF ÷ LLR
SL = 420 gpd ÷ 1.2 gallons per linear foot
SL = 350 feet

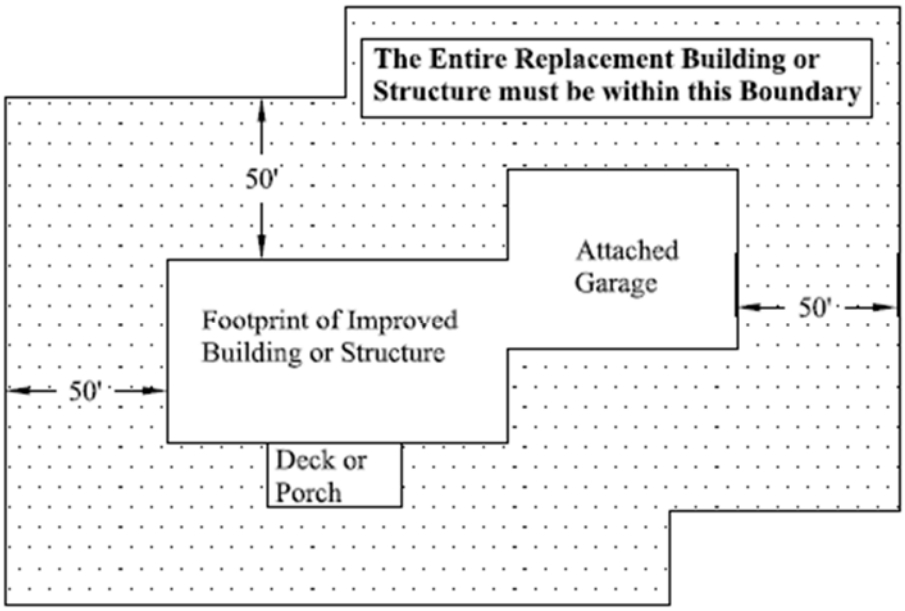
(2) Calculate the LLR and System Length Based on the 2 soil textures. Since the silt loam soil has an f-factor that is less than the underlying layer of sandy loam soil, the LLR shall be based on the f-factor for the silt loam soil.

Calculate the LLR:
(h) = (10 inches - 6 inches + 13 inches) ÷ 12 inches per foot = 1.4 feet
(f) = 3.7 (from Table 9-14 for a silt loam with a 5 percent slope)
LLR = (h)(f) = (1.4)(3.7) = 5.18 gallons per linear foot

Calculate the minimum system length (SL):
SL = DF ÷ LLR
SL = 420 gpd ÷ 5.18 gallons per linear foot
SL = 81 feet

Appendix C – Typical Details and Examples

Figure C-1 Example of 50-foot Calculation for Reconstruction



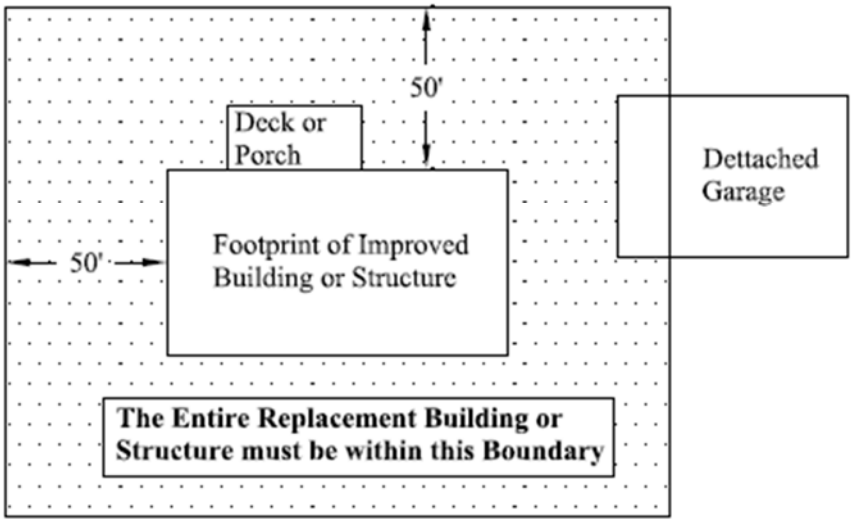
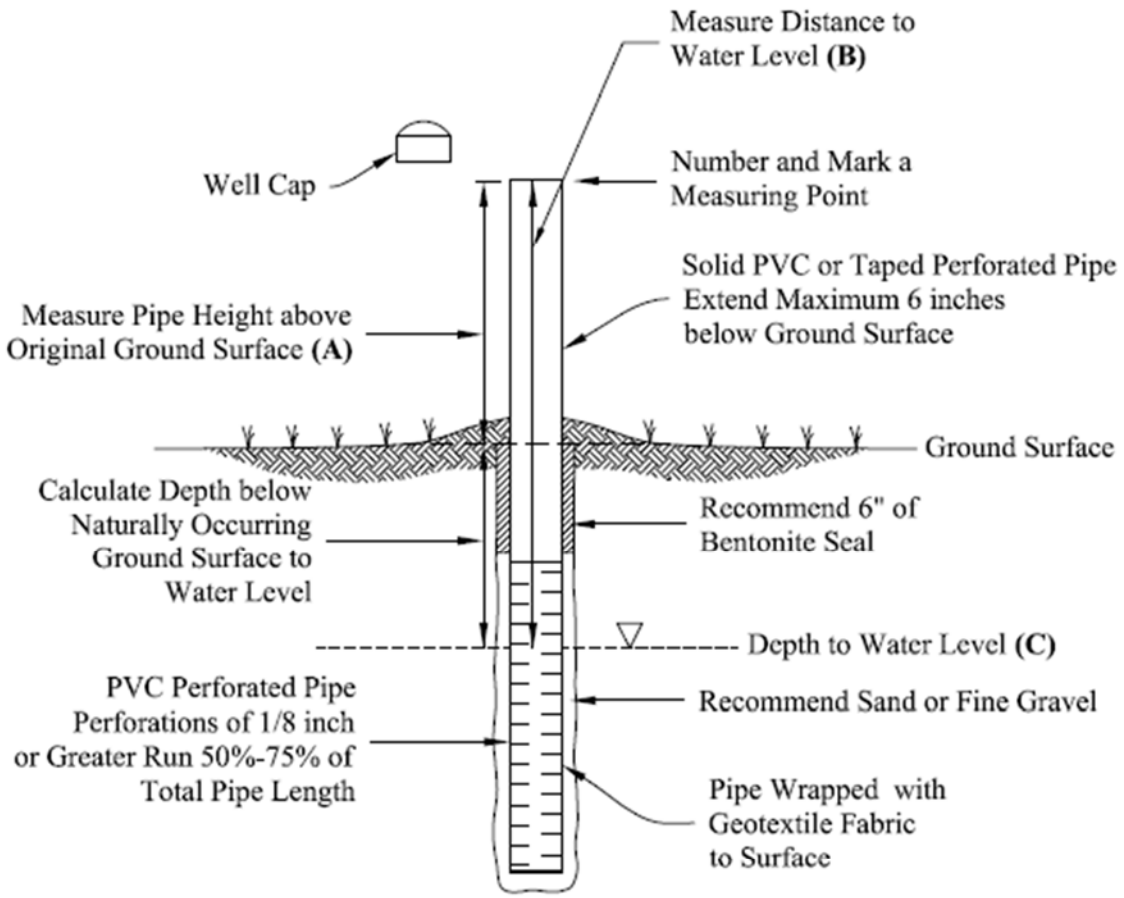


Figure C-2 Detail of Typical Groundwater Monitoring Well



Depth to Water Level {B-A=C}

Figure C-3 Detail of Typical Site that was Re-Graded

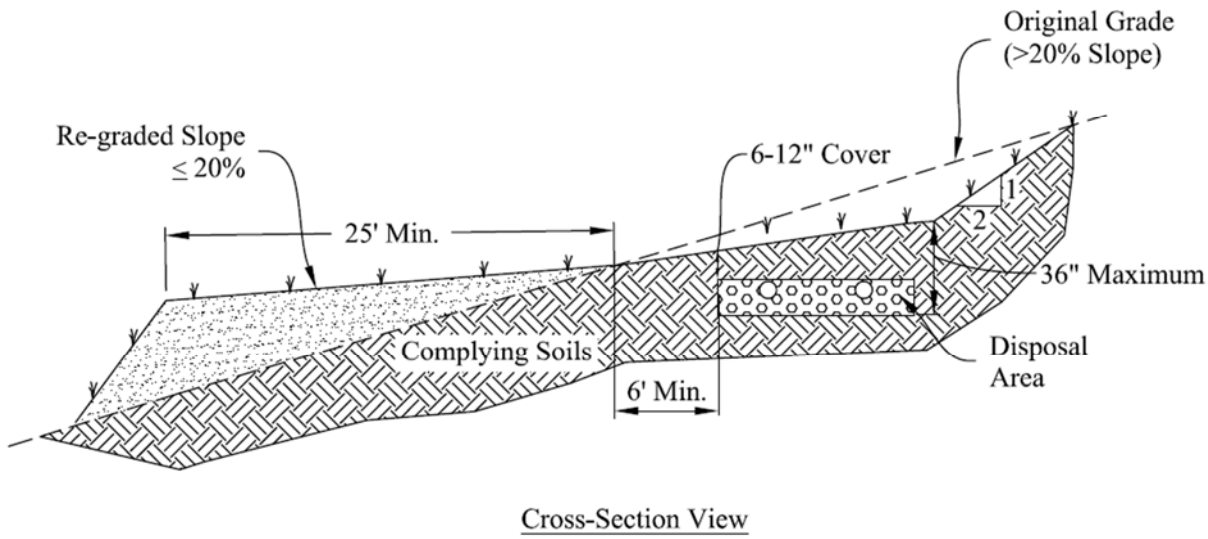


Figure C-4 Example for Drawing Isolation Zone Around a Drinking Water Source

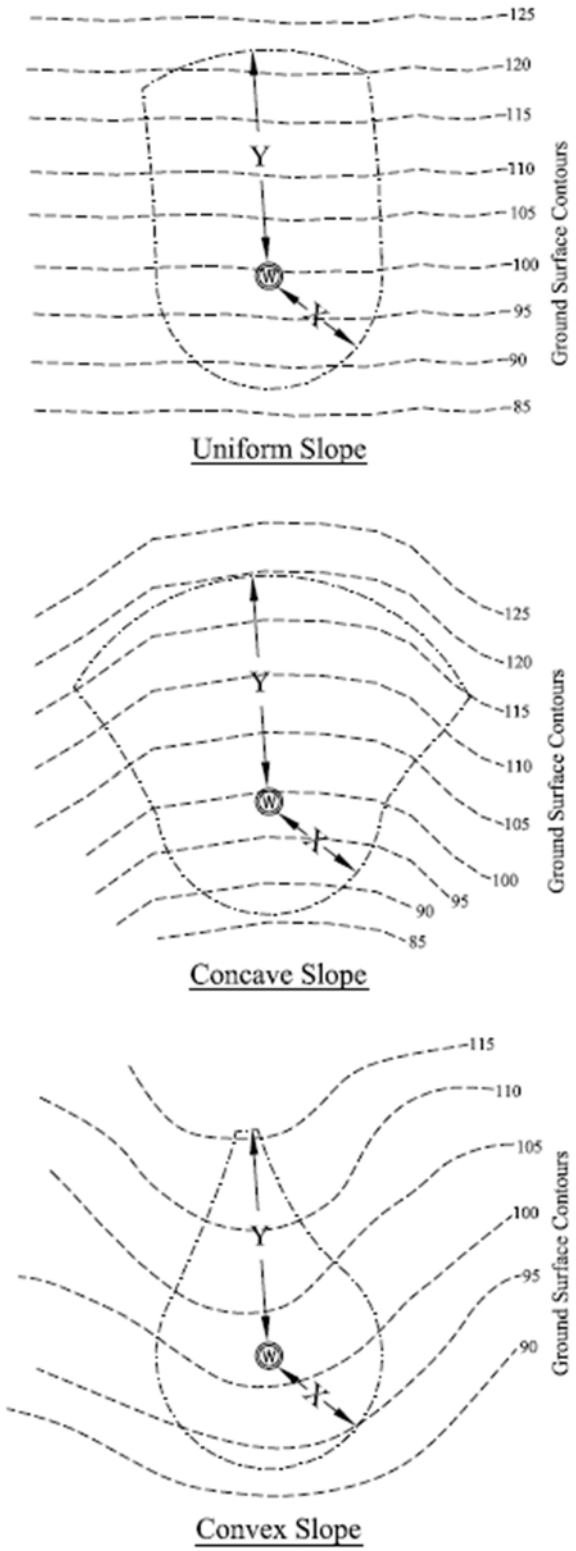


Figure C-5 Detail of Typical Time Dosing Pump Station

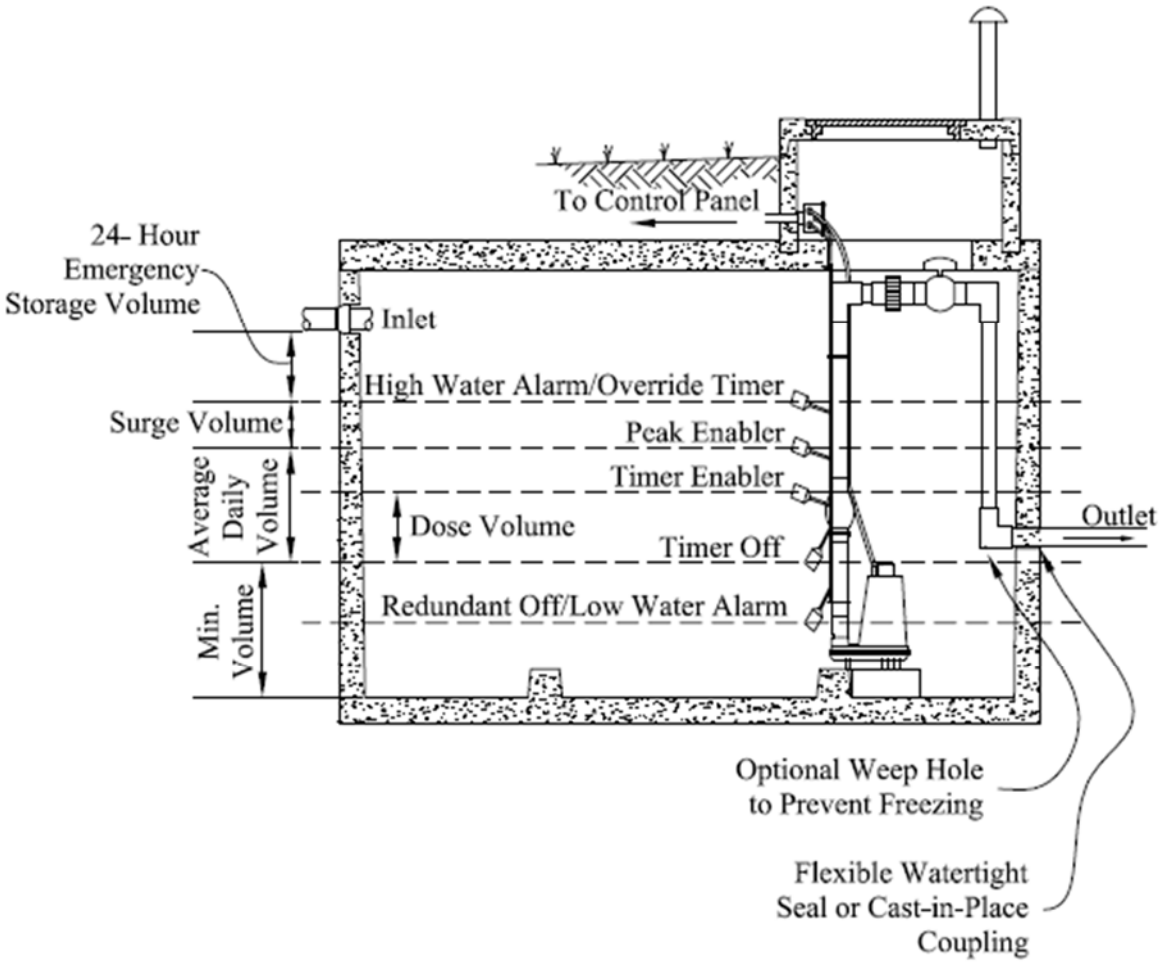
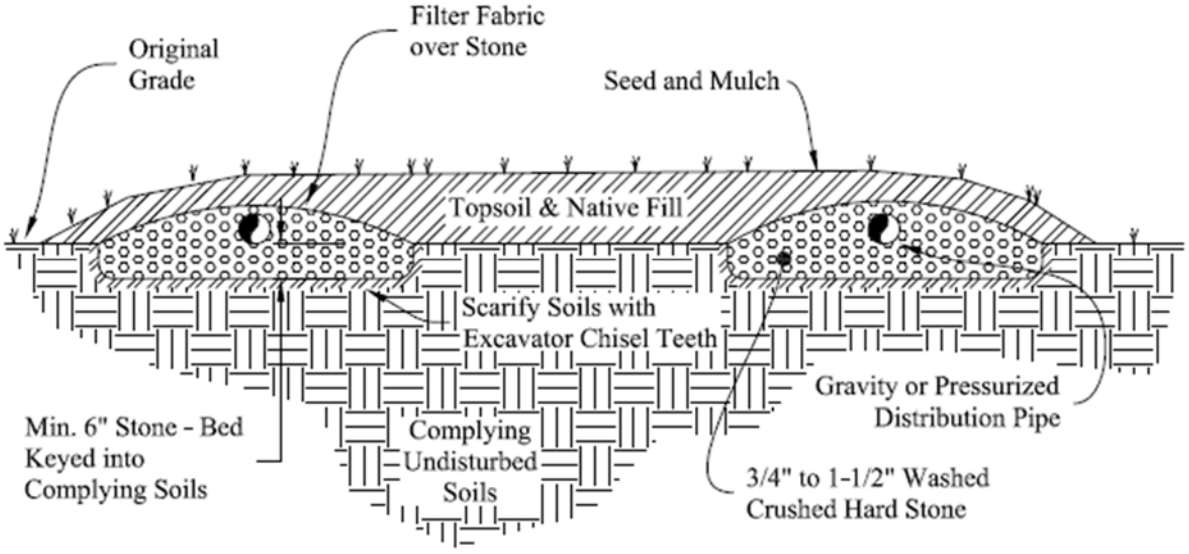


Figure C-6 Detail of Typical Shallow Trench Wastewater System



Cross-Section View

Bottom of Stone:
Min. 3' to Seasonal High Water Table,
Impervious Soils
Min. 4' to Bedrock

Figure C-7 Detail of Typical Trench Wastewater System With 24 Inches of Limiting Soil

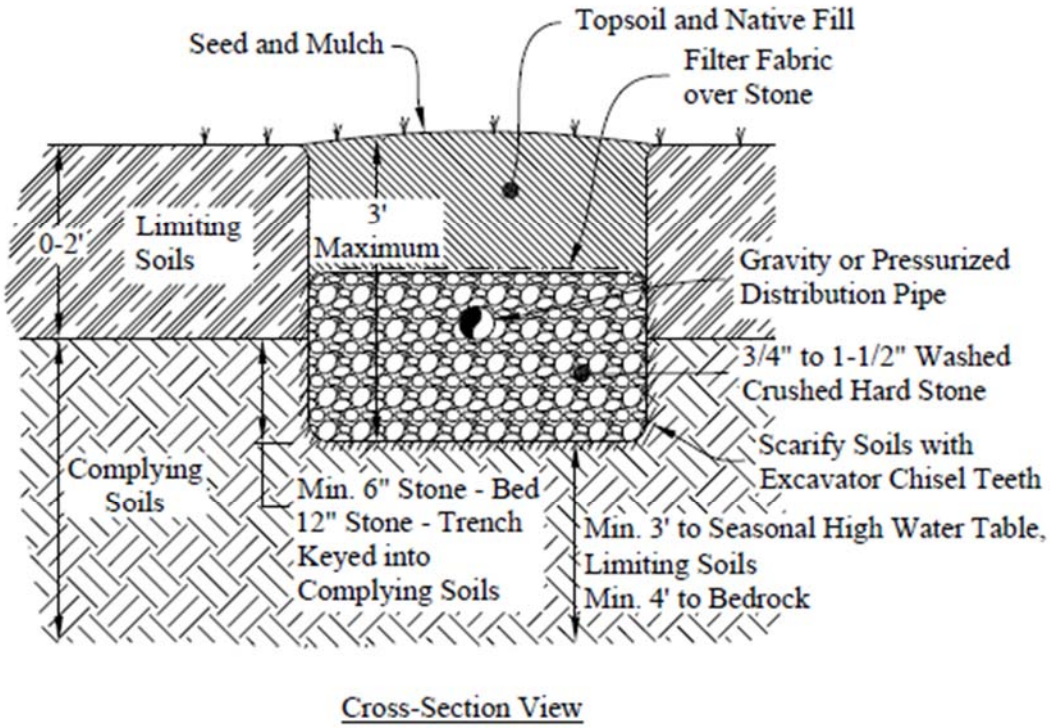


Figure C-8 Detail of Typical Trench Wastewater System With 24 Inches to 5 Feet of Limiting Soil

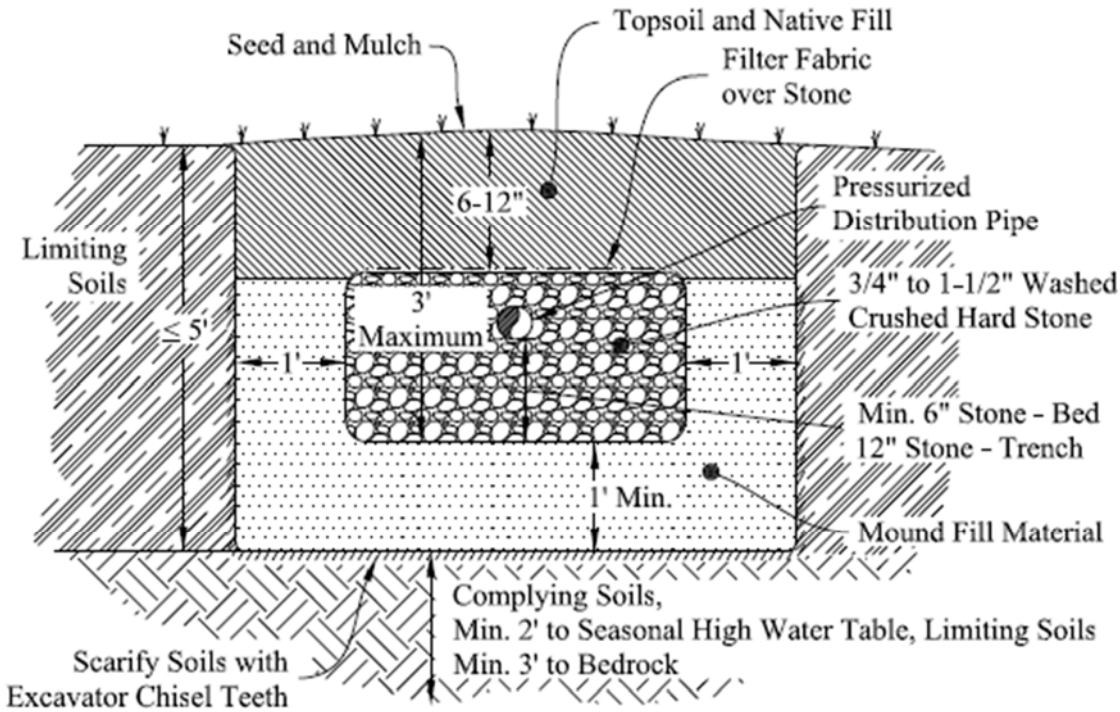


Figure C-9 Detail of Typical At-Grade Leachfield with One Infiltration Area (0-3 % Site Slope)

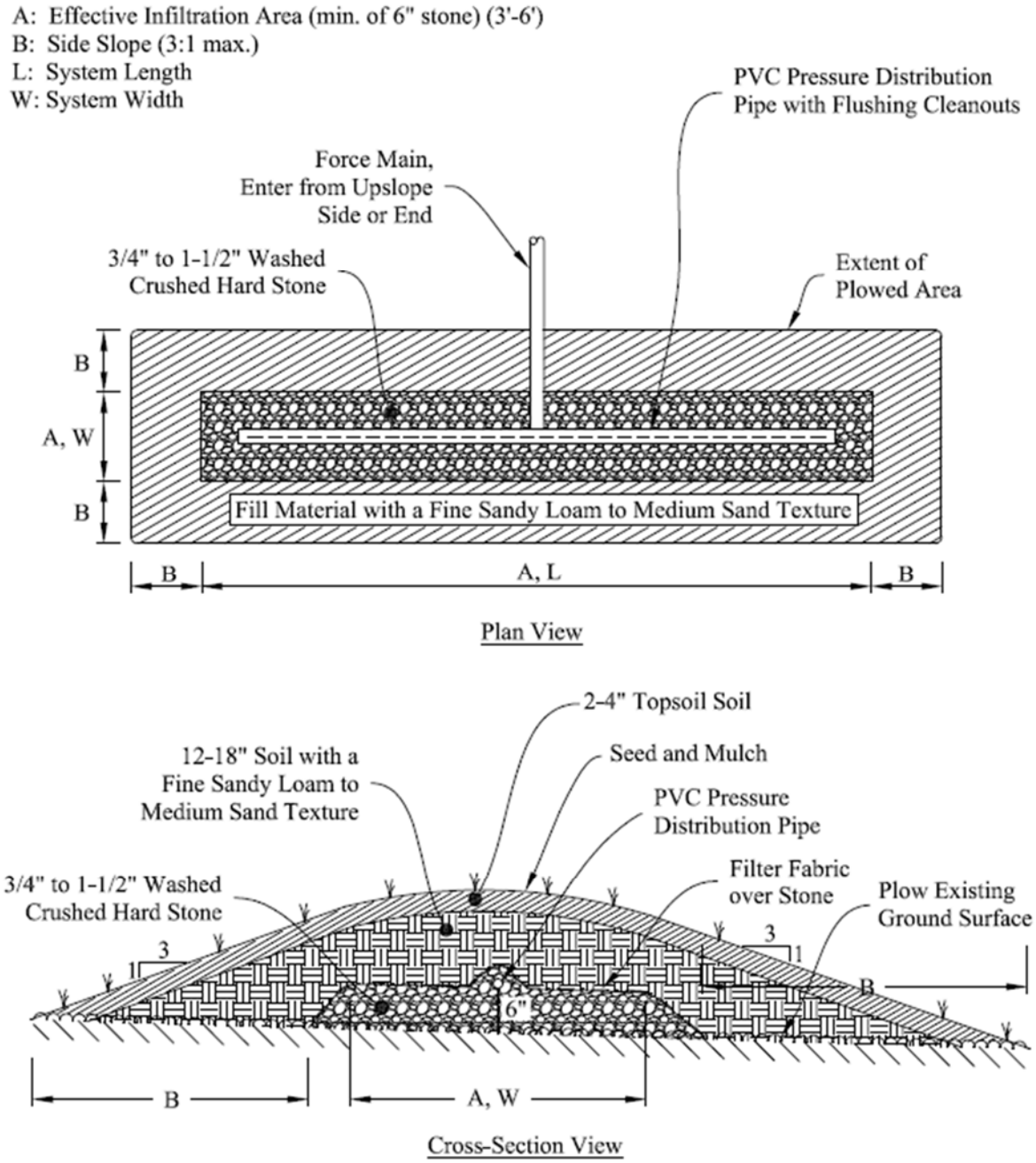


Figure C-10 Detail of Typical At-Grade Leachfield with Two Infiltration Areas (> 3 % Site Slope)

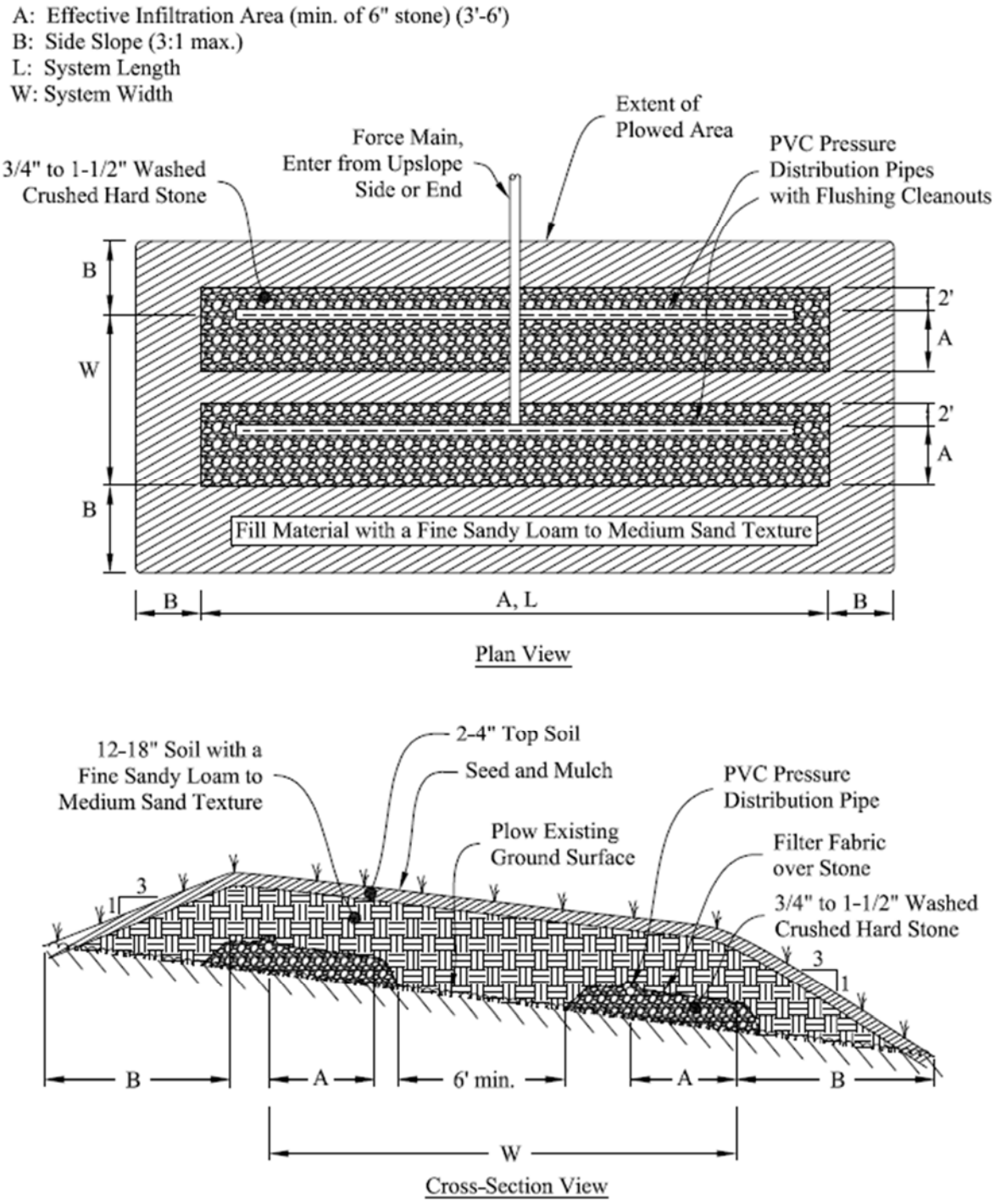


Figure C-11 Detail of Typical At-Grade Leachfield with Interfingering Infiltration Areas (> 3 % Site Slope)

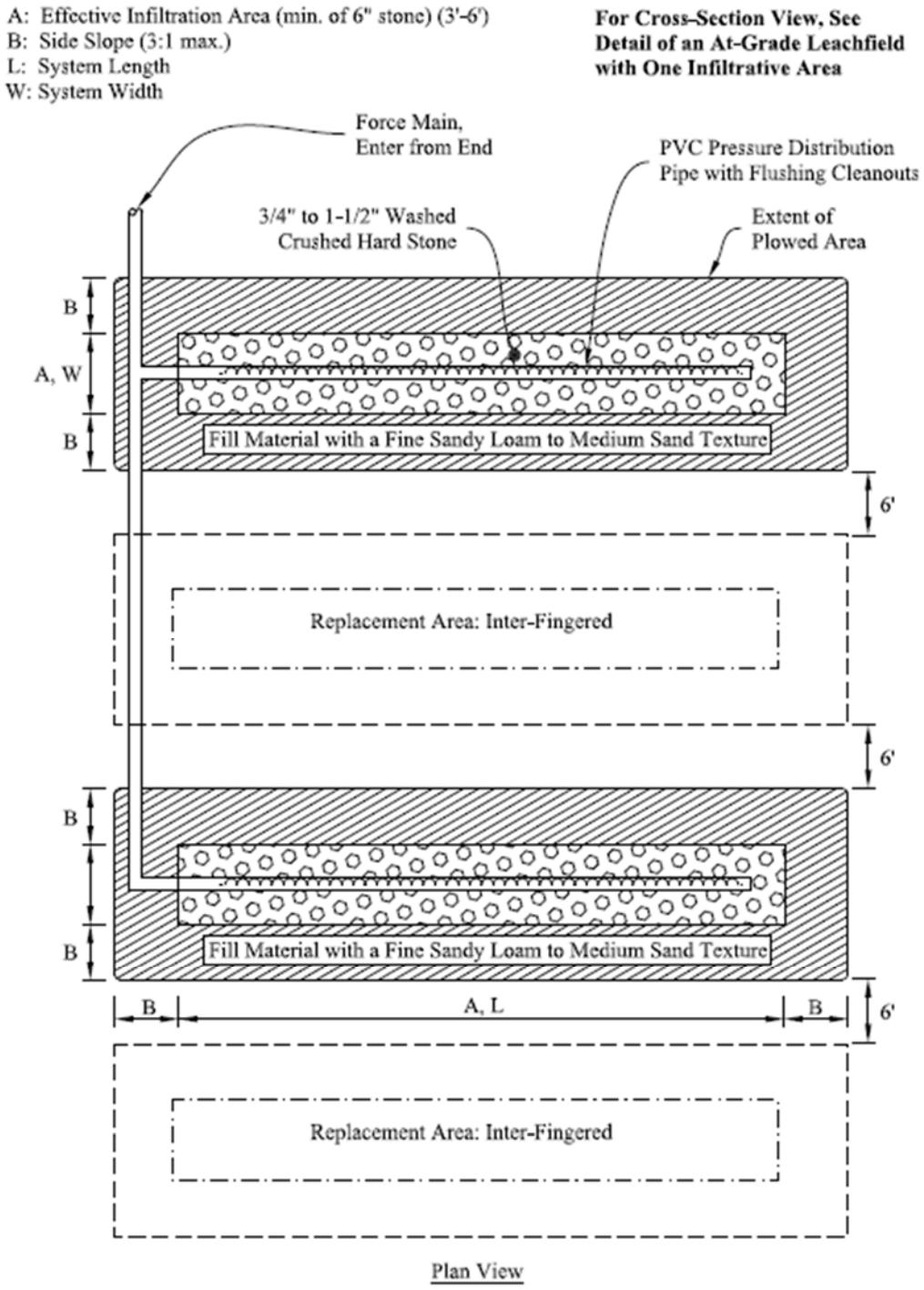


Figure C-12 Detail of Typical Bed in a Mound

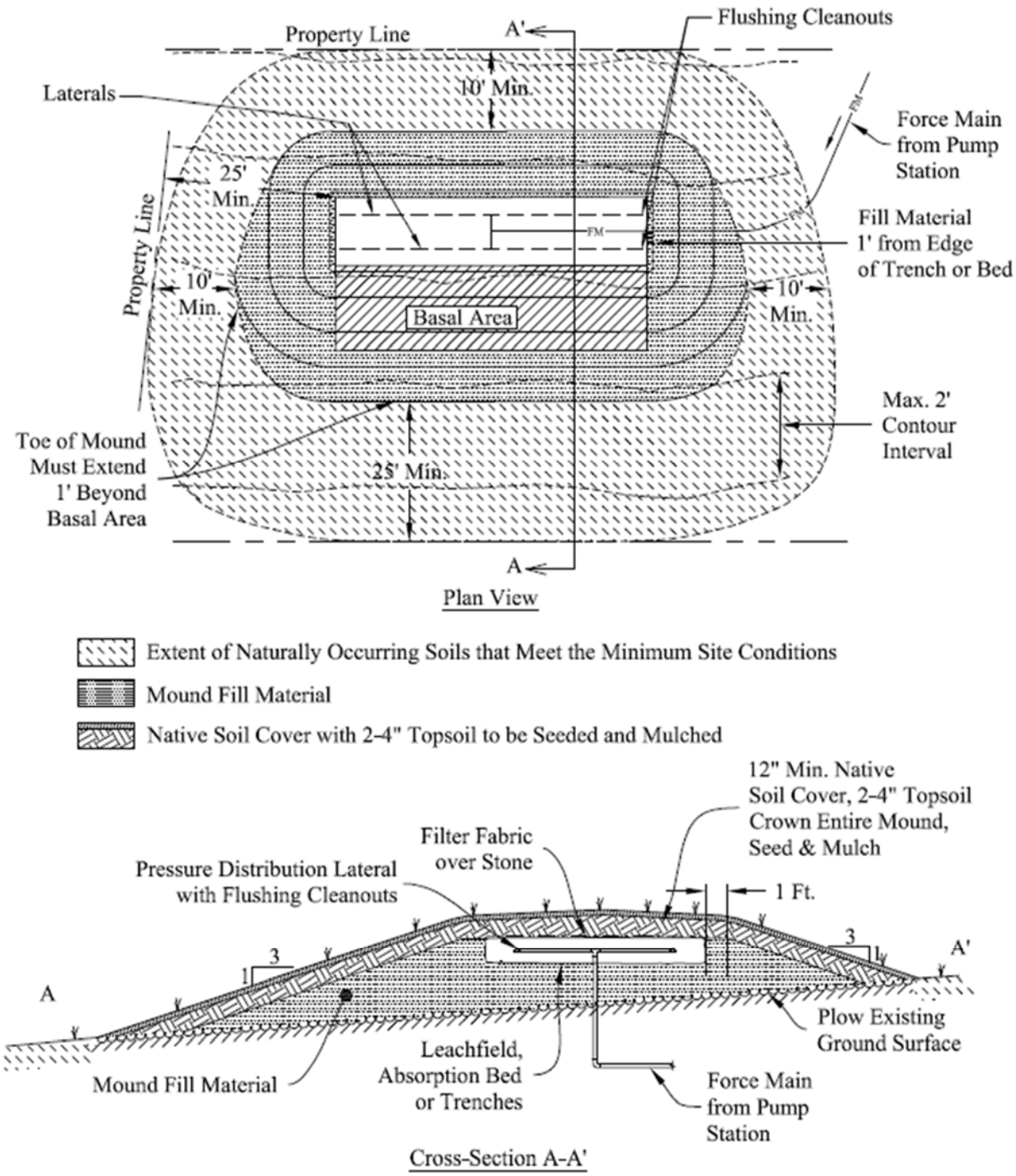


Figure C-13 Detail of Typical Leachfield in a Bottomless Sand Filter

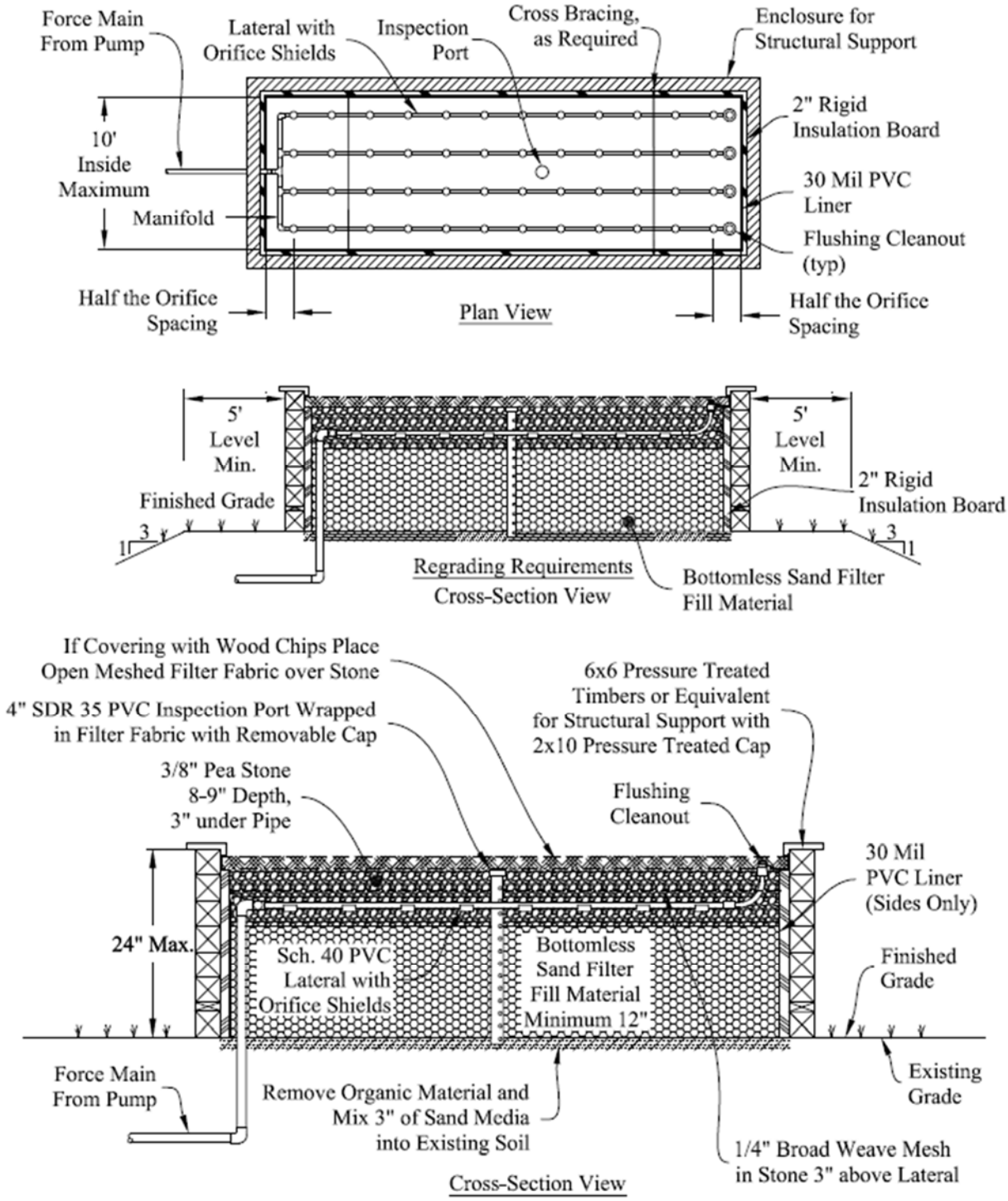
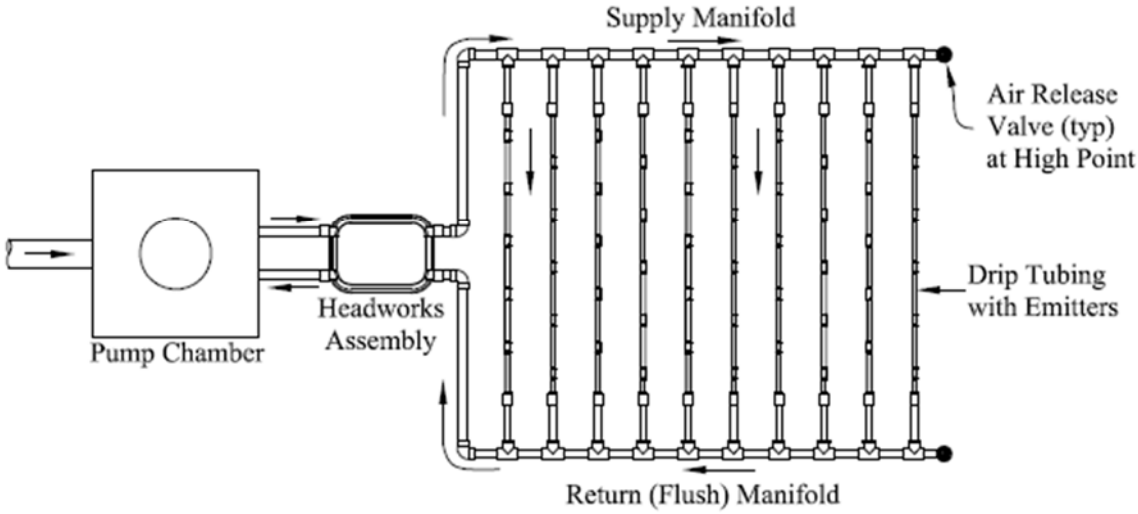
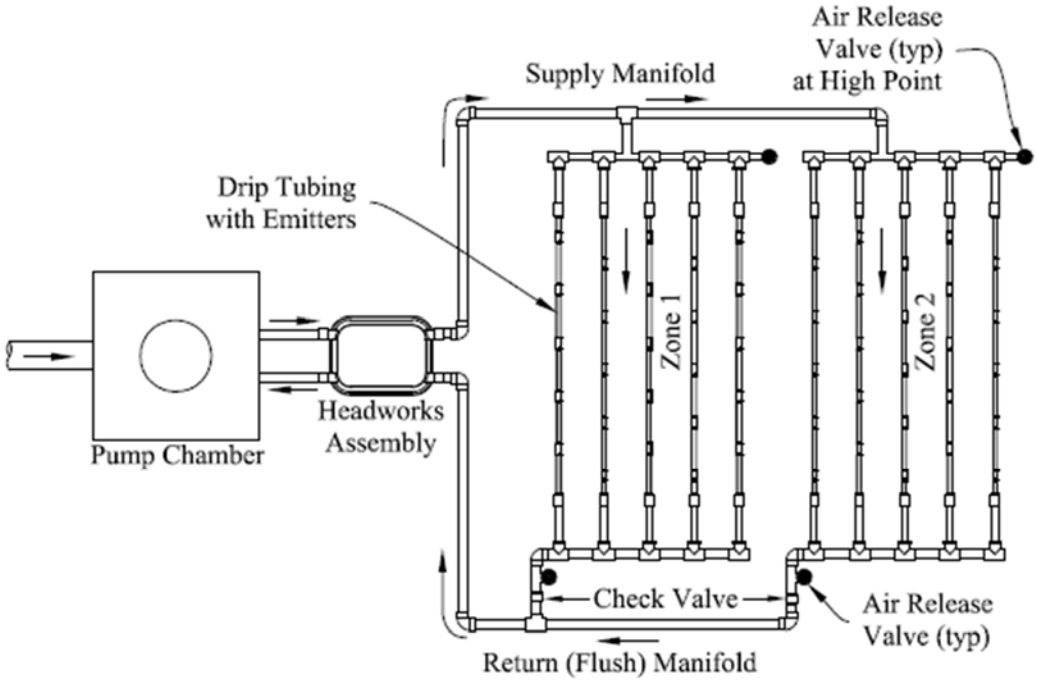


Figure C-14 Detail of Typical Leachfield using Subsurface Drip Distribution



Plan View

Typical Subsurface Drip Distribution - Two Zones



Plan View

Figure C-15 Example for Drawing Isolation Zone Around a Leachfield

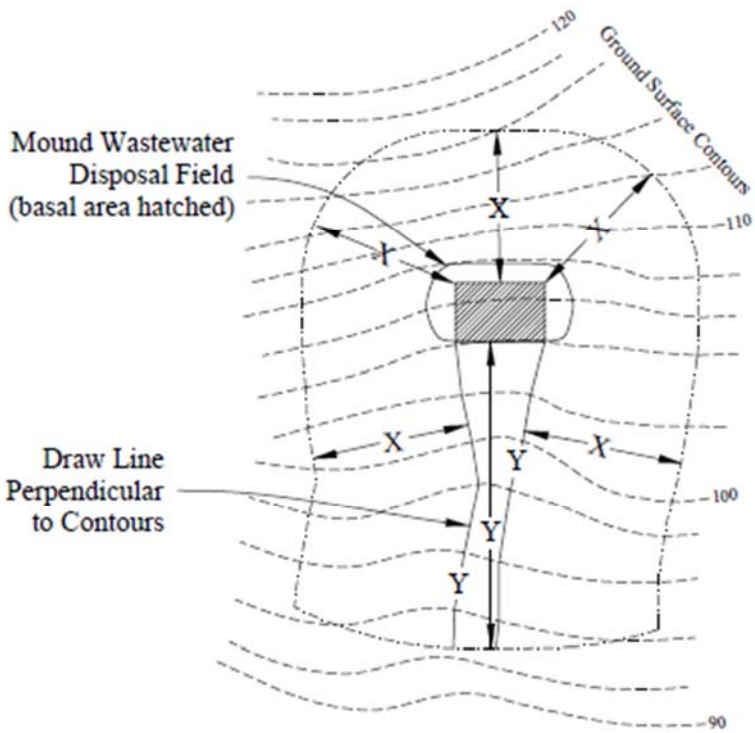


Figure C-16 Detail of Typical Drilled Bedrock Well

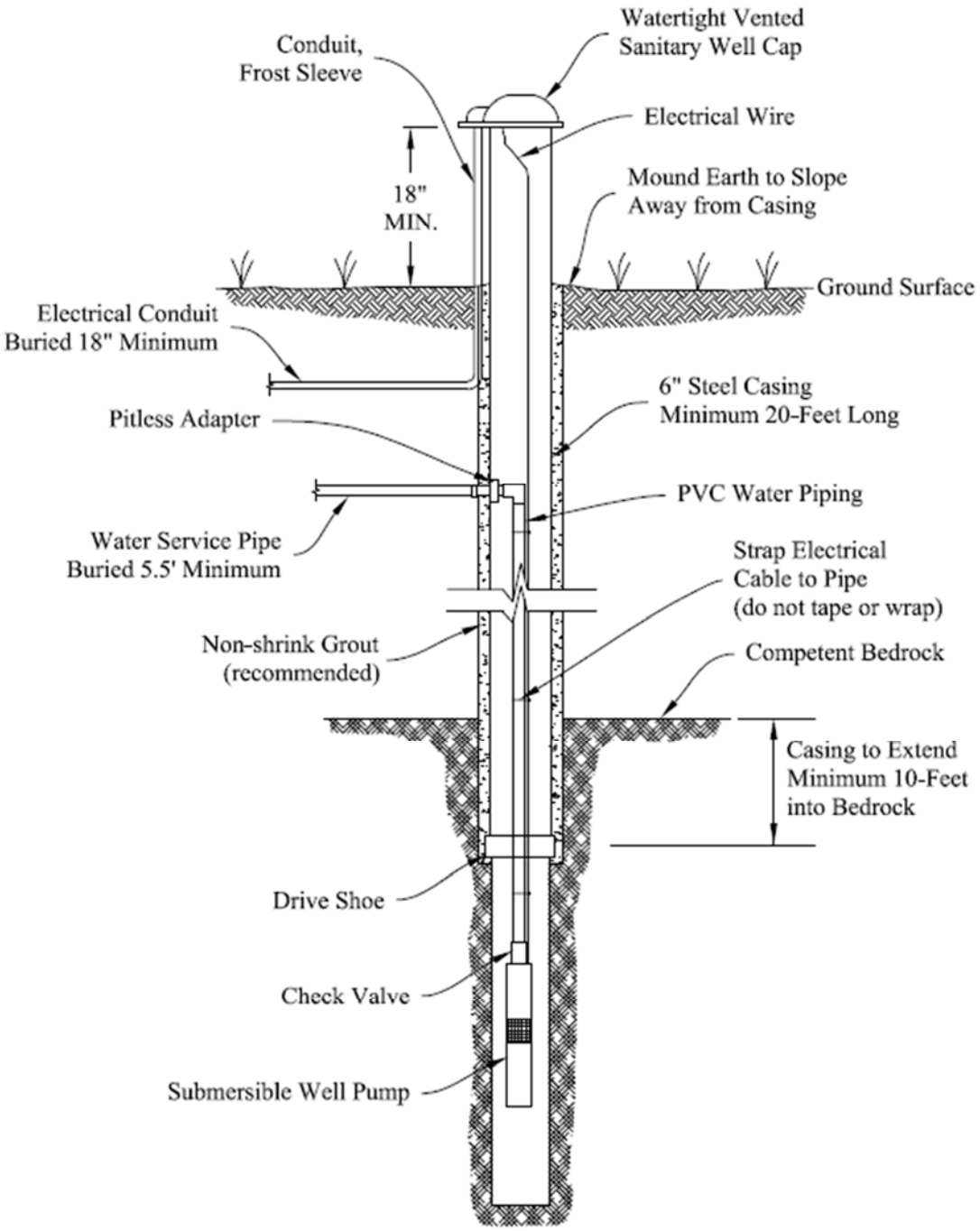


Figure C-17 Detail of Typical Driven Well

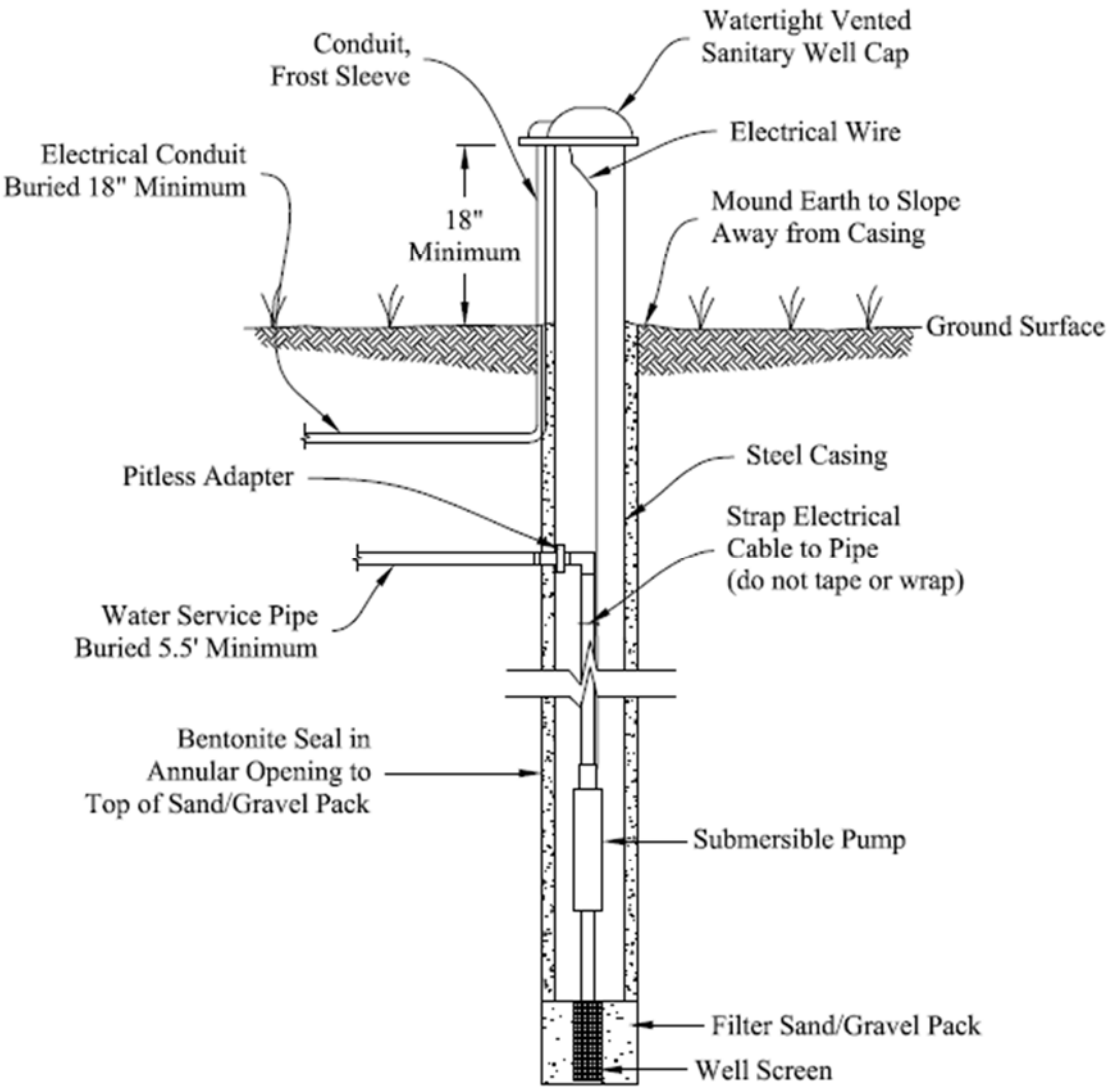
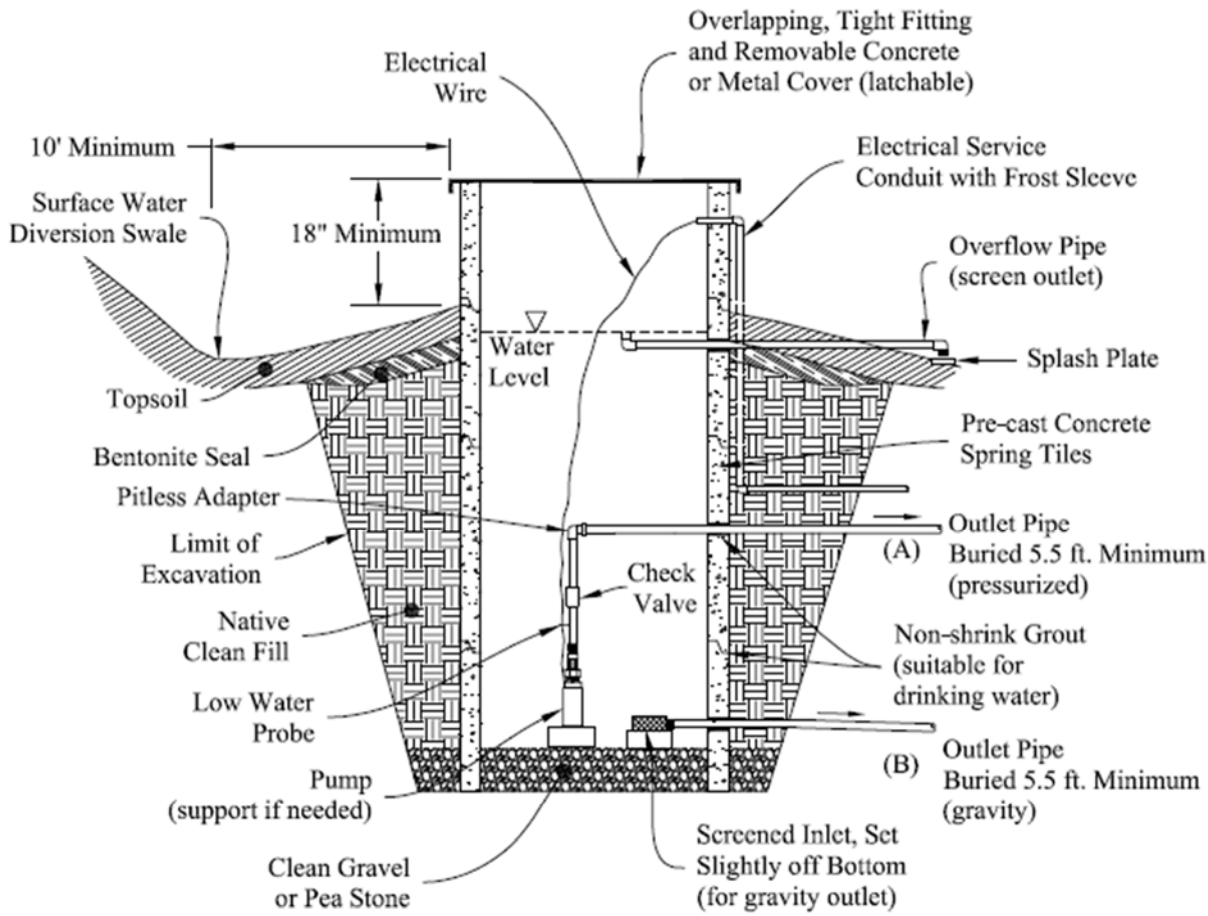


Figure C-18 Detail of a Typical Shallow Well



(A) For Designs with Pump
(B) For Designs that Gravity Flow

~~State of Vermont~~
~~Agency of Natural Resources~~
~~Department of Environmental Conservation~~

~~Wastewater Management Division~~
~~The Sewing Building~~
~~103 South Main Street~~
~~Waterbury, Vermont 05671-0405~~

~~(802) 241-3822~~

~~Environmental Protection Rules~~

~~Chapter 1~~

~~Wastewater System and Potable Water Supply Rules~~

~~Effective September 29, 2007~~

~~Department of Environmental Conservation (DEC)~~
~~District Environmental Commissions (Act 250)~~

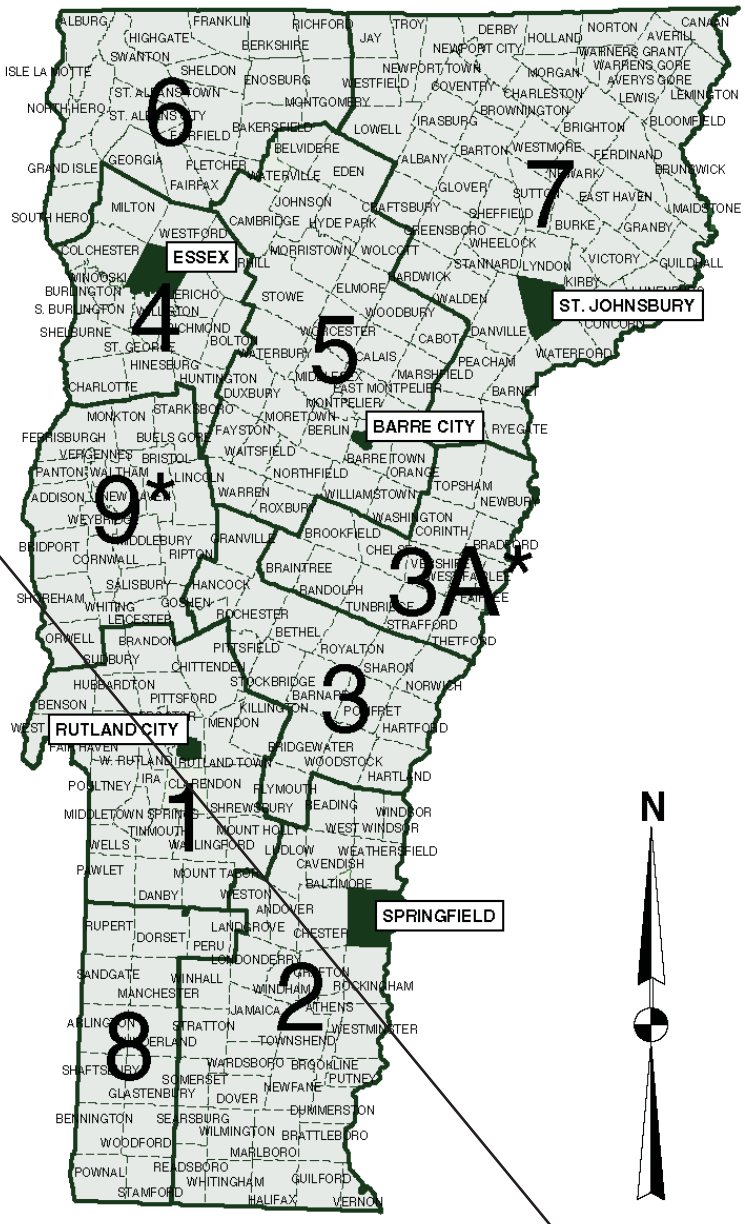
DISTRICTS 1, 8 & 9
450 Asa Bloomer State Office Bldg.
Merchants Row,
Rutland, VT 05701-5903
Permit Specialist 786-5907
Regional Engineer 786-5900
Act 250 (Dist #1 & 8) 786-5920
Act 250 (Dist #9) 879-5614
River Management 786-5906

DISTRICTS 2 & 3
100 Mineral St, Ste #303
Springfield, VT 05156
Permit Specialist 885-8850
Regional Engineer 885-8855
Act 250 (Dist #2, 3 & 3A) 885-8855
River Management 786-5906

DISTRICTS 4 & 6
111 West Street
Essex Junction, VT 05452
Permit Specialist 879-5676
Regional Eng (Dist #4 & 6) 879-5656
Regional Eng (Dist #9) 786-5900
Act 250 (Dist #4, 6 & 9) 879-5614
River Management 879-5631

DISTRICTS 3A & 5
5 Perry Street, Suite 80
Barre, VT 05641
Permit Specialist 476-0195
Regional Engineer 476-0190
Act 250 (Dist #3A) 885-8855
Act 250 (Dist #5) 476-0185
River Management 879-5631

DISTRICT 7
1229 Portland St-Ste 201
St. Johnsbury, VT 05819
Permit Specialist (Tues) 751-0127
Regional Engineer 751-0130
Act 250 751-0120
River Management 751-0129



3A* NOTE:
Towns in District 3A must contact the Springfield Office for Act 250 Permits. For Water Supply, Wastewater Disposal and Subdivision Permits, District 3A must contact the Barre Office.

9* NOTE:
Towns in District 9 must contact the Essex Junction Office for Act 250 Permits. For Water Supply, Wastewater Disposal and Subdivision Permits, District 9 must contact the Rutland Office.

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~~**Subchapter 1 – Scope, Purpose and Authority**~~

~~**§1-101 Scope**~~

~~(a) These Rules apply to the subdivision of land, the construction, modification or change in use of a building or structure, the creation or modification of a campground, and the construction, modification, replacement and operation of their associated potable water supplies and wastewater disposal systems.~~

~~(b) These Rules regulate soil-based disposal systems with design flows of less than 6500 gallons per day and sewerage connections of any size.~~

~~(c) These Rules regulate potable water supplies that are not subject to regulation under the Vermont Water Supply Rule as public water supplies.~~

~~**§1-102 Purpose**~~

~~(a) The purpose of these Rules is to:~~

~~(1) establish a comprehensive program to regulate the design, construction, replacement, modification, operation, and maintenance of potable water supplies and wastewater systems in order to protect human health and the environment, including potable water supplies, surface water and groundwater;~~

~~(2) prevent the creation of health hazards or unsanitary conditions;~~

~~(3) insure the availability of an adequate supply of potable water;~~

~~(4) insure adequate effluent dispersal and drainage for the proper functioning of wastewater systems;~~

~~(5) insure that potable water supplies and wastewater systems are designed, constructed, operated and maintained in a manner that supports the intended use of the supplies and systems with respect to reliability, incremental costs, and sustainability;~~

~~(6) insure that owners of potable water supplies and wastewater systems permitted under these Rules have knowledge of their systems' design, the operation and maintenance requirements, and their responsibilities for the satisfactory functioning of the systems;~~

~~(7) allow the use of alternative, innovative, and experimental technologies for the treatment and disposal of wastewater in the appropriate circumstances;~~

~~(8) protect the investment of homeowners through a flexible remediation process for failed potable water supplies and wastewater systems; and~~

~~(9) increase reliance on and the accountability of the private sector for the design and installation of potable water supplies and wastewater systems through licensing and enforcement.~~

~~**§1-02(b) Purpose**~~

~~(b) The basic performance criteria for the design, construction, operation and maintenance of wastewater systems are that:~~

~~(1) wastewater systems assure that wastewater not be exposed to the open air, not pool on the surface of the ground, or back up into a building or structure, unless the approved design specifically requires it to function in such a manner;~~

~~(2) wastewater systems do not allow direct discharges of wastewater to surface waters; and~~

~~(3) as affirmatively determined by the Secretary, wastewater systems have not contaminated a potable water supply so that it is rendered not potable.~~

~~(c) While implementing the purposes of these Rules, it is the express intent of the Department to encourage innovation, allow maximum flexibility in design, and minimize the amount of time necessary to process applications.~~

~~**§1-103 Authority**~~

~~(a) These Rules are adopted under the authority of the Secretary pursuant to: Title 3 V.S.A. §§808 and 2822 (i) and (j); 10 V.S.A §1259; 10 V.S.A. Chapter 64; 10 V.S.A. Chapter 159; 24 V.S.A. §§1154 and 1161; and 26 V.S.A. §1163(a).~~

~~(b) These Rules supersede the existing Wastewater System and Potable Water Supply Rules, which were effective on January 1, 2005.~~

~~(c) These Rules are not intended to affect other existing regulations, including but not limited to Vermont Health Regulations, Chapter 5, Subchapter 2 (Food Service Establishments), 3 (Schoolhouse Regulations), 4 (Food Establishments – not restaurants), Subchapter 14 (Day Care Facilities) and Subchapter 16 (Rental Housing Health Code).~~

~~(d) These Rules do not limit the powers of state or local authorities to control existing or potential threats to human health or the environment, or limit the exercise of other authorities to regulate human health, safety and welfare except as provided in Subchapter 5 of these Rules.~~

~~**Subchapter 2 – Definitions**~~

~~**§1-201 Definitions**~~

~~(a) As used in these Rules, the following terms shall have the specified meaning. If a term is not defined, it shall have its common meaning:~~

~~(1) **Absorption Bed** – means a disposal field that is a shallow excavation in the ground more than 48" wide, lined with crushed stone, that releases wastewater into the soil through perforated distribution lines.~~

~~(2) **Absorption Trench** – means a disposal field that is a shallow ditch 48" or less in width with vertical sides, lined with crushed stone, that releases wastewater into the soil through perforated distribution lines.~~

~~(3) **Agency** – means the Agency of Natural Resources.~~

~~(4) **Applicant** – means the person(s) who owns the land on which a project is located.~~

~~(5) **Base Flood** – means the flood having a one percent chance of being equaled or exceeded in any given year.~~

~~(6) **Base Flood Elevation** – means the height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum of 1929, the North American Vertical Datum of 1988, or other datum referenced in the flood insurance study report prepared for a municipality by the Federal Emergency Management Agency, National Flood Insurance Program, or the average depth of the base flood, usually in feet, above the ground surface as designated on the Flood Insurance Rate Maps prepared for a municipality by the Federal Emergency Management Agency, National Flood Insurance Program.~~

~~(7) **Bedrock** – means both solid impervious ledge, and loose, slabby, or weathered rock and shale that are not soil and provide essentially no treatment of sewage effluent.~~

~~(8) **Bedroom** – means:~~

~~(A) any room in a residential structure that is at least 80 square feet in area, that is susceptible to present or future use as a private sleeping area, and that has at least:~~

~~(i) one window;~~

~~(ii) one closet; and~~

~~(iii) one interior method of entry and exit, excluding closets and bathrooms, allowing the room to be closed off from the remainder of the residence for privacy; or~~

~~(B)~~ ~~any room within a building or structure that actually serves primarily as sleeping quarters.~~

~~(C)~~ ~~On a case by case basis, the Secretary may determine that a room that meets the criteria of subsection (8)(A) of this section shall not be deemed to be a bedroom. When making this determination, the Secretary shall consider the following criteria:~~

~~(i)~~ ~~whether the room has a history of use as a bedroom;~~

~~(ii)~~ ~~whether the size of the room is similar to other bedrooms in the residential structure or is consistent with room sizes customarily used for bedrooms;~~

~~(iii)~~ ~~whether the room is located within the residential dwelling in an area customarily used for sleeping;~~

~~(iv)~~ ~~whether the room is in fairly close proximity to bathroom facilities;~~

~~(v)~~ ~~whether the room affords a level of privacy customarily expected for a bedroom;~~

~~(vi)~~ ~~whether the room has been, or could be, marketed as a bedroom; and~~

~~(vii)~~ ~~whether there are any other factors which could support a determination that the room is not a bedroom.~~

~~Note: In determining the number of bedrooms contained in any residence, it shall be presumed that all residences contain a living room, kitchen, bathroom, and at least one bedroom.~~

~~(9)~~ ~~**Building or Structure**~~ ~~– means a building or structure whose use or useful occupancy requires the construction or modification of a potable water supply and/or wastewater system.~~

~~(10)~~ ~~**Campground**~~ ~~– means any lot of land containing more than three (3) campsites occupied for vacation or recreational purposes by camping units, such as: tents, yurts, tepees, lean-tos, camping cabins, and recreational vehicles including motor homes, folding camping trailers, conventional travel trailers, fifth wheel travel trailers, truck campers, van campers, and conversion vehicles designed and used for travel, recreation and camping. There shall be no distinction made between non-commercial (no charge, no service) and commercial operations. Note: A mobile home or Park Model recreational vehicle that is used as a residence at a campground is regulated as a building or structure.~~

~~(11)~~ ~~**Campsite** – means an area in a campground that is designed to accommodate a camping unit, for which design flows will be calculated. Design flows may be different for campsites in campgrounds that are open more than seven (7) months per year. A campsite may rely on water faucets, central toilet facilities, and/or a dumping station or may have individual potable water supply and sewerage connections.~~

~~(12)~~ ~~**Change in Use** – means increasing the number of permitted users/employees, converting to a different type of use such as from a residence to a restaurant or office space, changing from seasonal to year-round use, adding bedrooms, and other changes that result in an increase in design flow or modification of other operational requirements of the potable water supply or wastewater system.~~

~~(13)~~ ~~**Commissioner** – means the Commissioner of the Department or her or his designated representative.~~

~~(14)~~ ~~**Critical Level** – means the elevation of the seasonal high water table that must not be exceeded. Each site has a critical level that must be met in order to allow installation of any soil-based disposal system. The critical level varies when using the prescriptive, enhanced prescriptive, or performance based design approaches. The critical level also varies depending on the type of soil-based disposal system that will be used on the site.~~

~~(15)~~ ~~**Crushed Stone** – means clean, durable stone no smaller than ¾" or larger than 1-1/2" in diameter.~~

~~(16)~~ ~~**Department** – means the Department of Environmental Conservation.~~

~~(17)~~ ~~**Design Flow** – means the flows, set by section 1-808 of these Rules and Section 2.2 of Appendix A of the Vermont Water Supply Rules, that establish the size of the potable water supply and wastewater system serving a lot, building or structure, or campground.~~

~~(18)~~ ~~**Designer** – means a person who is operating within the scope of his or her license, as specified in Subchapter 7 of these Rules.~~

~~(19)~~ ~~**Desk Top Hydrogeologic Analysis** – means a hydrogeologic analysis that is based on assumptions about the hydraulic capacity of the soils on a specific site. The designer will consider the soil properties based on the test pit information and will assign a conservative estimate of the hydraulic conductivity for the soil. Based on this conservative assumption, the designer will calculate the site's hydraulic capacity without the expense of doing a site specific test.~~

~~(20)~~ ~~**Director** – means the Director of the Division or her or his designated representative.~~

~~(21)~~ ~~**Division** – means the Wastewater Management Division of the Department.~~

~~**§1-201(a)(22)**~~ ~~**Definitions**~~

~~(22)~~ ~~**Elevation** - means the height of a specified object or geologic feature relative to an established benchmark. The benchmark may be established by the licensed designer, or may be established by others, such as the U.S. Geological Survey datums. When working with plans or maps prepared by others, the related benchmark must be used to interpret those plans or maps.~~

~~(23)~~ ~~**Enhanced Prescriptive Designs** – means those designs for sites with less than 24" of naturally occurring permeable soil above bedrock and the seasonal high water table that meet specific soil and site criteria.~~

~~(24)~~ ~~**Failed Supply** - means~~

~~(A)~~ ~~a potable water supply:~~

~~(i)~~ ~~that has been tested for the following contaminants, in accordance with the protocols approved by the Secretary, and is found not to comply with the specified standard for one or more of the contaminants:~~

~~(I)~~	~~Total Coliform~~	~~None;~~
~~(II)~~	~~Nitrate~~	~~10 mg/L;~~
~~(III)~~	~~Nitrite~~	~~1 mg/L;~~
~~(IV)~~	~~Arsenic~~	~~0.010 mg/L;~~
~~(V)~~	~~Uranium~~	~~20 ug/L~~

~~(ii)~~ ~~that the Secretary affirmatively determines to be not potable, due to the presence of a contaminated site, a leaking underground storage tank, or other known sources of groundwater contamination or naturally occurring contaminants, and that information has been posted on the Agency website; or~~

~~(iii)~~ ~~that the Secretary affirmatively determines to be failed due to the supply providing an insufficient quantity of water to maintain the usual and customary uses of a building or structure or campground, and that information has been posted on the Agency of Natural Resources website:~~

~~(B)~~ ~~Notwithstanding the provisions above, a potable water supply shall not be a failed supply if:~~

~~(i)~~ ~~these effects can be and are remedied solely by a minor repair or replacement; or~~

~~(ii)~~ ~~these effects have lasted for only a brief period of time, the cause of the failure has been determined to be an unusual and non-recurring event, and the supply has recovered from the state of failure. Supplies which have recurring, continuing, or seasonal failures shall be considered to be failed supplies.~~

~~**§1-201(a)(24)(C)**~~ ~~**Definitions**~~

~~(C)~~ ~~If a project is served by multiple potable water supplies, the failure of one supply will not require the issuance of a permit or permit amendment for any other supply that is not in a state of failure.~~

~~(25)~~ ~~**Failed System** - means~~

~~(A)~~ ~~a wastewater system that is functioning in a manner:~~

~~(i)~~ ~~that allows wastewater to be exposed to the open air, to pool on the surface of the ground, to discharge directly to surface water, or to back up into a building or structure, unless in any of these instances the approved design of the system specifically requires the system to function in such a manner; or~~

~~(ii)~~ ~~that results in a potable water supply being affirmatively determined by the Secretary to be a failed supply, and that information has been posted on the Agency website.~~

~~(B)~~ ~~Notwithstanding the provisions above, a system shall not be a failed system if:~~

~~(i)~~ ~~these effects can be and are remedied solely by a minor repair or replacement; or~~

~~(ii)~~ ~~these effects have lasted for only a brief period of time, the cause of the failure has been determined to be an unusual and non-recurring event, and the system has recovered from the state of failure. Systems that have recurring, continuing, or seasonal failures shall be considered to be failed systems.~~

~~(C)~~ ~~If a project is served by multiple wastewater systems, the failure of one system will not require the issuance of a permit or permit amendment for any other system that is not in a state of failure.~~

~~(D)~~ ~~A wastewater system may be determined to be a failed system by the completion of a site visit that identifies one or more of the conditions set forth in subdivision (A)(i) of this definition.~~

~~(26)~~ ~~**Filtrate Effluent** - means effluent that has been treated to reduce BOD_5 and total suspended solids to 30 mg/l or less each.~~

~~(27)~~ ~~**Special Flood Hazard Area** - means the land in the flood plain within a community subject to a one percent or greater chance of flooding in any given year as designated on the flood insurance maps prepared for a municipality by the Federal Emergency Management Agency, National Flood Insurance program. For the purpose of these Rules, the term special flood hazard area is synonymous in meaning with the terms "area of special flood hazard" and "100-year floodplain".~~

~~(28)~~ ~~**Floodway** - means the channel of a river or other water course and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. Where available, the floodway is designated on either the Flood Insurance Rate maps or Flood Boundry and Floodway maps prepared for a municipality by the Federal Emergency Management Agency, National Flood Insurance Program.~~

~~(29)~~ ~~**Graywater** - means the wastewater from normal domestic activities such as bathing, clothes washing, food preparation, and cleaning but excluding wastewater from toilets.~~

~~(30)~~ ~~**Impervious Soil or Subsoil** - means a soil layer with a percolation rate that is slower than 120 minutes per inch.~~

~~(31)~~ ~~**Improved Lot** - means a lot that has a substantially completed building or structure on it, and an associated substantially completed potable water supply and wastewater system that may or not be located on the lot.~~

~~(32)~~ ~~**Induced Groundwater Mounding** - means the rise in the seasonal high water table caused by the discharge of wastewater into a soil-based disposal system.~~

~~(33)~~ ~~**Installer** - means a person who constructs a potable water supply and/or wastewater system serving or intended to serve a lot, building or structure, or campground. Installer does not mean the owner of an owner occupied single family residence who constructs a potable water supply and/or wastewater system to serve such residence.~~

~~(34)~~ ~~**Kitchen Facilities** - means the common plumbing fixtures and appliances normally expected in the food preparation area of a living unit. The presence of a sink, a refrigerator, and cooking facilities would meet this definition. Cooking facilities include, but are not limited to stoves, built-in ovens, counter top ovens, and microwave ovens.~~

~~(35)~~ ~~**Leachfield** - means that portion of a soil-based disposal system used to discharge wastewater into the soil. Examples of leachfields include, but are not limited to: absorption trenches and beds; at-grade systems; and mound systems.~~

~~(36)~~ ~~**Living Unit** - means a building or structure or a portion of a building or structure that has a toilet, lavatory, kitchen facilities, and one or more bedrooms that is reasonably private and separated from other living units. A single living unit may include one or more bedrooms, toilets and lavatories in an attached building or structure, such as a garage, or in a detached building or structure provided that the attached or detached building or structure does not have kitchen facilities. Notwithstanding the above definition, if a portion of a building or structure is rented or leased for residential occupancy, that portion shall be regulated as a separate living unit. Examples of buildings or~~

~~structures that contain more than one living unit include, but are not limited to: duplexes; single family residences with an accessory apartment; and rooming houses.~~

~~Note: There are situations where the presence of more than one kitchen might not automatically create a second living unit. Examples include, but are not limited to, outdoor kitchen facilities such as might be located on a deck or porch, or kitchen facilities in a wet bar or family room location. If the Secretary determines that additional living units are not created by the presence of additional kitchen facilities, that determination which may be in the form of a permit or letter, shall be filed and indexed in the land records of the municipality where the property is located.~~

~~(37)~~ ~~**Lot**~~ ~~– means a tract or portion of land with defined boundaries created by the act of subdivison. A deed may describe one or more lots. Multiple lots described in a single deed remain separate lots provided that they are described as having separate and distinct boundaries and that any subsequent deed describing the lots does not specifically eliminate the separate and distinct boundaries.~~

~~(38)~~ ~~**Minimum Site Conditions**~~ ~~– means those naturally occurring conditions related to soil permeability, soil depth, depth to seasonal high water table, depth to bedrock and slope that must exist in order to construct any soil-based wastewater system.~~

~~(39)~~ ~~**Minor Repair or Replacement**~~ ~~– means:~~

~~(A)~~ ~~For wastewater systems, the repair or replacement of a pipe leading from a building or structure to the septic tank; replacement of a septic tank; repair or replacement of a pump and/or associated valves, switches and controls; the repair or replacement of a toilet; or any other repair or replacement that the Secretary, on a case by case basis, determines to be a minor repair or replacement.~~

~~(B)~~ ~~For potable water supplies, the repair or replacement of an individual pipe leading from a building or structure to a well; repair or replacement of a pump; repair or replacement of filters or screens; repair or replacement of a mechanical component; repair or reconstruction of a driven well point in approximately the same location; deepening or hydrofracturing a well; repair or replacement of a lavatory; or any other repair that the Secretary, on a case by case basis, determines to be a minor repair or replacement.~~

~~Note: replacement of a distribution system, or replacement of piping related to a change in use, increase in design flow, or change in operational requirements of the water system are not normally considered minor repairs or replacements.~~

~~(40)~~ ~~**Mobile Home** - means a prefabricated dwelling unit that:~~

~~(A)~~ ~~is designed for long term and continuous residential occupancy;~~

~~(B)~~ ~~is designed to be moved on wheels, as a whole or in sections;~~

~~(C)~~ ~~on arrival at the site, is complete and ready for occupancy, except for incidental unpacking, assembly, connections with utilities, and placing on supports or a permanent foundation, or installation as a unit in a previously prepared structure; and~~

~~(D)~~ ~~contains the same type of interior plumbing fixtures as immovable housing (not RV (recreational vehicle) type fixtures);~~

~~(41)~~ ~~**Modification of Operational Requirements** - means physically changing a building or structure or campground or changing its use so that new operational standards must be applied. Examples of modifications of operational requirements include, but are not limited to: conversion to a restaurant or food preparation business requiring the installation of a grease trap, adding fire sprinklers that require upgrading of the water supply line, or increasing the number of plumbing fixtures that requires upgrading of the water distribution system. The addition of plumbing fixtures in a single-family residence is not a modification of operational requirements.~~

~~(42)~~ ~~**Municipality** - means a town, city, incorporated village or unincorporated village, or gore.~~

~~(43)~~ ~~**Permanent Legal Access** - means an easement, right of way, deed or other legal document that creates an enforceable permanent property interest that provides access to a potable water supply or wastewater system located off the lot for the purposes of construction, operation and maintenance of the supply or system.~~

~~(44)~~ ~~**Perched Water Table** - means a water table that forms in the upper horizons of some soils because layers with low permeability overlie layers with higher permeability. Under these Rules, a perched water table is the seasonal high water table and shall be treated as such.~~

~~(45)~~ ~~**Performance Based Design** - means a design based on site specific hydrogeologic testing that demonstrates the site's ability to function in accord with these Rules.~~

~~(46)~~ ~~**Person** - means any individual, partnership, company, corporation, association, unincorporated association, joint venture, trust, municipality, the state of Vermont or any agency, department or subdivision of the state, federal agency, or any other legal or commercial entity.~~

~~(47)~~ ~~**Potable Water Supply** - means the source, treatment and conveyance equipment used to provide water used or intended to be used for human consumption, including drinking, washing, bathing, the preparation of food, or laundering. This includes mechanical systems, such as pump stations and storage tanks or lavatories, that are located inside a building or structure and that are integral to the operation of a potable water system but does not include the building's internal piping or plumbing. This definition also does not include a potable water supply that is subject to regulation under 10 V.S.A. Chapter 56 (Public Water Supplies).~~

~~(48)~~ ~~**Prescriptive Design** - means a wastewater system design based on at least 24" of naturally occurring, permeable soil above bedrock and the seasonal high water table, such as a traditional septic tank and leachfield design. (See enhanced prescriptive and performance based designs for alternatives to prescriptive design.)~~

~~(49)~~ ~~**Primary Area** - means the area reserved for or containing the original wastewater system.~~

~~(50)~~ ~~**Project** - means all lots, buildings, structures, campgrounds, potable water supplies and wastewater systems for which a particular permit application is submitted.~~

~~(51)~~ ~~**Professional Engineer** - means an engineer licensed and in good standing by the Board of Professional Engineering under 26 V.S.A. Chapter 20.~~

~~(52)~~ ~~**Qualified Hydrogeologist** - means a person with training or experience in bedrock geology, glacial geology and groundwater hydrology sufficient to adequately prepare the hydrogeologic studies and analyses required by these Rules.~~

~~(53)~~ ~~**Seasonal High Water Table** - means the highest elevation that the water table reaches during the seasonally wet times of the year. This is determined by soil examination or groundwater level monitoring as described in the Rules.~~

~~(54)~~ ~~**Secretary** - means the Secretary of the Agency or a duly authorized representative of Secretary. A duly authorized representative of the Secretary includes a municipality that has requested delegation, in writing, and has been delegated the authority to implement provisions of these Rules in lieu of the Secretary.~~

~~(55)~~ ~~**Sewage** - means sanitary waste or used water from any building or structure or campground including, but not limited to, carriage water, and shower and wash water. For the purposes of these Rules, sewage does not include process wastewater. For purposes of these Rules, stormwater shall not be considered sewage.~~

~~(56)~~ ~~**Sewage Officer** – means a person appointed or employed by a municipality to administer these Rules when the municipality has received delegation of this program in accord with Subchapter 6 of these Rules,~~

~~(57)~~ ~~**Single Family Residence** – means a building (s) or a structure (s) that contains only one living unit.~~

~~(58)~~ ~~**Soil-Based Disposal System** – means a wastewater system that depends on naturally occurring soil to absorb the effluent from the system and to transmit the wastewater away from the site without any overland flow. Soil-based disposal systems include those that have a septic tank with leachfield, an advanced treatment system with leachfield, or a spray disposal system.~~

~~(59)~~ ~~**Subdivide** - means to divide land by sale, gift, lease, mortgage foreclosure, court-ordered partition or decree, or filing of a plat, plan, or deed in the town records where the act of division creates one or more lots. Subdivision shall be deemed to have occurred on the conveyance of the first lot or the filing of a plat, plan, or deed in the town records, whichever first occurs. A subdivision of land shall also be deemed to have taken place when a lot is divided by a state or municipal highway, road or right-of-way or when a lot is divided by surface waters with a drainage area of greater than ten square miles. A town boundary does not create a subdivision. A mortgage deed does not create a subdivision unless a foreclosure occurs that results in the division of land.~~

~~(60)~~ ~~**Substantially completed** - means a building or structure, potable water supply, or and wastewater system that is sufficiently constructed so that it can be used for its intended purpose.~~

~~(61)~~ ~~**Unimproved Lot** – means a lot that has no building or structure on the lot.~~

~~(62)~~ ~~**Wastewater** – means sanitary waste or used water from any building or structure or campground, including, but not limited to, carriage water, shower and wash water, and process wastewater. For the purposes of these Rules, stormwater shall not be considered wastewater.~~

~~(63)~~ ~~**Wastewater system** - means any piping, pumping, treatment or disposal system used for the conveyance and treatment of sanitary waste or used water, including, but not limited to, carriage water, shower and wash water, and process wastewater. This definition does not include any internal piping or plumbing, except for mechanical systems, such as pump stations and storage tanks or toilets, that are located inside a building or structure and that are integral to the operation of a wastewater system. This definition also does not include wastewater systems that are used exclusively for the treatment and disposal of animal manure. For the purposes of these Rules, "wastewater system" refers to a soil-based disposal system of less than 6,500 gallons per day, or a sewerage connection of any size.~~

~~**Subchapter 3 – Water Supply and Wastewater Permits**~~

~~**§1-301 Applicability**~~

~~(a) This Subchapter sets forth the permitting requirements for buildings or structures and campgrounds, together with their associated potable water supplies and wastewater systems, and for all other potable water supplies and wastewater systems.~~

~~(b) Buildings or structures, campgrounds, potable water supplies, and wastewater systems may also be subject to other state permits.~~

~~(c) No provision of this Subchapter shall limit the authority of the Department of Health with respect to facilities licensed by that Department. No provision of this Subchapter shall limit the authority of the Agency of Commerce and Community Development with respect to its authority to regulate mobile home parks including, but not limited to, sales, evictions, rents, habitability, and registrations.~~

~~(d) Buildings or structures, potable water supplies, and wastewater systems may also have to comply with municipal ordinances and bylaws that require municipal permits.~~

~~(e) Examples of buildings or structures that require a permit under this Subchapter include, but are not limited to, the following: single family residences on their own individual lots, accessory apartments, duplexes, buildings with three or more living units, condominiums, apartments, mobile homes, Park Model recreational vehicles and/or mobile homes used as a residence at a campground, places of employment, hospitals, nursing homes, motels, hotels, restaurants, filling stations, boarding homes, rooming houses, stores, shops, buildings or structures used as places of public assembly, buildings or structures used for home occupations, offices, manufacturing facilities, industrial facilities, and farm buildings or structures.~~

~~**§ 1-302 Technical Assistance and Project Review**~~

~~(a) The Department has permit specialists available to assist applicants in identifying the applicability of specific permit programs to their projects. These permit specialists complete a Project Review Sheet, that, based on the information and description provided by the applicant, initially identifies what permits may be required for a project.~~

~~(b) A prospective applicant should request a Project Review Sheet from the permit specialist or district coordinator in the early planning stages of a project so that potential regulatory requirements are identified.~~

~~(c) The Secretary shall give deference to a certification by a designer with respect to engineering design or judgment exercised by the designer in order to minimize the Secretary's review of certified designs. Nothing in this subsection shall limit the responsibility of the designer to comply with the standards and the Rules, or the authority of the Secretary to review and comment on design aspects of an application or to enforce these Rules with respect to the design or the design certification.~~

~~**§ 1-302(d) Technical Assistance and Project Review**~~

~~(d) The Secretary reserves the option to issue a permit without prior review of the potable water supply or wastewater system design by relying on the design certification required by these Rules.~~

~~**§1-303 Permit Required**~~

~~(a) Except as provided in this section and in section 1-304 of this Subchapter, no person shall take or cause to be taken any of the following actions without first obtaining a permit or permit amendment from the Secretary:~~

~~(1) the subdivision of a lot or lots;~~

~~(2) the construction of a new potable water supply or wastewater system;~~

~~(3) the modification or replacement of an existing potable water supply or wastewater system;~~

~~(4) the construction of a new building or structure;~~

~~(5) the modification of an existing building or structure in a manner that increases the design flow or modifies other operational requirements of a potable water supply or wastewater system;~~

~~(6) the connection of an existing potable water supply or wastewater system to a new or modified structure;~~

~~(7) the change of use of a building or structure in a manner that increases the design flow or modifies other operational requirements of a potable water supply or wastewater system including the conversion of a single family residence from seasonal to year-round use;~~

~~(8) the creation of a campground;~~

~~(9) the modification of a campground, including the creation, modification or relocation of one or more individual campsites, in a manner that affects a potable water supply or wastewater system or the requirements for providing potable water and wastewater disposal;~~

~~(10) the use or operation of a failed potable water supply or failed wastewater system; or~~

~~(11) the commencement of construction of any of the above. For the purposes of this section, commencing construction means any work involving the physical construction or modification of a building or structure and its associated potable water supply or wastewater system including, but not limited to: foundation excavation; foundation or building construction; and site work that involves or may affect any portion of the existing or proposed potable water supply or wastewater system serving the project.~~

~~**§1-303(b)**~~ ~~**Permit Required**~~

~~(b)~~ ~~A person may request, in writing, a jurisdictional determination by the Secretary that a particular building's or structure's use or useful occupancy does not require either a potable water supply or a wastewater system and therefore does not require a permit under this Subchapter. Such request should be submitted prior to the submission of a permit application. All jurisdictional determinations by the Secretary shall be in writing and, if the Secretary determines that no permit is required, such determinations shall be recorded and indexed by the person who requested the determination in the land records for the municipality where the building or structure is located. The Secretary's written determination will indicate that any change in the facts on which the determination is based may require a permit under this subchapter.~~

~~**§1-304**~~ ~~**Exemptions**~~

~~(a)~~ ~~The following are exempt from the permitting requirements of this Subchapter provided the specified conditions are met (Note: more than one exemption may apply in a particular situation).~~

~~(1)~~ ~~(A)~~ ~~All buildings or structures, campgrounds, and their associated potable water supplies and waste water systems that were substantially completed before January 1, 2007 and all improved and unimproved lots that were in existence before January 1, 2007. This exemption shall remain in effect provided:~~

~~(i)~~ ~~No action for which a permit is required under these Rules is taken or caused to be taken on or after January 1, 2007 unless such action is exempt under one of the other permitting exemptions listed in this section; and~~

~~(ii)~~ ~~If a permit has been issued under these Rules before January 1, 2007 that contained conditions that required actions to be taken on or after January 1, 2007, including, but not limited to, conditions concerning operation and maintenance and transfer of ownership, the permittee shall continue to comply with those permit conditions.~~

~~(B)~~ ~~If a permit or permit amendment is required under this subdivision because the potable water supply and/or wastewater system has failed, the variance provisions of section 1-806 of these Rules and the Vermont Water Supply Rules shall be available.~~

~~(C)~~ ~~An owner of a single family residence that qualified on January 1, 2007 for this exemption shall not be subject to administrative or civil penalties under 10 V.S.A. chapters 201 and 211 title for a violation of these Rules when the owner believes the supply or system meets the definition of a failed water supply or failed system provided the owner:~~

~~(i)~~ ~~conducts or contracts for an inspection of the supply or system;~~

~~(ii)~~ ~~notifies the Secretary of the results of the inspection; and~~

~~(iii)~~ ~~has not taken or caused to be taken any other action on or after January 1, 2007 for which a permit would be required under these Rules.~~

~~Note 1: Some single family residences on their own lots were authorized under the prior version of these Rules to make changes to the residence, and its associated potable water supply and wastewater system, until July 1, 2007 without obtaining a permit. If those actions occurred prior to July 1, 2007, they do not terminate this exemption.~~

~~Note 2: In order to determine whether something is substantially complete or in existence for the purposes of this exemption, the design flow and/or use of a building or structure, campground, wastewater system, or potable water supply as it existed no earlier than January 1, 2006 shall be used. This year period allows consideration of the most recent seasonal use, fluctuations in business size, etc.~~

~~Note 3: For the purposes of this exemption, lots that before January 1, 2007 had a wastewater system and potable water supply used as a hook-up for a recreational vehicle that was used on a seasonal basis but not a continuous basis, ie: the vehicle comes and goes during the seasonal period, shall considered to be improved lots and therefore qualify for this exemption.~~

~~(2)~~ ~~(A)~~ ~~unimproved lots created by an act of subdivision that occurs on or after January 1, 2007, provided that:~~

~~(i)~~ ~~the deed, that is recorded and indexed, that describes the affected property contains the following language:~~

~~"Notice of permit requirements. In order to comply with applicable state Rules concerning potable water supplies and wastewater systems, a person shall not construct or erect any structure or building on the lot of land described in this deed if the use or useful occupancy of that structure or building will require the installation of or connection to a potable water supply or wastewater system, without first complying with the applicable Rules and obtaining any required permit. Any person who owns this property acknowledges that this lot may not be able to meet state standards for a potable water supply or wastewater system and therefore this lot may not be able to be improved."; or~~

~~(ii)~~ ~~if there is no deed for the lot that was created by the act of subdivision, i.e. the retained lot, the owner of the unimproved lot shall record and index a copy of the notice language described in subdivision (2)(A)(i) above in the land records for the municipality in which the unimproved lot is located.~~

~~(B)~~ ~~This exemption shall terminate when the person who owns the unimproved lot takes or causes to be taken any action for which a permit is required under this Subchapter,except for the construction, modification, or replacement of a wastewater system or potable water supply that serves a building or structure located on a different lot.~~

~~Note 1: When a lot that is subject to the notice of permit requirements (lot 1) is merged with another lot (lot 2), the notice language may be removed if the two lots are merged in a recorded deed as one lot. The resulting lot shall have the status that lot 2 had prior to the merger. So, for example, if lot 2 was subject to the notice of permit requirements, the entire resulting lot has deferral restrictions. If lot 2 has an existing wastewater and potable water supply permit, the permit may be amended to reflect the additional land. If lot 2 was exempt under this section, the resulting lot shall retain the same exemption.~~

~~Note 2: Some old deferred permits contained a condition that required re-issuance of the permit upon the transfer of land. Notwithstanding the language of that permit condition, these permits do not need to be re-issued provided that the provisions of this exemption are met.~~

~~(3)~~ ~~a single family residence on its own lot, and its associated potable water supply and wastewater system, provided that the residence, supply, and system are constructed in accordance with a municipal permit, issued prior to November 1, 2004 pursuant to a municipal ordinance or zoning bylaw that requires the application of specific technical standards for the design and construction of wastewater systems and provided that no permit under these Rules has been issued. This exemption shall terminate:~~

~~(A)~~ ~~when the lot is subdivided and the resulting lots are not otherwise exempt under these Rules; or~~

~~(B)~~ ~~when any other action for which a permit is required under this Subchapter is taken or is caused to be taken on or after July 1, 2007 other than the construction authorized in this exemption.~~

~~Note 1: Some municipal permits approving wastewater systems include expiration dates to assure that construction occurs within a set period of time. If the municipal permit has expired, it is no longer in effect and therefore this exemption would not apply. People should review their municipal permits before relying on them under this exemption.~~

~~Note 2: Some municipal ordinances and bylaws simply require a design prepared by a professional engineer or site technician and do not have specific technical standards. Municipal permits issued under these types of ordinances and bylaws do not qualify for this exemption.~~

~~Note 3: In accordance with statute, permits issued by municipalities remain in effect even though the local ordinance or by-law has been superseded unless the permit has expired or has been amended under these Rules.~~

~~Note 4: If a municipality required the construction of a temporary structure when issuing a municipal permit under a valid ordinance or by-law, a person may replace the temporary structure and construct the permanent building or structure that was actually permitted. So, for example, if a municipality issued a permit for a three bedroom house but required the construction of a storage shed instead of the house, the house may be finally constructed without requiring a permit under these Rules, so long as the municipal permit remains valid.~~

~~(4) primitive camps on their own individual lots with no interior plumbing consisting of no more than a sink with water that are used for no more than three (3) consecutive weeks per year and no more than a total of sixty (60) days per year.~~

~~(5) a primitive camp, that meets the criteria of subdivision (a)(4) of this section, except that it may be located on the same lot as only one single family residence.~~

~~Note 1: the residence, and its associated potable water supply and wastewater system are only exempt if some other exemption in this section applies.~~

~~(6) the use of a single family residence on its own individual lot, and its associated potable water supply and wastewater system, as a family day care home, as defined in 33 V.S.A. section 4902(3), provided that:~~

~~(A) the residence, and its associated potable water supply and wastewater system, has been permitted under this Subchapter or is exempt from the permitting requirements of this Subchapter; and~~

~~(B) there has been no other change to the residence, lot, potable water supply or wastewater system that would otherwise require a permit under this Subchapter.~~

~~(7) the use of a single family residence on its own individual lot, and its associated potable water supply and wastewater system, for both residential and commercial purposes provided that:~~

~~(A) the commercial purposes do not entail the substantial presence of non-residential employees or regular visits by the public;~~

~~(B) the residence, and its associated potable water supply and wastewater system, has been permitted under this Subchapter or is exempt from the permitting requirements of this Subchapter; and~~

~~(C)~~ ~~there has been no other change to the residence, lot, potable water supply or wastewater system that would otherwise require a permit under this Subchapter.~~

~~(8)~~ ~~the use of an existing single family residence on its own lot, and its associated potable water supply and wastewater system for both residential and commercial purposes where the commercial purposes entail the substantial presence of non-residential employees or regular visits from the public provided that:~~

~~(A)~~ ~~the commercial use of the residence does not result in an increase in design flow or a change in the operational requirements of the potable water supply or wastewater system;~~

~~(B)~~ ~~the commercial use of the residence started after the building was used solely as a residence;~~

~~(C)~~ ~~the owner of the residence tests the potable water supply for total coliform, nitrate, nitrite, arsenic, and uranium;~~

~~(D)~~ ~~the results of the water tests demonstrate compliance with the standards contained in section 1-201(a)(24)(A)(i) of these Rules (the definition of a failed potable water supply) and the owner of the residence submits a copy of such water test results to the Secretary;~~

~~(E)~~ ~~the residence, and its associated potable water supply and wastewater system has been permitted under this Subchapter or is exempt from the permitting requirements of this Subchapter; and~~

~~(F)~~ ~~there has been no other change to the residence, lot, potable water supply or wastewater system that would otherwise require a permit under this Subchapter.~~

~~(9)~~ ~~a building or structure that is used for commercial purposes by an occupant of a single family residence that is located on the same lot and that uses the potable water supply and wastewater system serving the single family residence, provided that:~~

~~(A)~~ ~~the commercial purposes do not entail the substantial presence of non-residential employees or regular visits by the public;~~

~~(B)~~ ~~the residence, and its associated potable water supply and wastewater system, has been permitted under this Subchapter or is exempt from the permitting requirements of this Subchapter; and~~

~~(C)~~ ~~there has been no other change to the building or structure, lot, potable water supply or wastewater system that would otherwise require a permit under this Subchapter.~~

~~(10)~~ ~~the use of an existing building or structure, and its associated potable water supply and wastewater system for commercial purposes by an occupant of a single family residence that is located on the same lot, when the commercial purposes entail the substantial presence of nonresidential employees or regular visits by the public, provided that:~~

~~(A)~~ ~~the commercial use of the building or structure does not result in an increase in design flow or a change in the operational requirements of the potable water supply or wastewater system;~~

~~(B)~~ ~~the owner of the residence tests the potable water supply for total coliform, nitrate, nitrite, arsenic and uranium;~~

~~(C)~~ ~~the results of the water tests demonstrate compliance with the standards contained in section 1-201(a)(24)(A)(i) of these Rules (the definition of a failed potable water supply) and the owner submits a copy of such water test results to the Secretary; and~~

~~(D)~~ ~~there has been no other change to the building or structure, lot, potable water supply or wastewater system that would otherwise require a permit under this Subchapter.~~

~~(11)~~ ~~boundary line adjustments that affect either improved or unimproved lots provided that:~~

~~(A)~~ ~~each lot being adjusted meets one or more of the following standards:~~

~~(i)~~ ~~a lot being reduced in size is being reduced by no more than two percent;~~

~~(ii)~~ ~~a lot is increased in size;~~

~~(iii)~~ ~~the boundary line being adjusted is located, after adjustment, at least 500 feet from the footprint of the building or structure on an improved lot; or~~

~~(iv)~~ ~~the Secretary, on a case by case basis, makes a written determination that the proposed adjustment will not have an adverse effect on any existing potable water supply or wastewater system on the affected lots.~~

~~(B)~~ ~~a diagram is submitted to the Secretary that shows the existing and revised lot boundaries; and~~

~~(C)~~ ~~a copy of the diagram and, if applicable the Secretary's written determination, is recorded and indexed in the land records for the municipality where the lots are located by the landowner.~~

~~Note 1: Boundary line adjustments that were done pursuant to the prior version of this exemption (sections 1-403(a)(12) or 1-404(a)(4) of the January 1, 2005 version of these Rules) remain exempt so long as the diagram and Secretary's determination are recorded and indexed in the land records for the municipality where the lots are located.~~

~~Note 2: Case by case determinations under subdivision(A)(iv) of this exemption will require the submission of a diagram of the lots that shows the locations of all existing, and permitted but not yet built, potable water supplies and wastewater systems.~~

~~(12) minor repair or replacement of a potable water supply or wastewater system that serve a building or structure or campground. (See definition of minor repair or replacement in section 1-201(a)(39)).~~

~~(13) the subdivision of an unimproved or improved lot or campground where the subdivision occurs due to state or municipal condemnation for highway or utility construction, including lots created as a result of a settlement of an action for condemnation and lots created by a transfer in lieu of condemnation, provided that the state has held a hearing pursuant to 19 V.S.A. §502 or a municipality has held a necessity hearing pursuant to 19 V.S.A. §709.~~

~~(14) the connection of a building or structure or campground to a municipal sewer by a municipality at the time of initial construction and operation of the municipal sewer, provided that:~~

~~(A) the municipal sewer and the associated connection are part of a project approved by the Facilities Engineering Division of the Department; and~~

~~(B) either the Facilities Engineering Division of the Department has approved the building connection, or a designer retained by the municipality has signed the design and installation statements required under sections 1-306 and 1-308 of these Rules, submitted them to the Secretary, and recorded and indexed the statements in the land records for the municipality where the residence is located.~~

~~Note: If the building or structure or campground has been permitted under these Rules prior to the new connection, the existing permit shall be amended to reflect the change in the wastewater disposal method the amended permit shall be recorded and indexed in the land records for the municipality where the building or structure or campground is located.~~

~~(15)~~ ~~a single family residence on its own lot that does not have both a piped potable water supply and a piped wastewater system before January 1, 2007 provided:~~

~~(A)~~ ~~there is no increase in design flows;~~

~~(B)~~ ~~there is no change in use of the building or structure, including but not limited to, the addition of a home business or occupation or the initiation of a family day care operation;~~

~~(C)~~ ~~the building or structure is not a primitive camp, as that term is defined in subdivisions (a)(4) and (5) of this section;~~

~~(D)~~ ~~construction of a piped wastewater system or potable water supply that the building or structure did not have does not occur without first obtaining a permit under this Subchapter; and~~

~~(E)~~ ~~no other actions for which a permit is required under this Subchapter are taken or are caused to be taken.~~

~~Note 1: The replacement of wastewater systems and potable water supplies serving the residence requires a permit but may be done in accordance with the variance procedures of section 1-806 of these Rules.~~

~~Note 2: If the existing wastewater system uses a sewage holding tank, that tank may be replaced with another holding tank that meets the technical requirements of these Rules.~~

~~Note 3: Examples of situations where this exemption applies include, but are not limited to:~~

~~(i)~~ ~~the residence does not have interior plumbing that is piped to a soil-based wastewater system~~

~~(ii)~~ ~~the residence does have interior plumbing that is piped to a soil-based wastewater system but does not have potable water piped into the building~~

~~(iii)~~ ~~the residence does have potable water piped into the building but wastewater is not piped out of the residence to a soil-based wastewater system; or~~

~~(iv)~~ ~~the residence does not have potable water piped into the building~~

~~(16)~~ ~~disposal of wastewater associated with the operation and cleaning of milking equipment, milk storage tanks, and milking parlors. Note: consult the Vermont Agency of Agriculture, Food and Markets regarding regulation of this type of disposal.~~

~~(17)~~ ~~land application of process wastewater generated by farming activities, provided that the land application is conducted in accordance with the Accepted Agricultural Practices adopted by the Vermont Agency of Agriculture, Food and Markets and, if applicable, the Guidelines for Land Application of Dairy Processing Wastes adopted by the Agency. Note: This type of land application may require an indirect discharge permit from the Secretary.~~

~~(18)~~ ~~bonafide primitive or wilderness campgrounds, unless the Secretary determines, on a case-by-case basis, that a particular campground is likely to create a health hazard or threat to the environment.~~

~~(19)~~ ~~the elimination of a campsite in a campground, provided that a permit is obtained before the campsite is reopened or relocated.~~

~~(20)~~ ~~premises used solely for the storage or display of unoccupied or uninhabited mobile homes.~~

~~(21)~~ ~~a building or structure that is exempt or has a permit under these Rules that has been destroyed by fire, flooding, or other act of God or voluntarily removed, may be reconstructed without obtaining a permit or permit amendment provided that:~~

~~(A)~~ ~~if permitted on or after January 1, 2007, the reconstructed building or structure is in compliance with all permit conditions;~~

~~(B)~~ ~~the building or structure is reconstructed in approximately the same location;~~

~~(C)~~ ~~there is no increase in design flow;~~

~~(D)~~ ~~there is no change in the operational requirements of the potable water supply or the wastewater disposal system;~~

~~(E)~~ ~~if the building or structure is exempt it must be reconstructed within two years of its destruction or voluntary removal unless, on a case by case basis, the Secretary extends the time period based on a determination that there are unavoidable delays in reconstruction. If the building or structure is permitted, there is no time limit for the reconstruction; and~~

~~(F)~~ ~~there has been no other change to the building or structure, lot, potable water supply, or wastewater system that would require a permit under these Rules.~~

~~§1-304(a)(22)~~ **~~Exemptions~~**

~~(22)~~ ~~the design and installation of a replacement potable water supply serving only one single family residence on its own individual lot provided:~~

~~(1)~~ ~~the design and installation is performed in accordance with the Vermont Water Supply Rules;~~

~~(2)~~ ~~a form provided by the Secretary regarding the replacement well is recorded and indexed in the land records for the municipality where the project is located and;~~

~~(3)~~ ~~no other action has been taken or has been caused to be taken that would require a permit under these Rules.~~

~~Note: This exemption does not apply if any activity other than single family residency is occurring, including, but not limited to, home occupations, family day-care operations, and accessory living units.~~

~~(b)~~ ~~For exemptions (a) (6), (7), (8), (9) and (10) of this section, non-compliance with the permit issued for the single family residence, or the conditions of the permit exemption for the residence, does not terminate the specific exemption but does constitute a violation that may be enforced by the Secretary.~~

~~(c)~~ ~~Persons who wish to take advantage of any of the permit exemptions listed above are strongly encouraged to document compliance with the conditions of the exemption and record and index such documentation in the land records for the municipality where the lot, building or structure, campground, potable water supply, or wastewater system is located in order to avoid delays in closings for real estate transactions or financing.~~

~~§ 1-305~~ **~~Applications for Permits~~**

~~(a)~~ ~~Any person who is required to obtain a permit or permit amendment under these Rules, shall submit an application to the appropriate Agency Regional Office. All applications shall be made in accordance with the requirements of Appendix 6-A and on the form provided by the Secretary in accordance with the directions provided by the Secretary.~~

~~(b)~~ ~~Where hydrogeolic studies are required, they shall be performed by a qualified hydrogeologist who is a designer or who is working under the supervision of a designer.~~

~~(c)~~ ~~Proposed wastewater disposal areas and potable water supply source locations shall be accurately flagged in the field prior to filing an application. Final approved locations shall be flagged and shall be retained until construction is complete.~~

~~Note: In certain specified circumstances, the Secretary may waive the submission of some or all of the information required for a complete application under this section and Appendix 6-A. Please refer to Appendix 6-A(h) for more details.~~

~~**§ 1-305(d) Applications for Permits**~~

~~(d) The Secretary may deny an application in writing for one or more of the following reasons:~~

~~(1) the site conditions are not suitable for a soil-based wastewater system or potable water supply, or where an unreasonable burden will be placed on a municipal or private sewerage collection system or potable water supply;~~

~~(2) the proposed project does not meet the technical standards set forth in these Rules;~~

~~(3) the information submitted is not sufficient to make a determination that the proposed project can be developed in accord with these Rules;~~

~~(4) an applicant has failed to respond to a request for additional information within the time frame specified in the request;~~

~~(5) the information submitted is determined to be in error; or~~

~~(6) conditions exist or may be created by the proposed project that may endanger public health.~~

~~(e) An applicant may withdraw an application without prejudice at any time until the Secretary renders a decision on the project. If the application is withdrawn prior to initiation of any technical review, the application fee will be refunded. No fee shall be refunded once technical review has begun.~~

~~**§ 1-306 Design Certification**~~

~~(a) All designs and design-related information contained in an application for a permit shall be prepared by a designer and be accompanied by a certification, signed and dated by a designer, that states:~~

~~"I hereby certify that in the exercise of my reasonable professional judgment the design-related information submitted with this application is true and correct, and that the design included in this application for a permit complies with the Vermont Wastewater System and Potable Water Supply Rules and the Vermont Water Supply Rules."~~

~~(b) No permit shall be issued under these Rules unless the design certification required by this section has been submitted to the Secretary.~~

~~(c) Notwithstanding the other provisions of this section, the required design certification:~~

~~(1) is not required when no installation certification is required under section 1-308 of these Rules;~~

~~(2) is not required when a permit amendment is done solely to authorize the addition of land to a permitted lot;~~

~~§ 1-306(c)(3) Design Certification~~

~~(3) is not required for both the wastewater system and water supply when the project involves only the potable water supply or the wastewater system. In this situation, the certification will only be required for the supply or system that is being permitted; or~~

~~(4) is limited to merely that information that the Secretary requires if a waiver of the submission of information is granted under Appendix 6-A, subsection (h).~~

~~§ 1-307 Filing of Permits, Certifications, and Other Documents~~

~~(a) The Secretary shall forward a copy of all permits and/or denials to the municipal planning commission, or development review board, for the municipality in which the project is located, or to the municipal clerk in municipalities without a planning commission or development review board.~~

~~(b) Each permit shall be recorded and indexed by the permittee in the land records for the municipality in which the project is located prior to commencement of any activity authorized under that permit. The permittee shall also be responsible for ensuring that all required design and installation certifications and other documents that are required to be filed under these Rules, or under a specific permit condition, are also recorded and indexed in the land records for the municipality in which the project is located, and that copies of all certifications are sent to the Secretary.~~

~~(c) When a permit or document is required by these Rules to be recorded and indexed it shall be recorded and indexed in accordance with the provisions of 24 V.S.A. sections 1154 and 1161.~~

~~§ 1-308 Installation Certifications~~

~~(a) No permit issued by the Secretary shall remain valid after substantial completion of a potable water supply or wastewater system until the Secretary receives a signed and dated certification from a designer or an installer, as specified in the permit, that states:~~

~~"I hereby certify that in the exercise of my reasonable professional judgment the installation-related information submitted is true and correct and that the potable water supply and wastewater system:~~

~~(1) were installed in accordance with:~~

~~(A) the permitted design and all permit conditions; or~~

~~(B) record drawings and such record drawings are in compliance with the applicable rules, were filed with the Secretary, and are in accordance with all other permit conditions;~~

~~(2) were inspected;~~

~~(3) were properly tested; and~~

~~(4) have successfully met those performance tests."~~

~~(b) Notwithstanding the provisions of subsection (a) of this section, a permit issued by the Secretary shall remain valid for a substantially complete potable water supply or wastewater system without an installation certification if:~~

~~(1) the potable water supply that is permitted is an existing supply where no construction is required and where the supply was either previously permitted or exempt under these Rules; or~~

~~(2) the wastewater system that is permitted is an existing system where no construction is required and where the system was either previously permitted or exempt under these Rules.~~

~~Note: If a permitted project involves the construction of only a potable water supply or only a wastewater system, an installation certification is required only for the supply or system that will be constructed.~~

~~(c) Notwithstanding the provisions of subsection (a) of this section, a permit amendment done solely to authorize the addition of land to a permitted lot does not need an installation certification.~~

~~§ 1-309 General Permit Requirements and Provisions~~

~~(a) The Secretary may include any condition in a permit that he or she deems necessary to protect human health and the environment or to satisfy the purposes and requirements of these Rules including, but not limited to, requirements for operation and maintenance.~~

~~(b) No permit issued by the Secretary for a potable water supply or wastewater system located off the lot shall remain valid as of the date of initiation of construction until a document establishing permanent legal access has been recorded and indexed in the land records of the municipality where the project is located.~~

~~(c) Construction of a potable water supply or wastewater system, as permitted, does not relieve the permittee from the responsibility to properly operate and maintain the supply or system.~~

~~(d) Permits issued under these Rules shall run with the land.~~

~~(e) The Secretary, by issuing permits under these Rules, accepts no legal responsibility for any damage, direct or indirect, of whatever nature and by whomever suffered, arising out of the permitted project.~~

~~**§ 1-309(f) General Permit Requirements and Provisions**~~

~~(f) Permits do not convey any property rights in either real or personal property, or any exclusive privileges, nor do they authorize any infringement of federal, state or local laws or regulations.~~

~~(g) Notwithstanding the repeal of 3 V.S.A. §2873(c), 10 V.S.A. Chapter 61, the mobile home park permitting requirements of 10 V.S.A. Chapter 153, and 18 V.S.A. § 1218, permits regarding trailer camps, tent sites, campgrounds, potable water supplies, and wastewater systems, mobile home parks, and subdivisions issued before the August 16, 2002 shall be deemed to be permits issued under these Rules.~~

~~**§1-310 Site or Foundation Approval**~~

~~(a) Site work or foundation construction may commence prior to the issuance of a permit under this Subchapter only if the Secretary issues a written authorization for the commencement of such activities. This authorization may be granted if the Secretary finds that the commencement of site work or foundation construction will not inhibit the proper planning, design, or construction of the required potable water supply or wastewater system. Such authorization shall either be granted or denied within 21 days of the submission of a written request for the authorization provided that the written request includes all plans and information that the Secretary deems necessary to make the required finding. The request shall include a completed permit application form and the applicable fee. The approval may include conditions limiting the amount of work that may be done prior to the permit being issued.~~

~~**§1-311 Special Permit Standards for the Subdivision of Improved Lots**~~

~~(a) This section shall apply to any improved lots that are proposed to be subdivided.~~

~~(b) Notwithstanding any other provisions of these Rules, the lot or lots subject to the permit or permit amendment required under this section shall comply with the following requirements:~~

~~(1) if permitted, and not otherwise exempt from the permit requirements, the potable water supply and wastewater system serving the building or structure or campground on the lot may continue to be used as is, unless the supply or system is failed at the time of subdivision, or is not in compliance with the continuing requirements of a permit issued before January 1, 2007 or is not in compliance with the conditions of a permit issued on or after January 1, 2007;~~

~~(2) if exempt, the potable water supply and wastewater system serving the building or structure or campground on the lot may continue to be used as is unless the system or supply is failed at the time of subdivision, or is not in compliance with the conditions of the applicable exemption;~~

~~(3) (A) a fully complying area for a replacement wastewater system and potable water supply, serving a single family residence, duplex, and buildings or structures or campgrounds with a design flow of 500 gallons per day or less, is identified unless:~~

~~(i)~~ ~~the existing system and supply meets all of the requirements of these Rules;~~

~~(ii)~~ ~~the new property boundary is 500 feet or more from the existing footprint of the building or structure or campground;~~

~~(iii)~~ ~~any fully complying replacement area is so unaccessible that it would be clearly unreasonable to require its use; or~~

~~(iv)~~ ~~no replacement wastewater area is required because either the existing primary wastewater system is designed and constructed to handle 150% of the design flows and uses pressure distribution designed in accordance with section 1-906 of these Rules or the existing primary wastewater system is a mound wastewater disposal system.~~

~~(B)~~ ~~if no fully complying replacement area can be located within 500 feet of the existing footprint of the building or structure or campground, the variance provisions of section 1-806 of these Rules shall apply. In the event that no replacement is found because any replacement wastewater system built in the area is likely to fail, a holding tank may be used in accordance with the requirements of section 1-919 of these Rules and when the long term operation and maintenance costs of using the holding tank are considered.~~

~~(4)~~ ~~(A)~~ ~~A fully complying area for a replacement wastewater system and potable water supply, serving anything other than a single family residence, duplex, and buildings or structures or campgrounds with a design flow of more than 500 gallons per day, is identified unless:~~

~~(i)~~ ~~the existing supply meets all of the requirements of these Rules; or~~

~~(ii)~~ ~~any fully complying replacement area for the supply is so un-accessible that it would be clearly unreasonable to require its use; or~~

~~(iii)~~ ~~no replacement wastewater area is required because either the existing primary wastewater system is designed and constructed to handle 150% of the design flows and uses pressure distribution designed in accordance with section 1-906 of these Rules or the existing primary system is a mound wastewater disposal system.~~

~~(B)~~ ~~if no fully complying replacement area can be located on the lot that existed prior to subdivision, the variance provisions of section 1-806 of these Rules and the Vermont Water Supply Rules shall apply.~~

~~(5) each lot must have permanent legal access to the primary and any replacement areas that serve the lot; and~~

~~(6) any unimproved lot created by the subdivision is permitted or meets the requirements for a permit exemption.~~

~~§1-312 Special Permit Standards for Public Schools~~

~~(a) Design flows for the expansion of wastewater systems serving existing public schools may be based on the historical rate of wastewater system loading upon a demonstration that there currently is sufficient capacity for periods of peak demand and there is a strong likelihood of sufficient capacity for future periods of peak demand.~~

~~(b) Replacement area requirements for wastewater systems in Subchapter 8 of these Rules may be waived for existing public schools if the system design includes sufficient safety factors to protect the primary area. A mound wastewater disposal system sized to handle 100% of the design flows or any other type of soil-based disposal system that is sized to handle 150% of the required design flows are two examples of systems with sufficient safety factors that protect primary area.~~

~~§1-313 Special Permit Standards for Campgrounds~~

~~(a) In addition to meeting the potable water supply and wastewater system permitting standards described in these Rules, the following permitting standards shall apply:~~

~~(1) Each individual campsite shall be at least 2,500 square feet in size, with a minimum width of 25 feet. Each campsite shall be dry, clean and well drained during normal weather conditions.~~

~~(2) Potable water shall be available at faucets or from approved water supply risers or both. No water supply riser shall be located within 10 feet of a sewer connection. A faucet shall be provided within 400 feet of any dependent campsite. Common drinking vessels at such faucets are not allowed. Dependent campsites are all campsites that do not have individual water and sewer connections and all campsites used for camping units without interior plumbing.~~

~~(3) If water from a piped system is not available, water may be obtained from a spring or a well that is developed and protected in a manner approved by the Secretary.~~

~~(4) When showers or baths are provided, all plumbing shall conform to the Vermont Plumbing Rules.~~

~~§1-313(a)(5) Special Permit Standards for Campgrounds~~

~~(5) At least one dumping station shall be provided per campground, unless all campsites have individual sewer connections or the campground consists entirely of tent sites (which excludes all use by camping units with interior plumbing). Each dumping station shall serve no more than 100 dependent campsites, and shall be supplied with piped water under pressure for flushing and cleaning of the concrete apron after each use.~~

~~(6) All dependent campsites shall be within 400 feet of a toilet facility. These may be either water carried toilets, vault type privies, composting toilets, or incinerating toilets. One toilet or privy seat shall be provided to serve each group of 10 or fewer dependent campsites.~~

~~§ 1-314 Special Permit Standards for Amending Permits when Land is Added to a Lot~~

~~(a) When adding land to a lot already subject to a permit under these Rules, if the permittee wants to amend the permit even though the addition of land to a lot does not require a permit, that amendment shall be processed as an administrative amendment. The permit amendment shall acknowledge the addition of land and shall not require plans, a design certification, or installation certification. If the existing permit includes unfulfilled permit requirements, such as inspection requirements, those requirements shall be satisfied prior to issuance of the permit amendment unless completion of those requirements are authorized to be done at a different time by the permit amendment.~~

~~§ 1-315 Special Permit Standards for the Conversion of a Single Family Residence from Seasonal to Year-Round Use~~

~~(a) Notwithstanding any other provisions of these Rules, a single family residence on its own individual lot that converts from seasonal to year-round use may be granted a permit or permit amendment under these Rules provided~~

~~(1) (A) the potable water supply and wastewater system serving the residence are in full compliance with these Rules; or~~

~~(B) the potable water supply and/or wastewater system serving the residence are not in full compliance with these Rules. In this situation, an assessment shall be performed by a designer in order to determine the degree of non-compliance. Based on this assessment, the designer may prepare a design that uses the variance provisions of §1-806 of these Rules. No permit may be issued under this section that allows the use of a holding tank;~~

~~(2) there is no increase in the number of bedrooms; and~~

~~(3) no other actions for which a permit is required under this Rules are taken or are caused to be taken.~~

~~**Subchapter 4 - Appeals; Declaratory Rulings; Revocations; Enforcement**~~

~~**§ 1-401 Administrative Reconsideration of Permitting Decisions**~~

~~(a) An applicant, or following issuance of a permit, a permittee or any person whose interests are directly affected by the permitted project, may request, in writing, that a decision made in a Regional Office be reviewed by the Regional Office Programs Manager. The decision shall be issued in writing within 30 days.~~

~~(b) Any person who has requested a reconsideration under subsection (a) of this section may, within 30 days of the date of the decision, request that the decision of the Regional Office Programs Manager be reviewed by the Director using the following procedures:~~

~~(1) The person shall submit a written request for reconsideration to the Director. This request must specify which aspects of the decision are at issue, the reasons why the person believes the decision to be in error, and the decision requested of the Director.~~

~~(2) As soon as possible but no later than 15 days after receipt of the request, the Director shall convene a meeting with affected persons, their representatives and Division personnel. The Director may call on other individuals within or outside the Department who have expertise appropriate to the case to assist in her/his review.~~

~~(3) The Director shall issue a written decision within 15 days of the meeting. This time period may be extended if the affected persons agree.~~

~~(c) Any person who requested a reconsideration under subsection (b) above may, within 30 days of the date of the decision, submit a request for reconsideration of the Director's decision to the Commissioner using the following procedure:~~

~~(1) The person shall submit a written request for reconsideration to the Commissioner. This request must specify which aspects of the decision are at issue, the reasons why the person believes the decision to be in error, and the decision requested of the Commissioner.~~

~~(2) The Commissioner may hold additional meetings at her/his discretion or act on the basis of the record.~~

~~(3) The Commissioner shall issue a written decision within 30 days from the date of the request or the last meeting held on the matter, whichever is later. This written decision shall constitute the final decision by the Secretary.~~

~~**§ 1-402 Appeal of Final Agency Action**~~

~~(a) A person aggrieved by a final act or decision, other than an enforcement decision, of the Secretary under these Rules may appeal to the Environmental Court in accordance with 10 V.S.A. Chapter 220.~~

~~**§ 1-403 Declaratory Rulings**~~

~~(a) **General:** On petition of the Division or of a person who may be affected by the enabling statutes for this Rule or by this Rule itself, the Secretary shall render a declaratory ruling as to the applicability of any enabling statutory provision or this Rule as provided for in 3 V.S.A. §808.~~

~~(b) **Content of Petition for Declaratory Ruling:** The petition shall contain:~~

~~(1) the name, address, and telephone number of the petitioner;~~

~~(2) the signature of the petitioner;~~

~~(3) identification of the specific statutory provision or section of this Rule in question;~~

~~(4) a statement of the controversy or uncertainty involved;~~

~~(5) a statement of the petitioner's interest in the subject matter, including the reasons for the submission of the petition;~~

~~(6) a statement of the petitioner's contentions; and~~

~~(7) a memorandum of legal authorities in support of such position or contention.~~

~~(c) **Hearing:** Although in the usual course of disposition of a petition for a declaratory ruling a hearing will not be required, the Secretary may require a hearing in response to a request or by his/her own motion.~~

~~(d) **Hearing Procedure:** Hearings on petitions for declaratory rulings shall be conducted in accordance with the provisions of 3 V.S.A. §809-814, and this section, except that the burden of proceeding and proof that the facts in the petition are correct shall be upon the petitioner.~~

~~(e) **Secretary's Action:** The Secretary shall issue a decision within 30 days of the receipt of a petition for declaratory ruling unless a hearing is held, in which case the Secretary shall issue a decision within 30 days following the close of the hearing. This decision shall constitute the final decision of the Secretary.~~

~~(f) **Record of Declaratory Rulings:** All declaratory rulings shall be in writing. The Department shall maintain a file of all declaratory rulings and make copies of the rulings available to the public upon request.~~

~~§ 1-404 Revocation of Permits~~

~~(a) **General:** The Secretary may revoke a permit either in response to a petition or on his or her own motion. The Division may file a petition and may participate in revocation proceedings.~~

~~(b) **Bases for revocation:** The bases for revocation are:~~

~~(1) violation of a permit condition;~~

~~(2) false or misleading information submitted in support of the permit;~~

~~(3) untrue or incorrect design or installation certifications and/or design or installation related information that do not reflect the exercise of reasonable professional judgment;~~

~~(4) violation or failure to comply with the provisions of these Rules or authorizing statutes;~~

~~(5) a petition to revoke submitted by a municipality based on the expiration of the municipality's approval to connect to its wastewater treatment plant or public water supply; or~~

~~(6) a petition to revoke submitted by the permittee.~~

~~(c) **Petition for Revocation:** All petitions for revocation shall be addressed to the Secretary, shall be copied to the permittee and the landowner(s), and shall include:~~

~~(1) the name, address, and telephone number of the petitioner;~~

~~(2) the signature of the petitioner;~~

~~(3) identification of the specific statutory provision, rule, permit condition, or expired municipal approval in question;~~

~~(4) a statement of the petitioner's interest in the matter and the petitioner's contentions, including the alleged basis for the revocation of the permit; and~~

~~(5) a statement that a copy of the petition for revocation has been sent by the petitioner to the permittee and landowner(s).~~

~~(d) **Party Status:** The Secretary shall determine the right of the petitioner or other persons requesting party status to participate in the proceedings. In determining party status, the Secretary shall consider whether a person or his/her property is directly affected by the permitted project. The Division and the municipality in which the project at issue is located are automatically parties in a revocation proceeding.~~

~~**§ 1-404(e) Revocation of Permits**~~

~~(e) **Notice of Revocation Hearing:** Notice of a Petition for Revocation of a permit shall be sent to the permittee, the municipality in which the project is located, and all other potentially affected parties. The notice shall be issued at least two weeks prior to hearing and shall include the following information:~~

~~(1) the legal authority for revocation;~~

~~(2) a brief statement of facts upon which the proposed action is based;~~

~~(3) a statement that the Secretary will hold a hearing for the purpose of determining whether the permit shall be revoked; and~~

~~(4) the date, time, and place where the hearing will be held.~~

~~(f) **Hearing:** The hearing in a contested case shall be conducted by the Secretary. Any party to the revocation proceedings shall either appear in person or shall be represented by an attorney. The burden of proceeding and of proving that the permit should be revoked shall be upon the party petitioning for revocation. The admissibility of evidence in all revocation proceedings shall be determined under criteria set forth in 3 V.S.A. §810. Upon the request of a party, a hearing shall be transcribed by a qualified stenographer or recorded on an electronic sound device at the election of the party. If transcription by a stenographer is requested, the request shall be in writing and filed at least 10 days before the hearing. Costs shall be borne by the requesting party. The requesting party shall provide one copy of the transcript to the Secretary without cost; other parties wishing a copy shall reimburse the requesting party on a prorated basis.~~

~~(g) **Examination of Evidence, Decision and Order:** The examination of evidence, decision and order shall be governed by the provisions of 3 V.S.A. §§811 and 812. The final decision shall be made within 30 days after the close of the hearing. This decision shall constitute the final decision of the Secretary. Copies shall be sent to the permittee, other parties, the legislative body of the municipality, and all affected municipal and regional planning commissions.~~

~~(h) **Voluntary Revocation:** Notwithstanding the other provisions of this section, the permittee may voluntarily waive the right to have a hearing, in which case the permit may be administratively revoked by the Secretary.~~

~~(i) **Recording:** If the final decision of the Secretary is to revoke the permit, that revocation decision shall be recorded and indexed, by the party who petitioned for revocation, in the land records for the municipality in which the project is located upon close of the appeal period, or upon final resolution of any appeal, whichever is later.~~

~~**§1-405 Enforcement**~~

~~(a) The Secretary may initiate an enforcement action against a person, in accordance with the provisions of 10 V.S.A. Chapter 201 and/or 10 V.S.A. Chapter 211, if the Secretary determines that such person:~~

~~(1) has taken, or caused to be taken, an action that requires a permit or permit amendment under these Rules without first obtaining the required permit or permit amendment;~~

~~(2) has taken, or caused to be taken, an action that is in non-compliance with a permit or permit amendment issued under these Rules;~~

~~(3) is, or has been, in non-compliance with any order or assurance of discontinuance which addresses compliance with these Rules;~~

~~(4) has certified a design, installation or related design or installation information and, as a result of the person's failure to exercise reasonable professional judgment, submits design or installation information that is untrue or incorrect, or submits a design or installs a wastewater system or potable water supply that does not comply with these Rules; or~~

~~(5) has otherwise not complied with the provisions of these Rules.~~

~~Subchapter 5 – Municipal Regulations of Potable Water Supplies and Wastewater Systems~~

~~§1-501 Statewide Uniform Technical Standards~~

~~(a) After June 30, 2007, those provisions of existing municipal ordinances and zoning bylaws that establish technical standards and criteria for the design, construction, operation, and maintenance of potable water supplies and wastewater systems are superseded (i.e. no longer in effect) by the technical standards and criteria of these Rules and the Vermont Water Supply Rules. Municipalities may continue to have ordinances and/or bylaws that:~~

~~(1) are not specifically regulating potable water supplies and/or wastewater systems, but rather regulating development in general, (ex: setbacks);~~

~~(2) only regulate the use and/or operation of municipally owned water and/or sewage treatment plants; and~~

~~(3) require submission of copies of plans and documents used to obtain a state permit under these Rules to the municipality;~~

~~(4) require a certificate of occupancy that is based on full compliance with a state permit issued under these Rules;~~

~~(5) require notice of, and have the option to observe, any soil testing such as the digging of test pits; and~~

~~(6) require time of sale inspections.~~

~~Note: These are merely examples of what a municipality may still regulate as of July 1, 2007 without being delegated. Other options may exist so long as they do not revise the technical standards and criteria of these Rules and the Vermont Water Supply Rules.~~

~~§1-502 Ordinances and Bylaws in Delegated Municipalities~~

~~(a) After June 30, 2007, municipalities that have been delegated the authority to implement the permit program established by these Rules may continue to have ordinances and zoning bylaws that regulate potable water supplies and wastewater systems only to the extent that such ordinances and bylaws:~~

~~(1) eliminate some or all of the permit exemptions contained in this chapter;~~

~~(2) establish requirements for the processing of permits, including but not limited to, informal appeals of municipal acts or decisions, suspension or revocation of permits, and other procedural requirements, that are consistent with the provisions of these Rules and the Vermont Water Supply Rules.~~

~~§1-503~~ ~~Existing Municipal Permits Remain in Effect~~

~~(a)~~ ~~Nothwithstanding the fact that local ordinances and bylaws are superseded after June 30, 2007, as described in section 1-501 of this Subchapter, all permits issued under those municipal ordinances or bylaws shall remain in effect unless and until such permit is superseded by another permit issued under the provisions of these Rules.~~

~~**Subchapter 6 — Delegation**~~

~~**§1-601 Purpose**~~

~~(a) The purpose of this subchapter is to set forth the requirements that municipalities must comply with in order to receive delegation of the permitting and enforcement authorities of this chapter. In order to receive delegation, a municipality must demonstrate that it has sufficient authority, organization, technical expertise and enforcement authorities to adequately administer the permit program in accord with these Rules.~~

~~(b) A municipality may not request partial delegation of the wastewater system and potable water supply permit program under 10 V.S.A. §1976.~~

~~(c) The Secretary will not issue permits under these Rules in a delegated municipality.~~

~~Note: A municipally cannot receive delegation to regulate public water supplies.~~

~~**§1-602 Request for Delegation**~~

~~(a) Application:~~

~~(1) A municipality requesting the delegation of the permitting and enforcement program authorized by this chapter shall apply in writing on forms approved by the Secretary.~~

~~(2) The application shall include:~~

~~(A) the name and address of the municipality and the name of the authorized representative or chair of the local legislative body who is submitting the application on behalf of the municipality;~~

~~(B) signature of the authorized representative of the local legislative body of the municipality;~~

~~(C) the name, address and phone number of the designer responsible for the municipal program;~~

~~(D) a copy of any contract between the municipality and the designer if not a municipal employee;~~

~~(E) a copy of the appointment of the sewage officer, if any;~~

~~(F) a description of the process for accepting, reviewing and processing applications by the municipality;~~

~~(G) a copy of the agreement signed by the authorized representative or chair of the local legislative body committing to administer the program in accord with these Rules; and,~~

~~**§1-602(a)(2)(H)**~~ ~~**Request for Delegation**~~

~~(H)~~ ~~for municipalities cooperating to run the program, separate delegation applications from each municipality for delegation authority, with a copy of the inter-municipal cooperative agreement signed by the chair of each local body indicating the process agreed upon and the roles and responsibilities of the member municipalities.~~

~~(I)~~ ~~authority for the Secretary or his/her designee to enter the municipal property during normal working hours to review documents related to the delegation of the program and to assure compliance with the Rules.~~

~~**§1-603**~~ ~~**Performance Expectations**~~

~~(a)~~ ~~Municipalities receiving and retaining delegation under this subchapter shall:~~

~~(1)~~ ~~at all times administer the program in compliance with these Rules and with related procedures established by the Secretary to clarify, interpret or properly implement the Rules.~~

~~(2)~~ ~~process permit applications and amendments in a prompt and expeditious manner, generally within 30 to 45 days of receipt.~~

~~(3)~~ ~~only issue permits that have been reviewed and found to comply with these Rules by a designer employed by the municipality.~~

~~(4)~~ ~~not, if employing a design firm as the reviewer for the municipality, accept projects designed by employees of the firm for review.~~

~~(5)~~ ~~issue permits for sewerage connections only after receipt of the approved sewage allocation for the project from the owner of the wastewater treatment facility. A municipality shall not authorize connections that are beyond the reserve capacity of the wastewater treatment facility as determined by the Secretary. The municipality must send a copy of its authorization to connect to an indirect discharge system to the Secretary. In addition, if required by the Agency, the municipality must send a copy of its authorization to connect to a municipally owned sewerage collection system;~~

~~(6)~~ ~~provide copies to the Secretary of each permit or denial issued;~~

~~(7)~~ ~~maintain the items in the permit tracking system required by the Secretary;~~

~~(8)~~ ~~if delegation is revoked pursuant to section 1-607 of these Rules, promptly provide copies of all documents and required permit tracking data related to the permits processed during the period of delegation to the Secretary. Electronic or microfilm copies will be acceptable; and~~

~~(9)~~ ~~notify the Secretary if the designer or sewage officer is replaced or if additional designers or sewage officers are authorized to act for the municipality.~~

~~**§1-603(b) Performance Expectations**~~

~~(b) Upon delegating the authority to implement these Rules to a municipality, the Secretary shall deliver electronic copies of the historical permitting documents for permits issued by the State for projects in the municipality for use in administering the permit program.~~

~~(c) The Secretary shall promptly provide implementation documents established for the state permit program to delegated municipalities for their use in implementing the delegated program. Documents clarifying implementation documents shall be provided to delegated municipalities.~~

~~**§1-604 Application Fees**~~

~~(a) Fees for permit applications under this chapter in municipalities with valid delegation of the program shall be established by the municipality in an amount sufficient to support the municipal services provided by the delegated program.~~

~~(b) Municipalities whose delegation authority is revoked, voluntarily or otherwise, shall remit to the state the application fees for any permit application that reverts to the state for issuance.~~

~~**§1-605 Enforcement**~~

~~(a) Municipalities shall take timely enforcement actions in accordance with 10 V.S.A. Chapter 201 to assure compliance with these Rules.~~

~~(b) Penalties imposed through enforcement actions taken by the municipality shall be retained by the municipality.~~

~~(c) Notwithstanding municipal delegation, in instances where a delegated municipality does not or cannot address non-compliance, the Secretary, after consultation with the municipality, may institute enforcement proceedings. In no case shall a program delegation usurp the authority of the Secretary to protect human health and the environment.~~

~~**§1-606 Annual Report**~~

~~(a) An annual report shall be submitted by the delegated municipality to the Secretary on the forms provided by February 15th of the year following delegation and annually thereafter by the same date. The report shall cover the preceding calendar year or portion thereof and shall provide information on:~~

~~(1) number of projects permitted;~~

~~(2) number of projects denied;~~

~~(3) types of supplies and systems;~~

~~(4) number of failed supplies and systems;~~

~~**§1-606(a)(5)**~~ ~~**Annual Report**~~

~~(5)~~ ~~number of failed supplies and systems replaced;~~

~~(6)~~ ~~causes of failure, if known, and method of repair;~~

~~(7)~~ ~~number of permit violations;~~

~~(8)~~ ~~number of enforcement actions initiated, the number completed, and the results of those enforcement actions;~~

~~(9)~~ ~~number of designers referred to the Board of Professional Engineering for discipline;~~

~~(10)~~ ~~number of designers who are not professional engineers referred to the Agency for discipline; and~~

~~(11)~~ ~~such other data as the Secretary, in consultation with the Agency of Commerce and Community Development and the Technical Advisory Committee, may require in order to fulfill the reporting requirements of Act 133 section 15 (j), if such data is integral to the permit applications processed by the municipality.~~

~~**§1-607**~~ ~~**Revocation of Delegation**~~

~~(a)~~ ~~Basis for revocation~~

~~(1)~~ ~~The Secretary may revoke delegation to a municipality for the following reasons:~~

~~(A)~~ ~~violation of the delegation agreement;~~

~~(B)~~ ~~false or misleading information submitted in support of an application for delegation;~~

~~(C)~~ ~~issuing permits that do not comply with these Rules; or~~

~~(D)~~ ~~failure to take timely and appropriate enforcement actions under these Rules~~

~~(2)~~ ~~Delegation shall not be revoked solely based upon a disagreement regarding fees that are appropriate to support the program.~~

~~(3)~~ ~~Delegation shall not be revoked solely on the basis of independent actions of the municipality's designer. If the Agency suspends or revokes the license of the municipality's designer, the municipality shall promptly act to replace the designer. Permits shall not be issued without review by a designer on behalf of the municipality.~~

~~(4)~~ ~~Prior to commencing revocation proceedings, the Secretary shall work with the delegated municipality to achieve compliance with these Rules.~~

~~**§1-607(b) Revocation of Delegation**~~

~~(b) Process for revocation~~

~~(1) Upon investigation of a complaint or on his/her own motion, the Secretary shall send a Notice of Pending Revocation to the subject municipality briefly outlining the proposed basis for revocation of delegation. If the proposed basis for revocation involves actions by a designer, the designer will also be sent the Notice.~~

~~(2) If municipalities have contracted together to perform delegated activities, the Secretary will determine whether all the delegations are affected by the reasons for revocation, and may pursue revocation of delegation of one or all of the delegated municipalities as he or she deems appropriate.~~

~~(c) Party Status: The Secretary shall determine the right of the complainant or other persons requesting party status to participate in the proceedings. The local legislative body of the municipality that is the subject of the proposed revocation is a party by right.~~

~~(d) Notice of Pending Revocation Hearing:~~

~~(1) Notice of a Pending Revocation of Delegation shall be sent to the delegated municipality(ies). If the reasons for revocation involve any actions by a designer contracted to perform reviews for the municipality, the designer will also be sent the notice. The Notice shall be issued at least two weeks before the hearing and shall contain:~~

~~(A) the legal authority for the revocation;~~

~~(B) a brief statement of the issues upon which the proposed action is based;~~

~~(C) notice that the Secretary is holding a hearing for the purpose of determining whether the delegation shall be revoked; and~~

~~(D) the date, time and place the hearing will be held, which shall be in the region of the municipality(ies).~~

~~(e) Hearing: The hearing for revocation of a municipal delegation shall be conducted by the Secretary. Any party to the revocation proceedings shall either appear in person or shall be represented by an attorney. The burden of proceeding and of proving that the permit delegation should be revoked shall be upon the party petitioning for revocation. The admissibility of evidence in all revocation proceedings shall be determined under criteria set forth in 3 V.S.A. §810. Upon the request of a party, a hearing shall be transcribed by a qualified stenographer or recorded on an electronic sound device at the election of the party. If transcription by a stenographer is requested, the request shall be in writing and filed at least 10 days before the hearing. Costs shall be borne by the requesting party. The requesting party shall provide one copy of the transcript to the Secretary without cost; other parties wishing a copy shall reimburse the requesting party on a prorated basis.~~

~~**§1-607(f) Revocation of Delegation**~~

~~(f) Voluntary revocation: The delegated municipality may voluntarily waive the right to submit a petition and/or have a hearing prior to the Secretary revoking delegation.~~

~~(g) Appeal of a decision to revoke delegation: Appeal of a decision to revoke delegation shall be to the Environmental Court in accordance with 10 V.S.A. Chapter 220.~~

~~(h) Applications in process: Applications in process by a municipality requesting voluntary revocation shall be processed by the municipality in accord with the delegation agreement prior to the revocation of delegation. No additional applications shall be accepted by the municipality while the voluntary revocation is proceeding. Applications in process by a municipality that has received a Notice of Pending Revocation shall continue to be processed by the municipality until such time as delegation is revoked.~~

~~**§1-608 Audit of Delegated Programs**~~

~~(a) The Secretary shall audit the programs delegated to the town at least once within the first two years of delegation to assure compliance with these Rules. Such audits shall at a minimum review a random sample of permits issued, inspections made and enforcement actions taken to determine if there is a reasonable level of consistency with the review procedures being used in the regional office. The Secretary may also perform audits for quality control, information gathering, or in response to a complaint.~~

~~(b) A town shall make reasonable accommodation to allow audits to be performed at any time during normal working hours and shall maintain the records so that such an audit will not be delayed.~~

~~**Subchapter 7 – Designer Licensing**~~

~~**§1-701 General Requirements**~~

~~(a) No person shall design a potable water supply or wastewater system that requires a permit, or requires a designer's certification, under these Rules without first obtaining a designer's license from the Secretary, except for professional engineers who meet the requirements of subsection (b) of this section.~~

~~(b) A professional engineer shall be deemed to have a valid designer's license under this section, without going through the licensing process, provided that:~~

~~(1) the engineer is practicing within the scope of his or her engineering specialty; and~~

~~(2) if the engineer designing soil-based disposal systems after June 30, 2003, the engineer, prior to designing;~~

~~(A) submits evidence to the Vermont Board of Professional Engineering that demonstrates that he or she has satisfactorily completed a college-level soils identification course with specific instruction in the areas of soils morphology, genesis, texture, permeability, color, and redoximorphic features; or~~

~~(B) passes a soils identification test administered or approved by the Secretary; or~~

~~(C) retains one or more designers who have taken the course specified in this subsection or passed the soils identification test, whenever performing work regulated under these Rules. The name of the designer responsible for the soils identification for the project shall be included as part of any application or certification~~

~~(c) No person shall review or act on permit applications for a potable water supply or wastewater system that he or she designed or installed.~~

~~**§1-702 Scope of Authority for Designers Who Are Not Professional Engineers**~~

~~(a) Designers who are not professional engineers may prepare designs and the associated applications, for any project that requires a permit under these Rules, subject to the limitations of the class of license that they hold and the limitations described in this section. These designers may:~~

~~(1) design one or more soil-based disposal systems serving one or more buildings or structures or campgrounds, each of which has a design flow of 1350 gallons per day or less and that is expected to serve no more than 24 people;~~

~~(2) design a connection to a municipal or private sewage collection system from an individual building, structure, or campground, any of which has a design flow of 1350 gallons per day or less, that is expected to serve no more than 24 people. The individual building sewer connection may be of any length and may include a pumping station when connected to a gravity flow collection system;~~

~~(3) design one or more potable water supplies serving one or more buildings or structures or campgrounds, each of which has a design flow of 1350 gallons per day or less and that is expected to serve no more than 24 people;~~

~~(4) prepare designs and any associated applications for municipal approval required by a municipal sewage ordinance adopted pursuant to chapter 102 of Title 24 or municipal zoning bylaw provided that the design is limited to the type of wastewater system and/or water supply for which they are authorized under this section;~~

~~(5) perform reviews for a municipality of applications required by a municipal sewage ordinance adopted pursuant to chapter 102 of Title 24 or municipal zoning bylaw; and~~

~~(6) prepare design certifications and installation certifications provided the design is limited to the type of wastewater system and/or potable water supply for which they are authorized under this section.~~

~~(b) Notwithstanding the authorities described above, designers who are not professional engineers shall not design the following types of soil-based disposal systems, municipal connections or water supplies:~~

~~(1) soil-based disposal systems subject to the Indirect Discharge Rules;~~

~~(2) soil-based disposal systems using innovative/alternative systems or products that have received pilot or experimental use approval;~~

~~(3) soil-based disposal systems using innovative/alternative systems or products that have received general use approval when the approval specifies that the design must be prepared by a professional engineer;~~

~~(4) any soil-based disposal system disposing of non-domestic wastewater unless the Secretary has determined it to be compatible with domestic type wastewater. Domestic type wastewater includes, but is not limited to, wastewater associated with toilet use, bathing, clothes washing, cooking, and building maintenance. Examples of wastewater that is non-domestic includes process water, cooling water, and water used for building maintenance that has the potential to be contaminated with materials used in industrial processes.~~

~~(5) connections to a pressure sewer line that connect to a municipal or private sewerage collection system;~~

~~(6) connections to a municipal or private sewage collection system for the disposal of non-domestic wastewater unless the Secretary has determined it to be compatible with domestic type wastewater. Domestic type wastewater includes, but is not limited to, that associated with toilet use, bathing, clothes washing, cooking, and building maintenance. Examples of wastewater that is non-domestic includes process water, cooling water, and that used for building maintenance that has the potential to be contaminated with materials used in industrial processes;~~

~~(7) any water source or distribution system subject to the Vermont Water Supply Rules as a Public Water System;~~

~~(8) any connection into an existing public water supply other than an individual service line serving a building or structure or campground with a design flow of 1350 gallons per day or less;~~

~~(9) any water supply connection that includes a fire hydrant or fire suppression system with more than 2 sprinkler heads; and~~

~~(10) water treatment systems.~~

~~§1-703 Classes of Designer Licenses~~

~~(a) In addition to the restrictions for designers who are not professional engineers described in subsection 1-702(b) of these Rules, there are different classes of designer licenses that authorize designers to do different types of work. These classes are:~~

~~(1) Class 1 – a professional engineer who is authorized to do all aspects of site evaluation, application preparation, certification, and application review for a municipality, provided that he or she complies with subsection 1-701(b) of these Rules;~~

~~(2) Class A – a designer who can do all aspects of site evaluation, application preparation, certification, and application review for a municipality, except the following:~~

~~(A) design site modifications, as described in section 1-912 of these Rules;~~

~~(B) design storage and dose systems, as described in section 1-921 of these Rules;~~

~~(C) design wastewater disposal systems using the two-year time of travel approach, as described in section 1-920 of these Rules;~~

~~**§1-703(a)(2)(D)**~~ ~~**Classes of Designer Licenses**~~

~~(D) design any type of potable water supply other than a single source serving only one single family residence;~~

~~(E) design gravity storage tanks for potable water supplies;~~

~~(F) design innovative/alternative systems approved under Subchapter 10 of these Rules unless the specific approval authorizes Class A designers to design the product or system; and~~

~~(G) review applications for a municipality that include designs that a Class A designer is not authorized to design.~~

~~(3) Class B – a designer who is authorized to do all aspects of site evaluation, application preparation, certification, and application review for a municipality, except for the following:~~

~~(i) design storage and dose systems, as described in section 1-921 of these Rules; and~~

~~(ii) design potable water supplies that serve anything other than single family residences on their own lots until he or she has taken and passed an exam administered by the secretary regarding the design, construction, and operation of potable water supplies.~~

~~Note: Designers licensed under these Rules are permitted to design water and wastewater systems to the limits that they are tested and licensed under these Rules. Licensure under these Rules does not constitute authority to design, provide specification, or consulting services for any work beyond water and wastewater systems. Designers licensed solely under these Rules are not licensed to prepare plans, designs for other civil works including, but not limited to, stormwater systems, grading plans, roadways, access drives, culvert or bridge design, boundary surveys, or subdivision plans or any other services which constitute the practice of engineering or surveying as determined by the Boards of Professional Engineering or Land Surveying.~~

~~**§1-704**~~ ~~**Application for License; Examinations**~~

~~(a) A person who wants a Class A or Class B designer's license must:~~

~~(1) submit a completed and signed application form, provided by the Secretary. The Secretary must receive the application at least three weeks prior to the date of the required examination to ensure processing can be completed with sufficient notice to the applicant. Applications arriving less than three weeks prior to the examination will be processed to the extent possible;~~

~~(2) pay the fee for designers as specified in 3 V.S.A. §2822; and~~

~~§1-704 (a)(3) Application for License; Examinations~~

~~(3) complete and pass the examination administered or approved by the Secretary.~~

~~(b) Examinations for Class A and Class B designers shall consist of both written and field examinations prepared or approved by the Secretary. The examinations shall be offered at least once per year at a time and place publicly announced at least six weeks before the examination and shall be adequate to distinguish between Class A and Class B licenses.~~

~~(c) When the Secretary makes a decision to issue or deny a designer's license, notice shall be furnished in writing to the applicant within ten (10) days of the decision.~~

~~§1-705 License Renewal~~

~~(a) Class A and Class B designers shall maintain their licenses by annually filing a request for renewal, accompanied by the applicable fee, and if required that year, an affidavit of proof of continuing education. Expiration of a license for a period exceeding 2 years shall require re-examination prior to re-licensing.~~

~~(b) Renewals shall not be granted unless the continuing education requirements are met; except that a provisional license may be granted for a period not to exceed 6 months based on a date-specific schedule that will allow a designer to fulfill the continuing education requirements. No designer may be granted more than one provisional license in a four year period.~~

~~(c) All Class A and B designer licenses shall expire annually on December 31st unless renewed.~~

~~(d) Notwithstanding the other requirements of this section, designers certified as site technicians prior to April 26, 1977 shall remain licensed provided they pay the licensing fees necessary to maintain their licenses without expiration and provided that they fulfill the continuing education requirements. In addition, these designers: are subject to the imposition of conditions, suspension or revocation; are not entitled to a Class B certification without first passing the examination; and are subject to all other provisions related to designers who are not professional engineers.~~

~~§1-706 Continuing Education~~

~~(a) All Class A and Class B designers shall complete at least 12 hours of continuing education related to the design, construction, operation, or maintenance of wastewater systems and potable water supplies every 2 years. Proof that the required continued education has been completed will be required for all renewals starting December 1, 2006. Of the 12 hours required, at least 4 hours shall consist of soil related, in-field courses. All courses must be attended in person. Viewing of recordings of courses or on-line courses shall not count towards the continuing education requirements. The Secretary will provide sufficient training sessions to allow for fulfillment of this requirement. The Secretary may also recognize training provided by others as meeting this requirement. It is recommended that pre-approval be requested to ensure that training provided by others will be considered acceptable. In order to demonstrate completion of the continuing education requirements, the designer shall~~

~~submit an affidavit, using the form provided by the Secretary, every other year at the time of license renewal.~~

~~**§1-707 Complaints; Disputes**~~

~~(a) The Secretary may review, on a random basis or in response to a complaint, the testing procedures employed by a designer, the systems designed by a designer, the designs approved or recommended for approval by a designer, and any work associated with the performance of these tasks. This review authority shall apply to all types of designers, including professional engineers.~~

~~(b) If there is a dispute between the Secretary and a professional engineer concerning the design prepared by the engineer or the judgment exercised by the engineer, the engineer may request that the disputed issues be reviewed by a professional engineer employed or retained by the Secretary. The Secretary shall grant all such requests for review.~~

~~**§1-708 Disciplinary Actions; Enforcement**~~

~~(a) The Secretary, after a hearing conducted in accordance with Chapter 25 of Title 3, may suspend, revoke or impose conditions on a designer's license, except one held by a professional engineer. Notice of that revocation shall be included in the next Environmental Notice Bulletin. This proceeding may be initiated on the Secretary's own motion or upon a written request which contains facts or reasons supporting the request for the imposition of conditions, suspension, or revocation. Conduct specified in 3 V.S.A. §129(a) as constituting unprofessional conduct by a licensee is cause for imposing conditions on a designer's license or for the suspension or revocation of a license. In response to a complaint, or on his or her own motion, the Secretary shall refer deficiencies in design or installation performed by a professional engineer under these Rules to the Board of Professional Engineering for further investigation and potential disciplinary action.~~

~~(b) In addition to licensure actions, the secretary may initiate an enforcement action against a designer as specified in subchapter 4 of these Rules.~~

~~Subchapter 8 - General Requirements for Wastewater Systems and Potable Water Supplies~~

~~§1-801 General Requirements for Wastewater Systems and Potable Water Supplies~~

~~(a) This Subchapter applies to all soil-based disposal systems with a design flow of less than 6500 gallons per day and sewerage connections of any size.~~

~~(b) This Subchapter applies to design flows for all potable water supplies that are not public water supplies. All other requirements related to potable water supplies, such as standards for construction and location, are contained in the Vermont Water Supply Rules.~~

~~(c) New projects and projects with increases in design flow must be designed and constructed in accord with these Rules. Replacement systems shall be constructed in accordance with these Rules, but are eligible for variances as provided in §1-806 of these Rules.~~

~~(d) A soil-based disposal system(s) may be located on the lot to be improved or on other land to which the lot owner has permanent legal access. Proof of permanent legal access will be required prior to issuance of any permit, at the time of initiation of construction, or at the time of the transfer of any lot with an off-lot soil-based disposal system.~~

~~(e) If a project involves the construction, modification , replacement or construction of only a wastewater system or only a potable water supply, but not both, the permit that is issued shall only address the changes to the system or the supply that are being made.~~

~~(f) When designing projects under these Rules, a designer shall review not only the project itself but also all potable water supplies and wastewater systems, in existence or permitted at the time the permit application for the project is deemed complete, that are potentially affected by the proposed project. This review shall, at a minimum, assure that the project will not adversely affect such potable water supplies and/or wastewater systems.~~

~~(g) Wastewater systems regulated by these Rules may be subject to provisions from different sections and appendixes. Applicants, installers, and particularly designers are encouraged to become familiar with this Subchapter and Subchapter 9 and the appendixes as there are general requirements, such as isolation distances, that apply to all systems and specific requirements, such as those for mound wastewater disposal systems, that apply to only certain types of systems.~~

~~(h) No new soil-based disposal system with a design flow exceeding 1,000 gallons per day may be approved in a Class A watershed. The design flow of an existing soil-based system that discharges to Class A waters may not be increased if the total design flow will exceed 1,000 gallons per day. In addition, in order for a permit to be issued, there must be no more than one soil-based disposal system per lot and no more than one lot per application.~~

~~**§1-801(i) General Requirements for Wastewater Systems and Potable Water Supplies**~~

~~(i) Wastewater systems that discharge sewage to manure pits are prohibited under these Rules.~~

~~(j) Wastewater systems designed to dispose of 6,500 gallons or more per day of sewage may be under the jurisdiction of the Vermont Indirect Discharge Rules. For such systems, the applicant shall contact the Secretary for a jurisdictional ruling. If the project is under the jurisdiction of the Indirect Discharge Rules, an Indirect Discharge Permit will be required for the treatment and disposal system and a permit issued under this Subchapter will be required for the building or structure or campground connected to that system.~~

~~(k) Wastewater systems designed to use land application for disposal of non-sewage wastes may be under the jurisdiction of the Indirect Discharge Rules. For such systems the applicant shall contact the Secretary for a jurisdictional ruling. If the project is under the jurisdiction of the Indirect Discharge Rules, an Indirect Discharge Permit will be required for the land application of those wastes and a permit issued under this subchapter will be required for the building or structure or campground generating the waste. Any approval for land application of non-sewage wastes will be based on the Vermont Guidelines for the Land Application of Dairy Processing Wastes or other guidance documents approved by the Secretary.~~

~~(l) Wastewater systems designed for the subsurface disposal of non-sewage wastes may be under the jurisdiction of the Underground Injection Control Rules. For systems under those rules, an Underground Injection Control Permit will be required unless the waste is deemed to be compatible with sewage and is disposed of in a wastewater system permitted under this Subchapter.~~

~~**§1-802 Piped Water and Lavatory Required**~~

~~(a) All water produced by a potable water supply shall be delivered through a piped system.~~

~~(b) All buildings or structures and campgrounds shall have at least one (1) lavatory, unless an exemption applies.~~

~~(c) The Secretary may waive some or all of the requirements of this section for buildings or structures, other than single family residences on their own lots, and for campgrounds if he or she determines that the imposition of the requirements would be unreasonable due to the briefness or infrequency of occupancy of a particular building or structure, or class of building or structure, or due to the availability of a nearby potable water supply. Notwithstanding the Secretary's waiver:~~

~~(1) If the owner or operator of a building or structure, or a campground, elects to have a potable water supply, and/or water delivered through a piped system, and/or a lavatory, even though the requirement(s) have been waived, any such supply, piping and lavatory must comply with the requirements of these Rules; and~~

~~§1-802(c)(2) Piped Water and Lavatory Required~~

~~(2) Any waiver granted under this section shall not supersede any other federal, state or local laws concerning potable water supplies, piped systems, and lavatories for employees or the general public in particular buildings or structures, or classes of buildings or structures, nor shall it supersede labor agreements.~~

~~§1-803 Piped Wastewater Disposal and Toilet Required~~

~~(a) All wastewater produced by a building or structure or campground shall be disposed of through a pipe to a wastewater disposal system, unless an exemption applies.~~

~~(b) All buildings or structures shall have at least one (1) toilet.~~

~~(c) The Secretary may waive some or all of the requirements of this section for buildings or structures, other than single family residences, and for campgrounds if he or she determines that the imposition of those requirements would be unreasonable due to the briefness or infrequency of occupancy of a particular building or structure, or class of buildings or structures, or due to the availability of a nearby wastewater system. Notwithstanding the Secretary's waiver:~~

~~(1) If the owner or operator of a building or structure, or a campground, elects to have a wastewater system and/or a toilet, even though the requirement(s) have been waived, then any such system and toilet must comply with the requirements of subsection (a) of this section; and~~

~~(2) Any waiver granted under this section shall not supercede any other federal, state or local laws concerning wastewater systems and toilets for employees or the general public in particular buildings or structures, or classes of buildings or structures, nor shall it supercede labor agreements.~~

~~§1-804 Primary Wastewater Disposal Systems and Replacement Wastewater Areas~~

~~(a) All projects that require a permit under these Rules shall have a primary wastewater disposal system.~~

~~(b) All projects that require a permit under these Rules that use a soil-based disposal system as the primary system shall also have a designated replacement area where a new wastewater disposal system may be constructed except as otherwise provided in this section or in other sections of these Rules.~~

~~(c) There are three (3) options for meeting the replacement area requirement. These options are:~~

~~(1) The identification of a replacement area that meets the design flow requirements for the building or structure or campground;~~

~~§1-804(c)(2) Primary Wastewater Disposal Systems and Replacement Wastewater Areas~~

~~(2) No replacement area will be required if the primary system is sized at the time of design, and at the time of construction, to handle design flows that are 150% of the design flows for the building or structure or campground and the system uses pressure distribution designed in accordance with section 1-906 of these Rules; or~~

~~(3) No replacement wastewater area will be required if the primary system is a mound wastewater disposal system that is designed to handle 100% of the design flows for the building or structure or campground.~~

~~Note: When designing a wastewater system to handle 150% of the design flows, only the leachfield is required to be sized at 150%. Designers may, when looking at all components of the wastewater system, design other components of the system to handle 150% of the design flow if they deem it to be appropriate.~~

~~§1-805 Minimum Site Conditions~~

~~(a) No site may be improved by the construction of a wastewater system unless the site meets one of the following three sets of requirements regarding the minimum requirements for the site. Please note that these are only the requirements for the site and that requirements related to any specific type of wastewater system must also be met. Depending on the site conditions, an inground system, an at-grade system, or a mound system may be approvable. There is no presumption that a design using the performance based design approach must include the use of a filtrate system. Also note that even if a site meets these minimum requirements, additional fill material may be needed in order to meet the requirements for separation distance to bedrock or the seasonal high water table. As an example, a site with only 24" of naturally occurring soil to bedrock, where a non-filtrate disposal system is proposed, would require the addition of 24" of fill material on top of the naturally occurring soil so that the separation from bedrock to the bottom of the crushed stone is at least 48".~~

~~(b) Prescriptive Approach~~

~~(1) Sites that meet the following requirements may be improved using a prescriptive approach.~~

~~(A) There shall be at least 24" of naturally occurring soil with a percolation rate of 120 min/inch or less over bedrock.~~

~~(B) There shall be at least 24" of naturally occurring soil with a percolation rate of 120 min/inch or less above the seasonal high water table.~~

~~(C)~~ ~~The maximum ground slope shall not exceed 30% for wastewater systems on subdivided lots in existence before June 14, 2002. The maximum ground slope shall not exceed 20% for wastewater systems on lots that are subdivided on or after June 14, 2002. The limitation on maximum slope shall not apply to replacement systems that are subject to the variance provisions of Section 1-806 of these Rules.~~

~~(D)~~ ~~The wastewater system shall not be located in a floodway. In addition, if the site is located in a mapped special flood hazard area, the wastewater system must be located, designed, and constructed in a manner that avoids impairment to the system and contamination from the system during flooding. Refer to Flood Resistant Management Design guidance from FEMA 348: Protecting Building Utilities from Flood Damage.~~

~~(c)~~ ~~Enhanced Prescriptive Approach~~

~~(1)~~ ~~Sites that meet the following requirements can be improved using the enhanced prescriptive approach.~~

~~(A)~~ ~~There shall be at least 18" of naturally occurring soil with a percolation rate of 120 min/inch or less over bedrock.~~

~~(B)~~ ~~The site must have at least 12", or the thickness of the "A" soil horizon plus 4", whichever is greater, of naturally occurring soil above the seasonal high water table. Sites with less than 18" of naturally occurring soil above the seasonal high water table must lower the water table as described below:~~

~~(i)~~ ~~A site may be approved without pre-testing of the drain when a designer prepares a plan incorporating drainage of the site and asserts that the drainage will lower the seasonal high water table to provide at least 18" of permeable soil below the surface of the naturally occurring soil, and the Secretary agrees with the designer's assertion; or~~

~~(ii)~~ ~~if the Secretary does not agree, the designer may demonstrate through construction of a drainage system and the performance of groundwater monitoring in accordance with §1-903 below, that the seasonal high water table is lowered to at least 18" below the surface of the naturally occurring soil.~~

~~(C)~~ ~~The ground slope is at least 3% but does not exceed either 30% (for wastewater systems on subdivided lots in existence before June 14, 2002) or 20% (for wastewater systems on lots that are subdivided on or after June 14, 2002). The limitation on maximum slope shall not apply to replacement systems that are subject to the variance provisions of Section 1-806 of these Rules.~~

~~(D)~~ ~~The wastewater system shall not be located in a floodway. In addition, if the site is located in a mapped special flood hazard area, the wastewater system must be located, designed, and constructed in a manner that avoids impairment to the system and contamination from the system during flooding. Refer to Flood Resistant Management Design guidance from FEMA 348: Protecting Building Utilities from Flood Damage.~~

~~(E)~~ ~~The linear loading rate is not more than 2 gal/day/ft.~~

~~(F)~~ ~~The approvable site conditions must continue at least 25' downhill from the system and shall be measured from the toe of any fill used as part of a system.~~

~~(d)~~ ~~Performance Based Approach~~

~~(1)~~ ~~Sites that meet the following requirements may be improved using the performance-based approach.~~

~~(A)~~ ~~There shall be at least 18" of naturally occurring soil above bedrock.~~

~~(B)~~ ~~Sites that do not meet the above requirements for prescriptive designs or enhanced prescriptive designs for depth to seasonal high water table may demonstrate compliance with the Rules, based on a detailed and site specific analysis. The analysis must demonstrate that the system will function during all portions of the year while maintaining at least 6" of naturally occurring unsaturated soil above the calculated level of the effluent plume. The induced groundwater level may rise to less than 6" below the surface of the naturally occurring ground directly under a mound type system, and may rise into the mound fill itself, provided that the 6" distance is maintained at the toes and beyond. Any system based on this approach will require additional fill in order to maintain the required separation between the bottom of the crushed stone or other application surface and the induced water table. The analysis may be based on site specific hydraulic conductivity testing or on a desktop hydrogeologic analysis. All desktop hydrogeologic analyses shall be based on conservative assumptions. The level of information required in order to determine compliance with the Rules will be related to site specific conditions with more "limited" sites requiring more detailed information.~~

~~(C)~~ ~~The maximum ground slope shall not exceed 20% for wastewater systems that are on lots subdivided on or after June 14, 2002. For systems built on other lots, the maximum ground slope shall not exceed 30%, unless the Secretary has granted a specific approval to exceed 30%. The limitation on maximum slopes shall not apply to replacement systems that are subject to the variance provisions of Section 1-806 of these Rules.~~

~~**§1-805 (d)(1)(D)**~~ ~~**Minimum Site Conditions**~~

~~(D)~~ ~~A site-specific approval to construct a wastewater system on a subdivided lot in existence before June 14, 2002 with a ground slope exceeding 30% in the area of the wastewater system may be granted by the Secretary upon a request from a designer that:~~

~~(i)~~ ~~provides specific instructions on the method of construction;~~

~~(ii)~~ ~~Explains how the stability of the site will be maintained during and after construction with specific attention to erosion prevention and sediment control; and~~

~~(iii)~~ ~~Provides site-specific guidance as needed for safe construction.~~

~~(E)~~ ~~The wastewater system shall not be located in a floodway. In addition, if the site is located in a mapped special flood hazard area, the wastewater system must be located, designed, and constructed in a manner that avoids impairment to the system and contamination from the system during flooding. Refer to Flood Resistant Management Design guidance from FEMA 348: Protecting Building Utilities from Flood Damage.~~

~~(e)~~ ~~Erosion prevention and sediment control~~

~~An erosion prevention and sediment control plan shall be submitted with each application involving construction of a wastewater system when the ground slope exceeds 20%. The plan shall address site stability in the area of the wastewater system before, during, and after construction. The plan shall include specifications for construction, surface water diversions if needed, and re-vegetation to prevent soil erosion.~~

~~**§ 1-806**~~ ~~**Variances**~~

~~(a)~~ ~~Variances from the technical standards of these Rules for replacement wastewater systems and potable water supplies may be granted in the following circumstances:~~

~~(1)~~ ~~Replacement wastewater systems and replacement potable water supplies shall be constructed in accordance with the requirements for new systems and supplies whenever possible.~~

~~(2)~~ ~~Replacement systems that serve lots, buildings or structures, or campgrounds under these Rules may be granted the minimum necessary variances from the technical standards when full compliance cannot be obtained or when it would not be cost effective, meaning the value of the incremental increase in environmental and human health protection does not outweigh the cost of achieving the incremental increase.~~

~~(3) A wastewater system does not have to be a failed system in order to qualify for a variance.~~

~~(4) Any replacement system or supply must result in equal or better environmental and human health protection than the previous system or supply.~~

~~(5) Variances may not be granted if they would allow a replacement wastewater system and/or potable water supply to remain a failed system or supply.~~

~~(6) Variances will not be granted for replacement systems or supplies when:~~

~~(A) the replacement system or supply is for a project that requires a permit under these Rules but never obtained the permit, unless the project qualifies for the exemption described in section 1-304(a)(1) of these Rules; or~~

~~(B) the replacement system or supply will allow an increase in design flow.~~

~~(b) Requests for variances shall be accompanied by plans and specifications for the wastewater system and/or potable water supply for which a variance is being requested and a statement of the grounds for the request.~~

~~(c) Approval of a variance under this section shall not relieve the applicant of the responsibility to comply with all other applicable State and local laws, rules, bylaws or ordinances.~~

~~(d) Variances related to a potable water supply are also governed by the Vermont Water Supply Rules.~~

§1-807 Isolation Distances

(a) All wastewater systems that are permitted under this Subchapter shall be designed so that they meet the following isolation distances:

Minimum Isolation Distances	Horizontal Distance (feet)		
Item	**Leachfield**	**Septic Tank**	**Sewer**
Drilled well	(b)	50	50
Gravel pack well, shallow well or spring	(b)	75	75
Lakes, ponds, and impoundments	50[1]	25	25
River, streams	50	25	10
Drainage swales, roadway ditches	25	--	--
Main or municipal water lines	50	50	(d)
Atmospheric Water Storage Tanks	50	50	50
Service water lines	25	25	(d)
Roadways, driveways, parking lots	10	5	(c)
Top of embankment, or slope greater than 30%	25	10	--
Property line (a)	25[2]	10	10
Trees	10	10	10
Other disposal field or replacement area	10[3]	--	--
Foundation, footing, or curtain drains	35[4]	10	--
Public Community Water Supply (e)	(f)	(f)	(f)
Suction water line	100	50	50

These distances may be reduced when evident that the distance is unnecessary to protect an item or increased if necessary to provide adequate protection.

Note: See footnotes and criteria on the following page.

~~**§1-807 Isolation Distances**~~

~~Footnotes **(General Criteria Regarding Isolation Distances)**~~

~~(a) Isolation distances apply regardless of property line location and ownership.~~

~~(b) Separation between potable water supplies and leachfields shall be determined by the methods in the Vermont Water Supply Rule, Appendix A, Part 11, §11.4.~~

~~(c) Sewers under roads, driveways, or parking lots may require protective conduits or sleeves.~~

~~(d) Separation of pressure water lines considered as "service connections" and sewer lines shall adhere to the Vermont Plumbing Rules. Separation of pressure water lines (considered to be part of a public water system as defined by the Vermont Water Supply Rule) and sewer lines shall adhere to the requirements of the Vermont Water Supply Rule.~~

~~(e) This refers to Public Community Water Systems, as defined in the Vermont Water Supply Rule.~~

~~(f) Contact the Department of Environmental Conservation's Water Supply Division, 103 South Main Street, Waterbury, Vermont for isolation distances relative to a public community water supply.~~

~~Footnotes **(Specific Criteria for Isolation Distances)**~~

~~1. The isolation distance to surface waters shall be measured from the nearest portion of the leachfield, which will be the toe of the system for mound and at-grade systems. The isolation distance must be satisfied on a year-round basis, therefore the edge of the surface water is the annual high water level.~~

~~2. For mound wastewater disposal systems, the limit of mound fill must be 25 feet from any downhill property line and 10 feet from all property lines on the side or uphill.~~

~~3. No leachfield or replacement area shall be closer than 10 feet to one another, except as allowed for absorption trench systems in §1-907(m) of these Rules.~~

~~4. If a curtain or foundation drain is downslope of the leachfield, the leachfield cannot be closer than 75 feet to the drain. If the curtain or foundation drain is upslope of the leachfield, it shall be 35' if possible, and a minimum of 20 feet to the leachfield. The isolation distances for mound systems shall be from the edge of the minimum basal area or the edge of the absorption bed or trench, whichever is closer. These distances may be reduced if the designer provides adequate data and analysis to show that effluent from the soil-based disposal system will not enter the drain. Conversely the distance may be increased if it is determined that effluent will enter the drain at the minimum separation distance.~~

~~§1-808~~ **~~Design Flow~~**

~~(a)~~ ~~Wastewater design flows shall be determined based on Tables 1-3 (pages 66-72). Directions for calculating reductions in design flow based on plumbing fixture type and connection to large wastewater disposal systems are included in the Table. Potable water supply design flows are determined per Subsection 1-808(g) below. Based on the design changes listed in Tables 1 and 2, that are reduced from those in the 1996 version of these Rules, it may be possible to add more residential or camping units to an existing potable water supply and/or wastewater system when the supply and/or system conform to design requirements of these Rules and/or the applicable Vermont Water Supply Rules.~~

~~(b)~~ ~~When determining the flows for a particular project, the Secretary may determine that there is sufficient justification for requiring higher or lower flow values. When making this determination, the Secretary shall consider: the nature and design of the project; whether multiple units will be interconnected; past experience on existing projects; metered flows; the design safety factor allowances in Table 1 figures; and potential for fluctuations in flows.~~

~~(c)~~ ~~Flow metering used to support a request for an increase in the amount or type of uses for an existing project, or to support new projects, will require at least six months of daily meter readings. The metering period shall include the peak use periods if there is a seasonal variation, such as for a campground or ski area. The strength of the wastewater must also be determined when needed to size the leachfield or any treatment devices, or to determine any adjustments in leachfield loading rates that may be required. Any decision to adjust design flows based on flow metering must consider data concerning peak flow and long term effects on the wastewater system. Any increase in the number of units, such as bedrooms, people, or restaurant seats for an existing project that is based on metered flows, shall only be allowed when the connection is to an existing supply or system that complies with the design requirements of these Rules and the applicable Vermont Water Supply Rules.~~

~~(d)~~ ~~For projects without a specific design flow in Tables 1-3, such as food processing plants, the Secretary will determine a design flow for the specific project. The Secretary's determination will be based on available information related to the equipment and from metering information from similar projects that is submitted by a designer or that is available from other sources. The strength of the wastewater must also be determined when needed to size the leachfield or any treatment devices, or to determine any adjustments in leachfield loading rates that may be required.~~

~~(e)~~ ~~When collection and building sewers exceed 500 feet in total length, the design flow shall include an allowance for infiltration. New collection systems shall be estimated at 300 gallons/inch of diameter/mile of pipe/day, except when a designer provides project specific information that supports a reduction to not less than 200 gallons/inch of diameter/mile of pipe per day. When a reduction is granted, the acceptable level of leakage for the post construction leakage testing must also be proportionately reduced.~~

~~**§1-808(f) Design Flow**~~

~~(f) A soil-based disposal system constructed to serve a new project, or a project with an increase in design flow may be reduced in size when composting or incinerating toilets are used. Systems for residential units will be granted a 25% reduction. The reduction in size for other systems will be determined on a case by case basis.~~

~~(g) For potable water supplies that are not public water supplies, design flows shall be determined using this section of the Rules. For water supplies that are public water supplies, design flow shall be determined in accord with Section 2.2 and Table A2-1 of the Vermont Water Supply Rules. The design flow for a water supply may be different than wastewater design flows if the water supply is a public water supply. The design flow for the potable water supply may also differ from the wastewater design flow when the design basis of the two systems is different. Examples include:~~

~~(1) The wastewater flow is based on a connection to a wastewater system with a design capacity of 50,000 gallons per day or more and the water supply is an individual supply.~~

~~(2) The wastewater flow is based on connection of 5 or more units into a single wastewater system and the water supply is an individual supply for each unit.~~

~~Note: In the event of a conflict between these Rules and the Water Supply Rules, these Rules shall govern if the potable water supply is not a public water supply.~~

~~**Table 1**~~

~~Design Flow for Residential Units~~

~~(a) The design flow for single family residential units shall be calculated on the following requirements:~~

~~(1) The design flow for each person shall be 70 gallons per person per day;~~

~~(2) the first three bedrooms shall be assumed to have two persons per bedroom;~~

~~(3) each additional bedroom may be assumed to have one person per bedroom. When a building will be subject to rental use or when it is likely there will be extended or frequent high occupancy use, the system should be sized for at least 2 persons per bedroom; and~~

~~(4) the design flow for a single-family residence on its own individual lot shall be based on a minimum of two bedroom.~~

~~(b) When five or more single family residential units are connected to a single soil-based disposal system, a designer may choose to use the following design flows that are based only on the number of residential units without regard for the number of bedrooms:~~

~~§1-808 Design Flow~~ ~~Table 1 – Continued~~

~~Number of Single Family Units~~	~~Project Design Flow~~
~~5 units~~	~~1575 gallons per day~~
~~6 units~~	~~1830 gallons per day~~
~~7 units~~	~~2065 gallons per day~~
~~8 units~~	~~2280 gallons per day~~
~~9 units~~	~~2565 gallons per day~~
~~10 units~~	~~2800 gallons per day~~
~~11 units~~	~~3036 gallons per day~~
~~12 units~~	~~3264 gallons per day~~
~~13 units~~	~~3484 gallons per day~~
~~14 units~~	~~3696 gallons per day~~
~~15 units~~	~~3900 gallons per day~~
~~16 units~~	~~4112 gallons per day~~
~~17 units~~	~~4369 gallons per day~~
~~18 units~~	~~4518 gallons per day~~
~~19 units~~	~~4712 gallons per day~~
~~20 units~~	~~4900 gallons per day~~
~~20+ units~~	~~# of units X 245 gallons per day~~

~~Note: Single family residential units with only one bedroom, such as condominiums and apartment buildings will not benefit from the use of the design flows listed above. Single family residential units, with two bedrooms each, will benefit from use of the table when 11 or more units are connected to a single soil-based disposal system.~~

~~Note: Wastewater disposal systems with a design capacity of 6500 GPD or more may also require an Indirect Discharge Permit.~~

~~(c)~~ ~~Single family residential units connected to a wastewater disposal system with a design capacity of at least 50,000 gallons per day may use a design flow of 210 gallons per unit per day, regardless of the number of bedrooms.~~

~~(d)~~ ~~There is no reduction allowed in Table 1 design flows based on the use of low flow plumbing fixtures as the design flow assumes their use.~~

~~(e)~~ ~~Multi-unit elderly housing projects may be calculated on 1.5 person per unit~~

~~§1-808 Design Flow~~ **~~Table 2~~**

~~Campgrounds (also see camps)~~	~~Open 7 mo/yr Or Less~~	~~Open more than 7 mo/yr~~
~~Campgrounds that allow only tents and camping units with no interior plumbing~~		
~~Central toilets and showers 4 people per site~~	~~75 gpd/site~~	~~100 gpd/site~~
~~Campgrounds that allow only tents and camping units with no interior plumbing~~		
~~Central toilets without showers 4 people per site~~	~~60 gpd/site~~	~~75 gpd/site~~
~~Campground sites that allow camping units with interior plumbing~~		
~~Served by central toilet facilities and dumping stations~~	~~50 gpd/site for central facilities plus 25 gpd/site for the dumping station~~	~~90 gpd/site for central facilities plus 35 gpd/site for the dumping station~~
~~Served by an individual sewer hook-up~~	~~75 gpd/site~~	~~125 gpd/site~~
~~Seasonal RV site with individual sewer hook-up~~		
~~RV owned by the occupant~~	~~75 gpd/site~~	~~125 gpd/site~~
~~RV not owned by the occupant~~	~~125 gpd/site~~	~~175 gpd/site~~
~~Cabins with RV type plumbing~~		
~~4 people per site~~	~~125 gpd/site~~	~~175 gpd/site~~
~~Cabins with conventional plumbing Minimum of 4 people per site~~		
~~With or without kitchen~~	~~50 gpd/person~~	~~50 gpd/person~~
~~With or without kitchen but with laundry facilities~~	~~70 gpd/person~~	~~70 gpd/person~~

~~**§1-808 Design Flow**~~ ~~**Table 2 – Continued**~~

~~Campgrounds~~	~~Open 7 mo/yr Or Less~~	~~Open more than 7 mo/yr~~
~~Park Model RV~~		
~~For first bedroom~~	~~140 gpd/site~~	~~140 gpd/site~~
~~For additional bedroom~~	~~100 gpd/site~~	~~140 gpd/site~~
~~Mobile home used as vacation facilities~~		
~~For first bedroom~~	~~140 gpd/site~~	~~140 gpd/site~~
~~For additional bedrooms~~	~~100 gpd/site~~	~~140 gpd/site~~

~~Note: There is no reduction allowed in Table 2 design flows based on the use of low flow plumbing fixtures as the design flow assumes their use.~~

~~§1-808 Design Flow~~ **~~Table 3~~**

~~OTHER ESTABLISHMENTS~~	~~GALLONS/PERSON/DAY[a,b] (unless otherwise noted)~~
~~Assembly Areas, Conference Room~~	~~5~~
~~Airports (per passenger)~~	~~5~~
~~Bathhouses and Swimming Pools~~	~~5~~
~~Bowling Alley (no food service)(per lane)~~	~~75~~
~~Cafeterias (per seat)~~	~~50~~
~~Camps: Construction camps (semi permanent)~~	~~50~~
~~Day camps (no meals served)~~	~~15~~
~~Resort Camps (Night & Day) with limited plumbing~~	~~50~~
~~Churches: Sanctuary seating x 25%~~	~~5~~
~~Church suppers~~	~~8~~
~~Country Clubs (per resident member)~~	~~100~~
~~Country Clubs (per non resident member present)~~	~~25~~
~~Day Care Centers:~~	
~~Without meals:~~	~~15~~
~~With one meal:~~	~~20~~
~~With two meals:~~	~~25~~
~~Dentists:~~	
~~Staff Member~~	~~35~~
~~Per Chair~~	~~200~~
~~Doctor's Office:~~	
~~Staff Member~~	~~35~~
~~Patient~~	~~10~~
~~Room Rentals:~~	
~~Boarding Houses~~	~~50~~
~~Addition for non resident boarders~~	~~10~~

~~§1-808 Design Flow~~ **~~Table 3- Continued~~**

	~~GALLONS/PERSON/DAY a, b (unless otherwise noted)~~
~~Rooming Houses (per occupant bed space) ……~~	~~40~~
~~Factories (gallons per person, per shift, exclusive of industrial waste)……~~	~~15~~
~~Gyms: Per Participant……~~	~~10~~
~~Spectator ……..~~	~~3~~
~~Hairdressers: Operator ……~~	~~10~~
~~Per Chair …… ……..~~	~~150~~
~~Hospitals (per bed space) ……..~~	~~250~~
~~Hotels with Private Baths(per person sleeping space)~~ [e] ~~……. ……~~	~~50~~
~~Institutions other than hospitals (per bed)……~~	~~125~~
~~Laundries, self service (gallons per machine) ……~~	~~500~~
~~Mobile Home Parks:~~	
~~For wastewater systems serving 4 or fewer trailers (per space) ……..~~	~~450~~
~~For wastewater systems serving 5 or more trailers (per space) ……..~~	~~250~~
~~Motels with bath, toilet (per person sleeping space)~~ [c] ~~……~~	~~50~~
~~Picnic Parks (toilet wastes only/picnicker) ……~~	~~5~~
~~Restaurants (toilet and kitchen wastes/seat, including restaurant and bar seats) ……~~	~~30~~
~~Additional per seat for restaurant serving 3 meals per day …… ……...~~	~~15~~
~~Restaurants (fast food - see cafeterias)……~~	~~50~~
~~Schools:~~	
~~Boarding ……~~	~~100~~
~~Day, without gyms, cafeterias, or showers ……~~	~~15~~
~~Day, with gyms, cafeterias, and showers ……..~~	~~25~~
~~Day, with cafeteria, but without gyms or showers …. .~~	~~20~~

~~§1-808 Design Flow~~ **~~Table 3-Continued~~**

	~~GALLONS/PERSON/DAY~~ [a,b] ~~(unless otherwise noted)~~
~~Service Stations (first set of gas pumps) ……..~~	~~500~~
~~(each set thereafter) ……~~	~~300~~
~~Sewer Line Infiltrationd (where applicable)~~	~~300 gal/in pipe/dia/mile/day~~
~~Shopping Centers/Stores:~~[e]	
~~Large Dry Goods ……...~~	~~5 GPD/100 ft²~~
~~Large Supermarkets with meat department without garbage grinder ……~~	~~7.5 GPD/100 ft²~~
~~Large Supermarkets with meat department with garbage grinder ……..~~	~~11 GPD/100 ft²~~
~~Small Dry Good Stores (in shopping centers) …..~~	~~100 GPD/store~~
~~Theaters:~~	
~~Movie (per auditorium seat)……~~	~~5~~
~~Drive in (per car space) ……~~	~~5~~
~~Veterinary Clinic (3 or less doctors):~~	
~~without animal boarding ……..~~	~~750/clinic~~
~~with animal boarding ……~~	~~1,500/clinic~~
~~Workers:~~	
~~Construction (at semi permanent camps) ……~~	~~50~~
~~Day at schools and offices (per shift) ……~~	~~15~~

~~Note: These Rules change design flows for certain categories. It may be possible to add more residential or camping units to an existing potable water supply and/or wastewater system when the supply and/or system conform to current design requirements.~~

[a] ~~Use eighty (80) percent of design flows for projects to be connected to a wastewater system with a design capacity of 50,000 gallons per day or greater. Note that this design flow reduction applies only to the wastewater flow and DOES NOT apply to a project's associated potable water supply design flows if the water supply is regulated as a public transient, non-transient, or community water supply.~~

[b] ~~A 10% reduction in the design flow may be used when the plumbing includes standard water saving designs. Toilets must be 3.5 gallons per flush or less and showers and faucets must be 2 gallons per minute or less~~

[e] ~~Does not include laundry or restaurant waste.~~

[d] ~~The infiltration design flow is not reduced when water saving plumbing fixtures are used or when a connection is made to a wastewater system with a design flow of 50,000 gallons per day or greater. Any reduction shall be based the requirements of subsection 1-808(c) of this section.~~

~~Note: Elderly housing may be calculated at 1.5 people per bedroom~~

~~**Subchapter 9 – Specific Technical Standards for Wastewater Systems**~~

~~**§1-901 Building Sewers, Sewage Collection Systems, and Lift Stations**~~

~~Appendix 1-A contains guidelines that provide acceptable criteria for the design of these components. Other design standards may be used if approved by the Secretary.~~

~~**§1-902 Soil and Site Evaluations**~~

~~(a) General~~

~~A designer shall conduct a soil and site evaluation. The designer shall prepare a soil and site evaluation report including the necessary tests and investigations. These tests and investigations may include, but are not limited to, soil excavation, percolation testing, site and terrain investigation, groundwater levels, water supply investigations, and hydrogeologic investigations.~~

~~(b) Soil and Site Evaluations~~

~~A designer shall conduct soil excavations in locations chosen to accurately establish the soil conditions across the primary and, when a replacement area is required, replacement wastewater areas. The minimum number of excavations will be two for the primary and two for the replacement area, unless no replacement area is required or unless a proposal to use fewer excavations is approved by the Secretary on a site specific basis. More excavations will be necessary to properly evaluate a site for systems with design flows greater than 600 gallons per day or when initial investigation identifies a highly varied soil condition. The Secretary will allow fewer excavations if the designer demonstrates that the soils are uniform. Primary and, when a replacement area is required, replacement areas shall be tested to a depth sufficient to demonstrate that, when installed, the proposed soil-based systems will meet the isolation distances to bedrock, seasonal high water table, and impervious soil. The Secretary may require additional investigations and excavations to be conducted within each proposed leachfield area to determine uniform suitability of soils or adequacy of depth over bedrock, impervious soils, and the seasonal high water table. Excavations shall be conducted prior to percolation tests to determine at what depth the percolation test shall be conducted. All soils information derived from excavations for the project shall be submitted including excavations that are not used as the basis of any particular soil-based disposal system design. See §1-305 and Appendix 6-A of these Rules for details of what must be submitted with a permit application.~~

~~(1) The location of each excavation shall be individually identified and accurately shown on the site plan.~~

~~(2) A soil profile description shall be written for each excavation. The thickness of the different soil horizons shall be indicated. Horizons shall be differentiated on the basis of color, texture, soil mottles, density, structure and bedrock. Depth shall be measured from the ground surface. The estimated elevation of the seasonal high water table shall be specified. Absence of a seasonal high water table shall also be specified. Soil mottles shall be described in accordance with Appendix 2-A.~~

~~**§1-902(b)(3) Soil and Site Evaluations**~~

~~(3) Percolation tests shall be conducted in representative locations within the proposed leachfield areas using the procedures in Appendix 4-A. At least two or four percolation tests are required, with two in the primary area and, when a replacement area is required, two in the replacement area unless a lesser number is approved by the Secretary. The Secretary may require more tests for systems larger than 600 GPD, or when the soils downslope of the leachfield areas are in question.~~

~~**§1-903 Groundwater Level Monitoring**~~

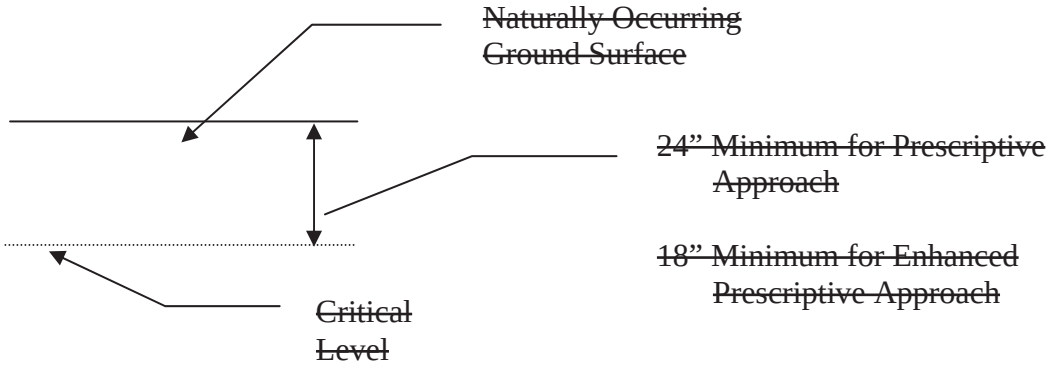
~~(a) Monitoring of the groundwater level may be used in lieu of a determination of the elevation of the seasonal high water table based on soil mottling. Once the elevation of the seasonal high water table is determined, the determination may be used for two purposes. The first is to determine if the site is suitable for wastewater disposal under the Rules. If it is determined that the site is suitable, the second use of the information is to help decide what type of system may be used; an in-ground system, an at-grade system, or a mound system. All portions of the monitored area must comply with the Rules. Testing must include the most limited portions of the monitored area.~~

~~(b) Critical level determination of site suitability - Each monitoring program begins with a determination of the critical level. It must be determined that the seasonal high water table is at or below this level in order to meet the Rules. A site to be used for wastewater disposal under the **prescriptive approach** must have at least 24" from the surface of the naturally occurring soil down to the seasonal high water table. A site using the **enhanced prescriptive approach** must have at least 18" from the surface of the naturally occurring soil down to the seasonal high water table. A site using the **performance-based approach** must first determine the amount of rise in the groundwater table that will occur when the effluent from the leachfield is added to the existing water table. This rise is called induced groundwater mounding. The critical level will be 6" plus the calculated induced groundwater mounding. For example, if the induced groundwater mounding in the water table is 8", the critical level will be 14" (based on 6" of unsaturated soil plus an 8" induced rise in the water table).~~

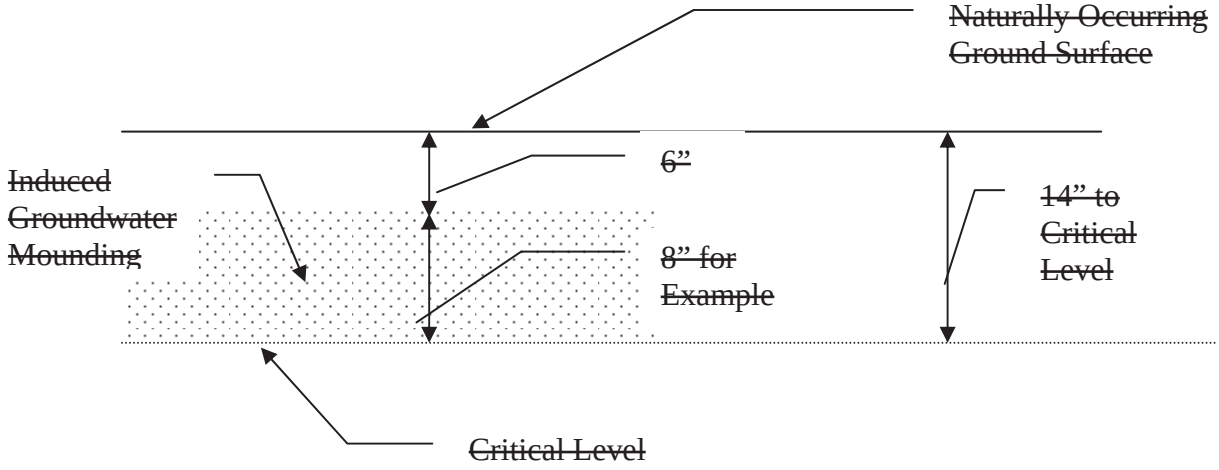
~~(c) While the critical levels noted in subsection (b) are based on meeting minimum site standards, the question is sometimes whether an at-grade system can be used in lieu of a mound wastewater disposal system or an in-ground system in lieu of an at-grade system. For these cases, as shown in figure 9.3 below, the critical level will be 36" below the bottom of the leachfield for a system using septic tank effluent or 24" below the bottom of the leachfield when using filtrate effluent. As an example, if a shallow in-ground system using filtrate effluent with the bottom of the leachfield 8" below ground surface is proposed, the critical level will be 24"+8" = 32" below the ground surface.~~

~~§1-903~~ ~~Groundwater Level Monitoring~~

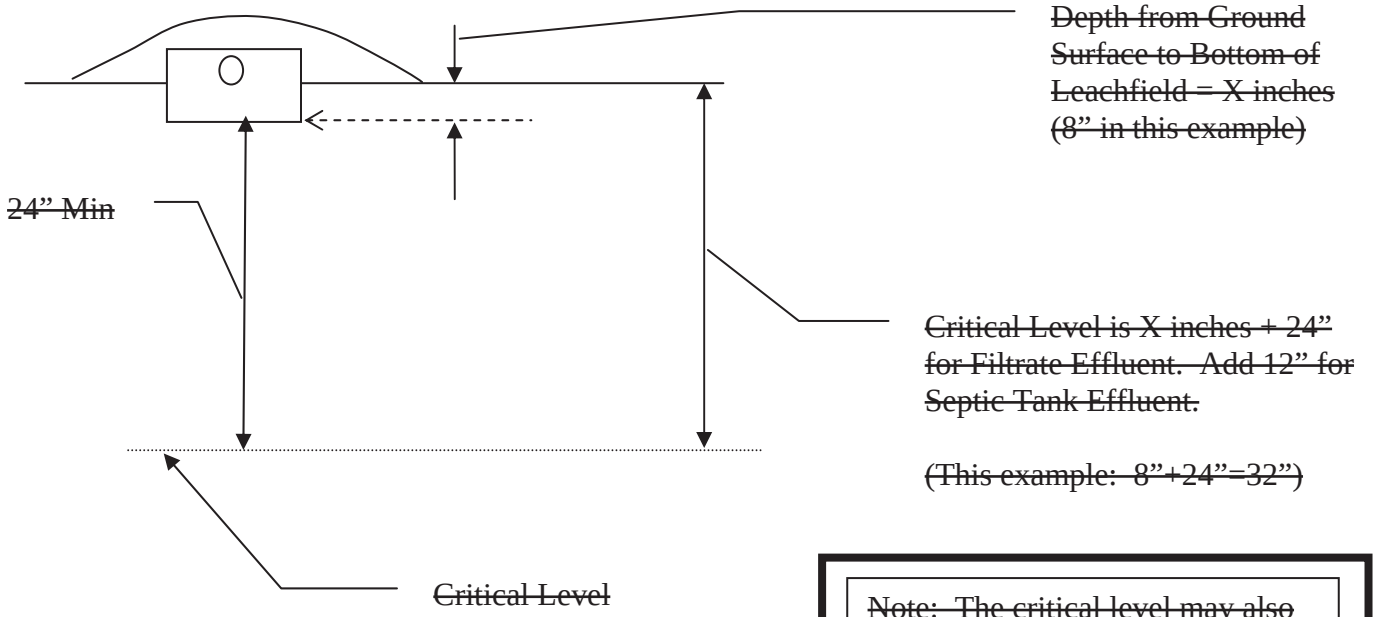
~~Figure 9.1 Critical Levels for Site Suitability~~
~~Prescriptive and Enhanced Prescriptive Based Designs~~



~~Figure 9.2 Critical Level for Site Suitability Performance Based Designs~~



~~Figure 9.3 Critical Level Based on Location of the Bottom of the Leachfield~~



~~Note: The critical level may also be affected by induced groundwater mounding. See §1-903(d) below.~~

~~§1-903(d)~~ ~~**Groundwater Level Monitoring**~~

~~(d)~~ ~~Induced groundwater mounding~~

~~(1)~~ ~~Filtrate disposal systems with linear loading rates greater than 4.5 gallons/day/linear foot, and performance based systems, shall calculate the induced groundwater mounding under the leachfield. In addition to maintaining at least 2' of permeable soil between the bottom of the leachfield and the seasonal high groundwater table, filtrate disposal systems shall maintain at least 18" between the bottom of the leachfield and the top of the induced groundwater mounding. Wastewater systems using septic tank effluent shall maintain at least 36" of permeable soil between the bottom of the leachfield and the top of the induced groundwater mounding. If the induced groundwater mounding for a filtrate disposal system is more than 6" above the seasonal high water table level, the critical level will be more than 24" below the bottom of the leachfield. As an example, for filtrate disposal systems, if the induced groundwater mounding is 8", the critical level will be 26" below the bottom of the leachfield (8"+18" = 26").~~

~~(2)~~ ~~Mound wastewater disposal systems with design flows of greater than 1000 gallons/day and in-ground and at-grade systems with design flows greater than 2000 gallons/day shall calculate the induced groundwater mounding under the leachfield. The system shall maintain at least 36" of unsaturated soil between the bottom of the leachfield and the top of the induced groundwater mounding. As an example, if the induced groundwater mounding is 8" the critical level will be 44" below the bottom of the leachfield (8"+36" = 44").~~

~~(e)~~ ~~Monitoring Procedure~~

~~(1)~~ ~~A minimum of four monitor wells will be required for each area tested unless otherwise approved by the Secretary. Some sites will require more monitor wells to establish compliance with the site requirements. It is strongly recommended that the Secretary be consulted if a groundwater monitoring program will be conducted. If the monitoring program has been approved by the Secretary, the designer may be assured that the number and location of the wells will be regarded as sufficient to provide a definitive answer as to whether or not the site complies with the Rules. The designer should apply no later than February 1st to allow sufficient lead time for review and approval of a monitoring plan. Any proposal for monitoring groundwater levels must include a property access agreement so that Agency personnel may inspect the site during the monitoring period. Any groundwater monitoring program must consider drainage patterns, soil textures, relief watershed, monitor installation procedures, monitor locations, and a monitoring schedule.~~

~~(2)~~ ~~Data collected from groundwater monitoring shall be evaluated against weather conditions over the period of measurement and data from other sites. In years with unusual seasonal groundwater patterns, actual monitoring data may not be representative of long term seasonal high groundwater. If a site is monitored for more than one year, all data must be submitted and the decision will be based on the most restrictive year not discounted because of unusual conditions.~~

~~**§1-903(c)(3)**~~ ~~**Groundwater Level Monitoring**~~

~~(3)~~ ~~The monitoring period shall be from March 1 until May 31. Groundwater level readings shall be taken at least once every 7 days during the monitoring period. If the water level reaches or exceeds the critical level the readings shall be taken at least once every 4 days until the water level falls below the critical level. Each reading shall be considered to represent the water level existing for ½ of the time since the previous reading plus ½ of the time until the next reading. For example, if the readings were 7 days apart, each reading would represent the 3 ½ days before and the 3 ½ days after a particular reading.~~

~~(4)~~ ~~The Secretary may consider information from a groundwater monitoring program that does not include the entire monitoring period. The results will be accepted only upon a conclusive demonstration by the designer that the results accurately represent the seasonal high water table during the monitoring period.~~

~~(5)~~ ~~Each reading shall be recorded as the number of days represented, as described in (3) above. The groundwater monitoring program demonstrates that the critical level is maintained if:~~

~~(A)~~ ~~the groundwater level does not rise above the critical level for more than a total of 30 days during the monitoring period;~~

~~(B)~~ ~~the groundwater level does not rise more than 6" above the critical level for more than a total of 20 days during the monitoring period;~~

~~(C)~~ ~~the groundwater level does not rise more than 12" above the critical level for more than a total of 10 days during the monitoring period;~~

~~(D)~~ ~~the groundwater level never rises more than 18" above the critical level; and~~

~~(E)~~ ~~the seasonal high water table or, if calculated, the induced groundwater mounding, never rises to less than 6" from the naturally occurring ground surface and, if calculated, the induced groundwater mounding never rises to less than 6" below the bottom of a leachfield receiving filtrate effluent.~~

~~(f)~~ ~~On some sites, due to low permeability soils, perched water tables may form in upper soil horizons. For the purpose of any wastewater system designed under these Rules, a perched water table is the seasonal high water table. The designer may analyze these in the same manner as any other type of groundwater table.~~

~~§1-904~~ **~~Septic Tanks~~**

~~(a)~~ ~~All-soil based disposal systems, including graywater disposal systems, shall include a septic tank. The septic tanks shall be sized as noted below:~~

~~Minimum Sizes for Septic Tanks~~

~~Design Flow, Gal/Day~~	~~Liquid Capacity Below the Invert of the Outlet *~~
~~Less than 667 Gal/Day~~	~~1,000 gallons~~
~~667 - 1500 Gal/Gay~~	~~1.5 times design flow~~
~~1,500 - 6500 Gal/Day~~	~~1,125 + 75% of design flow~~

~~* Unless a smaller tank can be justified by the designer.~~

~~Note: When an internal pump is installed within the septic tank, the capacity of the tank must be increased to allow for the dose volume and any emergency storage capacity that will be provided within the septic tank.~~

~~(b)~~ ~~Use of garbage grinders is strongly discouraged. The septic tank capacity shall be increased by a minimum of 25% if a garbage grinder is used.~~

~~(c)~~ ~~All septic tanks shall be installed with access risers to grade. Covers must be tight fitting and must be designed to prevent entry by children.~~

~~(d)~~ ~~Septic tanks shall be watertight, structurally sound, and constructed of materials not subject to extensive corrosion or decay.~~

~~(e)~~ ~~All septic tank installations shall include an effluent filter that has been tested and shown to prevent the passage of solids larger in size than 1/8th inch.~~

~~(f)~~ ~~Specifications and Maintenance. See Appendix 3-A~~

~~§1-905~~ **~~Grease Interceptor~~**

~~(a)~~ ~~An approved grease interceptor shall be installed in the waste line leading from sinks, drains, dishwashers, and other fixtures or equipment in restaurants, cafeterias, bars or clubs, hotels, factories, or school kitchens or other establishments where grease would be a particular concern, except when the wastewater will be disposed of in a municipal wastewater treatment plant.~~

~~Note: A municipal system receiving wastewater from the types of fixtures described above may have its own grease control requirements. Nothing in this rule exempts a person from complying with any municipal ordinance or policy regarding grease control requirements for wastewater being disposed of in a municipal wastewater treatment facility. The applicant is encouraged to contact the municipal officials as early in the design process as possible.~~

~~**§1-905(b)**~~ ~~**Grease Interceptor**~~

~~(b)~~ ~~A grease interceptor designed in accordance with the method described below, derived from the 1997 Uniform Plumbing Code, will be considered acceptable for soil-based systems. Alternative designs may be reviewed and approved based on a demonstration of equal or greater grease removal. Grease removal is very case specific and the designer should consider all of the factors in preparing a design for a grease interceptor, including the effects of ultra hot water.~~

~~(1)~~ ~~Number of Meals per peak hour X Wastewater Flow Rate X Retention Time X Storage Factor = Size Requirement in liquid capacity.~~

~~(A)~~ ~~Number of meals served at peak operating hour (Seating Capacity) X Peak Factor~~

~~(i)~~ ~~Where peak factor for fast food restaurants is …….1.33~~

~~(ii)~~ ~~Where peak factor for all other food service types is. 1.0~~

~~(B)~~ ~~Wastewater flow rate:~~

~~(i)~~ ~~With dishwasher …… 6 gallon flow~~

~~(ii)~~ ~~Without dishwasher …….. 5 gallon flow~~

~~(iii)~~ ~~Single Service kitchen ……. 2 gallon flow~~

~~(iv)~~ ~~Food waste disposer …….. 1 gallon flow~~

~~(C)~~ ~~Retention times~~

~~(i)~~ ~~Commercial kitchen waste/dishwasher …. 2.5 hours~~

~~(ii)~~ ~~Single service kitchen ……. 1.5 hours~~

~~(D)~~ ~~Storage factors~~

~~(i)~~ ~~Fully equipped commercial kitchen …8 hour operation .. 1~~

~~(ii)~~ ~~……16 hour operation .. 2~~

~~(iii) …….. 24 hour operation .. 3~~

~~(iv)~~ ~~Single service kitchen ……. 1.5~~

~~(2)~~ ~~The minimum size grease interceptor shall be 1000 gallon capacity~~

~~§1-905(b)(3)~~ ~~Grease Interceptor~~

~~(3)~~ ~~Construction requirements:~~

~~(A)~~ ~~The tank shall be watertight, structurally sound, and constructed of materials not subject to extensive corrosion or decay.~~

~~(B)~~ ~~The inlet and outlet baffles shall extend from 12" above the bottom of the tank and to well above the waterline and shall allow airflow back into the building plumbing system.~~

~~(C)~~ ~~Each compartment of the tank shall have an access riser to grade. The cover shall be tight fitting and designed to prevent entry by children.~~

~~(4)~~ ~~For the purposes of this Section, a single service kitchen is one where the food preparation consists of heat and serve only and that uses service items not expected to be used again on the premises or, if reused, the items are not washed on the premises. Operations with grills, frying machines, or cooking devices other than those used to heat food are not single service kitchens.~~

~~Note: The Vermont Plumbing Rules may require installation of an interior grease trap. If required, it will not substitute for the grease interceptor required by these Rules.~~

~~§1-906~~ ~~Dosing and Pressure Distribution System Design~~

~~(a)~~ ~~Dosing is recommended for all soil-based disposal systems and is required when the design flow requires more than 500 linear feet of distribution piping.~~

~~(b)~~ ~~Dosing may be accomplished by pumps, siphons, or other devices that can provide sufficient flow and pressure to meet the design requirements of the distribution system.~~

~~(c)~~ ~~Any soil-based disposal system using pressure distribution shall be dosed. The system shall be designed to maintain a minimum pressure of 1 psi (or 2.3 feet of head) at the end of each distribution line. There shall be a maximum of a 10% difference in the per-square foot loading rate between any two trenches or beds within a system. No trench or bed shall be loaded at a rate exceeding that permitted based on the percolation rate and any factors associated with advanced treatment except when approved as an innovative or alternative system. There shall be a maximum 10% difference in the discharge rate between any two orifices in a single trench or bed. The design shall provide even distribution throughout the leachfield. The minimum dose volume shall be 5 times the volume of the distribution network that must be filled during each dosing cycle. There shall be at least 4 dosing cycles per day based on the design flow of the soil-based disposal system. There shall be at least one orifice for each 25 SQFT of leachfield area unless there is a specific requirement in these Rules for additional orifices.~~

~~§1-906 (d)~~ ~~Dosing and Pressure Distribution System Design~~

~~(d)~~ ~~Pressure distribution pipe shall be smooth, rigid pipe and the pipe network shall be designed to allow for periodic cleaning. The distribution pipe shall be constructed so that there is access to the piping system for flushing of the piping system.~~

~~(e)~~ ~~All distribution pipe shall be laid level. Distribution pipe serving separate absorption trenches or absorption beds may be installed at different elevations provided that the design ensures even distribution.~~

~~(f)~~ ~~The minimum orifice diameter shall be 1/8". An septic tank effluent filter that prevents passage of particles larger than 1/8" shall be used to protect the pump, siphon, or other dosing device and the distribution piping. The orifices may face up or down. If the orifices are on the upper side of the pipe, they shall be protected by orifice shields. One or more additional orifices may be placed in the bottom of the pipe to facilitate drainage in situations where freezing of the distribution pipe is possible.~~

~~(g)~~ ~~Alternative designs proposed by a designer that result in equal distribution may be approved by the Secretary.~~

~~§1-907~~ ~~Absorption Trenches~~

~~(a)~~ ~~All absorption trench disposal fields shall comply with all isolation requirements set forth in §1-807 in addition to the isolation requirements in this subsection.~~

~~(b)~~ ~~Absorption trenches shall have a maximum width of 48".~~

~~(c)~~ ~~The size of an absorption trench is calculated as the bottom area of the trench. The amount of area is calculated based on the second slowest percolation rate in the proposed area of the trench, using the following formula:~~

$$\cancel{LR = \frac{3}{\sqrt{t}}}$$

~~where LR is the loading rate in gallons per square foot of absorption trench per day and t equals the percolation rate in minutes per inch. The size of the absorption trench is determined by dividing the design flow in gallons per day by the loading rate in gallons per day per square foot. The result is the number of square feet of bottom area required. The minimum acceptable value for t is 4 min/inch and the maximum acceptable value for t is 60 min/inch. The maximum loading rate is 1.5 gallons per day per square foot.~~

~~(d)~~ ~~Absorption trenches shall extend no deeper than 36" below ground surface.~~

~~(e)~~ ~~Absorption trenches may be installed on slopes of up to 20% on lots subdivided on or after June 14, 2002. For systems built on other lots, slopes of up to 30% or more than 30% may be approved on a case by case basis using a performance based approach. When a system is proposed on a slope of more than 20%, the plans shall meet the requirements of section 1-805(e) of these Rules.~~

~~§1-907 (f)~~ ~~Absorption Trenches~~

~~(f)~~ ~~When installed, the bottom of any absorption trench shall be at least 36" above the seasonal high water table, 36" above any impervious soil layer, and 48" above bedrock. On sloping sites, the measurements shall be taken from the deepest portion of the absorption trench. For systems with design flows of 2000 gpd or more, it shall be determined that the induced groundwater mounding associated with the system will be at least 36" below the bottom of the absorption trench. This determination shall be based on a site specific analysis using either the desk top hydrogeologic analysis or a site specific test. For example, sites with highly permeable soil and with a seasonal high water table significantly more than 36" below the bottom of the absorption trench are possible candidates for such a determination.~~

~~(g)~~ ~~The bottom of any absorption trench shall be level.~~

~~(h)~~ ~~Absorption trenches shall have crushed stone extending a minimum of 2" above and 12" below the distribution pipe. Exception: Absorption trench systems that use the loading rate calculations for absorption beds shall have a minimum of 6" of crushed stone below the distribution pipe. Absorption trenches shall extend a minimum of 6", or the depth of stone below the distribution pipe, whichever is greater, below the ground surface on the downslope edge of the trench.~~

~~(i)~~ ~~Absorption trench systems may be constructed using prefabricated leaching chambers with a minimum H-10 structural loading rating, instead of crushed stone. Distribution pipe must be used in any chamber system.~~

~~(j)~~ ~~The distribution piping must be 4" rigid, perforated pipe that is laid level, or small diameter pipe under pressure. If the distribution piping is more than 100' in length, it must be dosed. The ends of all pipes must be capped except for those at the same elevation, which should be connected.~~

~~(k)~~ ~~A layer of filter fabric shall be placed over the top of the crushed stone.~~

~~(l)~~ ~~Each absorption trench shall be covered with a minimum of 6"and a maximum of 12" of permeable soil, with the uppermost 2"- 4" being topsoil.~~

~~(m)~~ ~~Absorption trenches shall be designed at least 6' on center when measured on a horizontal plane, but in no case shall there be less than 4' of naturally occurring, undisturbed soil between adjacent absorption trenches. Primary and replacement absorption trenches may be interfingered. There shall be at least 4' of naturally occurring, undisturbed soil between the primary and replacement absorption trenches.~~

~~(n)~~ ~~Absorption trenches on sloping ground shall be laid parallel to the ground contours.~~

~~(o)~~ ~~A distribution box shall be installed when multiple absorption trenches are used. Flow equalization devices that can be adjusted to maintain equal distribution during the life of the wastewater system shall be installed in the pipes leading to each absorption trench. The distribution box shall be constructed with an at-grade access. The designer shall consider the need for protection against freezing and shall include design details as needed.~~

~~§1-907 (p)~~ ~~Absorption Trenches~~

~~(p)~~ ~~A reduction in the leachfield area may be allowed for absorption trenches and chamber trenches, where the depth of crushed stone exceeds the normal 12 inch depth below the distribution pipe. These design factors do not apply to gravel less systems. The reductions are as follows:~~

~~PERCENTAGE OF STANDARD DISPOSAL FIELD AREA REQUIRED~~

~~For absorption trenches~~

~~Depth of Crushed Stone Below Distribution Pipe~~	~~Trench Width 12”~~	~~Trench Width 18”~~	~~Trench Width 24”~~	~~Trench Width 36”~~	~~Trench Width 48”~~
~~18 inches~~	~~60%~~	~~64%~~	~~66%~~	~~71%~~	~~75%~~
~~24 inches (max)~~	~~50%~~	~~54%~~	~~57%~~	~~62%~~	~~66%~~

~~(q)~~ ~~No absorption trench shall be constructed in fill material except in accordance with the site modification requirements in §1-912 or §1-913.~~

~~(r)~~ ~~Absorption trenches shall not be constructed in soils with a percolation rate that is slower than 60 min/inch. Construction of absorption trenches in soils with a percolation rate that is faster than 1 min/inch requires a site modification as described in §1-912(e).~~

~~(s)~~ ~~All piping from the building or structure to the septic tank, from the septic tank to a distribution box, or to a pump or siphon chamber, and to the absorption trench shall be non-perforated, rigid pipe. The pipe penetrations shall be sealed to prevent leakage.~~

~~(t)~~ ~~After the absorption trench area has been excavated, any smeared surfaces shall be scarified with a rake. Construction equipment not needed to construct the leachfield shall be kept off the area to be used to prevent undesirable compaction of the soils. Construction shall not be initiated when the soil moisture content is high. If a fragment of soil from about 9” below the surface can easily be rolled into a wire, the soil moisture content is too high for construction purposes.~~

~~§1-908~~ ~~Absorption Beds~~

~~(a)~~ ~~All absorption bed systems shall comply with all isolation requirements set forth in §1-807 in addition to the isolation requirements in this subsection.~~

~~(b)~~ ~~Leachfields that are wider than 48” are referred to as absorption beds.~~

~~(c)~~ ~~The basis of design is the bottom area of the absorption bed. No reduction in area is allowed for extra stone under the distribution pipe.~~

~~(d)~~ ~~The maximum capacity for any single absorption bed is 2000 gallons per day.~~

~~**§1-908 (e) Absorption Beds**~~

~~(e) An absorption bed shall not be constructed in soils with a percolation rate slower than 60 minutes/inch. An absorption bed constructed in soils with a percolation rate faster than 1 minute/inch requires a site modification as described in §1-912 (e)~~

~~(f) Absorption beds shall extend no deeper than 36" below ground surface.~~

~~(g) When installed, the bottom of any absorption bed shall be at least 36" above the seasonal high water table, 36" above any impervious soil layer, and 48" above bedrock. On sloping sites, the measurements shall be taken from the deepest portion of the absorption bed. For absorption bed systems with design flows of 2000 gpd or more, it shall be determined that the induced groundwater mounding associated with the system will be at least 36" below the bottom of the system. This determination shall be based on a site specific analysis using either the desk top hydrogeologic analysis or a site specific test.~~

~~(h) The bottom of any absorption bed shall be level.~~

~~(i) Absorption beds on sloping ground shall be laid parallel to the ground contours.~~

~~(j) A large length to width ratio is recommended.~~

~~(k) Absorption beds shall have a minimum of 2" of crushed stone over the distribution piping and a minimum of 6" of crushed stone below the distribution piping. Absorption beds shall extend a minimum of 6", or the depth of the stone below the distribution piping, whichever is greater, below the ground surface on the downslope edge of the bed.~~

~~(l) All distribution piping shall be laid level. The piping shall be 4" rigid, perforated pipe unless small diameter pipe under pressure is used. Any length of pipe greater than 100' shall be dosed.~~

~~(m) Absorption bed systems may be constructed using prefabricated leaching chambers with a minimum H-10 structural loading rating, instead of crushed stone. Distribution pipe must be used in any chamber system.~~

~~(n) There shall be a layer of filter fabric over the top of the crushed stone.~~

~~(o) Each absorption trench shall be covered with a minimum of 6" and a maximum of 12" of permeable soil, with the uppermost 2"-4" being topsoil.~~

~~(p) Absorption beds shall not be constructed in fill except in accordance with §1-912 or §1-913.~~

~~**§1-908(q)**~~ ~~**Absorption Beds**~~

~~(q)~~ ~~Absorption beds shall be sized on the bottom area only. The design shall be based on the second slowest percolation rate for the site. The loading rate shall be determined by the formula:~~

$$\cancel{LR = 0.8 \times \frac{3}{\sqrt{t}}}$$

~~where LR is the loading rate in gallons per square foot of absorption bed per day and t equals the percolation rate in minutes per inch. The size of the absorption bed is determined by dividing the design flow in gallons per day by the loading rate in gallons per day per square foot. The result is the number of square feet of bottom area required. The minimum useable value for t is 4 min/inch and the maximum acceptable value for t is 60 min/inch. The maximum acceptable loading rate is 1.2 gallons per day per square foot.~~

~~(r)~~ ~~Absorption beds shall not be installed on land with a slope greater than 10%. The area between the downslope edge of the wastewater system and the point where the ground begins to exceed a slope of 30% may have a slope of up to 30%, even though the slope under the leachfield is restricted to no more than 10%.~~

~~(s)~~ ~~All distribution lines within the absorption bed shall be uniformly spaced no more than 6' apart. The maximum distance from a distribution line and the edge of the absorption bed shall be 3'.~~

~~(t)~~ ~~Primary and replacement absorption beds shall be separated by at least 10 feet.~~

~~(u)~~ ~~All piping from the building or structure to the septic tank, from the septic tank to a distribution box, or to a pump or siphon chamber, and to the absorption bed shall be non-perforated, rigid pipe. The pipe penetrations shall be sealed to prevent leakage.~~

~~(v)~~ ~~After the absorption bed area has been excavated, any smeared surfaces shall be scarified with a rake. Construction equipment not needed to construct the leachfield shall be kept off the area to be used to prevent undesirable compaction of the soils. Construction shall not be initiated when the soil moisture content is high. If a fragment of soil from about 9" below the surface can easily be rolled into a wire, the soil moisture content is too high for construction~~

~~**§1-909**~~ ~~**Spray Disposal Systems**~~

~~(a)~~ ~~A spray disposal system is a wastewater system disposing of treated wastewater into the native soil by surface application to the land using aerial dispersion (sprinklers) to distribute the sewage evenly. The maximum size wastewater system approvable under these Rules is 6499 gallons per day of design flow. Larger systems are reviewed under the Indirect Discharge Rules.~~

~~**§1-909 (b) Spray Disposal Systems**~~

~~(b) Wastewater shall be treated to provide an effluent with not more than 30 mg/l BOD_5 and 30 mg/1 TSS. Disinfection with 20-minute chlorine contact time immediately prior to spraying and a 1.0 ppm chlorine residual at the spray nozzle, or a 4.0 ppm total residual chlorine (or other equivalent disinfection method acceptable to the Secretary) shall be required.~~

~~(c) A soil and site evaluation shall be conducted under the supervision of a designer. The designer shall prepare a soil and site evaluation report in the following specific areas to properly locate and design a spray disposal system. The soil and site evaluation shall also include the designer's written opinion regarding the suitability of the soil and site to satisfactorily treat and dispose of the proposed volume of wastewater.~~

~~(1) An acceptable full time spray disposal site should have a fragipan or other impeding layer (silt or clay) beneath a more permeable overburden to prevent direct recharge to an unconfined aquifer or bedrock. A relatively flat site with impermeable soils at the ground surface may sometimes be utilized for spray disposal at lower than normal wastewater applications. Such application rates should be consistent with seepage and evaporation rates expected in the area.~~

~~(2) There shall be sufficient soil investigations on the site to establish that the fragipan or impeding layer is continuous on the site. Investigations shall also indicate the nature of the soil overlying the impeding layer. Soils investigations shall include, but are not necessarily limited to: in place densities, sieve analysis, horizontal and (when necessary) vertical permeability analysis.~~

~~(3) Groundwater recharge areas within bedrock or unconfined aquifer areas shall not be considered acceptable spray disposal sites.~~

~~(d) A hydrogeologic investigation shall be conducted on each spray disposal site by a qualified hydrogeologist. Such an investigation shall include the submission of data in the following specific areas.~~

~~(1) The character and thickness of unconsolidated sediments overlying bedrock at the site shall be provided. The saturated zones in the soil profile shall be indicated, including possible perched water tables, and regional or artesian aquifers at the site. Geophysical testing can be utilized.~~

~~(2) The direction of ground water movements to and from the site, and points or areas of ground water discharge or recharge shall be determined and located on a contour map for local and regional ground water regimes.~~

~~(3) All surface waters and potable and non-potable water supplies within 500 feet of the proposed spray disposal site shall be located on a contour map and, for potable and non-potable water supplies, the following information shall be obtained through house to house survey, well drilling records, observations, or whatever other means are necessary:~~

~~(A)~~ ~~owner of the water supply, whether it is in use or not, and its use as to potable, industrial or agricultural;~~

~~(B)~~ ~~type of water supply: drilled well, dug well, spring, surface water;~~

~~(C)~~ ~~well boring logs when available, depth of casing, depth to aquifer material, and material - i.e., gravel, bedrock, and if available, the predominant bedrock material.~~

~~(D)~~ ~~Any possible effects of the spray disposal system on quality or quantity of any local or regional aquifers, and water supplies shall be evaluated. Hydraulic relationships between the spray disposal site and identified water supplies shall also be evaluated and addressed as to the possible effects on the quality or quantity of the supply.~~

~~(e)~~ ~~The maximum spray disposal site application shall be 2 inches per week over the actual wetted area, with a minimum of 24 hours of rest between applications. The capacity of full time spray disposal sites shall be calculated on the basis of lateral flow downslope over the impeding layer while maintaining a minimum of one (1) foot of unsaturated soil between the ground surface and the resulting water table. Calculations of spray field capacity shall be made using recognized subsurface flow equations. The maximum hourly wastewater application rate shall be 0.25 inches per hour based on the actual wetted area. The maximum acceptable slope for a spray disposal site shall be 25 percent. There shall be a minimum of 5 feet between the wetted area of laterals of sprinklers in the direction of surface water runoff. Spraying during the winter shall be conducted during daylight hours, when air temperatures exceed 10 ° F. The pumping system shall be sized to deliver the average daily wastewater flow to the spray field in not more than eight (8) hours. The spray disposal and storage system shall be sized so that the system can operate effectively without having to spray during the spring run off months.~~

~~(f)~~ ~~There shall be no spray disposal of sewage that discharges to Class A waters. Class A waters are identified and listed in the Vermont Water Quality Standards. Other controls regarding isolation distances for spray disposal systems are:~~

~~(1)~~ ~~the wetted area from any sprinkler in a spray disposal system shall not be closer than 100 feet to the edge of any surface water;~~

~~(2)~~ ~~spray disposal areas shall be well isolated from road, habitation, and other places open to the general public. Isolation distances are dependent upon the intended use and disposition of the treated wastewater, degree of treatment provided, and local meteorological, vegetative and topographical system. The wetted area shall not be permitted closer than 200 feet from habitation, property lines, roads, or areas frequented by the public;~~

~~(3)~~ ~~no portion of a spray disposal area shall be permitted closer than 200 feet to any potable or non-potable water supply; and~~

~~(4) the spray disposal area shall be restricted from the public access by fencing and posting of signs, or other means acceptable to the Secretary, so that the public will be warned against entering the area and possible direct contact with the spray area.~~

~~(g) Any planned multiple use of the spray disposal area will be evaluated on its own merits, and approvals granted at the discretion of the Secretary, with such conditions and additional controls as required. When waivers to specific requirements of these Rules are necessary in order to approve a multiple use, (e.g., waiver of isolation distance requirements for snowmaking on ski trails or irrigation of golf courses), the waiver will be granted upon a showing by the applicant that the environmental and human health concerns, addressed in this section, have been adequately addressed in the multiple use design.~~

~~(h) When required by the Secretary, full time spray disposal systems shall have a storage capacity capable of storing a minimum of two months of wastewater . Seasonal spray disposal system facilities shall have sufficient storage capacity to allow for effective operation with a minimum acceptable storage capacity being 30 days of flow.~~

~~(i) A detailed Operation and Maintenance Manual on the complete wastewater system shall be submitted for review and approval. All sludge removed from the wastewater treatment plant shall be disposed of at locations approved by the Residuals Management Section of the Department. The permittee(s) shall comply with the reporting procedures specified in the Certification from the Residuals Management Section or approved Sludge Management Plan. Monitoring and operation for a spray disposal system shall be as required in §1-910 of these Rules.~~

~~§1-910 Monitoring and Operations~~

~~Monitoring and operation of wastewater systems shall adhere to the requirements of paragraphs (a) and (b) below:~~

~~(a) The required operation and maintenance of a wastewater system that depends only on a septic tank shall be those activities considered necessary to maintain an effective wastewater system. At the discretion of the Secretary, the owner may be required to install and maintain a ground water sampling and monitoring program considered necessary to detect contamination and degradation of ground water and surface water and water supplies with the results submitted to the Secretary in accord with the permit conditions.~~

~~(b) The treatment facilities of spray disposal systems shall be supervised by an operator licensed under the Vermont Wastewater Treatment Facility Operators Certification Program with the applicable certification, and the facilities shall be operated and maintained in a manner satisfactory to the Secretary. Operation reports, including flows received, volumes disposed of, and results of testing necessary to maintain plant efficiency and to demonstrate the reliability of the treatment system, shall be submitted to the Secretary on a monthly basis. Owners of such spray disposal systems where the Secretary has required the installation of groundwater monitors shall~~

~~**§1-910 (b) Monitoring and Operations**~~

~~maintain a groundwater sampling and analysis program to detect contamination and degradation of ground or surface water and potable and non-potable water supplies.~~

~~**§ 1-911 Construction**~~

~~Wastewater systems and potable water supplies shall be constructed in accord with the permitted design. The designer or the installer shall provide the installation certification required in §1-308 of these Rules. When the installation is different from the permitted design, a designer shall specify any deviations from the approved plans, specifications, or permit conditions in record drawings along with recommendations that the project be accepted as is, based on his or her certification of the revised design, or shall specify that alterations must be made to bring the project into compliance with the Rules. If alterations must be made, an installation certification must be completed after the alterations are complete. When the Secretary determines that the scope, complexity, or size, of the proposed facility justifies it, construction shall be accomplished under the supervision of a designer.~~

~~**§1-912 Site Modifications**~~

~~(a) Depending upon the severity of site limitations, it may be possible to convert marginal or unsuitable sites to sites that comply with the specific requirements of these Rules. Applicants may submit plans for the treatment and disposal of wastewater that involve modifications to an existing site intended to bring a non-conforming site into conformance with standards applicable for the type of wastewater system proposed. Cuts or fills that change the elevation of the naturally occurring ground surface 1' or less shall not be considered site modifications for the purposes of this section.~~

~~(1) Site conditions that may be improved by some degree of site modification are shallow depth to impervious layer, shallow depth to seasonal high ground water level, shallow depth to bedrock and excessive slope.~~

~~(2) Acceptable site modifications may include the installation of curtain drains to lower the water table, mound system construction, at-grade systems, filtrate disposal systems, and regrading of the site.~~

~~(3) Restrictions placed on site modifications apply only in cases where the site modifications are necessary to overcome limitations of an otherwise unacceptable site. The restrictions do not apply to modifications designed to enhance the functioning of a system on a complying site.~~

~~(b) Application Procedures and Standard Requirements~~

~~(1) All site modifications must be designed by a Class 1 or Class B designer.~~

~~(2) All plans for site modifications shall be submitted on an accurate contour map with a maximum of two (2) foot contour intervals. A scale of not greater than 20 feet per inch is recommended. A plan may be rejected if the scale is not adequate for review. Existing and proposed ground contours shall be shown along with a permanent benchmark.~~

~~**§1-912(b)(3)**~~ ~~**Site Modifications**~~

~~(3)~~ ~~A permit for the construction of a site modifications may be dependent upon the final site testing.~~

~~(4)~~ ~~Site modifications will not be permitted on sites with less than 24" of native soil over bedrock or ledge or other strata having a percolation rate slower than 120 minutes per inch except in accord with §1-805.~~

~~(5)~~ ~~Site modifications will not be permitted on sites having a seasonal high water table within two (2) feet of the ground surface. Exceptions:~~

~~(A)~~ ~~sloping sites with a seasonal high ground water table 18" or more from the ground surface may be approved for a mound wastewater system no larger than 600 gallons per day, if the designer concludes, and the Secretary agrees, that a curtain drain will lower the seasonal high water table to 24" or more. Mound wastewater disposal systems using trenches shall not use more than two trenches per system; and~~

~~(B)~~ ~~wastewater systems using enhanced prescriptive or performance based designs as described in sections §1-805 (c) and (d).~~

~~(6)~~ ~~Site modifications shall be constructed under the supervision of a Class 1 or Class B designer in accordance with the approved plans. Upon completion of construction, the supervising designer shall provide the certification required in §1-308 of these Rules. Failure to construct the site modifications under the supervision of a designer shall be a basis for revoking approval for the project.~~

~~(7)~~ ~~For site modifications involving flows of more than 2,500 gpd, the Secretary may require such additional design or construction specifications as may be necessary to insure the proper functioning of the system.~~

~~(c)~~ ~~Curtain or Dewatering Drains.~~

~~(1)~~ ~~Curtain or dewatering drains may be used to lower seasonal high water tables, that prevent compliance with the required wastewater disposal system design requirements.~~

~~(2)~~ ~~Drains are highly dependent upon their design and construction and site conditions for continued adequate performance. Prior to designing such drains, it is recommended that the designer consult such references as Drainage of Agricultural Land by the USDA Natural Resources Conservation Service and these Rules for design requirements and expected performance standards.~~

~~(3)~~ ~~When a drain is proposed to lower a seasonal high water table, it must be installed and tested during spring conditions to demonstrate its effectiveness before approval of the wastewater system, unless the Secretary concludes that the designer has provided sufficient evidence to show that the drain will work effectively and that spring testing is not necessary. Subdivision (b)(5)(A) of this section also gives specific guidance for small mound systems.~~

~~(4)~~ ~~The designer shall submit a plan to the Secretary that shows the drain and the proposed location of the wastewater system. After the permit has been issued the drain must be installed and tested before construction can commence, unless an exception has been granted in accordance with subsection (3) above.~~

~~(5)~~ ~~A plan that includes the location of monitoring wells and the schedule of measurement shall be submitted to the Secretary.~~

~~(6)~~ ~~Design Criteria~~

~~(A)~~ ~~All design criteria must be detailed as to plan, profile, discharge location, and typical section. When considered necessary to establish the effectiveness of the proposed drain, the Secretary may request supporting information, including permeability and sieve analysis of the soils at the site.~~

~~(B)~~ ~~The drain shall be constructed of material sufficient to transmit the water from the site and to prevent clogging of the drain and decrease of its effectiveness. The acceptable material shall be crushed stone, perforated or other porous pipe, and filter fabric material to prevent clogging. Other designs of graded material to prevent clogging may be approved when supported with sufficient information.~~

~~(C)~~ ~~If the curtain or foundation drain is downslope of the leachfield, the leachfield shall not be closer than 75 feet to the drain. If the curtain or foundation drain is upslope of the leachfield, it shall be a minimum of 20 feet, 35' if possible, to the leachfield. These distances may be reduced if the designer provides adequate data and analysis to show the effluent from this system will not enter the drain, or increased if effluent will enter the drain.~~

~~(D)~~ ~~All sites using drains shall have monitors installed to monitor their effectiveness. The location and design of the monitors shall be detailed on the plans.~~

~~(E)~~ ~~The outlet of all drains shall be constructed to prevent erosion and clogging. Rodent guards are required.~~

~~(d)~~ ~~Excessive Slope~~

~~(1)~~ ~~In some cases, sites with steep slopes may be regraded and reshaped to provide adequate leachfield sites (see the limitations on slope in §1-805). Prior to regrading, soil excavations shall be performed to show that there will be a sufficient amount of soil over the seasonal high water table and ledge after the regrading (Figure 9.4 page 94).~~

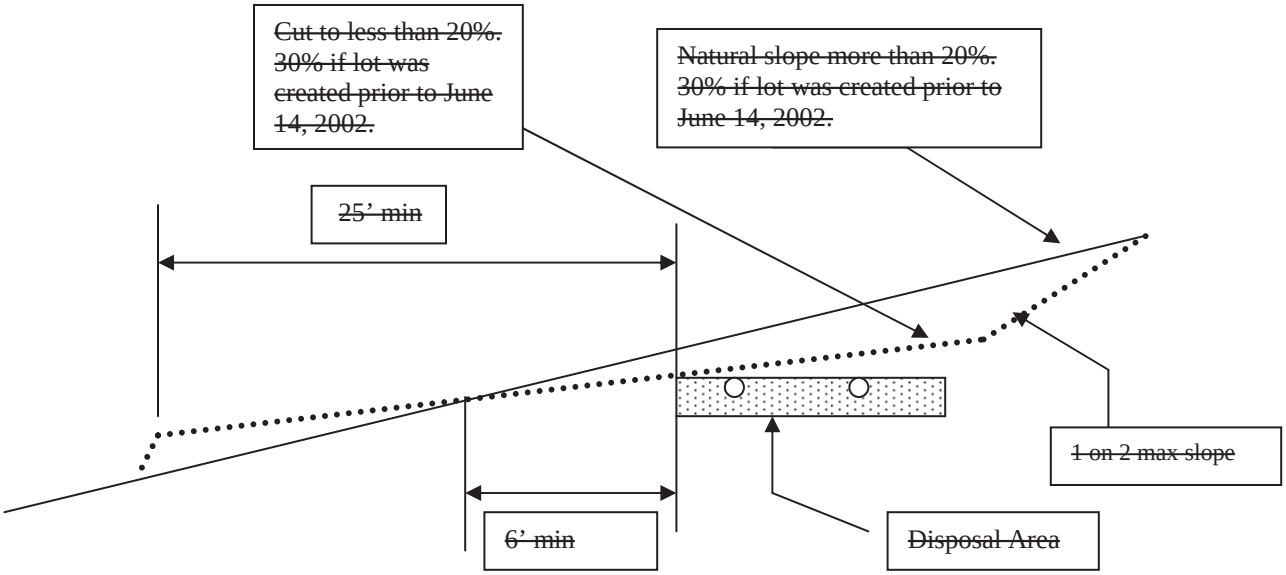
~~(A)~~ ~~The modification for primary and replacement areas shall be complete and soil excavation and percolation tests performed before construction can commence on any regraded site.~~

~~(B)~~ ~~The leachfield shall not be installed in the fill area of a regraded site, though the area of fill may be used as a portion of the required 25 foot separation from the crown of a natural slope. There shall be a minimum of 6 feet of natural soil between the edge of a system and the downslope side of the regraded area.~~

~~(C)~~ ~~An erosion prevention and sediment control plan that meets the requirements of §1-805(e) of these Rules shall be submitted as part of the application.~~

~~§1-912~~ **~~Site Modifications~~** **~~Figure 9.4~~**

~~Natural slope more than 20%~~



~~(e)~~ ~~Rapidly Permeable Soils~~

~~For soils with a percolation rate of faster than one minute per inch, treatment shall be provided with (1) a mound wastewater disposal system; or (2) an absorption trench or absorption bed system backfilled with at least one foot of sandy fill material between the bottom of the crushed stone and the native soil. The fill shall have a percolation rate of three minutes per inch or slower. The application rate shall be based on the percolation rate of the fill in place.~~

~~§1-913~~ **~~Mound Wastewater Disposal Systems~~**

~~(a)~~ ~~Mound wastewater disposal systems may be considered whenever site conditions preclude the use of a subsurface system. Not all sites will meet the minimum requirements for use of a mound system. Due to the nature of a mound wastewater disposal system, the selection of mound location, size of mound, and construction techniques must be thoroughly considered and the criteria established in this section must be carefully followed. See Figure 9.5 on page 97.~~

~~(1)~~ ~~All mound wastewater disposal systems must be designed by a Class 1 or Class B designer.~~

~~(2)~~ ~~The designer shall prepare a contour map using a contour interval of not more than two feet. A scale of not greater than 20 feet per inch is recommended. All details of the mound wastewater disposal system, including but not limited to, toe of slope, surface drains, curtain drains, existing and proposed contours, and trench details shall be shown on the plans.~~

~~§1-913(a)(3) Mound Wastewater Disposal Systems~~

~~(3)~~ ~~The plans shall show that there is sufficient area separate from the primary mound site on the lot to allow for construction of a replacement mound that meets all requirements, if a replacement area is required. The toe of the replacement mound shall not be closer than 10 feet to the toe of the primary mound on the sides or closer than 25 feet on the uphill or downhill side. Separation distances to non-mound systems shall be measured from the toe of the mound to the nearest portion of the adjacent leachfield.~~

~~(4)~~ ~~For mound wastewater disposal systems serving projects generating more than 1,000 gallons per day of wastewater, a hydrogeologic study of the site must be conducted to demonstrate the capability of the site to dispose of the volume of sewage to be generated. The ground water level at the downhill toe of the mound shall be raised no closer than 12" below the ground surface and the induced groundwater mounding beneath the mound shall be no closer than 36" below the bottom elevation of the leachfield within the mound unless using a performance based design per §1-805 of these Rules and /or when disposing of filtrate effluent per §1-916 of these Rules. A site specific test may be conducted if a desktop hydrogeologic analysis is insufficient for an approval.~~

~~(b)~~ ~~Site requirements~~

~~(1)~~ ~~Soils where the seasonal high water table, bedrock, or other strata having a percolation rate slower than 120 minutes per inch occurs within twenty-four inches of natural grade, are not suitable for mound wastewater disposal systems. These limitations may be different if the enhanced prescriptive or the performance based approach is used. The site must be free of these limitations beyond the toe of a mound (primary and replacement) for a distance of twenty five (25) feet in the downslope direction and ten (10) feet on all other sides.~~

~~(2)~~ ~~Mound wastewater disposal systems may be constructed upon undisturbed naturally occurring soils. Mounds may also be approved for sites where the naturally occurring soil has been removed in which case the remaining naturally occurring soil needs to comply with the soil and siting criteria for mound wastewater disposal systems. In rare circumstances, a mound system may be approved for a site where the naturally occurring soil satisfies all of the minimum site requirements for a mound but where fill material not meeting the mound fill requirements has been placed over the naturally occurring soil. A detailed evaluation is required to determine that the non-mound fill is clean mineral soil, with a percolation rate of 120 minutes per inch or less, and that the fill material will not tend to cause horizontal flows that would lead to surfacing of the effluent. The percolation rate of the fill material must be considered in addition to that of the naturally occurring soil and may be a limiting factor. A minimum of 12" of mound fill will be required above the fill material not meeting the mound fill standards.~~

~~(3)~~ ~~A crest site is preferred; no mound wastewater disposal system shall be located in a depression, which could act as a natural surface or ground water collection area.~~

~~(4)~~ ~~Generally, sites with large trees, numerous smaller trees or large boulders are unsuitable for a mound wastewater disposal system because of difficulty in preparing the surface and the reduced infiltration area beneath the mound. Rock fragments, tree roots, stumps and boulders occupy space, within the mound area, thus reducing the amount of soil for proper operation. If no other site is available, then it is recommended to cut the trees at ground level, leaving the stumps. A larger mound area may be necessary if too many stumps are involved, so that sufficient soil is available to accept the effluent.~~

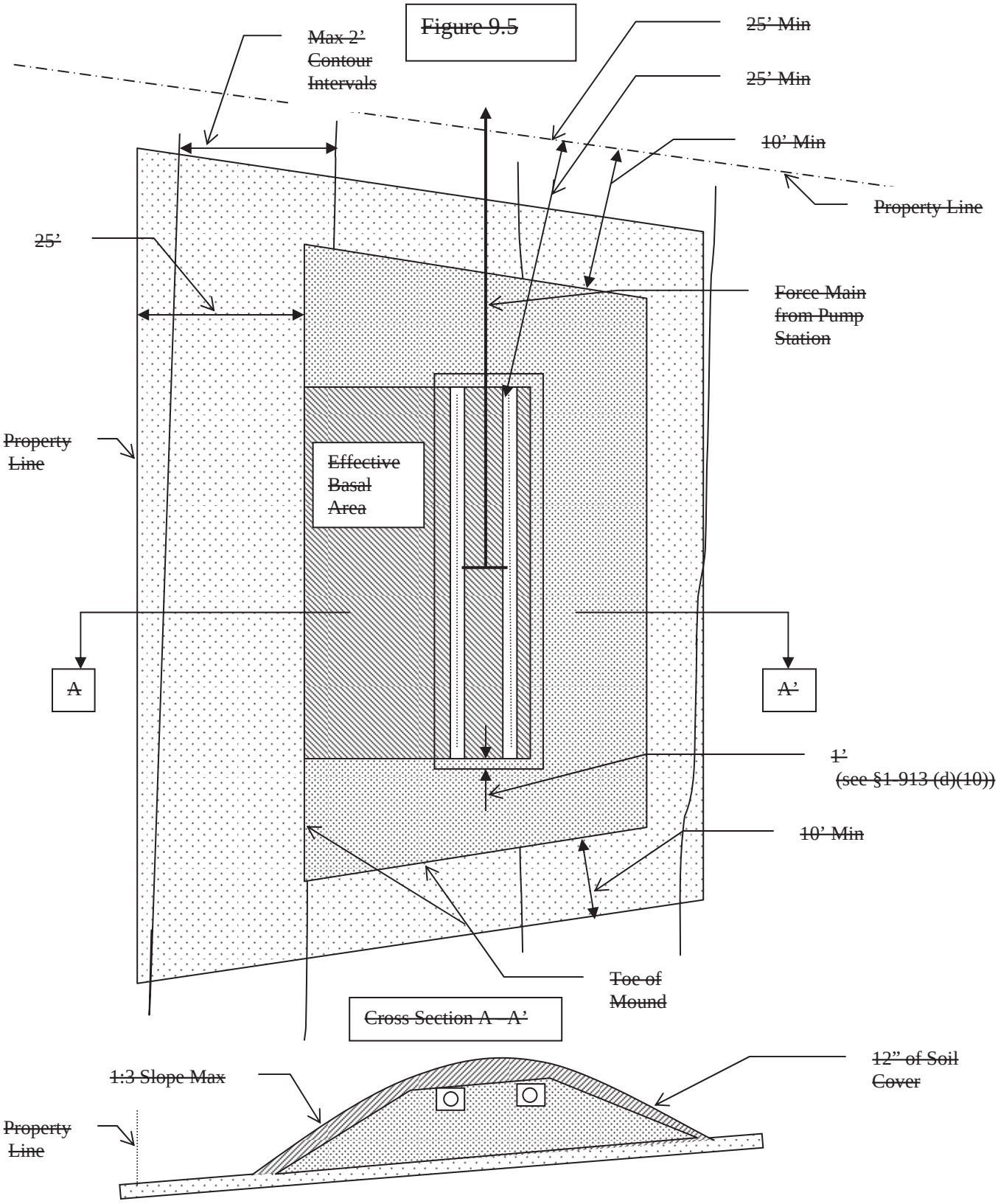
~~(5)~~ ~~The minimum isolation distance to drinking water supplies, per §1-807, shall be measured from the edge of the minimum required effective basal area of the mound wastewater disposal system or from the edge of the absorption trench or bed within the mound system, whichever is closer.~~

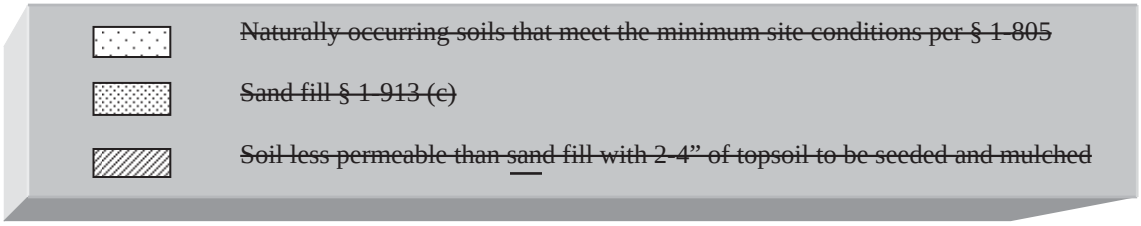
~~(6)~~ ~~Mound wastewater disposal systems shall be located at least 50 feet from any surface water, including but not limited to, streams, watercourses, lakes, or impoundments as measured from any toe of the mound.~~

~~(7)~~ ~~Mound wastewater disposal systems shall be located a minimum distance of 10 feet, as measured from the toe of the mound, from buildings, driveways, or any other subsurface obstruction except that this distance shall be 25 feet in the downgradient direction from the mound. Mound wastewater disposal systems shall be located a minimum distance of 10 feet, as measured from the toe of the mound or 25 feet as measured from the edge of the leachfield within the mound, whichever is greater, from property lines except that the distance from the downgradient toe of the mound to property lines shall be a minimum of 25 feet. The land area 25 feet downgradient of the elevated sand mound is the effluent dispersal area and soil in this area may not be removed or disturbed except as specified in these Rules.~~

~~(8)~~ ~~Separation may be required between mound wastewater disposal systems to prevent hydraulic interference in the disposal area.~~

~~Figure 9.5~~


Max 2' Contour Intervals
25' Min
25' Min
10' Min
Property Line
25'
Force Main from Pump Station
Property Line
Effective Basal Area
A
A'
1' (see §1-913 (d)(10))
10' Min
Toe of Mound
Cross Section A—A'
1:3 Slope Max
12" of Soil Cover
Property Line


Naturally occurring soils that meet the minimum site conditions per § 1-805
Sand fill § 1-913 (c)
Soil less permeable than sand fill with 2-4" of topsoil to be seeded and mulched

~~(c)~~ ~~Fill Material: The fill material from the natural soil plowed surface to the top of the trench or bed shall be clean washed silica sand meeting one of the following sieve requirements:~~

~~(1)~~

~~Sieve Number~~	~~Opening (mm)~~	~~Percent Passing, by Weight~~
~~3/8~~	~~9.500~~	~~85 – 100~~
~~40~~	~~0.420~~	~~25 – 75~~
~~60~~	~~0.240~~	~~0 – 30~~
~~100~~	~~0.149~~	~~0 – 10~~
~~200~~	~~0.074~~	~~0 – 5~~

~~(2)~~

~~Sieve Number~~	~~Opening, (mm)~~	~~Percent Passing, by Weight~~
~~4~~	~~4.750~~	~~95 – 100~~
~~8~~	~~2.380~~	~~80 – 100~~
~~16~~	~~1.190~~	~~50 – 85~~
~~30~~	~~0.590~~	~~25 – 60~~
~~50~~	~~0.297~~	~~10 – 30~~
~~100~~	~~0.149~~	~~2 – 10~~

~~(3)~~

~~Sieve Number~~	~~Opening (mm)~~	~~Percent Passing by Weight~~
~~3/8~~	~~9.500~~	~~85 – 100~~
~~40~~	~~0.420~~	~~30 – 50~~
~~200~~	~~0.074~~	~~0 – 5~~

~~(4)~~ ~~The fill material must meet the specifications (1), (2), or (3) above. Interpolation of analyses is not permitted. Fill material (2) is ASTM Specification C 33 and is intended for manufactured material. The Secretary may approve other fill material that is proposed by the designer.~~

~~(5)~~ ~~Mound wastewater disposal systems approved under the September 10, 1982 Environmental Protection Rules may use the fill material allowed under this subsection without redesign.~~

~~**§1-913(d) Mound Wastewater Disposal Systems**~~

~~(d) Design~~

~~(1) There shall be a minimum of one (1) foot of fill material and sufficient naturally occurring soils to meet the requirements in §1-805 of these Rules between the bottom elevation of the leachfield within the mound wastewater disposal system and the highest elevation of the limiting soil conditions.~~

~~(2) Sufficient depth of fill material shall be placed to provide for 48" of vertical separation between the bottom elevation of the leachfield within the mound wastewater disposal system and creviced or permeable bedrock.~~

~~(3) Sufficient depth of fill material shall be placed to provide for 36"of vertical separation between the bottom elevation of the leachfield within the mound wastewater disposal system and the seasonal high water table. For mound wastewater disposal systems with design flows of 1000 gpd or more, a designer shall determine that the induced groundwater mounding will be at least 36" below the bottom of the leachfield within the mound wastewater disposal system. This determination shall be based on a site specific analysis using either the desk top hydrogeologic analysis or a site specific test.~~

~~(4) The effective basal area is the area within the sand fill that is downslope of the long dimension of the leachfield constructed within the mound wastewater disposal system.~~

~~(5) The minimum isolation distance to drinking water supplies, per §1-807, shall be measured from the edge of the minimum required effective basal area of the mound wastewater disposal system or the edge of the absorption trench or bed, whichever is closer.~~

~~(6) Mound wastewater disposal systems shall utilize pressure distribution. A seepage bed with a maximum 10' width or absorption trench(es) which may include multiple trenches with a total width exceeding 10' shall be used. Mound wastewater disposal systems shall not be installed on land with a slope greater than 20% if the lot was subdivided on or after June 14, 2002. Mound wastewater disposal systems on other lots may be approved on slopes up to 30% and, subject to additional permitting requirements may be approved on slopes exceeding 30% (see restrictions in §1-805). When a system is proposed on a slope of more than 20%, an erosion prevention and sediment control plan shall be prepared in accordance with section 1-805(e) of these Rules. The area between the downslope edge of the wastewater system and a point where the ground slope exceeds 30% may have a slope of up to 30%, even though the slope under the leachfield is restricted to no more than 20%. The mound systems shall be installed with the long dimension of the system parallel to the land contour. Spacing between trenches shall be no less than 4'. For trench designs, the minimum trench length shall be twice the dimension across the top of the mound from the outside to outside of the trenches.~~

~~(7) The maximum application rate in an absorption trench or absorption bed bottom area shall be 1.0 gallons/day/square foot.~~

~~(8)~~ ~~The minimum required effective basal area of the mound wastewater disposal system, for soils with a percolation rate of 61 to 120 minutes per inch, is to be calculated using a maximum application rate of 0.24 gallons/day/square foot.~~

~~(9)~~ ~~The minimum required effective basal area of the mound wastewater disposal system for soils with a percolation rate of 0 to 60 minutes per inch is to be calculated using a maximum application rate of 0.74 gallons/day/square foot.~~

~~(10)~~ ~~The area of sand fill shall be sufficient to extend one (1) foot beyond the edge of the required absorption trenches or the absorption bed before the sides are shaped to the acceptable slope.~~

~~(11)~~ ~~The maximum acceptable slope for toe slopes of mound wastewater disposal systems shall be 1 on 3. The mound fill shall extend beyond the effective basal area.~~

~~(e)~~ ~~Pressure Distribution System Design~~

~~(1)~~ ~~Pressure distribution shall be required for all mound wastewater disposal systems.~~

~~(2)~~ ~~The leachfield shall be dosed a minimum of four times per day and not more than once in any thirty minute period. The size of the dosing pump or siphon shall be selected to maintain a minimum pressure of one pound per square inch or 2.3 feet of head at the end of each distribution line. The pump or siphon and the distribution piping shall be protected with an effluent filter that prevents the passage of any particle larger than 1/8".~~

~~(3)~~ ~~The pressure distribution pipe shall be rigid plastic pipe, Schedule 40 to 80 with a minimum of diameter of one (1) inch. The pipe shall provide a single row of holes, minimum 1/8-inch diameter, on center along the length of the pipe with the last hole in the end cap. A design that assures uniform distribution throughout the leachfield is required. There shall be a minimum of one opening in the distribution piping per 25 square feet of leachfield area. There shall be a maximum of a 10% difference in the per-square foot loading rate between any two absorption trenches within a system. There shall be a maximum 10% difference in the discharge rate between any two orifices in a single absorption trench or absorption bed. The design shall provide even distribution throughout the leachfield. The minimum dose volume shall be 5 times the volume of the distribution network that must be filled during each dosing cycle. All joints and connections shall be solvent welded.~~

~~(4)~~ ~~The pressure distribution pipe shall be placed in crushed stone with the orifices upward, and the holes shall be covered with an orifice shield or the orifices shall be directed downward. One or more additional orifices may be added to allow drainage of the piping when freezing may be a problem. The material used to cover the top of the stone shall be one layer of filter fabric.~~

~~(5) The ends of all distribution pipes shall be capped.~~

~~(6) The distribution pipe shall be constructed so that there is access to the piping system for flushing of the piping system.~~

~~(f) Construction~~

~~(1) A Class 1 or Class B designer shall review the mound wastewater disposal system through the critical stages of construction. Upon completion of construction, the designer shall submit a report in writing to the Secretary, including the certification required in §1-308 of these Rules. Upon completion of plowing of the mound area and prior to the placing of the fill material, the designer shall inspect the site preparations. This shall be specifically addressed in the designer's report. Upon completion of the installation of the distribution piping, the network shall be tested with clean water to assure that distribution is complete and meets the requirements in subsection (e) of this section.~~

~~(2) A plan showing the locations of the tests required under this section and any calculations shall be included with the designer's report.~~

~~(3) To prevent compaction, construction equipment shall not be moved across the plowed surface or the effluent dispersal area (see §1-913(b)(7)). However, after placement of a minimum of six (6) inches of sand fill over the plowed area, construction equipment may be driven over the protected surface to expedite construction. Construction and/or plowing shall not be initiated when the soil moisture content is high. If a sample of soil obtained from approximately nine (9) inches below the surface can be easily rolled into a wire, the soil moisture content is too high for construction purposes.~~

~~(4) Aboveground vegetation shall be closely cut and removed from the ground surface throughout the area to be used for the placement of the fill material. The area shall then be plowed to a depth of seven (7) to eight (8) inches, parallel to the land contour with the plow throwing the soil upslope to provide a proper interface between the fill and natural soils. Tree stumps shall be cut flush with the surface of the ground and roots shall not be pulled. Once plowing is completed, the area should be fenced to prevent vehicles and equipment from entering the plowed area, unless the fill material is going to be in place within 24 hours of the plowing. If the site cannot be plowed, a backhoe bucket fitted with chisel teeth may be used to "till" the site by creating furrows that are parallel to ground contour.~~

~~(5) The area surrounding the mound wastewater disposal system shall be graded to provide diversion of surface run off waters.~~

~~§1-913(f)(6)~~ ~~Mound Wastewater Disposal Systems~~

~~(6)~~ ~~Construction should be initiated immediately after preparation of the soil interface by placing the sand fill. After construction of the distribution system, but prior to covering the distribution system, a designer shall direct the testing of the distribution system. After successful testing of the distribution system, any necessary additional stone and the filter fabric shall be installed and the system completed. The entire mound wastewater disposal system is to be covered with topsoil native to the site, or of similar characteristics, to support vegetation found in the area. The installer shall crown the entire mound wastewater disposal system with a cover of soil less permeable than the mound fill, covering with 12" on the sides of the mound. Native soil from the site is normally suitable for cover material, though the top 2- 4" of this cover must be topsoil. The entire mound shall be seeded or sodded to assure stability of the installation. This grass cover shall be maintained and should be mowed on at least an annual basis.~~

~~§1-914~~ ~~At-grade Systems~~

~~(a)~~ ~~At-grade systems may be used on some sites that are not suitable for in ground systems because of inadequate depths to seasonal high water table, bedrock or impermeable soil. At-grade systems are constructed by tilling the ground surface and placing the crushed stone directly on the tilled surface. The crushed stone is not placed subsurface as in an in ground system and no sand is placed under the crushed stone as in a mound wastewater disposal system. Figures 9.6 and 9.7 (pages 107-108) show the layouts of typical at-grade systems.~~

~~(b)~~ ~~Site Requirements:~~

~~(1)~~ ~~Sites with either a high groundwater level or soil strata having a percolation rate slower than 60 minutes per inch (mpi) or faster than 1 mpi within 36 inches of natural grade are not suitable for at-grade systems. Also, soils that have bedrock within 48 inches of natural grade are not suitable. At-grade systems for filtrate disposal shall have at least 24 inches of soil, with a percolation rate between 1 minute per inch and 60 minutes per inch, above the seasonal high water table and bedrock. The site must be free of these limitations beyond the edge of the fill for a distance of 10 feet on all sides. At-grade systems shall not be located in a depression or swale that could act as a natural surface water collection or runoff area.~~

~~(2)~~ ~~Generally, sites with large trees, numerous small trees or large boulders are unsuitable for at-grade systems because of the difficulty in preparing the ground surface and the reduced infiltration area. If no other site is available, all trees shall be cut flush with the ground, leaving the stumps. Stumps shall not be removed as removal of the stumps creates channels where the roots existed and may allow inadequately treated wastewater to reach groundwater or bedrock. A larger area shall be designed if numerous stumps and/or boulders are involved so that sufficient soil surface is available to accept the wastewater.~~

~~(3)~~ ~~The maximum slope allowable for at-grade systems is 20% percent, except as permitted on a site specific basis (see §1-805). The area between the downslope edge of the wastewater system and a point where the ground begins to exceed a slope of 30% may have a slope of up to 30%, even though the slope under the leachfield is restricted to no more than 20%.~~

~~(4)~~ ~~Cut sites that meet the other site requirements for at-grade systems are acceptable.~~

~~(5)~~ ~~Filled sites may be approved by the Secretary for at-grade systems on a case by-case basis where the existing original soil under the fill meets the other site requirements for at-grade systems.~~

~~(6)~~ ~~At-grade systems are not allowed on sites having a percolation rate faster than 1 mpi within the 3 feet of soil below the bottom of the system. Replacing the excessively drained soil with filter sand is not allowed for at-grade systems.~~

~~(7)~~ ~~At-grade systems shall comply with the isolation distances in §1-807 of these Rules with the leachfield measurements taken from the edge of the crushed stone.~~

~~(c)~~ ~~Site Evaluation:~~

~~The site shall be evaluated in accord with §1-902 of these Rules.~~

~~(d)~~ ~~Design:~~

~~(1)~~ ~~A designer shall prepare a one foot interval contour map having a scale of 20 feet per inch or less. In addition, all of the required application information in §1-305 and Appendix 6-A of these Rules shall be submitted.~~

~~(2)~~ ~~The loading rate shall be based on the second slowest percolation rate using the following formula: (3/√ t) (0.8) where t is the second slowest percolation rate in minutes per inch. The maximum loading rate shall be 1.0 gallons per day per square foot. The effective infiltration area is the area upon which at least 6 inches depth of crushed stone is placed. It does not include the downslope area of the crushed stone that is less than 6" thick, the side slope fill areas or the portion of the crushed stone that is upslope of the distribution pipe on sites with slopes of greater than 3%. All at-grade system sizing calculations shall be submitted with the application.~~

~~(3)~~ ~~At-grade systems shall be laid out parallel to ground contour and should be designed to be long and narrow to minimize the linear loading rate. The maximum width of the effective infiltration area shall be 6 feet and the minimum width of the effective infiltration area shall be 3 feet.~~

~~**§1-914 (d)(4) At-grade Systems**~~

~~(4) A minimum length to width ratio of 2:1 shall be provided for at-grade systems. The system length and width shall be determined by measuring from the outer edges from the six-inch depth of the crushed stone. The width dimension includes the separation distance (6 ft. minimum) between individual infiltration areas for at-grade systems having more than one infiltration area. The width does not include the two feet of crushed stone upslope from the distribution pipe for at-grade systems on slopes of greater than 3%. See figure 9.7 (page 108)~~

~~(5) A minimum of 6 inches of crushed stone shall be placed under the distribution pipe and at least 2 inches of crushed stone shall be placed above the crown of the distribution pipe. Filter fabric shall be placed over the top of the crushed stone. The crushed stone shall be covered with a minimum of 12 inches of permeable soil, with a maximum of 18" of soil, the upper 2 to 4 inches of which shall be topsoil and the remainder of a fine sandy loam to medium sand texture. All four sides of the fill area shall be designed to slope away at a pitch that is not steeper than 1:3. The design shall indicate that a vegetated cover is to be maintained over all portions of the system.~~

~~(6) The distribution pipe shall be placed in the center of the effective infiltration area on sites with less than 3% slopes (figure 9.6, page 107) and placed at the upper side of the effective infiltration area on sites with slopes that are greater than 3%. (figure 9.7, page 108).~~

~~(7) On sites with slopes that are greater than 3% , only the area directly under the distribution pipe to the downslope limit of the 6 inch depth of crushed stone shall be used to meet the effective infiltration area square footage requirement (figure 9.7, page 108).~~

~~(8) All at-grade systems shall be pressurized and dosed by pump or siphon as described in §1-906 of these Rules. Pressure distribution hydraulic calculations including, but not limited to, friction loss, elevation head and pump/siphon sizing shall be included with the application.~~

~~(9) Where more than one effective infiltration area is used, there shall be at least 6 feet of separation between the tail edges of the crushed stone in each effective infiltration area (figure 9.7, page 108). Primary and replacement infiltrative areas shall not be interfingered unless the areas are at least 25' apart, as measured from the edge of the crushed stone.~~

~~(10) At-grade systems receiving more than 2,000 gpd of design wastewater flow shall require a hydrogeologic analysis showing that a minimum of 36 inches of unsaturated native soil is maintained between the bottom of the crushed stone and the induced groundwater mounding beneath the system. At-grade systems that are closer than 25 feet to each other as measured from the edge of stone aggregate shall be evaluated as one system for purposes of determining the need to conduct a hydrogeologic analysis.~~

~~(11)~~ ~~For at-grade systems receiving 3,000 gpd or more of design wastewater flow, dual-alternating at-grade systems shall be required. The dual alternating system requirement applies if either the primary or the replacement systems have design flows of 3,000 gpd or more.~~

~~(12)~~ ~~At-grade systems that are closer than 25 feet to each other as measured from the edge of stone aggregate shall be evaluated as one system for purposes of determining the need to have dual alternating at-grade systems. Exception: A hydrogeologic analysis may be used to demonstrate that systems located less than 25' apart are hydraulically independent.~~

~~(13)~~ ~~Where primary and replacement at-grade systems are placed next to each other, the systems shall be at least 10 feet apart when placed end to end, as measured from the stone aggregate, and at least 25 feet apart, as measured from the stone aggregate, when placed in the same flow path as determined from the edge of the filled area.~~

~~(14)~~ ~~A surface water diversion swale shall be constructed upgradient of all at-grade systems on sites with slopes that are greater than 3%.~~

~~(15)~~ ~~The area 25 feet downgradient of the at-grade system, as measured from the lower edge of the fill, shall not be disturbed by any construction activity including, but not limited to, building construction, roadways and parking areas.~~

~~(16)~~ ~~Where subsurface drains (including building perimeter drains) are located downslope of an at-grade system, the crushed stone shall be at least 75 feet from the drain.~~

~~(e)~~ ~~Construction Practices:~~

~~(1)~~ ~~The surface water diversion swale (mandatory for sites with slopes of more than 3%) shall be installed prior to constructing the at-grade system to keep surface water runoff away from the system while it is under construction.~~

~~(2)~~ ~~Construction of the at-grade system and/or tilling shall not take place when the soil moisture is high in the system area. If the soil at 9 inches below grade can be rolled into the shape of a wire, the soil moisture content is too high for construction to begin.~~

~~(3)~~ ~~To prevent compaction, construction equipment shall not be moved across and downslope of the at-grade system area before or after tilling.~~

~~(4)~~ ~~Vegetation shall be cut close to the ground and removed from the area to be tilled. Tree stumps shall be cut flush with the ground and the roots left in place. On wooded sites, the forest litter shall be raked off if more than an inch thick. The at-grade system area shall be tilled, preferably by mold board or chisel plow to a depth of 6 to 8 inches, parallel to the ground contour. During plowing, the soil should be thrown upslope to provide a proper interface between the soil and stone aggregate. If the site cannot be plowed, a backhoe bucket fitted with chisel teeth may be used to "till" the site by creating furrows that are parallel to ground contour.~~

~~(5)~~ ~~The forcemain may be installed before tilling or after tilling when the forcemain enters the system at the upslope side of the system. When the forcemain enters the system at the downslope side, the forcemain should be installed before tilling. If practical, forcemains should connect to the distribution pipe from the ends of the distribution pipe or from the upslope side of the system. In either situation, the forcemain shall be installed by working from the upslope edge of the system.~~

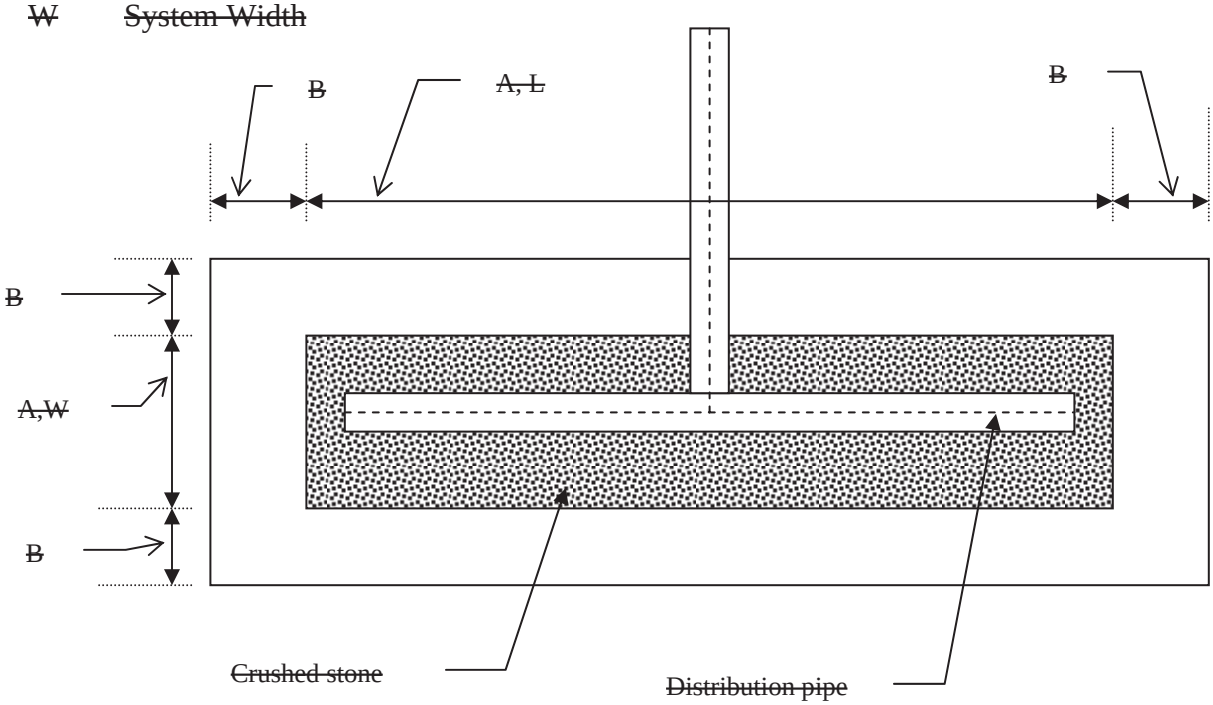
~~**Note: At-grade system diagrams are shown on the next two pages**~~

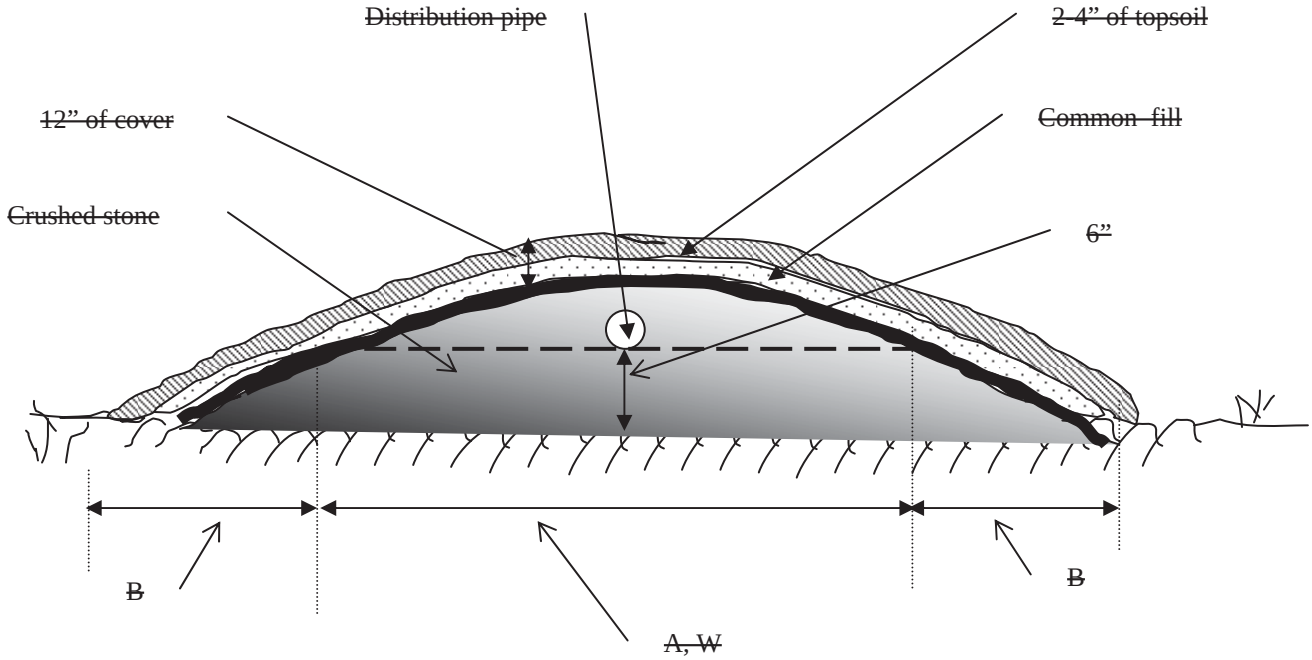
~~§1-914 At-grade Systems~~

~~Figure 9.6~~

~~Plan and Cross Sectional Views of an At-Grade System Having One Infiltration Area on a Level Site (less than 3%).~~

~~A~~ ~~Effective Infiltration Area System Length~~
~~B~~ ~~Side Slope (1:3)~~
~~L~~ ~~Length~~
~~W~~ ~~System Width~~

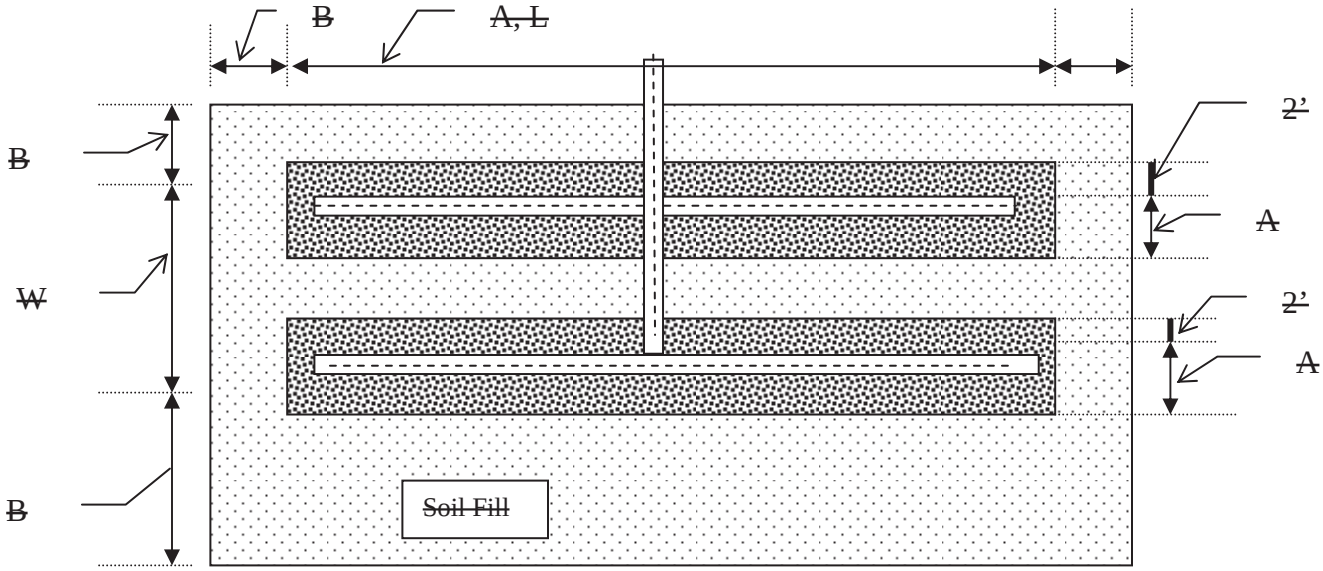


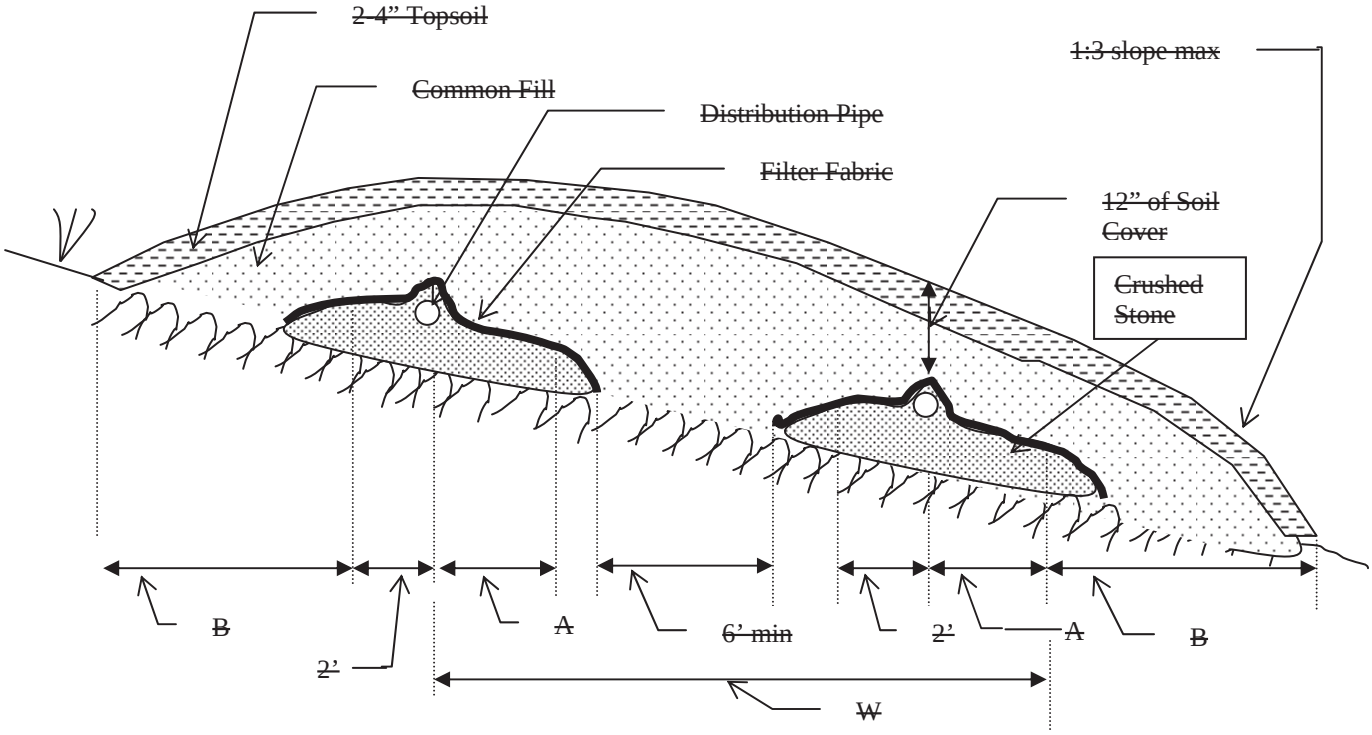


~~§1-914 At-grade Systems~~

~~Figure 9.7~~

~~Plan and Cross Sectional Views of an At-Grade System with Two Infiltrative Areas on a Sloping Site (greater than 3%).~~





~~A~~	~~Effective Infiltration Area (min. of 6" of stone)~~
~~B~~	~~Side Slope (1:3)~~
~~L~~	~~System Length~~
~~W~~	~~System Width~~

~~**§1-914(c)(6)**~~ ~~**At-grade Systems**~~

~~(6)~~ ~~Upon completion of the tilling and before placing the stone aggregate, a Class 1 or Class B designer shall inspect the site preparations.~~

~~(7)~~ ~~Construction should begin immediately after the tilling by placing the stone aggregate. The pressure distribution pipe shall be laid level on top of the stone and caps installed at the ends of the pipe. Upon completion of the distribution piping, the designer shall test the system with clean water. The test shall show that a minimum pressure of 2.3 feet of head is present at the ends of the pipe and that the distribution requirements in §1-906 of these Rules are met. After connecting the distribution pipe to the forcemain, the distribution pipe shall be covered with at least 2 inches of clean stone aggregate. The stone aggregate shall be covered completely with filter fabric.~~

~~(8)~~ ~~The filter fabric shall be covered with a minimum of 12 inches of soil but not more than 18 inches, with the upper 2 to 4 inches of soil being topsoil and the remainder of the fill being of a fine sandy loam to medium sand texture. The soil cover shall be placed at a maximum slope of 1:3. A vegetated cover free of large brush and trees shall be maintained over the system.~~

~~(9)~~ ~~Prior to use of the at-grade system, a Class 1 or Class B designer shall submit a written report that includes the installation certification required by section §1-308 of these Rules. The report shall specifically address the inspection of the site preparations and include numerical results of the orifice discharge rate comparison and pressure test.~~

~~**§ 1-915**~~ ~~**Sand Filters**~~

~~Sand filters are intended for use in conjunction with a filtrate disposal system (see §1-916 of these Rules). They allow for a reduction in the final disposal requirements due to the additional treatment of the wastewater. This subsection addresses the use of two different sand filter types: the intermittent sand filter and the recirculating sand (gravel) filter.~~

~~(a)~~ ~~General Requirements~~

~~(1)~~ ~~Wastewater Strength~~

~~(A)~~ ~~Intermittent sand filters may be used for residential and for other low strength domestic wastewater.~~

~~(B)~~ ~~Recirculating sand filters may be used for low and moderate strength wastewater.~~

~~**§ 1-915(a)(1)(C)**~~ ~~**Sand Filters**~~

~~(C)~~ ~~Wastewater from a septic tank shall be considered low strength when it meets the following standard:~~

~~(i)~~ ~~BOD_5<230 mg/l;~~

~~(ii)~~ ~~TSS < 150 mg/1; and~~

~~(iii)~~ ~~Oil & Grease <25 mg/1.~~

~~(D)~~ ~~Wastewater from a septic tank shall be considered moderate strength when it meets the following standard:~~

~~(i)~~ ~~BOD_5 <400 mg/1;~~

~~(ii)~~ ~~TSS < 150 mg/1; and~~

~~(iii)~~ ~~Oil & Grease <25 mg/1~~

~~(2)~~ ~~Container Design & Construction~~

~~(A)~~ ~~The filter container shall be water tight to prevent groundwater from infiltrating into the filter container and to prevent wastewater exfiltration from the filter container.~~

~~(B)~~ ~~Reinforced concrete shall be used, unless other materials having equivalent function, workmanship, watertightness and at least a twenty (20) year service life are specified.~~

~~(C)~~ ~~Flexible membrane liner materials may be used, provided they comply with the following requirements:~~

~~(i)~~ ~~they have properties that are at least equivalent to thirty (30) mil un-reinforced polyvinyl chloride;~~

~~(ii)~~ ~~they have field repair instructions and extra liner material that are provided to the purchaser with the liner;~~

~~(iii)~~ ~~they have factory fabricated "boots" suitable for field bonding onto the liner to facilitate the passage of piping through the liner in a waterproof manner; and~~

~~(iv)~~ ~~they are compatible with the wastewater being treated.~~

~~(D)~~ ~~All tanks associated with a sand filter, including septic and dosing tanks and any pumping vaults, shall have an at-grade access provided by a watertight manhole or riser not less than eighteen (18) inches in diameter, unless otherwise approved by the Secretary and shall be designed to be resistant to entry by children.~~

~~(E)~~ ~~After installation all components, including septic tanks, pump chambers, recirculation tanks and filter containers, shall be tested by filling to a point at least two inches, but not more than three inches, above the point of riser connection to the top of the tank, chamber, or container. During the test there shall not be a measurable leakage over a twenty-four (24) hour period.~~

~~(F)~~ ~~Notwithstanding subdivision (a)(2)(E) above, the Secretary may approve other leakage testing methods.~~

~~(3)~~ ~~Siting Requirements~~

~~(A)~~ ~~Filters must be protected from both groundwater and surface water infiltration.~~

~~(B)~~ ~~For the purpose of determining the minimum isolation distance to other site features, the filter container shall be comply with the isolation distances set forth in §1-807 of these Rules for septic tanks.~~

~~(4)~~ ~~Monitoring~~

~~(A)~~ ~~Wastewater Quality: The sand filter shall be designed for wastewater sample collection before and after the sand filter.~~

~~(B)~~ ~~Wastewater Quantity: All sand filters shall have the capability of measuring and recording the wastewater flow and the flow to the filter.~~

~~(5)~~ ~~Annual inspections of each sand filter by a Class 1 or Class B designer are required. A written report shall be submitted to the Secretary within 30 days of the inspection. At a minimum, the following items shall be addressed in the inspection report:~~

~~(A)~~ ~~use and age of system including the average daily flows;~~

~~(B)~~ ~~the recirculation ratio;~~

~~(C)~~ ~~mechanical or electrical malfunctions;~~

~~(D)~~ ~~neglect or improper use; and~~

~~(E)~~ ~~flushing of the laterals.~~

~~(6)~~ ~~Operation & Maintenance Manuals: A user's manual for the sand filter shall be developed and/or provided along with record drawing(s) at the time that the sand filter installation is completed. These materials, at a minimum, shall contain the following information:~~

~~(A)~~ ~~diagrams of the components and their location;~~

~~(B)~~ ~~an explanation of how the sand filter functions, operational expectations, and owner responsibility;~~

~~(C)~~ ~~specifications of the electrical and mechanical components installed (occasionally components other than those specified on the plans are used);~~

~~(D)~~ ~~names and telephone numbers of the designer, the local health authority, the supplier/installer, and/or the management entity to be contacted in the event of a failure;~~

~~(E)~~ ~~information on the periodic maintenance requirements of the sand filter, including the septic tank, the dosing and recirculating/mixing tanks, the sand filter unit, the pumps, the switches, the alarms, the filtrate disposal system, and other information as appropriate;~~

~~(F)~~ ~~information on "trouble shooting" common operational problems that might occur. This information should be detailed and complete as needed to assist the system owner make accurate decisions about when and how to attempt corrections of operational problems and when to call for professional assistance;~~

~~(G)~~ ~~information on the disposal of discarded filter media in accord with state and local requirements; and~~

~~(H)~~ ~~for proprietary sand filter units, a complete maintenance and operation document shall be developed and provided by the manufacturer. This document shall include all the appropriate items mentioned above, plus any additional general and site specific information useful to the system owner, and/or the maintenance person.~~

~~(b)~~ ~~Intermittent Sand Filters: In addition to the applicable requirements of subsection (a) of this section, the following system specific criteria shall apply to the design of intermittent sand filters:~~

~~(1)~~ ~~Underdrain system~~

~~(A)~~ ~~The base of the filter container shall be level or constructed at a grade of one (1) percent or less towards the underdrain piping.~~

~~(B)~~ ~~The underdrain piping shall be installed in the interior of the filter container at the lowest elevation. The piping shall be on a grade of one (1) percent or less to the point of passage through the filter container.~~

~~(C)~~ ~~The underdrain piping and filter container bottom shall be covered with a minimum of six (6) inches of clean washed ¾" – 1½" stone.~~

~~(D)~~ ~~Other types of underdrain systems may be proposed and approved after review by the Secretary.~~

~~**§ 1-915(b)(2) Sand Filters**~~

~~(2)~~ ~~Filter Media~~

~~(A)~~ ~~A minimum of twenty four (24) inches of approved sand filter soil media shall be placed over the underdrain system. The sand filter soil media complying with the specification listed below shall be approvable:~~

~~Sieve #~~	~~Opening (mm)~~	~~Percent Passing Number (by Weight)~~
~~3/8~~	~~9.500~~	~~100~~
~~4~~	~~4.750~~	~~95 – 100~~
~~8~~	~~2.380~~	~~80 – 100~~
~~16~~	~~1.190~~	~~45 – 85~~
~~30~~	~~0.590~~	~~15 – 60~~
~~50~~	~~0.297~~	~~3 – 15~~
~~100~~	~~0.149~~	~~0 – 4~~

~~(B)~~ ~~Other filter media may be proposed, provided a designer submits to the Secretary technical justification for the substitution of materials. The Secretary shall review and may approve the proposed substitution.~~

~~(C)~~ ~~The size of the sand filter shall be based on a maximum loading rate of 1.25 gallons per day per square foot.~~

~~(3)~~ ~~Distribution System~~

~~A pressurized distribution system shall be constructed in accord with the following requirements:~~

~~(A)~~ ~~above the filter media there shall be a minimum of three (3) inches of washed, clean ¾" to 1½" stone aggregate below the distribution laterals, and sufficient stone above the laterals equal to or covering the orifice shields to provide a smooth even cover;~~

~~(B)~~ ~~distribution laterals shall be spaced on maximum thirty (30) inch centers. Orifices shall be placed such that there is at least one orifice for each six (6) square feet of sand surface area;~~

~~(C)~~ ~~the ends of the distribution laterals shall be designed and constructed with a means to perform flushing of the piping, collectively or individually, through the operation of a non-corroding and accessible valve. The flushed wastewater must be discharged to the septic tank or into the sand filter;~~

~~(D)~~ ~~the diameters of the distribution manifold and laterals shall not be less than one half (1/2) inch diameter and shall be constructed of schedule 40 or 80 (or equivalent) piping;~~

~~(E)~~ ~~the orifices shall not be less than 1/8" in diameter. All orifices shall be covered by a removable, protective, durable, non-corroding shield; and~~

~~(F)~~ ~~other types of distribution systems may be proposed by a designer and used upon approval by the Secretary.~~

~~(4)~~ ~~Filter Dosing~~

~~(A)~~ ~~The dose volume shall not exceed ten (10) percent of the daily design flow.~~

~~(B)~~ ~~The system shall not dose more than once in a 30-minute period.~~

~~(C)~~ ~~Head calculation shall include maximum static lift, pipe friction and a residual head of five (5) feet at the furthest orifice.~~

~~(D)~~ ~~There shall be no more than a ten (10) percent flow variation between any two orifices.~~

~~(E)~~ ~~The pumping system shall be protected from solids by a filter apparatus that will not allow the passage of solids larger in size than 1/8 inch.~~

~~(F)~~ ~~The pump station designed to dose the filter shall be designed with storage equal to the one (1) day design flow above the high water alarm.~~

~~(5)~~ ~~Internal Pump Option~~

~~(A)~~ ~~Where the effluent from a sand filter is to be discharged by means of a pump to another treatment unit, a distribution unit, or to an a leachfield, the design and construction of the filter may include provisions for an internal pump station, providing the following conditions are met:~~

~~(i)~~ ~~the location, design, and construction of the pump station do not conflict with the requirements of these Rules for design, construction and operation of a sand filter system;~~

~~(ii)~~ ~~the pump and related apparatus shall be housed in a corrosion resistant vault designed to withstand the stresses placed upon it so that it will not allow the migration of drain media, sand, or underdrain media to its interior. The vault shall have a durable, attached floor. The vault shall provide watertight access to finished grade with a diameter large enough to remove, replace, or service any equipment in the vault shall and be designed to receive treated effluent from an elevation equal to that of a gravity discharging sand filter;~~

~~(iii)~~ ~~the depth of underdrain media and the operating level of the pump cycle and alarm shall not allow effluent to come within two inches of the bottom of the sand filter media. The pump off level shall not be lower than the invert of the perforations of the underdrain piping; and~~

~~(iv)~~ ~~an internal sand filter pump shall be electronically linked to the sand filter dosing apparatus in such a manner as to prevent wastewater from entering the sand filter in the event the internal sand filter pump fails.~~

~~(c)~~ ~~Recirculating Sand (Gravel) Filters~~

~~Recirculating Sand Filters are recommended for domestic wastewater of low to moderate strength. They are not recommended for seasonal residences or projects designed for periodic use. Projects that will experience periodic shut downs should take into account the cooling effect on the recirculating effluent and the effect of the filters going anaerobic and becoming odoriferous as a result.~~

~~In addition to the applicable requirements of subsection (a) of this section, the following standards apply to recirculating sand filters:~~

~~(1)~~ ~~Underdrain system~~

~~(A)~~ ~~The base of the filter container shall be level or constructed at a grade of one (1) percent or less towards the underdrain piping.~~

~~(B)~~ ~~The underdrain piping shall be installed in the interior of the filter container at the lowest elevation. The piping shall be on a grade of one (1) percent or less to the point of passage through the filter container.~~

~~(C)~~ ~~The underdrain piping and filter container bottom shall be covered with a minimum of six (6) inches of washed clean ¾" – 1½" stone aggregate.~~

~~(D)~~ ~~Other types of underdrain systems may be proposed and approved after review by the Secretary.~~

~~(2)~~ ~~Filter Media~~

~~(A)~~ ~~A minimum of thirty six (36) inches of approved filter media shall be placed above the underdrain system.~~

~~**§ 1-915(c)(2)(B)**~~ ~~**Sand Filters**~~

~~(B)~~ ~~The filter media shall be a soil material complying with the following sieve analysis:~~

~~Sieve~~	~~Opening (mm)~~	~~Percent Passing Number (by Weight)~~
~~3/8~~	~~9.500~~	~~100~~
~~4~~	~~4.750~~	~~60 - 100~~
~~8~~	~~2.380~~	~~7 - 75~~
~~16~~	~~1.190~~	~~0 - 5~~
~~30~~	~~0.590~~	~~0 - 3~~
~~50~~	~~0.297~~	~~0 - 2~~

~~(C)~~ ~~Other filter media may be proposed provided a designer submits to the Secretary technical justification for the substitution of materials. The Secretary shall review and may approve the proposed substitution.~~

~~(D)~~ ~~The size of the recirculating sand filter shall be based on either a hydraulic loading rate or wastewater strength as described below. The maximum loading rate is the lesser of subdivision (i) or (ii) below.~~

~~(i)~~ ~~The maximum hydraulic loading rate shall be 5 gallons per day per square foot.~~

~~(ii)~~ ~~The maximum loading rate based on waste strength, (expressed as gallons per square foot per day) shall be determined using the formula:~~

$$\text{Loading Rate (gal/sqft/day)} = \frac{5\ \text{gal/sqft/day} \times 230\ \text{mg/l}}{BOD_5\ \text{mg/l}}$$

~~where BOD_5 equals the wastewater strength of the septic tank effluent for the particular project. In particular, non-residential wastewater may exceed 230 mg/l of BOD_5.~~

~~(3)~~ ~~Distribution System~~

~~A pressurized distribution system shall be constructed in accordance with the following requirements:~~

~~(A)~~ ~~there shall be a minimum of three (3) inches of washed, clean ¾" to 1½" stone aggregate that is below the distribution laterals and above the filter media, and sufficient stone covering the orifice shields to provide a smooth even cover;~~

~~(B)~~ ~~distribution laterals shall be spaced on maximum twenty-four (24) inch centers. Orifices shall be placed such that there is at least one orifice for each four (4) square feet of sand surface area;~~

~~(C)~~ ~~the ends of the distribution laterals shall be designed and constructed with a means to perform flushing of the piping, collectively or individually, through the operation of a non-corroding and accessible valve. The flushed wastewater must be discharged to the septic tank or into the sand filter;~~

~~(D)~~ ~~the diameters of the distribution manifold and laterals shall not be less than one half (1/2) inch diameter and shall be constructed of schedule 40 or 80 (or equivalent) piping;~~

~~(E)~~ ~~the orifices shall not be less than 1/8" in diameter. All orifices shall be covered by a removable, protective, durable, non-corroding shield; and~~

~~(F)~~ ~~other types of distribution systems may be proposed by a designer and used upon approval by the Secretary.~~

~~(4)~~ ~~Recirculation/Dilution Tank and Dosing: The recirculation tank receives septic tank effluent and overflow from the filter. The recirculation tank shall have sufficient capacity to provide one (1) day's emergency storage above a high water alarm level. The recirculation tank and dosing system shall comply with the following requirements:~~

~~(A)~~ ~~the system shall be designed with a minimum recirculation ratio of not less than four (4). The recirculation ratio is the daily volume of recycled effluent divided by the design flow;~~

~~(B)~~ ~~the filter should be wetted 48 times per day and not more than once in a thirty (30) minute period. The minimum resting period between doses shall be twenty (20) minutes;~~

~~(C)~~ ~~the minimum wet volume in the recirculation tank should be at least eighty (80) percent of the design flow;~~

~~(D)~~ ~~the system shall be designed so that one hundred (100) percent of the filter effluent returns to the recirculation tank when the liquid volume of the tank is less than eighty (80) percent of the design flow. In addition to a high water alarm, a low water alarm shall be designed and installed to shut down the pump and notify the owner of the system when the liquid level of the recirculation tank is less than fifty (50) percent of the design flow;~~

~~(E)~~ ~~head calculations shall include maximum static lift, pipe friction and a residual head of five (5) feet at the furthest orifice;~~

~~(F)~~ ~~there shall be no more than a ten (10) percent flow variation between any two orifices; and~~

~~**§ 1-915(c)(4)(G)**~~ ~~**Sand Filters**~~

~~(G)~~ ~~The pumping system shall be protected from solids by a filter apparatus that will not allow the passage of solids larger than 1/8" in diameter.~~

~~**§1-916**~~ ~~**Filtrate Disposal Systems**~~

~~(a)~~ ~~Filtrate effluent disposal systems may be used when some form of treatment in addition to that which occurs in the septic tank is used as part of the wastewater system. The loading rates may be increased and the isolation distances required from the bottom of the leachfield to bedrock and the seasonal high water table may be reduced when applying treated effluent with less than 30 mg/l of BOD_5 and less than 30 mg/l of TSS.~~

~~(1)~~ ~~Filtrate effluent disposal systems shall be designed to hydraulically transmit the filtrate away from the filtrate disposal system. The minimum site conditions for filtrate effluent disposal systems are the same as for wastewater systems using only septic tanks for treatment prior to disposal of the wastewater.~~

~~(2)~~ ~~All types of soil-based disposal systems permitted by §1-907, §1-908, §1-913, and §1-914 are acceptable as filtrate effluent disposal systems. Design and construction requirements related to methods, materials, and location are unchanged except as specifically noted in this section.~~

~~(3)~~ ~~The following requirements refer to design variations based on the type of soil-based disposal system:~~

~~(A)~~ ~~filtrate effluent disposal systems may be constructed in soils having a percolation rate faster than 120 minutes per inch. Section 1-912(e) of these Rules shall be followed for soils with a percolation rate faster than 1 minute per inch;~~

~~(B)~~ ~~filtrate effluent disposal systems may be designed with a loading rate of up to twice that permitted for the system when septic tank effluent is applied;~~

~~(C)~~ ~~systems using filtrate effluent may reduce the 48" separation from the bottom of the leachfield to bedrock to a minimum of 24";~~

~~(D)~~ ~~systems using filtrate effluent may reduce the 36" separation from the bottom of the leachfield to the seasonal high water table to 24". When a hydrogeologic analysis is required, or is performed by choice, there shall also be at least 18" from the bottom of the leachfield to the induced water table; and~~

~~**§1-916(a)(3)(E)**~~ ~~**Filtrate Disposal Systems**~~

~~(E)~~ ~~the linear loading rate of any filtrate effluent disposal system shall be calculated using a site specific hydrogeologic analysis that demonstrates that the separation from the bottom of the leachfield to the induced groundwater mounding is met, except that systems using the prescriptive approach with a linear loading rate that does not exceed 4.5 gallons per day may be permitted without a hydrogeologic analysis. The analysis may be a desktop hydrogeologic analysis or based on site specific testing. The hydrogeologic analysis shall demonstrate that:~~

~~(i)~~ ~~the distance between the bottom of the leachfield and the seasonal high water table or induced groundwater mounding, as specified in §1-903(d)(1) of these Rules, is maintained. This distance may include both naturally occurring soil and approved fill material; and~~

~~(ii)~~ ~~the induced groundwater mounding is at least one (1) foot below grade at the downhill toe of the filtrate effluent disposal system, except for systems using a performance based design that must maintain at least 6" from the induced groundwater mounding to the ground surface.~~

~~Note: Filtrate effluent disposal systems designed using linear loading rates not exceeding 4.5 gallons per day, on sites with at least 24" of naturally occurring soil above the seasonal high water table, bedrock, and any impermeable soil layer, located more than twenty five (25) feet apart may be considered hydraulically isolated from each other for the purpose of this subsection.~~

~~(4)~~ ~~All filtrate effluent disposal systems shall use pressure distribution.~~

~~**§1-917**~~ ~~**Constructed Wetland Treatment Systems**~~

~~(a)~~ ~~A constructed wetland treatment system may be proposed on a case by case basis. Systems determined by the Secretary to be capable of meeting the 30 mg/l BOD_5 and 30 mg/l TSS requirements for filtrate effluent disposal systems will be approved for discharge to a complying filtrate effluent disposal system.~~

~~(b)~~ ~~Each constructed wetland system must be uniquely designed for the site on which it will be located. The design shall be prepared by a Class 1 designer. Prior to beginning such a design, the designer shall contact the Secretary and review the basic principles on which the design will be based. The review will include not only the ability of the system to produce the required level of treatment, but will also include review of the potential impact on its surroundings including issues related to invasive plant species or potential effects on existing wetlands and their buffers.~~

~~**§1-917(c) Constructed Wetland Treatment Systems**~~

~~(c) Any designer proposing a constructed wetland treatment system should consult existing references such as:~~

~~1. Reed, S.C.R. Crites, and E.J. Middlebrooks: Natural Systems for Waste Management and Treatment, McGraw-Hill Publishers, 2nd edition, 1995~~

~~2. Natural Systems for Wastewater Treatment, Manual of Practice FD-16, Water Pollution Control Federation, 1990(d).~~

~~(d) Any permit issued for use of a constructed wetland treatment system will include conditions related to the operation and maintenance of the system along with reporting conditions needed to ensure compliance with the operational and maintenance requirements.~~

~~**§1-918 Disposal of Wastes from Pump Out Facilities for Marine Sewage Holding Tanks**~~

~~(a) Where direct hookup to a wastewater treatment plant is available or site conditions permit, disposal of wastes from pump-out facilities shall be in conformance with the normal operational requirements of this Subchapter.~~

~~(b) Where it is not feasible to comply with subsection (a) above, a holding tank may be used.~~

~~(c) Holding tank design shall be in accord with §1-919 of these Rules.~~

~~**§1-919 Holding Tanks**~~

~~(a) The Secretary shall approve the use of sewage holding and pumpout tanks when it has been determined that :~~

~~(1) the existing or proposed building(s) or structure(s) to be served by the sewage holding tank are publicly owned;~~

~~(2) the plan for construction and operation of the sewage holding tank will not result in a public health hazard or environmental damage;~~

~~(3) a designer demonstrates that an economically feasible means of meeting current standards is significantly more costly than sewage holding and pumpout tanks, based on a projected twenty (20) year life of the project; and~~

~~(4) the design flows do not exceed 600 gallons per day.~~

~~(b) A sewage holding tank may also be used for a project that is eligible for a variance under §1-806, whether or not the project is publicly owned, where the existing wastewater system has failed, or is expected to fail, and in either instance, where there is no other cost feasible alternative;~~

~~**§1-919(c) Holding Tanks**~~

~~(c) When a sewage holding tank is proposed for use, a designer shall submit all information necessary to demonstrate that the holding tank will comply with the following requirements:~~

~~(1) the holding tank shall be capable of holding at least 14 days of the expected flow from the building or structure or campground;~~

~~(2) the tank shall be constructed of durable materials that are appropriate for the site conditions and the nature of the sewage to be stored;~~

~~(3) the tank, any piping connected to the tank, and all access structures connected to the tank shall be watertight. The tank shall be leakage tested prior to being placed in service;~~

~~(4) the tank shall be designed to protect against floatation when the tank is empty, such as when it is pumped;~~

~~(5) the tank shall be equipped with audio and visual alarms that are triggered when the tank is filled to 75% of its design capacity;~~

~~(6) the tank shall be located so that it can be reached by tank pumping vehicles at all times when the building or structure or campground is occupied; and~~

~~(7) the analysis supports a claim under subdivision (a)(4) of this section.~~

~~(d) The permit application shall specify the method and expected frequency of pumping.~~

~~(e) Any building or structure or campground served by a sewage holding tank shall have a water meter, or meters, installed that measures all water that will be discharged as wastewater from the building or structure or campground.~~

~~(f) Any permit issued for the use of a sewage holding tank will require a designer to periodically inspect the tank, visible piping, and alarms. The designer shall submit a written report to the Secretary detailing the results of the inspection and any repairs or changes in operation that are required. The report shall also detail the pumping history since the previous report, giving the dates of pumping and the volume of wastewater removed. The frequency of inspections and reports shall be stated in the permit issued for the use of the tank, but shall be no less frequent than once per year. The designer shall also inspect the water meter or meters and verify that they are installed, calibrated, and measuring all water that is discharged as wastewater. The designer shall read the meters and compare the metered flow to the pumping records. Any significant deviation shall be noted in the report and explained to the extent possible.~~

~~(g) The owner of a sewage holding tank shall maintain a valid contract with a licensed wastewater hauler at all times. The contract shall require the licensed wastewater hauler to provide written notice of dates of pumping and volume of wastewater pumped. Copies of all such notices shall be submitted with the written inspection reports.~~

~~**§1-919(h) Holding Tanks**~~

~~(h) Wastewater holding tanks used for process wastewater will be reviewed on a case by case basis. The decision will consider the nature of the wastewater, its ultimate point of disposal, and the risks associated with the failure of the system to operate, or to be operated, as permitted. Any permit that is issued will include conditions related to the operation and maintenance of the holding tank system along with reporting requirements needed to ensure compliance with the operational and maintenance requirements.~~

~~**§1-920 Systems located within a Two-Year Time of Travel Management Zone**~~

~~(a) The separation distance normally required between the bottom of a wastewater disposal system and the seasonal high water table may be reduced or eliminated provided:~~

~~(1) the permittee owns or controls all of the property that is located within the two-year time of travel management zone (management zone);~~

~~(2) there are no sources of potable water within the management zone;~~

~~(3) the design flow for the wastewater system is 700 GPD or less; and~~

~~(4) a qualified hydrogeologist has delineated the management zone.~~

~~(b) The management zone shall meet the following requirements:~~

~~(1) the soils throughout the management zone must be consistent and horizontally extensive, must be of silt or clay texture, and shall not be tills;~~

~~(2) site specific testing shall be done that demonstrates there will be at least a two-year time of travel from the bottom of the leachfield to the bedrock. The analysis must include any seasonal pathways such as drying cracks;~~

~~(3) the management zone must extend at least 50 feet uphill of the wastewater disposal system and at least 50 feet to the sides of the system with the downslope distance based on the two-year time of travel;~~

~~(4) the time of travel calculation must account for effluent movement in both shallow and more permeable layers and the deeper less permeable layers. The assumptions must include movement through the shallow layers when the mounded water table formed by the combination of the effluent and the seasonal high water table is present within the shallow layers; and~~

~~(5) the wastewater system must be designed to meet the performance based approach requirement that the mounded water table remain at least 6 inches below the surface of the naturally occurring soil throughout the management zone.~~

~~§1-920(c)~~ ~~Systems located within a Two-Year Time of Travel Management Zone~~

~~(c) Conditions may be included in any permit to ensure that the management zone is not altered or used in a way that would result in non-compliance with the two-year time of travel concept.~~

~~§1-921~~ ~~Storage and Dose Concept~~

~~(a) Systems that store the effluent during periods when the groundwater level is near the surface and then dose the wastewater into a leachfield when the groundwater is low may be approved provided:~~

~~(1) the system shall be designed so that the effluent will, at all times, remain at least 6 inches below the surface of the ground;~~

~~(2) the design incorporates the two-year time of travel management zone; and~~

~~(3) the design flow for the wastewater system is 700 gallons per day or less.~~

~~(b) The design must demonstrate that, on a yearly basis, the system can function in compliance with subsection (a) above while discharging the wastewater design flow in no more than 9 months per year.~~

~~(c) The design may propose an initial storage tank capacity that reflects an average water usage, the expected occupancy of the building, and the expected duration of the storage period. For residential use, a minimum of 50 gallons per day per person, 3 person occupancy, and 30 day storage period shall be used. The design shall indicate how additional tankage can be added to accommodate the full design flow. The design shall incorporate a high water alarm system that provides 5 days of storage above the alarm level.~~

~~(d) The system shall incorporate a control system that allows discharge of wastewater to the leachfield only when the effluent level is calculated to remain at least 6 inches below the surface of the naturally occurring ground.~~

~~(e) Conditions may be included in the permit to ensure that the system is operated in accordance with the Rules and that additional storage tankage is added if the site conditions or use exceed the initial capacity.~~

~~§1-922~~ ~~Composting or Incinerating Toilets and Greywater Disposal Systems~~

~~(a) Composting or incinerating toilets may be approved in place of conventional water carried toilets. Use of these toilets in buildings other than single family residences on their own individual lots, is subject to review related to the adequacy of the particular unit for the proposed use.~~

~~(b) All waste removed from a composting toilet shall be considered to be pathogenic. The waste material shall be disposed of at a certified landfill, or by shallow burial in a location approved by the Agency that meets the minimum site conditions given in section 1-805 of these Rules.~~

~~§1-922(c) Composting or Incinerating Toilets and Greywater Disposal Systems~~

~~(c) Use of a composting or incinerating toilet does not change the requirements for a potable water supply and interior plumbing. If there will be any interior plumbing, a greywater disposal system must be installed.~~

~~(d) A greywater disposal system shall comply with all of the design factors for wastewater disposal systems in these rules, except that a reduction in size of the system constructed may be approved. A 25% reduction in size will be approved for residential use. Reductions for use in non-residential situations will be determined on a case by case basis.~~

~~§1-923 Subsurface Drip Distribution~~

~~(a) Subsurface Drip Distribution (SDD) means a pressurized wastewater distribution system that delivers small, precise doses of effluent to shallow subsurface disposal fields. SDD distribution piping is small diameter, flexible polyethylene tubing (dripline) with small in-line emitters (orifices that can discharge effluent at slow, controlled rates, usually specified in gallons per hour). Dripline can be trenched (by hand or with a trenching machine) into narrow, shallow trenches or plowed (with a vibratory plow or other insertion tool) directly into the soil and backfilled without gravel. Typical installation depth is between 6 and 18 inches.~~

~~(b) Soil absorption systems using subsurface drip distribution may be permitted on any site meeting the requirements of §1-805 of these Rules. Subsurface drip distribution systems require highly treated effluent and are used with aerobic treatment units or packed media filters. The isolation distances required from the bottom of the subsurface drip distribution system to bedrock and the seasonal high water table may be reduced in accordance with §1-916 of these Rules, when effluent quality is equal to or better than filtrate effluent.~~

~~(c) Subsurface drip distribution systems shall be designed, installed, operated and maintained in accordance with current design, installation and maintenance instruction of the manufacturer. All designs for subsurface drip distribution systems shall be completed and submitted by a Class 1 Designer, as described in§1-701(b) of these Rules.~~

~~(d) All subsurface drip distribution systems shall be designed to ensure that the system will function in all weather conditions. This would include, at a minimum, that the system (transport and distribution piping) be designed to "drainback" between dosing events.~~

~~(e) The linear loading rate for subsurface drip distribution systems shall be calculated using a site specific hydrogeologic analysis in accordance with §1-916(a)(3)(E) of these Rules. The loading rate for subsurface drip distribution systems shall be calculated based on the percolation rate of the receiving soil and the actual wetted area around the drip emitters.~~

~~**§1-924**~~ ~~**Disposal of Used Stone, Mound Sand and Soil from a Soil-based Disposal System**~~

~~(a)~~ ~~When reconstructing, repairing or replacing a soil-based disposal system, the stone, mound sand, and soil removed from the system shall be disposed of in the following manner:~~

~~(1)~~ ~~If the material is disposed on the same lot on which the soil-based disposal system is located, it shall be disposed in a location that meets the minimum site conditions set forth in §1-805 of these Rules and in accordance with any applicable procedure under the Vermont Solid Waste Management Rules; or~~

~~(2)~~ ~~If the material is not disposed of on the same lot on which the soil-based disposal system is located, it shall be disposed of in accordance with the Vermont Solid Waste Management Rules.~~

~~Subchapter 10 – Approval of Innovative/Alternative Systems and Products~~

~~§ 1-1001 Innovative/Alternative Systems and Products: General Use~~

~~(a) The Secretary shall authorize an innovative/alternative system or product for general use when the Secretary determines that:~~

~~(1) the innovative/alternative system or product is designed to achieve the purposes and to satisfy the performance criteria of these Rules;~~

~~(2) the innovative/alternative system or product is of demonstrated reliability and performance based on its use elsewhere in sufficient numbers and ranges of applications to support its use in the manner proposed;~~

~~(3) all persons using or affected by the alternative system or product will be protected from health hazards and pollution associated with the use of the innovative/alternative system or product; and~~

~~(4) the innovative/alternative system or product will not place an unreasonable burden on persons using or affected by the innovative/alternative system or product through unreasonable increased costs or unreasonable long-term operation and maintenance obligations.~~

~~(b) In authorizing the general use of an innovative/alternative system or product, the Secretary shall specify the conditions under which such a system or product may be used.~~

~~§ 1-1002 Innovative/Alternative Systems and Products: Pilot Projects~~

~~(a) The Secretary shall authorize an innovative/alternative system or product for a limited number of specific applications, either individually or as part of a pilot project, when the Secretary determines that:~~

~~(1) the innovative/alternative system or product as designed is likely to achieve the purposes and to satisfy the performance criteria of these Rules;~~

~~(2) all persons using or affected by the innovative system or product are protected from health hazards and pollution in the event the innovative/alternative system or product does not meet the purposes or the performance criteria of these Rules;~~

~~(3) the innovative/alternative system or product is not likely to place an unreasonable burden on persons using or affected by the innovative/alternative system or product through unreasonable increased costs or unreasonable long-term operation and maintenance obligations; and~~

~~(4) the proposal is designed to measure and report on criteria related to reliability, performance and cost necessary to determine its suitability for general use under section 1-1001.~~

~~**§ 1-1002(a)(5) Innovative/Alternative Systems and Products: Pilot Projects**~~

~~(5) Up to twenty-five (25) installations or uses of each specific innovative/alternative system or product may be authorized under this subsection.~~

~~(c) The Secretary may require demonstration of any innovative/alternative system or product under this subsection before considering an application for general use under § 1-1001. Once the Secretary determines through individual project applications or through a pilot project that the innovative system or product performs as intended under this section, the Secretary may, on his or her own motion or upon application, consider the innovative/alternative system or product for general use in accordance with § 1-1001 of these Rules.~~

~~**§ 1-1003 Innovative/Alternative Systems and Products: Experimental Designs**~~

~~(a) The Secretary may authorize an experimental system or product intended to try a new technology or application, provided such experimental system or product meets the following criteria:~~

~~(1) the proposal as designed has the potential to achieve the purposes of these Rules and to satisfy all applicable performance criteria;~~

~~(2) the proposal is based on scientific and engineering principles;~~

~~(3) all persons using or affected by the proposal are protected from health hazards, pollution and increased costs in the event the experimental system or product does not meet the purposes or the performance criteria of these Rules;~~

~~(4) in the case of an experimental system, the site(s) at which the experimental system is to be located is capable of accommodating a fully complying system under these Rules, or the Secretary has determined that, as a replacement system, the experimental system is equal to or better than any other option available, considering the cost of the incremental increase in environmental and human health protection;~~

~~(5) in the case of an experimental product, the criteria in (a)(4) above are met, or the Secretary determines that sufficient safeguards exist in the rest of the system design to satisfy (a)(3) above; and~~

~~(6) adequate monitoring of the experimental system or product is provided to ensure protection of public health and the environment as well as to assess the performance of the experimental system or product.~~

~~(b) Up to five (5) installations or uses of each specific experimental system or product may be authorized under this subsection.~~

~~(c) The Secretary may require bonding or other surety of an appropriate amount to ensure performance or replacement of an experimental system or product in the event that it fails to meet the purposes of these Rules. Surety or bonding shall be established for a specified time period in each case.~~

~~§ 1-1004 Application Process for Innovative/Alternative Systems and Products~~

~~An application for use of an innovative/alternative technology shall be submitted on a form prepared by the Secretary. The application form shall require the following information:~~

~~(a) **General Information**~~

~~(1) Company or vendor name.~~

~~(2) Address.~~

~~(3) Specific contact name, address, phone number, fax number, and E-mail address.~~

~~(b) **System or Product Information**~~

~~(1) System trade name and model/s number(s), if any.~~

~~(2) Description of theory of operation.~~

~~(c) **Statement of Claim**~~

~~(1) Advantages related to prevention of health hazards, surface and ground water pollution, environmental protection or other advantages.~~

~~(2) Treatment performance claims, if any, expressed in mg/l or in appropriate units for biologic constituents.~~

~~(3) Type of authorization (general, pilot, or experimental) requested and justification why the system or product belongs in the requested class.~~

~~(4) Possible modes of failure and an assessment of the risks to public health, owners/operators of the system or product, and the environment.~~

~~(d) **Authorization/Denial History**~~

~~(1) Authorizations from (include copies of all authorizations and the contact person):~~

~~(A) Other states.~~

~~(B) Other jurisdictions.~~

~~(2) Denials from (include copies of all denials and the contact person):~~

~~(A) Other states.~~

~~(B) Other jurisdictions.~~

~~**§ 1-1004(c) Application Process for Innovative/Alternative Systems and Products**~~

~~(e) **Information Related to the System or Product**~~

~~(1) Copies of all operational reports, patent information, technical reports, and laboratory reports published on the proposed system or product even if the information might in whole or part reflect negatively on the system or product.~~

~~(2) The number of systems or products installed and their jurisdictional location~~

~~(3) Reports of any failures, with the cause if determined, and any corrections or modifications to the system or product that have been made to correct and/or prevent failures.~~

~~(f) **Design Criteria**~~

~~(1) Design and material requirements.~~

~~(2) Plans and cross sections.~~

~~(3) Design limitations or restriction.~~

~~(4) Leachfield sizing and justification.~~

~~(5) Construction requirements and limitations.~~

~~(6) Aesthetic (noise, odor, and appearance) issues.~~

~~(g) **Operation Requirements**~~

~~(1) Technical qualifications for operators.~~

~~(2) Specific actions required to operate the system or product.~~

~~(h) **Maintenance Requirements**~~

~~(1) Technical qualifications for maintenance personnel.~~

~~(2) Specific actions required to maintain the system or product.~~

~~(i) **Monitoring Requirements**~~

~~(1) Proposed schedule for monitoring, including frequency and constituents, if any is proposed.~~

~~(2) All treatment systems or products shall include suitable sample collection locations for routine or verification monitoring.~~

~~**§ 1-1004(j) Application Process for Innovative/Alternative Systems and Products**~~

~~(j) **Cost**~~

~~(1) Design cost estimates.~~

~~(2) Construction or installation costs.~~

~~(3) Operation and maintenance costs.~~

~~(4) Energy costs.~~

~~(k) **Approval or Denial of Applications**~~

~~(1) The Secretary shall make a determination for each of the factors related to the specific class (general, pilot, or experimental) for which authorization is requested.~~

~~(2) The Secretary shall consider all of the information available and its reliability as follows:~~

~~(A) an advisory opinion of the Technical Review Committee for the New England Interstate Regulatory Cooperation Project that verifies one or more performance claims shall satisfy the requirements related to that performance claim.~~

~~(B) information from third party testing at certified laboratories and test facilities that represent a significant number of systems or products that have been installed in a variety of situations representative of Vermont's soils and climate shall be given great weight in determining whether performance claims are met. Such testing will normally be required for any treatment system or product seeking general use authorization.~~

~~(C) recommendations from other states based on use of a particular system or product that has been installed in a variety of situations representative of Vermont's soils and climate will be important. Reports related to systems or products that have been installed in large numbers for more than 5 years and that the state has monitored to determine successful operation will be given significant weight.~~

~~(D) limited third party testing at certified laboratories.~~

~~(E) extensive testing by the company or vendor based on accepted testing protocols.~~

~~(F) a combination of favorable results from (C), and (D) or (E), will normally be sufficient for pilot approval.~~

~~(G) bench testing and other information collected by the company or vendor. Limited information and a proposed process based on~~

~~established scientific principles, when coupled with appropriate site limitations will normally be sufficient for experimental authorization.~~

~~(3) Decisions~~

~~(A) All decisions shall be in writing and shall be made available for public review.~~

~~(B) Authorizations shall include conditions related to the conditions under which the wastewater system or product may be used, the obligations of the system or product owner to operate and maintain the system or product, and any requirements to submit records.~~

~~(C) Any denial shall state the basis of the denial. Denials may be issued when it has been determined that the wastewater system or product does not meet the performance requirements of the Rules or when the company or vendor has failed to provide information that demonstrates compliance with the Rules.~~

~~(4) Revocation of authorization: A system or product authorization may be revoked if the Secretary determines:~~

~~(A) the authorization was granted on the basis of incorrect, false, or misleading information; or~~

~~(B) the system or product fails to perform in compliance with any performance standard established for the system; or~~

~~(C) the system or product does not function with the expectations for reliability and protection of health and the environment upon which the authorization was based on; or~~

~~(D) the company or vendor fails to comply with conditions in the authorization, including but not limited to:~~

~~(i) filing required reports;~~

~~(ii) maintaining a required supply of repair or replacement parts; or~~

~~(iii) ensuring an adequate supply of trained individuals to operate and maintain the system or product, if required.~~

~~(E) Any revocation proceeding under this subdivision shall be done in accordance with the process, as applicable, in section 1-404 of these Rules.~~

~~APPENDIX 1-A~~
~~DESIGN GUIDELINES~~

~~1-A-01 Introduction~~

~~**Following are guidelines for use in the design of systems subject to the Environmental Protection Rules, Chapter 1. Designers are encouraged to use equally or more effective technologies or practices in the design of systems under these guidelines. The Agency may approve different designs that are based on current technology and that have been demonstrated as effective. The Agency may approve a demonstration project designed to test a different design. The designer must support any request for a different approach. Depending on the degree of difference from the guidelines, approval may be conditioned upon periodic inspections to determine that the project is functioning as designed. Any design for a project where a municipality will ultimately be responsible for the operation and maintenance of the project shall include municipal acceptance of the system. While there are no specific technical requirements for any particular design detail, the Secretary will not approve any design that is not based on accepted scientific and engineering principles, except for a demonstration project.**~~

> ~~**Note: Although these guidelines have been subject to review and comment in a rulemaking process, they remain merely guidelines, not binding rules, in order to allow for flexibility in the design of those aspects of sewers, sewage collection systems and lift stations that are addressed in this appendix.**~~

~~1-A-02 Building Sewers~~

~~The building sewer is that part of the drainage system extending from a building drain to a public sewer, private sewer, septic tank system, or other treatment system. A sewer serving one building will be considered a building sewer. All other sewers will be considered a collection sewer.~~

~~(a) Materials: The building sewer shall be constructed in a manner that will prevent leaking, breaking or clogging. Acceptable materials for the sewer are rubber ring jointed, PVC, or cast iron (CI) sewer service pipe. Other materials may be proposed for acceptance by the Secretary.~~

~~(b) Sizing & Slope: Building sewers shall be sized based on procedures outlined under 1-A-02. Minimum building sewer size is 4 inches and minimum slope is 1/4 inch per foot.~~

~~(c) Connection to a collection sewer: Building sewers discharging to a collection sewer shall be connected through a manhole constructed in accordance with 1-A-03(l) or with a wye fitting so as to direct flow and minimize in line turbulence.~~

~~(d) Cleanouts: Cleanouts shall be provided at each horizontal change in direction of the building sewer greater than 45 degrees and at intervals of not more than 100 feet. Building sewer changes in direction that exceed 45 degrees should be made with two 45 degree ells or long sweep fittings. Manholes are acceptable in lieu of cleanouts. Where building sewers to be installed at a depth of less than 3 feet under driveways are anticipated, extra heavy cast iron or other high strength pipe acceptable to the Secretary shall be required.~~

~~**1-A-02(c) Building Sewers**~~

~~(e) Leakage: Building sewers shall meet the leakage standards prescribed in Section 1-A-03(k).~~

~~**1-A-03 Sewer Collection Systems**~~

~~(a) A sewer collection system is that system of sewers that transport wastewater from building sewers to the wastewater treatment/disposal system.~~

~~(b) No connections of roof drains, area drains, foundation drains, cellar drains or other clean water sources or any storm drains will be allowed to building or collection sewers.~~

~~(c) Building and collection sewers carrying raw or untreated wastewater shall be sized as follows:~~

~~(1) Collection sewers shall be a minimum of 6" diameter.~~

~~(2) The flow rate to be used in sizing the sewer shall be based on the full occupancy design flows for the facilities connected as derived from §1-808~~

~~(3) times the following factors.~~

~~(A) For design flows less than l0,000 gpd, a factor of 5.~~

~~(B) For design flows over l0,000 gpd, a factor derived from Table 1-A-1~~

~~TABLE 1-A-1~~
~~Peaking Factors~~

~~Design Flow~~	~~Peaking Factor~~
~~10,000 gpd~~	~~4.2~~
~~100,000 gpd~~	~~3.8~~
~~500,000 gpd~~	~~3.2~~
~~l, 000, 000 gpd~~	~~3.0~~

~~(4) Sewers shall be sized for the above derived flow rate to provide a minimum velocity of 2 feet per second when flowing full using the Kutter formula or other acceptable formulae and friction coefficients appropriate for the pipe materials proposed, considering surface deterioration over the expected useful life of the pipe.~~

~~(d) Depth: In general, sewers should be sufficiently deep to receive sewage from basements and to prevent freezing. A bury depth of at least four feet should be maintained. This depth should be increased to at least five feet in areas to be plowed during winter months. When these depths cannot be maintained without significant expense, the designer may propose less depths with mitigating measures to protect the sewer.~~

~~**1-A-03(c) Sewer Collection Systems**~~

~~(e) Slope, Velocity: All sewers shall be designed and constructed to provide mean velocities, when flowing full, of not less than 2.0 feet per second. Regardless of the formula used or friction factors used in the design of the sewers, all sewers shall be installed with at least the slopes shown in Table 1-A-2~~

~~TABLE 1-A-2~~
~~Minimum Slopes~~

~~Pipe Size (inches)~~	~~Slope (feet/l00 feet)~~
~~6”~~	~~0.60~~
~~8"~~	~~0.40~~
~~10"~~	~~0.28~~
~~12"~~	~~0.22~~
~~15"~~	~~0.15~~

~~Sewers shall be laid with uniform slope and straight alignment between manholes. Where velocities greater than 15 feet per second are attained, special provisions shall be made to protect against displacement by erosion and shock.~~

~~Sewers on 20 percent slopes or greater shall be anchored securely with concrete anchors or equal, spaced as follows:~~

~~(1) not over 36 feet center to center on grades 20 percent and up to 35 percent;~~

~~(2) not over 24 feet center to center on grades 35 percent and up to 50 percent; and~~

~~(3) not over 16 feet center to center on grades 50 percent and over.~~

~~(f) When a smaller sewer joins a larger one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.~~

~~(g) Sewer extensions should be designed for projected design flows even when the diameter of the receiving sewer is less than the diameter of the proposed extension. The Agency may require a schedule for future downstream sewer relief.~~

~~(h) Materials: Generally, rubber ring jointed PVC, AC or ductile iron (DI) gravity sewer pipe of the proper class is acceptable. Other materials may be approved by the Secretary .~~

~~(1) Sewer joints shall be designed to minimize infiltration and to prevent the entrance of roots throughout the life of the system.~~

~~(2) All sewers shall be designed to prevent damage from superimposed loads. Proper allowance loads on the sewer shall be made because of the width and depth of trench. Where necessary to withstand extraordinary superimposed loading, special bedding, concrete cradle or special construction may be used.~~

~~(i) Trenching: Ledge, rock, boulders, and large stones shall be removed to provide a minimum clearance of four inches below and on each side of all pipe(s).~~

~~(j) Bedding:~~

~~(1) Bedding classes A, B, or C, as described in American Society for Testing and Materials (ASTM) C12-77 or Water Pollution Control Federation Manual of Practice (WPCF-MOP) No. 9* shall be used for all rigid pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load.~~

~~*Note: WPCF-MOP No. 9 is a joint publication with the American Society of Civil Engineers (ASCE) which lists it as "Manuals and Reports on ENGINEERING PRACTICE No. 39. " See Appendix 5-A for the address of the ASCE.~~

~~(2) Bedding classes I, II, or III, as described in ASTM 0232174(80) shall be used for all flexible pipe provided the proper strength is used with the specified bedding to support the anticipated load.~~

~~(3) Backfill shall be of a suitable material removed from excavation except where other material is specified. Debris, frozen material, large clods or stones, organic matter, or other unstable materials shall not be used for backfill within two feet of the top of the pipe.~~

~~(k) Leakage Tests: When tested, the leakage inward and outward of a gravity sewer including manholes shall not exceed 200 gallons per inch of pipe diameter per mile per day. Upon completion of construction, a sewer line shall be tested in accordance with one of the following procedures:~~

~~(1) Water testing~~

~~(A) Plug or cap all service laterals, stubs, and fittings. Place adequate bracing to withstand thrust forces.~~

~~(B) A tapped plumber's plug should be inserted in the downstream manhole inlet sewer. The water supply connection is made at this point, but never directly from a public water supply system or hydrant unless a backflow preventer is used.~~

~~(C) A stand pipe is tightly connected at the upstream end of the sewer. The height of the stand pipe shall be at least two feet higher than any point in the sewer or two feet higher than the highest known ground water table, whichever is higher. A manhole may be used as a stand pipe .~~

~~(D) Water is added at the downstream connection in order to avoid trapping air bubbles or pockets. The line shall be filled to the elevation designated in the stand pipe.~~

~~(E)~~ ~~Allow the line to stand with water for at least a two hour stabilization period or such shorter period as may be required to achieve stabilized readings of water loss over three consecutive 15 minute periods. This allows air to escape and absorption to take place.~~

~~(F)~~ ~~Fill the sewer line to the reference mark and continue the test for at least one hour. Maintain the minimum head throughout the test, adding any volume of water required and including that volume in the leakage.~~

~~(G)~~ ~~Convert the leakage to the units specified.~~

~~(2)~~ ~~Air testing~~

~~(A)~~ ~~Procedures~~

~~(i)~~ ~~Determine the test time for the section of line to be tested using Table 1-A-3 or 1-A-4 or the formulas in Chart 1-A-1.~~

~~(ii)~~ ~~Plug all openings in the test section.~~

~~(iii)~~ ~~Add air until the internal pressure of the line is raised to approximately 4.0 pounds/square inch (psi) greater than the average pressure of any ground water. After this pressure is reached, allow the pressure to stabilize. The pressure will normally drop as the air temperature stabilizes. This usually takes 2 to 5 minutes depending on the pipe size. The pressure may be reduced to 3.5 psi before starting the test.~~

~~(iv)~~ ~~When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi above the pipe, start the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test. If a 1.0 psi drop does not occur within the test time, the line has passed the test.~~

~~(B)~~ ~~Test time~~

~~(i)~~ ~~Table 1-A-3 shows the required test time, T, in minutes/100 feet of pipe for each nominal pipe size. Test times are for a 1.0 psi pressure drop from 3.5 to 2.5 psi. Table 1-A-3 has been established using the formulas contained in Chart 1-A-1.~~

~~(ii)~~ ~~If the section of line to be tested includes more than one pipe size, calculate the test time for each size and add the test times to arrive at the total test time for the section.~~

~~(iii)~~ ~~It is not necessary to hold the test for the whole period when it is clearly evident that the rate of air loss is less than the allowable.~~

~~TABLE 1-A-3 MINIMUM TEST TIME FOR VARIOUS PIPE SIZES~~

~~Nominal Pipe Size in inches~~	~~T (time) min/100 ft.~~	~~Nominal Pipe Size in inches~~	~~T (time) min/100 ft.~~
~~3~~	~~0.2~~	~~21~~	~~3.0~~
~~4~~	~~0.3~~	~~24~~	~~3.6~~
~~6~~	~~0.7~~	~~27~~	~~4.2~~
~~8~~	~~1.2~~	~~30~~	~~4.8~~
~~10~~	~~1.5~~	~~33~~	~~5.4~~
~~12~~	~~1.8~~	~~36~~	~~6.0~~
~~15~~	~~2.1~~	~~39~~	~~6.6~~
~~18~~	~~2.4~~	~~42~~	~~7.3~~

~~CHART 1-A-1~~

~~FORMULAS AND ALLOWABLE AIR LOSS STANDARDS~~

~~Calculate the required test time at a given allowable air loss as follows:~~

$$T = (K) \times \frac{(D)^2(L)}{(Q)}$$

~~Calculate air loss with a timed pressure drop as follows:~~

$$Q = (K) \times \frac{(D)^2(L)}{(T)}$$

~~Symbols:~~

~~D = nominal size, in.~~
~~K = 0.534 x 10-6 for S.I. units~~
~~K = 0.371 x 10-3 for inch pound units~~
~~L = length of line of one pipe size, ft.~~
~~Q = air loss, ft 3/min.~~
~~T = time for pressure to drop 1.0 psi, min~~

~~(C)~~ ~~An appropriate allowable air loss, Q, in cubic feet per minute, has been established for each nominal pipe size. Based on field experience, the Q value that has been selected will enable detection of any significant leak. Table 1-A-4 lists the Q established for each pipe size.~~

~~TABLE 1-A-4 ALLOWABLE AIR LOSS FOR VARIOUS PIPE SIZES~~

~~Nominal Pipe Size in Inches~~	~~Q, ft^3/min~~	~~Nominal Pipe Size in Inches~~	~~Q, ft^3/min~~
~~3~~	~~2~~	~~21~~	~~5.5~~
~~4~~	~~2~~	~~24~~	~~6~~
~~6~~	~~2~~	~~27~~	~~6.5~~
~~8~~	~~2~~	~~30~~	~~7~~
~~10~~	~~2.5~~	~~33~~	~~7.5~~
~~12~~	~~3~~	~~36~~	~~8~~
~~15~~	~~4~~	~~39~~	~~8.5~~
~~18~~	~~5~~	~~42~~	~~9~~

~~For further information regarding the Air Testing procedures, refer to ASTM F1417-92 (2005) "Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air", ASTM International. For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary Page on the ASTM website.~~

~~**1-A-03(l) Sewer Collection Systems**~~

~~(l) Manholes~~

~~(1) Location: Manholes shall be installed at the end of each line, at all changes in grade, size or alignment, at all intersections, and at distances not greater than 300 feet unless the designer justifies a greater spacing.~~

~~(2) Drop Type: A drop pipe should be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert should be filleted to prevent deposition of solids.~~

~~Drop manholes should be constructed with an outside drop connection. Inside drop connections (when necessary) shall be secured to the interior wall of the manhole and provide access for cleaning. Where inside drops are used, the manhole diameter shall be increased to allow adequate access.~~

~~Due to the unequal earth pressures that would result from the backfilling operation in the vicinity of the manhole, the entire outside drop connection shall be encased in concrete and supported by the manhole base.~~

~~(3) Diameter: The minimum diameter of manholes shall be 48 inches; large diameters are preferred for connection to large diameter sewers. A minimum access diameter of 22 inches shall be provided.~~

~~(4) Flow Channel: Flow channels shall be provided in the base of all manholes and the flow channel through manholes should be made to conform in shape and slope to that of the sewers.~~

~~(5) Manholes shall be of the precast concrete or poured in place concrete type. Manholes shall be waterproofed on the exterior.~~

~~(6) Inlet and outlet pipes shall be joined to the manhole with a rubber gasketed flexible watertight connection that allows differential settlement of the pipe and manhole wall to take place.~~

~~Grouting is not an acceptable connection. All manhole connections, including building sewers, shall be constructed to this standard.~~

~~(7) Watertight manhole covers are to be used wherever the manhole tops may be flooded by street runoff or high water. Locked manhole covers may be desirable in isolated easement locations where vandalism may be a problem.~~

~~(8)~~ ~~All manholes shall be tested for leakage. Leakage testing of gravity sewers utilizing the water testing procedures takes into account the leakage from one manhole in the test section. Otherwise, manholes shall be tested for leakage in accordance with the following procedure:~~

~~After the manhole has been assembled in place, all lifting holes and exterior joints shall be filled and pointed with non shrinking mortar. All pipes and other openings into the manhole shall be suitably plugged and the plugs placed to prevent blowout.~~

~~Each manhole shall be checked for exfiltration by filling with water to the top of the cone section. A stabilization period of one hour shall be provided to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and the measuring time of at least six hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone measuring the volume of water added.~~

~~This amount shall be converted to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed one gallon per vertical foot for a 24 hour period for exfiltration and there shall be no visible infiltration.~~

~~Alternatively, the manhole may be tested for leakage using the following procedure:~~

~~All lifting hole and exterior joints shall be filled and pointed with an approved non-shrinking mortar. The completed manhole shall not be backfilled prior to testing. Manholes that have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of a hydrostatic test.~~

~~All pipes and other openings in the manhole shall be suitably plugged in a manner to prevent displacement.~~

~~A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to a pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.~~

~~Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of the air shall then be stopped and the test time begun.~~

~~The vacuum must not drop below 9 inches of mercury within a 2 minute test period. If more than 1 inch of drop in vacuum occurs within the 2 minute test period the manhole has failed the test and shall be repaired or reconstructed and retested.~~

~~Following satisfactory test results, the manhole may be backfilled.~~

~~**1-A-03(l)(9) Sewer Collection Systems**~~

~~(9) Location of Sewers on Streams~~

~~(A) Cover Depth: The top of all sewers entering or crossing streams shall be at a sufficient depth below the natural bottom of the stream bed to protect the sewer line. In general, the following cover requirements must be met:~~

~~(i) One foot of cover is required where the sewer is located in rock;~~

~~(ii) Three feet of cover is required in other material. In major streams, more than three feet of cover may be required; and~~

~~(iii) In paved stream channels, the top of the sewer line should be placed below the bottom of the channel pavement.~~

~~(B) Horizontal Location: Sewers located along streams shall be located outside of the stream bed and sufficiently removed therefrom to provide for future possible stream widening, minimize pollution by siltation during construction, and allow future access for repair and maintenance of sewers.~~

~~(C) Structures: The sewer, manholes, gate boxes, or other structures shall be located so they do not interfere with the free discharge of flood flows of the stream. No manholes or other access structures shall be located within the normal flow channel of the stream.~~

~~(D) Alignment: Sewer crossing streams should be designed to cross the stream as nearly perpendicular to the stream flow as possible and shall be free from change in grade. Sewer systems shall be designed to minimize the number of stream crossings.~~

~~(E) Construction - Materials: Sewers entering or crossing streams shall be constructed of cast or ductile iron pipe with mechanical joints and they shall be constructed so they will remain watertight and free from changes in alignment or grade. Material used to backfill the trench shall be stone, coarse aggregate, washed gravel, or other materials that will not cause situation.~~

~~(10)~~ ~~Aerial Crossings: Support shall be provided for all joints in pipes utilized for aerial crossings. The supports shall be designed to prevent frost heave, overturning and settlement.~~

~~Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above ground and below ground sewers.~~

~~For aerial stream crossings, the impact of flood waters and debris shall be considered. The bottom of pipe should be placed no lower than the elevation of the fifty (50) year flood.~~

~~(11)~~ ~~Water Line Separation~~

~~(A)~~ ~~Horizontal Separation: Sewers shall be laid at least ten feet horizontally from any existing or proposed water main. The distance shall be measured edge to edge.~~

~~Where impossible or impracticable, due to ledge, boulders or other unusual conditions, to maintain the ten foot sewer--water pipe horizontal separation between sewer and water lines, the water line may be in a separate trench or on an undisturbed earth shelf in the sewer trench provided that the bottom of the water line is at least 18 inches above the top of the sewer. Wherever impossible or impractical to maintain the 18 inch vertical separation, the sewer line shall be constructed to normal water line standards and pressure tested to 50 psi for 15 minutes prior to backfilling. No leakage shall be allowed for this test.~~

~~(B)~~ ~~Crossings: Sewers crossing water mains shall be laid beneath the water main with at least 18 inches vertical clearance between the outside of the sewer and the outside of the water main. When it is impossible to maintain the 18" vertical separation; 1) the crossing shall be arranged so that one full length of sewer is centered above or below the water line with sewer joints as far as possible from water joints; 2) the sewer pipe must be constructed to water main standards for a minimum distance of 20 feet either side of the crossing or a total of three pipe lengths, whichever is greater; 3) the section constructed to water main standards must be pressure tested to maintain 50 psi for 15 minutes without leakage prior to backfilling beyond one foot above the pipe to assure water tightness; 4) where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to prevent damage to the water main.~~

~~**1-A-04 Sewage Lift Stations**~~

~~(a) Flooding: Sewage pumping station structures and electrical and mechanical equipment shall be protected from physical damage from the one hundred (100) year flood. Sewage pumping stations should remain fully operational and accessible during the twenty five (25) year flood.~~

~~(b) Equipment Removal: Provision shall be made to facilitate removal of pumps, motors, and other mechanical and electrical equipment.~~

~~(c) Pump Removal: Submersible pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well.~~

~~(d) Construction: Submersible pumps and motors shall be designed specifically for raw sewage use, including totally submerged operation during a portion of each pumping cycle.~~

~~(e) Pumping Units: Lift stations receiving an average daily flow of less than 2,000 gal/day may be equipped with a single pumping unit, provided that replacement pumps are readily available, and one day's emergency storage is provided above the alarm level in the wet well. All other lift stations shall contain alternating duplex pumping units with each unit capable of pumping the maximum flow the station is expected to receive.~~

~~(f) Pump Openings: For pumps handling raw sewage, except where grinder pumps are used, pumps shall be capable of passing spheres of at least three inches in diameter, and pump suction and discharge piping should normally be at least four inches in diameter. Pumps handling only settled wastewater shall be capable of passing 1½" spheres. However, the Agency will entertain proposals for smaller pumps where the engineer can demonstrate that such pumps are satisfactory for the particular wastewater to be pumped, based on actual operating experience.~~

~~(g) Priming: Generally, the pump shall be so placed that, under normal operating conditions, it will operate under a positive suction head.~~

~~(h) Electrical Equipment: Electrical systems and components (e.g., motors, lights, cables, conduits, switchboxes, control circuits; etc.) in raw sewage wet wells, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present shall comply with the National Electrical Code®, 2005 Edition, requirements for Class I, Group D, Division 1 locations. In addition, equipment located in the wet well shall be suitable for use under corrosive conditions. Each flexible cable shall be provided with watertight seal and separate strain relief. A fused disconnect switch located above ground shall be provided for all pumping stations. When such equipment is exposed to weather, it shall meet or exceed the requirements of weatherproof equipment as specified by the National Electrical Manufacturers Association (NEMA). Standard 3R shall be used as a minimum and is specified in Publication #250-1997, "Enclosures for Electrical Equipment (1,000 Volt Maximum.)" See Appendix 5-A for the address.~~

~~**1-A-04(i) Sewage Lift Stations**~~

~~(i) Intake: Each pump should have an individual intake. Wet well design should be such as to avoid turbulence near the intake. Intake piping should be as straight and short as possible. Where turned down bellmouth inlets or submersible pumps are used the bottom of the inlets should be placed a sufficient distance above the wet well floor to minimize inlet head losses, but close enough to the wet well floor to assure inlet velocities sufficient to prevent solids deposition.~~

~~(j) Pumping Rates: The pumps selected shall be capable of providing the following pumping rates:~~

~~(1) The minimum pumping rate shall not be less than 5 gallons per minute~~

~~(2) For average daily flows less than 10,000 gallons per day, the maximum rate shall be 5 times the average design flow.~~

~~(3) For average design flows greater than 10,000 gallons per day, the maximum flow rate shall be determined by multiplying the average design flow by the appropriate peaking factor from Table 1-A-1 Peaking Factors (page 133) .~~

~~(k) Pump controls~~

~~(1) Location: The pump control system shall be located away from the turbulence of incoming flow and pump suction.~~

~~(2) Setting: The '2nd pump on' level and 'alarm on' level shall be at the same elevation.~~

~~(l) Valves~~

~~(1) Suction Line: Suitable shutoff valves shall be placed on the suction line of each pump except on submersible pumps.~~

~~(2) Discharge Line: Suitable shutoff and check valves shall be placed on the discharge line of each pump. The check valve shall be located between the shutoff valve and the pump. Check valves shall be suitable for the material being handled. Valves shall be capable of withstanding normal pressure and water hammer.~~

~~(3) Location: Valves may be located in wet wells only where single pump units are allowed. On all duplex unit pumping stations, the valves shall be in a separate valve pit adjacent to the wet well. This valve pit shall also contain a valved connection to allow the use of a portable pump for lift station bypassing during emergency conditions. The valve pit shall be provided with a drain to the wet well. An effective method of preventing sewage from entering the pit during surcharged wet well conditions shall be provided.~~

~~**1-A-04(m)**~~ ~~**Sewage Lift Stations**~~

~~(m)~~ ~~Wet Wells~~

~~(1)~~ ~~Size: For lift stations handling raw sewage and receiving more than 20,000 gallons per day average design flow, the size of the wet well shall be such that with any combination of inflow and pumping the cycle of operation of each pump will not be less than 5 minutes and the retention time in the wet well should not be more than 30 minutes at average design flow. For raw sewage lift stations receiving less than 20,000 gallons per day, the retention time in the wet well will not be more than 30 minutes at average design flow. These requirements do not apply for lift stations handling only settled wastewater.~~

~~Emergency storage or emergency power must be provided at all lift stations for power outage. Storage should be provided above the high water alarm level of the wet well, in the wet well or in an adjacent tank. The volume of storage should equal the design wastewater flow for a period in excess of the longest power outage in the last five years that would have affected the proposed site, or four hours, based on a 16 hour delivery rate, whichever is greater.~~

~~The emergency storage volume may overflow into the connecting sewer lines providing that the sewage does not back up into building basements or fixtures, back up into septic tanks or over top manholes or the wet well.~~

~~Emergency storage will be a minimum of one day of wastewater design flow for all lift stations with a single pump.~~

~~(2)~~ ~~Floor slope: For all raw wastewater pump stations except submersible pump types, the wet well floor shall have a minimum slope of one to one to the hopper bottom. The horizontal area of the hopper bottom shall be not greater than necessary for proper installation and function of the inlet.~~

~~(3)~~ ~~Ventilation~~

~~(A)~~ ~~Dry Wells: Ventilation may be either continuous or intermittent. Ventilation, if continuous, shall provide at least six complete air changes per hour, if intermittent, at least 30 complete air changes per hour.~~

~~(B)~~ ~~Wet Wells: For lift stations receiving less than 20,000 gallons per day design flow gravity ventilation is acceptable. For flows greater than 20,000 gallons per day design flow, forced ventilation shall be used. Forced ventilation may be either intermittent or continuous. Ventilation, if continuous, shall be capable of providing at least 12 complete air changes per hour, if intermittent, at least 30 complete air changes per hour. Air changes shall be forced into the wet well rather than exhausted from the wet well. Portable ventilation equipment may be approved when pumps, controls, screens, and other mechanical equipment can be serviced or replaced without entering the wetwell provided that the designer submits information demonstrating that the~~

~~proposed portable equipment will be suitable for the purpose, and operation and maintenance plan for the equipment, and a statement that the portable equipment will be equally or more effective than permanently installed equipment.~~

~~(n)~~ ~~Alarm Systems: Alarm systems shall be provided for pumping stations. The alarm shall be activated in cases of pump failure, use of the lag pump, high water in wet well, or other evidence of pump station malfunction. Audio and visual alarms shall be provided. Alarms shall be located in a normally frequented area.~~

~~1-A-05 Force Mains~~

~~(a)~~ ~~Velocity: The force main shall be sized to maintain a minimum hydraulic velocity of 2 feet per second with one pump on. The minimum force main size shall be 1 ½ inch diameter.~~

~~(b)~~ ~~Air Relief Valve: An automatic air relief valve shall be placed at high points in the force main to prevent air locking.~~

~~(c)~~ ~~Termination: Force mains should enter the gravity sewer system at a point not more than 2 feet above the flow line of the receiving manhole~~

~~(d)~~ ~~Design Pressure: Force mains and fittings, including reaction blocking, shall be designed to withstand normal pressure and pressure surges (water hammer).~~

~~(e)~~ ~~Design Friction Losses: Friction losses in force mains shall be based on the Hazen Williams formula or other acceptable method. Selected friction factors shall be representative of pipe materials selected, considering surface deterioration over the expected useful life of the pipe.~~

~~Hazen Williams Formula~~

$$V = 1.32\, C\, R^{0.63}\, S^{0.54}$$

~~R is the hydraulic radius~~
~~S is the slope of the energy grade line~~
~~C is the coefficient of roughness~~

~~(f)~~ ~~Separation from Water Mains: There shall be a minimum 10-foot horizontal separation between water mains and force mains. A minimum 18 inch vertical separation between the outside pipe surfaces shall be maintained where force mains cross water mains. Force mains shall cross water mains at or near right angles with one full length of water pipe centered on the force main so both end joints are at maximum separation from the force main. Special structural support for the water main and the force main may be required.~~

~~**1-A-05(g) Force Mains**~~

~~(g) Pressure Test: Upon completion of construction of a force main the line shall be pressure and leakage tested. All newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 x the highest working pressure in the section in accordance with the following procedure:~~

~~(1) Test pressures shall:~~

~~(A) not be less than 50 psi at the highest point along the test section.~~

~~(B) not exceed pipe or thrust restraint design pressures.~~

~~(C) be of at least 2 hour duration.~~

~~(D) not vary by more than 5 psi.~~

~~(E) not exceed twice the rated pressure of the valves when the pressure boundary of the test section includes closed gate valves.~~

~~(2) Pressurization. Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to test gauge, shall be applied by means of a pump connected to the pipe.~~

~~(3) Air Removal. Before applying the specified test pressure, air shall be expelled completely from the pipe and valves.~~

~~(4) Examination. All exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, or valves, that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated.~~

~~(h) Leakage Test~~

~~(1) A leakage test shall be conducted concurrently with the pressure test.~~

~~(2) Leakage Defined. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled.~~

~~**1-A-05(h)(3)**~~ ~~**Force Mains**~~

~~(3)~~ ~~Allowable Leakage. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:~~

$$\cancel{L = \frac{(N)(D) \times \sqrt{P}}{7400}}$$

~~L is the allowable leakage, in gallons per hour~~
~~N is the number of joints in the length of pipeline tested~~
~~D is the nominal diameter of the pipe, in inches~~
~~P is the average test pressure during the leakage test, in pounds per square inch gage.~~

~~APPENDIX 2-A~~
~~SOIL MOTTLING~~

~~2-A-01 Soil Mottling~~

~~(a) Mottling indicates the average seasonal high water table over many years produced by the seasonal fluctuation of the water table. The presence of mottling is a definite indication of the seasonal high water table. However, mottling does not occur in all soils. The absence of mottling does not necessarily indicate that the seasonal high water table is not a problem.~~

~~(b) The soil mottling should be described in abundance, size, contrast, and color of the mottles in the following manner:~~

~~(1) Abundance. Abundance shall be described as "few" if the mottled color occupies less than 2% of the exposed surface; "common," if the mottle color occupies from 2% to 20% of the exposed surface; or "many" if the mottled color occupies more than 20% of the exposed surface.~~

~~(2) Size. Size refers to the length of the mottle measured along the longest dimension and shall be described as "fine" if the mottle is less than 5mm; "medium" if the mottle is from 5mm to 15mm, or "coarse" if the mottle is greater than 15mm.~~

~~(3) Contrast. Contrast refers to the difference in color between the soil mottle and the background color of the soil and is described as "faint" if the mottle is evident but recognizable only with close examination; "distinct" if the mottle is readily seen but not striking; or "prominent" if the mottle is obvious and one of outstanding features in the soil horizon~~

~~(4) Color. The color(s) of the mottle(s) shall be given.~~

~~(c) Observed Groundwater: Groundwater shall be observed and reported at the highest level the ground water rises in the soil excavation or at the highest level of sidewall seepage in the excavation. Measurements shall be made from the ground surface. Soil above the water level in the excavation shall be checked for the presence of mottles or color patterns indicative of soi1 saturation.~~

~~(d) Color Patterns Not Indicative of Seasonal High Groundwater: One-foot exception. Soil profiles that have an abrupt textural change with finer textured soils overlying more than 4 feet of unmottled, or coarse sand can have a mottled zone in the finer textured material. If the mottled zone is less than one foot thick and is immediately above the textural change, then a soil-based system may be installed in the loamy sand or coarser material below the mottled layer.~~

~~**2-A-01(c)**~~ ~~**Soil Mottling**~~

~~(e)~~ ~~Other Color Patterns: Soil mottles can occur that are not due to zones of seasonal or periodic soil saturation. Examples of such soil conditions not limited by enumeration are:~~

~~(1)~~ ~~soil mottles formed from uneven weathering of glacially deposited material. Glacially deposited material may also be naturally gray in color. This may include concretionary materials in various stages of decomposition;~~

~~(2)~~ ~~deposits of lime in a profile derived from highly calcareous parent materials;~~

~~(3)~~ ~~soil mottles that are usually vertically oriented along old or decayed root channels with dark organic stain usually present in the center of the mottled area.~~

~~APPENDIX 3-A~~
~~SEPTIC TANK SPECIFICATIONS AND MAINTENANCE~~

~~3-A-01~~ ~~Septic Tank Specifications and Maintenance~~

~~(a)~~ ~~Specifications~~

~~(1)~~ ~~Materials: Septic tanks shall be watertight, structurally sound, and constructed of materials not subject to extensive corrosion or decay. Heavy gauge steel, reinforced concrete and fiberglass are considered the normal construction materials. Steel tanks shall be continuous and watertight. Precast concrete tanks shall have a minimum wall thickness of 3 inches and shall be adequately reinforced to facilitate handling. When precast slabs are used as covers, they shall be watertight, have a thickness of at least 3 inches, and be adequately reinforced. For fiberglass tanks, the manufacturer may be required to substantiate the structural soundness of the tank by submitting an approved laboratory report, that relates to structural testing of the tank.~~

~~(2)~~ ~~Tank Properties: Adequate tank capacity is required above the liquid tank level to provide for that portion of the scum that floats above the liquid. Although some variation is to be expected, on the average, about 30 percent of the total scum will accumulate above the liquid line. In addition to the provision for scum storage, one inch is usually provided at the top of the tank to permit free passage of gas back to the inlet and house vent pipe.~~

~~For tanks having straight, vertical sides, the distance between the top of the tank and the liquid line should be equal to approximately 20% of the liquid depth. In horizontal, cylindrical tanks, an area equal to approximately 15 percent of the total circle should be provided above the liquid level.~~

~~(3)~~ ~~Access to Tank: Adequate access must be provided to each compartment of the tank for inspection and cleaning. Both the inlet and outlet devices shall be accessible. Access shall be provided to each compartment by means of either a removable cover or a manhole of at least 16 inches in diameter. Each tank shall have one manhole access to grade of sufficient diameter to allow removal of any septic tank covers. If only one access to grade is provided it shall provide access to the outlet filter. Covers should be tight fitting and designed to prevent entry by children.~~

~~(4)~~ ~~Inlet: The inlet invert shall enter the tank at least 3 inches above the liquid level in the tank to allow for momentary rises in liquid level during discharges to the tank. A vented inlet tee, or baffle, shall be provided to direct the incoming wastewater downward. It shall penetrate at least 6 inches below the liquid level, but in no case shall the penetration be greater than that allowed for the outlet device.~~

~~(5)~~ ~~Outlet: It is important that the outlet device penetrate just far enough below the liquid level of the septic tank to provide a balance between sludge and scum storage volume. The outlet device retains scum in the tank, but at the same time, it limits the amount of sludge that can be accommodated without scouring, which results in sludge discharging in the effluent from the tank.~~

~~The outlet device should generally extend to a distance below the surface equal to 40 percent of the liquid depth. For horizontal, cylindrical tanks, this should be reduced to 35 percent. All septic tank installations shall include an effluent filter approved by the Secretary. The filter shall prevent the passage of solids larger in size than 1/8th inch.~~

~~(b)~~ ~~Maintenance~~

~~(1)~~ ~~At least once a year, the depth of sludge and scum in the septic tank should be measured. The tank should be pumped if:~~

~~(A)~~ ~~the sludge is closer than twelve inches to the outlet baffle, or~~

~~(B)~~ ~~the scum layer is closer than three inches to the septic tank outlet baffle.~~

~~(C)~~ ~~Following septic tank cleaning in units over 5,000 gallons, all interior surfaces of the tank should be inspected for leaks and cracks.~~

~~(2)~~ ~~At least once a year, dosing tanks and distribution boxes should be opened and settled solids removed as necessary and the dosing tank or distribution box checked for levelness.~~

~~(3)~~ ~~Toxic or hazardous substances should in general not be disposed of in septic systems. These substances may pass through the system in an unaltered state and contaminate groundwater or remain in the septage and subsequently contaminate the soil or crops at the site of ultimate disposal.~~

~~APPENDIX 4-A~~
~~PERCOLATION TEST PROCEDURES~~

~~4-A-01 Percolation Test Procedures~~

~~The following procedure is to be used for determining the percolation value required by these rules.~~

~~(a) Depth of Test - Tests shall be taken entirely within the most dense, least permeable soil identified within one (1) to three (3) feet below the bottom of the infiltrative surface of the proposed leachfield.~~

~~(b) Type of Test Holes - The test hole will be unlined, shaped like a vertically oriented cylinder with a diameter of 6-8 inches and a depth of 10 inches.~~

~~(c) Preparation of Test Hole - Using a sharp instrument, carefully scrape the sidewalls of the hole to remove any smeared soil surface. This is particularly important in soils that have a significant silt or clay content. Place one (1) inch of clean crushed stone in the bottom of the hole to reduce scouring. When possible, instead of pouring water directly from a bucket into the hole, use a hose to siphon water out of a suitably located reservoir to provide a high degree of control over the rate of water entering the hole, to minimize scouring.~~

~~(d) Percolation Test Measurements - To begin the test, fill the hole with water up to a level six (6) inches above the stone and allow it to drop the distance specified in the table below for seven (7) consecutive runs. After each run, bring the water up to the six (6) inch level. The time of each run, the refill time between each run, and the total elapsed time must be accurately recorded.~~

~~WATER LEVEL DROPS FOR EACH TEST RUN OF THE PERCOLATION TEST PROCEDURE~~

~~Soil Texture:~~	~~Coarse to Medium Sand~~	~~Fine Sand to Silt Loam~~	~~Silts to Clay Loam~~
~~Anticipated Percolation Rate (min/in)~~	~~1 - 10~~	~~10 - 60~~	~~60 - 120~~
~~Drop (inches)~~	~~2~~	~~1~~	~~1/2~~

~~(e) Determining the Percolation Rate - The rate of drop for each run is plotted, on graph paper with logarithmic scales on both axes (log/log graph paper), against the cumulative time of the seven runs, including the refill times. The best straight line is fitted to the seven data points and extrapolated out to one (1) day (1440 minutes) of cumulative time The rate of drop after 1440 minutes is the percolation rate.~~

~~APPENDIX 5-A~~

~~ORGANIZATIONS THAT PUBLISH THE CODES AND MATERIAL STANDARDS REFERRED TO IN THE GUIDELINES CONTAINED IN APPENDIX 1-A~~

~~ASCE~~ ~~American Society of Civil Engineers~~
~~1801 Alexander Bell Drive~~
~~Reston, VA 20191-4400~~
~~Telephone: 800-548-2723~~
~~www.ascc.org~~

~~ASTM~~ ~~ASTM International~~
~~100 Barr Harbor Drive~~
~~P.O. Box C700~~
~~West Conshohocken, PA 19428-2959~~
~~Telephone: 610-832-9585~~
~~www.astm.org~~

~~CISPI~~ ~~Cast Iron Soil Pipe Institute~~
~~5959 Shallowford Road, Suite 419~~
~~Chattanooga, TN 37421~~
~~Telephone: 423-400-0784 (Northeast Regional Representative)~~
~~www.cispi.org~~

~~NEIWPCC~~ ~~New England Interstate Water Pollution Control Commission~~
~~Boott Mills South~~
~~116 John Street~~
~~Lowell, MA 01852~~
~~Telephone: 978-323-7929~~
~~www.neiwpcc.org~~

~~For copies of:~~
~~"TR-16 Guide for the Design of Wastewater Treatment Works"~~
~~contact NEIWPCC at 978-323-7929 or by email at: mail@neiwpcc.org~~

~~BOCA~~
~~&~~
~~IPC~~

~~International Code Council~~
~~500 New Jersey Avenue, NW, 6th Floor~~
~~Washington, DC 20001~~
~~Telephone: 888-422-7233~~
~~Email: webmaster@iccsafe.org~~

~~NFPA~~ ~~National Fire Protection Association, Inc.~~
~~1 Batterymarch Park~~
~~Quincy, MA 22169-7471~~
~~Telephone: 800-344-3555~~
~~617-770-3000~~
~~www.nfpa.org~~

~~Note: The National Electrical Code is a registered trademark of the National Fire Protection Association, Inc. of Quincy, Massachusetts.~~

~~APPENDIX 5-A~~

~~NEMA~~ ~~National Electrical Manufacturers Association~~
~~1300 North 17th Street, Suite 1752~~
~~Rosslyn, VA 22209~~
~~Telephone: 703-841-3200~~
~~www.nema.org~~

~~Publications available through Global Engineering Documents~~
~~Telephone: 800-854-7179~~
~~www.global.ihs.com~~

~~Health Education Services, Inc.~~
~~P.O. Box 7126~~
~~Albany, NY 12224~~
~~Telephone: 518-439-7286~~
~~www.hes.org~~

~~Source for: "Recommended Standards of Sewage Works"~~

~~APPENDIX 6-A~~
~~SPECIFIC INFORMATION FOR APPLICATIONS~~

~~**6-A-01**~~

~~An application for a water supply and wastewater permit shall contain the following information:~~

~~(a)~~ ~~**General Content:**~~

~~(1)~~ ~~name and location of the proposed project;~~

~~(2)~~ ~~design flow of the project's wastewater system(s) and potable water supply(ies);~~

~~(3)~~ ~~name and address of the applicant;~~

~~(4)~~ ~~signature of the applicant, and any co-applicants;~~

~~(5)~~ ~~applicable fee as required by 3 V.S.A. section 2822;~~

~~(6)~~ ~~name and address of the designer who designed the project;~~

~~(7)~~ ~~a statement of the purpose of the project, including the intended use of land after subdivision or improvement, such as residential, single family, 2 family, multiple housing, commercial, industrial, recreational, or agricultural;~~

~~(8)~~ ~~a statement of the type of potable water supply proposed for the project, such as individual systems on each lot, community system, or municipal system;~~

~~(9)~~ ~~a statement of the type of wastewater system proposed for the project, such as individual soil-based system on each lot, community soil-based system, or municipal system;~~

~~(10)~~ ~~The latitude and longitude of the "center of parcel" shall be reported on the application form using a global positioning system receiver using the NAD 83 coordinate system or a NAD 83 base map. The coordinates shall be reported in decimal degrees to five decimal places with an accuracy of +/- 50 feet. The "center of parcel" is the center of the parcel of land that is being built on or subdivided. Because many parcels are irregularly shaped, the center location is approximate.~~

~~(11)~~ ~~a description of the existing use(s) of adjacent properties, including the locations of all existing and/or permitted water supplies (potable and non-potable) and wastewater systems that may be potentially affected by the project or that may potentially affect the project design;~~

~~(12)~~ ~~if the potable water supply or wastewater system is located on a different lot of land than the lot on which the building or structure or campground that it will be serving is located, evidence of permanent legal access to the supply or system, if available at the time of application;~~

~~Note: If evidence of permanent legal access is not available at the time of application, it must be submitted to the Secretary prior to the initiation of construction or else the permit that was issued is null and void until the evidence is provided.~~

~~(13)~~ ~~whether the potable water supply is located within one (1) mile of a site listed on the hazardous sites list maintained by the Waste Management Division of the Department; and~~

~~(14)~~ ~~such additional information as the Secretary deems necessary to determine compliance with these Rules.~~

~~(b)~~ ~~**Plot Plan:** An application shall also include a detailed plot plan of the proposed project drawn to an accurate scale of 1" = 100' or larger showing:~~

~~(1)~~ ~~the location and dimensions of the land involved, with North arrow showing orientation. When the lot is larger than 10 acres in size, the exterior boundary may be shown on a map or aerial photograph where 1" equals more than 100'. The portion of the lot that may be potentially affected by the potable water supplies and wastewater systems shall be shown at a scale where 1" equals not more than 100';~~

~~(2)~~ ~~the scale of the plan, preparer's signature and date of preparation and revision(s) clearly indicated;~~

~~(3)~~ ~~the permanent benchmark established on the land involved and shown on the plan;~~

~~(4)~~ ~~existing and proposed topographic contours, in the areas that may be potentially affected by the project or that may potentially affect the project design, using contour intervals that are no greater than five (5) feet. At least 90% of the contours shall be accurate within one half contour interval and no inaccuracies shall exceed one contour interval. This plan shall include the location of all outcroppings and existing and proposed embankments. The designer shall be responsible for the accuracy of the contour information on the plot plan in areas of the project where contours are of critical importance (wastewater system disposal areas, sewer lines, potable water supply source locations, etc.). Photogrammetric contour maps may be used to show the general contour of the land in less critical areas. Some types of wastewater systems may require different contours. See Subchapter 9 of these Rules;~~

~~(5)~~ ~~when lots are being subdivided, the location of all existing and proposed lots, their dimensions and area;~~

~~(6)~~ ~~the location of all existing and proposed property lines, easements, rights-of-way, parking areas, streets, parks, playgrounds and open spaces that may be potentially affected by the project or that may potentially affect the project design;~~

~~(7)~~ ~~the location of all standing and flowing waters and wetlands on the lot on which the project is located that may be potentially affected by the project or that may potentially affect the project design, including but not limited to lakes, ponds, brooks, rivers, streams, swamps, bogs, sedge meadows, and marshes; and the location of all existing and/or permitted potable water supplies that may be potentially affected by the project or that may potentially affect the project design;~~

~~(8)~~ ~~the location of all drainage courses, natural or artificial, existing and proposed, within or immediately bordering the lot on which the project is located that may be potentially affected by the project or that may potentially affect the project design, including identification of surface drainage patterns; and~~

~~(9)~~ ~~the location and elevation of any mapped special flood hazard area (using any available base flood elevation data) and any floodway on the lot on which the project is located.~~

~~(c)~~ ~~**Detail Sheets:** The application shall include detail sheets that include site plans, drawn to a scale of at least 1" = 100', and plans for potable water supplies and wastewater systems, drawn to a scale of at least 1" = 30', that include:~~

~~(1)~~ ~~the location of all existing and proposed buildings and building remnants on the lot on which the project is located that may be potentially affected by the project or that may potentially affect the project design, including previous foundations and excavations;~~

~~(2)~~ ~~the location and detail of all existing and proposed wastewater system components on the lot on which the project is located such as septic tanks, treatment units, sewers, pump stations, siphons, disposal fields, and piping, including the location of replacement areas; and~~

~~(3)~~ ~~the location of all existing and proposed potable water supply sources on the lot on which the project is located, including any source protection areas, and the location and detail of the project's potable water supply components such as pipelines, pumphouses and reservoirs.~~

~~(d)~~ ~~**Soil Data:** Soil data must be included in the application as follows:~~

~~(1)~~ ~~If a project or any portion of a project is to be served by a publicly or privately owned wastewater treatment plant, no soil data is required for the project or the portion of a project served by the plant;~~

~~(2)~~ ~~If the project or a portion of the project is not served by a wastewater treatment plant, the soil and site evaluation report required under section 1-902 of these Rules must be submitted; and~~

~~(3)~~ ~~The designer shall submit the results of all soils tests or investigations performed for the project, whether or not they were used to support the project design. If the designer prepared a map or diagram that shows the location of all soils tests or investigations, a copy of the map or diagram shall also be submitted.~~

~~(e)~~ ~~**Basis of design calculations:** The designer shall include with the application, a copy of his or her basis of design for the complete potable water supply and/or wastewater system. The calculations shall include all values used and any assumptions made.~~

~~(f)~~ ~~**Flow Metering:** For any application for which flow metering will be the basis of a request for increase in flow or for a new project, a designer shall verify the accuracy of the flow meters, ensure that all water related to the project is measured, and ensure that the system has been maintained and operated so that valid information is collected. Note: See section 1-808 of these Rules.~~

~~(g)~~ ~~**Construction details:** Each application shall contain plans, material specifications and construction specifications sufficient for construction of the potable water supply and wastewater system and shall include, as applicable:~~

~~(1)~~ ~~lists of all materials to be used and specifications for those materials;~~

~~(2)~~ ~~invert elevations;~~

~~(3)~~ ~~final grades;~~

~~(4)~~ ~~details of all building enclosures for potable water supplies or wastewater systems, including structural details where required;~~

~~(5)~~ ~~specifications for potable water supply and wastewater system components, such as treatment units, pipelines, sewer lines, pumps, etc.;~~

~~(6)~~ ~~the make, size and model numbers of all equipment to be used;~~

~~(7)~~ ~~specifications on methods of installation, performance standards, quality of workmanship; and~~

~~(8)~~ ~~any other information necessary for adequate construction of the potable water supply or wastewater system.~~

~~(h)~~ ~~**Waiver of Required Information:**~~

~~(1)~~ ~~For projects that present a negligible potential for adverse environmental impact, the Secretary may waive the submission of any of the specific information required by this Appendix as he or she deems appropriate provided that the project being permitted does not require an installation certification; or~~

~~(2)~~ ~~For persons who need a permit because their wastewater system and/or potable water supply has failed, the Secretary may waive the submission of some or all of the specific information required by this Appendix and section 1-305 of these Rules.~~

~~(i)~~ ~~**Format:** The Secretary may require information to be submitted in a standard format in order to expedite project review.~~

~~Appendix 7-A Simplified Method for Prescriptive Desktop Mounding Analysis~~

~~*Background*~~

~~The Wastewater System and Potable Water Supply Rules (Rules) effective August 16, 2002 require that all subsurface wastewater disposal systems maintain an unsaturated zone of soil beneath and immediately downgradient of the disposal system. This unsaturated zone provides treatment of the wastewater effluent, and groundwater protection. The bottom of the disposal system must be at least 36" above the seasonal high water table when applying septic tank effluent or at least 24" above the seasonal high water table when applying filtrate effluent. In addition, the systems must maintain at least 36" separation between the bottom of the disposal system and the mounded water table when applying septic tank effluent or at least 18" when applying filtrate effluent.~~

~~*Scope of this Document*~~

~~This document incorporates a simplified method for a prescriptive desktop mounding analysis for use with mound systems with design flows of less than 1,000 gallons per day and in-ground and at-grade systems with design flows of less than 2,000 gallons per day. For larger systems, which include mounds over 1,000 gallons per day and in-ground and at-grade systems greater than 2,000 gallons per day, the Rules require a site/system specific hydrogeologic evaluation by a qualified hydrogeologist, as defined in §1-201 (a) (47) of the Rules, to insure that the design unsaturated zone is maintained. This document does not preclude a more in-depth site-specific hydrogeologic analysis by a qualified hydrogeologist for these smaller systems.~~

~~This document is for use by all licensed designers. It is based on a simple model incorporating Darcy's Law and using soil texture and ground-surface slope. It is intended that this model will generally produce conservative results, but care should be taken to insure that the site conditions used for the calculations are present beneath and within 25 feet downgradient of the entire disposal area.~~

~~**Design standards set forth in the Rules must be adhered to. This approach may produce values, based on hydraulic loading, that do not meet the minimum design standards set forth in the Rules. If the design standard is more restrictive, the system must be designed to that standard.**~~

~~If the Agency agrees with the assumptions made for this equation, this approach can be used to satisfy the desktop hydrogeologic study required by the rules when designing performance based systems.~~

~~*Method and Assumptions*~~

~~Incorporated in the Rules in the filtrate disposal and the enhanced prescriptive standards sections, the concept of system Linear Loading Rate (LLR) is conservatively used to insure the design unsaturated zone is maintained. This method identifies a design Linear Loading Rate (LLR) based on specific site characteristics, including soil texture, natural (not modified) ground slope, and the soil thickness available for groundwater mounding. The LLR is defined as the loading rate in gallons per day applied to each linear foot of the overall system~~ ~~**along the ground contour**~~~~. This is different than the AR, or application rate, which is based on percolation rate and is used to determine the size of the system. The Application Rate is the rate in gallons per square foot of trench or bed per day. Using this approach the minimum system length is calculated first based on the hydraulic capacity of the site. The system size is then determined based on the Application Rate, site limitations, designer preference, and other restrictions in the Rules (i.e. length to width ratios for mound systems).~~
~~The soil texture is based on the NRCS soil triangle that classifies soil textures based on percentages of clay, silt and sand.~~ ~~***Note: This Method may not be used on soils whose consistence is "firm" or denser.***~~ ~~The soil descriptions must be representative of the soils beneath the disposal area and for 25 feet downgradient. Additionally, the ground slope must be representative of the disposal area and 25 feet downgradient. The available thickness for groundwater mounding (h) is the thickness of soil from above the highest limiting condition to within 6" of the surface of the naturally occurring soil. Limiting conditions include, but are not limited to: seasonal high water table predicted by soil indicators, seasonal high water table "critical levels" based on the monitoring method in Section 1-903(e) of the Rules, bedrock, soil with a consistence of "firm" or denser, or a maximum of 36 inches below the natural ground surface.~~

~~Appendix 7-A Simplified Method for Prescriptive Desktop Mounding Analysis~~

~~After the above site characteristics are identified, select the appropriate LLR Factor (f) from Table 1. Use the following formula to calculate the appropriate LLR for the disposal system:~~

~~LLR = (h) (f)~~

~~Where: LLR = linear loading rate, in gallons per day per linear foot of disposal system, measured parallel to the natural ground contours;~~
~~h = the soil thickness available for groundwater mounding, measured in feet;~~
~~f = the LLR Factor from Table 1, based on soil texture and ground slope.~~

~~Table 1. Linear Loading Rate Factors Based on Soil Texture and Natural Ground Slope~~

	~~LINEAR LOADING RATE FACTORS (f)~~						
	~~Natural Ground Slope~~						
~~Soil Texture~~	**~~0 - 2%~~**	**~~2.1 - 4%~~**	**~~4.1 - 6%~~**	**~~6.1 - 8%~~**	**~~8.1 - 10%~~**	**~~10.1 - 15%~~**	**~~15.1 - 20%~~**
~~Coarse Sand, Sand, Loamy Coarse Sand, Loamy Sand~~	~~7.5~~	~~22.4~~	~~37.4~~	~~52.4~~	~~52.4~~	~~52.4~~	~~52.4~~
~~Coarse Sandy Loam, Sandy Loam, Fine Sand, Very Fine Sand, Loamy Fine Sand, Loamy Very Fine Sand~~	~~3.7~~	~~11.2~~	~~18.7~~	~~26.2~~	~~33.7~~	~~33.7~~	~~33.7~~
~~Fine Sandy Loam, Very Fine Sandy Loam~~	~~1.5~~	~~4.4~~	~~7.5~~	~~10.5~~	~~13.5~~	~~18.7~~	~~26.2~~
~~Loam~~	~~1.1~~	~~3.4~~	~~5.6~~	~~7.9~~	~~10.1~~	~~14.0~~	~~19.6~~
~~Silt Loam~~	~~0.7~~	~~2.2~~	~~3.7~~	~~5.2~~	~~6.7~~	~~9.4~~	~~13.1~~
~~Sandy Clay Loam, Silty Clay Loam, Clay Loam~~	~~0.4~~	~~1.1~~	~~1.9~~	~~2.6~~	~~3.4~~	~~4.7~~	~~6.5~~
~~Sandy Clay, Silty Clay, Clay~~	~~0.2~~	~~0.7~~	~~1.1~~	~~1.6~~	~~2.0~~	~~2.8~~	~~3.9~~

~~Limiting conditions include, but are not limited to:~~

- ~~• seasonal high water table predicted by soil indicators~~
- ~~• seasonal high water table "critical levels" based on the monitoring method in §1-507(e) of the Rules~~
- ~~• bedrock~~
- ~~• soil with a consistence of "firm" or denser~~
- ~~• 36 inches maximum below the natural ground surface.~~

~~Example #1~~

~~Three bedroom home with a design flow of 420 gpd with a fine sandy loam friable to 28 inches with the estimated seasonal high water table (SHWT) at 24 inches and a ground slope of 8%.~~
~~LLR = (h) (f)~~

~~h = 18 inches~~ ~~or~~ **~~1.5 feet~~**. ~~(24 inches to SHWT minus the 6 inches of unsaturated soil needed to be maintain between the induced mounding and the ground surface)~~ **~~f = 10.5~~** ~~(From Table 1)~~

~~LLR = (1.5) (10.5) LLR = 15.75 gpd/lf~~

~~System length is design flow divided by LLR~~

~~System Length~~ **~~= 420 gpd / 15.75 gpd/lf~~**

~~= 27~~ **~~lf.~~** ~~System size: The maximum application rate for a mound system is 1.0 gallons/day/square foot. Therefore, 420 square feet of trench or bed bottom is needed.~~

~~**Appendix 7-A Simplified Method for Prescriptive Desktop Mounding Analysis**~~

~~The minimum system length is 27 feet.~~

~~The system width is: 420 square feet/ 27 feet = 16 feet.~~

~~A system 27 feet long and 16 feet wide does not meet the 2:1 ratio required by the Rules. The length of the system has to be increased to meet the design standards of the Rules.~~

~~System design could include a mound with 2.5 feet of sand beneath the disposal area for septic tank effluent or 1 foot of sand for filtrate effluent.~~

~~**Example #2**~~

~~Four bedroom home with a design flow of 490 gpd with a silt loam with the estimated seasonal high water table at 8 inches and a ground slope of 3%. Note: silt loams that are firm or denser in place do not qualify for use of this simplified method.~~

~~**LLR = (h) (f)**~~

~~**h = 2 inches or 0.17 f = 2.2**~~

~~**LLR = (0.17) (2.2) LLR = 0.37 gpd/lf**~~

~~**System length = 490 gpd / 0.37 = 1324 lf**~~

~~System design could include a mound with 2.5 feet of sand beneath the disposal area for septic tank effluent or 1 foot of sand for filtrate effluent.~~

~~**Example #3**~~

~~Determine the LLR of an at-grade filtrate disposal system maintaining an 18 inch design unsaturated zone for a three bedroom home with a design flow of 420 gpd with a silt loam with the estimated seasonal high water table at 40 inches and a ground slope of 12%. Note: silt loams that are firm or denser in place do not qualify for use of this simplified method.~~

~~**LLR = (h) (f)**~~

~~**h = 18 inches or 1.5 feet** (36 inch limiting factor minus 18 inches of unsaturated soil needed) **f = 9.4**~~

~~**LLR = (1.5) (9.4) LLR = 14.1 gpd/lf**~~

~~**System length = 420 gpd / 14.1 = 30 lf**~~

~~System size:~~

~~The maximum application rate for an at-grade system with filtrate is 2.0 gallons/day/square foot. Therefore, 210 square feet of effective infiltration bottom is needed.~~

~~The minimum system length is 30 feet.~~

~~The system width is: 210 square feet / 30 feet = 7 feet~~

~~**Appendix 7-A Simplified Method for Prescriptive Desktop Mounding Analysis**~~

~~Example #4~~

~~Determine the LLR of an at-grade disposal system maintaining an 18 inch design unsaturated zone for a four bedroom home with a design flow of 490 gpd with a granular loamy sand with water table at 31 inches and an average ground slope of 3%.~~

~~**LLR = (h) (f)**~~

~~**h = 13 inches or 1.08 feet** (31 inches minus 18 inches of unsaturated soil) **f = 22.4**~~

~~**LLR = (22.4) (1.08) LLR = 24.2**~~

~~**Minimum system length, based on hydraulic calculations, = 490 gpd / 24.2 =20.3 ft. The actual length of the system is determined by the requirements for at-grade systems.**~~

State of Vermont
Agency of Natural Resources
Department of Environmental Conservation
Drinking Water and Groundwater Protection Division

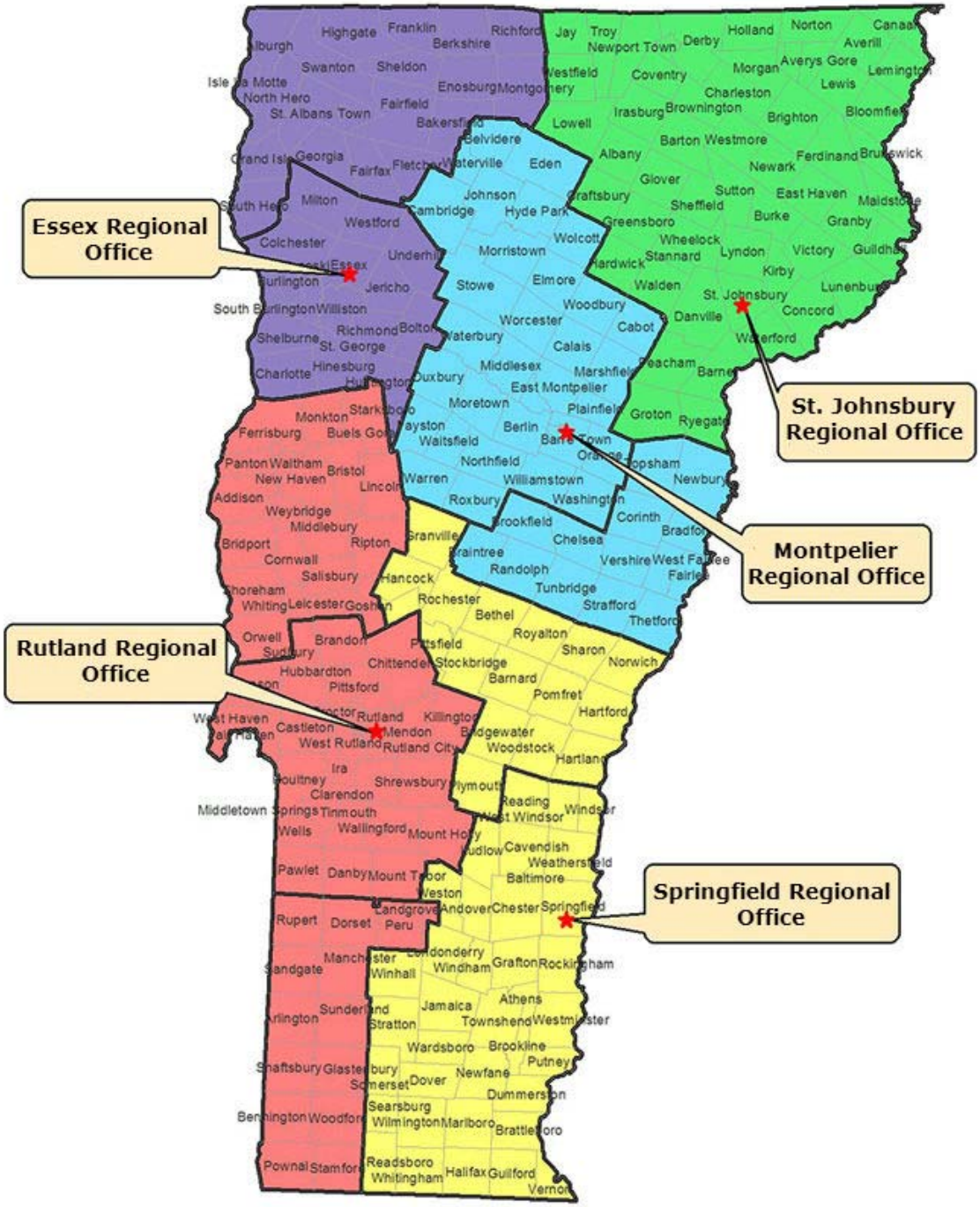
Environmental Protection Rules

Chapter 1

Wastewater System and Potable Water Supply Rules

Adopted: _____

Department of Environmental Conservation (DEC)
Wastewater System and Potable Water Supply Regions and Regional Office Locations
http://dec.vermont.gov/water/ww-systems



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Subchapter 1 – Purpose and Authority

§ 1-101 Purpose

The purpose of these Rules is to:

(1) establish a comprehensive program to regulate the design, construction, replacement, modification, operation, and maintenance of potable water supplies and wastewater systems in order to protect human health and the environment including protecting potable water supplies, public water systems, surface water, and groundwater;

(2) prevent the creation of health hazards or unsanitary conditions;

(3) ensure adequate effluent dispersal and drainage for the proper functioning of wastewater systems;

(4) ensure that potable water supplies and wastewater systems are designed, constructed, operated, and maintained in a manner that supports the intended use of the supplies and systems with respect to reliability, incremental costs, and sustainability;

(5) ensure that owners of potable water supplies and wastewater systems permitted under these Rules have knowledge of their systems' design, the operation and maintenance requirements, and their responsibilities for the satisfactory functioning of the supplies and systems;

(6) allow the use of alternative, innovative, and experimental technologies for the treatment and disposal of wastewater in the appropriate circumstances;

(7) protect the investment of homeowners through a flexible remediation process for failed potable water supplies and wastewater systems; and

(8) increase reliance on and the accountability of the private sector for the design and installation of potable water supplies and wastewater systems through licensing and enforcement.

§ 1-102 Authority

(a) These Rules are adopted by the Secretary under the authority of the Secretary granted by 10 V.S.A., Chapters 47, 56, and 64, and 10 V.S.A. §§ 901, 905b, 1390, 6616.

(b) These Rules supersede the existing Wastewater System and Potable Water Supply Rules which were effective on September 29, 2007.

(c) The provisions of these Rules that regulate potable water supplies supersede all provisions of the Water Supply Rule, effective December 1, 2010, that apply to potable water supplies insofar as they apply to such supplies.

(d) These Rules do not supersede or otherwise affect other existing regulations, including Vermont Department of Health regulations and the Vermont Plumbing Rules. No provision in these Rules limits the authority of the Vermont Department of Health to license facilities under its jurisdiction.

(e) These Rules do not limit the powers of state or local authorities to control existing or potential threats to human health or the environment or limit the exercise of other authorities to regulate human health, safety, and welfare, except as provided in § 1-103.

§ 1-103 Statewide Uniform Technical Standards

(a) After June 30, 2007, those provisions of existing municipal ordinances and zoning bylaws that establish technical standards for the design, construction, operation, and maintenance of potable water supplies and wastewater systems are superseded (i.e. no longer in effect) by the technical standards of these Rules.

(b) Municipalities may continue to have ordinances or bylaws that do not establish technical standards, for example, ordinances or bylaws that:

(1) are not specifically regulating potable water supplies or wastewater systems but rather regulating development in general (e.g., setbacks);
(2) require submission to the municipality of copies of plans and documents used to obtain a state permit under these Rules;
(3) require a certificate of occupancy that is based on full compliance with a state permit issued under these Rules;
(4) require notice of, and have the option to observe, any soil testing such as the digging of test pits conducted in support of a permit application;
(5) require notice of, and have the option to observe, construction of a permitted wastewater system or potable water supply;
(6) determine where connections can be made to wastewater treatment facilities and public water systems; and
(7) require time of sale inspections.

§ 1-104 Existing Municipal Permits Remain in Effect

Notwithstanding the fact that local ordinances and bylaws are superseded after June 30, 2007 as described in § 1-103, all permits issued under those municipal ordinances or bylaws, provided the ordinances or bylaws established specific technical standards for the design, construction, operation, and maintenance of the permitted potable water supplies and wastewater systems, shall remain in effect unless and until such permit is superseded by another permit issued under the provisions of these Rules.

§ 1-105 Severability

The provisions of these Rule are severable. If any provision of these Rules is found to be invalid, or if any application of these Rules to any person or circumstance is found to be invalid, the invalidity shall not affect other provisions that can be given effect in the absence of the invalid provision or application.

Subchapter 2 – Definitions

§ 1-201 Definitions

As used in these Rules, the following terms shall have the specified meaning.

(1) **Aquifer** – means a water bearing stratum of permeable bedrock, sand, gravel, or other soil.

(2) **Agency** – means the Agency of Natural Resources.

(3) **Alternative Hand Washing Supplies** – means pre-moistened towlettes, hand sprays, or hand sanitizer gels.

(4) **Alternative Toilet** – means a unit that has a toilet and is self-contained (i.e., includes a holding tank to store the wastewater generated by use of the unit), is portable, is brought to a site for temporary use, and meets one of the following descriptions:

(A) a unit that contains a waterless toilet and a holding tank to capture waste from the toilet and either contains alternative hand washing supplies or is located near a portable sink brought to the site for temporary use with a water tank to supply water to the sink and a holding tank to capture waste from the sink;

(B) a unit that contains one or more waterless toilets, sinks, water tanks to supply water to the sinks, and holding tanks to capture waste from the sinks and toilets; or

(C) a unit that contains one or more toilets, sinks, water tanks to supply water to the sinks and toilets, and holding tanks to capture the waste from the sinks and toilets.

(5) **Applicant** – means a person who owns the lot on which is or will be located the building or structure or campground that is or will be served by the wastewater system and potable water supply for which a permit or permit amendment is sought.

(6) **Artesian Well** – means a well that penetrates a confined aquifer such that the water level in the well rises above the top of the aquifer.

(7) **Base Flood** – means base flood as defined in the Vermont Flood Hazard Area and River Corridor Rule.

(8) **Base Flood Elevation** – means base flood elevation as defined in the Vermont Flood Hazard Area and River Corridor Rule.

(9) **Bed** – means a leachfield that is a shallow excavation in the ground, or mound fill material, more than 48 inches wide that is lined with leachfield stone, contains chambers, or utilizes other dispersal method, and that releases wastewater into the soil through perforated distribution pipes.

(10) **Bedrock** – means igneous, metamorphic, or sedimentary rock regardless of whether it underlies soil or is exposed at ground surface. For the purpose of wastewater system design, bedrock includes weathered rock that is not soil.

(11) **Bedroom** – except where otherwise specified in these Rules, means any room within a building or structure that is permitted, used, or serves as sleeping quarters.

(12) **Biochemical Oxygen Demand (BOD_5)** – means the quantity of oxygen used in the biochemical oxidation of organic matter in five days at 20 degrees Celsius under specified conditions and reported as milligrams per liter (mg/L).

(13) **Building or Structure** – means a building or structure whose use or useful occupancy requires the construction or modification of a potable water supply or wastewater system.

(A) For the purposes of these Rules, the following are buildings or structures:

(i) A primitive camp.

(ii) A recreational vehicle, or vehicle used for commercial purposes, and modified in one of the following ways, unless the vehicle is on a campsite in a campground:

(I) placing skirting or insulation around the base of the vehicle;

(II) placing the vehicle unit on a foundation or removing the wheels;

(III) attaching a deck or stairs to the vehicle;

(IV) making the vehicle immobile in any way that inhibits the vehicle from being driven off the lot in order to fill the water holding tank and empty the wastewater holding tank;

(V) connecting the vehicle to a potable water supply or wastewater system;

(VI) the vehicle, although qualifying as a vehicle, cannot travel over Vermont roads without a special permit; or

(VII) occupying a vehicle that is not registered and inspected to travel on the roads.

(B) For the purposes of these Rules, a cabin located on a campsite in a campground is not a building or structure.

(C) For the purposes of these Rules, a remote hut used by outdoor recreationists with no connection to a water source, no connection to a wastewater system (other than a composting or incinerating toilet that does not yield a liquid, provided its contents are disposed of in compliance with § 1-929), and accessible only by foot or water, is not a building or structure.

(D) Examples of other buildings or structures: single-family residences; accessory apartments; duplexes; yurts; yomes; cabins; multi-unit buildings; condominiums; apartments; mobile homes; hospitals; nursing homes; motels; hotels; restaurants; filling stations; boarding houses; rooming houses; dormitories; stores or shops; buildings or structures used as places of public assembly, places of employment, or home occupations;

offices; manufacturing facilities; industrial facilities; and farm buildings or structures.

(14) **Campground** – means 4 or more campsites on a lot that are occupied or made available to be occupied for vacation or recreational purposes by camping units, such as tents, yurts, tepees, lean-tos, camping cabins, and recreational vehicles. There shall be no distinction made between non-commercial (no charge, no service) and commercial operations.

(15) **Campsite** – means an area that is occupied or made available to be occupied for vacation or recreational purposes by a camping unit, such as a tent, yurt, tepee, lean-to, cabin, or recreational vehicle, but does not include an area used only for primitive camping. For the purposes of this definition "primitive camping" means camping that involves temporary overnight occupancy in a natural environmental setting without a potable water supply, a wastewater system, picnic tables, or other developed structures or facilities and that is left in its original condition upon vacancy such that there is no, or minimal, evidence of human visitation. A campsite may rely on water faucets, central toilet facilities, or a dumping station or may have individual water service lines and sanitary sewer service lines.

(16) **Child Care Facility** – means a child care facility registered or licensed by the Vermont Agency of Human Services, Department for Children and Families pursuant to 33 V.S.A., Chapter 35. Child care facilities include registered or licensed family child care homes.

(17) **Change in Use** – means converting to a different type of use, such as from a residence to a restaurant or office space or from a restaurant to a residence; change from seasonal to year-round use; or scaling up a use, such as increasing the number of employees or adding bedrooms. Change of use does not include the addition of a home occupation to a living unit.

(18) **Commissioner** – means the Commissioner of the Department or her or his designated representative.

(19) **Confined Surficial Aquifer** – means an aquifer that is not in bedrock, is overlain by a low permeability layer, and contains groundwater under pressure such that the water level in a well that penetrates the aquifer rises above the top of the aquifer.

(20) **Constant Rate Discharge Test** – means a test of a water source that is pumped for a specified duration at one flow rate, expressed in gallons per minute, to determine the yield of the source, aquifer characteristics, or source interference.

(21) **Department** – means the Department of Environmental Conservation.

(22) **Dependent Campsite** – means a campsite that does not provide for the ability of a camping unit or recreational vehicle to physically connect to a wastewater system and a potable water supply.

(23) **Design Flow** – in reference to a particular component of a wastewater system or potable water supply, means the quantity of wastewater or water, calculated in gallons per day, that is required for all uses of each building or structure or campground to be served by the component and which, in total, dictates the sizing of the component. Individual components of a wastewater system or potable water supply can have design flows distinct from other components' design flows.

(24) **Design Rate** – means the rate of flow, calculated in gallons per minute, that needs to be delivered by a potable water supply. Design rate is determined by dividing the design flow by 720 minutes.

(25) **Designer** – means a person licensed by the Office of Professional Regulation under 26 V.S.A., Chapter 97 as a wastewater system and potable water supply designer or professional engineers who are Class 1 Designers.

(26) **Director** – means the Director of the Division or her or his designated representative.

(27) **Division** – means the Drinking Water and Groundwater Protection Division of the Department.

(28) **Effective Basal Area** – means the area of naturally occurring soil that is directly beneath and downslope of the leachfield within the mound.

(29) **Elevation** – means the vertical position of a specified object or geologic feature relative to an established vertical benchmark. The benchmark may be established by the designer, or may be established by others, such as the U.S. Geological Survey datums. When working with plans or maps prepared by others, the related benchmark must be used to interpret those plans or maps.

(30) **Employee** – means paid or unpaid staff including volunteers that regularly constitute a portion of the staff.

(31) **Failed Supply** – means:

(A) a potable water supply:

(i) that has been tested for the following contaminants, in accordance with the protocols approved by the Secretary, and is found not to comply with the specified standard for one or more of the contaminants:

(I)	Arsenic	0.010 mg/L;
(II)	Escherichia coli (E.coli)	None (absent or less than 1);
(III)	Total Coliform	None (absent or less than 1);
(IV)	Fluoride	4 mg/L;
(V)	Lead	0.015 mg/L;
(VI)	Manganese	0.3 mg/L;
(VII)	Nitrate	10 mg/L;
(VIII)	Nitrite	1 mg/L;

(IX) Uranium 20 ug/L (0.02 mg/L); and

(X) Adjusted Gross Alpha Particle Activity (including radium 226 but excluding radon and uranium) 15 pCi/L

(ii) that the Secretary affirmatively determines is not potable due to the presence of a contaminated site, a leaking underground storage tank, or other known sources of groundwater contamination or naturally occurring contaminants, and such determination has been posted on the Agency website; or

(iii) that the Secretary affirmatively determines is providing an insufficient quantity of water to maintain the usual and customary uses of a building or structure or campground or to maintain its uses permitted in a wastewater system and potable water supply permit, and such determination has been posted on the Agency website.

(B) Notwithstanding the provisions above, a potable water supply shall not be a failed supply if:

(i) these effects can be and are remedied solely by a minor repair or minor replacement; or

(ii) these effects have lasted for only a brief period of time, the cause of the failure has been determined to be an unusual and non-recurring event, and the supply has recovered from the state of failure. Supplies which have recurring, continuing, or seasonal failures shall be considered to be failed supplies.

(32) **Failed System** – means:

(A) a wastewater system that is functioning in a manner:

(i) that allows wastewater to be exposed to the open air, to pool on the surface of the ground, to discharge directly to surface water, or to back up into a building or structure, unless in any of these instances the approved design of the system specifically requires the system to function in such a manner; or

(ii) that results in a potable water supply being affirmatively determined by the Secretary to be a failed supply and such determination has been posted on the Agency website.

(B) Notwithstanding the provisions above, a system shall not be a failed system if:

(i) these effects can be and are remedied solely by a minor repair or minor replacement; or

(ii) these effects have lasted for only a brief period of time, the cause of the failure has been determined to be an unusual and non-recurring event, and the system has recovered from the state of failure. Systems that have recurring, continuing, or seasonal failures shall be considered to be failed systems.

(33) **Family Child Care Home** – means a child care facility registered or licensed by the Vermont Agency of Human Services, Department for Children and Families as a family child care home.

(34) **Filtrate Effluent** – means effluent that has been treated to reduce BOD_5 to 30 mg/L or less and total suspended solids (TSS) to 30 mg/L or less.

(35) **Floodway** – means floodway as defined in the Vermont Flood Hazard Area and River Corridor Rule.

(36) **Flood Hazard Area** – means flood hazard area as defined in the Vermont Flood Hazard Area and River Corridor Rule.

(37) **Flowing Artesian Well** – means an artesian well that penetrates a confined bedrock aquifer or surficial aquifer such that the water level in the well rises above ground surface.

(38) **Food Processing Waste** – means wastewater that is generated from the manufacturing of a food or beverage product and that consists of washwater or residual food or beverage waste from food processing facilities making such products as dairy products, beer, wine, spirits, maple syrup and candy, and microwave dinners. "Food processing waste" does not include waste from slaughterhouse facilities or rendering operations, wastewater associated with the washing of unaltered fruits, vegetables or other farm produce, or food or food preparation wastewater from food markets, grocery stores, food store, delis or restaurants.

(39) **Ground Slope** – means the slope of the ground surface.

(40) **Ground Surface** – means the elevation of the naturally occurring soil.

(41) **Groundwater** – means water below the ground surface in a zone of saturation.

(42) **Home Occupation** – means a business, profession, occupation, or trade conducted for gain or support within a living unit, or in a detached structure located on the same lot as the living unit, provided the home occupation is incidental and secondary to the residential use of the living unit; is conducted by an occupant of the living unit; has no employees except for family members who are occupants of the living unit; does not provide clients, customers, or other members of the public access to the potable water supply or wastewater system serving the living unit; and is not required by any state or federal agency to provide clients, customers, or other members of the public with access to a potable water supply or wastewater system. A child care facility is not a home occupation.

(43) **Hydrofracturing** – means a method of bedrock well development used to increase the yield of wells in which high pressures are generated in the well to open fractures. Propping agents may be introduced to keep the fractures open.

(44) **Hydrogeologist** – means a person with training or experience in bedrock geology, surficial geology, and groundwater hydrology sufficient to prepare the hydrogeologic studies and analyses required by these Rules.

(45) **Impeding Soil Layer** – means a naturally occurring soil layer with a thickness of at least 8 feet and a soil texture of sandy clay, silty clay, or clay with any structure, or, sandy clay loam, silty clay loam, or clay loam with massive or platy structure.

(46) **Improved Lot** – means a lot on which exists a campground or a substantially completed building or structure and an associated substantially completed potable water supply and wastewater system that may or may not be located on the lot.

(47) **Indirect Discharge System** – means an indirect discharge, as defined in the Indirect Discharge Rules, that is issued a discharge permit pursuant to the Indirect Discharge Rules. Indirect discharge systems include pollution abatement facilities that engage in the indirect discharges of waste.

(48) **Induced Water Table** – means the rise in the seasonal high-water table caused by the discharge of wastewater into a soil-based wastewater system. For the purposes of this definition, "seasonal high-water table" means the seasonal high-water table prior to use of a curtain drain except when the curtain drain complies with the requirements of § 1-906(a) and the water table is monitored pursuant to § 1-905.

(49) **Injection well** – means an injection well as defined in the Underground Injection Control Regulations, the discharge to which is issued a discharge permit, or is otherwise permitted, pursuant to the Underground Injection Control Regulations.

(50) **Installer** – means a person who constructs a potable water supply or wastewater system serving or intended to serve a building or structure, or campground.

(51) **Instantaneous Peak Demand** – means the maximum rate of water that needs to be supplied to meet the fixture unit demand, based on the load values assigned to plumbing fixtures determined by the Vermont Plumbing Rules or determined by these Rules, of a potable water supply. The rate is expressed in gallons per minute.

(52) **Inverted Siphon** – means a depressed sanitary sewer collection line designed to flow full and under pressure.

(53) **Kitchen** – means the common plumbing fixtures and appliances normally expected in the food preparation area of a living unit. This includes, at a minimum, the combination of a sink, a refrigerator, and cooking facilities. Cooking facilities include stoves, built-in ovens, counter top ovens, microwave ovens, and similar appliances.

(54) **Land Surveyor** – means a land surveyor licensed by the Board of Land Surveyors under 26 V.S.A., Chapter 45.

(55) **Leachfield** – means that portion of a soil-based wastewater system used to disperse wastewater into the soil.

(56) **Leachfield Stone** – means clean, screened, durable stone no smaller than ¾ inch and no larger than 1-1/2 inch in diameter. For the purposes of this definition, "clean stone" means stone with no more than 1.5 percent of fines passing the #200 sieve as determined using the AASHTO test method T 11-85 and "durable stone" means stone that has a hardness value of three or greater on the Moh's Scale of Hardness.

(57) **Linear Loading Rate** – means the amount of wastewater measured in gallons per day that may be applied to each linear foot of the overall length of a leachfield as measured along the ground contour.

(58) **Living Unit** – means a building or structure or a portion of a building or structure that has a toilet, sink, kitchen, and one or more bedrooms, and that is reasonably private and separated from other living units. A second, detached building or structure that contains a toilet, sink, or one or more bedrooms, but does not contain a kitchen, is not a separate living unit. Examples of buildings or structures that contain more than one living unit are duplexes and single-family residences with an accessory apartment.

(59) **Long-Term Yield** – means the quantity of water that may flow or be pumped continuously from a source over a specified length of time.

(60) **Lot** – means a tract or portion of land with defined boundaries created by the act of subdivision. A deed may describe one or more lots. Multiple lots described in a single deed remain separate lots provided that they are described as having separate and distinct boundaries and that any subsequent deed describing the lots does not specifically eliminate the separate and distinct boundaries.

(61) **Mean Water Level** – means mean water level as defined in the Rules Determining Mean Water Levels.

(62) **Minimum Site Conditions** – means those naturally occurring conditions related to soil permeability, soil depth, depth to seasonal high-water table, soil depth to bedrock and slope that must exist in order to construct any soil-based wastewater system. This definition also means the limits for siting in a floodway or floodplain.

(63) **Minor Repair or Minor Replacement** – means:

(A) For wastewater systems, the:

(i) repair or replacement of a pipe leading from a building or structure or campground to the septic tank or from the septic tank to the

leachfield, not including piping within the leachfield, in the same approximate location;

(ii) replacement of a portion of a distribution pipe in a leachfield when a designer concludes the leachfield is not a failed system, there is no removal of leachfield stone beneath the distribution pipe, and the pipe is crushed or otherwise preventing wastewater from flowing to other portions of the leachfield;

(iii) replacement of a sanitary sewer service line or sanitary sewer collection line in the same approximate location;

(iv) replacement of a septic tank;

(v) replacement of a distribution box;

(vi) repair or replacement of a pump or associated valves, switches and controls; or

(vii) any other repair or replacement that the Secretary, on a case by case basis, determines to be a minor repair or minor replacement.

For the purposes of this definition, "same approximate location" means within 10 feet of its original location and no closer horizontally to a public water source, a potable water source, water service line, or water service pipe, or water main. The addition of an innovative/alternative component to a wastewater system or the removal of an existing or permitted innovative/alternative component and replacement with a different innovative/alternative component is not a minor repair or minor replacement.

(B) For potable water supplies:

(i) the repair or replacement of a water service pipe in the same approximate location;

(ii) replacement of a water service line in the same approximate location;

(iii) repair or replacement of a pump;

(iv) repair or replacement of filters or screens;

(v) repair or replacement of a mechanical component;

(vi) repair or reconstruction of a driven well point in approximately the same location;

(vii) hydrofracturing a potable water source;
or

(viii) any other repair that the Secretary, on a case by case basis, determines to be a minor repair or minor replacement.

For the purpose of this definition, "same approximate location" means within 10 feet of its original location and no closer horizontally or vertically to a sanitary sewer service line, sanitary sewer collection line, or any other portion of a wastewater system.

(C) The following are not minor repairs or replacements:

(i) installation of a water treatment system;

(ii) replacement of a distribution system; and

(iii) any action, including replacement of piping related to a change in use, that increases design flow or modifies other operational requirements of the potable water supply or wastewater system.

(64) **Mobile Home** – means a living unit that:

(A) is designed for long term and continuous residential occupancy;

(B) is designed to be moved on wheels, as a whole or in sections;

(C) on arrival at the site, is complete and ready for occupancy, except for incidental unpacking, assembly, connections with utilities, and placing on supports or a permanent foundation, or installation as a unit in a previously prepared structure; and

(D) contains the same type of interior plumbing fixtures as immovable housing (not recreational vehicle-type fixtures).

(65) **Modifies Operational Requirements –** means the need to apply new technical standards from these Rules. Examples of actions that modify operational requirements:

(A) Installation and use of a water treatment system to a potable water supply unless exempt under § 1-304(19) or (20).

(B) Installation and use of an innovative/alternative system or component for a potable water supply or wastewater system that has or requires approval pursuant to Subchapter 4.

(C) Installation of a flush toilet to replace a composting or incinerator toilet.

(D) Conversion to a restaurant or food preparation business requiring the installation of a grease tank.

(E) Conversion to a brewery from a different use identified in Table 8-3.

(F) Addition of a fire suppression system that requires upgrading of the water service line.

(G) Change in use of a single-family residence from seasonal to year-round.

(H) Change in the use of a building or structure when the proposed use does not appear on Table 8-3 and the proposed wastewater does not meet the specifications for low strength wastewater pursuant to § 1-805(b).

(I) Change in the use of a building or structure that produces a waste or wastewater identified in § 1-301(e) which will be treated and disposed of via a wastewater system serving the building or structure.

(J) Adding plumbing fixtures that increase the demand on the potable water supply that is not connected to a public water system by more than 10 fixture units, using the load values assigned to plumbing fixtures determined by the Vermont Plumbing Rules, to a building or structure thereby increasing the project's instantaneous peak demand.

(K) Installation of a pump station, dosing siphon, or floating outlet dosing system to a wastewater system.

(L) Installation of an atmospheric water storage tank to serve one single-family residence that is served by a potable water source that serves no other buildings or structures and no campground.

(66) **Municipality** – means a city, town, fire district, school district, consolidated water district, incorporated village, or unorganized town or gore.

(67) **Naturally Occurring Soil** – means soil that does not contain evidence of human-alteration or human-transport other than wide-area, uniform, shallow modification such as tilling.

(68) **Normal High-Water Elevation** – means the boundary of any surface water that delineates the highest water elevation that has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly the point where the natural vegetation changes from predominantly aquatic or no vegetation to predominantly terrestrial. For streams, the normal high-water elevation is the elevation of the top of the bank of the channel that is not the floodway. For reservoirs, the normal high-water elevation is the operating elevation of the normal summer pool. For streams, when the normal high-water elevation shows signs of eroding, the normal high-water elevation for the purposes of these Rules shall be the limits of erosion.

(69) **Permanent Legal Access** – means an easement, right of way, deed, or other legal document that creates an enforceable permanent property interest of access to and use of land for a designated purpose.

(70) **Perched Water Table** – means the upper surface of a zone of saturation held above a less permeable layer which is underlain by an unsaturated zone and the main water table.

(71) **Person** – means any individual, partnership, company, corporation, association, unincorporated association, joint venture, trust, municipality, the state of Vermont or any agency, department or subdivision of the state, federal agency, or any other legal or commercial entity.

(72) **Potable Water Source** – means a component of a potable water supply that withdraws or collects water from soil or bedrock. Potable water sources include springs; drilled, driven, or dug wells; and surface water.

(73) **Potable Water Supply** – means the source, treatment, and conveyance equipment used to provide water used or intended to be used for human consumption, including drinking, washing, bathing, the preparation of food, or laundering. This definition does not include any internal piping or plumbing except for mechanical systems, such as pump stations and storage tanks or lavatories, that are located inside a building or structure and that are integral to the operation of a potable water supply. This definition also does not include a potable water supply that is subject to regulation under 10 V.S.A. Chapter 56 (Public Water Systems). For the purposes of these Rules, water service lines are potable water supplies.

(74) **Potable Water Supply Presumptive Isolation Zone –** means an area delineated around a potable water source in which a component of a leachfield with a design flow of less than 2000 gallons per day is presumed to be unable to be located. It takes the size and shape identified in § 1-1105(a).

(75) **Primitive Camp** – means a living unit, the occupancy of which neither exceeds 3 consecutive weeks per calendar year nor exceeds a total of 60 days per calendar year, that has no interior plumbing except for one sink with water. Primitive camps may contain a composting or incinerating toilet that does not yield a liquid provided its contents are disposed of in compliance with § 1-929.

(76) **Professional Engineer** – means an engineer licensed by the Board of Professional Engineering under 26 V.S.A., Chapter 20.

(77) **Prospective Applicant –** means a person who owns the lot on which is or will be located the building or structure or campground that is or will be served by the wastewater system and potable water supply for which a permit or permit amendment will be sought in the future.

(78) **Public Water Source** – means a public water source as defined in the Water Supply Rule.

(79) **Public Water System** – means a public water system as defined in the Water Supply Rule.

(80) **Recreational Vehicles** – means motor homes, folding camping trailers, conventional travel trailers, fifth wheel travel trailers, truck campers, van campers, conversion vehicles, park model recreational vehicle, and other similar vehicles designed for travel and camping.

(81) **Replacement Area** – means a portion of land that can accommodate a wastewater system.

(82) **Replacement System** – means a wastewater system that is proposed to replace a failed system, to replace an operating wastewater system, or to replace a wastewater system proposed in an application when included in lieu of a replacement area in the same application as the wastewater system it would replace, provided that, in none of these scenarios, there is a request or need for an increase in design flow from the wastewater system it would replace. An application involving a request or need for an increase in design flow shall not be construed as seeking approval for a replacement system.

(83) **Replacement Supply –** means a potable water system that is proposed to replace a failed supply or to replace an operating potable water supply, provided that, in neither of these scenarios, there is a request or need for an increase in design flow from the potable water supply it would replace. An application involving a request or need for an increase in design flow shall not be construed as seeking approval for a replacement supply.

(84) **Sanitary Sewer Collection Line** – means piping and associated components that collects wastewater from two or more sanitary sewer service lines and conveys it to a wastewater treatment facility, to an indirect discharge system, or to the leachfield of a soil-based wastewater system of less than 6500 gallons per day. A sanitary sewer collection line begins, and a sanitary sewer service line ends, at the joint where multiple sanitary sewer service lines converge.

(85) **Sanitary Sewer Service Line** – means piping and associated components that conveys wastewater from a building or structure or campground to a wastewater treatment facility, to an indirect discharge system, or to the leachfield of a soil-

based wastewater system of less than 6500 gallons per day. Sanitary sewer service lines also include piping that conveys wastewater from a building or structure or campground to a sanitary sewer collection line.

(86) **Seasonal** – in reference to the use of a single-family residence, means occupancy of the residence for less than 180 days in each calendar year; as used elsewhere in these Rules means of, relating to, or characteristic of a particular season of the year.

(87) **Seasonal High-Water Table** – means the highest elevation that the water table reaches as determined by soil examination pursuant to § 1-910(g) or determined by monitoring the water table pursuant to § 1-905.

(88) **Secretary** – means the Secretary of the Agency or a duly authorized representative of the Secretary. A duly authorized representative of the Secretary includes a municipality that has received delegation to implement provisions of these Rules in lieu of the Secretary pursuant to Subchapter 6.

(89) **Septic Tank Effluent** – means wastewater that discharges from a septic tank.

(90) **Sewage Officer** – means a person appointed or employed by a municipality to administer these Rules when the municipality has received delegation to implement provisions of these Rules pursuant to Subchapter 6.

(91) **Single-family Residence** – means a building or a structure that contains only one living unit.

(92) **Sleeping Space** – means a space that is designed or designated to sleep one person. For example, a single or twin bed equals one sleeping space, and a double bed equals two sleeping spaces.

(93) **Soil-Based Wastewater System** – means a wastewater system that depends on naturally occurring soil to absorb the effluent from the system and to transmit the wastewater away from the site without any overland flow.

(94) **Stream –** means the full length and width, including the bed and banks, of any watercourse, including rivers, streams, creeks, brooks, and branches, which experience intermittent or perennial flow. "Stream" does not include ditches or other constructed channels primarily associated with land drainage or water conveyance through or around private or public infrastructure.

(95) **Subdivide** – means to divide land by sale, gift, lease, mortgage foreclosure, court-ordered partition or decree, or filing of a plat, plan, or deed in the town records where the act of division creates one or more lots. Subdivision shall be deemed to have occurred on the conveyance of the first lot or the filing of a plat, plan, or deed in the town records, whichever first occurs. A subdivision of land shall also be deemed to have taken place when a lot is divided by a state or municipal highway, road or right-of-way or when a lot is divided by surface waters with a

drainage area of greater than ten square miles. A municipal boundary does not create a subdivision. A mortgage deed does not create a subdivision unless a foreclosure occurs that results in the division of land. A lease will not be considered a subdivision unless the lease is effectuated by filing of plat, plan, lease agreement, or deed in the town records.

(96) **Substantially Completed** – means a building or structure, potable water supply, or wastewater system that is sufficiently constructed for it to be used for its intended purpose.

(97) **Subsurface Drip Distribution** – means a pressurized wastewater distribution system that delivers small, precise doses of effluent through small diameter, flexible polyethylene tubing (i.e., drip line) with small in-line emitters (orifices that can discharge effluent at slow, controlled rates, usually specified in gallons per hour).

(98) **Surface Water** – means all streams, reservoirs, ponds, lakes, springs and all bodies of surface waters, artificial or natural, which are contained within, flow through, or border upon the State or any portion of it.

(99) **Trench** – means a leachfield that is a shallow excavation in the ground, or mound fill material, 48 inches or less in width that is lined with leachfield stone, contains chambers, or utilizes other dispersal method, and that releases wastewater into the soil through perforated distribution pipes.

(100) **Unconfined Surficial Aquifer** – means an aquifer that is not in bedrock and is not a confined surficial aquifer. An unconfined surficial aquifer is also known as a water table aquifer.

(101) **Unimproved Lot** – means a lot that is not an improved lot.

(102) **Wastewater** – means sanitary waste or used water from any building or structure or campground, including, but not limited to, carriage water, toilet water, shower and wash water, food processing wastewater, and process wastewater. Wastewater does not include stormwater.

(103) **Wastewater System Presumptive Isolation Zone –** means an area delineated around leachfields, replacement areas, and wastewater tanks in which a potable water source with a design rate of less than or equal to 2.0 gallons per minute, assuming it would be located in bedrock or confined surficial aquifer, is presumed to be unable to be located. It takes the size and shape identified in § 1-913(a).

(104) **Wastewater System** – means any piping, pumping, treatment, or disposal system used for the conveyance and treatment of sanitary waste or used water (i.e., wastewater), including, but not limited to, carriage water, shower and wash water, and process wastewater. This definition does not include any internal piping or plumbing except for mechanical systems such as pump stations and storage tanks or toilets that are located inside a building or structure and that are integral to the

operation of a wastewater system. This definition also does not include wastewater systems that are used exclusively for the treatment and disposal of animal manure. For the purposes of these Rules, "wastewater system" is limited to soil-based wastewater systems of less than 6500 gallons per day, sanitary sewer service lines, and sanitary sewer collection lines. Sanitary sewer service lines and sanitary sewer collection lines may be permitted as part of a soil-based wastewater system.

(105) **Wastewater Treatment Facility** – means a pollution abatement facility issued a NPDES or federal pretreatment permit pursuant to 10 V.S.A. § 1263 or § 1265 that is not an indirect discharge system or a discharge to an injection well.

(106) **Water Main** – means water piping, such as a transmission main or distribution main, that is part of a public water system as defined in the Water Supply Rule. This includes piping leading to fire hydrants.

(107) **Water Service Line** – means the piping that is not a water main and extends from the water main to a building or structure or campground.

(108) **Water Service Pipe** – means the piping that extends from a potable water source to a building or structure, campground, or water outlet (such as drinking fountains and hose bibbs).

(109) **Year-round** – in reference to the year-round use of a residence, means occupancy that is equal to or more than 180 days in a calendar year.

Subchapter 3 – Wastewater System and Potable Water Supply Permits

§ 1-301 Permit Required

(a) Except as provided in this Section and in § 1-302, § 1-303, and § 1-304, no person shall take or cause to be taken any of the following actions without first obtaining a permit or permit amendment from the Secretary for the construction and operation of a potable water supply and wastewater system:

(1) the subdivision of a lot or lots;
(2) the construction of a new potable water supply or wastewater system;
(3) the physical modification or replacement of an existing potable water supply or wastewater system;
(4) the construction of a new building or structure, including when reconstruction or replacement;
(5) the connection of an existing potable water supply or wastewater system to a building or structure;
(6) the modification of an existing building or structure in a manner that increases the design flow of any component of the potable water supply or wastewater system or modifies other operational requirements of a potable water supply or wastewater system;
(7) the change in use of a building or structure in a manner that increases the design flow of any component of the potable water supply or wastewater system or modifies other operational requirements of a potable water supply or wastewater system;
(8) the conversion of an existing public water system to a potable water supply;
(9) the conversion of an indirect discharge system to a wastewater system;
(10) the creation of a campground;
(11) the modification of a campground, including the creation, modification or relocation of one or more individual campsites, in a manner that increases the design flow of any component of the potable water supply or wastewater system or modifies other operational requirements of a potable water supply or wastewater system;
(12) the use or operation of a failed supply or failed system; or
(13) the commencement of construction of any of the above. For the purposes of this Section, the "commencement of construction" means any work involving the physical construction or modification of a building or structure and its associated potable water supply or wastewater system, for example, foundation excavation, foundation construction, and site work that involves or may affect any portion of the existing or proposed potable water supply or wastewater system.

(b) When an application proposes to utilize all of, or a portion of, an existing potable water supply or wastewater system and does not involve an increase in design flow of any component of the potable water supply or wastewater system or involve a modification of other operational requirements of the potable water supply or wastewater system, the Secretary may issue a permit or permit amendment authorizing the use of the existing portions of the potable water supply and wastewater system even if those portions are not in full compliance with the technical standards in Chapters 8, 9, 10, 11, and 12, provided:

(1) The existing portions of the potable water supply and wastewater system are:

(A) exempt from the permitting requirements of this Subchapter under § 1-303; or

(B) if the application proposes only the subdivision of an improved lot and no other activities requiring a permit, permitted and in compliance with the permit.

(2) A designer certifies that the existing portions of the potable water supply are not a failed supply and the existing portions of the wastewater system are not a failed system.

(3) The existing portions of the potable water supply and wastewater system comply with the horizontal isolation distances required pursuant to § 1-912 and § 1-1104 for distances to new portions of the building or structure or campground that:

(A) will be constructed outside of the footprint of the existing or replaced building or structure or campground; and

(B) will be served by the wastewater system and potable water supply.

(4) The existing portions of the potable water supply and wastewater system are connected to a building or structure or campground or were disconnected not more than 4 years prior to the application to utilize the existing supply or system.

(5) The new portions of the potable water supply and wastewater system proposed in the application comply with the technical standards in Chapters 8, 9, 10, 11, and 12 of these Rules.

(6) If the application involves the subdivision of land:

(A) a replacement area, or a replacement system proposed in lieu of a replacement area, is designated for the resulting complete wastewater system, and other existing wastewater systems on the subdivided lot, unless the conditions of § 1-902(b) are met; and

(B) the existing portions of the potable water supply and wastewater system comply with the horizontal isolation distances required pursuant to § 1-912 and § 1-1104 for distances to new property lines.

(c) A person may seek a permit pursuant to Subsection (a)(3) despite not intending to immediately construct the replacement system.

(d) The use or operation of a failed supply or failed system is prohibited except in the following situations:

(1) The Secretary authorizes the continued use of the failed system or failed supply while the landowner is actively pursuing the cause of, and resolution to, correcting the failed system or failed supply.

(2) For a failed supply, a water treatment system is installed in compliance with § 1-1113 that achieves an elimination or reduction in the concentration of primary contaminants in the potable water source to below the standard in Table 11-5.

(3) For a failed supply, the potable water supply serves only one single-family residence.

(e) Neither soil-based wastewater systems nor sanitary sewer service lines that convey wastewater to indirect discharge systems shall be permitted for the treatment and disposal of any of the following wastewater or wastes:

(1) Wastewater or waste prohibited from discharge to an injection well pursuant to the prohibition in the Underground Injection Control Regulations against Class I, II, and III, and all but a limited number of Class IV, injection wells.
(2) Wastewater or waste prohibited from discharge to a Class V injection well pursuant to the Underground Injection Control Regulations.
(3) Wastewater or waste requiring an UIC permit from the Secretary prior to their discharge to a Class V injection well pursuant to the Underground Injection Control Regulations.
(4) Any wastewater or waste determined by the Secretary to adversely affect the biological action within a septic tank or leachfield which will not receive pretreatment prior to discharge to the septic tank or leachfield to prevent adverse effects. The Secretary, in making this determination, shall consider pH, dissolved oxygen, alkalinity, temperature, and chemical constituents of the wastewater or waste.

(f) For the purpose of determining, pursuant to Subsection (a), whether an action will result in an increase in design flow of any component of a wastewater system or potable water supply, the proposed design flow shall be calculated pursuant to § 1-803 and the baseline design flow from which a potential increase is measured shall be calculated pursuant to § 1-806.

(g) The following actions are presumed to not increase the design flow of any component of the potable water supply or wastewater system or modify other operational requirements of a potable water supply or wastewater system:
(1) The addition of a home occupation to a living unit.
(2) The construction of a new building or structure used solely for a home occupation conducted by the occupants of a living unit that is located on the same lot.
(3) The addition of plumbing fixtures in a single-family residence.
(4) The addition of a water storage tank for a single-family residence that is served by a potable water source that serves no other buildings or structures and no campground.
(5) The addition of one or more bedrooms to a single-family residence with 3 or more bedrooms, that is served by a water service line that serves no other buildings or structures, or campgrounds, and that is served by a sanitary sewer service line that serves no other buildings or structures, or campgrounds, that discharges to a municipal sanitary sewer collection line that conveys wastewater to a wastewater treatment facility.

§ 1-302 Permit Exemption for Reconstruction

(a) A building or structure that is exempt from the permitting requirements of this Subchapter under § 1-303, or that has an associated potable water supply or wastewater system which was permitted by the Secretary on or after January 1, 2007, that has been voluntarily removed or destroyed by fire, flooding, or other force majeure may be reconstructed without obtaining a permit or permit amendment provided all of the following are met:
(1) The replacement building or structure is in compliance with all conditions of permits issued under these Rules on or after January 1, 2007;

(2) If the building or structure is exempt pursuant to § 1-303, it shall be reconstructed within 4 years of its removal or destruction. On a case by case basis, this period may be extended for 1 year by the Secretary if:
   (A) the request for the extension is submitted in writing before the end of the 4-year period; and
   (B) the Secretary determines there is good cause for the extension, such as delays in reconstruction due to difficulties resolving insurance claims, insufficient financing, or unresolved municipal permitting issues.
(3) The replacement building or structure connects to the existing water service line or water service pipe and existing sanitary sewer service line that were connected to the previously existing building or structure;
(4) The replacement building or structure does not increase design flow or modify other operational requirements of the existing potable water supply or wastewater system;
(5) The entire footprint of the replacement building or structure, except for that portion of a building or structure that is a deck or porch, is constructed within 50 feet of any outside wall of the previously existing building or structure that is being replaced; and
(6) No other actions are taken or caused to be taken that under these Rules requires the issuance of a permit or permit amendment.

(b) For the purposes of this Section, a building or structure is "destroyed" if the building or structure is in ruins, the roof has collapsed, the walls or foundation have collapsed or are collapsing, or the building or structure is condemned by a municipality or the State.

Note: Appendix C, Figure C-1, depicts an example for calculating the 50 feet from an outside wall for reconstruction.

§ 1-303 "Clean Slate" Permit Exemption

(a) The following are exempt from the permitting requirements of this Subchapter:
   (1) All buildings or structures, campgrounds, and their associated potable water supplies and waste water systems that were substantially completed before January 1, 2007 and all improved and unimproved lots that were in existence before January 1, 2007. This exemption shall remain in effect provided:
      (A) No action for which a permit is required under these Rules is taken or caused to be taken on or after January 1, 2007, unless such action is exempt under one of the other permitting exemptions listed in § 1-302 or § 1-304.
      (B) If a permit has been issued under these Rules before January 1, 2007 that contained conditions that required actions to be taken on or after January 1, 2007, including conditions concerning operation and maintenance and transfer of ownership, the permittee shall continue to comply with those permit conditions.
   (2) An owner of a single-family residence that qualified on January 1, 2007 for this exemption shall not be subject to administrative or civil penalties under 10 V.S.A. chapters 201 and 211 for a violation of these Rules when the owner believes the

supply or system meets the definition of a failed water supply or failed system provided the owner:

(A) conducts or contracts for an inspection of the supply or system;

(B) notifies the Secretary of the results of the inspection; and

(C) has not taken or caused to be taken any other action on or after January 1, 2007 for which a permit would be required under these Rules.

(b) The use of a single-family residence served by a wastewater system or potable water supply for which the exemption in Subsection (a) is in effect shall be considered year-round unless the single-family residence was occupied for fewer than 180 days in each calendar year between and including December 31, 1986 and December 31, 2006.

§ 1-304 Permit Exemptions

The following actions are exempt from the permitting requirements of this Subchapter, provided no other action is taken or caused to be taken that under these Rules requires the issuance of a permit or permit amendment:

(1) The modification, completed between January 1, 2007 and July 1, 2007, of an existing single-family residence.

(2) The construction, substantially completed between January 1, 2007 and July 1, 2007, of a single-family residence and its associated potable water supply or wastewater system, provided:

(A) the only building or structure on the lot is the single-family residence;

(B) the potable water supply and wastewater system complies with the technical standards in Subchapters 8, 9, 10, 11, and 12, except for the requirement to identify a replacement area;

(C) a designer completes a design certification for the potable water supply or wastewater system that complies with § 1-306;

(D) a designer or, when allowed by these Rules, an installer completes an installation certification for the potable water supply or wastewater system that complies with § 1-311; and

(E) copies of the design and installation certifications required pursuant to Subsections (C) and (D) are submitted to the Secretary and recorded and indexed in the land records for the municipality where the building or structure, and, if different, where the wastewater system and potable water supply is located.

(3) The construction of a primitive camp, provided:

(A) the primitive camp is on a lot with no other buildings or structures and with no campground; or

(B) the primitive camp is on a lot with a single-family residence but no other buildings or structures and no campground.

(4) The subdivision of an unimproved lot on or after January 1, 2007, provided:

(A) the deed, that is recorded and indexed, that describes the affected property contains the following language:

"Notice of permit requirements. In order to comply with applicable state Rules concerning potable water supplies and wastewater systems, a person shall not construct or erect any structure or building on the lot of land described in this deed if the use or useful occupancy of that structure or building will require the installation of or connection to a potable water supply or wastewater system, without first complying with the applicable rules and obtaining any required permit. Any person who owns this property acknowledges that this lot may not be able to meet state standards for a potable water supply or wastewater system and therefore this lot may not be able to be improved."; or

(B) if there is no deed for the lot that is created by the act of subdivision, the owner of the unimproved lot shall record and index a copy of the notice language described in Subsection (4)(A) in the land records for the municipality where the unimproved lot is located.

(5) The addition of land to a lot.

(6) The subdivision of an improved lot by a lease for the sole purpose to develop a cell tower, solar panel, wind turbine, or telephone switching station provided:

(A) the horizontal isolation distance between the footprint of the cell tower, solar panel, wind turbine, or telephone switching station and any wastewater system or potable supply shall be a minimum of 10 feet, unless there is a foundation drain, in which case the horizontal isolation distance shall be 20 feet between the wastewater system and upslope drains and 75 feet between the wastewater system and downslope drains;

(B) a plan, drawn to scale, and prepared by a designer or land surveyor, of the subdivided lot is prepared showing the location of the existing building or structure and the existing and proposed boundary lines of the subdivided lot;

(C) the plan is recorded and indexed in the land records of the municipality where the lot is located within 30 days of the date of the subdivision; and

(D) upon termination of the lease, the land subject to the lease reverts to the original lot.

(7) The subdivision of an improved lot, provided:

(A) the lot is improved with either:

(i) up to two single-family residences or one duplex; or

(ii) up to two buildings or structures, two campgrounds, or one building or structure and one campground, where the total design flow for the uses is 560 gallons per day or less;

(B) if the buildings or structures or campgrounds are served by soil-based wastewater systems, the new lot boundary for any resulting improved lot is 500 feet or more from the footprint of each building or structure and campground;

(C) a plan, drawn to scale and prepared by a designer or land surveyor, of the subdivided lot is prepared, showing the location of the building or structure and the existing and proposed boundary lines of the subdivided lot; and

(D) the plan is recorded and indexed in the land records of the municipality where the lot is located.

(8) The subdivision of a lot where the subdivision results from a transfer of property for a highway or other transportation project that is authorized under the State's enacted Transportation Program or is an emergency project within the meaning of 19 V.S.A. § 10g(h) regardless of whether the State or the municipality has commenced any condemnation proceedings in connection with the project.

(9) The boundary line adjustment of improved or unimproved lots, provided:

(A) each lot being adjusted meets one or more of the following standards:

(i) the lot is reduced in size by no more than 2 percent;

(ii) the lot is increased in size;

(iii) the boundary, after adjustment, is 500 feet or more from the footprint of each building or structure or campground on an improved lot; or

(iv) the Secretary makes a written determination that the proposed adjustment will not have an adverse effect on any existing potable water supply or wastewater system on the affected lots. In making the determination, the Secretary shall consider:

(I) whether the land being removed from a lot is more suitable for a replacement wastewater system than the land being retained with the lot or land being added to the lot; and

(II) whether there is a natural land feature, such as bedrock, that prevents a lot that is being reduced in size from accessing the land being conveyed for a wastewater system;

(B) a plan, drawn to scale and prepared by a designer or land surveyor, of the boundary line adjustment is prepared; and

(C) the plan and, if applicable, the Secretary's written determination, is recorded and indexed in the land records of the municipality where the lots are located.

(10) The minor repair or minor replacement of a potable water supply or wastewater system.

(11) The construction of a municipal sanitary sewer collection line, the connection of a building or structure to the collection line via a new sanitary sewer service line, and the construction of the service line, at the time of initial construction and operation of the municipal sanitary sewer collection line, provided:

(A) the sanitary sewer collection line and associated sanitary sewer service lines are part of a project approved by the Facilities Engineering Division of the Department;

(B) the sanitary sewer service lines comply with the technical standards in Subchapters 8, 9, and 10;

(C) a designer completes a design certification for the sanitary sewer service lines that complies with § 1-306;

(D) a designer or, when allowed by these Rules, an installer, completes an installation certification for the sanitary sewer service lines that complies with § 1-311; and

(E) copies of the design and installation certifications required pursuant to Subsection (B) and (C) are submitted to the Secretary and recorded and indexed in the land records of the municipality where the building or structure is located.

(12) The connection of an existing building or structure to a water main via a new water service line, and the construction of the water service line, at the time of initial construction and operation of the portion of the municipal water main to which the water service line connects, provided:

(A) the associated water service lines are included on the plans that are approved as part of a public water system construction permit;

(B) the water service line complies with the technical standards in Subchapters 8, 11, and 12;

(B) a designer completes a design certification for the water service line that complies with § 1-306;

(C) a designer or, when allowed by these Rules, an installer, completes an installation certification for the potable water supply that complies with § 1-311; and

(D) copies of the design and installation certifications required pursuant to Subsection (B) and (C) are submitted to the Secretary and recorded and indexed in the land records of the municipality where the building or structure is located.

(13) The modification of an existing building or structure, the change in use of a building or structure, or the modification of a campground, in a manner that increases the design flow of any component of a sanitary sewer service line, and any associated sanitary sewer collection line, that conveys wastewater to a wastewater treatment facility, or in a manner that modifies any operational requirements of such a sanitary sewer service line, and any associated sanitary sewer collection line, provided:

(A) the building or structure or campground is served by a water service line that connects to a public water system;

(B) a designer certifies that the design capacity of the existing sanitary sewer service line and sanitary sewer collection line can accommodate the increase in design flow or modification of operational requirements;

(C) the landowner obtains a letter from the wastewater treatment facility confirming the facility has capacity to treat the constituents of the wastewater and dispose of the design flow identified in § 1-803 for each building or structure or campground to be served by the sanitary sewer service line and any associated sanitary sewer collection line; and

(D) a copy of the certification required pursuant to Subsection (13)(B) is recorded and indexed in the land records for the municipality where the building or structure or campground is located.

(14) The modification of an existing building or structure, the change in use of a building or structure, or the modification of a campground, in a manner that increases the design flow of any component of a water service line, or in a manner that modifies any operational requirements of a water service line, provided:

(A) the building or structure or campground is served by a sanitary sewer service line, and any associated sanitary sewer collection line, that conveys wastewater to a wastewater treatment facility;

(B) no booster pump is added to the potable water supply;

(C) a designer certifies that the design capacity of the existing water service line can accommodate the increase in design flow or modification of operational requirements;

(D) the landowner obtains a letter from the public water system confirming the public water system has the capability to supply the design flow identified in § 1-803 for each building or structure or campground to be served by the water service line; and

(E) a copy of the certification required pursuant to Subsection (14)(C) is recorded and indexed in the land records for the municipality where the building or structure or campground is located.

(15) The construction of a replacement supply serving only one single-family residence on a lot with no other buildings or structures and with no campground, provided:

(A) the replacement supply will not be located in an area classified by the Secretary as a Class IV groundwater area;

(B) the replacement supply does not utilize surface water as the potable water source;

(C) there is not a change in use of the single-family residence to include a child care facility;

(D) if the replacement supply is a water service line and a booster pump will be installed in the single-family residence, the technical standards for the booster pump design in § 1-1111(d) are met (Secretary approval for the installation of the booster pump is not required);

(E) a form provided by the Secretary that corresponds to the type of replacement supply is recorded and indexed in the land records of the municipality where the single-family residence is located, and, if different, where the replacement supply will be located; and

(F) water sampling that complies with § 1-1113(b) and (c) is conducted prior to any consumptive use of the water from the replacement supply.

(16) The development of a potable water source to supplement an existing potable water source serving only one single-family residence on a lot with no other buildings or structures and with no campground, provided:

(A) the supplemental potable water source will not be located in an area classified by the Secretary as a Class IV groundwater area;

(B) the supplemental potable water source is not a surface water source;

(C) there is not a change in use of the single-family residence to also be a child care facility;

(D) the potable water supply presumptive isolation zone for the supplemental potable water source does not extend onto land owned by a person different than the owner of the single-family residence;

(E) a plan, with contours, drawn to scale prepared by a designer, showing the location of the existing and supplemental potable water sources, the location of the potable water supply presumptive isolation zone for the supplemental potable water source, and the boundary lines for the lot on which the single-family residence is located;

(F) a form provided by the Secretary, which includes the plan, is recorded and indexed in the land records of the municipality where the single-family residence is located, and, if different, the existing and supplemental potable water sources will be located; and

(G) water sampling that complies with § 1-1113(b) and (c) is conducted prior to any consumptive use of the water from the additional potable water supply.

(17) The deepening of an existing potable water source, provided that water sampling that complies with § 1-1113(b) and (c) is conducted prior to any consumptive use of the water from the deepened potable water source.

(18) The use or operation of a failed supply or failed system that is identified in § 1-301(d).

(19) The installation and use of a water treatment system for a potable water supply where the treatment system is designed to:

(A) reduce or eliminate water hardness;

(B) reduce or eliminate properties or constituents on the list of secondary standards in the Vermont Water Supply Rule;

(C) reduce or eliminate arsenic, fluoride, lead, manganese, nitrate, nitrite, gross alpha, uranium, or a combination of these, provided the treatment system treats all of the water used for drinking and the preparation of food; or

(D) eliminate bacteria, pathogenic organisms, radon, or radium, provided the treatment system treats all of the water used for drinking, washing, bathing, the preparation of food, and laundering.

(20) The installation and use of a water treatment system when authorized by the Secretary in a corrective action plan required pursuant to 10 V.S.A. § 6615b, in a remediation plan required pursuant to the Groundwater Protection Rule and Strategy, or in any other response action required to address contamination or the threat of contamination of a potable water supply.

(21) The increase in flow to a wastewater system through the connection to the wastewater system of a water treatment system identified in Subsection (18).

(22) The increase in flow to an existing wastewater system as a result of the use of a water treatment system identified in Subsection (19).

(23) The change in use of a single-family residence, on a lot with no other buildings or structures and with no campground, to include a family child care home registered by the Vermont Agency of Human Services, Department for Children and Families, provided the potable water supply does not utilize surface water as the potable water source.

(24) The installation of a water service pipe from a potable water source serving only one single-family residence, to provide water to an outside hose bibb that is located on the same lot as the residence.

(25) The construction of a wastewater system for purposes of serving only State or Federally owned remote campsites, provided:
- (A) each campsite is served by a waterless alternative toilet or a waterless pit privy that complies with the horizontal isolation distances contained in Table 9-5 without a reduction by the Secretary, except horizontal isolation distances from trees; and
- (B) if a waterless pit privy is used, the bottom of the excavation for the pit privy maintains a minimum of 36 inches above the seasonal high-water table, a minimum of 36 inches above a soil that with a percolation rate slower than 120 minutes per inch or that has a soil texture of sandy clay, clay, or silty clay, and a minimum of 48 inches above bedrock.

For the purposes of this Subsection, "remote campsites" means campsites regarded as remote campsites by the state or federal agency that makes the campsite available.

(26) A periodic and temporary change in use of a building or structure for events, provided:
- (A) the building or structure is served by a potable water supply and wastewater system;
- (B) each event lasts no more than 4 consecutive days;
- (C) there are no more than 12 days of events per year;
- (D) the owner of the building or structure retains records of the dates of each event for at least 3 years following each event and provides them to the Secretary if requested by the Secretary.

Examples include the periodic and temporary change in use of a hotel, motel, or restaurant for holding weddings; of an arena for holding horse shows; or of a building or structure for holding auctions, vehicle shows, or periodic concerts, provided the changes in use meets the criteria in this Subsection. The provision of an adequate number of alternative toilets and alternative hand washing supplies to accommodate everyone on site for the event is encouraged.

(27) The construction and use of a building or structure that will be used for events, provided:
- (A) the building or structure is not connected to a water service line, water service pipe, or sanitary sewer service line;
- (B) there are no more than 28 days of events per year;
- (C) there is no food preparation or dishwashing on site for the events unless the food preparation or dish washing is:

(i) fully completed within a mobile unit licensed by the Vermont Department of Health as a Temporary Food Stand or motorized or push cart type mobile unit; and

(ii) does not require on site water or waste disposal;

(D) the events do not require water, including for food preparation, dish washing, or clean-up, other than:

(i) for hand washing that is accommodated by alternative hand washing supplies; and

(ii) the disposal of wastewater that is accommodated by the use of alternative toilets;

(E) an adequate number of alternative toilets and alternative hand washing supplies are provided to accommodate everyone on site;

(F) there is no discharge of wastewater to the ground surface;

(G) the owner of the building or structure retains records of the following actions for at least 3 years following each event and provides them to the Secretary if requested by the Secretary:

(i) dates of each event;

(ii) the frequency of the pumping of the alternative toilets;

(iii) the number of gallons pumped from the alternative toilets; and

(iv) the dates on which alternative toilets and alternative hand washing supplies were delivered to the lot and removed from the lot.

(28) The periodic and temporary creation of a campground provided:

(A) The campground is not connected to a water service line, water service pipe, or sanitary sewer service line;

(B) there are no more than 12 nights of camping per year; and

(C) there is no discharge of wastewater to the ground surface.

(29) The construction and use of a building or structure for seasonal outdoor activities (e.g., outdoor archery, gun range, golf driving range, farm stand, Christmas tree farm), provided:

(A) the use does not require water for operation or clean-up, including employee wash up, other than for:

(i) hand washing that is accommodated by alternative hand washing supplies; and

(ii) the disposal of wastewater that is accommodated by the use of alternative toilets; and

(iii) the building or structure is not connected to a water service line, water service pipe, or sanitary sewer service line.

(30) The construction of a building or structure associated with quarries, sand and gravel pits, and rock crushing operations, where site conditions prevent the installation of a soil-based wastewater system, provided:

(A) a designer submits a written certification to the Secretary stating that based on his or her site investigations no soil-based wastewater system that complies with these Rules can be located within a 500-foot radius of the building or structure;

(B) the use does not require water for operation or clean-up, including employee wash up, other than for:
  (i) hand washing that is accommodated by alternative hand washing supplies; and
  (ii) the disposal of wastewater that is accommodated by the use of alternative toilets; and
(C) the building or structure is not connected to a water service line or water service pipe.

(31) The placement and use of a mobile home or recreational vehicle at a construction site as temporary office space occupied by employees, provided:
(A) the mobile home or recreational vehicle is removed immediately upon completion of construction;
(B) the use does not require water for operation or clean-up, including employee wash-up, other than for:
  (i) hand washing that is accommodated by alternative hand washing supplies; and
  (ii) the disposal of wastewater that is accommodated by the use of alternative toilets; and
(C) the mobile home or recreational vehicle is not connected to a water service line, water service pipe, or sanitary sewer service line.

(32) The use of telephone switching stations, electrical substations, hydroelectric dam operation stations, and similar buildings or structures, for their intended purposes, provided:
(A) the use involves no more than 4 employees that enter or visit the building or structure for less than 2 hours each in any day;
(B) the use does not involve access to the building or structure by non-employees;
(C) the use does not require water for operation or clean-up, including employee wash-up; and
(D) the building or structure is not connected to a water service line, water service pipe, or sanitary sewer service line.

(33) The use of rental storage units as rental storage units, provided:
(A) the use involves no more than 4 employees that enter or visit the building or structure for less than 2 hours each in any day;
(B) the use does not require water for operation or clean-up, including employee wash-up; and
(C) the building or structure is not connected to a water service line, water service pipe, or sanitary sewer service line;

§ 1-305 Applications for Permits

(a) Applications for permits or permit amendments required pursuant to § 1-301 shall be:
(1) submitted using the application form provided by the Secretary and be completed in accordance with the instructions provided with the application form;

(2) contain the information required in this Section and Appendix A and all other information necessary to demonstrate compliance with requirements in these Rules that apply to the application;

(3) signed by the person who owns the lot on which is or will be located the building or structure or campground that is or will be served by the wastewater system and potable water supply for which a permit or permit amendment is sought (i.e., the applicant); and

(4) submitted to the Regional Office that processes applications for the location the application concerns.

(b) Applications involving a wastewater system, potable water supply, or replacement area that is or will be located on a lot other than the lot where the building or structure or campground served or to be served by the system or supply is located, shall include:

(1) documentation that demonstrates the applicant has permanent legal access to the current or proposed off-lot potable water supply, wastewater system, or replacement area for the purposes of construction, operation, and maintenance of, as applicable, a potable water supply or wastewater system; or

(2) a signed and dated document from the owner of the lot on which the off-lot potable water supply, wastewater system, or replacement area is or will be located, provided the owner is not the applicant, indicating that:

(A) the owner will convey to the applicant permanent legal access to the current or proposed off-lot potable water supply, wastewater system, or replacement area shown on the site plan for the purposes of construction, operation, and maintenance of, as applicable, a potable water supply or wastewater system; and

(B) the owner will record and index the documents establishing such permanent legal access in the municipality where the building or structure or campground is or will be located, and, if different, where the wastewater system and potable water supply is or will be located, within 30 days of the date of the permit.

(c) An application seeking a variance pursuant to § 1-802 shall include a written request for the variance that meets the requirements of § 1-802(d).

(d) The perimeter of each proposed in-ground leachfield, at-grade leachfield, mound, and bottomless sand filter, and the center of each proposed potable water source, except when the potable water supply utilizes a surface water source, shall be flagged in the field prior to filing an application and the flagging maintained by the landowner until the Secretary issues a permit or denial, or the landowner withdraws the application from consideration.

(e) An application for the construction and operation of only a wastewater system or only a potable water supply needs a site plan, detail sheets, and any accompanying narrative and supporting data and design certification for only the system or the supply that is to be permitted.

(f) The Secretary may waive the submission, otherwise identified in Appendix A, of detail sheets for existing components of a wastewater system or potable water supply included in an application that the application does not propose to change.

(g) An application for a sanitary sewer service line, and any associated sanitary sewer collection line, that conveys wastewater to a wastewater treatment facility or an indirect discharge system, shall include a letter from the wastewater treatment facility or indirect discharge system confirming the facility or system has capacity to treat the constituents of the wastewater and dispose of the design flow identified in § 1-803 for each building or structure or campground to be served by the sanitary sewer service line and any associated sanitary sewer collection line.

(h) An application for a water service line shall include a letter from the public water system confirming the public water system has the capability to supply the design flow identified in § 1-803 for each building or structure or campground to be served by the water service line.

(i) An application to use surface water as the potable water source serving one single-family residence shall include the following statement signed by the applicant:
"I understand that a surface water source may not provide the same water quality as a groundwater source and that a surface water source will require constant treatment of the water including monitoring, proper operation, and maintenance of the water treatment system. I understand that the use of a treatment system will not ensure the water will meet drinking water standards. I understand I may not be notified when chemicals, such as lampricide, are applied to the surface water that serves my residence. I understand and accept the potential risk to human health and the liability for use of the surface water source and treatment system to provide potable water to my residence."

(j) The Secretary shall not commence a technical review of a permit application under these Rules until he or she deems the application is administratively complete, meaning the application includes a complete application form; application fee; connection approval letters, when required by Subsections (g) or (h); signed statement concerning a surface water source, when required by Subsection (i); documentation of permanent legal access, when required by Subsection (b); and a site plan and detail sheets, when required for the wastewater system or potable water supply for which the permit or permit amendment is required.

(k) An applicant may withdraw an application without prejudice at any time until the Secretary renders a decision on the project. The application fee will be refunded only when the request for withdrawal of the application is made prior to the initiation of a technical review.

(l) The Secretary shall give deference to a design certification included in an application, with respect to engineering design or judgment exercised by the designer, for the following aspects of the design:
(1) calculations used to size grease interceptors;
(2) calculations used to size septic tanks;
(3) calculations used to determine dosing volumes and pressure distribution;
(4) calculations used to determine cleansing velocities of sanitary sewer collection lines;
(5) slopes of sanitary sewer service lines or sanitary sewer collection lines;
(6) calculations for sizing wastewater and water pumps and pump selections;

(7) calculations for sizing water service lines, water service pipes, and sanitary sewer service lines;
(8) calculations for sizing water storage; and
(9) specifications for quality of workmanship.

(m) Nothing in Subsection (l) shall limit the responsibility of the designer to comply with these Rules with respect to the design of, and design certification for, a wastewater system or potable water supply.

(n) Nothing in Subsection (l) shall limit the authority of the Secretary to review and comment on design aspects of an application or to enforce these Rules with respect to the design or the design certification. The Secretary retains the authority to deny an application that includes a design that is out of compliance with these Rules.

§ 1-306 Site Plans, Supporting Information, and Design Certification

(a) All site plans, detail sheets, accompanying narrative, and other supporting data for the design of a wastewater system or potable water supply submitted with a permit application shall be prepared, signed and dated by a designer.

(b) All site plans, detail sheets, accompanying narrative, and other supporting data for the design of a wastewater system or potable water supply that is required in a permit application shall be accompanied by a design certification, signed and dated by a designer, that states:
"I hereby certify that, in the exercise of my reasonable professional judgment, the design-related information submitted with this application is true and correct and the design included in this application for a permit complies with the Vermont Wastewater System and Potable Water Supply Rules."

§ 1-307 Required Notification of Presumptive Isolation Zones

(a) When an applicant for a permit or permit amendment proposes a potable water supply or wastewater system with a wastewater system presumptive isolation zone or potable water supply presumptive isolation zone that extends onto property other than the property for which the permit is sought, the permit applicant shall send by certified mail, on a form provided by the Secretary, a notice of an intent to file a permit application, with the site plan that will be included with the permit application and that accurately depicts the presumptive isolation zone, to any landowner affected by the presumptive isolation zone at least 7 calendar days prior to the date that the permit application is submitted to the Secretary.

(b) If, during the course of the Secretary's review of an application for a permit or permit amendment, the location of a wastewater system and potable water supply is revised, and the revised wastewater system presumptive isolation zone or potable water supply presumptive isolation zone extends onto property other than the property for which the permit is sought, the permit applicant shall send by certified mail, on a form provided by the Secretary, a notice of filing a revised site plan, with the revised site plan that

accurately depicts the revised presumptive isolation zone, to any landowner affected by the revised presumptive isolation zone.

(c) If, after a permit or permit amendment has been issued under this Section, a water supply or wastewater system is not installed in accordance with the permit and if the record drawings indicate that the wastewater system presumptive isolation zone or potable water supply presumptive isolation zone as constructed extends onto property other than the property on which the system is located, the permittee shall send by certified mail a notification form provided by the Secretary with a copy of the record drawings showing the presumptive isolation zone to any landowner affected by the presumptive isolation zone.

(d) An applicant or permittee subject to the requirements of Subsections (a) through (c) shall submit a copy of the certified mail receipts to the Secretary demonstrating that the notices and information required by this Section have been sent by certified mail to affected landowners and shall include in the certification the name and address of all affected landowners. If the Secretary approves a permit or permit amendment application, the permit shall not be issued to an applicant subject to the requirements of Subsection (b) prior to 7 calendar days after the applicant certifies to the Secretary that the notice required under this Section has been sent to affected landowners.

(e) Notwithstanding Subsections (a) through (c), the notifications identified in this Section are not required for wastewater system presumptive isolation zones or potable water supply presumptive isolation zones that fall under one of the following descriptions:
(1) the presumptive isolation zone extends only onto property owned by the applicant;
(2) the presumptive isolation zone extends only onto a Town or State highway;
(3) the presumptive isolation zone does not differ in location from that which existed prior to the pending application or record drawings, provided the potable water supply or wastewater system existing prior to the application or record drawings was exempt from the permitting requirements of this Subchapter under § 1-303 or was permitted and in compliance with the permit;
(4) the potable water supply presumptive isolation zone is for a replacement supply;
(5) the wastewater system presumptive isolation zone is for a replacement system, provided the replacement system is not proposed in lieu of a replacement area in the same application as the wastewater system it would replace;
(6) the potable water supply presumptive isolation zone exists only in a municipality that prohibits the installation of a soil-based wastewater system; or
(7) the wastewater system presumptive isolation zone exists only in a municipality that prohibits the installation of a potable water supply other than a connection to the municipal water supply.

§ 1-308 Denial of an Application for a Permit

The Secretary shall deny, in writing, an application if the Secretary reaches one of the following conclusions:
(1) the owner of a wastewater treatment facility, indirect discharge system, or public water system has approved the physical connection of a sanitary sewer service

line, sanitary sewer connection line, or water service line to the wastewater treatment facility, indirect discharge system, or water main when the Secretary has prohibited the allocation of additional capacity from the facility or system;

(2) the proposed project does not comply with the technical standards in Subchapters 8, 9, 10, 11, and 12 or is otherwise not able to be developed in compliance with these Rules;

(3) the information submitted is not sufficient to make a determination that the proposed project can be developed in compliance with these Rules;

(4) the information submitted is determined to be false or misleading; or

(5) the application proposes the treatment and disposal of wastewater or wastes identified in § 1-301(e).

§ 1-309 Permit Conditions

(a) The Secretary may include any condition in a permit that he or she deems necessary to protect human health and the environment or to otherwise satisfy the purposes and requirements of these Rules, including requirements addressing operation and maintenance of a wastewater system or potable water supply.

(b) A permit for a wastewater system may be conditioned on the completion of a groundwater sampling, effluent sampling, water metering, and water quality sampling program when the Secretary determines a program is necessary to detect potential contamination and degradation of groundwater or surface water.

(c) A permit that approves a sanitary sewer service line, and any associated sanitary sewer collection line, that conveys wastewater to a wastewater treatment facility or an indirect discharge system, shall be conditioned on the existence, at the time of construction of the permitted wastewater system, of capacity in the wastewater treatment facility or indirect discharge system to treat the constituents of the wastewater and dispose of the design flow identified in § 1-803 for each building or structure or campground to be served by the sanitary sewer service line and any associated sanitary sewer collection line.

(d) A permit that approves a water service line shall be conditioned on the existence, at the time of construction of the permitted potable water supply, of capability of the public water system to supply the design flow identified in § 1-803 for each building or structure or campground to be served by the water service line.

(e) A permit that approves a potable water supply with a surface water potable water source shall contain conditions that require the landowner, prior to a change of ownership of the lot on which the building or structure or campground served by the supply is located, to submit the following documents to the Secretary:

(1) An inspection report, completed by a professional engineer practicing within the scope of his or her engineer specialty, that:

(A) confirms all approved components of the water treatment system exist and are functioning properly pursuant to the approved design; or

(B) if one or more components are not in existence or functioning properly, identifies corrective actions needed to bring the design into compliance

with the approved design, and identifies those components that are in existence and functioning properly pursuant to the approved design.

(2) Documentation demonstrating that the inspection report was provided to the prospective landowner.

(3) If the inspection report required corrective action, a second inspection report completed by a professional engineer, practicing within the scope of his or her engineering specialty, certifying the corrective actions have been taken and all approved components of the water treatment system exist and are functioning properly per the approved design.

(4) The following statement signed by the prospective landowner:

"I understand that a surface water source may not provide the same water quality as a groundwater source and that a surface water source will require constant treatment of the water including monitoring, proper operation, and maintenance of the water treatment system. I understand that the use of a treatment system will not ensure the water will meet drinking water standards. I understand I may not be notified when chemicals, such as lampricide, are applied to the surface water that serves my residence. I understand and accept the potential risk to human health and the liability for use of the surface water source and treatment system to provide potable water to my residence."

(f) A permit that approves a wastewater system that includes a constructed wetland shall contain conditions addressing:

(1) the operation and maintenance of the constructed wetland that are specific to the particular design and site; and

(2) reporting requirements to ensure compliance with the operational and maintenance requirements.

§ 1-310 Filing of Permit

(a) Except where otherwise specified in these Rules, permits issued under these Rules shall run with the land.

(b) Within 30 days of permit issuance, the permitee shall ensure the permit is recorded and indexed in accordance with the provisions of 24 V.S.A. §§ 1154 and 1161 in the land records of the municipality where the building or structure or campground is or will be located, and, if different, where the wastewater system and potable water supply is or will be located.

§ 1-311 Construction and Installation Certification

(a) A designer shall flag each of the following prior to construction or site work on the lot on which the wastewater system and potable water source approved in a permit is, or will be, located and the flags shall be maintained by the landowner until commencement of construction of the wastewater system component or potable water source:

(1) Perimeter of the approved leachfield, or, if the leachfield is within a bottomless sand filter or a mound, perimeter of the bottomless sand filter or mound.

(2) Perimeter of the approved replacement area; and

(3) Center of the approved potable water source.

(b) Subsequent to the substantial completion of a potable water supply or wastewater system and prior to the use and operation of the wastewater system or potable water supply, a signed and dated installation certification from an installer, or a designer if required in Subsection (f), shall be submitted to the Secretary that states:

"I hereby certify that, in the exercise of my reasonable professional judgment, the installation-related information submitted is true and correct and the potable water supply and wastewater system:

(A) *were installed in accordance with:*

(i) *the permitted design and all permit conditions; or*

(ii) *record drawings and such record drawings are in compliance with the Vermont Wastewater and Potable Water Supply Rules, were filed with the Secretary, and are in accordance with all other permit conditions;*

(B) *were inspected;*

(C) *were properly tested; and*

(D) *have successfully met those performance tests."*

(c) If any deviations to a permitted design for a wastewater system or potable water supply occur during the construction or installation of the system or supply, the permittee shall submit one of the following to the Secretary:

(1) An application for a permit amendment if, pursuant to Subsection (d), any deviation constitutes a significant modification of the design of the wastewater system or potable water supply that was approved; or

(2) Each of the following if no deviation constitutes a significant modification of the design of the wastewater system and potable water supply that was approved:

(A) record drawings prepared by a designer for the constructed and installed wastewater system or potable water supply that specify all deviations from the permitted design; and

(B) a design certification, signed and dated by the designer, that states:

"I hereby certify that, in the exercise of my reasonable professional judgment, the record drawings are true and correct and the design shown on the record drawing complies with the Vermont Wastewater System and Potable Water Supply Rules."

(d) For the purposes of this Section, a significant modification of the design of the wastewater system or potable water supply is one or more of the following:

(1) 50 percent or more of the leachfield is not located within the footprint of the leachfield as depicted on the approved site plan;

(2) portions of the leachfield are in an area for which no soil testing was submitted in the application or for which existing soil testing indicates the soil may not be suitable for the type of leachfield designed;

(3) the wastewater system includes a pump station that is not part of the approved design;

(4) the location of the leachfield is changed from the location depicted on the approved site plan so that a new or revised hydrogeologic analysis is necessary;

(5) the wastewater system is a different type of system from the type that was approved, such as the installation of a mound or at grade system when an in-ground system was permitted;

(6) the installation of a different innovative/alternative system or component, or the installation of a different manufacturer's model of an innovative/alternative system or component, than is part of the approved design;
(7) the failure to install an innovative/alternative system or component that is part of the approved design;
(8) the design of the sanitary sewer service line is modified so that manholes are required;
(9) the potable water supply is modified by the addition of water storage or pressure tanks, except for such modifications at a single-family residence served by a potable water supply that serves no other building or structure and no campground;
(10) the potable water supply includes a booster pump that is not part of the approved design;
(11) the wastewater system or potable water supply includes a modification that creates non-compliance with a technical standard in Subchapters 8, 9, 10, 11, or 12;
(12) the wastewater system or potable water supply includes a modification involving an action or design for which these Rules require a Secretary determination;
(13) the wastewater system or potable water supply includes a modification that would otherwise require a permit amendment pursuant to § 1-301; or
(14) any other modification that the Secretary determines is a significant modification.

(e) Applications for permit amendments required pursuant to Subsection (c)(1) shall be subject to the same review process as other permit amendment applications.

(f) A designer shall submit the installation certification required pursuant to Subsection (b) when any of the following circumstances exist:
(1) the installation is completed in accordance with record drawings;
(2) the Secretary determines that the proposed wastewater system or potable water supply is of a type, complexity, or size that requires the expertise and knowledge of a specific class of designer and includes as a condition of the permit that a designer of a specified class submit the installation certification; or
(3) when otherwise required by these Rules.

(g) A permit issued by the Secretary shall be invalid for the use and operation of a substantially completed potable water supply or wastewater system unless and until an installation certification meeting the requirements of Subsection (b) is received by the Secretary.

(h) Notwithstanding Subsection (b), an installation certification need not be submitted for a substantially complete potable water supply or wastewater system when the authorizing permit or permit amendment does not contain a condition requiring an installation certification for the potable water supply or wastewater system.

§ 1-312 Authorization to Commence with Site Work or Foundation Construction

(a) Following submission of an administratively complete application for a permit under this Subchapter, but prior to the issuance of a permit, an applicant may request authorization

from the Secretary to commence site work for the proposed wastewater system or potable water supply or site work or foundation construction for a building or structure to be served by the wastewater system or potable water supply.

(b) Within 30 days of receipt of a request made pursuant to Subsection (a), the Secretary shall grant or deny the request or request additional information from the applicant necessary to make a determination under Subsection (c).

(c) The Secretary shall grant authorization when the Secretary determines that the soil and other conditions of the site of the proposed leachfield, sanitary sewer service line, sanitary sewer collection line, or potable water source complies with these Rules.

(d) An authorization may limit the work that may be done prior to issuance of the permit and shall not be construed to mean that the applicant does not have to obtain any other permits prior to engaging in the site work or foundation construction.

§ 1-313 Additional Requirement for Replacement Systems and Replacement Supplies Permitted by Variance

Replacement systems or replacement supplies that are permitted by a variance granted under § 1-802 shall only be connected to buildings or structures or campgrounds that are located on the same lot as the buildings or structures and campgrounds that were served by the system or supply being replaced at the time the variance is granted.

Subchapter 4 – Approval of Innovative/Alternative Systems and Components

§ 1-401 Purpose and Decisions

(a) This Subchapter authorizes the Secretary to review and approve the following innovative/alternative systems and components for their use and inclusion in designs for wastewater systems:
- (1) alternative materials used in the construction or fabrication of tankage that is part of a wastewater system;
- (2) a component used for the treatment of wastewater prior to disposal including filter units;
- (3) a component that is substituted for conventional wastewater distribution systems to a leachfield;
- (4) a component or alternative method that substitutes for conventional wastewater dispersal in a leachfield; and
- (5) a new wastewater system design or a new design for a portion of a wastewater system.

(b) The Secretary may require manufacturers of innovative/alternative systems and components to provide the following information either as part of their applications for approval or as a condition of their approval:
- (1) component manuals;
- (2) design instructions;
- (3) installation instructions;
- (4) required operation and maintenance activities and the frequency at which they must occur;
- (5) instructions for the owner of the system; and
- (6) a list of representatives and manufacturer trained and approved designers, installers and service providers.

(c) All decisions by the Secretary on applications for approval of the use and inclusion of innovative/alternative systems or components shall specify the type of approval granted (general use, pilot, or experimental), be in writing, and include conditions related to the following:
- (1) the obligations of the system or component owner to operate and maintain the system or component;
- (2) requirements for inspections to be completed and inspections reports be submitted to the Secretary to confirm the system or component is functioning in a manner that meets the manufacturer's specifications; and
- (3) prohibiting any change or modification to the design of the innovative/alternative system or component without prior review and approval by the Secretary.

(d) Denials of requests for approval shall be in writing and state the basis for the denial.

(e) Approvals may have an expiration date. Manufacturers granted approval may seek renewal of approvals.

(f) Following expiration or revocation of an approval, a wastewater system and potable water supply permit authorizing installation of the previously approved innovative/alternative systems and components remains valid.

(g) Notwithstanding any condition in a permit authorizing the use or inclusion of an innovative/alternative system or component which has an approval requiring inspection of that system or component to be completed by a manufacturer-approved designer, the inspection may be completed by:
- (1) a manufacturer-approved service provider; or
- (2) if the manufacturer is no longer in business in Vermont:
  - (A) a designer; or
  - (B) a person authorized by the Secretary when that person demonstrates knowledge for properly maintaining and repairing the system or component to operate in a manner that meets the manufacturers requirements.

(h) The Secretary may revoke an authorization for a system or component when the Secretary determines:
- (1) the authorization was granted on the basis of incorrect, false, or misleading information;
- (2) the system or component fails to perform in compliance with any performance standard established for the system;
- (3) the system or component does not function with the expectations for reliability and protection of health and the environment upon which the authorization was based on; or
- (4) the company, manufacturer, or vendor fails to comply with conditions in the authorization including conditions concerning:
  - (A) maintaining records of sale or installation of a component;
  - (B) sale of a component when a permit requires the use of a different component;
  - (C) filing required reports;
  - (D) maintaining a required supply of repair or replacement parts; or
  - (E) ensuring an adequate supply of trained individuals to operate and maintain the system or component, if required.

§ 1-402 General Use Approval

(a) The Secretary shall authorize the general use of an innovative/alternative system or component proposed by a manufacturer seeking approval when the Secretary determines that the manufacturer has demonstrated the following:
- (1) the design of the innovative/alternative system or component protects human health and the environment;
- (2) the design of the innovative/alternative system or component satisfies the particular purposes served by the specific technical standards in Subchapters 8, 9, 10, 11, and 12 for which the system or component is intended to substitute; and
- (3) the innovative/alternative system or component is of demonstrated reliability and performance for its proposed use in soil and climate found in Vermont, based on its use elsewhere, such as other States or Canadian Provinces.

(b) An application for general use approval shall contain documentation demonstrating each of the above determinations, including documentation of bench or field testing of the system or component at a certified laboratory and testing facility by a third party or the manufacturer that meets the requirements of § 1-407.

§ 1-403 Pilot Approval

(a) The Secretary shall authorize the pilot use of an innovative/alternative system or component proposed by a manufacturer seeking approval when the Secretary determines that the manufacturer has demonstrated the following:
   (1) the design of the innovative/alternative system or component protects human health and the environment;
   (2) the design of the innovative/alternative system or component satisfies the particular purposes served by the specific technical standards in Subchapters 8, 9, 10, 11, and 12 for which the system or component is intended to substitute; and
   (3) the proposal is designed to measure and report data related to reliability and performance of the innovative/alternative system or component in soil and climate found in Vermont.

(b) An application for pilot approval shall contain documentation demonstrating each of the above determinations, including documentation of bench or field testing of the system or component at a certified laboratory and testing facility by a third party or the manufacturer that meets the requirements of § 1-407.

(c) Up to 25 installations or uses of each specific innovative/alternative system or component may be authorized in the pilot approval.

§ 1-404 Experimental Approval

(a) The Secretary may authorize the use of an experimental innovative/alternative system or component intended to try a new technology, application of technology, or methods proposed by a manufacturer seeking approval when the Secretary determines that the manufacturer has demonstrated the following:
   (1) the design of the innovative/alternative system or component protects human health and the environment; and
   (2) the design of the innovative/alternative system or component satisfies the particular purposes served by the specific technical standards in Subchapters 8, 9, 10, 11, and 12 for which the system or component is intended to substitute.

(b) An application for experimental approval shall contain documentation demonstrating each of the above determinations, including, if it exists, documentation of bench or field testing of the system or component at a certified laboratory and testing facility by a third party or the manufacturer that meets the requirements of § 1-407.

(c) Up to 5 installations or uses of each specific innovative/alternative system or component may be authorized in the experimental approval.

(d) The Secretary, as a condition of the wastewater system and potable water supply permit authorizing the installation of an experimental innovative/alternative system or component, shall require the owner of the installed system or component to perform monitoring of the system's or component's operation and submit monitoring reports to the Secretary.

(1) The type and frequency of monitoring shall be the monitoring necessary to demonstrate that the specific approved system or component is functioning as intended.

(2) If the system or component is to treat the wastewater, the condition shall include a requirement to sample the discharge from the system or component and to the submit testing results to demonstrate the system or component is meeting the expected level of treatment.

§ 1-405 Application Process for Innovative/Alternative Systems and Components

An application for approval of the use and inclusion of an innovative/alternative system or component in wastewater system and potable water supply permits shall be submitted on a form prepared by the Secretary. The application form shall require the following information.

(1) General information:
- (A) Company, manufacturer, vendor, or designer name.
- (B) Mailing address of company, manufacturer, vendor, or designer.
- (C) Administrative contact's name, address, phone number, and e-mail address.

(2) System or component information:
- (A) System trade name and model(s)/number(s), if any.
- (B) Description of theory of operation.

(3) Statement of claim:
- (A) Advantages related to prevention of health hazards, surface and groundwater pollution, environmental damage, or other similar advantages from the use of the innovative/alternative system or component.
- (B) Treatment performance claims, if any, expressed in mg/L or in appropriate units for biologic constituents.
- (C) Type of authorization (general, pilot, or experimental) requested and justification why the system or component belongs in the requested class.
- (D) Possible causes of or reasons for failure and an assessment of the risks to public health, owners/operators of the system or component, and the environment from such failure.
- (E) Documentation demonstrating the authorization-type specific determinations included in the proceeding sections that the Secretary must make prior to authorizing use.

(4) Authorization and denial history:
- (A) Authorizations from other States or Provinces, including copies of all authorizations, and the contact person for each State or Province.
- (B) Denials from other States or Provinces, including copies of all denials, and the contact person for each State or Province.

(5) Information related to the system or component:

(A) Copies of all operational reports, patent information, technical reports, and laboratory reports on the proposed innovative/alternative system or component, even if the information might in whole or part reflect negatively on the system or component.

(B) Documentation of all bench or field testing conducted of the system or component at a certified laboratory and testing facility by a third party or the manufacturer that meets the requirements of § 1-407.

(C) The number of systems or components installed and their jurisdictional location.

(D) Reports of any component or system that was found to not properly function or operate, or to not meet the manufacturer's performance expectation, with the cause, if determined, and any corrections or modifications to the system or component that were made to correct or prevent future functioning or operational problems or non-compliance with performance expectations.

(E) Reports that demonstrate the design of the innovative/alternative system or component satisfies the particular purposes served by the specific technical standards in Subchapters 8, 9, 10, 11, and 12 for which the system or component is intended to substitute.

(6) Design criteria:

(A) Design and material requirements.

(B) Plans and cross sections for the innovative/alternative system or component.

(C) Design limitations or restriction, including sizing, siting, and wastewater strength and characteristics.

(D) Leachfield sizing and justification.

(E) Construction requirements and limitations.

(F) For systems and components intended for treating of wastewater, the location of sampling ports for samples for analysis of the treated wastewater.

(7) Operation requirements:

(A) Technical qualifications for operators.

(B) Specific actions required to operate the system or component.

(8) Maintenance requirements:

(A) Technical qualifications for service providers.

(B) Specific actions and their frequency required to maintain the system or component.

(C) Information that will be provided to owner of the system or component regarding maintenance requirements.

(9) Monitoring and analysis requirements:

(A) Proposed schedule for monitoring, including frequency and constituents, if any is proposed.

(B) The method for collection, delivery, and analyses of the effluent from the system or component that meets the requirements of 40 C.F.R. Part 136, unless an alternative method is approved by the Secretary.

(C) Results of the effluent analysis performed by:

(i) a laboratory certified by the NELAC Institute (TNI) to test for the parameters of concern; or

(ii) a laboratory accepted by the Bureau de Normalization du Quebec or the European Committee for Standardization.

(10) Cost estimates:

(A) Design cost estimates.

(B) Construction and installation costs.

(C) Operation and maintenance costs.

(D) Energy costs.

§ 1-406 Renewal Application Process for Innovative/Alternative Systems and Components

An application for renewal of an approval shall be submitted on a form prepared by the Secretary. The application form shall require the following information:

(1) Results of any tests not submitted with the original application for approval of the system or component.

(2) Any approvals or denials by a State or Province not submitted with the original application for approval of the system or component.

(3) A statement as to whether there were design changes or modifications to the innovative/alternative system or component since the last approval.

(A) If there was a change or modification to the design of the innovative/alternative system or component, the manufacturer shall include a full description of the changes.

(B) If the change or modification affects performance of the system or component, the manufacturer or designer must submit a new application for approval of the system or component.

(4) Any updates needed for Vermont-specific manuals and design drawings so that they are in compliance with these Rules.

(5) Confirmation of manufacturer contact information.

(6) Confirmation of the availability of the system or component, parts, and trained and approved service providers for the system or component.

(7) Confirmation that the manufacturer met the conditions of the approval letter including the monitoring of the distribution of the innovative/alternative system or component and the annual reporting requirements.

§ 1-407 Standards and Protocols for Testing Innovative/Alternative Systems and Components

(a) Bench testing or field testing of innovative/alternative systems or component shall comply with the following standards or protocols:

(1) ANSI/NSF Standard 40 – Residential Wastewater Treatment Systems;

(2) ANSI/NSF Standard 24-5 – Wastewater Treatment Systems; Nitrogen Reduction;

(3) Canadian BNQ Standard NO 3680-910;

(4) European (EU) Standard EN 12566-3; or

(5) other standards and protocols developed by independent standards organizations and approved by the Secretary.

(b) Field testing shall be conducted by a testing facility that complies with the following standards or protocols:

(1) EPA/NSF – Protocol for the Verification of Wastewater Treatment Technologies; or

(2) EPA Environmental Technology Verification Program protocol for the Verification of Residential wastewater treatment technologies for nutrient reduction.

Subchapter 5 – Administrative Reconsiderations; Appeals; Enforcement

§ 1-501 Administrative Reconsideration

(a) An applicant for a permit or permit amendment, a person requesting a determination of the Secretary pursuant to a provision in these Rules that allows for such a determination, or a permittee, may request that a decision made in a Regional Office be reviewed and reconsidered by the Regional Office Programs Manager by submitting such request in writing within 60 days of the date of the decision to the Regional Office Programs Manager.

(1) The request shall specify which aspects of the decision are at issue, the reasons why the person believes the decision to be in error, and the decision requested of the Regional Office Programs Manager.

(2) The Regional Office Programs Manager may call on other individuals within or outside the Department who have expertise appropriate to the case to assist in his or her review including the Regional Office personnel. The Regional Office Programs Manager shall issue a written decision in writing within 60 days of receipt of a request made pursuant to Subsection (a), unless the requester and Regional Office Programs Manager mutually agree to an extension of this time period.

(3) The decision of the Regional Office Programs Manager shall constitute the final decision by the Secretary if reconsideration of the decision is not requested pursuant to Subsection (b).

(b) Any person who requested a reconsideration under Subsection (a) may, within 30 days of the date of the decision by the Regional Office Programs Manager, request that Regional Office Programs Manager's decision be reviewed and reconsidered by the Director by submitting such request in writing to the Director.

(1) The request shall specify which aspects of the decision are at issue, the reasons why the person believes the decision to be in error, and the decision requested of the Director.

(2) Within 30 days of receipt of the request, the Director shall convene a meeting with the requester and Division personnel. The Director may call on other individuals within or outside the Department who have expertise appropriate to the case to assist in his or her review including the Regional Office Programs Manager and Regional Office personnel.

(3) The Director shall issue a written decision within 30 days of the meeting. This time period may be extended by mutual agreement of the requester and Director. This written decision shall constitute the final decision by the Secretary.

§ 1-502 Appeal of Final Agency Decision

(a) A person aggrieved by a final act or decision of the Secretary under these Rules may appeal to the Environmental Division of the Vermont Superior Court in accordance with 10 V.S.A., Chapter 220.

(b) The period for appealing a decision to the Environmental Division is stayed if, within the appeal period, a request is received by the Secretary seeking reconsideration of the

decision pursuant to § 1-501 and the decision is one for which reconsideration is available pursuant to § 1-501. The full appeal period shall be available following the Secretary's final decision in response to the request for reconsideration.

§ 1-503 Enforcement

(a) The Secretary may initiate an enforcement action against a person, in accordance with the provisions of 10 V.S.A., Chapter 201 or 10 V.S.A. Chapter 211, if the Secretary determines that such person:

(1) has taken, or caused to be taken, an action that requires a permit or permit amendment under these Rules without first obtaining the required permit or permit amendment;

(2) has taken, or caused to be taken, an action that is in non-compliance with a permit or permit amendment issued under these Rules;

(3) is, or has been, in non-compliance with any order or assurance of discontinuance which addresses compliance with these Rules; or

(4) has otherwise not complied with the provisions of these Rules.

(b) If the Secretary determines that a licensed professional engineer or a Class A, B, or BW designer, as a result of the person's failure to exercise reasonable professional judgment, submits design or installation information that is untrue or incorrect, the Secretary may notify the Office of Professional Regulation.

Subchapter 6 – Delegation

§ 1-601 Full or Partial Delegation

(a) A municipality may request that it be delegated the authority to implement the provisions of 10 V.S.A., Chapter 64, except §§ 1975, 1976 and 1978, in lieu of the Agency, through administration of the permitting program set forth in these Rules for all types of wastewater systems and potable water supplies located within the municipality. This is called full delegation.

(b) A municipality may alternatively request that it be partially delegated, called partial delegation, the authority to implement the provisions of 10 V.S.A., Chapter 64, except §§ 1975, 1976 and 1978, in lieu of the Agency, through administration of the permitting program set forth in these Rules for only those projects that consist of buildings or structures or campgrounds that are served by both:

(1) sanitary sewer service lines connected to or that will connect to a sanitary sewer collection line owned and controlled by the municipality; and

(2) water service lines connected or that will connect to a water main owned and controlled by the municipality.

§ 1-602 Process for Delegation

(a) A municipality requesting the full or partial delegation shall submit the following information to the Agency in writing:

(1) A request for delegation indicating if full or partial delegation is sought.

(2) The name, mailing address, and phone number of the chair of the local legislative body of the municipality submitting the request;

(3) The name, mailing address, phone number, and license number of the designer or professional engineer who will be responsible for reviewing applications and issuing permits pursuant to these Rules;

(4) A description of the process the municipality will use for accepting and reviewing applications and for issuing permits;

(5) A statement signed by the chair of the local legislative body committing to administer the program in accordance with these Rules;

(6) For municipalities cooperating to manage the program, separate requests from each municipality for delegation of authority plus a copy of an inter-municipal agreement signed by the chair of each local body indicating the process agreed upon and the roles and responsibilities of the member municipalities; and

(7) Authority for the Secretary or his or her designee to enter the municipal property during normal working hours to review records related to the municipality's administration of these Rules.

(b) The delegation of authority from the Agency to the municipality shall be executed through a written agreement signed by the chair of the local legislative body on behalf of the municipality and the Commissioner that identifies the scope of the delegation and the parties' obligations.

§ 1-603 Performance Expectations for a Delegated Municipality

Municipalities receiving delegation under this Subchapter shall:

(1) Administer the program in conformance with these Rules and with the procedures and practices adopted by the Secretary that interpret these Rules.

(2) If receiving full delegation, employ a designer to review applications and issue permits pursuant to these Rules.

(3) If receiving partial delegation, employ a designer or employ a professional engineer practicing within the scope of their engineering specialty to review applications and issue permits pursuant to these Rules.

(4) Require the designer or a professional engineer employed to review applications and issue permits pursuant to these Rules to attend Department training programs, seminars, and meetings related to the administration of these Rules that the Agency requires staff administering these Rules to attend.

(5) Issue permits for sanitary sewer service lines and sanitary sewer collection lines that convey wastewater to a wastewater treatment facility or indirect discharge system only if there is capacity in the facility or system to treat the constituents of the wastewater and dispose of the design flow identified in § 1-803 for each building or structure or campground to be served by the sanitary sewer service line or sanitary sewer collection line.

(6) Issue permits for water service lines connecting to water mains only if there is capacity in the public water system to supply the design flow identified in § 1-803 for each building or structure or campground to be served by the water service line.

(7) Include in each permit standard conditions that are provided by the Agency.

(8) Act as the custodian of all records obtained or created in administering these Rules and maintain the records in conformance with the Agency's records schedules that would control the disposition of such records were the Agency the custodian of such records.

(9) Make electronic copies of all documents received or prepared during the course of an application review that were used to make a decision on the particular application available in a web-based format so that they may be examined from remote locations by Agency staff and members of the public.

(10) Maintain and operate an electronic tracking system for applications and permitting decisions that includes the applicant's name, address, and phone number; a project description; design flow for the potable water supply and wastewater system; application receipt date; the date the municipality deems the application to be administratively complete; dates of correspondence from municipal personnel to the applicant seeking additional application information during the review of an administratively complete application; dates for the receipt of additional information from the applicant; and date of the final decision.

(11) Submit an annual report to the Agency by February 15 of each calendar year that lists the number of applications received, the number of permits or denials issued, the number of permits issued that include the use of innovative/alternative systems or components, the number of annual inspections reports received for permits issued that include innovative/alternative systems or components, the average in-house application processing time, and the average application

processing time from the date of receipt of an administratively complete application to the date of the final decision.

(12) Take timely and appropriate enforcement for violations of municipality-issued permits and for violations of these Rules within the municipality's boundaries pursuant to 10 V.S.A., Chapter 201.

(13) Be responsible for all costs of administering these Rules pursuant to their delegation agreement and establish permit review fees in an amount sufficient to support the municipal services. If delegation is revoked pursuant to § 1-606, promptly provide copies of all documents and required permit tracking data related to the permits processed during the period of delegation to the Secretary. Electronic or microfilm copies will be acceptable.

§ 1-604 Agency Responsibilities

(a) Upon delegating the authority to implement these Rules to a municipality, the Secretary shall deliver the following to the municipality:

(1) Procedures and practices adopted by the Secretary that interpret these Rules.

(2) A list of standard conditions to be included in permits issued pursuant to these Rules.

(3) The record schedules adopted by the Agency that control the disposition of records obtained or created in administering these Rules.

(4) Electronic copies of the historical permitting documents for permits issued by the State for projects in the municipality for use in administering the permit program.

(b) The Secretary may audit a delegated municipality's administration of these Rules to assure the municipality's administration complies with the Rules, to perform quality control and ensure a level of consistency between the municipality's review and the review by a Regional Office, to gather information, or to investigate a complaint received in reference to the municipality's administration of these Rules.

(c) Notwithstanding delegation to a municipality pursuant to § 1-602, the Secretary, after consultation with the municipality, may institute enforcement proceedings against a person for violations of these Rules within the municipalities' municipal boundaries when the delegated municipality does not or cannot address non-compliance, or when the Secretary determines that enforcement is necessary to protect human health and the environment.

(d) The administrative reconsideration process established in § 1-501 is not available for permitting decisions by delegated municipalities made pursuant to their delegation agreement. Municipalities may develop a process for administrative reconsideration of such permitting decision.

§ 1-605 Permit Fees and Enforcement Penalties

(a) Delegated municipalities shall retain permit review fees for all municipal-issued permits except as indicated in Subsection (b) and shall retain all penalties collected from enforcement actions taken by the municipality within the scope of their delegated authority.

(b) Municipalities whose delegation authority is revoked or who work with the Agency to terminate their delegation shall remit to the Agency the application fees for any permit application that reverts to the Agency for issuance.

§ 1-606 Revocation of Delegation

(a) The Secretary may revoke delegation to a municipality for one or more of the following reasons:
- (1) violation of the delegation agreement;
- (2) false or misleading information submitted in support of an application for delegation;
- (3) issuance of permits for sanitary sewer service lines, sanitary sewer collection lines, or water service lines when the receiving facility or system has insufficient capacity for the design flow approved in the permits;
- (4) issuing permits that do not comply with these Rules; or
- (5) failure to take timely and appropriate enforcement actions under these Rules.

(b) Process for revocation
- (1) Prior to commencing revocation proceedings, the Secretary shall work with the delegated municipality to achieve compliance with these Rules.
- (2) Upon investigation of a complaint leading the Secretary to conclude that revocation is warranted, or on his or her own motion, the Secretary shall schedule a hearing for revocation and issue a notice of pending revocation to the municipality at least two weeks prior to the hearing.
- (3) A notice of pending revocation shall include the following:
  - (A) the legal authority for revocation;
  - (B) a brief statement of the proposed basis for revocation;
  - (C) notice that the Secretary will hold a hearing for the purpose of determining whether delegation shall be revoked; and
  - (D) the date, time, and place the hearing will be held.
- (4) A hearing shall be conducted in accordance with Subsection (c) and the Secretary shall issue a written decision within 30 days of conclusion of the hearing. If the decision is to revoke authority, the decision shall establish a timeline for transfer of records to the Agency.

(c) Hearing
- (1) A hearing for revocation shall be conducted in the Regional Office within closest driving distance to the delegated municipality's municipal offices, unless an alternative location is agreed to by the Secretary and delegated municipality.
- (2) The hearing for revocation shall be treated as a contested case and conducted in accordance with the provisions of 3 V.S.A. §§ 809–813, and this section.
- (3) The local legislative body of the municipality that is the subject of the proposed revocation is a party by right. Other persons who demonstrate to the Secretary that their interests are directly affected by delegation revocation shall be afforded party status to participate in the proceedings.
- (4) Any party to the revocation proceedings shall either appear in person or shall be represented by an attorney.

(5) The burden of proving that the delegation should be revoked shall be upon the Secretary.

(6) Upon the written request of a party filed at least 10 days before the hearing, the hearing shall be transcribed by a qualified stenographer or recorded on an electronic sound device. Costs shall be borne by the requesting party. The requesting party shall provide one copy of the transcript to the Secretary without cost; other parties wishing a copy shall reimburse the requesting party on a prorated basis.

(d) In response to a notice of pending revocation, the delegated municipality may waive the right to have a hearing and agree to revocation initiated by the Secretary.

(e) Applications in Process

(1) No additional applications shall be accepted by a municipality following the municipality's submission of a request for voluntary revocation.

(2) Applications in process by a municipality that has received a Notice of Pending Revocation shall continue to be processed by the municipality until such time as delegation is revoked.

(f) Appeal of a decision to revoke delegation shall be to the Environmental Court in accordance with 10 V.S.A., Chapter 220.

Subchapter 7 – Designer Scope of Authority, Examination, and Continuing Education

§ 1-701 General Requirements

(a) No person, except professional engineers, shall submit a design to the Secretary for a wastewater system or potable water supply without first obtaining a Class A, B, or BW wastewater and potable water supply designer license from the Office of Professional Regulation.

(b) A designer or professional engineer employed to review applications and issue permits pursuant to these Rules by a municipality with delegated authority pursuant to Subchapter 6, and other employees from the designer's or professional engineer's firm or business, shall not complete a design, any part of an application, an installation certificate, or other certification for a wastewater system or potable water supply located, or proposed to be located, within the municipality employing them.

§ 1-702 Scope of Authority for Class 1 Designers and Professional Engineers

(a) Class 1 Designers are licensed professional engineers who:
- (1) are practicing within the scope of his or her engineering specialty; and
- (2) if designing soil-based wastewater systems:
  - (A) received from the Vermont Board of Professional Engineering designation that he or she passed a college-level soil identification course with specific instruction in the areas of soil morphology, genesis, texture, permeability, color, and redoximorphic features; or
  - (B) passed a soil identification exam administered or approved by the Secretary.

(b) Class 1 Designers may perform the site evaluation, application preparation, and design and installation certifications required under these Rules for the design of all wastewater systems and potable water supplies.

(c) Professional engineers practicing within the scope of their engineering specialty who are not Class 1 Designers may:
- (1) perform the site evaluation, application preparation, and certification required under these Rules for the design of water service piping, water service lines, sanitary sewer service lines, and sanitary sewer collection lines.
- (2) perform the site evaluation, application preparation, and certification required under these Rules for the design of a soil-based wastewater system if the engineer retains one or more designers who are Class 1, Class A, Class B, or Class BW to perform all aspects of site evaluation, application preparation, and certification under these Rules for soil evaluation. In such cases, the name of the designer responsible for the soil evaluation for the application shall be included as a part of the permit application and certification.

§ 1-703 Scope of Authority for Class A Designers

(a) Class A Designers may perform the site evaluation, application preparation, and design and installation certifications required under these Rules for the design of the following wastewater systems and potable water supplies:

(1) a soil-based wastewater system with a design flow of 1350 gallons per day or less, including a system with a wastewater pump station that discharges to a gravity flow sanitary sewer collection line, gravity flow sanitary sewer service line, or distribution box;

(2) a sanitary sewer service line with a design flow of 1350 gallons per day or less, including a sanitary sewer service line that uses a wastewater pump station that discharges to a gravity flow sanitary sewer collection line or gravity flow sanitary sewer service line; and

(3) a potable water supply that serves only one single-family residence with a design flow of 1350 gallons per day or less, including a water service line with a fire suppression system with no more than 2 sprinkler heads.

(b) Notwithstanding Subsection (a), a Class A designer shall not perform the site evaluation, application preparation, and design and installation certifications required under these Rules for the design of a wastewater system or potable water supply that includes or falls within one of the following:

(1) a soil-based wastewater system that uses pressure distribution;

(2) a soil-based wastewater system that uses subsurface drip distribution;

(3) a soil-based wastewater system with a leachfield in a mound or bottomless sand filter;

(4) a soil-based wastewater system with a leachfield disposing of filtrate effluent;

(5) a soil-based wastewater system designed using the 2-year time of travel management zone;

(6) a soil-based wastewater system that includes a constructed wetland;

(7) a soil-based wastewater system that uses a storage and dose approach;

(8) a soil-based wastewater system that disposes of high strength wastewater, and for which design flow is determined pursuant to § 1-803(f)(2) or (3);

(9) a soil-based wastewater system that disposes of high strength wastewater and serves a building or structure with a use as a brewery;

(10) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received pilot or experimental approval pursuant to Subchapter 4;

(11) an innovative/alternative system, or wastewater system that uses innovative/alternative components that has received general use approval pursuant to Subchapter 4, unless the approval authorizes a Class A designer to design such systems;

(12) a sanitary sewer service line that includes manholes or connects to a pressure sanitary sewer collection line;

(13) a sanitary sewer collection line;

(14) a potable water supply that serves any building or structure or campground other than a single-family residence;

(15) a potable water supply that includes a water treatment system, the installation and use of which is not exempt under § 1-304(19);
(16) a potable water supply with a surface water potable water source; or
(17) a water service line that includes a fire hydrant or fire suppression system except as provided in Subsection (a)(3).

(c) Class A designers shall not complete design or installation certifications for wastewater systems and potable water supplies they are not authorized to design.

§ 1-704 Scope of Authority for Class B Designers

(a) Class B designers may perform the work within a Class A designer's scope of authority and the site evaluation, application preparation, and design and installation certifications required under these Rules for the design of the following wastewater systems:
(1) a soil-based wastewater system that uses pressure distribution;
(2) a soil-based wastewater system that uses subsurface drip distribution;
(3) soil-based wastewater systems with a leachfield in a mound or bottomless sand filter;
(4) a soil-based wastewater system with a leachfield disposing of filtrate effluent;
(5) a soil-based wastewater system designed using the 2-year time of travel management zone;
(6) a soil-based wastewater system that includes a constructed wetland;
(7) a soil-based wastewater system that disposes of high strength wastewater and does not include the use of treatment or innovative/alternative components to reduce the strength to low;
(8) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received general use approval pursuant to Subchapter 4, unless the approval requires a Class 1 designer to design such systems; and
(9) a sanitary sewer collection line that meets the following:
(A) the total design flow into the collection line is 1350 gallons per day or less;
(B) the collection line is less than 400 feet in length; and
(C) the collection line does not have a manhole and is not required to have a manhole under § 1-1002(j).

(b) Notwithstanding Subsection (a), a Class B designer shall not perform the site evaluation, application preparation, and design and installation certification required under these Rules for the design of a wastewater system or potable water supply that includes or falls within one of the following:
(1) a soil-based wastewater system that uses a storage and dose approach;
(2) a soil-based wastewater system that disposes of high strength wastewater and includes the use of treatment or innovative/alternative components to reduce the strength to low strength;
(3) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received general use approval

pursuant to Subchapter 4, when the approval requires a Class 1 designer to design such systems;

(4) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received pilot or experimental approval pursuant to Subchapter 4;

(5) a sanitary sewer service line or sanitary sewer collection line that includes manholes;

(6) a sanitary sewer service line or sanitary sewer collection line that connects to a pressure sanitary sewer collection line;

(7) a potable water supply that serves any building or structure or campground other than a single-family residence;

(8) a potable water supply that includes a water treatment system the installation and use of which is not exempt under § 1-304(19);

(9) a potable water supply with a surface water potable water source; or

(10) a water service line that includes a fire hydrant or fire suppression system except as provided in § 1-703(a)(3).

(c) Class B designers shall not complete design or installation certifications for wastewater systems and potable water supplies they are not authorized to design.

§ 1-705 Scope of Authority for Class BW Designers

(a) Class BW designers may perform the work within a Class A or Class B designer's scope of authority and the site evaluation, application preparation, and design and installation certifications required under these Rules for the design of a potable water supply with a total design flow of 1350 gallons per day or less regardless of the number of buildings or structures or campgrounds served.

(b) Notwithstanding Subsection (a), a Class BW designer shall not perform the site evaluation, application preparation, and design and installation certification required under these Rules for the design of a wastewater system or potable water supply that includes or falls within one of the following:

(1) a soil-based wastewater system that uses a storage and dose approach;

(2) a soil-based wastewater system that disposes of high strength wastewater and includes the use of pre-treatment or innovative/alternative components to decrease the strength of the wastewater;

(3) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received general use approval pursuant to Subchapter 4, when the approval requires a Class 1 designer to design such systems;

(4) an innovative/alternative system, or wastewater system that uses innovative/alternative components, that has received pilot or experimental approval pursuant to Subchapter 4;

(5) a sanitary sewer service line or sanitary sewer collection line that includes manholes;

(6) a sanitary sewer service line or sanitary sewer collection line that connects to a pressure sanitary sewer collection line;

(7) a potable water supply that includes a water treatment system the installation and use of which is not exempt under § 1-304(19);
(8) a potable water supply with a surface water potable water source; or
(9) a water service line that includes a fire hydrant or fire suppression system except as provided in § 1-703(a)(3).

(c) Class BW designers shall not complete design or installation certifications for wastewater systems and potable water supplies they are not authorized to design.

§ 1-706 Examinations

(a) Examinations to become a Class A designer shall consist of both written and field exams prepared and approved by the Secretary that test the individual's knowledge of soil identification and the requirements of these Rules for those wastewater systems and potable water supplies that a Class A designer is authorized by these Rules to design.

(b) Examinations to become a Class B designer shall consist of the Class A examinations and a written exam prepared and approved by the Secretary that tests the individual's knowledge of the requirements of these Rules for those wastewater systems and potable water supplies that a Class B designer is authorized by these Rules to design.

(c) Examinations to become a Class BW designer shall consist of the Class A and Class B examinations and a written exam prepared and approved by the Secretary that tests the individual's knowledge of designing potable water supplies that a Class BW designer is authorized by these Rules to design.

§ 1-707 Continuing Education for Class A, B, and BW Designers

(a) To provide continuing education hours toward a designer's license renewal, a course must be Secretary approved as either relevant to the siting and design of a wastewater system or potable water supply or in-field or laboratory related courses pertaining to soil.

(b) Any person may request that the Secretary review a course to determine whether to approve the course for continuing education hours.
(1) When approving a course, the Secretary shall identify the:
(A) type of the course;
(B) whether in-field, laboratory, or interactive distance learning;
(C) the number of hours completion of the course provides;
(D) whether the hours qualify as general hours or soil hours; and
(E) whether the provider is able to verify attendance and participation.
(2) Courses that consist of passive listening or viewing of recorded matter shall not be approved for continuing education hours.

(c) The Secretary shall provide at least one soil course each year to assist designers fulfilling their continuing education hours.

§ 1-708 Audit of Designers

(a) The Secretary may review, on a random basis, or in response to a complaint, or on his or her own motion, the performance of a designer, including the following and any work completed by the designer in association with the following:
   (1) soil analysis and testing procedures employed by the designer;
   (2) systems designed by the designer; and
   (3) designs approved or recommended for approval by the designer.

(b) The Secretary may use the results to work with a designer to reduce the number of administratively and technically incomplete or deficient applications.

(c) The Secretary may provide the results of the audit to the Office of Professional Regulation.

Subchapter 8 – General Technical Standards for Wastewater Systems and Potable Water Supplies

§ 1-801 Basic Requirements

(a) All buildings or structures or campgrounds shall have a wastewater system that complies with the technical standards in this Subchapter and Subchapters 9 and 10 except as provided in § 1-301(b), § 1-802, or an approval for an innovative/alternative system or component.

(1) Except as provided in Subsection (a)(2), the wastewater system shall be physically connected to the building or structure it serves.

(2) The wastewater system serving a building or structure may be a wastewater system that is not physically connected to the building or structure provided the wastewater system is physically connected to a separate building or structure and the buildings or structures are on the same lot and not more than 500 feet apart.

(b) A wastewater system shall be maintained to ensure that the components of the wastewater system meet the technical standards in this Subchapter and Subchapters 9 and 10 and do not operate improperly.

(c) All buildings or structures or campgrounds shall have a potable water supply that complies with the technical standards in this Subchapter and Subchapters 11 and 12 except as provided in § 1-301(b), § 1-802, or an approval for an innovative/alternative system or component.

(1) Except as provided in Subsection (c)(2), the potable water supply shall be physically connected to the building or structure it serves.

(2) The potable water supply serving a building or structure may be a potable water supply that is not physically connected to the building or structure provided the potable water supply is physically connected to a separate building or structure and the buildings or structures are on the same lot and not more than 500 feet apart.

(d) A potable water supply shall be maintained to ensure that the components of the potable water supply meet the technical standards in this Subchapter and Subchapters 11 and 12 and do not operate improperly.

(e) All dependent campsites in a campground shall be within 400 feet of a toilet facility. The toilet facility may consist of water carried toilets, vault privies, composting toilets, or incinerating toilets.

(f) There shall be at least 1 toilet to serve each group of 10 or fewer dependent campsites in a campground.

(g) Each component of a wastewater system shall be sized to convey, treat, or dispose of the design flow associated with the component and identified in § 1-803.

(h) Each component of a potable water supply shall be sized to supply or convey the design flow associated with the component and identified in § 1-803.

(i) A water faucet shall be provided within 400 feet of any dependent campsite in a campground. Common drinking vessels at faucets are prohibited.

(j) At least one dumping station shall be provided per campground unless:
- (1) all campsites have individual sanitary sewer service lines; or
- (2) the campground consists entirely of tent sites and the campground prohibits the use of camping units with interior plumbing.

(k) Each dumping station in a campground shall:
- (1) serve no more than 100 dependent campsites;
- (2) be designed with a concrete apron that slopes to the sanitary sewer service line inlet; and
- (3) be supplied with piped water under pressure for flushing and cleaning of the concrete apron after each use.

§ 1-802 Variances

(a) An application for a permit or permit amendment may include a request, prepared by a designer, for a variance from one or more technical standards in this Subchapter and Subchapters 9, 10, 11, and 12 if the application meets one of the following:
- (1) involves the construction of a replacement system or replacement supply and the variance is sought for the replacement system or replacement supply, provided the replacement system is not proposed in lieu of a replacement area and in the same application as the wastewater system it would replace;
- (2) involves the change in use of a single-family residence from seasonal to year-round use and the variance is sought for the wastewater system or potable water supply proposed to serve the single-family residence, provided no holding tank is proposed as part of the wastewater system;
- (3) involves the subdivision of an improved lot, and, if desired, the construction of a replacement system in lieu of a replacement area, and the variance is sought for the replacement area or replacement system, provided the lot is improved with, and the replacement area or replacement system is proposed to serve, either:
  - (A) up to two single-family residences or one duplex; or
  - (B) up to two buildings or structures, two campgrounds, or one building or structure and one campground, where the total design flow for the uses is 560 gallons per day or less.

(b) Variances are not available in circumstances other than those identified in Subsection (a).

(c) Notwithstanding Subsection (a), a variance from a technical standard in these Rules shall not be granted when an increase in design flow is sought for the wastewater system or potable water supply.

(d) An application that includes a request for a variance shall identify the specific provision and technical standard in these Rules for which the applicant is requesting a variance,

identify the alternative design standard requested, and contain the site plan, detail sheets, narrative, or data that supports the grant of such a variance pursuant to the standard identified in Subsection (e) or (f).

(1) The burden shall be on the person requesting the variance to provide information that would enable the Secretary to reach each conclusion identified in Subsection (e) or (f).

(2) The Secretary may request additional information that he or she deems necessary to determine whether to grant a variance pursuant to Subsection (e) or (f).

(e) The Secretary shall grant a variance from a technical standard in these Rules only when the Secretary reaches each of the following conclusions:

(1) Full compliance with the technical standard cannot be achieved.

(2) The variance is the minimum necessary considering both cost and the potential impacts on human health and the environment. In reaching this determination, the Secretary shall presume that the following designs are the minimum necessary considering the cost and impacts on human health and the environment:

(A) For the design of a soil-based wastewater system, when it is determined that a reduction of no more than 4 inches in the depths of naturally occurring soil required pursuant to § 1-903 is not needed to protect the water table, a variance from one or more technical standards in § 1-903 is available and the following variances are available:

(i) Variances from the requirement for a pump station and that allow the development of an in-ground leachfield.

(ii) Variances that allow an in-ground leachfield instead of a pump station and an at-grade leachfield.

(iii) Variances that allow an at-grade leachfield instead of a leachfield in a mound or bottomless sand filter.

(B) For the design of a potable water supply, when a proposed groundwater potable water source cannot meet the isolation required pursuant to § 1-1104(e) from an existing leachfield or septic tank, and the proposed potable water source is designed to include casing that exceeds the casing required pursuant to § 1-1206 or to include grouting of any annular space of the proposed potable water source, a variance from § 1-1104(e) for isolation from the existing leachfield or septic tank is available.

(3) The variance will not allow the wastewater system or potable water supply to function as a failed supply or failed system.

(4) If sought for a replacement system or replacement supply, the replacement system or replacement supply will provide equal to or better protection to human health or the environment than the wastewater system or potable water supply it is replacing. In reaching this determination the Secretary shall consider, among other factors, if the replacement system or replacement supply will provide equal or better protection of the groundwater, will provide equal or better protection of surface water, and will provide equal or better protection for potable water sources and public water sources.

(f) Notwithstanding Subsection (e):

(1) When a variance is sought for a replacement system or replacement supply that will replace a wastewater system or potable water supply exempt from the permitting requirements of this Subchapter under § 1-303, the conclusion in Subsection (e)(1) is not applicable, and the Secretary shall grant a variance from a technical standard in these Rules when the Secretary reaches the conclusions in Subsection (e)(2), (3), and (4).

(2) When a variance is sought in the circumstance identified in Subsection (a)(3), the conclusion in Subsection (e)(1) is not applicable, and the Secretary shall grant a variance from a technical standard in these Rules when the Secretary reaches the conclusions in Subsection (e)(2), (3), and (4) and concludes that full compliance with the technical standard cannot be achieved within 500 feet of each building or structure or campground proposed to be served by the replacement area or replacement system.

(g) The grant of a variance by the Secretary shall be in writing in the permit for the wastewater system or potable water supply for which the variance was requested by identifying that the permit includes the grant of a variance and by identifying both the technical standard for which the variance is granted and the design modification or alternative design standard approved.

(h) The grant of a variance shall not relieve the applicant of the responsibility to comply with all other provisions of these Rules and applicable State and local laws.

§ 1-803 Design Flows

(a) For the purposes of this Section, the term "employee," when associated with a non-residential use of a residence, does not include employees residing in the residence whose water usage is included as part of a residential use.

(b) For the purposes of this Section, the term "meal" means any food service that includes more than coffee, tea, water, other beverages, and pre-packaged food. Meals include any food service that the Vermont Department of Health determines to be a meal or requires a Health License to be prepared on the premises.

(c) The design flow for individual components of a wastewater system and potable water supply, and the design flow for a replacement area, that will serve a single-family residence on a lot with no other buildings or structures and with no campground, shall be calculated based on a minimum of 2 bedrooms, regardless of whether the residence will contain only one bedroom.

(d) The design flow for individual components of a wastewater system and a potable water supply, and the design flow for a replacement area, that will serve buildings or structures with a residential use shall be calculated using one of the following methods for the total living units served:

(1) The design flow of 70 gallons per day per person at the maximum residential occupancy proposed for each living unit, provided the resulting design flow is not

less than the design flow calculated using the following minimum design standards:

(A) a living unit contains at least 1 bedroom, except as provided in Subsection (c);

(B) the first 3 bedrooms in a living unit contain a minimum occupancy of 2 persons per bedroom; and

(C) each additional bedroom beyond 3 contains a minimum occupancy of 1 person per bedroom.

(2) The design flow specified in Table 8-1.

(e) The design flow for individual components of a wastewater system and potable water supply, and the design flow for a replacement area, that will serve campgrounds shall be calculated using the design flow specified in Table 8-2.

(f) The design flow for individual components of a wastewater system and potable water supply, and the design flow for a replacement area, that will serve buildings or structures with a non-residential use shall be calculated using one of the following methods:

(1) The design flow specified in Table 8-3 for the maximum quantity of each unit proposed.

(2) A Secretary approved design flow using water meter data authorized pursuant to § 1-804.

(3) For uses not appearing in Table 8-3:

(A) when the wastewater system is a soil-based wastewater system, or a sanitary sewer service line that conveys wastewater to an indirect discharge system, a design flow approved by the Secretary following receipt of the designer's proposal for a design flow that will accommodate the wastewater strength and characteristics and the amount of water necessary for the proposed use, taking into account:

(i) the design flows for uses in Table 8-3 with similar water usage and wastewater strength and characteristics;

(ii) the submission of water use data that meets the requirements in § 1-804(d) and (e) and the submission of wastewater strength and characteristics that meets the requirements of § 805(c), accompanied by a request to establish a design flow for the proposed use that includes the information identified in § 1-804(a) and (c); or

(iii) for commercial, industrial, manufacturing, or agricultural uses, the design flow determined by other methods approved by the Secretary. Other methods may include manufacturer's specifications and method used to determine design flow and wastewater strength and characteristics; flows and wastewater strength and characteristics from other States or the Environmental Protection Agency; or published and peer review studies by States, Colleges, or Universities that include flows and wastewater strength and characteristics.

(B) when the wastewater system is a sanitary sewer service line that conveys wastewater to a wastewater treatment facility, a design flow approved by

the Secretary following receipt of the designer's proposal for a design flow that will accommodate the wastewater strength and the amount of water necessary for the proposed use, taking into account:

(i) the design flows for uses in Table 8-3 with similar water usage and wastewater strength;

(ii) the submission of water use data that meets the requirements in § 1-804(d) and accompanied by a request to establish a design flow for the proposed use that includes the information identified in § 1-804(b) and (c); or

(iii) for commercial, industrial, manufacturing, or agricultural uses, the design flow determined by other methods approved by the Secretary. Other methods may include manufacturer's specifications and method used to determine design flow and wastewater strength and characteristics; flows and wastewater strength and characteristics from other States or the Environmental Protection Agency; or published and peer review studies by States, Colleges, or Universities that include flows and wastewater strength and characteristics.

(g) In the following situations, a designer may reduce, by the reduction indicated as follows, the design flow calculated pursuant to Subsection (d), (e), and (f) for individual components of a wastewater system or potable water supply:

(1) If the living unit served is senior housing but does not include assisted living or nursing care associated with the senior housing, the design flow for a component that will serve the living unit may be reduced to 105 gallons per day (based on 1.5 persons per living unit).

(2) If not more than four living units will be served by a component and each living unit contains only composting or incinerating toilets, the design flow for the component may be reduced by 25 percent.

(3) If a building or structure, other than in a living unit, or a campground, that will be served by a component contains only composting or incinerating toilets and the Secretary determines that a reduction in design flow proposed by the applicant's designer for the component will not increase the probability the system or supply will fail, the design flow for the component may be the design flow approved by the Secretary.

(h) The design flow for individual components of a wastewater system or potable water supply, and the design flow for a replacement area, that will serve a building or structure or campground with multiple uses, whether residential or non-residential, shall be determined by calculating the maximum sum of the design flows for each use of the building or structure or campground in any 24-hour period.

(i) When a wastewater system includes a gravity sanitary sewer service line or gravity sanitary sewer collection line exceeding 500 feet in total length, individually or in combination, the following infiltration design flow shall be added to the design flow identified in Subsection (c) through (h) for individual components of the wastewater system that receive flow from the service or collection line:

(1) 300 gallons per inch of diameter per mile of pipe per day; or
(2) 200 gallons per inch of diameter per mile of pipe per day when the Secretary approves the reduction based on a request and specific information provided by a designer in the application.

Table 8-1
Design Flows for the Residential Use of Buildings or Structures With 5 or More Living Units

Number of Living Units	Wastewater System (Gallons Per Day)	Potable Water Supply (Gallons Per Day)
5	1575	1800
6	1830	2160
7	2065	2520
8	2280	2880
9	2565	3240
10	2800	3600
11	3036	3960
12	3264	4320
13	3848	4680
14	3696	5040
15	3900	5400
16	4112	5760
17	4369	6120
18	4518	6480
19	4712	6840
20 or more	245 per living unit*	360 per living unit

* Provided the individual component of the wastewater system is receiving less than 50,000 gallons per day. When the component is receiving 50,000 gallons per day or more, the design flow for the component decreases to 210 per day per living unit.

Table 8-2
Design Flows for Campsites

Use of Campsite		
Type or description of campsite use	**Units**	**Gallons Per Day Per Unit**
Campsites for Tents and Other Camping Units with No Interior Plumbing		
central toilets with showers	site	75
central toilets without showers	site	50

Use of Campsite		
Type or description of campsite use	**Units**	**Gallons Per Day Per Unit**
Campsites for Camping Units with Interior Plumbing but No Sewer Hook-Up		
central toilets facilities	site	50
dumping station	site	25
Campsites for Camping Units with Sewer Hook-Up		
with or without central toilet facilities serving the units	site	75
Cabins with Plumbing; Park Model Recreational Vehicles		
with or without kitchen but without laundry facilities	sleeping space*	50
with or without kitchen but with laundry facilities	sleeping space*	70

* Design flow shall be calculated based on a minimum of four sleeping spaces.

Table 8-3
Design Flows for Non-Residential Uses of Buildings or Structures

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
Animal, Dog, or Small Animal Grooming; Kennels		
for each use	employee	13
grooming station	station	400
kennels cages or enclosures	cage or enclosure	25
Airport		
airport	passenger	4
with restaurant licensed by the Department of Health	seat licensed by the Department of Health	use ***Restaurant***

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
Assembly Area; Conference Room with no food service		
for each use	seat	4
Assembly Area; Banquet Hall; Conference Room with catered food service prepared off the lot		
for each use	seat per meal	8
Assembly Area; Banquet Hall; Conference Room with food service for one meal (food prepared in a kitchen on the lot) (if more than one meal is served, use Restaurant)		
for each use	seat	14
Barber Shop; Hair Salon		
no hair washing	chair	50
hair washing	chair	150
hair salon	stylist, operator	32
barber shop; hair salon	employee (not a barber, stylist or operator)	13
Beer, Wine, or Spirits Tasting Room		
no public toilets, may have seats but no meal served	tasting room	100
no public toilets, may have seats but no meal served	employee	13
with public toilets and seats but no meal served	tasting room	300
with public toilets and seats if meal served	seat licensed by the Department of Health	use ***Restaurant*** or 300, whichever is greater
Brewery		
brewery	gallon of beer brewed	4.5
brewery	employee	13
Bowling Alley		

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
bowling alley	lane	67
restaurant	seat licensed by the Department of Health	use ***Restaurant***
Car Wash		
car wash	car	based on the manufacturer's specifications for per vehicle wash
with employees	employee	13
providing public toilets	patron	4
Care Facilities		
correctional facility	sleeping space	125
assisted living facility	sleeping space licensed by the Agency of Human Services	85
hospitals	sleeping space	250
nursing care home	sleeping space	125
residential care homes or disabled housing	bedroom	105
rehabilitation or therapeutic community residence and shelters	sleeping space licensed by the Agency of Human Services	70
rehabilitation or therapeutic community residence and shelters	non-resident staff per shift	13
other care facilities	sleeping space	125
Catering or Take-Out Facility (no on-premise public seating)		
limited operation – serving coffee, steamed or roto-grilled frankfurters	N/A	0
commercial catering within a residence	N/A	100
commercial catering within a residence	employee	13
commercial caterer not in a residence	N/A	100

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
commercial catering not in a residence	employee	13
ice cream shop	N/A	100
ice cream shop	employee	13
bakery	N/A	100
bakery	employee	13
deli	N/A	100
deli	employee	13
with seafood license	N/A	100**
with seafood license	employee	13**
Child Care Facility		
without meals	child, employee	13
with 1 meal	child, employee	16
with 2 meals	child, employee	19
Children's Summer Camp		
overnight camp	person	45
day camp (no meals served)	person	13
day camp (meals served)	person	use ***Child Care Facility***
Church; Temples; Mosques; Other Places of Worship		
sanctuary	seat	1
other areas of assembly	seat	4
meals prepared off site	seat per meal	8
Dentist Office		
dentist office	dentist, hygienist, other medical employee	32
dentist office	non-medical employee	13
dentist office	chair	based on manufacturer's specifications; if no specifications, 100
dentist office	patient	4, unless using 100 gallons or more per chair (then 0)

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
Doctor Office		
doctor office	doctor, nurse, other medical employee	32
doctor office	non-medical employee	13
doctor office	patient	4
Food Markets; Grocery Stores; Food Stores		
with bakery	N/A	100
with deli	N/A	100
with meat department but without garbage grinder	100 square feet	7.5
with meat department with garbage grinder	100 square feet	11
with seafood license	N/A	100**
with public seating	seat licensed by the Department of Health	15
Hotels; Motels; Inns; Bed & Breakfasts; Extended Stay Hotels		
for each use	sleeping space	50
meals served only to guests	meal per sleeping space	5
kitchen in room	sleeping space	5
staff, manager, or owner bedroom	bedroom	140
on premise laundry	machine	use ***Laundromat; Laundry Services***
Laundromat; Laundry Services		
laundromat or laundry service	top or front-loading machine	450
laundromat or laundry service	machine	case by case based on type of operation, hours of operation, and manufacturer's specifications
laundromat or laundry service	employee	13

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
Marina		
with no showers	slip, mooring	4
with showers	slip, mooring	10
holding tank pump-out	boat	25 with a minimum size on-shore holding tank of 500 gallons
marina	employee	13
Nail Salon		
nail salon	manicurist or pedicurist	32
nail salon	employee (non-manicurist or pedicurist)	13
nail salon	manicure station	50
nail salon	pedicure station	100
Office, Factory, Welcome Center, and Place of Employment		
without showers	employee per shift	15
with showers	employee per shift	20
with cafeteria	seat	use ***Restaurant***
with public toilet	patron or client (non-employee)	4
Restaurant		
restaurant serving a max. of 2 meals per day	seat licensed by the Department of Health	27
restaurant serving a max. of 3 meals per day	seat licensed by the Department of Health	40
restaurant with 9 or fewer seats	restaurant	300
School		
boarding; includes dormitories with staff, cafeterias, and showers	student	90
grades pre-school through 8 w/o cafeterias or showers	student, employee	5

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
grades 9 through 12 w/o cafeterias or showers	student, employee	12
grades pre-school through 8 with cafeteria and w/o showers	student, employee	8
grades 9 through 12 with cafeteria and w/o showers	student, employee	15
grades pre-school through 8 with cafeteria and showers	student, employee	11
grades 9 through 12 with cafeteria and showers	student, employee	18
Service Station		
service station	employee per shift	13
with public toilets	gas or diesel fueling hose	125
Sports Arena; Skating Rink; Soccer Field; Tennis Court; Pools; Hot Tubs; Saunas; Spas; Health Club; Exercise Gym; Dance Studio; Similar Facility		
for each use	trainer	32
for each use	employee (non-trainer)	13
for each use	spectator	3
without showers	participant	4
with showers	participant	8
restaurant or cafeteria	seat licensed by the Department of Health	15
water treatment backwash	case by case	case by case based on quantity of backwash per cycle and frequency of cycle
rink, pool, spa discharge	case by case	case by case based on the quantity of discharge and frequency of discharge
Store not otherwise identified in this Table		
store in a shopping center, mall, or on an individual lot	varies	4 gpd/100 sq. ft. or 90 gpd/store, whichever is greater

Use of Building or Structure		
Details of use	**Units**	**Gallons Per Day (gpd) Per Unit***
Therapist Office (massage, physical therapy, acupuncturist, chiropractor)		
therapist office	therapist	32
therapist office	employee (non-therapist)	13
without showers	client	4
with showers	client	8
Therapist Office (mental health counseling)		
therapist office	therapist, employee	13
therapist office	client	4
Toilet Buildings associated with Outside Activities such as Picnic Areas and Recreational Fields		
toilet and handwashing	person	3
showers, toilet, and handwashing	person	8
Theatre		
drive-in	car space	3
indoor	seat	3
with food concession	concession area	100
Veterinary Clinic		
veterinary clinic	veterinarian	200
veterinary clinic	employee (non-veterinarian)	13
with animal boarding	animal	25

* Design flows for each use take into account the water use of employees and toilets available to the public, unless separately addressed for a use.

** Design flow does not include disposal of ice used for storing and displaying seafood. If the ice is disposed of by spraying with water to melt the ice, the design flow needs to include the quantity of water needed to melt the ice.

Note: A use identified in Table 8-3 may generate high strength wastewater. Examples include restaurant use, convenience store use particularly with coffee sale, bar use, and coffee and donut shop use.

§ 1-804 Water Meter Data

(a) An applicant or prospective applicant may submit a written request prepared by a designer that the Secretary determine that the wastewater strength and quantity of water necessary for a proposed non-residential use of a building or structure does not require the design flows specified in Table 8-3 for individual components of a soil-based wastewater system or of a sanitary sewer service line that conveys wastewater to an indirect discharge system, for individual components of a potable water supply, and for the replacement area, and that the Secretary assign a design flow for the use based on the following factors:

(1) the nature and design of the proposed use, including equipment that may be part of the use and any manufacturing process;
(2) daily water use data, as further described in Subsection (c);
(3) daily wastewater discharge collected and recorded using a method approved by the Secretary prior to collection;
(4) seasonal variations known or anticipated in occupancy or water usage of the building or structure;
(5) wastewater strength and characteristics analysis data, including BOD and TSS, that may be required to adjust the sizing of the leachfield according to § 1-904, as further described in Subsection (e); and
(6) other information the Secretary deems necessary based on the specific proposed use and request.

(b) An applicant or prospective applicant may submit a written request prepared by a designer that the Secretary determine that the quantity of water necessary for a proposed non-residential use of a building or structure does not require the design flows specified in Table 8-3 for individual components of a sanitary sewer service line that conveys wastewater to a wastewater treatment facility and individual components of a potable water supply and that the Secretary assign a design flow for the use based on the following factors:

(1) the nature and design of the proposed use, including equipment that may be part of the use and any manufacturing process;
(2) daily water use data, as further described in Subsection (c);
(3) daily wastewater discharge collected and recorded using a method approved by the Secretary prior to collection;
(4) seasonal variations known or anticipated in occupancy or water usage of the building or structure; and
(5) other information the Secretary deems necessary based on the specific proposed use and request.

(c) The burden shall be on the applicant or prospective applicant requesting the determination pursuant to Subsection (a) or (b) to satisfy the following requirements with information from a designer:

(1) Propose a design flow for the wastewater system based on:
    (A) the 90th percentile of all daily water meter readings; and
    (B) a proposed safety factor that accounts for fluctuations in metered flows. Considerations for determining a safety factor include:

(i) the number of days the water meter readings exceeds the average flow calculated based on the water meter readings for the year;
(ii) the number of days the water meter readings exceed the average flow calculated based on the water meter readings during the 3 consecutive months representing the highest water usage; and
(iii) the 90th percentile of the water meter readings representing the highest water usage for 3 consecutive months.

(2) Propose a design flow for the potable water supply based on the peak recorded daily water meter reading.

(3) Demonstrate that the wastewater system and potable water supply comply with technical standards in this Subchapter and Subchapters 9, 10, 11, and 12;

(4) Provide information that addresses each factor in Subsection (a) or (b) and enables the Secretary to reach a determination and assign a design flow.

(d) Water use data shall include the following:

(1) A minimum of daily water meter readings for a year, unless:

(A) the wastewater system and potable water supply will be operated for less than 180 days of days, in which case, daily water meter readings shall be taken for each day in operation; or

(B) the wastewater system and potable water supply will be operated for 180 days or more and the Secretary concludes that 1 year of daily water meter readings is not necessary to demonstrate the wastewater strength and quantity of water necessary for the proposed use and the Secretary provides approval, prior to the collection of water meter readings, for daily water meter readings to be taken for 180 consecutive days. An applicant seeking such approval shall submit the following information:

(i) the nature the existing use of the building or structure, including equipment that may be part of the use and any manufacturing process, that will be in use when meter readings will not be taken;
(ii) seasonal variations in occupancy or water usage of the building or structure demonstrating that all variations will be recorded during the 180 days;
(iii) wastewater strength and characteristics, including BOD and TSS, that may be required to adjust the sizing of the leachfield according to § 1-904 and as further described in Subsection (e), for the days when meter readings will not be taken; and
(iv) other information the Secretary deems necessary based on the specific proposed use and request.

(2) Daily record of the number of occupants, employees, or other users of the building or structure, unless approval is provided by the Secretary, prior to collection of water meter readings and based in information submitted by the applicant, of an alternative basis for recording the intensity of the daily use of the building or structure.

(3) The quantity of process water used for industrial or manufacturing facilities.

(4) The quantity of water for domestic type use.

(5) The quantity of water that comes from the potable water supply serving the building or structure that will not discharge to the wastewater system.

(e) Wastewater strength and characteristics analysis data shall include 8-hour composite samples or other sampling method approved by the Secretary during the period of recording the water meter readings, taken at the following intervals:

(1) 1 sample during each 3-month period of use of the building or structure, provided that, if the building or structure is in use for fewer than 6 months, a minimum of 2 samples are taken;

(2) at least 2 of the samples shall be taken during the normal peak use of the building or structure or campground; and

(3) more frequent sampling when the Secretary determines that the sampling results may not be representative of the use of the building or structure.

(f) The approval by the Secretary of a design flow different than that specified in Table 8-3 shall not be used for the purposes of determining, pursuant to § 1-301(a), whether an action will result in an increase in design flow of any component of a wastewater system or potable water supply.

(g) The approval by the Secretary of a design flow different than that specified in Table 8-3 for a proposed non-residential use of a building or structure shall:

(1) be issued in writing in the permit for the wastewater system or potable water supply that will serve the building or structure; and

(2) state that a reduction from the design flow specified in Table 8-3 was approved and identify the approved design flow.

§ 1-805 Wastewater Strength

(a) A leachfield for which design flow is determined pursuant to § 1-803(f)(2) or (3) or that will dispose of food processing waste, including a leachfield that will serve a building or structure with a use as a brewery, shall comply with the following requirements:

(1) Septic tank effluent that is low strength may be discharged to the leachfield.

(2) Septic tank effluent that is high strength but treated to reduce the strength to low strength may be discharged to the leachfield after such treatment.

(3) Septic tank effluent that is high strength is prohibited from being discharged to the leachfield unless the leachfield is sized pursuant to Subsection (d).

(b) Wastewater strength of septic tank effluent shall be categorized based on the following standards:

(1) Septic tank effluent is low strength when it meets the following standards:

(A) $BOD_5 \leq 300$ mg/L;

(B) TSS $\leq$ 150 mg/L; and

(C) Fats, Oil & Grease (FOG) $\leq$ 50 mg/L.

(2) Septic tank effluent that exceeds any one of the standards for BOD_5, TSS, or FOG specified in Subsection (b)(1) is high strength.

(c) When wastewater strength is determined for septic tank effluent, it shall be determined using one of the following methods:

(1) sampling of BOD_5, TSS, and Fats, Oil, & Grease as an 8-hour composite or other sampling method approved by the Secretary;

(2) sampling of BOD_5, TSS, and Fats, Oil, & Grease from a wastewater system serving buildings or structures or campground with similar uses as an 8-hour composite or other sampling method approved by the Secretary; or

(3) literature review of BOD_5, TSS, and Fats, Oil, & Grease from buildings or structures, or campgrounds with similar uses, using the highest strength value identified for the particular uses.

(d) When a leachfield is proposed to dispose of high strength wastewater and is proposed using a Secretary-assigned design flow based on the submission of water use data and wastewater strength calculations pursuant to § 1-803(f)(3)(A) or § 1-804, the leachfield shall be sized using one of the following formulas in lieu of any formula or method for sizing the particular type of leachfield specified in Subchapter 9 that would otherwise apply:

(1) The formula SQLF = (BOD_5 ÷ 300 mg/L) x (DF ÷ AR) where

(A) SQLF = the minimum required square footage of leachfield in square feet;

(B) DF = the design flow in gallons per day; and

(C) AR = the application rate for the soil in gallons per square foot per day identified in § 1-911.

(2) Another formula proposed by an applicant's designer and accepted by the Secretary.

§ 1-806 Determining Baseline Design Flow for Increases in Design Flow

(a) For the purpose of this Section, the term "bedroom" means:

(1) a room identified as a bedroom on a lister card applicable between January 1, 2006 and December 31, 2006; or

(2) a room the owner of the building or structure between January 1, 2006 and December 31, 2006 certifies under oath was:

(A) occupied as sleeping quarters for a minimum of 90 days between January 1, 2006 and December 31, 2006; and

(B) contained one window or door that leads directly to the outside and one door that separates the room from the other living space.

(b) For the purpose of determining, pursuant to § 1-301(a), whether an action will result in an increase in design flow of any component of a wastewater system or potable water supply for which the clean slate permit exemption in § 1-303 is in effect, the baseline design flow from which a potential increase is measured shall be calculated according to the following:

(1) For living units:

(A) The maximum number of bedrooms in the living unit between January 1, 2006 and December 31, 2006, and the following standards:

(i) that the first 3 bedrooms in a living unit contains 2 persons per bedroom, unless Subsection (B) or (C) applies;

(ii) that each additional bedroom beyond 3 contains 1 person per bedroom, unless Subsection (B) or (C) applies; and

(iii) that each person uses 70 gallons of water per day.

(B) If a bedroom contains built-in beds providing sleeping space for more than 2 persons, the number of persons assumed for that bedroom shall be based on the number of sleeping spaces.

(C) If an applicant certifies under oath that more than 2 persons were living in a bedroom at the same time between January 1, 2006 and December 31, 2006, the number of persons assumed for that bedroom shall be based on the number certified to.

(2) For campsites, the maximum number and the use of campsites that existed between January 1, 2006 and December 31, 2006, and the design flow specified in Table 8-2.

(3) For buildings or structures or portions of building or structure other than living units, the use, or combination of uses in a 24-hour period, of the building or structure between January 1, 2006 and December 31, 2006 with the highest design flow, and the design flow specified in Table 8-3.

(c) For the purpose of determining, pursuant to § 1-301(a), whether an action will result in an increase in design flow of any component of a wastewater system or potable water supply for which the clean slate permit exemption in § 1-303 is not in effect, the baseline design flow from which a potential increase is measured shall be calculated by reference to the permit authorizing the operation of the component, the approved site plan, and the design flows specified in § 1-803.

(d) A baseline design flow shall not be calculated using a Secretary approved design flow authorized pursuant to § 1-804 except pursuant to § 1-803(f)(3) for uses not appearing in Table 8-3.

Subchapter 9 – Specific Technical Standards for Wastewater Systems

§ 1-901 Use of Term Wastewater System

Except as used in § 1-928, the term wastewater system as used in this Subchapter shall mean soil-based wastewater system.

§ 1-902 Replacement Area

(a) All existing and proposed wastewater systems on a lot on which one or more of the following actions is proposed in an application shall have designated replacement areas:
- (1) the construction of a new building or structure or the creation of a campground;
- (2) an increase in the design flow of the leachfield;
- (3) the subdivision of the lot; or
- (4) the construction of a wastewater system that is an innovative/alternative system with experimental approval.

(b) Notwithstanding Subsection (a), a replacement area is not necessary for a wastewater system in any of the following circumstances:
- (1) The wastewater system:
  - (A) includes a leachfield or combination of leachfields sized to dispose of 150 percent or more of the design flow;
  - (B) is designed to use pressure distribution; and
  - (C) meets the other technical standards in this Subchapter and Subchapters 8 and 10.
- (2) The wastewater system includes a mound that:
  - (A) includes a leachfield or combination of leachfields sized to dispose of 100 percent or more of the design flow; and
  - (B) meets the other technical standards in the September 10, 1982 version of these Rules, or a later version.
- (3) The wastewater system includes a bottomless sand filter that:
  - (A) includes a leachfield or combination of leachfields sized to dispose of 100 percent or more of the design flow;
  - (B) a hydrogeological analysis which demonstrates a minimum of 12 inches of unsaturated naturally occurring soil exists beneath the bottomless sand filter fill material to the induced water table; and
  - (C) meets the other technical standards in this Subchapter and Subchapters 8 and 10.

(c) A wastewater system that is required to have a designated replacement area can alternatively have a designated replacement system in lieu of the replacement area.

(d) A replacement area shall be an area that is able to comply with:
- (1) the technical standards in this Subchapter to support the type of leachfield, required naturally occurring soil around the perimeter of the leachfield, and fill material for the particular type of leachfield that is intended to be placed in the replacement area;

(2) if the wastewater system to be replaced is an innovative/alternative system with general use approval or pilot approval pursuant to Subchapter 4, the requirements of the approval to support a leachfield of the same type to be placed in the replacement area; or

(3) if the wastewater system to be replaced is an innovative/alternative system with experimental approval, the technical standards in this Subchapter to support a type of leachfield, required naturally occurring soil around the perimeter of the leachfield, and fill material for a leachfield that complies with the technical standards in this Subchapter to be placed in the replacement area.

§ 1-903 General Requirements for Soil-Based Wastewater Systems

(a) Except where otherwise specified in these Rules, a wastewater system shall include a leachfield, or combination of leachfields, that are sized to dispose of at least 100 percent of the design flow and that comply with all other technical standards in this Subchapter.

(1) The leachfields shall be in-ground leachfields, at-grade leachfields, leachfields in mounds, or leachfields in bottomless sand filters that comply with the technical standards in this Subchapter.

(2) Cesspools and dry wells (i.e., seepage pits) are prohibited from inclusion in a wastewater system.

(b) A wastewater system shall include a septic tank that complies with § 1-908 unless this requirement is waived by the Secretary following determination by the Secretary that a septic tank is unnecessary for the separation of grease, scum, and solids associated with the wastewater, based on information provided by an applicant's or prospective applicant's designer.

(c) When a hydrogeological analysis is performed to demonstrate compliance with a requirement in these Rules, the minimum length of the leachfield shall be the length determined from the hydrogeological analysis if this length is greater than that the minimum length required for the particular type of leachfield found in other provisions of these Rules.

(d) Ground slope requirements for leachfields

(1) The average ground slope of the naturally occurring soil across the entire width and length of the area where an in-ground leachfield is proposed to be constructed, or where the limits of the mound fill material for a leachfield to be constructed in a mound is proposed, or where the infiltrative surface for an at-grade leachfield is proposed to be constructed, shall not exceed 20 percent.

(2) When the design of an in-ground leachfield is less than 10 feet in width or length, the average slope shall not exceed 20 percent in the area measured beginning at the upslope edge of the trench or bed and continuing 10 feet horizontal distance in the downslope direction.

(3) Notwithstanding Subsections (d)(1) and (2), when the lot on which the building or structure or campground to be served by a proposed wastewater system was created before June 14, 2002:

(A) The average ground slope of the naturally occurring soil across the entire width and length of the area where an in-ground leachfield is proposed to

be constructed, or where the limits of the mound fill material for a leachfield to be constructed in a mound is proposed, or where the infiltrative surface for an at-grade leachfield is proposed to be constructed, shall not exceed 30 percent; and

(B) when the design of an in-ground leachfield is less than 10 feet in width or length, the average slope shall not exceed 30 percent in the area measured beginning at the upslope edge of the trench or bed and continuing 10 feet horizontal distance in the downslope direction.

(4) The average ground slope of the naturally occurring soil across the entire width and length of the area where a bottomless sand filter is proposed to be constructed shall not exceed 5 percent.

(5) When the average ground slope of the naturally occurring soil across the entire width and length of the area where an in-ground leachfield is proposed to be constructed, or where the limits of the mound fill material for a leachfield to be constructed in a mound is proposed, or where the infiltrative surface for an at-grade leachfield is proposed to be constructed, exceeds 20 percent, the design shall include the following:

(A) Methods for site stability in the area of the leachfield before, during, and after construction with specific attention to erosion prevention and sediment control.

(B) Specifications for:

(i) construction of the wastewater system;

(ii) stormwater diversions if needed to prevent stormwater from eroding soil in the area of the leachfield; and

(iii) re-vegetation to prevent soil erosion.

(6) The long dimension of distribution piping in a leachfield shall be laid parallel to the ground slope or contours.

(7) No leachfield shall be constructed in an area where the ground slope or contours create a depression that will act as a natural surface or groundwater collection area.

(e) No portion of a wastewater system, except a sanitary sewer service line or sanitary sewer collection line, shall be located in a floodway.

(f) A wastewater system shall be located, designed, and constructed in a manner that avoids impairment to the system and contamination from the system during flooding if the site is located in a mapped flood hazard area.

(g) No portion of a wastewater system shall be located in a Zone 1 of a Public Community Water System Source Protection Area, except a replacement system that replaces an existing wastewater system located in the same Zone 1.

(h) For wastewater systems in Class A watersheds, except a replacement system that is not proposed in lieu of a replacement area in the same application as the wastewater system it would replace, the following requirements apply:

(1) No wastewater system with a design flow that exceeds 1000 gallons per day shall be approved.

(2) The maximum cumulative design flow for multiple wastewater systems on the same lot shall not exceed 1000 gallons.

(i) The following are the required depths of naturally occurring soil for in-ground leachfields and at-grade leachfields.

(1) Except where Subsection (i)(2) applies and where otherwise specified in these Rules, the minimum depth of naturally occurring soil below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be:

(A) 36 inches to the seasonal high-water table;

(B) 36 inches to a soil with:

(i) a percolation slower than 60 minutes per inch; or

(ii) a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(C) 36 inches to a soil with a consistence of firm or denser regardless of texture;

(D) 48 inches to bedrock; and

(E) for a leachfield disposing of 2000 gallons or more per day of effluent, 36 inches to the induced water table, as demonstrated through a hydrogeological analysis.

(2) When the leachfield disposes of filtrate effluent and is designed in accordance with § 1-904(c), the minimum depth of naturally occurring soil below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be:

(A) 18 inches to a soil with:

(i) a percolation slower than 120 minutes per inch; or

(ii) a texture of sandy clay, silty clay, or clay;

(B) 18 inches to a soil with a consistence of firm or denser, regardless of texture;

(C) 24 inches to bedrock; and

(D) 18 inches to the induced water table, as demonstrated through a hydrogeological analysis.

(3) For in-ground leachfields, the minimum depths of naturally occurring soil shall be met for a distance of 10 feet beyond the edge of the leachfield stone or other infiltrative surface.

(4) For at-grade leachfields, the minimum soil depths of naturally occurring soil shall be met for a distance of:

(A) 25 feet beyond the limits of the fill material in the downslope direction; and

(B) 10 feet beyond the limits of the fill material on all other sides.

(j) The following are the required depths of naturally occurring soil and fill material for a leachfield in a mound.

(1) The minimum depth of naturally occurring soil below ground surface to site the leachfield, shall be:

(A) 24 inches to the seasonal high-water table;

(B) 24 inches to a soil with:

(i) a percolation rate slower than 120 minutes per inch; or

(ii) a texture of sandy clay, silty clay, or clay;

(C) 24 inches to a soil with a consistence of firm or denser, regardless of texture; and

(D) 24 inches to bedrock.

(2) The minimum depths of naturally occurring soil shall be met:

(A) for a distance of 25 feet beyond the limits of the fill material of the mound in the downslope direction;

(B) for a distance of 10 feet beyond the limits of the fill material at each end of the mound; and

(C) at the limits of the fill material of the mound in the upslope direction.

(3) The depth of mound fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(A) 36 inches to the seasonal high-water table;

(B) 36 inches to a soil with:

(i) a percolation rate slower than 120 minutes per inch; or

(ii) a texture of sandy clay, silty clay, or clay; and

(C) 48 inches to bedrock.

(4) The minimum depth of mound fill material between the bottom of the leachfield stone or other infiltrative surface of the leachfield and ground surface shall be 12 inches.

(k) Notwithstanding Subsection (j), the following are the required depths of naturally occurring soil and mound fill material for a leachfield in a mound when a hydrogeological analysis is performed.

(1) The minimum depth of naturally occurring soil below ground surface to site the leachfield shall be 24 inches to bedrock.

(2) The minimum depth of naturally occurring soil beneath the mound fill material to site the leachfield shall be:

(A) 6 inches to the induced water table, as demonstrated through a hydrogeological analysis; or

(B) 6 inches to the induced water table at the limits of the fill material, as demonstrated through a hydrogeological analysis completed through a method identified in Subsection (r)(1)(B) or (C), regardless of whether the induced water table rises to less than 6 inches beneath the mound fill material or rises into the mound fill material beneath the leachfield.

(3) The minimum depths of naturally occurring soil shall be met:

(A) for a distance of 25 feet beyond the limits of the fill material of the mound in the downslope direction; and

(B) for a distance of 10 feet beyond the limits of the fill material of the mound at each end of the mound; and

(C) at the limits of the fill material of the mound in the upslope direction.

(4) The depth of mound fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(A) 36 inches to the induced water table, as demonstrated through a hydrogeological analysis;

(B) 36 inches to a soil with:

(i) a percolation rate slower than 120 minutes per inch; or

(ii) a texture of sandy clay, silty clay, or clay; and

(C) 48 inches to bedrock.

(5) The minimum depth of mound fill material between the bottom of the leachfield stone or other infiltrative surface of the leachfield and ground surface shall be 12 inches.

(l) Notwithstanding Subsection (j), the following are the required depths of naturally occurring soil and mound fill material for a leachfield in a mound that disposes of filtrate effluent and is designed in accordance with § 1-904(c).

(1) The minimum depth of naturally occurring soil below ground surface to site the leachfield shall be 18 inches to bedrock.

(2) The minimum depth of naturally occurring soil beneath the mound fill material to site the leachfield shall be:

(A) 6 inches to the induced water table, as demonstrated through a hydrogeological analysis; or

(B) 6 inches to the induced water table at the limits of the mound fill material, as demonstrated through a hydrogeological analysis completed through a method identified in Subsection (r)(1)(B) or (C), regardless of whether the induced water table rises to less than 6 inches beneath the fill material or rises into the mound fill material beneath the leachfield.

(3) The minimum depths of naturally occurring soil shall be met:

(A) for a distance of 25 feet beyond the limits of the fill material of the mound in the downslope direction;

(B) for a distance of 10 feet beyond the limits of the fill material of the mound at each end of the mound: and

(C) at the limits of the fill material of the mound in the upslope direction.

(4) The depth of mound fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(A) 18 inches to the induced water table, as demonstrated through a hydrogeological analysis;

(B) 18 inches to a soil with:

(i) a percolation rate slower than 120 minutes per inch; or

(ii) a texture of sandy clay, silty clay, or clay; and

(C) 24 inches to bedrock.

(5) The minimum depth of mound fill material between the bottom of the leachfield stone or other infiltrative surface of the leachfield and ground surface shall be 12 inches.

(m) The following are the required depths of naturally occurring soil and bottomless sand filter fill material for a leachfield in a bottomless sand filter.

(1) The minimum depth of naturally occurring soil below ground surface to site the leachfield shall be:

(A) 24 inches to a soil with:

(i) a percolation rate slower than 60 minutes per inch; or

(ii) a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(B) 24 inches to a soil with a consistence of firm or denser, regardless of texture; and

(C) 24 inches to bedrock.

(2) The minimum depth of naturally occurring soil beneath the bottom of the enclosure to site the leachfield shall be 6 inches to the induced water table, as demonstrated through a hydrogeological analysis.

(3) The minimum depths of naturally occurring soil shall be met for a distance of:

(A) 25 feet from the edge of the enclosure for the bottomless sand filter in the downslope direction; and

(B) 10 feet from the edge of the enclosure for the bottomless sand filter on all other sides.

(4) Except where Subsection (m)(5) applies, the depth of bottomless sand filter fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(A) 36 inches to the induced water table, as demonstrated through a hydrogeological analysis;

(B) 36 inches to a soil with:

(i) a percolation rate slower than 60 minutes per inch; or

(ii) a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(C) 36 inches to a soil with a consistence of firm or denser, regardless of texture; and

(D) 48 inches to bedrock.

(5) When a leachfield in a bottomless sand filter disposes of filtrate effluent and is designed in accordance with § 1-904(c), the depth of bottomless sand filter fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(A) 18 inches to the induced water table, as demonstrated through a hydrogeological analysis;

(B) 18 inches to a soil with:

(i) a percolation rate slower than 60 minutes per inch; or

(ii) a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(C) 18 inches to a soil with a consistence of firm or denser, regardless of texture; and

(D) 24 inches to bedrock.

(6) The minimum depth of bottomless sand filter fill material between the bottom of the leachfield stone or other infiltrative surface of the leachfield and ground surface shall be 12 inches.

(n) Except as allowed by (p) or (q) of this Subsection, a hydrogeological analysis shall be completed in each of the following circumstances:

(1) An in-ground leachfield, or at-grade leachfield, has a design flow of 2000 gallons per day or more.

(2) A leachfield in a mound with a design flow of 1000 gallons per day or more.

(3) The leachfield is constructed in a bottomless sand filter.

(4) There is a potential hydraulic connection between the leachfield or replacement area and a separate leachfield or replacement area because all of the following are true:

(A) the leachfield or replacement area is located 25 feet or closer upslope or downslope to another leachfield or another replacement area as measured from the following points:

(i) for in-ground leachfields, the limits of the leachfield stone or other infiltrative surface of the leachfield;

(ii) for at-grade leachfields, the limits of the fill material;

(iii) for leachfields in mounds, the limits of the fill material for the mound; and

(iv) for leachfields in bottomless sand filters, the edge of the enclosure.

(B) the downslope leachfield is located partially or entirely in the same flow path of the upslope leachfield as determined by ground slope or groundwater flow; and

(C) one of the following exist:

(i) the combined design flow for an in-ground leachfield, or at-grade leachfield, and any upslope leachfield is 2000 gallons per day or more;

(ii) the combined design flow for a leachfield in a mound and any upslope leachfield is 1000 gallons per day or more;

(iii) the downslope leachfield is in a bottomless sand filter; or

(iv) the downslope leachfield is unable to comply with the depth of naturally occurring soil required pursuant to this Section, regardless of the design flow of the proposed leachfield.

(o) The hydrogeological analysis required pursuant to Subsection (n) shall demonstrate that:

(1) the leachfield will maintain the depths of naturally occurring soil and fill material for the leachfield required by this Section; and

(2) any leachfield located downslope of a proposed wastewater system or replacement area will maintain the depths of naturally occurring soil and fill material for the leachfield required by this Section; or

(3) if the downslope leachfield is unable to comply with the depth of naturally occurring soil required pursuant to this Section, the induced water table does not rise closer to the bottom of the leachfield.

(p) The Secretary may waive the hydrogeological analysis required pursuant to Subsection (n)(1) or (4) when an applicant or prospective applicant requests a waiver and provides information from a designer demonstrating that any hydraulic interference will not reduce the depths of naturally occurring soil and fill material for each leachfield to less than that required by this Section.

(q) The Secretary may waive the hydrogeological analysis required under Subsection (n)(2), when an applicant or prospective applicant requests a waiver and provides information from a designer demonstrating that:

(1) the leachfield will dispose of filtrate effluent and is designed in accordance with § 1-904(c);

(2) the leachfield will be designed using a linear loading rate not exceeding 4.5 gallons per day per linear foot;
(3) there is a minimum of 24 inches of naturally occurring soil below ground surface to the seasonal high-water table, impermeable soil layer, and bedrock; and
(4) the limits of the fill material for the mound will be a minimum of 25 feet to an in-ground leachfield, a leachfield in a mound, and a leachfield in a bottomless sand filter.

(r) When a hydrogeological analysis is performed to demonstrate compliance with a requirement in these Rules, the hydrogeological analysis shall:
(1) Be completed through one of following methods:
(A) the simplified method described in § 1-927, performed by a hydrogeologist or a designer authorized to design the wastewater system for which the hydrogeological analysis is performed, provided the soil does not have a consistence of firm or denser and the leachfield is one of the following:
(i) an in-ground leachfield or at-grade leachfield with a design flow of less than 2000 gallons per day;
(ii) a leachfield in a mound with a design flow of less than 1000 gallons per day; or
(iii) a leachfield in a bottomless sand filter with a design flow of less than 1000 gallons per day;
(B) a method, performed by a hydrogeologist, approved by the Secretary based on using site specific soil descriptions and conservative hydraulic conductive assumptions; or
(C) a method, performed by a hydrogeologist, approved by the Secretary based on site specific hydraulic conductivity testing.
(2) Determine the minimum length of the leachfield based on the height of the induced water table.

(s) When a 2-year time of travel is calculated to demonstrate compliance with a requirement in these Rules, the 2-year time of travel shall be determined by:
(1) a hydrogeologist; and
(2) taking into consideration:
(A) the hydraulic gradient;
(B) porosity; and
(C) the saturated hydraulic conductivities in the materials with the largest saturated hydraulic conductivity.

(t) The distances over which naturally occurring soil is required to be met pursuant to § 1-903(i), (j), (k), (l), and (m) may overlap for different wastewater systems, but no portions of a wastewater system shall be located within the distance over which naturally occurring soil is required for a different wastewater system.

(u) When a wastewater system is designed to dispose only of food processing waste that does not contain pathogens and of wastewater from hand-washing fixtures located in the food processing area, the leachfield shall comply with the minimum depths of naturally occurring soil and fill material identified in Subsections (i)(2), (l), (m)(5) that are

otherwise reserved only for leachfields that dispose of filtrate effluent designed in accordance with § 1-904(c).

§ 1-904 Filtrate Effluent

(a) Wastewater systems designed to dispose of filtrate effluent shall:
  (1) be designed using pressure distribution pursuant to § 1-914; and
  (2) comply with all other technical standards in this Subchapter, except that a wastewater system designed to dispose of filtrate effluent may use up to twice the application rate of soil for sizing the leachfield required by § 1-911.

(b) A Class 1, Class B, or Class BW designer is required to submit the installation certification for the installation of a wastewater system designed to dispose of filtrate effluent.

§ 1-905 Water Table Monitoring

(a) Except for a leachfield designed in a mound using a curtain drain pursuant to § 1-921(c), monitoring of the water table shall be used to establish the seasonal high-water table for a site where a curtain drain is used to lower the seasonal high-water table.

(b) Monitoring of the water table may be used to establish the seasonal high-water table in lieu of determining the seasonal high-water table using soil evaluation pursuant to § 1-910(g).

(c) By March 1 of the year during which monitoring of the water table is to be conducted, the prospective applicant shall submit to the Secretary a proposal for water table monitoring prepared by a designer or hydrogeologist which meets the following requirements:
  (1) Takes into account:
    (A) the site-specific drainage area;
    (B) regional drainage that may affect the area being monitored;
    (C) soil evaluation; and
    (D) spacing of monitoring wells to sufficiently establish the water table level to site a leachfield.
  (2) Includes the following information:
    (A) permit number if the project has a permit application submitted to the Secretary or the project has a permit;
    (B) site location map;
    (C) 911 address of the property on which monitoring wells will be located;
    (D) landowner name, phone number, and mailing address;
    (E) signed property access form;
    (F) calculations for sizing the leachfield if the proposed use is known.
  (3) Includes a site plan showing, at a minimum:
    (A) boundary lines and dimensions for the lot;
    (B) anticipated footprint of any proposed wastewater systems if calculated;
    (C) locations of all monitoring wells with corresponding identification number or letter;
    (D) location of existing diversion ditches and curtain drains;

(E) location and construction details for proposed diversion ditches and curtain drains to be authorized by the Secretary;
(F) location and results of soil test pits and percolation tests; and
(G) any other existing or proposed features that may affect the leachfield area.

(4) Includes a detail sheet for the design of the monitor wells including:
(A) depth of the bottom of each well below ground surface;
(B) height of each well above ground surface;
(C) pipe material including:
(i) perforation spacing; and
(ii) filter fabric or method to prevent clogging or siltation of the monitoring pipes. The designer may propose to the Secretary alternatives to filter fabric when the designer concludes wells will not be subject to clogging or siltation.

(5) Includes a monitoring schedule and plan which meets the following requirements:
(A) A minimum of 4 water table monitoring wells shall be installed for each leachfield and replacement area, except in the following circumstances:
(i) The Secretary authorizes fewer monitoring wells to determine site suitability in the following situation:
(I) the area to be monitored is 75 feet or less in length;
(II) the area to be monitored is 75 feet or less in width;
(III) the area to be monitored is for an in-ground leachfield; and
(IV) soil evaluations indicate consistent soil depths to the anticipated seasonal high-water table
(ii) The Secretary requires additional monitoring wells to determine site suitability in the following situations:
(I) the length or width of the area intended for a leachfield or downslope receiving soil to be monitored exceeds 75 feet; or
(II) soil evaluations indicate highly varied soil depths to the anticipated seasonal high-water table.
(B) Monitoring shall occur between March 1 and May 31.
(C) Water table readings shall be taken at each well at least once every 5 days during the monitoring period by a designer or hydrogeologist.
(D) Each water table reading shall represent the water elevation for the 2 ½ days before and the 2 ½ days after a particular reading, or 1 ½ days if readings occur more frequently than every 5 five days.
(E) The recorded water table shall be based on the elevation of the ground surface at each monitoring well to the water table.

(d) Monitoring of the water table shall be completed in conformance with the water table monitoring proposal.
(1) Water table monitoring may begin prior to the Secretary's approval of the proposal, but the Secretary reserves the ability to ultimately determine that some or all of the monitoring does not meet the requirements of Subsection (a).
(2) The Secretary may conduct site visits and record the water table on a site undergoing monitoring.

(e) Data collected from monitoring of the water table shall be analyzed to determine the seasonal high-water table.

(1) The analysis shall be completed by:

(A) a Class 1, Class B, or Class BW designer authorized to design the wastewater system for which the analysis is being completed; or

(B) a hydrogeologist.

(2) A perched water table shall be analyzed in the same manner as any other type of water table.

(3) Except where Subsection (e)(4) applies, the analysis shall demonstrate that the water table did not:

(A) For more than 30 total days during the monitoring period, rise above the depth of naturally occurring soil required pursuant to § 1-903 to the seasonal high-water table.

(B) For more than 20 total days during the monitoring period, rise more than 6 inches above the depth of naturally occurring soil required pursuant to § 1-903 to the seasonal high-water table.

(C) For more than 10 total days during the monitoring period, rise more than 12 inches above the depth of naturally occurring soil required pursuant to § 1-903 to the seasonal high-water table.

(D) For any day during the monitoring period, rise more than 18 inches above the depth of naturally occurring soil required pursuant to § 1-903 to the seasonal high-water table.

(4) When a hydrogeological analysis is or will be performed for calculating the induced water table, the following requirements shall be met:

(A) The hydrogeological analysis:

(i) shall calculate the induced water table using the shallowest water level reading measured in the monitoring wells within the area for the leachfield or replacement area; or

(ii) if completed by a hydrogeologist, may identify the interpreted form of the induced water table within the area of the leachfield or replacement area using data acquired from each monitoring well.

(B) The analysis of the water level monitoring data shall demonstrate that the induced water table will not:

(i) For in-ground leachfields or at-grade leachfields that do not comply with the requirements of § 1-904(c), rise to less than 36 inches below the bottom of the leachfield stone or other infiltrative surface.

(ii) For in-ground leachfields or at-grade leachfields that dispose of filtrate effluent and are designed in accordance with § 1-904(c), rise to less than 18 inches below the bottom of the leachfield stone or other infiltrative surface.

(iii) For all other leachfields, rise to less than 6 inches below ground surface.

(f) Following completion of water table monitoring, all water table monitoring data collected shall be submitted to the Secretary.

(g) For sites on which the water table is monitored for more than 1 year, the seasonal high-water table shall be based on the year that recorded the most restrictive water table monitoring readings.

(h) The Secretary may allow sites on which the water table was previously monitored to be re-monitored when a physical change is planned for the site that is anticipated to affect the water table.

(1) Examples of physical changes the Secretary will consider include the installation of a curtain drain and the installation of a groundwater diversion that did not exist during the first monitoring of the site, provided these changes have Secretary approval if required by these Rules.

(2) When the Secretary has allowed re-monitoring, calculation of the seasonal high-water table shall be based on water table monitoring readings taken during the year of re-monitoring and shall not take into account prior years' readings.

Note: Appendix C, Figure C-2, depicts a detail of a typical groundwater monitoring well.

§ 1-906 Site Modifications

(a) Requirements for curtain drains.

(1) Except for a leachfield designed in a mound pursuant to § 1-921(c), if the area in which a leachfield is proposed to be located does not comply with depth of naturally occurring soil required pursuant to § 1-903 to the seasonal high-water table, the design of a wastewater system may, in the following circumstances only, rely on curtain drains to lower the seasonal high-water table in order to comply with § 1-903:

(A) The Secretary has pre-authorized the installation and use of such drains pursuant to Subsection (a)(3) and monitoring of the water table has been conducted pursuant to § 1-905 to demonstrate the drain's effectiveness.

(B) In conjunction with an application, the Secretary approves the installation of and use of such drains, provided the following requirements are met:

(i) The curtain drain is designed in compliance with a plan that conforms with the requirements in Subsection (a)(2)(C).

(ii) The bottom of the curtain drain is designed to be a minimum of 12 inches into a soil with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay.

(iii) The curtain drain is designed to lower the seasonal high-water table 6 inches or less.

(iv) The area in which the leachfield is proposed to be located and the area 100 feet upslope meet the following requirements:

(I) has permeable soil or soil that does not have soil with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(II) is underlain by a low permeable soil with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(III) has a slope of 5 percent or greater with a seasonal high-water table 24 inches or greater below ground surface

where the low permeable soil layer is 12 inches or more below the seasonal high-water table; and

(IV) has a recharge area extending 100 feet or more upslope of the curtain drain.

(v) Unless the seasonal high-water table is determined by water table monitoring conducted pursuant to § 1-905, when a hydrogeological analysis is completed, the seasonal high-water table is determined by soil evaluation conducted pursuant to § 1-910(g).

(2) To seek pre-authorization to install and use a curtain drain, a prospective applicant, prior to submitting an application, shall submit the following to the Secretary:

(A) A letter requesting authorization to install and use a curtain drain.

(B) A signed property access form.

(C) A plan prepared by a Class I, Class B, or Class BW designer or hydrogeologist that:

(i) shows the location and point of discharge of the drain;

(ii) depicts construction details for the drain including a profile and typical sections;

(iii) specifies the type of construction material to be used that is sufficient to transmit the water from the site and to prevent clogging of the drain that will decrease its effectiveness. Acceptable material shall be:

(I) leachfield stone;

(II) perforated or other porous pipe; and

(III) filter fabric wrapped around the leachfield stone to prevent clogging;

(iv) depicts the design of the outlet of the drain to prevent erosion and clogging;

(v) depicts cleanouts to grade;

(vi) depicts rodent guards at the outlet of the drain; and

(vii) demonstrates compliance with all isolation distances required pursuant to § 1-912.

(D) Supporting information required by the Secretary, including permeability and sieve analysis of the soil at the site, when necessary to establish the effectiveness of the proposed drain.

(3) The Secretary, upon determining that the plan and any supporting information provided by the designer or hydrogeologist complies with Subsection (a)(2)(C) and (D), shall issue an authorization letter with conditions to install and use the drain.

(b) Requirements for sites following re-grading.

(1) When a site is re-graded for the purpose of constructing a leachfield, the following requirements shall be met:

(A) Soil excavations required and percolation tests completed pursuant to § 1-910 shall be performed after re-grading.

(B) There shall be a minimum of 6 feet of naturally occurring soil between the downslope side of any area that has been re-graded and either the edge of

a leachfield or limits of the fill material for the particular type of leachfield that is intended, whichever is larger.

(2) It is acceptable to add soil to an area in order to comply with the isolation distance required pursuant to § 1-912 between slopes greater than 30 percent and the edge of the leachfield or limits of the fill material for the particular type of leachfield that is intended.

(3) Cuts and fills of 1 foot or less do not constitute re-grading.

Note: Appendix C, Figure C-3, depicts a detail of a typical site that was re-graded.

§ 1-907 2-year Time of Travel Management Zone

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification for the installation of a wastewater system designed using a 2-year time of travel management zone.

(b) The required depths of naturally occurring soil and fill material between the bottom of a leachfield and the seasonal high-water table required pursuant to § 1-903 may be reduced or eliminated provided:

(1) the permittee owns or controls all of the property that is located within the 2-year time of travel management zone;

(2) there are no public water system or potable water sources within the 2-year time of travel management zone;

(3) the design flow for the wastewater system is 700 gallons per day or less; and

(4) a hydrogeologist delineates the 2-year time of travel management zone pursuant to Subsection (c).

(c) The 2-year time of travel management zone shall meet the following requirements:

(1) The naturally occurring soil throughout the management zone shall be consistent and horizontally extensive.

(2) The naturally occurring soil shall be of sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay texture.

(3) The management zone shall extend a minimum of 50 feet uphill and to the sides of the leachfield and a distance downslope of the leachfield equal to the 2-year time of travel.

(4) The 2-year time of travel calculation shall account for effluent movement in both shallow and more permeable layers and the deeper less permeable layers. The assumptions must include movement through the shallow layers when the induced water table formed by the combination of the effluent and the seasonal high-water table is present within the shallow layers.

(d) A leachfield designed using a 2-year time of travel management zone shall demonstrate:

(1) that the induced water table shall remain at least 6 inches below the surface of the naturally occurring soil throughout the management zone; and

(2) through site specific permeability testing and hydrogeological analysis, that includes any seasonal pathways such as drying cracks, that there will be at least a 2-year time of travel within the management zone from the bottom of the leachfield to bedrock.

§ 1-908 Septic Tanks

(a) A septic tank shall be sized for the minimum capacity established in Table 9-1, except in the following circumstances:

(1) Multiple tanks placed in series provide the minimum tank capacity established in Table 9-1.

(2) The Secretary determines that a smaller tank will retain the wastewater for a minimum of one day prior to discharge, based on information submitted by an applicant's or prospective applicant's designer.

(3) When a pump is installed within the septic tank, the capacity of the tank shall be increased above the capacities in Table 9-1 to provide required capacity for the dose volume and required emergency storage capacity.

(4) The septic tank capacity shall be increased by a minimum of 50 percent above the capacities in Table 9-1 if the building or structure to be served by the wastewater system will include a garbage disposal.

(5) If a pump station discharges wastewater to a septic tank, the capacity of the septic tank shall be increased above the capacities in Table 9-1 to provide adequate retention time to retain settleable solids, and to allow the formation of the scum layer.

Table 9-1
Minimum Capacities for Septic Tanks

Design Flow, Gallons Per Day	Liquid Capacity Below the Bottom of the Outlet
560 or less	1000 gallons
Greater than 560 – less than 6500	2 times design flow

(b) The design of each septic tank shall meet the following requirements:

(1) Septic tanks shall be structurally sound and constructed of materials that are not subject to extensive corrosion or decay, such as the following:

(A) Reinforced precast concrete tanks that comply with ASTM standards and have a minimum wall thickness of 3 inches and adequate reinforcing to facilitate handling.

(B) Fiberglass and plastic tanks that have approval by the National Sanitation Foundation (NSF), the American Society of Testing and Materials (ASTM), International Association of Plumbing and Mechanical Officials (IAPMO), Canadian Standards Association (CSA), or the American Water Works Association (AWWA).

(2) There shall be access to each compartment of the septic tank for inspection and cleaning. Access to each compartment of a tank shall:

(A) be available by means of either a removable cover or a manhole of at least 18 inches in diameter; and

(B) allow access to both inlet and outlet devices.

(3) Septic tanks shall have at least one manhole access to grade. If only one access to grade is provided, it shall provide access to the effluent filter. The access riser shall:

(A) be of sufficient diameter to allow removal of any septic tank covers; and

(B) have covers that are be tight fitting and designed to prevent entry by children.

(4) Inlets shall enter the tank at least 3 inches above the liquid level in the tank to allow for momentary rises in liquid level during discharges to the tank.

(5) Inlets consisting of a vented inlet tee or baffle to direct the incoming wastewater downward. The tee or baffle shall penetrate at least 6 inches below the liquid level but, in no case, shall the penetration be greater than that allowed for the outlet device.

(6) Outlet devices shall retain scum in the tank and limit the amount of sludge that can be accommodated without the scouring that causes sludge to discharge in the effluent from the tank. The outlet device should generally extend to a distance below the surface equal to:

(A) 40 percent of the liquid depth; or

(B) 35 percent of the liquid depth for horizontal cylindrical tanks.

(7) An effluent filter shall be placed on the outlet pipe that:

(A) prevents the passage of solids larger in size than 1/8th inch; and

(B) received NSF/ANSI 46 certification or other similar third-party testing results that is accepted by the Secretary on a case-by-case basis.

(8) When multiple septic tanks are proposed in a series to provide the required tank capacity, the following requirements apply:

(A) If the tanks are of unequal capacity, the design shall place the largest capacity tank upstream of tanks of lessor capacity.

(B) Only the outlet pipe of the final tank is required to have an effluent filter although optional effluent filters, if provided, shall meet the requirements of Subsection (b)(7) and manhole access for each filter shall be provided and shall meet the requirements of Subsection (b)(3).

(9) When a septic tank is located in the seasonal high groundwater, the tank shall be provided proper anchors when necessary to prevent movement of the tank.

(10) No portion of a septic tank shall be placed under a porch, deck, or other type structure.

(c) The septic tank shall be pumped to prevent settleable solids and scum from exiting the tank that may cause a downstream component of the wastewater system to improperly operate.

(d) Effluent filters shall be cleaned to prevent solids from clogging the filter.

(e) The excavation for installing a septic tank shall not be located within:

(1) 10 feet of the edge of the leachfield stone or other infiltrative surface for an in-ground trench or in-ground bed;

(2) 25 feet of the limits of the fill material in the downslope direction, and 10 feet of the limits of the fill material in all other directions, for an at-grade leachfield;

(3) 25 feet of the limits of the fill material in the downslope direction, and 10 feet of the limits of the fill material in all other directions for a mound; and

(4) 25 feet of the edge of the enclosure in the downslope direction, and 10 feet from the edge of the enclosure in all other directions for a bottomless sand filter.

§ 1-909 Grease Tanks

(a) A grease tank shall be installed in the sanitary sewer service line serving only plumbing fixtures within a building or structure with non-residential uses where wastewater from the fixtures, such as kitchen sinks and dishwashers in restaurants, cafeterias, and school kitchens, may include grease.

(1) A grease tank shall not be installed in other sanitary sewer service lines.

(2) The installation of an interior grease trap or interceptor shall not substitute for the grease tank.

(b) The grease tank shall discharge to a septic tank prior to discharging to a leachfield.

(c) The grease tank shall have a minimum capacity of 1000 gallons and shall be sized based on the method described below derived from the 1997 Uniform Plumbing Code.

(1) Meals per peak hour (A) X Wastewater Flow Rate (B) X Retention Time (C) X Storage Factor (D) = Size Requirement in liquid capacity in gallons.

(A) Meals per peak hour = Number of meals served at peak operating hour (Seating Capacity) X Peak Factor or maximum number of seats, where Peak Factor is:

(i) Peak Factor for fast food restaurants ..……1.33

(ii) Peak Factor for all other food service types …1.0

(B) Wastewater Flow Rates:

(i) With dishwasher …… 6-gallon flow

(ii) Without dishwasher …….. 5-gallon flow

(iii) Single Service kitchen ……... 2-gallon flow

(iv) Garbage Grinder (Food waste disposer) …… 1-gallon flow

(C) Retention Times:

(i) Commercial kitchen waste/dishwasher …..… 2.5 hours

(ii) Single service kitchen …… 1.5 hours

(D) Storage Factors:

(i) Fully equipped commercial kitchen ….8 hour operation ...1

(ii) Fully equipped commercial kitchen …16 hour operation ..2

(iii) Fully equipped commercial kitchen ....24 hour operation ..3

(iv) Single service kitchen ……..1.5

(2) For the purposes of this Subsection, "single service kitchen" means a kitchen:

(A) where the food preparation consists of only heat and serve;

(B) that uses service items not expected to be used again on the premises; and

(C) where service items that are reused are not washed on the premises.

The operation of grills, frying machines, or cooking devices other than those used to heat food does not constitute a single service kitchen.

(3) The Secretary shall accept alternative designs when the applicant provides information from a designer demonstrating that the alternative design provides equal or greater grease removal. The information shall include consideration of grease removal when transported by ultra-hot water.

(d) The design of the grease tank shall meet the following requirements:

(1) Grease tanks shall be structurally sound and constructed of materials that are not subject to extensive corrosion or decay, such as the following materials:

(A) heavy gauge steel tanks with continuous welds;
(B) reinforced precast concrete tanks that comply with ASTM standards with a minimum wall thickness of 3 inches and adequate reinforcing to facilitate handling; and
(C) fiberglass and plastic tanks that have approval by the National Sanitation Foundation (NSF) , the American Society of Testing and Materials (ASTM), International Association of Plumbing and Mechanical Officials (IAPMO), Canadian Standards Association (CSA) or the American Water Works Association (AWWA).

(2) Tanks shall have the inlet and outlet baffles extend from 12 inches above the bottom of the tank and to well above the waterline to allow airflow back into the building plumbing system.

(3) There shall be access to each compartment of the grease tank for inspection and cleaning. Access to each compartment of a tank shall:
(A) be available by means of either a removable cover or a manhole of at least 18 inches in diameter;
(B) allow access to both inlet and outlet devices; and
(C) have covers that are tight fitting and designed to prevent entry by children.

(4) When the grease tank is located in the seasonal high groundwater, the tank shall be provided proper anchors when necessary to prevent movement of the tank.

(e) Grease tanks shall be pumped to prevent grease from exiting the tank that may cause a downstream component of the wastewater system to improperly operate.

§ 1-910 Soil Evaluation

(a) For all wastewater systems, soil conditions within the area in which a leachfield or a replacement area is proposed to be located shall be evaluated to determine the design of the leachfield that may be used.

(b) Soil conditions within the area in which a leachfield or a replacement area is proposed to be located shall be evaluated by completing the number of soil excavations necessary to demonstrate, and describing soil to a depth necessary to demonstrate, that the area complies with the depths of naturally occurring soil required pursuant to § 1-903.

(c) The minimum number of soil excavations for specific leachfields.

(1) For in-ground leachfields and at-grade leachfields that dispose of 600 gallons of effluent per day or less, a minimum of 2 soil excavations shall be performed in the area in which each leachfield and replacement area is proposed to be located.

(2) For a leachfield in a mound or in a bottomless sand filter that dispose of 600 gallons of effluent per day or less, a minimum of 3 soil excavations shall be performed in the area in which each leachfield and replacement area is proposed to be located. The excavations shall be spaced to confirm the soil under the leachfield and 25 feet downslope of the limits of the fill material for the mound or filter.

(3) The Secretary may allow fewer soil excavations, upon an applicant's request, when the applicant's designer provides information demonstrating that soil is uniform throughout the area for the leachfield or replacement area.

(4) The Secretary may require additional soil excavations to confirm complying soil conditions within the area in which a leachfield or a replacement area is proposed to be located.

(d) Soil excavations shall be conducted using a backhoe or similar equipment unless an alternative method to evaluate the soil is authorized by the Secretary.

(e) Soil shall be described and recorded for each soil horizon from ground surface according to the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Field Book for Describing and Sampling Soil. The description shall include the following:

(1) color based on a description with Munsell® Soil Color notation, e.g. 10YR 4/3 (Brown);

(2) redoximorphic features and mottling;

(3) texture, as identified by the full name or the following acronyms:

(A) COS = coarse sand

(B) S = sand

(C) FS = fine sand

(D) VFS = very fine sand

(E) LCOS = loamy coarse sand

(F) LS = loamy sand

(G) LFS = Loamy fine sand

(H) LVFS = loamy very fine sand

(I) COSL = coarse sandy loam

(J) SL = sandy loam

(K) FSL = fine sandy loam

(L) VFSL = very fine sandy loam

(M) L = loam

(N) SIL = silt loam

(O) SI = silt

(P) SC = sandy clay

(Q) SCL = sandy clay loam

(R) CL = clay loam

(S) SICL = silty clay loam

(T) SIC = silty clay

(U) C = clay;

(4) structure according to the structure types identified on Table 9-3; and

(5) consistence determined by rupture resistance or excavation difficulty.

(f) Notwithstanding Subsection (e), soil descriptions and recordings completed on or after January 1, 2007 and completed prior to the effective date of these Rules may be accepted by the Secretary when the descriptions and recordings identify:

(1) the soil texture corresponding to the name or acronym in Subsection (e)(3); and

(2) soil structure corresponding to the structure types identified on Table 9-3 or, in the absence of identifying structure, the soil evaluation shall be based on the most limiting soil structure identified in Table 9-3 for the reported soil texture.

(g) The Secretary may require an applicant to submit the results of a sieve analysis using the USDA method of analysis to confirm the texture of the soil identified pursuant to Subsection (e).

(h) Evidence of the seasonal high-water table and evidence of soil saturation below ground surface shall be determined by observation within each soil horizon of each soil excavations of:
- (1) sidewall seepage;
- (2) standing water; and
- (3) the presence of redoximorphic features or color patterns indicative of soil saturation.

(i) Percolation testing may be conducted for the purpose of establishing application rates that will be based on more than soil excavations.
- (1) When percolation tests are performed to establish the soil application rate a minimum of 2 percolation tests shall be performed in the area in which each leachfield and replacement area is proposed to be located.
  - (A) The Secretary may require additional percolation tests when the design flow to the wastewater system is greater than 600 gallons per day;
  - (B) The Secretary may allow fewer percolation tests when the soil is demonstrated to be uniform throughout the area for the leachfield or replacement area.
- (2) When percolation tests are completed, they shall be performed in the following manner.
  - (A) Tests shall be conducted entirely within the most-dense, least permeable soil identified:
    - (i) within 1 to 3 feet of naturally occurring soil below the bottom of the leachfield stone or other infiltrative surface of an in-ground leachfield or at-grade leachfield; or
    - (ii) in the upper 24 inches of naturally occurring soil below the proposed fill material and 25 feet downslope of the fill material for a leachfield in a mound or bottomless sand filter.
  - (B) The test hole shall be unlined, shaped like a vertically oriented cylinder, with a diameter of 6 to 8 inches and a depth of 10 inches within the layer being tested.
  - (C) The test hole shall be prepared as follows:
    - (i) carefully scrape the sidewalls of the hole using a sharp instrument to remove any smeared soil surface (this is particularly important in soil that has a significant silt or clay content);
    - (ii) place 1 inch of clean leachfield stone in the bottom of the hole to reduce scouring; and
    - (iii) when possible use a hose to siphon water out of a suitably located reservoir to provide a high degree of control over the rate of water entering the hole instead of pouring water directly from a bucket into the hole to minimize scouring.
  - (D) Percolation test measurements shall be obtained by:

(i) filling the hole with water up to a level 6 inches above the leachfield stone and allowing it to drop the distance specified in Table 9-2 for 7 consecutive runs;
(ii) bringing the water up to the 6-inch level after each run; and
(iii) accurately recording the time of each run, the refill time between each run, and the total elapsed time.

(E) To determine the percolation rate:
(i) plot the rate of drop for each run on graph paper with logarithmic scales on both axes (log/log graph paper) against the cumulative time of the seven runs including the refill times;
(ii) fit the best straight line to the seven data points and extrapolate out to 1 day (1440 minutes) of cumulative time; and
(iii) the percolation rate is the rate of drop at 1440 minutes.

Table 9-2
Percolation Test Water Level Drops

Soil Texture	Anticipated Percolation Rate (minutes per inch)	Drop in Inches
Course Sand to Loamy Sand	1 – 10	2
Fine Sand to Very Fine Sandy Loam	10 – 60	1
Loam to Silty Clay	60 – 120	0.5

§ 1-911 Maximum Application Rates for Leachfields

(a) The maximum application rate for sizing a leachfield in a mound shall be 1.0 gallon per square foot per day.

(b) The maximum application rate for sizing a leachfield in a bottomless sand filter system shall be determined based on the following.
(1) The maximum application rate shall be determined using one of the following methods:
(A) Table 9-3, using the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below ground surface identified from soil excavations; or
(B) Table 9-4, using the results of the percolation tests conducted pursuant to § 1-910 in the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below the bottom of the leachfield stone or other infiltrative surface of the leachfield.
(2) If using the method in Subsection (b)(1)(B) results in a higher application rate than using the method in Subsection (b)(1)(A), the maximum application rate for sizing a leachfield in a bottomless sand filter shall be determined using the method in Subsection (b)(1)(A).

(c) The maximum application rate for sizing an in-ground leachfield or an at-grade leachfield shall be determined based on the following:

(1) The maximum application rate shall be determined using one of the following methods:

(A) Table 9-3, using the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below the bottom of the leachfield stone or other infiltrative surface of the leachfield identified from soil excavations; or

(B) Table 9-4, using the results of the percolation tests conducted pursuant to § 1-910 in the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below the bottom of the leachfield stone or other infiltrative surface of the leachfield.

(2) If using the method in Subsection (c)(1)(B) results in a higher application rate than using the method in Subsection (c)(1)(A), the maximum application rate for sizing an in-ground leachfield or an at-grade leachfield shall be determined using the method in Subsection (c)(1)(A).

Table 9-3
Application Rates Established Using Soil Excavation

Soil Characteristics		**Application Rates (gallons per square foot per day)**			
Texture	**Structure Type[1]**	**In-Ground Trench**	**In-ground Bed**	**At-Grade Leachfield**	**Leachfield in a Bottomless Sand Filter**
Very Coarse Sand or Coarser	SG	See § 1-919(b)	See § 1-919(b)	1.00	1.00
Coarse Sand, Sand	SG	1.50	1.20	1.00	1.00
Loamy Coarse Sand, Loamy Sand	SG	1.50	1.20	1.00	1.00
Fine Sand, Very Fine Sand, Loamy Fine Sand, Loamy Very Fine Sand	SG	1.00	0.80	0.80	0.80
	MA/PL	0.50	0.40	0.40	0.40
	PR/ABK/ SBK/GR	0.70	0.60	0.60	0.60
Coarse Sandy Loam, Sandy Loam	MA/PL	0.50	0.40	0.40	0.40
	PR/ABK/ SBK/GR	0.70	0.60	0.60	0.60
Fine Sandy Loam, Very Fine Sandy Loam	MA/PL	0.50	0.40	0.40	0.40
	PR/ABK/ SBK/GR	0.60	0.50	0.50	0.50
Loam	MA/PL	0.50	0.40	0.40	0.40
	PR/ABK/ SBK/GR	0.60	0.50	0.50	0.50
Silt Loam, Silt	MA/PL	0.30	0.20	0.20	N/A

Soil Characteristics		Application Rates (gallons per square foot per day)			
Texture	**Structure Type[1]**	**In-Ground Trench**	**In-ground Bed**	**At-Grade Leachfield**	**Leachfield in a Bottomless Sand Filter**
	PR/ABK/ SBK/GR	0.40	0.30	0.30	N/A
Sandy Clay Loam, Clay Loam, Silty Clay Loam	MA/PL	0.25	0.20	0.20	N/A
	PR/SBK/ GR	0.30	0.20	0.20	N/A
Sandy Clay, Clay, Silty Clay	N/A (See § 1-926)				

Adapted from J. Tyler, 2000.

[1] The abbreviations used for structure are: SG = single grain; GR = granular; MA = massive; PL = platy; PR = prismatic; ABK = angular blocky; SBK = subangular blocky.

Table 9-4
Application Rates Established Using Soil Excavations and Percolation Tests

In-ground Trenches	In-ground Beds	At-grade Leachfields
$AR = 3 \div \sqrt{t}$ where: AR is the application rate in gallons per square foot of trench per day with a maximum allowable application rate of 1.5 gallons per square foot per day; and t equals the second slowest percolation rate in minutes per inch for the site where the maximum acceptable value for t is 60 minutes per inch.	$AR = 0.8(3 \div \sqrt{t})$ where: AR is the application rate in gallons per square foot of bed per day with a maximum allowable application rate of 1.2 gallons per square foot per day; and t equals the second slowest percolation rate in minutes per inch for the site where the maximum acceptable value for t is 60 minutes per inch.	$AR = 0.8(3 \div \sqrt{t})$ where: AR is the application rate in gallons per square foot of bed per day with a maximum allowable application rate of 1.0 gallons per square foot per day; and t equals the second slowest percolation rate in minutes per inch for the site where the maximum acceptable value for t is 60 minutes per inch.

§ 1-912 Horizontal Isolation Distances and Isolation Zones for Components of Wastewater Systems

(a) Table 9-5 identifies the minimum horizontal isolation distance that each identified component of a wastewater system, and that each replacement area, shall be located from all portions of the identified features and objects, unless the Secretary has authorized a reduction to the isolation distance or increased the isolation distance pursuant to

Subsections (e) or (f), or unless an isolation zone is required in lieu of an isolation distance for the particular feature or object.

Table 9-5
Horizontal Isolation Distances, in Feet, for Features and Objects

Features and Objects	Sanitary Sewer Collection Line, Sanitary Sewer Service Line and Manholes	Wastewater Tanks[1]	In-Ground Leachfields and Replacement Areas
	Closest Portion of the Collection Line, Service Line, or Manhole	Outside Edge of the Tanks	Edge of Leachfield Stone, Other Infiltrative Surface , or Replacement Areas
Curtain drains (located downslope of a leachfield)	N/A	10	75
Curtain drains (located upslope of a leachfield)	N/A	10	35
Drainage swales and ditches with seeps, including seasonal seeps (located downslope of a leachfield)	N/A	25	75
Drainage swales and ditches with seeps, including seasonal seeps (located upslope of a leachfield)	N/A	25	35
Drainage swales and ditches without seeps	N/A	N/A	25
Foundation, footing, or perimeter of a building or structure with a drain (located downslope of a leachfield)	N/A	10	75
Foundation, footing, or perimeter of a building or structure with a drain (located upslope of a leachfield)	N/A	10	20
Foundation, footing, or perimeter of a building or structure without drains (located downslope of a leachfield)	N/A	10	20
Foundation, footing, or perimeter of a building or structure without a drain (located upslope of a leachfield)	N/A	10	20

Features and Objects	**Sanitary Sewer Collection Line, Sanitary Sewer Service Line and Manholes**	**Wastewater Tanks[1]**	**In-Ground Leachfields and Replacement Areas**
	Closest Portion of the Collection Line, Service Line, or Manhole	**Outside Edge of the Tanks**	**Edge of Leachfield Stone, Other Infiltrative Surface , or Replacement Areas**
Potable water sources in bedrock or confined surficial aquifer, (proposed, existing, or permitted)	50	Requires isolation zone (See Table 9-6)	
Potable water sources in an unconfined surficial aquifer (proposed, existing, or permitted)	75	Requires isolation zone (See Table 9-6)	
Property lines	10	10	25
Public water sources (proposed, existing, or permitted)	50	Requires isolation zone (See Table 9-6)	
Roadways, driveways, parking lots	N/A	5	10
Slopes exceeding 30 percent	N/A	10	25
Surface water, normal high-water elevation[2]	10	25	50
Stormwater conveyance/treatment/control practice	10	25	50
Trees	10	10	10
Water mains (proposed, existing, or permitted)	Distances and requirements established in § 1-1007 apply in lieu of this Section	50	5020
Water service lines and water service pipes (pressure) (proposed, existing, or permitted)	Distances and requirements established in § 1-1007 apply in lieu of this Section	25	25
Water service lines and water service pipes (suction) (proposed, existing, or permitted)	Distances and requirements established in	50	100

Features and Objects	Sanitary Sewer Collection Line, Sanitary Sewer Service Line and Manholes	Wastewater Tanks[1]	In-Ground Leachfields and Replacement Areas
	Closest Portion of the Collection Line, Service Line, or Manhole	Outside Edge of the Tanks	Edge of Leachfield Stone, Other Infiltrative Surface , or Replacement Areas
	§ 1-1007 apply in lieu of this Section		
Water sources that are not a potable water source or public water source	10	50	100
Water storage tanks (atmospheric tank located below ground surface) (proposed, existing, or permitted)	50	50	50

Table 9-5 (continued)
Horizontal Isolation Distances, in Feet, for Features and Objects

Features and Objects	At-Grade Leachfields		Leachfields in Mounds			Leachfields in Bottomless Sand Filters
	Edge of Leachfield Stone	Limits of Fill Material	Leach-field	Effective Basal Area	Limits of Fill Material	Enclosure
Curtain drains (located upslope of a leachfield)	35	35	35	35	35	35
Drainage swales and ditches with seeps, including seasonal seeps (located downslope of a leachfield)	75	50	75	75	50	75
Drainage swales and ditches with seeps, including seasonal	35	10	35	35	10	35

Features and Objects	At-Grade Leachfields		Leachfields in Mounds			Leachfields in Bottomless Sand Filters
	Edge of Leachfield Stone	Limits of Fill Material	Leach-field	Effective Basal Area	Limits of Fill Material	Enclosure
seeps (located upslope of a leachfield)						
Drainage swales and ditches without seeps	25	10	25	25	10	25
Curtain drain, foundation, footing, or perimeter of a building or structure with a drain (located downslope of a leachfield)	75	50	75	75	50	75
Foundation, footing, or perimeter of a building or structure with a drain (located upslope of a leachfield)	20	10	20	20	10	20
Foundation, footing, or perimeter of a building or structure without drains (located downslope of a leachfield)	35	35	35	35	35	35
Foundation, footing, or perimeter of a building or structure without a drain (located upslope of a leachfield)	20	20	20	20	20	20
Potable water sources in bedrock or confined surficial aquifer, (proposed, existing, or permitted)	Requires isolation zone (See Table 9-6)					
Potable water sources in an unconfined surficial	Requires isolation zone (See Table 9-6)					

Features and Objects	At-Grade Leachfields		Leachfields in Mounds			Leachfields in Bottomless Sand Filters
	Edge of Leachfield Stone	Limits of Fill Material	Leach-field	Effective Basal Area	Limits of Fill Material	Enclosure
aquifer (proposed, existing, or permitted)						
Property lines	25	10 for upslope and sides, 25 for downslope	25	25	10 for upslope and sides, 25 for downslope	25
Public water sources (proposed, existing, or permitted)	Requires isolation zone (See Table 9-6)					
Roadways, driveways, parking lots	10	10 for upslope and sides, 25 for downslope	10	10	10 for upslope and sides, 25 for downslope	10 for upslope and sides, 25 for downslope
Slopes exceeding 30 percent	25	25	25	25	25	25
Stormwater conveyance/ treatment/ control practice	50	50	50	50	50	50
Surface water, normal high-water elevation[2]	50	50	50	50	50	50
Trees	10	0	10	10	0	10
Water mains (proposed, existing, or permitted)	50	10 for upslope and sides, 25 for downslope	50	50	10 for upslope and sides, 25 for downslope	50
Water service lines or water service pipes (pressure) (proposed, existing, or permitted)	25	10 for upslope and sides, 25 for downslope	25	25	10 for upslope and sides, 25 for downslope	25
Water service lines or water service pipes (suction)	100	25	100	100	10 for upslope and sides,	100

Features and Objects	At-Grade Leachfields		Leachfields in Mounds			Leachfields in Bottomless Sand Filters
	Edge of Leachfield Stone	Limits of Fill Material	Leach-field	Effective Basal Area	Limits of Fill Material	Enclosure
(proposed, existing, or permitted)					25 for downslope	
Water sources that are not potable water sources or public water sources	100	10 for upslope and sides, 25 for downslope	100	100	10 for upslope and sides 25 for downslope	100
Water storage tanks (atmospheric tank located below ground surface) (proposed, existing, or permitted)	50	25	50	50	25	50

[1] Wastewater Tanks include septic tanks, pump stations, dosing siphons, holding tanks, wastewater storage tanks, wastewater treatment tanks, sand filters, constructed wetlands, and grease tanks.
[2] The horizontal location to surface water shall allow for possible future widening of the surface water due to bank erosion.

(b) Subsections (c) and (d), in conjunction with Table 9-6, identify the size and shape of the isolation zone around the identified proposed, existing, or permitted drinking water sources in which no portion of each identified component of a wastewater system, and of each replacement area, shall be located, unless the Secretary has authorized a reduction to the isolation zone or required a larger isolation zone pursuant to Subsections (e) or (f).

Table 9-6
Distances, in Feet, Used to Create Isolation Zones Around Drinking Water Sources

<table>
<tr><th colspan="2">Proposed, Existing, or Permitted Drinking Water Sources (by gallons per minutes design rate)</th><th>Leachfields[1] and Replacement Areas (< 2000 gallons per day design flow)</th><th>Leachfields[1] and Replacement Areas (≥ 2000 to < 6500 gallons per day design flow)</th><th>Wastewater Tanks[2]</th></tr>
<tr><td rowspan="4">Potable water sources or Public water sources for community water systems, non-community non-transient water systems, and transient non-community water systems (in bedrock or confined surficial aquifer)</td><td>≤ 2.0</td><td>X = 100
Y = 200</td><td>X = 150
Y = 300</td><td rowspan="4">X = 50
Y = 50</td></tr>
<tr><td>> 2.0 and ≤ 5.0</td><td>X = 150
Y = 300</td><td>X = 150
Y = 300</td></tr>
<tr><td>> 5.0 and ≤ 8.0</td><td>X = 200
Y = 400</td><td>X = 200
Y = 400</td></tr>
<tr><td>> 8.0</td><td colspan="2">X = 200
Y = 1000</td></tr>
<tr><td rowspan="2">Potable water sources or Public water sources for community water systems, non-community non-transient water systems, and transient non-community water systems (in an unconfined surficial aquifer)</td><td>≤ 8.0</td><td>X = 150
Y = 500</td><td>X = 150
Y = 1000</td><td rowspan="2">X = 75
Y = 75</td></tr>
<tr><td>> 8.0</td><td colspan="2">X = 200
Y = 1000</td></tr>
</table>

[1] For the purposes of this table, the term "leachfields" includes the edge of the leachfield stone or other infiltrative surface for in-ground leachfields; the edge of leachfield stone for at-grade leachfields; the leachfield and effective basal area for leachfields in mounds; and the enclosure for leachfields in bottomless sand filters. It does not include the limits of fill material for in-ground leachfields, at-grade leachfields, or a leachfields in mounds.
[2] Wastewater Tanks include septic tanks, pump stations, dosing siphons, holding tanks, wastewater storage tanks, wastewater treatment tanks, sand filters, constructed wetlands, and grease tanks.

Note: See § 1-903(g) for additional restrictions concerning the location of a wastewater system components in proximity of a Public Community Water System.

(c) One of the following methods shall be used to determine the size and shape of the required isolation zone around proposed, existing, or permitted drinking water sources, with X and Y equaling the numbers identified in Table 9-6:

(1) When drawing a size and shape around a source and detailed topographical data is not available, the shape around the source shall be Y from the source.

(2) When drawing the size and shape around a source, and all points of the shape are at the same or lower elevation than the elevation of the source, the shape around the source shall be X from the source.

(3) When drawing the size and shape around a source, and all points of the shape are at a higher elevation than the elevation of the source, the shape around the source shall be Y from the source.

(4) When drawing the size and shape around a source, and not all points of the shape are at a higher elevation than the elevation of the source, the shape around the source shall be:

(A) a circle with a radius of Y from the source;

(B) when Y is variable, a shape around the source so that all points in the shape are Y from the source;

(C) a circle around the source so that all points are X from the source and, from the points on either side of the source where the circle intersects the contour elevation that the source is on, draw lines beginning at these intersections extending upslope and perpendicular to the contours until these lines intersect an arc with a radius equal to Y; or

(D) when drawing the shape in (c)(4)(C), the lines continuing upslope and perpendicular to the contours reach a crest less than Y from the source and, from the crest, the contours continue to decrease a distance Y from the source, the distance upslope of the source shall be Y and the points along the crest, or X if the crest is less than X, where those points intersect with Y.

(d) Notwithstanding Subsection (c), when a 2-year time of travel management zone is determined for a leachfield, the size and shape of the required isolation zone around proposed, existing, or permitted drinking water sources to be isolated from the leachfield shall be identified pursuant to Subsection (c) except that the portion of the isolation zone overlapping the leachfield's 2-year time of travel management zone shall be replaced with the leachfield's 2-year time of travel management zone, provided:

(1) When the drinking water source is grouted, in no case shall any point along the isolation zone be less than 50 feet from the drinking water source.

(2) When the drinking water source is not grouted, in no case shall any point along the isolation zone be less than 100 feet from the drinking water source.

(e) An applicant or prospective applicant may submit a written request to the Secretary for a reduction in the required isolation distance or isolation zone for a particular feature or object.

(1) The Secretary shall authorize the use of a reduced isolation distance or isolation zone for a particular feature or object when the Secretary determines that the isolation distance specified in Table 9-6 or isolation zone identified pursuant to Subsection (c) is unnecessary to protect human health and the environment because the specific site conditions, or the construction techniques and pipe materials, will prevent the potential subsurface flow of effluent from impacting the feature or object and will prevent the performance of the wastewater system from being impacted by the feature or object.

(2) In determining whether to authorize the use of a reduced isolation distance or isolation zone, the Secretary shall consider the following factors:
   (A) the ground slope;
   (B) groundwater flow;
   (C) depth to the seasonal high groundwater and the induced water table;
   (D) depth of the impeding soil layer;
   (E) soil texture and structure;
   (F) travel time for effluent from a component of a wastewater system to reach a feature or object; and
   (G) construction techniques or pipe materials that provides equal or greater protection to the wastewater system or feature or object than afforded by the isolation distance or isolation zone.

(3) The Secretary shall not authorize a reduction to the distances used to create an isolation zone around a drinking water source pursuant to Subsection (c) to less than the following:
   (A) When there is a continuous impeding soil layer from the leachfield to the source, and it is demonstrated the source is grouted, has no annular space, or soil sealed the source casing to prevent contaminant migration along the casing, X and Y shall not be less than 100 feet.
   (B) When groundwater flow from beneath the leachfield is not towards a drinking water source, X and Y shall not be less than 100 feet.
   (C) When a hydrogeological investigation is completed that reveals that groundwater flow from beneath the leachfield does not flow toward a drinking water source under pumping conditions, X and Y shall not be less than 100 feet.
   (D) When a 2-year time of travel management zone is determined, X and Y shall not be less than 50 feet when the drinking water source is grouted.
   (E) When a 2-year time of travel management zone is determined, X and Y shall not be less than 100 feet when the drinking water source is not grouted.

(4) The burden shall be on the applicant or prospective applicant to provide information from a designer that addresses the factors in Subsection (e)(2) and enables the Secretary to reach a determination.

(5) The Secretary's determination shall be in writing and indicate the reduced isolation distance or isolation zone.

(f) The Secretary shall require a greater isolation distance or larger isolation zone for a particular feature or object when the Secretary determines that, based on the specific site conditions described in an application, a greater isolation distance or larger isolation zone is necessary to prevent the potential subsurface flow of effluent from impacting the feature or object or to prevent the feature or object from impacting the performance of the wastewater system.

Note: Appendix C, Figure C-4, depicts an example for drawing an isolation zone around a drinking water source.

§ 1-913 Wastewater System Presumptive Isolation Zone

(a) A presumptive isolation zone shall be identified, using the methods identified in § 1-1104, around proposed leachfields, replacement areas, and wastewater tanks in which a potable water source with a design rate of less than or equal to 2.0 gallons per minute, assuming it would be located in bedrock or confined surficial aquifer, cannot be located.

(b) Each wastewater system presumptive isolation zone identified pursuant to Subsection (a) shall be considered in conjunction with the requirements of § 1-307 to determine if notification to adjacent landowners is required pursuant to § 1-307 and considered in conjunction with the requirements of Appendix A to determine if the wastewater system presumptive isolation zone is required to be shown on the site plan.

§ 1-914 Dosing and Pressure Distribution

(a) A wastewater system is required to use dosing when:
- (1) the design proposes more than 500 linear feet of distribution piping within a leachfield or combination of leachfields; or
- (2) the wastewater system uses pressure distribution.

(b) The use of dosing, including pressure distribution, in the design of a wastewater system is otherwise optional, but it is recommended for all wastewater systems.

(c) Dosing shall be accomplished by pumps, dosing siphons, or other devices that can provide sufficient flow and pressure to meet the design requirements of the distribution system.

(d) Requirements for pressure distribution
- (1) Except where otherwise specified in these Rules, wastewater systems using pressure distribution shall meet the following additional requirements:
  - (A) maintain a minimum pressure of 1 pound per square inch (or 2.3 feet of head) at the end of each distribution line;
  - (B) maintain a maximum of a 10 percent difference in the per-square foot application rate between any 2 trenches or beds within a system;
  - (C) prevent any trench or bed from being loaded at a rate exceeding that allowed based on the application rate for the soil and factors associated with advanced treatment except when approved as an innovative/alternative system;
  - (D) maintain a maximum 10 percent difference in the discharge rate between any 2 orifices in a single trench or bed;
  - (E) maintain a minimum dose volume 5 times the volume of the distribution network that must be filled during each dose cycle;
  - (F) maintain a minimum of 4 dosing cycles per day based on the design flow of the wastewater system, although the Secretary may allow a lower number of dosing cycles when the design flow is low and 4 doses per day are impractical for pump sizing and operation (examples include when the dose volume, based on 4 doses per day, for a low design flow, cannot fill

the laterals and maintain proper pressure at each orifice or the pump run time is less than the recommended run time); and

(G) maintain at least one orifice for each 25 square feet of leachfield area unless there is a specific requirement in these Rules for additional orifices.

(2) Pressure distribution pipe shall:

(A) be smooth, rigid pipe;

(B) have the ends of each lateral within the piping network designed with a flushing cleanout to allow for periodic cleaning;

(C) be constructed so that there is access to the piping system for flushing of the piping system;

(D) be designed so the distribution pipe within a trench or bed is laid level;

(E) be designed so that pipes serving separate trenches or beds that are at different elevations have even distribution; and

(F) have orifices that:

(i) have a minimum diameter of 1/8 inch;

(ii) may face up when the orifices are protected by orifice shields; and

(iii) may face down without an orifice shield.

(e) Notwithstanding Subsection (d), the Secretary may approve alternative designs of pressure distribution provided the design achieves distribution of the effluent in a leachfield that equals the distribution of effluent in a leachfield that would be obtained by the application of Subsection (d).

(f) During operation, settled solids shall be periodically removed from pump stations, dosing siphons, or other devices used to pressurize a leachfield to prevent passage of solids to downstream components.

§ 1-915 Time Dosing

(a) A Class 1, Class A, Class B, or Class BW designer is required to submit the installation certification for the installation of wastewater systems using time dosing.

(b) A wastewater system is required to use time dosing where specified in these Rules. The use of time dosing in the design of a wastewater system is otherwise optional.

(c) General requirements for time dosing.

(1) Wastewater systems that are time dosed:

(A) shall distribute the design flow to a leachfield in small equal doses distributed evenly over 24 hours.

(B) shall be designed using pressure distribution that uses a pump and complies with § 1-914(d)(1)(A)-(E) and (G) and § 1-914(d)(2).

(2) Unless otherwise authorized by the Secretary, the dose volume shall not exceed 10 percent of the design flow.

(3) A leachfield shall not be dosed more than once in a 30-minute period.

(d) Pump stations shall:

(1) be sized to achieve storage equal to 150 percent of the design flow;

(2) have an adjustable timer to control the pump run/rest times/dose volume;

(3) have an alarm float;
(4) have a cycle counter; and
(5) have the following additional floats:
(A) a redundant off float (the redundant off float can be controlled by the same float used for the timer enabler); and
(B) a peak enabler float between the timer enabler float and the high-water alarm float (the peak enabler float and the high-water alarm can be controlled by the same float).

(e) When a wastewater system using time dosing includes a pretreatment unit with a discharge pump that is designed using time dosing and discharges to a pump station or dosing siphon, the discharge pump shall either:
(1) discharge to a pump station that has the pump on level set to discharge an equal quantity of effluent as being pumped from the pretreatment unit; or
(2) discharge to a dosing siphon that discharges an equal quantity of effluent as being pumped from the pretreatment unit.

Note: Appendix C, Figure C-5, depicts a detail of a typical time dosing pump station.

§ 1-916 Flow Equalization

(a) A Class 1, Class A, Class B, or Class BW designer is required to submit the installation certification for the installation of a wastewater system using flow equalization.

(b) The use of flow equalization in the design of a wastewater system is optional.

(c) General requirements for flow equalization
(1) Notwithstanding § 1-803(h), the use of flow equalization allows a leachfield serving a building or structure or campground with multiple uses to be sized to dispose of the quantity of wastewater calculated by adding together the sum of the design flows for each use of the building or structure or campground in each 24-hour period for a week and dividing by the number of days when effluent will be distributed to the leachfield, provided:
(A) The leachfield can be expanded to dispose of the design flow calculated pursuant to § 1-803(h); and
(B) If a replacement area is required by §1-902, the replacement area can accommodate the design flow calculated pursuant to § 1-803(h).
(2) Wastewater systems that use flow equalization shall:
(A) Distribute the wastewater to a leachfield over 7 days when the flows vary greatly by the day of the week (examples include marinas, campgrounds, day use facilities, and places of worship when there are no other uses or activities of the building or facility during the off-peak days such as a daycare or preschool).
(B) Be designed using pressure distribution pursuant to § 1-914.
(C) Include pump stations that comply with § 1-915(d) to time dose the leachfield except when a treatment unit uses a pump designed to comply with §-915(e) to discharge to a pump station or dosing siphon that discharges to the leachfield.

(D) Include storage tanks for flow equalization (also referred to as surge tanks) that are sized to enable the wastewater system to meet the following requirements:

(i) when the flow into the system on a particular day exceeds the flow pumped to the leachfield, the remaining volume must be stored in flow equalization storage tanks;

(ii) when a following day also results in more flow into the system than is discharged, the remaining volume is added to that from the previous day or days;

(iii) based on an analysis of the weekly cycle, the maximum volume that must be stored at any point in time is calculated; and

(iv) the storage capacity of the flow equalization storage tanks is 150 percent of the calculated volume with no reduction allowed based on the required storage provided in the pump station.

(E) Include water meters to record the daily total quantity of water entering the building or structure or campground served by the wastewater system.

(3) When the design for a wastewater system using flow equalization includes a pretreatment unit, the pretreatment unit shall:

(A) be located between the flow equalization storage tanks and the pump station that discharges to the leachfield; and

(B) be sized based on the amount of effluent derived in Subsection (c)(1).

(4) A flow equalization storage tank shall:

(A) have a high-water alarm set at an elevation that equals 1.1 times the calculated storage volume; and

(B) include a cycle counter to record the number of times the alarm float in the flow equalization tank is activated.

(d) An annual inspection shall be performed by a designer during April or May of each year; and a report from the annual inspection shall be submitted to the Secretary by July 1 of the year of the inspection, which includes:

(1) the recorded daily meter readings and an analysis of the daily water meters to determine if any adjustment to the sizing of the wastewater system is needed; and

(2) a description of whether there is a need for changes to the pump station float settings based on the daily flow and dose cycle for the wastewater system.

Note: Examples for designing a flow equalization tank are included in Appendix B, Examples B-1.

§ 1-917 In-ground Trenches and Trenches in Mounds

(a) An in-ground trench or a trench in a mound shall be sized according to the following requirements:

(1) Trenches shall have a maximum width of 48 inches.

(2) The minimum required square footage shall be calculated using the formula TA = DF ÷ AR where:

(A) TA is the minimum required bottom trench area in square feet;

(B) DF is the design flow in gallons per day; and

(C) AR is the application rate in gallons per day per square foot identified in § 1-911.

(3) When the minimum linear loading rate is calculated, the minimum length of a trench shall equal the length derived by dividing the DF by the linear loading rate.

(4) Where the depth of leachfield stone exceeds 12 inches below the distribution pipe, the size of a trench calculated pursuant to Subsection (a)(2) may be reduced to the percentage indicated in Table 9-7, except for:

(A) trenches that do not use leachfield stone;

(B) trenches in leachfields disposing of filtrate effluent that are designed in accordance with § 1-904(c);

(C) trenches in mounds;

(D) innovative and alternative dispersal systems; and

(E) systems designed to dispose of high strength wastewater that do not include pre-treatment to reduce the BOD_5 and TSS to low strength.

Table 9-7
Percentage of Standard Trench Leachfield Area Required

Depth of Leachfield Stone Below Distribution Pipe	Trench Width 12 inches	Trench Width 18 inches	Trench Width 24 inches	Trench Width 36 inches	Trench Width 48 inches
18 inches	60%	64%	66%	71%	75%
24 inches (max)	50%	54%	57%	62%	66%

(b) The design of an in-ground trench or a trench in a mound shall meet the following additional requirements:

(1) Trenches shall not be constructed in fill material except when trenches are constructed in mounds or constructed pursuant to the requirements in § 1-919.

(2) Trenches in mounds shall be horizontally separated by at least 4 feet of fill material.

(3) In-ground trenches shall be horizontally separated by at least 4 feet of naturally occurring soil.

(4) The bottom of each trench shall be level.

(5) Trenches shall have one of the following designs:

(A) Leachfield stone that complies with the following requirements:

(i) Leachfield stone shall extend a minimum of 2 inches above the distribution pipe and either:

(I) 12 inches below the distribution pipe; or

(II) 6 inches below the distribution pipe if the trench design uses the application rate for beds.

(ii) A layer of filter fabric shall be placed over the top of the leachfield stone.

(B) Prefabricated chambers that have a minimum H-10 structural loading rating and are laid level in the trench.

(C) Subsurface drip distribution that complies with § 1-923.

(c) The design of an in-ground trench shall meet the following additional requirements:

(1) A primary in-ground leachfield with trenches shall be at least 10 feet from a replacement in-ground leachfield with trenches, unless the trenches of the primary in-ground leachfield are interfingered with the trenches of the replacement in-ground leachfield.

(2) When the number of primary trenches does not equal the number of replacement trenches, the design shall maximize the number of primary and replacement trenches that are interfingered.

(3) In-ground trenches shall not be constructed in soil:

(A) with a percolation rate that is slower than 60 minutes per inch; or

(B) that have a soil texture of sandy clay, silty clay, or clay.

(4) The design of an in-ground trench shall comply with § 1-919(b) when the soil has a:

(A) percolation rate that is faster than 1 minute per inch; or

(B) a soil texture of coarse sand or sand.

(5) The bottom of any portion of the leachfield or other infiltrative surface shall be no greater than 36 inches below ground surface.

(6) The distribution piping shall be:

(A) 4-inch rigid perforated pipe that is laid level;

(B) when chambers are used, 4-inch rigid perforated pipe; or

(C) when the wastewater system is designed to use pressure distribution, piping sized appropriately to achieve the requirements § 1-914.

(7) The ends of all pipes must be capped except pipes that are laid at the same elevation may be connected.

(8) When the design of the in-ground trench does not use pressure distribution and the design includes multiple trenches, a distribution box shall be part of the design and shall be:

(A) equipped with flow equalization devices for each distribution pipe that can be adjusted to maintain equal distribution;

(B) designed with an at-grade access; and

(C) protected against freezing.

(9) Any length of pipe within an in-ground trench that exceeds 100 feet in length shall be dosed pursuant to the requirements of § 1-914.

(10) In-ground trenches shall extend a minimum of 6 inches, or the required depth of the leachfield stone below the distribution pipe, whichever is greater, below ground surface on the downslope edge of the trench when constructed in naturally occurring soil.

(11) The bottom of an in-ground trench shall extend no deeper than 36 inches below ground surface. When the trench is constructed in naturally occurring soil and on a sloping site, the vertical measurements shall be taken from the deepest portion of the trench below the surface of the naturally occurring soil.

(12) Each in-ground trench shall be covered with a minimum of 6 inches and a maximum of 12 inches of permeable soil, the top 2 to 4 inches of which shall be topsoil.

(d) The construction of an in-ground trench or a trench in a mound shall meet the following requirements:

(1) Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes.

(2) After excavation of each trench, any smeared surface of the trench area including sidewalls shall be scarified with a rake.

(3) To prevent undesirable compaction of the scarified soil, construction equipment not needed to construct the leachfield shall be kept off the leachfield area.

(e) During operation of distribution boxes:

(1) Flow equalization devices shall periodically be adjusted to maintain equal distribution.

(2) Settled solids shall periodically be removed to prevent passage of solids to downstream components.

§ 1-918 In-ground Beds and Beds in Mounds and Beds in Bottomless Sand Filters

(a) An in-ground bed, a bed in a mound, or a bed in a bottomless sand filter shall be sized according to the following requirements:

(1) The minimum required square footage shall be calculated using the formula BA = DF ÷ AR where:

(A) BA is the minimum required bed area in square feet;

(B) DF is the design flow in gallons per day; and

(C) AR is the application rate in gallons per day per square foot identified in § 1-911.

(2) When the minimum linear loading rate is calculated, the minimum length of a bed shall equal the length derived by dividing the DF by the linear loading rate.

(b) The design of an in-ground bed, a bed in a mound, or a bed in a bottomless sand filter shall meet the following additional requirements:

(1) Beds shall not be constructed in fill material except when beds are constructed in mounds or bottomless sand filters.

(2) Beds in mounds shall be horizontally separated by at least 10 feet of fill material.

(3) In-ground beds shall be horizontally separated by at least 10 feet of naturally occurring soil.

(4) All distribution pipes within the bed shall be uniformly spaced no more than 6 feet apart.

(5) The maximum distance from a distribution pipe and the edge of the bed shall be 3 feet.

(6) Beds shall have one of the following designs:

(A) Leachfield stone that complies with the following requirements:

(i) Leachfield stone shall extend a minimum of 2 inches above the distribution pipe and 6 inches below the distribution pipe.

(ii) A layer of filter fabric shall be placed over the top of the leachfield stone.

(B) Prefabricated chambers that have a minimum H-10 structural loading rating that are laid level in the bed.

(C) Subsurface drip distribution that complies with § 1-923.

(7) The maximum capacity for any single bed is 2000 gallons per day.

(c) In-ground beds shall meet the following additional requirements:

(1) In-ground beds shall not be constructed in soil:

(A) with a percolation rate slower than 60 minutes per inch; or

(B) that have a soil texture of sandy clay, silty clay or clay.

(2) The design of an in-ground bed shall comply with § 1-919(b) when the soil has:

(A) a percolation rate faster than 1 minute per inch; or

(B) a soil texture of coarse sand or sand.

(3) The bottom of any portion of the leachfield or other infiltrative surface shall be no greater than 36 inches below ground surface.

(4) When the design of the in-ground bed does not use pressure distribution, a distribution box shall be part of the design and shall be:

(A) equipped with flow equalization devices for each distribution pipe that can be adjusted to maintain equal distribution;

(B) designed with an at-grade access; and

(C) protected against freezing.

(5) When the design of the in-ground bed does not use pressure distribution and the design includes multiple beds, a distribution box that complies with Subsection (c)(4) shall be part of the design to equally distribute effluent to each distribution box serving each bed.

(6) The distribution piping shall be:

(A) 4-inch rigid perforated pipe that is laid level;

(B) when chambers are used, 4-inch rigid perforated pipe; or

(C) when the wastewater system is designed to use pressure distribution, piping sized appropriately to achieve the requirements § 1-914.

(7) The ends of all pipes must be capped except pipes that are laid at the same elevation may be connected.

(8) Any length of pipe within an in-ground bed that exceeds 100 feet in length shall be dosed pursuant to the requirements of § 1-914.

(9) In-ground beds shall extend a minimum of 6 inches, or the required depth of the leachfield stone below the distribution piping, whichever is greater, below ground surface.

(10) The bottom of a portion of an in-ground bed shall extend no deeper than 36 inches below ground surface. On a site that has a slope, the vertical measurements shall be taken from the deepest portion of the bed below the surface of the naturally occurring soil.

(11) Each in-ground bed shall be covered with a minimum of 6 inches and a maximum of 12 inches of permeable soil, the top 2 to 4 inches of which shall be topsoil.

(d) The construction of an in-ground bed, bed in a mound, and bed in a bottomless sand filter shall meet the following requirements:

(1) Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes.

(2) After excavation of the bed, any smeared surfaces of the bed area, including sidewalls, shall be scarified with a rake.

(3) To prevent undesirable compaction of the scarified soil, construction equipment not needed to construct the leachfield shall be kept off the leachfield area.

(e) During operation of distribution boxes:
(1) Flow equalization devices shall periodically be adjusted to maintain equal distribution.
(2) Settled solids shall periodically be removed to prevent passage of solids to downstream components.

§ 1-919 Additional Design Requirements for In-Ground Leachfields

(a) Except as provided in Subsection (d), in-ground leachfields shall be located on sites that comply with the depths of naturally occurring soil required pursuant to § 1-903(i) and any additional requirements in this Section.

(b) For sites where the soil that will be directly beneath the proposed infiltrative surface of an in-ground leachfield has a percolation rate faster than 1 minute per inch or a soil texture of very coarse sand or coarser, and there is no soil with a thickness of 1 foot or greater with a percolation rate 1 minute per inch or slower or a soil texture of coarse sand or finer between the bottom of the proposed infiltrative surface of the leachfield and the seasonal high groundwater table or bedrock:
(1) The in-ground leachfield shall be a trench or bed with a minimum of 12 inches and a maximum of 18 inches of fill material meeting the specifications in § 1-921(g) placed below the bottom of the leachfield stone, piping for subsurface drip distribution, or other infiltrative surface.
(2) Notwithstanding § 1-911(c), the maximum application rate for sizing the in-ground leachfield shall be 1.0 gallon per square foot per day.

Note: An alternative to constructing an in-ground leachfield in conformance with Subsection (b) is to construct the leachfield in a mound in compliance with these Rules.

(c) For sites with 42 inches or greater depths of soil required pursuant to § 1-903 (i.e., complying soil), over a soil with redoximorphic features, with indicators of seasonal high-water table, with a percolation rate slower than 60 minutes per inch, or with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay (i.e., limiting soil), and 54 inches or greater depths of soil required pursuant to § 1-903 over bedrock, an in-ground leachfield shall meet the following requirements.
(1) The required depth of leachfield stone below the distribution pipe as required for an in-ground trench or bed shall be located entirely in naturally occurring soil that complies with § 1-903.
(2) If the design of the leachfield uses subsurface drip distribution that is in a trench or bed that does not use leachfield stone below the bottom of the drip distribution pipe, the drip distribution pipe shall be located entirely on naturally occurring soil that complies with § 1-903.
(3) The maximum application rate for sizing the in-ground leachfield that uses leachfield stone shall be based on the complying soil below the limiting soil.
(4) Naturally occurring soil from the site is suitable to cover the leachfield stone, but the top 2 to 4 inches of the cover shall be topsoil.

Note: Appendix C, Figure C-6, depicts a detail of a typical shallow trench wastewater system.

(d) For sites with soil with redoximorphic features, with indicators of seasonal high-water table, with a percolation rate slower than 60 minutes per inch, or with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay (i.e., limiting soil), and where the limiting soil terminates 24 inches or less below ground surface, provided the soil below the limiting soil comply with the depths of naturally occurring soil required pursuant to § 1-903 (i.e., complying soil), the in-ground leachfield shall meet the following requirements.

(1) The required depth of leachfield stone below the distribution pipe as required for an in-ground trench or bed shall be located entirely in naturally occurring soil that complies with § 1-903.

(2) If the design of the leachfield uses subsurface drip distribution that is in a trench or bed that does not use leachfield stone below the bottom of the drip distribution pipe, the drip distribution pipe shall be located entirely on naturally occurring soil that complies with § 1-903.

(3) The maximum application rate for sizing the in-ground leachfield that uses leachfield stone shall be based on the complying soil below the limiting soil.

(4) For sites where there is a soil directly beneath the infiltrative surface of an in-ground leachfield with a percolation rate of faster than 1 minute per inch or with a soil texture of coarse sand or sand, and the design of the leachfield uses leachfield stone below the distribution pipes, or the design is a subsurface drip distribution with less than 1 foot of fill below the distribution line, the design shall comply with Subsection (b)(1).

(5) A stormwater diversion swale to divert stormwater away from the leachfield shall be located upslope of the leachfield with the bottom of the drain or swale cut into, but not through, the soil with redoximorphic features.

Note: Appendix C, Figure C-7, depicts a detail of a typical trench wastewater system with 24 inches of limiting soil.

(e) For sites with soil with redoximorphic features, with indicators of seasonal high-water table, with a percolation rate slower than 60 minutes per inch, or with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay (i.e., limiting soil), and where the limiting soil terminates 5 feet or less below ground surface, the in-ground leachfield shall meet the following requirements:

(1) The in-ground leachfield shall be designed using pressure distribution.

(2) Notwithstanding § 1-911(c), the maximum application rate for sizing the in-ground leachfield shall be 1.0 gallon per square foot per day.

(3) Except as provided in Subsection (e)(5), the required depths of naturally occurring soil for the in-ground leachfield shall be:

(A) The minimum depth of naturally occurring soil (i.e., complying soil) below the limiting soil shall be:

(i) 24 inches to the seasonal high-water table;

(ii) 24 inches to a soil with:

(I) a percolation rate slower than 60 minutes per inch; or

(II) a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay; and

(iii) 24 inches to bedrock.

(B) The minimum depth of the naturally occurring soil below the limiting soil shall be met for a distance of:

(i) 25 feet in the downslope direction beyond the limits of the excavation for the leachfield; and

(ii) 10 feet on all other sides, beyond the limits of the excavation for the leachfield.

(C) The depth of fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(i) 36 inches to the seasonal high-water table;

(ii) 36 inches to a soil with:

(I) a percolation rate slower than 120 minutes per inch; or

(II) a texture of sandy clay, silty clay, or clay; and

(iii) 48 inches to bedrock.

(4) For an in-ground leachfield with a design flow of 1000 gallons per day or more, a hydrogeological analysis shall be completed that demonstrates the induced water table is a minimum of:

(A) 6 inches below the bottom of the limiting soil; and

(B) 36 inches below the bottom of the leachfield stone or other infiltrative surface of the leachfield.

(5) Notwithstanding Subsection (e)(3), when the in-ground leachfield disposes of filtrate effluent and is designed in accordance with § 1-904(c):

(A) The minimum depth of naturally occurring soil (i.e., complying soil) below the limiting soil shall be:

(i) 18 inches to a soil with a percolation slower than 120 minutes per inch;

(ii) 18 inches to a soil that has a texture of sandy clay, silty clay, or clay; and

(iii) 18 inches to bedrock.

(B) The depth of fill material below the bottom of the leachfield stone or other infiltrative surface of the leachfield shall be sufficient to obtain the following vertical separations:

(i) 18 inches to the induced water table, as demonstrated through a hydrogeological analysis;

(ii) 18 inches to a soil with:

(I) a percolation rate slower than 120 minutes per inch; or

(II) a texture of sandy clay, silty clay, or clay; and

(iii) 24 inches to bedrock.

(6) The limiting soil shall be removed to the depth of the complying soil and replaced with fill material that meets the specifications in § 1-921(g) and:

(A) The complying soil shall be scarified prior to placement of the fill material.

(B) The fill material shall extend a minimum of 1 foot beyond the outside edge of the leachfield stone or other infiltrative surface of the in-ground trench or bed.

(C) The fill material shall extend at least 1 foot beyond the outside area of the calculated actual wetted area around the emitters when the design of the

leachfield uses subsurface drip distribution that is not in a trench or bed and does not use leachfield stone as the infiltrative surface.

(7) A curtain drain or drainage swale to divert groundwater and stormwater away from the leachfield area shall be installed up-slope of the leachfield. The bottom of the drain or swale shall cut into the limiting soil but shall be no deeper than 80 percent of the limiting soil.

Note: Appendix C, Figure C-8, depicts a detail of a typical trench wastewater system with 24 inches to 5 feet of limiting soil.

§ 1-920 At-grade Leachfields

(a) For the purposes of this Section, "effective infiltration area" means the area of naturally occurring soil upon which at least 6 inches of leachfield stone is placed. It does not include:
(1) the downslope area of the leachfield stone that is less than 6 inches thick;
(2) the side slope fill areas; or
(3) the portion of the leachfield stone that is upslope of the distribution pipe on sites with a slope of greater than 3 percent.

(b) A Class 1, Class B, or Class BW designer is required to submit the installation certification required pursuant to § 1-311(b) for the installation of an at-grade leachfield.

(c) At-grade leachfields shall be located on sites that comply with the following requirements:
(1) At-grade leachfields shall be located on sites that comply with the depths of naturally occurring soil required pursuant to § 1-903(i); and
(2) At-grade leachfields shall not be constructed on soil with a percolation rate of faster than 1 minute per inch or a soil texture of very coarse sand or coarser, unless there is soil with a thickness of 1 foot or greater with a percolation rate 1 minute per inch or slower or a soil texture of coarse sand or finer between the bottom of the proposed infiltrative surface of the leachfield and the seasonal high groundwater table or bedrock.

(d) An at-grade leachfield shall be sized according to the following requirements:
(1) The minimum required square footage shall be calculated using the formula BA = DF ÷ AR where:
(A) BA is the minimum required stone area in square feet;
(B) DF is the design flow in gallons per day; and
(C) AR is the application rate in gallons per day per square foot identified in § 1-911 or Subsection (e)(2).
(2) When the minimum linear loading rate is calculated, the minimum length of a leachfield shall equal the length derived by dividing the DF by the linear loading rate.
(3) When tree stumps or boulders are left in place within the area for the leachfield, the size of the leachfield and replacement area shall be increased approximately equal to the percentage of soil surface lost due to tree stumps or boulders.

(e) At-grade leachfields can be located on an area that has non-naturally occurring soil over naturally occurring soil, provided the site complies with Subsection (c) and the following:

(1) The non-naturally occurring soil:

(A) is clean mineral soil free of wood, leaves, and other debris;

(B) has a percolation rate of 60 minutes per inch or faster and does not have a soil texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay;

(C) will not cause horizontal flows that could lead to surfacing of the effluent; and

(D) is of sufficient size and consistency to place an at-grade leachfield.

(2) Notwithstanding § 1-911(c), the maximum application rate for sizing the at-grade leachfield shall be determined based on the following:

(A) The maximum application rate shall be determined using one of the following methods:

(i) Table 9-3, using the texture and structure of the non-naturally occurring soil, or the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below the non-naturally occurring soil, identified from soil excavations, whichever results in the lower application rate; or

(ii) Table 9-4, using the results of the percolation tests conducted pursuant to § 1-910 in the non-naturally occurring soil, or in the most limiting naturally occurring soil texture and structure identified within 0 to 3 feet below the non-naturally occurring soil, whichever results in the lower application rate.

(B) If using the method in Subsection (e)(2)(A)(ii) results in a higher application rate than the using the method in Subsection (e)(2)(A)(i), the maximum application rate for sizing the at-grade leachfield shall be determined using the method in Subsection (e)(2)(A)(i).

(f) The design of an at-grade leachfield shall meet the following requirements:

(1) When an at-grade leachfield has two or more infiltrative surfaces placed end to end, the infiltrative areas shall be a separated a minimum of 10 feet as measured from the edge of the leachfield stone.

(2) When an at-grade leachfield has two or more infiltrative areas placed in the same flow path, the infiltrative areas shall:

(A) be separated a minimum of 6 feet as measured from the edge of the leachfield stone; and

(B) comply with § 1-903(i)(4)(A) from the most downslope infiltrative area.

(3) The infiltrative areas of a primary at-grade leachfield and a replacement at-grade leachfield may interfinger provided:

(A) there is maintained a minimum of 6 feet of naturally occurring soil between infiltrative areas as measured from the edge of the fill material over each infiltrative area; and

(B) the infiltrative areas comply with § 1-903(i)(4)(A) from the most downslope infiltrative area.

(4) When a primary at-grade leachfield and a replacement at-grade leachfield are placed in the same flow path but the infiltrative areas of the primary at-grade leachfield and the replacement at-grade leachfield are not interfingered, the

primary at-grade leachfield and replacement at-grade leachfield shall be separated by 10 feet of naturally occurring soil measured from the edge of the fill material for the primary and replacement at-grade leachfields.

(5) Notwithstanding Subsection (f)(1), (2), (3) and (4), when the primary and replacement at-grade leachfields are designed on an area that has non-naturally occurring soil over naturally occurring soil pursuant to Subsection (e), there shall be an equal distance of undisturbed non-naturally occurring soil between infiltrative areas as would be required for naturally occurring soil pursuant to § 1-903(i)(4).

(6) At-grade leachfields shall utilize pressure distribution pursuant to § 1-914.

(7) At-grade leachfields receiving 3000 gallons per day or more of design flow shall consist of dual alternating at-grade leachfields.

(8) The maximum width of the effective infiltration area shall be 6 feet.

(9) The minimum width of the effective infiltration area shall be 3 feet.

(10) A minimum length to width ratio of 2 to1 shall be provided for at-grade leachfields.

(A) The system length and width shall be determined by measuring from the outer edges from the 6-inch depth of the leachfield stone.

(B) The width dimension includes the separation distance (6 feet minimum) between individual infiltration areas for at-grade leachfields having more than one infiltration area.

(C) The width does not include the 2 feet of leachfield stone upslope from the distribution pipe for at-grade leachfields on a slope of greater than 3 percent.

(11) Force mains shall connect to the distribution pipe from:

(A) the ends of the leachfield; or

(B) from the upslope side of the leachfield.

(12) The distribution pipe shall:

(A) be placed in the center of the effective infiltration area on sites with less than or equal to a 3 percent slope; and

(B) placed at the upper side of the effective infiltration area on sites with a slope that is greater than 3 percent.

(13) A minimum of 6 inches of leachfield stone shall be placed under the distribution pipe and at least 2 inches of leachfield stone shall be placed above the top of the distribution pipe.

(14) Filter fabric shall be placed over the top of the leachfield stone. The leachfield stone shall be covered with a minimum of 12 inches of permeable fill material, with a maximum of 18 inches of soil, the top 2 to 4 inches of which shall be topsoil and the remainder a fine sandy loam to medium sand texture.

(15) All four sides of the fill material shall be designed to slope away at a pitch that is not steeper than 1-foot rise for every 3-foot run.

(16) The design shall indicate that a vegetated cover shall be maintained over all portions of the system.

(17) A swale shall be designed, or the area surrounding the at-grade leachfield shall be graded, to divert stormwater away from the at-grade.

(g) The construction of an at-grade leachfield shall meet the following requirements:

(1) The stormwater diversion swale, if part of the design, shall be installed prior to constructing the at-grade leachfield to keep stormwater away from the system while it is under construction.

(2) Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes.

(3) To prevent compaction, construction equipment shall not move across the plowed or tilled surface or the effluent dispersal area for a distance of 25 feet downslope of the fill material except for equipment required for placing the leachfield stone or fill material.

(4) Vegetation shall be cut close to the ground and removed from the area to be plowed or tilled.

(5) Tree stumps shall be cut flush with the ground and the roots left in place.

(6) On wooded sites, the forest litter shall be raked off the infiltrative area if more than an inch thick.

(7) The infiltrative area for an at-grade leachfield and the area beneath the non-naturally occurring soil shall be plowed, preferably by mold board or chisel plow, to a depth of 6 to 8 inches, parallel to the ground contour. If the site cannot be plowed, a backhoe bucket fitted with chisel teeth may be used to "till" the site by creating furrows that are parallel to the ground contours.

(8) During plowing, the soil shall be thrown downslope to provide a proper interface between the soil and the leachfield stone.

(9) The force main may be installed before or after plowing or tilling.

(10) Construction shall begin immediately after the plowing or tilling by placing the leachfield stone.

(11) Upon completion of the distribution piping, pressure test the system with clean water.

(12) After successful testing of the distribution piping, the distribution pipe shall be covered with at least 2 inches of clean leachfield stone.

(13) The leachfield stone shall be covered completely with filter fabric.

(14) The filter fabric shall be covered with a minimum of 12 inches but not more than 18 inches of soil, the top 2 to 4 inches of which must be topsoil and the remainder a fine sandy loam to medium sand texture.

(15) The entire at-grade leachfield shall be seeded and mulched or sodded to assure stability of the installation.

(16) The area surrounding the at-grade leachfield shall be graded to divert stormwater away from the at-grade leachfield.

Note: Appendix C, Figure C-9, depicts a detail of a typical at-grade leachfield with one infiltration area (0-3 % site slope). Figure C-10, depicts a detail of a typical at-grade leachfield with two infiltration areas (> 3 % site slope). Appendix C, Figure C-11, depicts a detail of a typical at-grade leachfield with interfingering infiltration areas (> 3 % site slope).

§ 1-921 Leachfields in Mounds

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification required pursuant to § 1-311(b) for the installation of a leachfield in a mound.

(b) Leachfields in mounds shall be located on sites that comply with the depths of naturally occurring soil required pursuant to § 1-903.

(c) The design of a leachfield in a mound may rely on curtain drains to lower the seasonal high-water table to 24 inches or more in order to comply with § 1-903(j) without complying with the requirements of § 1-906(a) when:
- (1) the leachfield disposes of 600 gallons or less per day of effluent;
- (2) the leachfield is sited on ground which has a slope;
- (3) the leachfield consists of a maximum of either 2 trenches or a bed that has a maximum width of 10 feet;
- (4) the seasonal high-water table is 18 inches or more below the naturally occurring soil prior to use of the curtain drain;
- (5) the bottom of the curtain drain is designed to be a minimum of 12 inches into the soil with a texture of silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, clay, and silty clay;
- (6) any hydrogeological analysis performed for the leachfield is based on an assumed seasonal high-water table of 18 inches below the ground surface; and
- (7) the Secretary agrees the curtain drain will lower the seasonal high-water table to 24 inches or more.

(d) A leachfield in a mound shall be one of the following:
- (1) a trench provided, when there are 2 or more trenches:
  - (A) for designs not including a hydrogeological analysis, the minimum trench length shall be twice the width across the top of the mound as measured from the outside to outside of the trenches; or
  - (B) for designs including a hydrogeological analysis, the trench length equals or exceeds the combined width of the trenches; or
- (2) a bed, provided the bed has a maximum width of 10 feet and the bed length equals or exceeds the bed width.

(e) Leachfields in mounds shall be sized according to the following requirements:
- (1) Trenches shall be sized according to the requirements of § 1-917(a).
- (2) Beds shall be sized according to the requirements of § 1-918(a).
- (3) When tree stumps or boulders are left in place within the area for the leachfield, the size of the leachfield shall be increased approximately equal to the percentage of soil surface lost due to tree stumps or boulders.

(f) Leachfields in mounds can be located on an area that has non-naturally occurring soil over naturally occurring soil, provided
- (1) The non-naturally occurring soil:
  - (A) is clean mineral soil free of wood, leaves, and other debris;
  - (B) has a percolation rate of 120 minutes per inch or faster and does not have a soil texture of sandy clay, silty clay, or clay;

(C) will not cause horizontal flows that could lead to surfacing of the effluent; and

(D) is of sufficient size and consistency to place a mound;

(2) The maximum application rate for sizing the effective basal area is based on the following requirements:

(A) The maximum application rate shall be 1 gallon per square foot or determined using one of the following methods if the methods result in a lower application rate:

(i) Table 9-3, using the texture and structure of the non-naturally occurring soil, or the most limiting naturally occurring soil texture and structure identified within 0 to 2 feet below the non-naturally occurring soil identified from soil excavations, whichever results in the lower application rate; or

(ii) Table 9-4, using the results of the percolation tests conducted pursuant to § 1-910 in the non-naturally occurring soil, or in the most limiting naturally occurring soil texture and structure identified within 0 to 2 feet below the non-naturally occurring soil, whichever results in the lower application rate.

(B) If using the method in Subsection (f)(2)(A)(ii) results in a higher application rate than the using the method in Subsection (f)(2)(A)(i), the maximum application rate for sizing the mound shall be determined using the method in Subsection (f)(2)(A)(i).

(3) The design includes a minimum of 12 inches of mound fill above the non-naturally occurring soil.

(g) The fill material to be used in a mound shall meet the following requirements:

(1) The mound fill material from the plowed ground surface, or the top of the non-naturally occurring soil identified in Subsection (f), to the top of the trench or bed in the mound fill material shall be clean silica sand meeting the sieve requirements in Table 9-8, Table 9-9, or Table 9-10. Interpolation of any fill analyses is not permitted.

Table 9-8
Mound Fill Material #1

Sieve Number	Opening (mm)	Percent Passing, by Weight
3/8	9.500	85 - 100
40	0.420	25 - 75
60	0.240	0 - 30
100	0.149	0 - 10
200	0.074	0 - 5

Table 9-9
Mound Fill Material #2[1]

Sieve Number	Opening (mm)	Percent Passing, by Weight
4	4.750	95 - 100
8	2.380	80 - 100
16	1.190	50 - 85
30	0.590	25 - 60
50	0.297	10 - 30
100	0.149	2 - 10

[1] Mound Fill Material #2 is ASTM Specification C 33 and is intended for manufactured material.

Table 9-10
Mound Fill Material #3

Sieve Number	Opening (mm)	Percent Passing, by Weight
3/8	9.500	85 - 100
40	0.420	30 - 50
200	0.074	0 - 5

(2) The Secretary may approve other fill material that is proposed by the designer when the designer submits information demonstrating that the fill material will provide the same treatment of effluent as using the mound fill material identified in Subsection (g)(1) and will provide the same life expectancy for a mound as using the mound fill material identified in Subsection (g)(1).

(3) Notwithstanding any condition in a permit issued under the September 10, 1982 Environmental Protection Rules authorizing a leachfield in a mound requiring the use of fill material that differs from the mound fill material identified in Subsection (g)(1), a wastewater system not yet constructed pursuant to the permit may use the mound fill material identified in Subsection (g)(1).

(h) The effective basal area for a mound shall be sized according to one of the following methods:

(1) The minimum required square footage calculated using the formula EBA = DF ÷ AR where:

(A) EBA is the minimum required square footage of effective basal area in square feet;

(B) DF is the design flow in gallons per day; and

(C) AR is the maximum application rate in gallons per day per square foot identified in Subsection (i) or (f)(2).

(2) The minimum required square footage determined through a hydrogeological analysis, but in no case less than that equal to the length and width required for the leachfield pursuant to these Rules.

(i) Except where Subsection (f)(2) applies, the maximum application rate for sizing the effective basal area shall be:

(1) 0.74 gallons per day per square foot when it is determined through soil excavations or a percolation test that the most limiting naturally occurring soil texture and structure identified within 0 to 2 feet below the ground surface has:
  (A) soil textures of coarse sand, sand, fine sand, very fine sand, sand, loamy coarse sand, loamy sand, loamy fine sand, loamy very fine sand, coarse sandy loam, sandy loam, fine sandy loam, very fine sandy loam, and loam; or
  (B) a percolation rate of 0 to 60 minutes per inch.
(2) 0.24 gallons per day per square foot when it is determined through soil excavations or a percolation test that the most limiting naturally occurring soil texture and structure identified within 0 to 2 feet below the ground surface has:
  (A) soil textures of silt loam, silt, sandy clay loam, clay loam, silty clay loam; or
  (B) a percolation rate of more than 60 to 120 minutes per inch.

(j) The design of a mound shall meet the following requirements:
(1) There shall be a minimum of 1 foot of mound fill material between the bottom elevation of the leachfield and the naturally occurring soil.
(2) The mound fill material shall extend a minimum of 1 foot beyond the effective basal area.
(3) Mounds shall utilize pressure distribution pursuant to § 1-914.
(4) Mounds shall be designed with the long dimension of the system parallel to the land contour.
(5) Force mains shall connect to the distribution pipe in the leachfield from:
  (A) the ends of the leachfield in the mound; or
  (B) from the upslope side of the leachfield in the mound.
(6) The area of mound fill material shall be sufficient to extend 1 foot beyond the edge of the required trenches or the bed before the sides are shaped to the acceptable slope.
(7) The maximum acceptable side slope for mounds shall be:
  (A) 1-foot rise for every 3-foot run; or
  (B) 1-foot rise for every 2-foot run when the design:
    (i) includes instructions for construction; and
    (ii) includes one of the following erosion prevention design measures to protect side slope stability following seeding or sodding:
      (I) placing rolled erosion control product along the entire side slopes; or
      (II) other erosion prevention measures acceptable to the Secretary.
(8) A swale shall be designed, or the area surrounding the mound shall be graded, to divert stormwater away from the mound.
(9) The area 25 feet downgradient of the mound, as measured from the edge of the mound fill material, is the effluent dispersal area and shall not be disturbed by removal of soil or any development, including building construction, swimming pools, roadways, and parking areas.

(k) The construction of a mound shall meet the following requirements:

(1) Vegetation shall be closely cut and removed from the ground surface throughout the area to be used for the placement of the mound fill material. Tree stumps shall be cut flush with the surface of the ground and roots shall not be pulled.
(2) Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes.
(3) The area shall be plowed to a depth of 7 to 8 inches.
(4) If the site cannot be plowed, a backhoe bucket fitted with chisel teeth may be used to "till" the site by creating furrows that are parallel to the ground contours.
(5) To prevent compaction, construction equipment shall not move across the plowed or tilled surface or the effluent dispersal area for a distance of 25 feet downslope of the mound fill material except for equipment required for placing the mound fill material.
(6) Construction shall commence immediately after preparation of the soil interface by placing the mound fill material in a minimum of 6-inch lifts at which point construction equipment may drive over the mound fill material.
(7) After construction of the distribution system, but prior to covering the distribution system, the distribution system shall be pressure tested.
(8) After successful testing of the distribution system, any necessary additional leachfield stone and the filter fabric shall be installed and the system completed.
(9) The entire mound shall be covered with topsoil native to the site, or of similar characteristics, to support vegetation found in the area.
(10) The entire mound shall be covered with 12 inches of soil that is less permeable than the mound fill material with the top of the mound being covered. Naturally occurring soil from the site is normally suitable for cover material but the top 2 to 4 inches of the cover shall be topsoil.
(11) The entire mound shall be seeded and mulched or sodded to assure stability of the installation.
(12) Install the swale, or the area surrounding the mound shall be graded, to divert stormwater away from the mound.

Note: Appendix C, Figure C-12, depicts a detail of a typical bed in a mound.

§ 1-922 Leachfields in Bottomless Sand Filters

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification for the installation of a leachfield in a bottomless sand filter and the results of all sieve analysis completed pursuant to Subsection (d).

(b) Bottomless sand filters shall be located on sites that comply with the following requirements:
(1) Bottomless sand filters shall only be located on sites that comply with the depths of naturally occurring soil required pursuant to § 1-903.
(2) Bottomless sand filters shall not be located on sites with tree stumps or boulders.

(c) A leachfield in a bottomless sand filter shall be a bed and shall be sized according to the requirements of § 1-918(a).

(d) The fill material to be used in a bottomless sand filter shall meet the following requirements:

(1) The bottomless sand filter fill material from the plowed ground surface to the bottom of the cover stone in the filter shall be clean silica sand meeting the sieve requirements in Table 9-11.

Table 9-11
Bottomless Sand Filter Fill Material

Sieve Number	Opening (mm)	Percent Passing, by Weight
4	4.750	95 - 100
8	2.380	80 - 100
16	1.190	50 - 85
30	0.590	25 - 60
50	0.297	10 - 30
100	0.149	2 - 10
200	0.074	0 - 1

(2) All bottomless sand filter fill material within the enclosure below the cover stone shall have:

(A) an effective size (D10) of 0.33 mm (+/-); and

(B) uniformity coefficient (D60 ÷ D10) of 3.0 to 4.0.

(i) Uniformity coefficient (U.C.) is a numeric quantity which is calculated by dividing the size of a sieve opening which will pass 60 percent by weight of a sand media sample by the size of the sieve opening which will pass 10 percent by weight of the same sand media sample. Note that 50 percent of the sample is retained between the two. The uniformity coefficient is a measure of the degree of size uniformity of the sand particles in a sand media sample. As the U.C. value approaches 1, the more uniform in particle size the sand media is. The larger the U.C., the less uniform the particle size.

(ii) U.C. = Particle Diameter 60 percent divided by Particle Diameter10 percent (D60 ÷ D10).

(3) The designer shall complete at least one sieve analysis of the bottomless sand filter fill material as it is being installed to demonstrate compliance with the requirements of Subsections (d)(1) and (2). When the bottomless sand filter is designed to dispose of 1000 gallons per day or more, the Secretary may require additional sieve analyses to be taken from different sections of the bottomless sand filter.

(e) The design of a leachfield in a bottomless sand filter shall meet the following requirements:

(1) The design of a bottomless sand filter shall use time dosing that complies with § 1-915.

(2) When the design uses a subsurface drip distribution system:

(A) the laterals shall be placed on the stone or bottomless sand filter fill material; and

(B) the laterals shall have a maximum of 2 inches of sand that extends above the top of the lateral with stone to the required height above the lateral above the sand.

(3) The stone to be used in a bottomless sand filter shall meet the following requirements:

(A) Stone shall be 3/8-inch round or sub-rounded, screened or crushed, uniform in size so that no more than 5 percent of the sample is greater than ½ inch and no more than 5 percent shall pass a 3/8-inch sieve, not to be shale or other soft stone.

(B) Stone shall be double washed prior to placement on the bottomless sand filter fill material so it contains little or no fines.

(C) Total depth of the stone shall be 8 to 9 inches depending on the size of the lateral.

(4) Laterals within the bottomless sand filter shall provide lateral spacing and orifice spacing that:

(A) is as square as possible;

(B) has the liner approximately one half the lateral spacing to the closest lateral; and

(C) has a space between the ends of the laterals to the liner approximately equal to one half the orifice spacing that is able to accommodate the fittings (i.e.: 45-degree elbow, threaded end adapter and cap). Regardless of the lateral spacing, there shall be sufficient space between the end of the lateral and liner for maintenance activities.

(5) Orifices shall comply with § 1-914(d) except:

(A) there must be 2 orifices facing up spaced 1/3 and 2/3 respectively along each lateral;

(B) all other orifices must face down; and

(C) there must be a shield for all orifices. Shields for down facing holes shall contain slots or holes to provide free draining.

(f) Pump stations used with a bottomless sand filter shall include pumps that meet one of the following requirements unless they are following an approved treatment unit:

(1) Pumps shall be housed in a screened basket and have an in-line effluent filter on the pump's discharge piping that is located accessible within the pump station; or

(2) Pumps shall be designed in a manner that the Secretary concludes provides equal or greater protection as Subsection (f)(1) in preventing the passage of suspended solids to the leachfield.

(g) Force mains used with a bottomless sand filter shall meet the following requirements:

(1) Force mains shall drain back to the pump station unless:

(A) the design provides insulation of the force main; or

(B) the force main is sufficiently deep to prevent freezing.

(2) Force mains shall connect to the distribution pipe in the leachfield from:

(A) the ends of the bottomless sand filter; or

(B) from the upslope side of the bottomless sand filter.

(h) The design of the bottomless sand filter shall meet the following requirements:

(1) The maximum inside width of a bottomless sand filter shall be 10 feet.

(2) The area 25 feet downgradient of the bottomless sand filter, as measured from the edge of the enclosure, is the effluent dispersal area and shall not be disturbed by removal of soil or any development, including building construction, swimming pools, roadways, and parking areas

(3) The effluent dispersal area may be plowed and covered with a maximum of 6 inches of soil, the top 2 to 4 inches of which shall be topsoil.

(4) Sod, vegetation, or dead or decaying organic litter or any organic soil horizon shall be removed from inside the footprint of the enclosure for the bottomless sand filter. Stripping of the topsoil layer under or outside the footprint for the bottomless sand filter is prohibited except as needed to lay the bottom of the enclosure level.

(5) The walls of bottomless sand filters must be lined with a 30-mil flexible PVC liner with all boots, patches, repairs, and seams having the same physical properties as the liner material. The designer shall inspect the liner as part of the installation certification to ensure all seams or tears of the liner were properly repaired and all boots are properly installed to prevent leakage of effluent through the side wall structure.

(6) The designer shall determine if the design needs to include insulation, such as foam board, inside the enclosure to prevent freezing within the enclosure.

(7) The design shall identify the location and type of cross bracing to ensure structural integrity and prevent bowing of the sides of the enclosure. The Secretary may request a designer provide calculations to show where there needs to be cross bracing particularly when the total height of the bottomless sand filter exceeds 24 inches above finished grade.

(8) Stainless steel or galvanized rods may be used for cross bracing inside the bottomless sand filter to minimize bowing of the sides of the structure. The bolt heads and nuts holding the rods in place shall be recessed into the bottomless sand filter exterior structure to minimize risks of injury from sharp edges.

(9) Penetration through the PVC liner shall be done with a PVC boot attachment glued to the liner with appropriate resilient sealer.

(10) A permanent top frame structure (such as pressure treated 6 inch by 6-inch timbers, or other suitable structural support) must be provided on any portion of the above grade bottomless sand filter.

(11) The perimeter of the bottomless sand filter below the required minimal structural support may be bermed with naturally occurring soil or other material such as landscape stone or other non-degrading material. In areas where slope is a consideration, a concrete structure may be considered by the designer to minimize damage to the bottomless sand filter.

(12) A swale shall be designed, or the area surrounding the bottomless sand filter shall be graded, to divert stormwater away from the bottomless sand filter.

(13) One inspection well shall be installed in the approximate center of the filter that extends through the bottomless sand filter fill material terminating at the interface with the naturally occurring soil.

(14) Bottomless sand filters that have multiple zones shall have at least one inspection well per zone.

(15) The inspection well shall be PVC pipe (SDR 35 minimum) with a minimum diameter of 2 inches that is perforated or slotted, wrapped in filter fabric, and topped with a removable cap positioned slightly below the finished elevation of the cover stone.

(16) The area around the enclosure of the bottomless sand filter shall:

(A) extend level for a minimum horizontal isolation distance of 5 feet from the enclosure; and

(B) from each point 5 feet from the enclosure, be graded a minimum of 1-foot rise for every 3-foot run until the slope intersects the naturally occurring soil.

(i) The construction of a bottomless sand filter shall meet the following requirements:

(1) Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes.

(2) Excavation of naturally occurring soil beneath the bottomless sand filter is prohibited, except as required by Subsection (h)(3).

(3) Once the proper elevation for the base of the bottomless sand filter is reached, construct the enclosure of the bottomless sand filter.

(4) Upon completion of the enclosure, place 3 inches of the approved bottomless sand filter fill material in the enclosure and thoroughly mix with the upper 3 inches of the naturally occurring soil.

(5) Placement of the remaining bottomless sand filter fill material to the necessary elevation shall be completed by:

(A) an excavator/backhoe bucket that is thoroughly washed prior to placement of the bottomless sand filter fill material to remove any soil in or on the bucket;

(B) placing the bottomless sand filter fill material in 8-inch lifts with the fill material wetted during installation to promote even settling (do not over wet the fill material as particle stratification may occur);

(C) using a hand rake or equivalent, to spread each 8-inch lift of bottomless sand filter fill material within the enclosure;

(D) "walking down" each 8-inch lift using only foot pressure by a person or persons wearing clean shoes free of soil with a texture of loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, or clay (no compaction equipment shall be used); and

(E) inspecting each placement, wetting, and "walk down" of the fill material, by the installer or designer to be certain the filter liner is not stretched or punctured during the filling of the enclosure.

(6) Placement of the stone over the bottomless sand filter fill material shall be as follows:

(A) place 3 inches of 3/8-inch stone over the fill material;

(B) place the laterals on the stone and pressure test the laterals;

(C) after successful testing of the distribution system, cover the laterals with stone or ¼ inch mesh plastic fabric;

(D) add a maximum of 6 inches of 3/8-inch stone over the lateral. If desired, place 1 to 2 inches of stone over the laterals, place a ¼ inch mesh plastic

fabric over the top of the stone, and add the remaining stone over the fabric;

(E) maintain the top of the stone to prevent plants with roots that can penetrate more than 2 inches; and

(F) if desired, place bark mulch pellets to cover the stone or other material acceptable to the Secretary that will not limit the air movement into and out of the filter. Do not place topsoil over the stone.

Note: Appendix C, Figure C-13, depicts a detail of a typical leachfield in a bottomless sand filter.

§ 1-923 Leachfields Using Subsurface Drip Distribution

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification for the installation of a wastewater system with subsurface drip distribution.

(b) The use of subsurface drip distribution in the design of a wastewater system is optional.

(c) General requirements for subsurface drip distribution

(1) A wastewater system using subsurface drip distribution shall be designed to dispose of filtrate effluent in accordance with § 1-904(c).

(2) The bottom of the drip line shall be:

(A) a minimum of 6 inches below finished ground surface when placed on naturally occurring soil;

(B) a minimum of 6 inches into naturally occurring soil below ground surface or O soil horizon;

(C) a minimum of 6 inches below finished ground surface when used in place of leachfield stone and pipe for mounds; or

(D) placed on leachfield stone when used with designs using leachfield stone as the infiltrative area.

(3) The required length of the subsurface drip distribution line shall be determined by:

(A) the linear loading rate determined by a hydrogeological analysis;

(B) the soil application rate; and

(C) the actual wetted area around the drip emitters.

(4) Designs of subsurface drip distribution shall:

(A) use time dosing that complies with § 1-915;

(B) ensure that the system will function in all weather conditions;

(C) ensure that the transport and distribution piping within the systems be designed to “drain-back” to the pump station between dose cycles;

(D) specify the manufacturer of the piping, emitter, and pumping system (only one manufacturer may be specified per design);

(E) include the design, installation and maintenance instructions of the manufacturer; and

(F) include design calculations and details that demonstrate compliance with the manufacturer’s requirements and these Rules.

(d) Subsurface drip distribution shall be constructed according to the following:

(1) Subsurface drip distribution shall be installed, operated, and maintained in accordance with the current design, installation, and maintenance instruction of the manufacturer.
(2) Drip line, when placed in naturally occurring soil, shall be trenched by hand or with a trenching machine into narrow, shallow trenches or plowed (with a vibratory plow or other insertion tool) directly into the soil and backfilled without gravel or leachfield stone.
(3) After construction of the subsurface drip distribution, but prior to covering the distribution piping, a designer shall direct the testing of the distribution system.
(4) After successful testing of the distribution system, the distribution piping shall be covered.

Note: Appendix C, Figure C-14, depicts a detail of a typical leachfield using subsurface drip distribution.

§ 1-924 Intermittent and Recirculating Sand Filters

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification required for the installation of wastewater system that includes an intermittent or recirculating sand filter.

(b) The use of intermittent and recirculating sand filters in the design of a wastewater system is optional and may be proposed as a treatment component of a wastewater system.
(1) The wastewater existing after filtration by an intermittent sand filter shall be presumed to be filtrate effluent when the septic tank effluent being discharged to the sand filter is low strength prior to filtration.
(2) The wastewater existing after filtration by a recirculating sand filter shall be presumed to be filtrate effluent when the septic tank effluent being discharged to the sand filter is low strength prior to filtration.

(c) General requirements for intermittent and recirculating sand filters
(1) Container Design & Construction
(A) The filter container shall be watertight to prevent groundwater from infiltrating into the filter container and to prevent wastewater exfiltration from the sand filter container. The container material shall be:
(i) reinforced concrete;
(ii) flexible membrane liner materials, provided they comply with the following requirements:
(I) they have properties that are at least equivalent to 30-mil un-reinforced polyvinyl chloride;
(II) they have field repair instructions and extra liner material that are provided to the purchaser with the liner;
(III) they have factory fabricated “boots” suitable for field bonding onto the liner to facilitate the passage of piping through the liner in a waterproof manner; and
(IV) they are compatible with the wastewater being treated; or
(iii) other materials having equivalent function, workmanship, watertightness and at least a 20-year service life.

(B) All tanks associated with a sand filter, including septic and dosing tanks and any pumping vaults, shall:
  (i) be watertight;
  (ii) have an at-grade access provided by a watertight manhole or riser not less than 18 inches in diameter, unless otherwise approved by the Secretary; and
  (iii) be designed to prevent entry by children.
(C) Upon completion of installation of a sand filter, the recirculation tank and sand filter container shall be tested for watertightness by filling the recirculation tank and sand filter to a point at least 2 inches but not more than 3 inches above the point of riser connection to the top of the tank, chamber, or container. During the test, there shall not be a measurable leakage over a 24-hour period.
(D) Notwithstanding Subsection (c)(1)(C), the Secretary may approve other leakage testing methods.

(2) Siting Requirements
  (A) The sand filters shall be protected from both groundwater and stormwater infiltration.
  (B) For the purpose of determining the minimum isolation distance to other site features, the sand filter container shall comply with the isolation distances set forth in § 1-912 for septic tanks.

(3) Monitoring
  (A) The sand filter shall be designed for wastewater sample collection before and after the sand filter.
  (B) The sand filter shall have the capability of measuring and recording the wastewater flow from buildings or structures or campgrounds to the sand filter.

(4) Annual inspections of each sand filter by a Class 1, Class B, or Class BW designer are required. A written report shall be submitted to the Secretary within 30 days of the inspection. At a minimum, the following items shall be addressed in the inspection report:
  (A) use and age of system including the average daily flows;
  (B) the recirculation ratio for recirculating sand filters;
  (C) mechanical or electrical malfunctions;
  (D) neglect or improper use; and
  (E) flushing of the laterals.

(5) Operation & Maintenance Manuals
  (A) A user's manual for the sand filter shall be developed or provided along with record drawing(s) at the time that the sand filter installation is complete. These manuals, at a minimum, shall contain the following information:
    (i) diagrams of the components and their location;
    (ii) an explanation of how the sand filter functions, operational expectations, and owner responsibility;
    (iii) specifications of the electrical and mechanical components installed (occasionally components other than those specified on the plan and detail sheets are used);

(iv) names and telephone numbers of the designer, the local health authority, the supplier/installer, or the management entity to be contacted in the event of a failure;

(v) information on the periodic maintenance requirements of the sand filter, including the septic tank, the dosing and recirculating/mixing tanks, the sand filter unit, the pumps, the switches, the alarms, the leachfield, and other information as appropriate;

(vi) information on "trouble shooting" common operational problems that might occur. This information should be detailed and complete as needed to assist the system owner to make accurate decisions about when and how to attempt corrections of operational problems and when to call for professional assistance;

(vii) information on the disposal of discarded sand filter media in accord with state and local requirements; and

(viii) for proprietary sand filter units, a complete operation and maintenance document shall be developed and provided by the manufacturer. This document shall include all the appropriate items mentioned above plus any additional general and site-specific information useful to the system owner or the service provider.

(d) Additional requirements for the design and construction of intermittent sand filters.

(1) Underdrain System

(A) The base of the sand filter container shall be level or constructed at a grade of 1 percent or less towards the underdrain piping.

(B) The underdrain piping shall be installed in the interior of the sand filter container at the lowest elevation. The piping shall be on a grade of 1 percent or less to the point of passage through the sand filter container.

(C) The underdrain piping and sand filter container bottom shall be covered with a minimum of 6 inches of clean washed ¾ inch to 1½ inch stone.

(D) Other types of underdrain systems may be proposed and approved after review by the Secretary.

(2) Sand Filter Media

(A) A minimum of 24 inches of approved sand filter soil media shall be placed over the underdrain system.

(B) The sand filter media shall be soil material meeting the sieve requirements in Table 9-12.

Table 9-12
Intermittent Sand Filter Media

Sieve Number	Opening (mm)	Percent Passing, by Weight
3/8	9.500	100
4	4.750	95 - 100
8	2.380	80 - 100
16	1.190	45 - 85
30	0.590	15 - 60
50	0.297	3 - 15
100	0.149	0 - 4

(C) Other sand filter media may be proposed, provided a designer submits to the Secretary technical justification for the substitution of materials. The Secretary shall review and may approve the proposed substitution.

(D) The size of the sand filter shall be based on a maximum application rate of 1.25 gallons per day per square foot.

(3) Distribution System

(A) A pressurized distribution system shall be constructed in accord with the following requirements:

(i) above the sand filter media there shall be a minimum of 3 inches of washed, clean ¾ inch to 1½ inch stone below the distribution laterals, and sufficient stone above the laterals equal to or covering the orifice shields to provide a smooth even cover;

(ii) distribution laterals shall be spaced on maximum 30-inch centers. Orifices shall be placed such that there is at least one orifice for each 6 square feet of sand surface area;

(iii) the ends of the distribution laterals shall be designed and constructed with a means to perform flushing of the piping, collectively or individually, through the operation of a non-corroding and accessible valve. The flushed wastewater must be discharged to the septic tank or into the sand filter;

(iv) the diameters of the distribution manifold and laterals shall not be less than ½ inch diameter and shall be constructed of schedule 40 or 80 (or equivalent) piping;

(v) the orifices shall not be less than 1/8-inch in diameter. All orifices shall be covered by a removable, protective, durable, non-corroding shield; and

(vi) other types of distribution systems may be proposed by a designer and used upon approval by the Secretary.

(4) Sand Filter Dosing

(A) The dose volume shall not exceed 10 percent of the daily design flow.

(B) The system shall not dose more than once in a 30-minute period.

(C) Head calculation shall include maximum static lift, pipe friction and a residual head of 5 feet at the furthest orifice.

(D) There shall be no more than a 10 percent flow variation between any 2 orifices.

(E) The pumping system shall be protected from solids by a filter apparatus that will not allow the passage of solids larger in size than 1/8 inch.

(F) The pump station designed to dose the sand filter shall be designed with storage equal to the 1-day design flow above the high-water alarm.

(5) Internal Pump Option

(A) Where the effluent from a sand filter is to be discharged by means of a pump to another treatment unit, a distribution unit, or to a leachfield, the design and construction of the sand filter may include provisions for an internal pump station, providing the following conditions are met:

(i) the location, design, and construction of the pump station do not conflict with the requirements of these Rules for the design, construction, and operation of a sand filter system;

(ii) the pump and related apparatus shall be housed in a corrosion resistant vault designed to withstand the stresses placed upon it so that it will not allow the migration of drain media, sand, or underdrain media to its interior. The vault shall:

(I) have a durable, attached floor; and

(II) provide watertight access to finished grade with a diameter large enough to remove, replace, or service any equipment in the vault and be designed to receive treated effluent from an elevation equal to that of a gravity discharging sand filter;

(iii) the depth of underdrain media and the operating level of the pump cycle and alarm shall not allow effluent to come within 2 inches of the bottom of the sand filter media. The pump off level shall not be lower than the bottom of the perforations of the underdrain piping; and

(iv) an internal sand filter pump shall be electronically linked to the sand filter dosing apparatus in such a manner as to prevent wastewater from entering the sand filter in the event the internal sand filter pump fails.

(e) Additional requirements for the design and construction of recirculating sand filters.

(1) Recirculating sand filters are not recommended for seasonal residences or projects designed for periodic use. Projects that will experience periodic shut downs should take into consideration the cooling effect on the recirculating effluent and the effect of the sand filters going anaerobic and becoming odoriferous.

(2) Underdrain System

(A) The base of the sand filter container shall be level or constructed at a grade of 1 percent or less towards the underdrain piping.

(B) The underdrain piping shall be installed in the interior of the sand filter container at the lowest elevation. The piping shall be on a grade of 1 percent or less to the point of passage through the sand filter container.

(C) The underdrain piping and sand filter container bottom shall be covered with a minimum of 6 inches of clean washed ¾ inch to 1½ inch stone.

(D) Other types of underdrain systems may be proposed and approved after review by the Secretary.

(3) Sand Filter Media

(A) A minimum of 36 inches of approved sand filter media shall be placed above the underdrain system.

(B) The sand filter media shall be soil material meeting the sieve requirements in Table 9-13.

Table 9-13
Recirculating Sand Filter Media

Sieve Number	Opening (mm)	Percent Passing, by Weight
3/8	9.500	100
4	4.750	60 - 100
8	2.380	7 - 75
16	1.190	0 - 5
30	0.590	0 - 3
50	0.297	0 - 2

(C) The Secretary shall review and may approve other sand filter media when a designer submits technical justification for substitution.

(D) The maximum application rate to size the recirculating sand filter shall be the lesser of:

(i) 5 gallons per day per square foot; and

(ii) the waste strength, expressed as gallons per square foot per day, using the formula:

AR = 5 gallons per square foot per day x 230 milligrams per liter ÷ BOD_5 where:

(I) AR is the application rate in gallons per day per square foot

(II) BOD_5 is the wastewater strength of the septic tank effluent in milligrams per liter.

(4) Distribution System

(A) A pressurized distribution system shall be constructed in accordance with the following requirements:

(i) there shall be a minimum of 3 inches of clean washed ¾ inch to 1½ inch stone that is below the distribution laterals and above the sand filter media, and sufficient stone covering the orifice shields to provide a smooth even cover;

(ii) distribution laterals shall be spaced on maximum 24-inch centers. Orifices shall be placed such that there is at least 1 orifice for each 4 square feet of sand surface area;

(iii) the ends of the distribution laterals shall be designed and constructed with a means to perform flushing of the piping, collectively or individually, through the operation of a non-corroding and accessible valve. The flushed wastewater must be discharged to the septic tank, recirculating tank or into the sand filter;

(iv) the diameters of the distribution manifold and laterals shall not be less than ½ inch diameter and shall be constructed of schedule 40 or 80 (or equivalent) piping;

(v) the orifices shall not be less than 1/8 inch in diameter. All orifices shall be covered by a removable, protective, durable, non-corroding shield; and

(vi) other types of distribution systems proposed by a designer may be approved by the Secretary.

(B) Recirculation/Dilution Tank and Dosing

(i) The recirculation tank receives septic tank effluent and overflow from the sand filter. The recirculation tank shall have sufficient capacity to provide 1 day's emergency storage above a high-water alarm level. The recirculation tank and dosing system shall comply with the following requirements:

(I) The system shall be designed with a minimum recirculation ratio of not less than 4. The recirculation ratio is the daily volume of recycled effluent divided by the design flow.

(II) The sand filter shall be wetted 48 times per day. The minimum resting period between doses shall be 20 minutes.

(III) The minimum wet volume in the recirculation tank shall be at least 80 percent of the design flow.

(IV) The system shall be designed so that 100 percent of the sand filter effluent returns to the recirculation tank when the liquid volume of the tank is less than 80 percent of the project design flow.

(V) There shall be a high-water alarm, and a low water alarm designed and installed to shut down the pump and notify the owner of the system when the liquid level of the recirculation tank is less than 50 percent of the project design flow.

(VI) Head calculations shall include maximum static lift, pipe friction and a residual head of 5 feet at the furthest orifice.

(VII) There shall be no more than a 10 percent flow variation between any 2 orifices.

(VIII) The pumping system shall be protected from solids by a filter apparatus that will not allow the passage of solids larger than 1/8 inch in diameter.

§ 1-925 Constructed Wetlands

(a) A Class 1, Class B, or Class BW designer is required to submit the installation certification required for the installation of a wastewater system that includes a constructed wetland.

(b) The use of constructed wetlands in the design of a wastewater system is optional and may be proposed as a treatment component of a wastewater system.

(c) General requirements for constructed wetlands

(1) A constructed wetland shall include a wetland container that is watertight to prevent wastewater from exfiltrating the filter container and be made of one of the following materials:

(A) reinforced concrete;
(B) flexible membrane liner materials, provided they comply with the following requirements:
(i) they have properties that are at least equivalent to 30-mil un-reinforced polyvinyl chloride;
(ii) they have field repair instructions and extra liner material that are provided to the purchaser with the liner;
(iii) they have factory fabricated "boots" suitable for field bonding onto the liner to facilitate the passage of piping through the liner in a waterproof manner; and
(iv) they are compatible with the wastewater being treated; or
(C) other materials having equivalent function and watertightness for the life of the wetland.

(2) The design of a constructed wetland shall be based on an industry accepted publication that identifies construction requirements, test requirements, and wastewater strength sampling results. Publications shall include wetlands constructed and monitored for wastewater strength in a climate like Vermont.

(3) The design of a wetland shall include plant species that are demonstrated by the applicant's designer to treat septic tank effluent.

(4) Constructed wetlands shall include only plant species that are native to Vermont and plants that will not adversely impact existing wetland species.

(d) Prior to submitting an application for a wastewater system that includes a constructed wetland, the prospective applicant shall have their designer contact the Secretary to review the basic principles on which the design will be based.

Note: The effluent resulting from a constructed wetland may be filtrate effluent.

§ 1-926 Storage and Dose Approach to Wastewater Systems

(a) A Class 1 designer is required to submit the installation certification required for the installation of a wastewater system that uses a storage and dose approach.

(b) Notwithstanding the depths of naturally occurring soil required pursuant to § 1-903 to site a leachfield on sites where the height of the seasonal high-water table would otherwise preclude the construction of a wastewater system, wastewater systems with a design flow of 700 gallons per day or less that use a storage and dose approach can be permitted.

(c) Minimum requirements for a wastewater system using a storage and dose approach:

(1) Wastewater may be stored without discharging to the leachfield for a maximum of 3 months.

(2) The wastewater system shall be designed so that the induced water table will remain at least 6 inches below ground surface when wastewater, including that which was stored, is discharged to the leachfield.

(3) The wastewater system shall be designed using the 2-year time of travel management zone specified in § 1-907.

(4) The wastewater system shall include storage tanks that are sized to store the average water use of the building or structure or campground to be served by the

wastewater system, taking into account the expected occupancy of the building or structure or campground, for the expected duration of the storage period.

(A) If the wastewater system will serve a building or structure with a residential use, the storage tanks shall be sized to store, for a 30-day storage period, a minimum of 150 gallons per day per living unit plus an additional 50 gallons per day per person above three for a living unit with a proposed maximum residential occupancy over three persons.

(B) The wastewater system shall provide space for additional storage tanks to be added to accommodate the design flow identified in § 1-803.

(C) The storage tanks shall include a high-water alarm system and space for 5 days of storage shall be provided above the alarm level.

(5) The design of the wastewater system shall incorporate a groundwater monitoring control system that allows discharge of wastewater to the leachfield only when the induced water table remains at least 6 inches below ground surface.

§ 1-927 Simplified Method of Completing a Hydrogeological Analysis

The simplified method for calculating the minimum length of a leachfield.

(1) The linear loading rate shall be calculated using the formula LLR = (h) x (f) where:

(A) LLR = linear loading rate, in gallons per day per linear foot of leachfield, measured parallel to the natural ground contours;

(B) h = the soil thickness available for groundwater mounding, measured in feet; and

(C) f = the LLR factor from Table 9-14, based on soil texture and ground slope.

(i) Unless Subsection (1)(C)(ii) or (iii) apply, the value of the f-factor from Table 9-14 shall be determined using the finest textured soil within the thickness available for groundwater mounding.

(ii) When any overlying soil layer that is within the thickness available for groundwater mounding has an f-factor that is less than the f-factor of any underlying soil layer that is within the thickness available for groundwater mounding, the lowest f-factor shall be used to calculate the total LLR of all soil layers.

(iii) When the f-factor of each overlying soil layer that is within the thickness available for groundwater mounding is greater than the f-factor of any underlying soil layer that is within the thickness available for groundwater mounding, the LLR may be calculated for the overlying soil layer and underlying soil layer separately for each thickness and the two numbers shall be added together to obtain the allowable LLR for the wastewaters system.

(2) The minimum leachfield length shall be calculated using the formula SL = DF ÷ LLR where:

(A) SL is the system length; and

(B) DF is the design flow.

Table 9-14
Linear Loading Rate Factors Based on Soil Texture and Ground Slope

Soil Texture	LINEAR LOADING RATE FACTORS (f)						
	Ground Slope						
	0 - 2%	> 2 - 4%	> 4 - 6%	> 6 - 8%	> 8 - 10%	> 10 - 15%	> 15 - 20%
Coarse Sand, Sand, Loamy Coarse Sand, Loamy Sand	7.5	22.4	37.4	52.4	52.4	52.4	52.4
Coarse Sandy Loam, Sandy Loam, Fine Sand, Very Fine Sand, Loamy Fine Sand, Loamy Very Fine Sand	3.7	11.2	18.7	26.2	33.7	33.7	33.7
Fine Sandy Loam, Very Fine Sandy Loam	1.5	4.4	7.5	10.5	13.5	18.7	26.2
Loam	1.1	3.4	5.6	7.9	10.1	14.0	19.6
Silt Loam	0.7	2.2	3.7	5.2	6.7	9.4	13.1
Sandy Clay Loam, Silty Clay Loam, Clay Loam	0.4	1.1	1.9	2.6	3.4	4.7	6.5
Sandy Clay, Silty Clay, Clay	0.2	0.7	1.1	1.6	2.0	2.8	3.9

Note: Completion of the simplified method does not preclude the design of a wastewater system from being based on the use of a different method for completing the hydrogeological analysis which may result in a lower linear loading rate.

Note: Examples for calculating the induced water table using the simplified method are included in Appendix B, Examples B-2.

§ 1-928 Holding Tanks

(a) The Secretary shall approve the use of holding and pump out tanks as a wastewater system serving a building or structure in lieu of a soil-based wastewater system or sanitary sewer service line that conveys wastewater to a wastewater treatment facility or indirect discharge system when all of the following requirements are met:
- (1) The building or structure:
  - (A) is existing or proposed and is publicly owned; or
  - (B) is existing and owned by a charitable, religious, or nonprofit organization.
- (2) The plan for construction and operation of the holding and pump out tank shall not result in a public health hazard or environmental damage.
- (3) A designer demonstrates that an economically feasible means of meeting current standards is significantly costlier than wastewater holding and pump out tanks, based on a projected 20-year life of the project.
- (4) The design flows do not exceed 600 gallons per day.
- (5) If the building or structure is owned by a charitable, religious, or nonprofit organization, the applicant agrees to post a bond or other financial surety, prior to construction of the holding and pump out tank, sufficient to finance maintenance

of the holding and pump out tank for the life of the system which shall be at least 20 years.

(b) The Secretary may approve the use of holding and pump out tanks as a wastewater system serving a building or structure or campground in lieu of a soil-based wastewater system or sanitary sewer service line that conveys wastewater to a wastewater treatment facility or indirect discharge system when all of the wastewater to be treated does not, and is unlikely in the future to, contain pathogens. In reaching this determination the Secretary shall consider:
(1) the nature of the wastewater;
(2) the ultimate point of disposal of the wastewater; and
(3) the risks associated with the failure of the system to operate, or to be operated, as permitted.

(c) The Secretary may approve a holding and pump out tank as a wastewater system serving a building or structure in lieu of a soil-based wastewater system or sanitary sewer service line that conveys wastewater to a wastewater treatment facility or indirect discharge system, whether or not the building or structure is publicly owned, when:
(1) the building or structure is served by an existing wastewater system that has failed, or is expected to fail;
(2) there is no other cost feasible alternative; and
(3) a variance is sought and granted pursuant to § 1-802 from all technical standards in this Subchapter and Subchapter 10 that would otherwise apply.

(d) The Secretary shall approve the use of a marine holding and pump out tank as a wastewater system, where it is not feasible to discharge the contents of marine wastewater holding and pump out tanks to a soil-based wastewater system or to a sanitary sewer service line that conveys wastewater to a wastewater treatment facility or indirect discharge system.

(e) A holding and pump out tank shall:
(1) be capable of holding at least 14 days of the expected flow from the building or structure or campground;
(2) be constructed of durable materials that are appropriate for the site conditions and the nature of the wastewater to be stored;
(3) be watertight, and any piping connected to the tank, and all access structures connected to the tank shall be watertight;
(4) prior to being placed in service, be tested for watertightness using the same method as identified in § 1-1010;
(5) be designed to protect against floatation when the tank is empty, such as when it is pumped;
(6) be equipped with audio and visual alarms that are triggered when the tank is filled to 75 percent of its design capacity;
(7) be located so that it can be reached by tank pumping vehicles at all times when the building or structure or campground is occupied.

(f) Any building or structure or campground served by a holding and pump out tank, other than a marine holding and pump out tank, shall have a water meter, or meters, installed

that measures all water that will be discharged as wastewater from the building or structure or campground.

(g) A permit issued for the use of a holding and pump out tank shall require a designer to periodically inspect the tank, visible piping, and alarms and meet the following requirements:
- (1) A designer shall submit a written report to the Secretary detailing the results of the inspection and any repairs or changes in operation that are required.
- (2) The report shall also detail the pumping history since the previous report, giving the dates of pumping and the volume of wastewater removed.
- (3) The frequency of inspections and reports shall be stated in the permit issued for the use of the tank, but shall be no less frequent than once per year.
- (4) Unless permitting a marine holding and pump out tank, the designer shall also inspect the water meter or meters and verify that they are installed, calibrated, and measuring all water that is discharged as wastewater.
- (5) Unless permitting a marine holding and pump out tank, the designer shall read the meters and compare the metered flow to the pumping records.
- (6) Any significant deviation shall be noted in the report and explained to the extent possible.

(h) A permit authorizing a holding and pump out tank as a wastewater system pursuant to Section (a) shall not run with the land, unless it is issued to a charitable, religious, or non-profit organization.
- (1) When a permit is issued to a charitable, religious, or non-profit organization it shall apply to all subsequent owners of the property being served by the holding tank for the duration of the permit regardless of whether the owner is a charitable, religious, or non-profit organization.
  - (A) A subsequent owner shall not increase the design flow of the holding and pump out tank system, or, take any other action which requires the issuance of a permit or permit amendment without seeking a permit or permit amendment.
  - (B) All permit conditions, including the financial surety requirement of Subsection (a)(5), shall apply to a subsequent owner.

(i) A permit authorizing a holding and pump out tank as a wastewater system under a provision of this Section shall require the owner of a holding and pump out tank to maintain a valid contract with a licensed wastewater hauler at all times.
- (1) The contract shall require the licensed wastewater hauler to provide written notice of dates of pumping and volume of wastewater pumped.
- (2) Copies of all such notices shall be submitted with the written inspection reports.

§ 1-929 Disposal of Contents of Composting or Incinerating Toilets

(a) The contents of a composting or incinerating toilet, provided the toilet does not yield a liquid, may be disposed of as directed in Subsection (c).

(b) The installation and use of composting or incinerating toilets does not create an exemption from any requirement of these Rules, including the requirement that all

buildings or structures have wastewater systems that comply with the technical standards in this Subchapter and Subchapters 8 and 10, for the disposal of all other wastewater from the building or structure.

(c) The contents removed from a composting or incinerating toilet shall be disposed of in the following manner:
  (1) If disposed of on the same lot on which the toilet is located, the contents shall be disposed of by shallow burial at a location approved by the Secretary in a permit, provided the location meets the following requirements:
    (A) complies with the isolation distances and isolation zones required pursuant to § 1-912 for locating an in-ground leachfield; and
    (B) maintains a 3-foot separation between the bottom of the excavation for the contents to the seasonal high-water table and a 4-foot separation between the bottom of excavation for the contents to bedrock.
  (2) If not disposed of on the same lot on which the toilet is located, the contents shall be disposed of:
    (A) at a certified landfill; or
    (B) in accordance with the Vermont Solid Waste Management Rules.

§ 1-930 Discontinuing Use and Removal of a Wastewater System

(a) A wastewater system that is no longer serving a building or structure or campground, may remain in place, provided all tanks, including the septic tanks, pump stations, and dosing siphons, are:
  (1) pumped; and
  (2) broken in-place or filled with soil.

(b) When a leachfield is removed, the stone, fill material, and soil removed from in and around the components, shall be disposed of in the following manner:
  (1) If disposed of on the same lot on which the wastewater system is located, the material shall be disposed of in a location approved by the Secretary in a permit, provided the location meets the following requirements:
    (A) Complies with the isolation distances and isolation zones required pursuant to § 1-912 for locating an in-ground leachfield; and
    (B) Maintains a 3-foot separation between the bottom of the burial to the seasonal high-water table and 4-foot separation between the bottom of the burial to bedrock.
  (2) If not disposed of on the same lot on which the wastewater system is located, the material shall be disposed of:
    (A) at a certified landfill; or
    (B) in accordance with the Vermont Solid Waste Management Rules.

Subchapter 10 – Flexible Specific Technical Standards for Wastewater Systems

§ 1-1001 Request for Alternative Technical Standard

(a) The Secretary may accept, in an application for a permit or permit amendment, the use of an alternative technical standard to a technical standard included in this Subchapter when the Secretary concludes that the alternative technical standard:
- (1) will meet the purpose served by the technical standard in this Subchapter;
- (2) has been adopted and published by one of the following organizations:
  - (A) American Association of the State Highway and Transportation Officials (AASHTO);
  - (B) National Science Foundation (NSF);
  - (C) American National Standards Institute, Inc. (ANSI);
  - (D) American Society of Civil Engineers (ASCE);
  - (E) American Public Works Association (APWA);
  - (F) American Society for Testing and Materials (ASTM);
  - (G) American Water Works Association (AWWA);
  - (H) Cast Iron Soil Pipe Institute (CISPI);
  - (I) Ductile Iron Pipe Research Association;
  - (J) New England Interstate Water Pollution Control Commission (NEIWPCC); and
  - (K) 10 States Standards – Recommended Standards for Wastewater Facilities;
- (3) incorporates more current technology than included in the technical standard in this Subchapter; and
- (4) will not adversely affect the maintainability, operation, or safety of the wastewater system; and
- (5) where specified, meets any additional criteria required by these Rules for a Secretary approved alternative technical standard.

(b) An application that seeks to use an alternative technical standard shall include a written request that includes:
- (1) the specific technical standard in this Subchapter for which approval of an alternative technical standard is sought; and
- (2) supporting documentation demonstrating each of the findings included in Subsection (a).

§ 1-1002 General Requirements for Sanitary Sewer Service Lines

(a) Groundwater or stormwater drains including roof drains, area drains, foundation drains, and cellar drains shall not connect to sanitary sewer service lines.

(b) Sanitary sewer service lines shall be sized for the design flow and, for gravity sewers, shall be a minimum of 4 inches in diameter.

(c) Sanitary sewer service lines shall comply with the following requirements.
- (1) Pipes from a building or structure to a septic tank, from a septic tank to a distribution box or leachfield, and from a septic tank to a pump or siphon chamber:

(A) shall be non-perforated rigid pipe; and
(B) shall have all pipe penetrations to tanks, chambers, or boxes sealed to prevent leakage.

(d) Sanitary sewer service lines shall be constructed of one of the following materials:
(1) rubber ring jointed or solvent welded polyvinyl chloride SDR 35 with oil-resistant gasket joints complying with standard ASTM D-1869;
(2) cast iron (CI) or other sewer pipe that complies with the Vermont Plumbing Rules or ASTM standards;
(3) Ductile iron gravity sewer pipe, ASTM A746; or
(4) extra heavy cast iron where sanitary sewer service lines are designed or anticipated to be installed at a depth of less than 3 feet under driveways.

(e) Sanitary sewer service lines carrying raw or untreated wastewater shall maintain a minimum slope of 1/4 inch per foot.

(f) Sanitary sewer service lines carrying septic tank effluent shall maintain a minimum slope of 1/8 inch per foot.

(g) Sanitary sewer service lines shall:
(1) be buried sufficiently deep to prevent freezing; and
(2) have a minimum bury depth of:
(A) 4 feet;
(B) in areas subject to plowing or snow removal, 5 feet; or
(C) a number approved by the Secretary when a designer demonstrates that a shallower bury depth will protect the sanitary sewer service line from frost and other superimposed loads.

(h) Connection of a sanitary sewer service line to a sanitary sewer collection line shall be:
(1) through a manhole; or
(2) with a wye fitting so as to direct flow and minimize in line turbulence.

(i) Cleanouts or manholes shall be provided on a sanitary sewer service line carrying raw or untreated wastewater at:
(1) each horizontal change in direction greater than 45 degrees and at intervals of not more than 100 feet; or
(2) at intervals of 40 feet of length where more than one change of direction of less than 45 degrees occurs in a run of piping.

(j) Sanitary sewer service lines with changes in direction that exceed 45 degrees shall be made with two 45-degree ells or long sweep fittings or made with a manhole.

(k) A sanitary sewer collection line that conveys wastewater from two or more buildings or structures may be considered a sanitary sewer service line under these Rules and comply with the requirements for a sanitary sewer service line in lieu of the requirements for a sanitary sewer collection line when:
(1) the total length of the sanitary sewer collection line and each sanitary sewer service line is less than 300 feet;

(2) cleanouts, not manholes, are provided where the sanitary sewer service lines join; and

(3) the distance between cleanouts does not exceed 100 feet.

(l) When a design for a sanitary sewer service line or sanitary sewer collection line contains a septic tank or a grease tank, the design of the septic tank or the grease tank shall comply with the requirements in § 1-908 and § 1-909(c) and (d).

§ 1-1003 General Requirements for Sanitary Sewer Collection Lines

(a) Groundwater or stormwater drains, including roof drains, area drains, foundation drains, and cellar drains, shall not connect to sanitary sewer collection lines.

(b) Sanitary sewer collection lines shall be sized for the design flow even when the diameter of the receiving collection line is less than the diameter of the proposed line. The Agency may require a schedule for future downstream sewer relief.

(c) Sanitary sewer collection lines carrying raw or untreated wastewater shall:

(1) be a minimum of 6 inches in diameter for gravity sewers;

(2) be sized to transport the peak hourly flow rate, calculated using the design flows listed in § 1-803 for buildings or structures or campgrounds multiplied by the peaking factors listed in Table 10-1, in order to provide:

(A) a minimum velocity of 2.0 feet per second when flowing full using the Manning equation and roughness coefficients appropriate for the pipe materials proposed considering surface deterioration over the expected useful life of the pipe; or

(B) have the pipe diameter and slope selected to obtain the greatest practical velocities to minimize settling problems when maintaining 2.0 feet per second is not attainable. Oversize sewers will not be approved to justify using flatter slopes. If the proposed slope is less than the minimum slope of the smallest pipe which can accommodate the peak hourly flow rate, the designer shall provide calculations to justify solids deposition will not be an issue using the smallest pipe; and

(3) where velocities greater than 15 feet per second are attained, have special provisions made to protect against displacement by erosion and shock.

Table 10-1
Peaking Factors

Design Flow in gallons per day	Peaking Factor
less than 10,000	5.0
10,000 to less than 100,000	4.2
100,000 to less than 500,000	3.8
500,000 to less than 1,000,000	3.2
1,000,000 or greater	3.0

(d) Sanitary sewer collection lines shall be designed:

(1) with the minimum slopes shown in Table 10-2 regardless of the formula used or friction factors used in the design of the lines; and
(2) when a smaller sanitary sewer collection line joins a larger sanitary sewer collection line, the bottom of the larger sanitary sewer collection line shall be lowered sufficiently to maintain the same energy gradient. A method for securing these results is to place the 0.8 depth point of both sewers at the same elevation.

Table 10-2
Minimum Slopes

Size (inches Pipe)	Slope (feet/l00 feet)
6	0.60
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12

(e) Sanitary sewer collection lines shall:
(1) be sufficiently deep to prevent freezing; and
(2) have a bury depth:
(A) of at least 4 feet; or
(B) at least 5 feet in areas subject to plowing or snow removal that allows for deeper frost penetration, unless Subsection (f) applies.

(f) When the depths in Subsection (e)(2)(B) cannot be maintained without significant expense and when the design demonstrates the collection line will be protected from frost or other superimposed loads, the Secretary may approve a sanitary sewer collection line placed at shallower depths.

(g) Sanitary sewer collection lines shall be laid with uniform slope and straight alignment between manholes.

(h) Sanitary sewer collection lines on 20 percent slopes or greater shall be anchored securely with concrete anchors or equal spaced as follows:
(1) not over 36 feet center to center on grades 20 percent and less than 35 percent;
(2) not over 24 feet center to center on grades 35 percent and less than 50 percent; and
(3) not over 16 feet center to center on grades 50 percent and over.

(i) Sanitary sewer collection lines and fittings shall be constructed of one of the following materials:
(1) rubber ring jointed polyvinyl chloride pipe, meeting the requirements of ASTM 3034 for SDR 35 or heavier;
(2) fused HDPE;
(3) ductile iron (DI) gravity sewer pipe of the proper class; or
(4) other materials approved by the Secretary.

(A) In determining if the pipe material is appropriate for the specific use, the Secretary shall consider:
(i) the character of the waste (domestic, commercial or industrial);
(ii) soil characteristics;
(iii) exceptionally heavy external loadings;
(iv) abrasion; and
(v) corrosion.

(B) The Secretary may require the designer to submit information from the pipe manufacturer certifying that the materials are acceptable for the specific use.

(j) Sanitary sewer collection line joints shall:
(1) have couplings complying with ASTM specifications, including oil resistant joints that comply with ASTM D-1869;
(2) be designed to minimize infiltration and to prevent the entrance of roots throughout the life of the system; and
(3) be of similar materials as the collection line.

(k) Sanitary sewer collection lines shall be designed to prevent damage from superimposed, live, dead, and frost induced loads.
(1) Proper allowance loads on the sewer shall be made based on the soil characteristics and potential groundwater conditions as well as the width and depth of trench.
(2) Where necessary, special bedding, haunching and initial backfill, concrete cradle, or special construction shall be used to withstand the anticipated potential superimposed loading or loss of trench wall stability.

(l) Sanitary sewer collection line trenching shall comply with the following requirements:
(1) Ledge, rock, boulders, and large stones shall be removed to provide a minimum clearance of four inches below and on each side of all pipes.
(2) All water entering the excavations or other parts of the work shall be removed until all the work is complete.

(m) Sanitary sewer collection line bedding shall comply with the following requirements:
(1) Bedding Class A, B, C, or crushed stone as described in ASTM C 12 or bedding that complies with the Vermont Agency of Transportation's 2011 Standard Specifications for Construction shall be used and carefully compacted for all rigid pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load based on the soil type encountered and potential water table.
(2) Embedment materials for bedding, haunching and initial backfill shall be Classes I, II, or III as described in ASTM D 2321 and shall be carefully compacted for all flexible pipe provided the proper strength pipe is used with the specified bedding to support the anticipated load based on the soil type encountered and potential water table.
(3) Backfill shall be of a suitable material removed from the excavation except where other material is specified. Debris, frozen material, large clods or stones, organic

matter, or other unstable materials shall not be used for backfill within 2 feet of the top of the pipe.

(4) Final backfill shall be placed in such a manner as not to disturb the alignment of the pipe.

(n) Trenchless technologies that may be used in lieu of open-trenching include:

(1) jack and bore and pipe jacking;

(2) micro-tunneling; and

(3) horizontal directional drilling.

(o) Upon completion of construction of a sanitary sewer collection line and prior to backfilling over the collection line, leakage testing shall be performed in accordance with one of the following procedures:

(1) Water (Hydrostatic) Leakage Testing

(A) Plug or cap all service laterals, stubs, and fittings. Place adequate bracing to withstand thrust forces.

(B) A tapped plumber's plug shall be inserted in the downstream manhole inlet sewer. The water supply connection is made at this point, but never directly from a water main, including the fire hydrant, unless a backflow preventer is used.

(C) A stand pipe is tightly connected at the upstream end of the sanitary sewer service line or sanitary sewer collection line. The height of the stand pipe shall be at least 2 feet higher than any point in the line or 2 feet higher than the highest known water table, whichever is higher. A manhole may be used as a stand pipe.

(D) Water is added at the downstream connection in order to avoid trapping air bubbles or pockets. The line shall be filled to the elevation designated in the stand pipe.

(E) Allow the line to stand with water for at least a 2-hour stabilization period or such shorter period as may be required to achieve stabilized readings of water loss over three consecutive 15-minute periods. This allows air to escape and absorption to take place.

(F) Fill the sanitary sewer service line or sanitary sewer collection line to the reference mark and continue the test for at least 1 hour. Maintain the minimum head throughout the test, adding any volume of water required and including that volume in the leakage.

(G) Convert the calculated leakage to gallons per inch of pipe diameter per mile per day.

(H) Gravity sanitary sewer collection lines including manholes shall not exceed leakage of 200 gallons per inch of pipe diameter per mile per day.

(2) Air Testing

(A) Procedures

(i) Determine the test time for the section of line to be tested using Table 10-3 or Table 10-4 or the formulas in Chart 10-1.

(ii) Plug all openings in the test section.

(iii) Add air until the internal pressure of the line is raised to approximately 4.0 pounds per square inch (psi) greater than the average pressure of any groundwater. After this pressure is

reached, allow the pressure to stabilize. The pressure will normally drop as the air temperature stabilizes. This usually takes 2 to 5 minutes depending on the pipe size. The pressure may be reduced to 3.5 psi before starting the test.

(iv) When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi above the pipe start the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test. If a 1.0 psi drop does not occur within the test time, the line has passed the test.

(B) Test Time

(i) Table 10-3 shows the required test time, T, in minutes per 100 feet of pipe for each nominal pipe size. Test times are for a 1.0 psi pressure drop from 3.5 to 2.5 psi. Table 10-3 has been established using the formulas contained in Chart 10-1.

(ii) If the section of line to be tested includes more than 1 pipe size, calculate the test time for each size and add the test times to arrive at the total test time for the section.

(iii) It is not necessary to hold the test for the whole period when it is clearly evident that the rate of air loss is less than the allowable.

Table 10-3
Minimum Test Time for Various Pipe Sizes

Nominal Pipe Size in inches	T (time) minutes per 100 feet	Nominal Pipe Size in inches	T (time) minutes per 100 feet
3	0.2	21	3.0
4	0.3	24	3.6
6	0.7	27	4.2
8	1.2	30	4.8
10	1.5	33	5.4
12	1.8	36	6.0
15	2.1	39	6.6
18	2.4	42	7.3

Chart 10-1
Formulas and Allowable Air Loss Standards

Calculate the required test time at a given allowable air loss as follows:

$$T = (K)[(D^2)(L) \div (Q)]$$

Calculate air loss with a timed pressure drop as follows:

$$Q = (K)[(D^2)(L) \div T]$$

Where:
D = nominal size in inches;
L = length of line of 1 pipe size in feet;
K = 0.534×10^6 for S.I. units (International Standard of Units) or 0.371×10^3 for inch pound units;
Q = air loss in cubic feet per minute; and
T = time for pressure to drop 1.0 pound per square inch in minutes

(C) An appropriate allowable air loss, Q, in cubic feet per minute, has been established for each nominal pipe size. Based on field experience, the Q value that has been selected will enable detection of any significant leak. Table 10-4 lists the Q established for each pipe size.

Table 10-4
Allowable Air Loss for Various Pipe Sizes

Nominal Pipe Size in Inches	Q ft^3/min	Nominal Pipe Size in Inches	Q ft^3/min
3	2.0	21	5.5
4	2.0	24	6.0
6	2.0	27	6.5
8	2.0	30	7.0
10	2.5	33	7.5
12	3.0	36	8.0
15	4.0	39	8.5
18	5.0	42	9.0

(D) The air test shall, at a minimum, conform to the test procedure described in ASTM C 828-86 for clay pipe, ASTM C 924 for concrete pipe, and ASTM F 1417 for plastic pipe.

(3) A designer may present other methods for conducting leakage testing to the Secretary for approval prior to conducting the test.

(p) Thirty or more days following final backfill of the sanitary sewer collection line, the following tests shall be performed:

(1) Deflection tests shall be performed on all flexible sanitary sewer collection lines to verify the following requirements are met:

(A) No pipe shall exceed a deflection of 5 percent. If deflection exceeds 5 percent, the pipe shall be excavated. Replacement or correction shall be accomplished in accordance with requirements in the approved specifications.

(B) The rigid ball or mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or average inside diameter of the pipe depending on which diameter is specified in the ASTM Specification, including the appendix, to which the pipe is manufactured. The test shall be performed without mechanical pulling devices.

(2) The sanitary sewer collection line shall be tested for alignment to verify the following requirements are met:

(A) Each segment of pipe between manholes shall pass a lamp test for correctness of horizontal and vertical alignment.

(B) Water shall be introduced into each pipe segment with no standing water observed during the test.

(C) If the collection line fails the alignment test, the pipe shall be excavated. Replacement or correction shall be accomplished in accordance with requirements in the approved specifications.

§ 1-1004 Requirements for Sanitary Sewer Manholes

(a) Required locations for manholes in sanitary sewer collection lines

(1) Manholes shall be installed:

(A) at the end of each sanitary sewer collection line;

(B) at all changes in grade, size or alignment;

(C) at all intersections; and

(D) at distances not greater than 400 feet except manholes may be spaced at distances of 600 feet:

(i) for municipal sanitary sewer collection lines, when the municipality has the equipment capable of cleaning the sewer for 600 feet and submits a letter to the Secretary verifying ownership of the equipment: or

(ii) for a privately owned sanitary sewer collection line, if a municipality submits a letter to the Secretary indicating its intent to take over ownership or control of the line upon completion of construction and verifying that it has the equipment capable of cleaning the sewer for 600 feet.

(2) Notwithstanding Subsection (a)(1), when the sanitary sewer service line or sanitary sewer collection line is carrying only effluent, the Secretary may approve greater distances between manholes than that specified in Subsection (a)(1). In determining whether to authorize greater distances the Secretary shall consider the following factors:

(A) the diameter of the sanitary sewer collection line; and

(B) availability of cleaning equipment.

(b) Required diameter of manholes

(1) The minimum diameter of manholes shall be 48 inches; large diameters are preferred for connection to large diameter sewers.

(2) A minimum access diameter of 24 inches shall be provided.

(3) Larger access diameters may be required by VOSHA to meet confined space entry procedures.

(c) Requirements for drop manholes:

(1) A drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole bottom.

(2) Where the difference in elevation between the incoming sanitary sewer collection line or sanitary sewer service line and the manhole bottom is less than 24 inches, the bottom shall be filleted to prevent deposition of solids.

(3) Outside drop connections, due to the unequal earth pressures that would result from the backfilling operation in the vicinity of the manhole, shall have the entire outside drop connection encased in concrete.

(4) Inside drop connections, when necessary, shall be secured to the interior wall of the manhole. Where inside drops are used, the manhole diameter shall be increased to 60 inches to allow adequate access for cleaning and maintenance except when a municipality requests an inside drop to an existing manhole that has a minimum diameter of 4 feet.

(d) Flow channels shall be provided in the base of all manholes. The flow channel through manholes shall:

(1) conform in shape and slope to that of the sanitary sewer collection line or sanitary sewer service line entering and exiting the manhole;

(2) be constructed so that the flow at peak conditions will remain in the flow channel; and

(3) for curved flow channels, slope through the manhole shall be increased to maintain the necessary velocities.

(e) Manholes shall include a bench that meets the following requirements:

(1) A bench shall be provided on each side of a manhole flow channel.

(2) The bench shall have a slope of:

(A) no less than 0.5 inch per foot; and

(B) no greater than 1.0 inch per foot.

(3) No sewer shall discharge onto the surface of the bench.

(f) Manholes shall be constructed using the following material.

(1) Manholes shall be of the precast concrete or poured in place concrete type.

(2) Manholes shall be waterproofed on the exterior.

(3) Inlet and outlet pipes shall be joined to the manhole with a flexible watertight gasket that allows differential settlement of the pipe and manhole wall to take place.

(4) A watertight connection using non-shrink mortar that allows differential settlement of the pipe and manhole wall to take place is acceptable when connecting a new sanitary sewer service line or sanitary sewer collection line to

an existing manhole when it is impractical to make the connection using a gasketed flexible watertight connection.

(5) Watertight manhole covers shall be used wherever the manhole tops may be flooded by street runoff or high-water.

(6) After the manhole has been assembled in place, all lifting holes, whether or not the holes penetrate through the manhole, depressions and exterior joints shall be filled and pointed with non-shrinking mortar or other comparable material.

(g) Where groundwater may affect the buoyancy of a manhole, appropriate construction specifications to prevent movement of the manhole shall be provided.

(h) Upon completion of construction of a manhole, leakage testing of manholes shall be performed in accordance with one of the following procedures.

(1) Water (Hydrostatic) Leakage Testing

(A) All pipes and other openings into the manhole shall be suitably plugged to prevent blowout.

(B) Each manhole shall be checked for exfiltration by filling with water to the top of the cone section.

(i) A stabilization period of 1 hour shall be provided to allow for absorption.

(ii) At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and the measuring time of at least 6 hours begins.

(iii) At the end of the test period, the manhole shall be refilled to the top of the cone measuring the volume of water added.

(C) The volume of water in (B) needed to refill the manhole shall be converted to a 24-hour rate and the leakage determined on the basis of depth.

(D) The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period for exfiltration and there shall be no visible infiltration.

(E) If more than 1 gallon per vertical foot for a 24-hour period for exfiltration occurs or there is visible infiltration within the test period, the manhole failed the test and shall be repaired or reconstructed and retested.

(2) Vacuum Leakage Testing

(A) Manholes that have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing.

(B) All pipes and other openings in the manhole shall be plugged in a manner to prevent displacement.

(C) A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to a pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

(D) Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of the air shall then be stopped and the test time begun. The vacuum drop shall not exceed 1 inch of mercury over the period of time as follows:

(i) 0 to 10-foot deep manholes – 2 minutes;

(ii) greater than 10 feet to 15-foot deep manholes – 2.5 minutes; or

(iii) greater than 15-foot deep manholes – 3 minutes.

(E) If more than 1 inch of drop in vacuum occurs within the test period, the manhole failed the test and shall be repaired or reconstructed and retested.

(F) Air testing of concrete sewer manholes may conform to the test procedures described in ASTM C 1244.

(3) Following satisfactory test results, the manhole may be backfilled.

§ 1-1005 Requirements for Inverted Siphons

Inverted siphons shall:

(1) Have not less than 2 barrels with a minimum pipe size of 6 inches.

(2) Have inlet and discharge structures

(A) with adequate clearances for cleaning equipment, inspection, and flushing (vented manholes are recommended); and

(B) that are arranged so that the design flow is diverted to 1 barrel and so that either barrel may be cut out of service for cleaning.

(3) Provide sufficient head and appropriate pipe sizes to secure re-suspension velocities of at least 3.0 feet per second for design average flows to prevent settling in pipes.

(4) Have a vertical alignment that allows cleaning and maintenance.

§ 1-1006 Design Standards for Sanitary Sewer Collection Lines and Sanitary Sewer Service Lines Under and Over Surface Waters

(a) Sanitary sewer collection lines and sanitary sewer service lines shall:

(1) be designed to avoid stream crossings when possible;

(2) minimize the number of stream crossings when stream crossings are needed; and

(3) when crossing a stream, be designed to cross under the stream as nearly perpendicular to the stream flow as possible.

(b) The horizontal location of sanitary sewer collection lines and sanitary sewer service lines along streams shall be sufficiently far from the stream to:

(1) allow for meander belt of the stream as required by the Watershed Management Division;

(2) allow for possible future widening of the stream due to bank erosion;

(3) prevent discharges into the stream of dirt, silt or other substances during construction; and

(4) allow future access for repair and maintenance of the line without entering the stream.

(c) Sanitary sewer collection lines and sanitary sewer service lines crossing under streams shall meet the following requirements:

(1) Sanitary sewer collection lines and sanitary sewer service lines shall be at a sufficient depth below the natural bottom of the stream bed to protect the lines.

(2) When the line is located in bedrock beneath a stream, a minimum of 1 foot of cover is required.

(3) When the line is not located in bedrock beneath a stream a minimum of 3 feet of cover is required.

(4) When the line is under a paved stream channel, the top of the line shall be placed below the bottom of the channel pavement.

(d) Construction materials for sanitary sewer collection lines and sanitary sewer service lines crossing under streams shall be:
(1) ductile iron pipe with restrained joints constructed so the line will remain watertight and free from changes in alignment or grade; and
(2) stone, coarse aggregate, washed gravel, or other materials for the backfill of the sewer trench that will not readily erode, cause discharges of dirt, silt or other materials, damage pipe during placement, or corrode the line.

(e) Manholes for sanitary sewer service lines or sanitary sewer collection lines crossing under or over streams shall:
(1) not be located within the stream channel; and
(2) be located so they do not interfere with the free discharge of flood flows of the stream.

(f) Sanitary sewer service lines or sanitary sewer collection lines crossing aerially over streams shall meet the following requirements.
(1) Ductile iron pipe with restrained mechanical joints is required for all aerial sanitary sewer collection line crossings.
(2) Support shall be provided for all joints in pipes utilized for aerial crossings. The supports shall be designed to prevent thermal expansion, vibration, frost heave, overturning, settlement or loads that may adversely affect the structural integrity of the support.
(3) Precautions against freezing, such as insulation and increased slope, shall be included with the design of an aerial crossing.
(4) Expansion jointing shall be used between above ground and below ground sanitary sewer collection lines.
(5) The impact of flood waters and debris shall be considered.
(A) When the line is not attached to a road, highway, or railroad bridge, the bottom of the pipe shall be placed no lower than the elevation of the 100-year flood.
(B) When the line is attached to a road, highway, or railroad bridge:
(i) the bottom of the pipe shall be placed above the required bottom elevation of the bridge; and
(ii) the pipe shall be attached to a support beam that is the least exposed to the flow of the flood waters.

§ 1-1007 Separation of Sanitary Sewer Service Lines and Sanitary Sewer Collection Lines from Water Mains, Water Service Lines and Water Service Pipes

(a) Horizontal Isolation Distances from Water Mains, Water Service Lines, and Water Service Pipes
(1) All portions of a sanitary sewer collection line and sanitary sewer service line shall be at least 10 feet horizontally from all portions of a proposed, existing, or permitted water mains, except where site conditions prevent obtaining the 10-foot separation and one of the following requirements is met:

(A) The sanitary sewer collection line or sanitary sewer service line shall be water works grade 150 pounds per square inch pressure rated pipe meeting AWWA standard C-900 or equivalent pipe and pressure tested to 150 pounds per square inch to assure watertightness.

(B) The bottom of the water main shall be at least 18 inches above the top of the sanitary sewer collection line or sanitary sewer service line and the water main is in a separate trench or on an undisturbed soil shelf in the sewer trench.

(2) All portions of a sanitary sewer collection line and sanitary sewer service line shall be at least 10 feet horizontally from all portions of a proposed, existing, or permitted water service line or water service pipe, except when one of the following requirements is met:

(A) The water service line or water service pipe shall be sleeved with pipe materials approved by the Vermont Plumbing Rules, and:

(i) if the sleeves terminate below ground, the ends of the sleeve are sealed to be watertight; or

(ii) if the sleeves terminate above finished slab or in a basement, the ends of the sleeve are sealed to be watertight or left open.

(B) The water service line or water service pipe shall be in a separate trench or an undisturbed soil shelf in the sewer trench and one of the following requirements is met:

(i) the bottom of the water service line or water service pipe shall be at least 18 inches above the top of the sanitary sewer collection line or sanitary sewer service line; or

(ii) the sanitary sewer collection line or sanitary sewer service line shall be water works grade 150 pounds per square inch pressure rated pipe meeting AWWA standard C-900 or equivalent pipe and pressure tested to 150 pounds per square inch to assure watertightness.

(b) Vertical Separation and Crossings for Water Mains, Water Service Lines, and Water Service Pipes

(1) Sanitary sewer collection lines and sanitary sewer service lines crossing above proposed, existing, or permitted water mains shall be laid so the bottom of the collection line or service line is 18 inches above the top of the water main with the joints of the collection line or service line equal distance from the crossing, except where site conditions prevent obtaining the 18-inch separation and one of the following requirements is met:

(A) The sanitary sewer collection line or sanitary sewer service line shall be sleeved to a point 10 horizontal feet from the center line of the crossing.

(B) The sanitary sewer collection lines and sanitary sewer service lines shall:

(i) be water works grade 50 pounds per square inch pressure rated pipe meeting AWWA standard C-600 or equivalent pipe and be pressure tested to 150 pounds per square inch to assure watertightness; and

(ii) the sanitary sewer collection line shall be provided structural support, such as sleeving of the sanitary sewer, that will extend

beyond the trench excavation for the water service line or water service pipe.

(2) Sanitary sewer collection lines and sanitary sewer service lines crossing below proposed, existing, or permitted water mains shall be laid so the top of the collection line or service line is 18 inches below the bottom of the water main, except when one of the following requirements are met:

(A) The sanitary sewer collection lines and sanitary sewer service lines shall: be water works grade 150 pounds per square inch pressure rated pipe meeting AWWA standard C-600 or equivalent pipe and pressure tested to 50 pounds per square inch to assure watertightness.

(B) The sanitary sewer collection line or sanitary sewer service line shall be sleeved to a point 10 horizontal feet from the center line of the crossing.

§ 1-1008 Requirements for Wastewater Pump Stations

(a) General requirements for wastewater pump stations:

(1) There shall be no physical connection between any potable water supply and a wastewater pump station.

(2) Pump stations with a design flow of 2000 gallons per day or larger shall be readily accessible by maintenance vehicles during all weather conditions.

(3) Pump station structures and electrical and mechanical equipment shall be protected from physical damage from a 100-year flood.

(4) Pump stations shall remain fully operational and accessible during a 25-year flood.

(5) Exterior access hatches shall be provided with locks.

(6) Where it is necessary to pump wastewater prior to grit removal, the wet well and pump station piping shall be designed to avoid operational problems from the accumulation of grit.

(7) Pump stations shall not be located within a building or structure except when the pump station is considered interior plumbing by the Vermont Plumbing Rules.

(b) The design of a combination wet and dry well pump station, a submersible pump station, and a suction lift wastewater pump station shall meet the following additional requirements:

(1) Wastewater Pump Station Construction Materials

(A) Materials shall be selected that are appropriate under conditions of exposure to hydrogen sulfide and other corrosive gases, greases, oils, and other constituents frequently present in wastewater. This is particularly important in the selection of metals and paints.

(B) Contact between dissimilar metals should be avoided. If contact cannot be avoided the design shall include provisions to minimize galvanic action.

(C) Pump stations shall be watertight. All inlet and outlet pipes penetrations shall:

(i) for concrete tanks, be made with flexible rubber boots; or

(ii) for plastic or fiberglass tanks, be made with watertight rubber grommets.

(2) The designer is responsible for ensuring the pump station, when it is located in the seasonal high groundwater, is provided proper anchors to prevent movement of the station.

(3) Dry wells

(A) Dry wells, including their superstructure, shall:

(i) be completely separate from the wet well;

(ii) have all common walls with the wet well be water and gas tight;

(iii) not provide access to the wet well; and

(iv) for the pump equipment compartment dry well, be above grade or offset to the wet well.

(B) Dry wells shall have a sump with a sump pump to remove leakage or drainage. Dry wells shall be designed so that the sump pump:

(i) is equipped with dual check valves;

(ii) discharges the contents of the sump to the wet well;

(iii) has a pump discharge pipe terminating above the maximum high-water elevation of the wet well;

(iv) discharges all seal leakage via a pipe or channel directly to the sump; and

(v) is sized to remove the maximum pump seal water discharge that would occur in the event of a pump seal failure.

(4) Wet Wells

(A) Size

(i) The design fill time and minimum pump cycle time shall be taken into account when sizing the wet well.

(ii) The effective volume of the wet well shall be based on design flow and a filling time not to exceed 30 minutes unless the facility uses flow equalization.

(iii) The pump manufacturer's duty cycle recommendations shall be used to determine the minimum cycle time.

(B) Access openings to the wet well:

(i) shall be at least 24 inches in diameter; and

(ii) shall have gasketed replacement plates maintained on site to cover the access opening to the wet well in the event that the existing cover plate needs replacing after its removal.

(C) Floor Slope

(i) The wet well floor shall have a minimum slope of 1 to 1 to the hopper bottom.

(ii) The horizontal area of the hopper bottom shall be not greater than necessary for proper installation and function of the inlet.

(D) Air Displacement (Venting)

(i) Covered wet wells shall have provisions for air displacement to the atmosphere such as an inverted "j" tube or similar means.

(5) Ventilation

(A) General

(i) Adequate ventilation shall be provided for all pump stations. Where the dry well is below ground surface, mechanical ventilation is required.

(ii) If screens or mechanical equipment requiring maintenance or inspection are located in the wet well, permanently installed ventilation is required.

(iii) There shall be no interconnection between the wet well and dry well ventilation systems.

(B) Air Inlets and Outlets

(i) In dry wells over 15 feet deep, multiple inlets and outlets are desirable.

(ii) Dampers shall not be used on exhaust or fresh air ducts.

(iii) Fine screens or other obstructions in air ducts shall be avoided to prevent clogging.

(C) Electrical Controls

(i) All intermittently operated ventilation equipment shall be interconnected with the respective pit lighting system.

(ii) The manual lighting/ventilation switch shall override the automatic controls.

(D) Fans, Heating, and Dehumidification

(i) The fan wheel shall be fabricated from non-sparking material.

(ii) Automatic heating and dehumidification equipment shall be provided in all dry wells.

(iii) The electrical equipment and components shall meet the requirements in Subsection (f)(1) and (2).

(E) Dry Well Ventilation

(i) Ventilation may be either continuous or intermittent.

(I) If continuous, there shall be at least 6 complete air changes per hour.

(II) If intermittent, there shall be at least 30 complete air changes per hour.

(ii) A system of 2 speed ventilation with an initial ventilation rate of 30 changes per hour for 10 minutes.

(iii) The air change requirements shall be based on 100 percent fresh air.

(F) Wet Well Ventilation

(i) Ventilation may be either continuous or intermittent.

(I) If continuous, it shall provide at least 12 complete air changes per hour.

(II) If intermittent, it shall provide at least 30 complete air changes per hour.

(ii) Air shall be forced into the wet well by mechanical means rather than solely exhausted from the wet well.

(iii) The air change requirements shall be based on 100 percent fresh air.

(iv) Portable ventilation equipment shall be provided for use at submersible pump stations and wet wells with no permanently installed ventilation equipment.

(v) For submersible pump stations receiving less than 2000 gallons per day design flow, gravity ventilation is acceptable.

(vi) All wet wells shall have provisions for air displacement to the atmosphere such as an inverted "j" tube or similar means. Vents shall:
(I) open downward;
(II) terminate 24 inches above ground surface; and
(III) have a 24 mesh non-corrodible screen covering the vent opening.

(c) The design of pumps shall meet the following requirements:
(1) Protection Against Clogging
(A) Sanitary sewer collection lines that accept wastewater and stormwater shall have:
(i) pumps capable of handling the combined wastewater and stormwater;
(ii) pump screening;
(iii) trash racks;
(iv) grinders; or
(v) a combination of the components described in Subsection (c)(1)(A)(ii), (iii) and (iv) to protect the pumps.
(B) Sanitary sewer collection lines that are 30-inch or larger in diameter that accept only wastewater shall include the components identified in Subsection (1)(A)(ii), (iii), (iv) or (v).
(2) Wastewater pump stations receiving a design flow of less than 2000 gallons per day:
(A) may be equipped with a single pump provided that replacement pumps are readily available; and
(B) shall have one day's emergency storage above the high-water alarm level in the wet well.
(3) Multiple Pumps
(A) Wastewater pump stations receiving an average design flow of 2000 gallons per day or more shall have multiple pumping units.
(B) Multiple pumping units shall have the capacity so that, if any single unit is out of service, the remaining units will have the capacity to handle the peak hourly flow rate.
(4) For pumps handling raw or untreated wastewater, except where grinder pumps are used:
(A) the pumps shall be solid handling capable of passing spheres of at least 3 inches in diameter; and
(B) pump suction and discharge piping shall be at least 4 inches in diameter.
(5) Pumps handling only settled wastewater shall be capable of passing 1½ inch spheres.
(6) The pump shall be placed so that, under normal operating conditions, it will operate under a positive suction head except as specified in Subsection (c)(12).
(7) Intake
(A) Each pump shall have an individual intake.
(B) Wet wells shall be designed to avoid turbulence near the intake and to prevent vortex formation.
(C) Piping shall be as straight and short as possible.

(D) Where turned down bellmouth inlets or submersible pumps are used, the bottom of the intake shall be placed a sufficient distance above the wet well floor to minimize inlet head losses but close enough to the wet well floor to assure inlet velocities sufficient to prevent solids deposition.

(8) Pumping Rates for Pump Stations Receiving 2000 gallons or more of Wastewater Per Day

(A) The pumps and controls of main pump stations shall be selected to operate at varying delivery rates.

(B) When possible, such stations shall be designed to deliver as uniform a flow as is technically practical in order to minimize hydraulic surges.

(C) The station design capacity shall be based on the peak hourly flow rate as determined by § 1-1003(c)(2) and be adequate to maintain a minimum velocity of 2 feet per second in the force main.

(9) Pump Controls

(A) Bubbler type level monitoring systems shall include dual air compressors.

(B) Provision shall be made to automatically alternate the pumps when there are multiple pumps in use.

(C) The second pump "on" level and "alarm on" level shall be at the same elevation when there are multiple pumps in use.

(10) Valves

(A) Suction Line

(i) Suitable shutoff valves shall be placed on the suction line of dry pit pumps.

(B) Discharge Line

(i) Suitable shutoff and check valves shall be placed on the discharge line of each pump.

(ii) The check valve shall be located between the shutoff valve and the pump.

(iii) Valves shall be capable of withstanding normal pressure and water hammer.

(C) Location of Valves

(i) All shutoff and check valves shall be operable from the floor level and accessible for maintenance. Outside levers are recommended on swing check valves.

(ii) Valves, except for valves associated with pump stations with a single pump, shall not be located in the wet well but shall be in a separate valve pit adjacent to the wet well. The valve pit shall:

(I) contain a valve connection to allow the use of a portable pump for the pump station; and

(II) be designed to remove or drain accumulated water from the valve chamber. The valve pit shall be dewatered to the wet well through a drain line with a gas and watertight valve or be dewatered using a sump pump that discharges the water to the wet well. The design shall include an effective method of preventing wastewater from entering the pit during surcharged wet well conditions.

(III) Valves associated with a pump station with a single pump shall be accessible without needing to enter the station.

(iii) Check valves that are integral to the pump and would be removed from the wet well with the pump do not need to be located in a separate valve chamber.

(iv) Valves may be located in wet wells only where single pump units are allowed. Valves shall be accessible without entering the wet well.

(11) Submersible Pumps – Special Requirements

(A) Submersible pumps shall be easily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well except when allowed for pump stations with a single pump.

(B) Submersible pumps and motors in a pump station not receiving septic tank effluent shall be designed specifically for raw or untreated wastewater use including totally submerged operation during a portion of each pumping cycle and shall meet the requirements of the National Electrical Code for such units. An effective method to detect shaft seal failure or potential seal failure shall be included in the design.

(C) Submersible pumps shall have a minimum pump run time of 5 minutes except when the Rules allow or require a pump time of less than 5 minutes, such as in § 1-914, § 1-915, § 1-916, and § 1-923.

(12) Suction-Lift Pumps – Special Pump Priming and Lift Requirements

(A) Suction-lift pumps shall be either self-priming or vacuum-primed.

(B) Calculations must include:

(i) static suction-lift as measured from "lead pump off" elevation to center line of pump suction;

(ii) friction and other hydraulic losses of the suction piping;

(iii) vapor pressure of the liquid;

(iv) altitude correction;

(v) required net positive suction head; and

(vi) an additional 6 feet of head.

(C) Self-Priming Pumps

(i) Self-priming pumps shall be capable of rapid priming and re-priming at the "lead pump on" elevation.

(ii) Such self-priming and re-priming shall be accomplished automatically under design flow operating conditions.

(iii) Suction piping shall not exceed the size of the pump suction and shall not exceed 25 feet in total length.

(iv) Priming lift at the "lead pump on" elevation shall include a minimum of 4 additional feet from the maximum allowable priming lift for the specific equipment at design flow operating conditions.

(v) The combined total of dynamic suction-lift at the "pump off" elevation and required net positive suction head at design flow operating conditions shall not exceed 22 feet.

(D) Vacuum-Priming Pumps

(i) Vacuum-priming pump stations shall be equipped with dual vacuum pumps capable of automatically and completely removing air from the suction-lift pump.

(ii) The vacuum pumps shall be adequately protected from damage due to wastewater.

(iii) The combined total of dynamic suction-lift at the "pump off" elevation and required net positive suction head at design flow operating conditions shall not exceed 22 feet.

(E) Suction-lift pump stations using dynamic suction lifts exceeding the limits outlined in Subsection (c)(12)(C) and (D) may be used when the designer has the manufacturer's certification of pump performance and made calculations that indicate satisfactory performance under the proposed design flow operating conditions.

(d) Requirements for Flow Measurement

(1) Suitable devices for measuring wastewater flow shall be provided at all pump stations except as provided in Subsection (d)(3). Indicating, totalizing, and recording flow measurement meters shall be provided at pump stations with a peak hourly flow rate of 1200 gallons per minute or greater.

(2) Elapsed time meters used in conjunction with annual pumping rate tests may be acceptable for pump stations with a peak hourly flow rate up to 1200 gallons per minute, provided sufficient metering is configured to measure the duration of individual and simultaneous pump operation.

(3) Pump stations with a single pump receiving less than 2000 gallons of wastewater per day are exempt from the requirements of this Subsection.

(e) Requirements for Equipment Removal

(1) The design shall facilitate removal of pumps, motors, and other mechanical and electrical equipment.

(2) When there are multiple pumps, individual pump and motor removal shall not interfere with the continued operation of remaining pumps.

(3) Submersible pumps shall be easily removable and replaceable without personnel entering or dewatering the wet well or, for pump stations with multiple pumps, disconnecting any piping in the wet well.

(4) Pump stations with a single pump may allow pump removal using the discharge pipe from the pump, provided the coupling that allows the disconnection to the force main is accessible without entering the wet well.

(5) For suction-lift or vacuum primed pump stations, the following requirements shall be met:

(A) The pump equipment compartment shall be above grade or offset and shall be isolated from the wet well to prevent a hazardous and corrosive sewer atmosphere from entering the equipment compartment.

(B) Wet well access shall not be through the equipment compartment and shall be at least 24 inches in diameter.

(C) Gasketed replacement plates shall be maintained on site to cover the opening to the wet well in the event that the existing cover plate needs replacing when a pump unit is removed for servicing.

(f) Requirements for Electrical Equipment

(1) Electrical systems and components (e.g. motors, lights, cables, conduits, switchboxes, control circuits, etc.) in raw or untreated wastewater wet wells, or in

enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapors may be present shall comply with the National Electrical Code® for Class I, Division 1, Group D, locations.

(2) Equipment located in the wet well shall be suitable for use under corrosive conditions.

(A) Each flexible cable shall be provided with a watertight seal and separate strain relief.

(B) A fused disconnect switch located above ground shall be provided for all pump stations.

(C) Lightning and surge protection systems shall be provided.

(D) A 110-volt power receptacle to facilitate maintenance shall be located inside the control panel for pump stations that have control panels outdoors.

(E) Ground Fault Circuit Interruption (GFCI) protection shall be provided for all outdoor outlets.

(3) Submersible Pump Stations – Special Requirements

(A) Power Supply and Control Circuitry

(i) Electrical supply, control, and alarm circuits shall be designed to provide strain relief and to allow disconnection from outside the wet well.

(ii) Terminals and connectors shall be protected from corrosion by location outside the wet well or through use of watertight seals.

(B) Controls

(i) The motor control center shall be:

(I) located outside the wet well;

(II) easily accessible; and

(III) protected by a conduit seal or other appropriate measures meeting the requirements of the National Electrical Code to prevent the atmosphere of the wet well from entering the control center.

(ii) The conduit seal shall be located so that the pump may be removed and electrically disconnected without disturbing the conduit seal.

(iii) When the control center is exposed to weather, it shall meet the requirements of weatherproof equipment of NEMA 3R or 4.

(C) Power Cord

(i) Pump motor power cords shall be designed for flexibility and serviceability under conditions of extra hard usage and shall meet the requirements of the National Electrical Code standards for flexible cords in wastewater pump stations.

(ii) Ground fault interruption protection shall be used to de-energize the circuit in the event of any failure in the electrical integrity of the cord.

(iii) Power cord terminal fittings shall be:

(I) corrosion-resistant;

(II) constructed in a manner to prevent the entry of moisture into the cord;

(III) include strain relief appurtenances; and

(IV) designed to facilitate field connecting.

(g) Requirements for Emergency Storage

(1) Emergency storage shall be provided for all pump stations except for pump stations:

(A) that have:

(i) a permanent independent engine generator that has sufficient capacity to start up and maintain the total rated running capacity of the pumps when the generator automatically starts up when there is a power outage; or

(ii) alternate electrical power source for electrically driven pumps; and

(B) where there are no down-stream pump stations that rely on storage.

(2) Storage shall be provided above the high-water alarm level of the wet well.

(A) Storage may be provided in the wet well, or in an adjacent tank that is designed to drain back into the wet well.

(B) For pump stations with multiple pumps, the volume of storage shall equal the design flow for a period in excess of the longest power outage in the last 5 years that would have affected the pump station or the design flow based on a 16-hour delivery rate divided by 4 hours, whichever is greater.

(C) Emergency storage shall be a minimum of one day of the design flow for all pump stations with a single pump.

(D) The emergency storage volume may overflow into the connecting sanitary sewer service line or sanitary sewer collection line provided the wastewater does not:

(i) back up into building basements or fixtures;

(ii) back up into septic tanks; or

(iii) flow over the top of manholes or the wet well.

(h) Requirements for Alarm Systems

(1) Pump station alarm systems shall have a backup power source.

(2) The alarm, at a minimum, shall be activated in cases of:

(A) power failure;

(B) dry well sump high-water elevation;

(C) wet well high-water elevation;

(D) low water wet well level;

(E) pump failure;

(F) other causes of pump station malfunction;

(G) standby power failure; and

(H) except for a pump station with a single pump, unauthorized entry.

(3) Audio and visual alarms shall be located outside the pump station.

(4) Pump stations with a single pump shall be provided an audio and visual alarm located at the pump station that is activated by the high-water elevation.

§ 1-1009 Requirements for Force Mains

(a) Force mains shall meet the following requirements:

(1) Layout:

(A) Looping force main piping is prohibited.

(B) Pipe routing shall include long radius sweeps no less than those recommended by the pipe manufacturer.

(2) The force main shall be sized to maintain a minimum hydraulic velocity of 2.0 feet per second with one pump on.

(3) The minimum force main size shall be 1½ inch diameter when using a grinder pump.

(4) The minimum force main diameter for raw or untreated wastewater shall be 4 inches.

(5) An automatic air relief valve shall be placed at high points in the force main to prevent air locking.

(6) Vacuum relief valves may be necessary to relieve negative pressures on force mains. The force main configuration and head conditions shall be evaluated as to the need for and placement of vacuum relief valves.

(7) Air or vacuum relief valves shall be located in a manhole or structure to allow access for repair and maintenance.

(8) Maintenance Valves, Cleanouts, Isolation Valves, and Check Valves

(A) Isolation valves shall be installed where one force main connects into a second force main.

(B) Cleanouts shall be installed every 1500 to 2000 feet in all force mains.

(C) A valve box with a redundant check valve or equivalent shall be located:

(i) at the property line to protect buildings or structures from flooding when the building or structure connects to a pressure force main; or

(ii) on each force main upstream of the connection where 2 force mains join together.

(D) Isolation valves shall be provided on either side of a check valve so that the check valve can be removed for maintenance, repair or replacement.

(9) Force mains shall enter a gravity sanitary sewer manhole:

(A) at a point not more than 1 foot above the flow line of the receiving manhole: and

(B) so that flow is directed in a manner that protects the manhole and sewer line from scouring.

(10) Pipe Material

(A) Acceptable pipe material includes Class 200, SDR 21 PVC ; Class 160, SDR 26 or greater; or HDPE SDR 11 or equivalent.

(B) Pipe and joints shall be equal to piping and joints used for water mains.

(11) Force mains and fittings, reaction blocking, and pump station piping shall be designed to withstand water hammer pressures and associated cyclic reversal of stresses that are expected with the cycling of wastewater pump stations.

(12) Friction losses in force mains shall be based on the Hazen Williams formula or other acceptable method. When the Hazen and Williams formula is used, the value for "C" shall be:

(A) 100 for unlined iron or steel pipe for design; and

(B) for other smooth pipe materials, such as PVC, polyethylene, lined ductile iron, etc., a higher "C" value not to exceed 120 may be allowed for design.

(13) Force mains shall comply with § 1-1007 for separation to water services lines, water service pipes, or water mains.

(14) Where force mains are constructed of material which might cause the force main to be confused with water services lines, water service pipes, or water mains, the force main shall be appropriately identified.

(b) Upon completion of construction of a force main, the force main shall be pressure and leakage tested to ensure there are no leaks.

(1) Pressure Test

(A) All newly laid pipe or any valved section thereof shall be subjected to a hydrostatic pressure of at least 1.5 times the highest working pressure in the section in accordance with the following procedure:

(i) Test pressures shall:

(I) not be less than 50 pounds per square inch at the highest point along the test section;

(II) not exceed pipe or thrust restraint design pressures;

(III) be of at least 2-hour duration;

(IV) not vary by more than 5 pounds per square inch; and

(V) not exceed twice the rated pressure of the valves when the pressure boundary of the test section includes closed gate valves.

(B) Each valved section of pipe shall be filled with water slowly and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to test gauge, shall be applied by means of a pump connected to the pipe.

(C) Before applying the specified test pressure, air shall be expelled completely from the pipe and valves.

(D) All exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, or valves that are discovered following the pressure test shall be repaired or replaced with sound material and the test shall be repeated.

(2) Leakage Test

(A) A leakage test shall be conducted concurrently with the pressure test.

(B) Leakage shall be determined by the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 pounds per square inch of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled.

(C) No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$L = (N)(D)(\sqrt{P}) \div 7400$

where:

L is the allowable leakage, in gallons per hour;

N is the number of joints in the length of pipeline tested;

D is the nominal diameter of the pipe, in inches; and

P is the average test pressure during the leakage test, in pounds per square inch gauge.

(c) Force mains shall be covered with sufficient earth or other insulation to prevent freezing.

§ 1-1010 Requirements for Testing of Tanks for Watertightness

(a) Septic tanks, dosing siphons, holding tanks, pump stations, wastewater storage tanks, wet wells, and grease tanks shall be watertight.

(b) When required to be tested for watertightness by a permit, tanks shall be tested using the ASTM for testing of tanks or the following:

(1) For concrete tanks, complete one of the following tests:

(A) Using a water pressure test, seal the tank and risers, fill with water to the top of the risers, and let stand for 24 hours. Refill the tank. The tank is considered watertight if the water level is held for 1 hour.

(B) Using a vacuum test, seal the empty tank and risers and apply a vacuum to 2 inches (50 mm) of mercury. The tank is considered watertight if 90 percent of the vacuum is held for 2 minutes.

(2) For plastic or fiberglass tanks, fill the tank up to the top of the risers with water for 1 hour. The tank is considered watertight if there is no drop in the water level.

(3) For steel tanks, fill the tank up to the top of the risers with water for 1 hour. The tank is considered watertight if there is no drop in the water level.

Subchapter 11 – Specific Technical Standards for Potable Water Supplies

§ 1-1101 Use of Term Potable Water Supply

The term potable water supply as used in this Subchapter shall mean a potable water supply that includes a potable water source (i.e., as used in this Subchapter, the term potable water supply shall not include water service lines).

§ 1-1102 General Requirements for Potable Water Supplies and Water Service Lines

(a) Except when the potable water supply serves only one single-family residence, a potable water supply shall include a potable water source with a long-term yield that is capable of supplying the design rate necessary to accommodate the design flow associated with each component of the potable water supply.

(b) A building or structure shall be served by no more than one potable water source unless:
- (1) the Secretary determines, based on information provided by the applicant's designer, that more than one source is required to meet the design flow for the building or structure; or
- (2) none of the potable water supply presumptive isolation zones for the potable water sources serving the building or structure extend onto land owned by a person different than the owner of the building or structure.

(c) A potable water source shall either:
- (1) be demonstrated to have sufficient yield to meet the design rate without adversely interfering with existing or permitted public water sources or potable water sources through a long-term yield analysis conducted pursuant to the requirements of § 1-1107 and interference testing and analysis, if required, conducted pursuant to the requirements of § 1-1108; or
- (2) be demonstrated to have a high probability of yielding a sufficient quantity of water to meet the design rate without adversely interfering with existing or permitted public water sources or potable water sources based on the yields of surrounding wells.

(d) A surface water potable water source shall meet the following requirements:
- (1) A surface water potable water source shall serve only one building or structure that is a single-family residence occupied by the owner of record. The single-family residence may include a home occupation as that term is defined in these Rules but the residence may not be used in any other way, including uses that employ persons other than family members and involve visits by the public in a manner or duration that would presume the need for use of a potable water supply.
- (2) The only surface waters that may be used as potable water sources are lakes and ponds that the Watershed Management Division has determined to be not impaired and Lake Champlain, excluding St. Albans Bay, Missisquoi Bay, and portions from the Lake Champlain Bridge south. Streams shall not be used.

(e) The construction, installation, or hydrofracturing of a groundwater potable water source,

except the construction of a potable water supply using surface water, that is equal to or greater than 20 feet deep shall be performed by a well driller.

(f) The minimal working pressure in water service lines and water service pipes shall be:
(1) 35 pounds per square inch at the main if connecting to a public water system;
(2) 20 pounds per square inch at the ground level at the foundation wall; and
(3) 8 pounds per square inch at the highest elevation fixture.

§ 1-1103 Source Siting Requirements

(a) A potable water source shall not be located:
(1) In a floodway.
(2) In Zone 1 of a Public Community Water System Source Protection Area.
(3) In an area classified by the Secretary as a Class IV groundwater area unless the Secretary has authorized use of the groundwater as a source for a potable water supply under a reclassification order.

(b) A potable water source, located in a flood hazard area, shall be located, designed, and constructed in a manner that avoids impairment to the source and contamination of the source during flooding.

§ 1-1104 Horizontal Isolation Distances and Isolation Zones for Components of Potable Water Supplies

(a) Table 11-1 identifies the minimum horizontal isolation distance that all portions of each identified component of a potable water supply shall be located from all portions of the identified potential sources of contamination, unless the Secretary has authorized a reduction to the isolation distance or increased the isolation distance pursuant to Subsections (k) or (l).

(b) Isolation distances between potable water sources and injection wells required to have a permit that are within 1000 feet of each other shall be established on a case-by-case basis taking into consideration the following information provided by a designer:
(1) the contaminants expected from the injection well and their constituents;
(2) expected soil treatment; and
(3) site specific conditions including ground slope and groundwater flow direction.

(c) Isolation distances between potable water sources and a site listed on the hazardous sites list maintained by the Waste Management and Prevention Division of the Department that are within one third of a mile of each other shall be established on a case-by-case basis.

(d) Isolation distances between potable water sources, water service pipes, water service lines, and water storage tanks and potential sources of contamination not identified in Table 11-1 or in Subsections (b) or (c) shall be established on a case-by-case basis taking into consideration the following information provided by a designer:
(1) the potential contaminants and their constituents;
(2) expected soil treatment;

(3) site specific conditions including ground slope and groundwater flow direction; and

(4) design standards that may protect the source or service from contamination.

Table 11-1
Horizontal Isolation Distances, in Feet for Potential Sources of Contamination

Potential Source of Contamination	Potable Water Sources in Bedrock or Confined Surficial Aquifer	Potable Water Sources in Unconfined Surficial Aquifer	Water Service Lines and Water Service Pipes (Pressure)	Water Service Lines and Water Service Pipes (Suction)	Water Storage Tanks (Atmospheric Below Ground Surface)
Agriculture cropland	100	200	25	100	50
Buildings or structures, porches, foundations of buildings or structures	5	5	N/A	N/A	N/A
Cemeteries	100	150	25	100	50
Composting sites (commercial or agricultural)[1]	200	300	25	300	50
Concentrated livestock holding areas barnyard [2]	200	500	25	100	50
Driveways (fewer than 3 residences)	5	10	N/A	N/A	10
Driveways (3 or more residences), roadways, parking lots	25	25	N/A	N/A	25
Fertilizer or pesticide storage structures (buried tank of any size; above ground tank >1,500 gallons; dry or liquid; and piping serving a non-residential facility)	100	200	50	200	50
Fuel oil, gasoline & other petroleum tanks and piping (not including liquefied petroleum gas tank)	25	100	25	100	50
Herbicide or pesticide application on utility right of way where herbicides or pesticides either have been applied in the last 12 months or may be applied within the next 12 months[3]	100	200	25	200	100

Potential Source of Contamination	**Potable Water Sources in Bedrock or Confined Surficial Aquifer**	**Potable Water Sources in Unconfined Surficial Aquifer**	**Water Service Lines and Water Service Pipes (Pressure)**	**Water Service Lines and Water Service Pipes (Suction)**	**Water Storage Tanks (Atmospheric Below Ground Surface)**
Leachfields (proposed, existing, or permitted)	Requires isolation zone (See Table 11-2)		25	100	100
Manure storage systems, above ground[2]	50	100	25	50	50
Manure storage systems, in-ground concrete or geosynthetic lined[2]	100	200	25	200	100
Manure storage system, earthen lined[2]	200	500	25	200	200
Property lines	10	10	N/A	N/A	10
Salvage yards[4]	300[8]	300[8]	25	300	100
Sanitary sewer collection lines and sanitary sewer service lines	50	75	Distances and requirements established in § 1-1204 apply in lieu of this Section		50
Silage storages	50	75	25	75	50
Solid waste transfer facilities[5]	100	200	25	200	100
Stormwater conveyance/treatment/control practice (lined)	10	10	10	10	10
Stormwater conveyance/treatment/control practice (unlined and subsurface systems)	100	150	10	150	25
Storm sewers	10	50	Distances and requirements established in § 1-1204 apply in lieu of this Section	Distances and requirements established in § 1-1204 apply in lieu of this Section	10
Surface water, normal high water elevation[6]	10	25	N/A	N/A	25
Wastewater disposal spray area and lagoons	200	300	50	300	100
Wastewater tanks (proposed, existing, or permitted)[7]	Requires isolation zone (See Table 11-2)		25	50	50

Potential Source of Contamination	**Potable Water Sources in Bedrock or Confined Surficial Aquifer**	**Potable Water Sources in Unconfined Surficial Aquifer**	**Water Service Lines and Water Service Pipes (Pressure)**	**Water Service Lines and Water Service Pipes (Suction)**	**Water Storage Tanks (Atmospheric Below Ground Surface)**
Wells that are not potable water sources (e.g., irrigation wells, geothermal wells)	100	100	N/A	N/A	N/A

[1] Isolation distances for composting sites (commercial or agricultural) shall be measured from the perimeter of the composting area or area used for storage of composted material.
[2] Isolation distances for concentrated livestock holding areas and manure storage systems shall be measured from the perimeter of the holding area or outside perimeter of the manure storage system.
[3] Isolation distances for herbicide or pesticide application on utility right of way where herbicides or pesticides either have been applied in the last 12 months or may be applied within the next 12 months shall be measured from points of application of the herbicide or pesticide.
[4] Isolation distances for salvage yards shall be measured from the perimeter of the area used for the storage of salvaged materials to the component.
[5] Isolation distances for solid waste transfer facilities shall be measured from points within the transfer facility used for storing solid waste.
[6] The horizontal location to surface water shall allow for possible future widening of the surface water due to bank erosion.
[7] Wastewater Tanks include septic tanks, pump stations, dosing siphons, holding tanks, wastewater storage tanks, wastewater treatment tanks, sand filters, constructed wetlands, and grease tanks.
[8] If the applicant's designer demonstrates that the groundwater flow from the salvage yard is not in the direction of the potable water source, the isolation distance shall be 100 feet rather than 300 feet.

(e) Subsections (f), (g), (h), and (i), in conjunction with Table 11-2, identify the size and shape of the isolation zone around the identified components of proposed, existing, or permitted wastewater systems, and proposed or permitted replacement areas, in which no portion of a potable water source shall be located, unless the Secretary has authorized a reduction to the isolation zone or required a larger isolation zone pursuant to Subsections (k) or (l).

Table 11-2
Distances, in Feet, Used to Create Isolation Zones Around Components of Wastewater Systems and Replacement Areas

Drinking Water Sources (by gallons per minutes design rate)		Proposed, Existing, or Permitted Leachfields and Proposed or Permitted Replacement Areas (< 2000 gallons per day design flow)	Proposed, Existing, or Permitted Leachfields and Proposed or Permitted Replacement Areas (≥ 2000 to < 6500 gallons per day design flow)	Proposed, Existing, or Permitted Leachfields and Proposed or Permitted Replacement Areas (≥ 6500 gallons per day or more design flow)	Proposed, Existing, or Permitted Wastewater Tanks[1]
Potable water sources in bedrock or confined surficial aquifer	≤ 2.0	X = 100 Y = 200	X = 150 Y = 300	X = 200 Y = 1000	X = 50 Y = 50
	> 2.0 and ≤ 5.0	X = 150 Y = 300	X = 150 Y = 300	X = 200 Y = 1000	
	> 5.0 and ≤ 8.0	X = 200 Y = 400	X = 200 Y = 400	X = 200 Y = 1000	
	> 8.0	X = 200 Y = 1000			
Potable water sources in an unconfined surficial aquifer	≤ 8.0	X = 150 Y = 500	X = 150 Y = 1000	X = 200 Y = 1000	X = 75 Y = 75
	> 8.0	X = 200 Y = 1000			

[1] Wastewater Tanks include septic tanks, pump stations, dosing siphons, holding tanks, wastewater storage tanks, wastewater treatment tanks, sand filters, constructed wetlands, and grease tanks.

(f) One of the following methods shall be used in conjunction with the points identified in Subsection (h) to determine the size and shape of the required isolation zone around proposed, existing, or permitted leachfields, and proposed or permitted replacement areas, with X and Y equaling the numbers identified in Table 11-2:

(1) Draw an arc so that all points of the arc are Y from all portions of the component.

(2) Use the ground surface contours (not artificial modifications, such as roadways, filled areas, or retaining walls) to draw the following arcs to create a complete zone around all portions of the component:

(A) Beginning at the 2 upslope corners of the component, swing an arc to the outside of the system with a radius of X to create a point where the arcs intersect with the same contour as the 2 upslope corners of the component.

(B) Continue the 2 arcs in the upslope direction to a point that is X upslope of each corner of the component.

(C) Connect the 2 arcs with a tangent line so that no portion of the arcs or tangent line are less than X from the component.

(D) Beginning at the 2 downslope corners of the component, swing an arc to the outside of the system with a radius of X to a point where the arcs intersect with the same contour as the 2 lowermost corners of the component.

(E) Connect the 2 points derived in Subsections (f)(2)(A) and (D) with a line so that the tangent line maintains a minimum of X beyond either side of the component.

(F) From each of the 2 downslope corners of the component, draw a "fall line," a line oriented perpendicular to the topographic contours, to a point that is a minimum of Y from each corner.

(G) Beginning at the 2 points derived in Subsections (f)(2)(D), draw lines that are X from and parallel to the 2 fall lines.

(H) From each of the 2 downslope corners of the component and in the downslope direction, draw an arc with a radius of Y to connect the farthest downslope lines drawn in Subsections (f)(2)(F) and (G).

(I) Connect the 2 points derived in Subsections (f)(2)(F) with a tangent line so that no point of the tangent line is less than Y from the downslope side of the component.

(J) If the component is irregularly shaped, no portion of component shall be less than X in the upslope direction or along the same contour of the component, and, Y in the downslope direction of the component.

(g) Notwithstanding Subsection (f), when a 2-year time of travel management zone is determined for a proposed, existing, or permitted leachfield, the size and shape of the required isolation zone around the leachfield shall be the 2-year time of travel management zone, provided:

(1) When the drinking water source to be isolated from the leachfield is grouted, in no case shall any point along the isolation zone be less than 50 feet from the drinking water source.

(2) When the drinking water source to be isolated from the leachfield is not grouted, in no case shall any point along the isolation zone be less than 100 feet from the drinking water source.

(h) Notwithstanding Subsection (f), where detailed topographical data is not available, the size and shape of the required isolation zone around proposed, existing, or permitted leachfields shall be determined using the method described in Subsection (f)(1).

(i) The following points shall be used in conjunction with Subsection (f), (g), and (h) to identify the required isolation zones around proposed, existing, or permitted leachfields:

(1) For in-ground leachfields, the corners of the outermost edges of the leachfield.

(2) For a leachfield in a mound, the corners of the effective basal area of the mound.

(3) For at-grade leachfields, the corners of the leachfield stone or other application surface.

(4) For leachfield in a bottomless sand filter, the corners of the enclosure for a bottomless sand filter system.

(j) The method to determine the size and shape of the required isolation zone around proposed, existing, or permitted wastewater tanks shall be to draw an arc around each tank so that all points of the arc are X, identified in Table 11-2, or greater from all portions of the tank.

(k) An applicant or prospective applicant may submit a written request to the Secretary for a reduction in the required isolation distances or isolation zone for a particular potential source of contamination.

(1) The Secretary shall authorize the use of a reduced isolation distance or isolation zone between a potable water source and a particular potential source of contamination when the Secretary determines that the isolation distance specified in Table 11-1 or the isolation zone identified pursuant to Subsection (f) is unnecessary to protect human health because the specific site conditions, or the construction techniques and pipe materials for the potable water supply or wastewater system will prevent the performance of the potable water supply from being impacted by the potential source of contamination.

(2) In determining whether to authorize the use of a reduced isolation distance or isolation zone between a potable water source and a potential source of contamination specified in Table 11-1, the Secretary shall consider the following factors:

(A) the constituents of the potential contamination;

(B) the expected soil treatment; and

(C) site specific conditions.

(3) The Secretary may authorize the use of a reduced isolation distance between a water service line or water service pipe and a potential source of contamination listed in Table 11-1 when one or more of the following conditions exist:

(A) The water service line or water service pipe is installed in a sleeve that is determined to be watertight to prevent the introduction of the contaminant into the sleeve.

(B) The site-specific conditions indicate that the groundwater flow direction is from the water service line or water service pipe to the potential source of contamination.

(C) The site-specific conditions indicate that the seasonal high-water table is a minimum of 18 inches below the bottom of the water service line or water service pipe.

(4) The Secretary shall not authorize a reduction to the distances used to create an isolation zone around a leachfield pursuant to Subsection (f) to less than the following:

(A) When a hydrogeological analysis is not completed, the groundwater flow is not analyzed, and the water source is not grouted, X and Y shall not be reduced.

(B) When a hydrogeological analysis is not completed and when there is a continuous impeding layer from the leachfield to the potable water source, and the water source is grouted, X and Y shall not be less than 100 feet.

(C) When groundwater flow from beneath a leachfield is not towards the potable water source, Y shall not be less than X.

(D) When a hydrogeological analysis is completed that reveals that groundwater flow from beneath a leachfield does not flow toward the potable water source under pumping conditions, Y shall be not less than 100 feet.

(E) When a hydrogeological analysis is completed that demonstrates there is at least a 2-year time of travel between a leachfield and the potable water source and the source is not grouted, Y shall not be less than 100 feet.

(F) When a hydrogeological analysis is completed that demonstrates there is at least a 2-year time of travel between a leachfield and the potable water source and the source is grouted, X and Y shall not be less than 50 feet.

(5) The burden shall be on the applicant or prospective applicant to provide information from a designer that addresses the factors in Subsection (k)(2) or the conditions in (k)(3) and enables the Secretary to reach a determination.

(6) The Secretary's determination shall be in writing and indicate the reduced isolation distance or isolation zone.

(l) The Secretary shall require a greater isolation distance or larger isolation zone for a particular potential source of contamination when the Secretary determines that, based on the specific site conditions described in an application, a greater isolation distance or larger isolation zone is necessary to prevent the potential subsurface flow of contaminant from impacting the performance of the potable water supply.

Note: Appendix C, Figure C-15, depicts an example for drawing an isolation zone around a leachfield.

§ 1-1105 Potable Water Supply Presumptive Isolation Zone

(a) A presumptive isolation zone shall be identified, using the methods identified in § 1-912, around proposed potable water sources in which a leachfield with a design flow of less than 2000 gallons per day is presumed to be unable to be located.

(b) Each potable water supply's presumptive isolation zone identified pursuant to Subsection (a) shall be considered in conjunction with the requirements of § 1-307 to determine if notification to adjacent landowners is required pursuant to § 1-307 and considered in conjunction with the requirements of Appendix A to determine if the potable water supply presumptive isolation zone is required to be shown on the site plan.

§ 1-1106 Grouting Annular Space

(a) The annular space around the casing or well tile of a groundwater potable water source shall be grouted using the methods identified in § 1-1205(j) when:

(1) A reduction in the isolation zone between a leachfield and the potable water source is granted pursuant to § 1-1104(k) or § 1-912(e) and the Secretary requires grouting as a condition of the reduction.

(2) The Secretary determines there are site factors that require grouting to protect the potable water source from possible contamination.

(b) Grouting is recommended if a potable water source may, in the future, require a public water system source permit under the Vermont Water Supply Rule.

(c) When grouting is not required, the annular space of a potable water source shall be filled with native materials such as drill cuttings except for wells that do not have annular space, including concentric, dual rotary, eccentric, and drill and drive wells when the pilot hole is no larger than the drill hole for the casing.

§ 1-1107 Long-Term Yield Analysis

(a) Except as provided in Subsection (b), the long-term yield for a potable water source with a design rate of 5 gallons per minute or less equals 50 percent of the well driller's estimated yield.

(b) A long-term yield analysis of a potable water source shall be conducted for the following sources to establish the long-term yield:
- (1) potable water sources with a design rate of more than 5 gallons per minute;
- (2) potable water sources with a design rate greater than 50 percent of the well driller's estimated yield, except when the potable water supply serves only one single-family residence;
- (3) potable water sources that gravity flow to a potable water pipe, except when the potable water supply serves only one single-family residence;
- (4) potable water sources, including a potable water source serving only one single-family residence, that are required to conduct interference testing and analysis pursuant to § 1-1108.

(c) A long-term yield analysis conducted for the potable water sources identified in Subsection (b)(1), (2), and (4) shall comply with the following requirements:
- (1) The long-term yield analysis shall consist of a constant discharge pumping test and recovery completed and analyzed by a hydrogeologist or a Class 1 designer.
- (2) The duration of the constant discharge pumping test shall comply with Table 11-3 at a pumping rate greater than or equal to the required design rate of the source.
- (3) The hydrogeologist or Class 1 designer shall:
  - (A) During the constant discharge pumping test, measure and record the water elevation drawdown and rate of discharge using accepted methods at intervals that will plot evenly on a logarithmic scale graph.
  - (B) Continue to measure and record the water elevation into the recovery period for 2 days, or until a minimum of 90 percent recovery is achieved, whichever occurs first.
  - (C) Determine the static water elevation, pump elevation, total available head, predicted drawdown, and remaining available head (the difference between the total available head and predicted drawdown).
  - (D) Estimate a long-term yield that meets or exceeds the following criteria:
    - (i) a constant withdrawal at the design rate for 180 days; and
    - (ii) a drawdown that shall not exceed 90 percent of the total available head.

Table 11-3
Constant Discharge Pumping Test Duration

Design rate of Potable Water Source (gallons per minute)	Minimum Test Length (Hours)
≤ 2.0	24
> 2.0 and ≤ 5.0	36
> 5.0 and ≤ 8.0	48, or 72 if there is unacceptable interference identified in the first 48 hours between the potable water source being tested and the public water source or potable water source
> 8.0 and ≤ 50	72
> 50 and < 100	96
100 gallons per minute or greater	120

(d) A long-term yield analysis conducted for the potable water sources identified in Subsection (b)(3) shall comply with the following requirements:
- (1) The long-term yield analysis shall be conducted by a hydrogeologist or a Class 1 designer and shall include a prediction of the long-term yield based on the monitoring data.
- (2) The method for conducting the long-term yield analysis shall be prepared by a hydrogeologist or Class 1 designer and shall be submitted to and approved by the Secretary prior to conducting the analysis.
- (3) The long-term yield analysis shall be conducted during the lowest flow that may be expected during the calendar year.

§ 1-1108 Interference Testing and Analysis

(a) For the purposes of this Section, "unacceptable interference" means when a potable water source causes:
- (1) an existing or permitted potable water source to be unable to meet the design rate or existing yield, whichever is lower; or
- (2) an existing or permitted public water source to be unable to meet the authorized demand or permitted yield, whichever is greater.

(b) A potable water source shall not create unacceptable interference with an existing or permitted public water source or potable water source.

(c) If a potable water source is located within the distances specified in Table 11-4 to an existing or permitted public water source, interference testing shall be conducted in conformance with the Water Supply Rules to determine whether the potable water source will create unacceptable interference.

(d) If a potable water source is located within the distances specified in Table 11-4 to an existing or permitted potable water source, interference testing shall be conducted that complies with the following requirements:

(1) a hydrogeologist or Class 1 designer shall monitor the existing or permitted potable water sources for interference while conducting a long-term yield analysis on the proposed potable water source conducted pursuant to the requirements of § 1-1107; or

(2) when the owner of the existing or permitted potable water source has refused permission to monitor the source, it is otherwise not feasible to access the source, or, when the source is permitted but not existing, the source shall be analyzed by a hydrogeologist for potential interference using one of the following:

(A) the results of interference testing on other similar sources in the area; or

(B) calculations using text book values for aquifer parameters if no interference testing data is available.

(e) The Secretary may waive the requirement to complete interference testing pursuant to Subsection (c) or (d) for a particular existing or permitted public water source or potable water source when the applicant provides information from a designer that demonstrates:

(1) the yield for the existing or permitted potable water source will not be reduced below its design rate or existing yield, whichever is lower;

(2) the yield for the existing public water source will not be reduced below its authorized demand or permitted yield, whichever is greater; and

(3) well completion information for existing or permitted potable water source and public water sources located within the distances in Table 11-4 of the subject well supports the designer's opinion there is a sufficient quantity of water to supply the project without causing unacceptable interference with the existing potable or public water sources.

Table 11-4
Monitoring Distance from Test Source to a Potable or Public Water Source

Design Rate of Tested Source (gallons per minute)	Monitoring Distance (Feet)
≤ 2	100
> 2 and ≤ 5	300
> 5 and ≤ 20	1000
> 20 and ≤ 50	2000
> 50 < 100	2500
100 or greater	3000

(f) Unacceptable interference identified through interference testing conducted pursuant to Subsection (c) or (d) may be resolved by:

(1) drilling the affected source deeper and re-conducting interference testing;

(2) hydrofracturing the affected source and re-conducting interference testing;

(3) closing of the affected source; or

(4) another method approved by the Secretary.

§ 1-1109 Instantaneous Peak Demand

(a) A potable water supply shall be capable of supplying the instantaneous peak demand associated with each component of the potable water supply, except as provided in Subsection (d).

(b) A potable water supply's instantaneous peak demand shall be calculated using the following methods:
- (1) the methodology in the Vermont Plumbing Rules;
- (2) 5 gallons per minute multiplied by the number of living units; or
- (3) a different methodology approved by the Secretary that is accepted by the AWWA or similar national publication.

(c) A potable water supply with an instantaneous peak demand that is equal to or less than the long-term yield for the potable water source complies with the requirements of Subsection (a).

(d) A potable water supply serving only one of the following is not subject to Subsections (a) and (e) when a pump is provided at the potable water source capable of supplying the potable water supply's instantaneous peak demand:
- (1) a single-family residence;
- (2) a single-family residence with an attached 1 bedroom living unit that uses the same potable water source with a total design flow of 560 gallons per day or less; or
- (3) a building or structure with non-residential uses and a design flow of 560 gallons per day or less with an instantaneous peak demand of less than 15 gallons per minute.

(e) Except as provided in Subsection (d), when a potable water supply's instantaneous peak demand exceeds the long-term yield for the potable water source, and the potable water source is pumped:
- (1) the potable water supply shall include water storage that enables the potable water supply to meet the instantaneous peak demand and that complies with the requirements of § 1-1110; or
- (2) an abbreviated constant discharge pumping test using one of the following methods shall be conducted that demonstrates the potable water source can provide the quantity of water necessary to meet the instantaneous peak demand of the potable water supply:
  - (A) The source is pumped at the potable water supply's instantaneous peak demand rate or greater for a duration where the total volume pumped equals twice the design flow and:
    - (i) the pumping test is supervised by a hydrogeologist, a Class 1 designer, Class BW designer, or well driller; and
    - (ii) the pump discharge rate is measured and recorded at 30-minute intervals with a minimum of 3 readings.
  - (B) A 3-hour blow test with flow measurements at less than or equal to 30-minute intervals is performed by a well driller.

(C) A well driller's estimated yield is determined by methods other than Subsection (e)(2)(A) or (e)(2)(B) that is divided by 2.

(D) Another method for testing the potable water source approved by the Secretary is completed.

(f) When a potable water supply's instantaneous peak demand exceeds the long-term yield for the potable water source, and the potable water source is not pumped (i.e., gravity flow to a potable water pipe), the potable water supply shall include water storage that enables the potable water supply to meet the instantaneous peak demand and that complies with the requirements of § 1-1110.

§ 1-1110 Water Storage and Water Storage Tanks

(a) The base of a water storage tank shall be placed at or above the base flood elevation.

(b) When water storage is required pursuant to § 1-1109:

(1) The required water storage volume shall be identified using the following calculations:

(A) If the long-term yield equals or exceeds 2/3rds of the design rate but is less than the design rate, storage shall equal the design flow.

(B) If the long-term yield equals or exceeds the design rate:

(i) storage shall equal 55 percent of the design flow; or

(ii) storage shall be calculated using the equation $S = D [1 - Y/P]$ where:

(I) S = volume of water storage (gallons);

(II) D = design flow multiplied by 1 day (gallons);

(III) P = potable water supply's instantaneous peak demand (gallons per minute); and

(IV) Y = long-term yield or the results of the abbreviated constant discharge pumping test (gallons per minute).

(2) For drilled or driven wells, all, or a portion of, the required water storage volume may be met through the available casing storage identified using the following calculations:

(A) The total available head shall be calculated using the equation TAH = PCL – SL where:

(i) TAH = total available head (feet);

(ii) PCL = pump cut-off level measured below top of casing (feet); and

(iii) SL = static level measured below top of casing (feet).

(B) The approximate drawdown elevation shall be calculated using the equation $DL = SL + (TAH \times (DR/Y))$ while pumping at the design rate where:

(i) DL = drawdown level measured below top of casing (feet);

(ii) SL = static level measured below top of casing (feet);

(iii) TAH = total available head (feet);

(iv) DR = design rate (gallons per minute); and

(v) Y = Long-term yield (gallons per minute).

(C) The remaining available head shall be calculated using:

(i) In all circumstances other than that in Subsection (b)(2)(C)(ii), the equation RAH = PCL – DL where:

(I) RAH = remaining available head (feet);

(II) PCL = pump cut-off level measured below top of casing (feet); and

(III) DL = drawdown level measured below top of casing (feet).

(ii) When the source is a flowing artesian well and the drawdown elevation remains above the top of casing when pumping at the design rate, the equation RAH = PCL where:

(I) RAH = remaining available head (feet);

(II) PCL = pump cut-off level measured below top of casing (feet).

(D) The available storage in the well shall be calculated using the equation AS = $\pi \times r^2 \times$ RAH $\times$ 7.48 where:

(i) AS = Available storage (gallons);

(ii) $\pi = 3.14$

(i) r = casing inside radius (feet); and

(ii) 7.48 (gallons per cubic foot).

(3) For dug wells or springs, all, or a portion of, the required water storage volume may be met through the available storage in well tiles identified using the following calculations:

(A) For round well tiles, the equation WTS = 1/2 (LWL – PCL)($\pi \times r^2$)(7.48), where:

(i) WTS = available well tile storage (gallons);

(ii) LWL = annual low water level measured below the top of the tile (feet);

(iii) PCL = pump cut-off level or outlet measured below the top of the tile (feet);

(iv) $\pi = 3.14$;

(v) r = radius of the inside dimension of a round tile (feet); and

(vi) 7.48 (gallons per cubic foot).

(B) For square or rectangular well tiles, the equation WTS = 1/2 (LWL – PCL)(L)(W)(7.48) where:

(i) WTS = available well tile storage (gallons);

(ii) LWL = annual low water level measured below the top of the tile (feet);

(iii) PCL = pump cut-off level or outlet measured below the top of the tile (feet);

(iv) L = length of the inside dimension of a rectangular tile (feet);

(v) W = width of the inside dimension of a rectangular tile (feet); and

(vi) 7.48 (gallons per cubic foot).

(c) The portion of the required water storage volume not met by casing storage, if allowed pursuant to Subsection (b)(2), or storage in well tiles if allowed pursuant to Subsection (b)(3), shall be met through a combination of hydropneumatic tanks and other water storage tanks.

(d) The storage volume provided by hydropneumatic tanks, when used to provide all or a portion of the required water storage volume, shall be calculated based on the volume of water available between the pump-on pressure and the minimum operating pressure for the distribution system to supply a minimum of 8 psi to all plumbing fixtures.

(e) Hydropneumatic tanks (i.e., pressure tanks) shall meet the following requirements:
- (1) Hydropneumatic tanks shall meet the requirements of the Vermont Plumbing Rules for hydropneumatics tanks and shall:
  - (A) be located in a building or structure;
  - (B) have the minimum working pressure at the hydropneumatic tank system set at 20 psi;
  - (C) have pressure reducing devices on the distribution system prior to the hydropneumatic tank when static pressures exceed 100 psi;
  - (D) have a drain, pressure gauge, watertight glass if applicable, and automatic or manual means for adding air, air blow-off, and pressure operated start-stop controls for pumps; and
  - (E) have a drain or overflow discharge pipe that:
    - (i) opens downward a minimum of 18 inches above a splash plate when discharging to ground surface; or
    - (ii) has an air-gap between the pipe and a sanitary sewer service line, sanitary sewer collection line, or storm drain when discharging to a line or drain. No drain or overflow pipe shall physically connect to any sanitary sewer service line, sanitary sewer collection line, or storm drain.
- (2) Hydropneumatic tank storage shall be not used for fire protection purposes.

§ 1-1111 Pumps

(a) A potable water supply that does not include an atmospheric water storage tank shall have a pump at the potable water source capable of supplying the instantaneous peak demand, unless the potable water supply is proposed to serve only one single-family residence.

(b) A potable water supply that includes an atmospheric water storage tank shall have a pump at the potable water source capable of supplying the design rate and a pump at the water storage tank capable of supplying the instantaneous peak demand, unless the potable water supply is proposed to serve a single family-residence.

(c) Pumps shall be sized based on a hydraulic analysis that considers flow, demand, and pressure requirements.

(d) Booster pumps shall not be used in a building or structure that is connected to a water service line unless the booster pump design is approved in writing by the Secretary prior to installation. A booster pump design shall include:
- (1) an appropriately sized air gap in the water service line between the booster pump and the water main; or

(2) for buildings and structures other than single-family residences, an appropriately sized back flow prevention device in the water service line between the booster pump and the water main.

§ 1-1112 Cross Connections

(a) There shall be no connection between:
- (1) Any component of a public water system and a potable water source or other components of the potable water supply.
- (2) A well that is not a potable water source (e.g., irrigation wells and wells used for closed loop geothermal systems) and a potable water source or other components of the potable water supply.
- (3) A well used for an open loop geothermal system and a potable water source, unless the requirements in Subsection (b) are met.
- (4) Any pipes, pumps, or tanks that would allow non-potable water or contaminants to be discharged or drawn into a potable water source or other components of the potable water supply.

(b) Open loop geothermal systems intended to circulate groundwater within a potable water supply may be connected to a potable water source provided the following requirements are met:
- (1) No additive is added to the re-circulated groundwater.
- (2) The heat exchange medium in the system is R-410A or a different heat exchange medium approved by the Secretary.
- (3) The system has a low-pressure safety cutout circuit that will turn off the system when there is a pressure leak in the heat exchange medium containment vessel.
- (4) All electrical components of the system are properly grounded to prevent potential electrolysis of metals.
- (5) In the event that the heat exchange unit is disconnected as a heating or cooling source, all piping associated with the unit shall either be capped and labeled or removed.
- (6) Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to a potable water supply.

(c) Water loading stations that are designed to fill potable water vessels, containers, or vehicles with water from a potable water supply shall meet the following requirements:
- (1) There shall be an air gap device between the potable water supply and water vessels being filled to prevent back flow into the supply.
- (2) Hose inlets and outlets used at the station shall not come in contact with the ground, hands, or other sources of contamination.
- (3) The hose bibb for the water loading station shall be equipped with a vacuum breaker or backflow preventer.

(d) Drains from pits containing air relief and blow off valves shall not connect directly to sanitary sewer service or sanitary sewer collection lines nor shall they discharge at a point that will permit possible back-siphonage.

§ 1-1113 Water Quality

(a) When a permit authorizes the construction of a groundwater potable water source, the physical modification of an existing groundwater potable water source, or an action that increases the design flow of, or modifies other operational requirements of, a groundwater potable water source, the potable water source shall be sampled for the following substances, and any water treatment system required pursuant to Subsection (d) installed, prior to any water use authorized in the permit:

(1) each primary and secondary contaminant listed in Tables 11-5 and 11-6; and

(2) any substance with a groundwater enforcement standard in the Groundwater Protection Rule and Strategy that the Secretary determines may be present in the source.

(b) Water sampling required pursuant to Subsection (a) in association with the construction of a groundwater potable water source shall be conducted a minimum of 2 days following flushing the permitted water source for a duration sufficient to:

(1) remove all chlorine odor from the water supply; and

(2) ensure all additives, source development fluids, native silts and clays, drilling mud, and finer fraction of the gravel pack or rock fracture in the casing or bore hole are removed, to the extent practicable, and at least achieving no visible evidence of the materials, prior to sampling the potable water supply.

(c) Water sampling required pursuant to Subsection (a) shall comply with the following requirements:

(1) Waters samples shall be taken by the person who owns the lot on which is located the building or structure or campground that is served by the potable water supply, a well driller, a designer, a hydrogeologist, a certified water specialist, a Town health officer, a master plumber, a public water system certified operator, a Vermont State employee responsible for taking water samples prior to licensing a facility or activity, or another person deemed qualified by the Secretary.

(2) Water samples shall be collected from the cold water tap for a sink or, if the sink is preceded by a water treatment system, at a cold water tap before the treatment system. Water samples taken for lead shall be first draw.

(3) Water samples shall be submitted to the Vermont Department of Health or a certified laboratory for analysis.

(4) The results of the analysis shall be submitted to the Vermont Department of Health Laboratory and, when required pursuant to the permit, submitted to the Secretary. Submission of results by a certified laboratory to the respective Agency satisfies this requirement.

(d) If the results of water sampling conducted at any time on a proposed, existing, or permitted groundwater potable water source, except those serving only one single-family residence, identify the presence of a primary contaminant at a concentration that exceeds the standard for the contaminant identified in Table 11-5 or identify the presence of a substance at a level exceeding the groundwater enforcement standards in the Groundwater Protection Rule and Strategy:

(1) The potable water supply may be re-tested and determined not to require water treatment pursuant to the following process:

(A) Protocol prepared by a designer for re-testing the potable water source shall be submitted to the Secretary.

(B) The potable water source shall be retested pursuant to a Secretary approved protocol and information shall be provided to the Secretary that is sufficient for the Secretary to reach a determination under Subsection (d)(1)(C).

(C) Water treatment shall not be required if the Secretary determines that the concentration of the contaminant has lasted for only a brief period of time, the cause of the exceedance has been determined to be an unusual and non-recurring event, and the contaminant is unlikely to exist in the potable water source at a concentration that exceeds the standard.

(2) Except where the Secretary has reached a determination pursuant to Subsection (d)(1) that no water treatment is necessary, the person who owns the lot on which is located the building or structure or campground that is served by the potable water supply shall:

(A) obtain a permit or permit amendment for the installation of, unless subject to a permit exemption in § 1-304, a water treatment system that eliminates or reduces the concentration of the contaminant in the potable water source to below the standard; or

(B) obtain a permit or permit amendment for a new potable water source.

Note: The presence of a primary contaminant in a potable water supply at a concentration that exceeds the standard for the contaminant identified in Table 11-5, or the presence of a substance at a level exceeding the groundwater enforcement standards in the Groundwater Protection Rule and Strategy, is a health concern for those drinking or otherwise consuming the water. While the Secretary does not require a landowner with a groundwater potable water source serving only one single-family residence to install a water treatment system or to seek a new potable water source when contamination is identified, the Secretary recommends the landowner do so.

(e) A failed supply for which a water treatment system is installed that eliminates or reduces the concentration of a contaminant in the potable water source to below the associated standard remains a failed supply.

Table 11-5
Primary Contaminant Standards for Potable Water Supplies

Primary Contaminants	Standards
Arsenic	0.010 mg/L
Escherichia coli (E.coli)	0 (absent or less than 1)
Fluoride	4 mg/L
Lead	0.015 mg/L
Manganese	0.3 mg/L
Nitrate as N	10 mg/L
Nitrite as N	1.0 mg/L

Primary Contaminants	Standards
Total Coliform Bacteria	0 (absent or less than 1)
Uranium	0.020 ug/L
Adjusted Gross Alpha Particle Activity (including radium 226 but excluding radon and uranium)	15 pCi/L

Note: The Vermont Department of Health also adopts health advisories for substances that may be found in drinking water and may be below the standards identified in Table 11-5. Additionally, the Vermont Department of Health provides recommendations for testing drinking water. Contact the Vermont Department of Health for additional information on testing and treatment options.

Table 11-6
Secondary Contaminant Standards for Potable Water Supplies

Secondary Contaminants	Standards
Chloride	250 mg/L
Sodium	250 mg/L
Iron	0.3 mg/L
Odor	3 threshold odor number
pH	6.5 to 8.5

(f) All surface water potable water sources shall have water treatment systems that comply with the following requirements:
- (1) The treatment components shall achieve the following standards:
  - (A) reduction of turbidity of the raw water to a level compatible with the prescribed treatment;
  - (B) 99.99 percent (4-Log) removal/inactivation of viruses;
  - (C) 99.9 percent (3-Log) removal/inactivation of Giardia lamblia; and
  - (D) 99.9 percent (3-Log) removal/inactivation of Cryptosporidium.
- (2) The sizing of treatment components shall be based on the rate of flow through each treatment component.
- (3) Filtration shall be completed prior to disinfection by:
  - (A) slow sand filtration;
  - (B) cartridge filter that received NSF certification for the intended level of water treatment;
  - (C) a product certified to meet standards established by the NSF/ANSI 60 and 61; or
  - (D) a product certified by one of the following organizations:
    - (i) the Water Quality Association (WQA);
    - (ii) the International Association of Plumbing and Mechanical Officials (IAPMO); or

(iii) an organization certified accreditation by ANSI.

(4) Disinfection shall be completed to achieve the standards identified in Subsection (a)(1) by:

(A) chlorination with a contact time calculated by using the pH; and temperature of the surface water source during the coldest anticipated water temperature; or

(B) ultraviolet light (UV) treatment which:

(i) is capable of treating for adenovirus;

(ii) includes a solenoid valve to prohibit the flow of water when the UV light is not properly functioning; and

(iii) includes an audio alarm system that sounds when the UV unit is not properly functioning (e.g., dosage, lamp-out, lamp age, etc.).

(5) If the water intake is less than 20 feet below the mean water level of the surface water, there shall also be treatment to reduce turbidity and remove cyanobacteria.

(6) An operational and maintenance manual shall be prepared for the water treatment system that includes:

(A) how to maintain the water intake to remove zebra mussels or other species that may grow or reside in the pipe and affect flow rate; and

(B) how to maintain the water treatment system components.

Note: When proposing UV disinfection, an applicant's designer may consider a secondary disinfectant to provide a residual in the water distribution system.

§ 1-1114 Flowing Artesian Well

(a) The Secretary may require an applicant with a known or expected flowing artesian well in bedrock or a confined surficial aquifer to use source construction methods that reduce or stop the overflow of water onto the land surface and that prevent erosion of the aquifer's confining materials.

(b) In making the determination in Subsection (a), the Secretary shall consider:

(1) the cost of the required action;

(2) the safety of the required action; and

(3) whether:

(A) the overflow water poses an undue adverse impact on the environment, including undue erosion of the confining layers of the aquifer; or

(B) the overflow water may interfere with any potable water source or public water source.

(c) Known or expected flowing artesian wells shall have an overflow pipe from the source that:

(1) directs the overflow water from the source away from any soil-based wastewater system;

(2) does not discharge to a wastewater system;

(3) prevents the surface discharge of overflow water to land not owned by the applicant unless the applicant has permanent legal access that allows such discharge;

(4) discharges the overflow water a minimum of 6 inches above the ground surface to

allow water to passively drain away from the well and to prevent the flow of water through the overflow pipe back into the source;

(5) discharges above a splash plate or pad; and

(6) has a 24 mesh non-corrodible screen covering the outlet.

Note: The overflow water from artesian wells may be subject to other Agency rules and permitting requirements.

§ 1-1115 Closure of Potable Water Sources

(a) Potable water sources that are no longer serving a building or structure or campground are recommended to be closed and may be required by the Secretary to be closed to prevent possible contamination of the aquifer or to otherwise protect human health and the environment.

(b) Potable water sources that are failed supplies are recommended to be closed and may be required by the Secretary to be closed to prevent possible contamination of the aquifer or to otherwise protect human health and the environment.

(c) Closure of a groundwater potable water source that is equal to or greater than 20 feet deep shall be performed by a well driller.

(d) Closure of a groundwater potable water source shall be completed by taking the following steps:

(1) Clearing the potable water source of any pumps, wires, and piping.

(2) Removing the cover and all other materials that will interfere with effective closing.

(3) Sealing the potable water source to prevent exchange of water from one aquifer to another or out of the casing.

(4) For a potable water source that is equal to or greater than 20 feet deep, completely filling the casing and bore hole with the following grouting materials:

(A) For potable water sources located at solid waste disposal facilities, hazardous waste facilities, or contaminated sites, bentonite or Portland Type I or III Cement.

(B) For potable water sources at all other locations, acceptable sealing materials based on site specific conditions, such as:

(i) cement grout;

(ii) bentonite grout slurry (15 percent solids by volume);

(iii) bentonite chips;

(iv) a sealing material or other material to render the bore hole as impeding as the surrounding native material; or

(v) alternating 50-foot layers of clean stone, pea stone, or sand and 10-foot sections of bentonite with the last 10-foot layer to just below ground surface filled with neat cement.

(5) For a potable water source that is less than 20 feet deep, completely filling the well tile with soil or other material to ground surface.

(6) Cutting or removing the casing so that the remaining casing terminates below finished ground surface.

(e) Closure of a surface water potable water source shall be completed by taking the following steps:

(1) Removing the water intake pipe and associated infrastructure from the source.

(2) Cutting and capping the pipe located in the source, or sealing it using other methods approved by the Secretary, at a point above the normal high-water elevation.

Subchapter 12 – Flexible Specific Technical Standards for Potable Water Supplies

§ 1-1201 Request for Alternative Technical Standard

(a) The Secretary may accept, in an application for a permit or permit amendment, the use of an alternative technical standard to a technical standard included in this Subchapter when the Secretary concludes that the alternative technical standard:
- (1) will meet the purpose served by the technical standard in this Subchapter;
- (2) has been adopted and published by one of the following organizations:
  - (A) American Association of the State Highway and Transportation Officials (AASHTO);
  - (B) National Sanitation Foundation (NSF);
  - (C) American National Standards Institute, Inc. (ANSI);
  - (D) American Society of Civil Engineers (ASCE);
  - (E) American Public Works Association (APWA);
  - (F) American Society for Testing and Materials (ASTM);
  - (G) American Water Works Association (AWWA);
  - (H) Cast Iron Soil Pipe Institute (CISPI);
  - (I) New England Interstate Water Pollution Control Commission (NEIWPCC);
  - (J) 10 States Standards – Recommended Standards for Water Works;
  - (K) National Groundwater Association (NGWA);
- (3) incorporates more current technology than included in the technical standard in this Subchapter;
- (4) will not adversely affect the maintainability, operation, or safety of the potable water supply; and
- (5) where specified, meets any additional criteria required by these Rules for a Secretary approved alternative technical standard.

(b) An application that seeks to use an alternative technical standard shall include a written request that includes:
- (1) the specific technical standard in this Subchapter for which approval of an alternative technical standard is sought; and
- (2) supporting documentation demonstrating each of the findings included in Subsection (a).

§ 1-1202 General Requirements for Water Service Lines and Water Service Pipes

(a) Water service lines and water service pipes shall be sized based on a hydraulic analysis that considers flow demands and pressure requirements, using the standards in the Vermont Plumbing Rules.

(b) Water service lines and water service pipes shall be constructed of one of the following materials:
- (1) Type K copper tubing complying with standard ASTM B-88;
- (2) materials that comply with the standards in the Vermont Plumbing Rules; or
- (3) other materials approved by the Secretary when it is demonstrated that the pipe material equals or exceeds the requirements in the Plumbing Rules.

(c) Water service lines and water service pipes shall:
  (1) Have watertight joints;
  (2) Have a working pressure rating of not less than 160 psi;
  (3) Be designed to minimize friction loss; and
  (4) Be protected against surge or water hammer.

(d) Water service lines shall not connect to hydrant lead lines.

(e) Connections of a water service line to a water main shall include a water shutoff or curb stop that allows the flow of water from the water main to the water service line to be stopped during repairs.

(f) Packing and jointing materials used in the joints of pipes shall meet the standards of the Vermont Plumbing Rules.

(g) Valves, blow-offs, meters, air relief valves, or other such appurtenances on water service lines or pipes shall not be located in chambers, pits, or manholes, unless the chamber, pit, or manhole has a discharge pipe that terminates at least 18 inches above ground surface, shall passively drain water from the enclosure, and shall remain visible.

(h) Thrust blocks or restrained mechanical joints shall be used at tees or bends of water service pipes and water service lines if necessary to prevent pipe movement.

(i) Water service lines and water service pipes shall not pass through sewer manholes or be submerged in a basin containing wastewater, contaminated material, or hazardous material.

(j) Water service lines and water service pipes shall be covered with at least 5.5 feet of soil or be insulated and covered in a manner that provides an equivalent degree of protection from freezing and damage that 5.5 feet of soil would provide.

§ 1-1203 Design Standards for Water Service Lines and Water Service Pipes Under and Over Surface Water

(a) Water service lines and water service pipes crossing under surface water shall:
  (1) include flexible watertight joints; and
  (2) except for water service pipes of a potable water supply with a surface water source:
    (A) maintain a minimum of 5 feet of soil cover over the water service line or water service pipe, as measured from the lowest point of the surface water bed;
    (B) have accessible valves at both ends of the underwater crossing so the section may be isolated; and
    (C) be placed in a watertight sleeve that extends the full length of the underwater crossing.

(b) Water service lines and water service pipes crossing aerially over surface water shall:
  (1) be adequately supported and anchored;
  (2) be protected from damage from flood waters, floating debris, ice, and freezing;

(3) have accessible valves that are placed in naturally occurring soil at both ends of the lake, pond, or stream crossing so the section exposed to atmosphere may be isolated; and
(4) be accessible for repair or replacement.

(c) A water service pipe that is a surface water intake shall:
(1) be a minimum of 20 feet below the low water elevation of the surface water unless the water treatment system complies with § 1-1113(f);
(2) meet one of the following:
(A) terminate the intake of the water service pipe a minimum of 2 feet above the bottom of the surface water; or
(B) terminate the intake of the water service pipe in a sand infiltrative gallery installed below the bottom of the surface water source with a minimum of 2 feet of sand fill over the water intake;
(3) be sufficiently anchored to prevent movement of the pipe;
(4) be protected from freezing;
(5) not impact a wetland; and
(6) not be located in a Waste Management Zone as determined by the Watershed Management Division for the discharge from a municipal treatment facility.

§ 1-1204 Separation of Water Service Lines and Water Service Pipes from Sanitary Sewer Service Lines, Sanitary Sewer Collection Lines, and Storm Sewers

(a) Horizontal Isolation Distances from Sanitary Sewer Collection Lines, Sanitary Sewer Service Lines, and Storm Sewers
(1) All portions of a water service line and water service pipe shall be at least 10 feet horizontally from all portions of the proposed, existing, or permitted sanitary sewer collection lines and sanitary sewer service lines, including sewer manholes, except when the water service line or water service pipe is:
(A) sleeved with pipe materials approved by the Vermont Plumbing Rules and
(i) if the sleeves terminate below ground, the ends of the sleeve are sealed to be watertight; or
(ii) if the sleeves terminate above finished slab or in a basement, the ends of the sleeve are sealed to be watertight or left open; or
(B) in a separate trench or an undisturbed soil shelf in the sewer trench and one of the following requirements is met:
(i) the bottom of the water service line or water service pipe shall be at least 18 inches above the top of the sanitary sewer collection line or sanitary sewer service line; or
(ii) the sanitary sewer collection line or sanitary sewer service line shall be water works grade 150 pounds per square inch pressure rated pipe meeting AWWA standard C-900 or equivalent pipe and pressure tested to 150 pounds per square inch to assure watertightness.
(2) All portions of water service lines and water service pipes shall be laid at least 5 horizontal feet from all portions of a proposed, existing, or permitted storm sewer.

(b) Vertical Separation and Crossings for Sanitary Sewer Collection Lines, Sanitary Sewer

Service Lines, and Storm Sewers

(1) Water service lines and water service pipes crossing above proposed, existing, or permitted sanitary sewer collection lines or sanitary sewer service lines shall meet one of the following requirements:

(A) The bottom of the water service lines and water service pipes shall be laid 18 inches above the top of the sanitary sewer collection line or sanitary sewer service line.

(B) The water service lines and water service pipes shall be sleeved with pipe materials approved by the Vermont Plumbing Rules to a point 10-horizontal feet from the sanitary sewer collection line or sanitary sewer service line and:

(i) if the sleeves terminate below ground surface, have the ends of the sleeve sealed to be watertight; or

(ii) if the sleeves terminate above finished slab or in a basement, have the ends of the sleeve sealed to be watertight or left open.

(C) The water service lines and water service pipes shall be centered at the crossing, so the water joints will be as far as possible from the sanitary sewer joints and one of the following requirements shall be met:

(i) The water service lines and water service pipes shall be laid to provide a minimum vertical distance of 18 inches between the bottom of the water service line or water service pipe and the top of the sanitary sewer collection line or sanitary sewer service line.

(ii) The sanitary sewer collection lines and sanitary sewer service lines shall be water works grade 150 pounds per square inch pressure rated pipe meeting AWWA standard C-900 or equivalent pipe and pressure tested to 150 pounds per square inch to assure watertightness.

(2) Water service lines and water service pipes crossing below proposed, existing, or permitted sanitary sewer collection lines or sanitary sewer service lines shall meet one of the following requirements:

(A) The water service line or water service pipe shall be sleeved with pipe materials approved by the Vermont Plumbing Rules to a point 10-horizontal feet from the sanitary sewer collection line or sanitary sewer service line and

(i) if the sleeves terminate below ground surface, have the ends of the sleeve sealed to be watertight; or

(ii) if the sleeves terminate above finished slab or in a basement, have the ends of the sleeve sealed to be watertight or left open.

(B) The water service line or water service pipe meets the following requirements:

(i) The top of the water service lines and water service pipes shall be laid 18 inches below the bottom of the sanitary sewer collection line or sanitary sewer service line.

(ii) Water service lines and water service pipes shall be centered at the crossing, so the joints in the water line or water pipe will be a minimum of 10 feet from the center line of the crossing.

(3) Water service lines and water service pipes crossing above or below proposed, existing, or permitted storm sewers shall meet the following requirements:

(A) If the water service line or water service pipe is crossing above, the water service lines and water service pipes shall be laid to provide a minimum vertical distance of 18 inches between the bottom of the water service line or water service pipe and the top of the storm drain.

(B) If the water service line or water service pipe is crossing below, the water service lines and water service pipes shall be laid to provide a minimum vertical distance of 18 inches between the top of the water service line or water service pipe and the bottom of the storm drain.

(C) Water service lines and water service pipes crossing less than 18 inches over a storm drain shall be centered at the crossing so the joints in the line or pipe will be as far as possible from the storm sewer joints.

(D) Water service lines and water service pipes crossing less than 18 inches under a storm sewer, the lines or pipes shall have the joints in the line or pipe a minimum of 10 feet from the center line of the storm drain.

§ 1-1205 Potable Water Source Design and Construction

(a) Design and construction of potable water sources shall:

(1) prevent damage to the casing;

(2) extend casings a minimum of 18 inches above finished grade except as allowed in Subsection (f);

(3) ensure all fluids, muds, and additives have the approval of an ANSI accredited organization;

(4) ensure process water for drilling a source, or injection water for hydrofracturing a water source, is obtained from a potable water source or public water source; however, if such water is unavailable in sufficient quantity, ensure clear, non-potable water that is obtained from a surface water body and is disinfected with an initial dosage of at least 100 mg/L of chlorine prior to using it as the process water;

(5) ensure that any casing, tools, or drilling fluids that may be contaminated shall not be used or reused when constructing or repairing a source; and

(6) include a cap or other protective cover that is:

(A) permanent and tight fitting that cannot be removed or opened without the use of tools or keys;

(B) water-tight designed to shed water and snow;

(C) an overlapping, shoebox-type cover or hatch that is permanently attached to the source structure, or protective structure; and

(D) animal and insect proof.

(b) Requirements for Casing Material

(1) Well casing shall be made of material that will not distort, collapse, crack, or disintegrate during placement or under normal conditions; and

(2) Well casing shall be sized and designed to provide for the installation, removal, and maintenance as appropriate for caps, covers, pitless adapters, screens, pumps, pipes, wires, or other devices.

(3) Well casing extensions shall be of the same material that is, at a minimum, of equal strength and weight as the existing casing.

(A) For steel casing extensions, the extension shall be joined to the original

casing by:
(i) threaded steel coupling;
(ii) welded pipe joint;
(iii) weld to threaded steel slip coupling; or
(iv) mechanical steel bolted restraining coupling, also known as Dresser coupling.

(B) For plastic casing extensions, the extension shall be joined to the original casing by:
(i) solvent welds; or
(ii) threaded couplings.

(4) When steel pipe is used for permanent casing, the steel pipe shall be a new pipe meeting the minimum of AWWA, ASTM, or API specifications for water well construction and:
(A) be Schedule 30 or greater; or
(B) meet all of the following requirements:
(i) have a minimum ¼ inch wall thickness for 7-inch casing;
(ii) be equipped with a drive shoe or equivalent when driven into bedrock; and
(iii) have full circumferential welds or threaded coupling joints.

(5) When nonferrous materials are used for permanent casing, the nonferrous materials shall be:
(A) resistant to the corrosivity of the water and to the stresses that it will be subjected to during installation, grouting, and operation;
(B) PVC pipe, when used as permanent casing, that is Schedule 80, SDR 21, or heavier new pipe that complies with ASTM specification F 480 and NSF or UL standards; and
(C) concrete tiles joined with a watertight material that is ANSI or NSF approved.

(6) Liners set within the uncased bore hole shall:
(A) terminate with a packer or otherwise be secured to the bore hole;
(B) be slotted, screened, or perforated to permit the movement or storage of water; and
(C) when the liner is set to control water movement or contamination, be grouted and watertight.

(7) Packers or well seals placed within the casing or bore hole to prevent the migration of water shall be of material that will not impart taste, odor, toxic substance or bacterial contamination to the source water.

(c) Liner material, when used in a potable water source, shall be of such strength and composition to prevent the movement of water or contaminants into or out of the potable water source in the interval cased.

(d) Potable water sources located in a flood hazard area shall:
(1) if the top of the casing is below the base flood elevation, have a watertight cap or cover (a sanitary seal shall not be used);
(2) have the top of the well casing terminate at least 18 inches above finished grade;
(3) have source vents terminate above the base flood elevation;
(4) be located, designed, and constructed in a manner that avoids impairment to the

supply and contamination to the system during flooding. (Refer to the following guidance from the Department of Homeland Security, Federal Emergency Management Agency FEMA P-348: Protecting Building Utility Systems from Flood Damage); and

(5) have other suitable protection as required by the Secretary to prevent surface or storm water entering the casing.

(e) Potable water sources shall only be located in a structure when:

(1) the floor of the structure terminates a minimum of 12 inches above finished ground surface;

(2) if the structure is located in a flood hazard area, the floor of the structure terminates at or above the base flood elevation;

(3) the source casing extends a minimum of 12 inches above finished floor elevation;

(4) water runoff from the structure floor, roof, and exterior passively drains away from the structure,

(5) the structure is sealed and screened to exclude birds and animals, and is capable of being locked; and

(6) the design of the structure allows for removal of the pump.

(f) Potable water sources shall not be located in an underground enclosure unless approved by the Secretary. When location of a potable water source in an underground enclosure is authorized by the Secretary:

(1) the enclosure shall be watertight with a watertight access cover;

(2) the enclosure shall have a cap or protective cover that terminates 18 inches above finished floor;

(3) construction of the source shall comply with the standards in Subsection (d) when the source is located in flood hazard areas;

(4) the floor of the enclosure shall be made of concrete and shall be sealed to the casing~~;~~

(5) the enclosure shall have all penetrations standard wall castings that are:

(A) poured in place during the forming of the concrete; or

(B) wall sleeves with flexible wall penetrations for concrete tanks joined to the underground enclosure with watertight connections;

(6) the enclosure shall have a minimum of one floor drain within the floor of the enclosure that has a backwater valve on the drain/discharge pipe that complies with the Vermont Plumbing Rules. The discharge pipe shall terminate at least 18 inches above ground surface, shall passively drain away from the enclosure, and shall remain visible;

(7) the wiring for the pump shall be sealed for watertightness where it enters the cap or be contained in a watertight conduit system;

(8) the potable water source and underground enclosure shall be vented to the atmosphere independent of each other, and all vents shall terminate above the base flood elevation;

(9) the enclosure shall be sealed and screened to exclude birds and animals; and

(10) the enclosure shall be capable of being locked.

(g) Requirements for Venting

(1) Venting of the potable water source casing and of an enclosure in which a potable

water source is located shall:
(A) be to atmosphere;
(B) be of adequate size to provide rapid venting of the casing and be corrosion resistant; and
(C) terminate in a downturned position.
(2) Flowing artesian wells are not required to have a vent at the source.

(h) Caps, covers, vents, drains, and overflow pipes shall be covered or inserted with a 24 mesh non-corrodible screen.

(i) One of the following drilling methods shall be used to drill a potable water source:
(1) air rotary;
(2) cable tool (driven);
(3) mud rotary;
(4) reverse circulation;
(5) eccentric and concentric;
(6) dual rotary;
(7) drill and drive; and
(8) other methods allowed by the Secretary.

(j) Grouting shall be designed to allow negligible movement of all fluids in the annular space around well casings and provide negligible shrinkage, breakage, or deterioration of the grout after placement. One of the following grout types and specifications shall be used:
(1) neat cement grout:
(A) consisting of a mixture of API Sec. 10, ASTM C150 type 1 or ASTM C150 type 2, with a maximum of 6 gallons of water per 94-pound sack of cement for 1½ inch or larger annular openings; and
(B) containing additives approved by the Secretary when proposed to increase fluidity;
(2) concrete grout:
(A) consisting of equal parts of ASTM C150, type 1 or 2 Portland cement, and sand, with a maximum of 5 gallons of water per 94-pound sack of cement for annular openings larger than 1½ inches; and
(B) where an annular opening is larger than 4 inches, gravel not larger than ½ inch in size may be added;
(3) bentonite grout that has standard ANSI 60 certification and is installed according to manufacturers' directions;
(4) clay seal/bentonite grout consisting of clay mixed with at least 10 percent swelling bentonite may be used when there is an annular opening greater than 6 inches and approved by the Secretary prior to grout application;
(5) bentonite chips, slurry, or powder shall be placed continuously around the casing during advancement with each of the following drilling methods when no pilot hole is drilled larger than the drill hole for the casing:
(A) concentric drilling;
(B) dual rotary;
(C) drill and drive; or
(D) eccentric; or

(E) other types of grout approved by the Secretary.

§ 1-1206 Potable Water Sources in Bedrock, Confined Surficial Aquifers, and Unconfined Surficial Aquifers

(a) Potable water sources in bedrock shall be constructed with a minimum of:
- (1) 20 feet of watertight casing; and
- (2) a minimum of 10 feet of casing set into competent bedrock.

(b) Drilled wells, driven wells, or well points in unconfined surficial aquifers and confined surficial aquifers shall:
- (1) Provide a bentonite seal between the casing and ground surface if the source is not required to be grouted.
- (2) Have gravel pack that is rounded particles, 95 percent siliceous material; that is smooth and uniform, free of foreign material, properly sized, washed and then disinfected immediately prior to or during placement.
- (3) Have the gravel pack placed in one uniform continuous operation.
- (4) Have screens that:
  - (A) are made of materials capable of withstanding the imposed structural loads;
  - (B) are resistant to damage by chemical action of groundwater or cleaning operations;
  - (C) have openings sized based on the sieve analysis of the formation or gravel pack materials;
  - (D) have sufficient diameter to provide adequate specific capacity and low aperture entrance velocity. The entrance velocity should not exceed 0.1 feet per second.
  - (E) allow the pumping water elevation to remain above the screen under all operating conditions;
  - (F) when applicable, be designed and installed to permit removal or replacement without adversely affecting watertight construction of the well; and
  - (G) have a bottom plate or wash-down bottom fitting of the same material as the screen.
- (5) Provide protection from leakage of grout or fine-grained formation materials into the gravel pack or screen.

Note: Appendix C, Figure C-16, depicts a detail of a typical drilled bedrock well and Appendix C, Figure C-17, depicts a detail of a typical driven well.

(c) Wells using tiles in unconfined surficial aquifers and confined surficial aquifers shall have:
- (1) All joints between concrete tiles and pipe penetrations be watertight using sealant or grout specifically designed for drinking water systems. All sealant or grout used shall be approved by an ANSI accredited organization.
- (2) Bedding that is clean ½ inch washed stone.
- (3) A diversion berm or swale constructed up-gradient from the source to divert runoff and stormwater away from the source.

(4) Backfill from ground surface to the bedding stone of clean native fill or finer textured soil.
(5) Backfill material of high clay content or equal surrounding the well tile and sloping away from the source for a distance of 10 feet to prevent stormwater from ponding around the well or well gallery.
(6) A minimum of 4 inches of topsoil over the clay.
(7) For sources that are pumped:
    (A) dry run protection or a low water shut-off; and
    (B) pumps set above the bottom of the source.
(8) Not be required to have overflow openings. Design of an overflow, when proposed, shall comply with § 1-1114(c).

Note: Appendix C, Figure C-18, depicts a detail of a typical shallow well.

§ 1-1207 Pipes and Pumps

(a) Pipes and fittings that are part of a potable water supply shall meet ANSI standards for potable water.

(b) Pumps shall meet the following requirements:
(1) Pumps shall have a standard pressure gauge in the discharge line for each pump prior to a hydropneumatic tank or other water storage tank.
(2) Pumps shall be designed to alternate when 2 or more pumps are installed.
(3) Pumps shall have a check valve within the casing at an elevation below the calculated drawdown level to prevent backflow for pumps installed in the well and to allow for operation, maintenance, repair, and replacement of the equipment.
(4) If a design includes multiple pumps, each shall have positive-acting check valve on the discharge side between the pump and the shut-off valve.
(5) If a design includes a foot valve, the foot valve shall have a net valve area of at least 1.5 times the area of the suction pipe and be screened.

(c) Suction lift pumps shall also:
(1) be no more than 15 feet above the static water elevation in the source; and
(2) include measures for priming the pump including:
    (A)
    (B) using prime water that is at least the same quality as the water being pumped; and
    (C) provisions to prevent back siphonage.

(d) Potable water sources with submersible pumps shall have:
(1) the electrical cable firmly attached to the riser pipe at 20-foot intervals or less;
(2) torque arresters if needed; and
(3) other appropriate means to properly support and prevent excessive movement of the pumping system or damage to the source.

(e) Wiring inside the potable water source casing shall comply with the Vermont Electrical Safety Rules.

(f) Wiring outside of the potable source casing shall:
- (1) be in a conduit or pipe from the well cap to at least 2 feet below land surface;
- (2) include a frost sleeve if piped with electrical conduit; and
- (3) comply with other requirements in the Vermont Electrical Safety Rules.

§ 1-1208 Requirements for Water Storage Tanks

(a) The bottom of a water storage tank shall be 2 feet above the seasonal high-water table unless the structure is provided proper anchors to prevent movement of the structure. If the structure is plastic or fiberglass, it shall comply with the manufacturers specifications for location within a seasonal high-water table.

(b) Water storage tanks shall be structurally capable of withstanding all external and internal forces exerted on the tank and shall be constructed of one of the following materials:
- (1) steel that complies with ASTM standards for steel tanks, reservoirs, and elevated tanks;
- (2) cast-in place and pre-cast concrete that is reinforced; or
- (3) a material approved by the Secretary, including types of plastic and fiberglass, that:
  - (A) will not decay by ultraviolet light or other causes; and
  - (B) will protect the quality of the stored water.

(c) Water storage tanks shall:
- (1) Be designed to prevent freezing.
- (2) Be designed so that the top of the water storage tank is a minimum of 24 inches above the ground surface.
- (3) Have a watertight access hatch that is elevated at least 18 inches above the top of the structure.
- (4) Have a solid watertight cover that overlaps the hatch frame opening that extends down around the frame at least 2 inches.
- (5) Have a drain to passively empty the tank for cleaning or maintenance.
- (6) Have an overflow of sufficient diameter to permit discharge of water in excess of the filling rate.
- (7) Have the drain and overflow discharge pipe:
  - (A) open downward a minimum of 18 inches above a splash plate when discharging to ground surface; or
  - (B) have an air-gap between the pipe and a sanitary sewer collection line, sanitary sewer service line, or storm drain when discharging to a line or drain.
- (8) The overflow discharge pipe shall have a 24 mesh non-corrodible screen covering the outlet.

(d) Venting shall be provided on all water storage tanks and the venting shall:
- (1) prevent the entrance of stormwater and precipitation;
- (2) open downward;
- (3) terminate 24 inches above finished ground surface; and
- (4) have a 24 mesh non-corrodible screen covering the vent outlet.

(e) Water storage overflow pipes shall not be used as vents.

(f) Roofs and sidewalls of water storage tanks shall meet the following requirements:

(1) Roofs and sidewalls shall have watertight construction with no openings except properly constructed means of access, vents, manholes, overflows, risers, drains, pump mountings, control ports, and piping for inflow and outflow. Open construction between the sidewall and roof of the structure is not permissible.

(2) Pipes extending through the roof or sidewall of a finished water storage tank shall:

(A) for metal tanks, have welded or properly gasketed sleeves; or

(B) for concrete tanks:

(i) be connected to standard wall castings that were poured-in-place during the forming or the concrete. The wall castings shall have seepage rings embedded in the concrete for water stoppage on sleeves (castings) in exterior or water-bearing walls; or

(ii) have interconnected synthetic rubber links shaped and sized to continuously fill the annular space between the pipe and wall sleeve opening.

(3) Openings in the roof or top of the water storage tank that accommodate control apparatus or pump columns shall be curbed and sleeved with proper additional shielding to prevent the access of surface or drainage water into the structure.

(4) Roofs shall be sloped to facilitate draining.

(5) Valves and controls located outside the water storage tank shall not have valve systems and similar projections pass through the roof or top of the storage structure.

(6) Materials that will be exposed to the potable water are required to meet the NSF International/American National Standard Institute (NSF/ANSI) Standard 61.

(g) Painting or cathodic protection shall be applied to metal surfaces of water storage tanks.

(1) Paints or coatings used in the interior of water storage tanks shall be approved for use in drinking water systems by ANSI accredited organizations.

(2) Samples of the water in a water storage tank shall be analyzed for volatile organic compounds prior to putting the water storage tank into service to establish that the paint or coating properly cured and will not contaminate water held in the structure.

(h) Grading around a ground level water storage tank shall be done in a manner to prevent stormwater from standing within 50 feet of the structure.

§ 1-1209 Leakage and Pressure Testing

(a) Water service lines and water service pipes shall be pressure tested and leakage tested according to one of the following procedures prior to placing the potable water supply into service:
   (1) Vermont Plumbing Rules;
   (2) the AWWA; or
   (3) by pressurizing the lines and pipes with water at the working pressure of the system or greater and hold without a drop in pressure for a minimum of 16 minutes.

(b) Atmospheric storage structures shall be leakage tested according to the following procedure to ensure water loss is equal to or less than 0.05 of 1 percent of the tank capacity prior to placing the structure into service:
   (1) filling the tank with potable water and let stand for 24 hours; and
   (2) measuring the loss of water over 24 hours.

(c) If the water service line, water service pipe, or atmospheric storage structure fails the pressure or leakage test, the cause of the failure shall be repaired, and the line, pipe, or structure retested.

§ 1-1210 Disinfection

(a) A potable water supply shall be disinfected pursuant to the requirements of Subsection (b), (c), and (d) prior to placing the potable water supply into service and after any servicing or repair of the potable water supply, such as installation of new pipes, wires, casing, or pumps.

(b) Disinfection of the potable water source shall be completed pursuant to the recommendations by the Vermont Department of Health for disinfecting a water system, or the following method:
   (1) flush the potable water supply until the water runs clear;
   (2) provide an initial dosage of at least 100 mg/L of chlorine in the potable water source;
   (3) circulate the water in the potable water source; and
   (4) allow the water to rest in the potable water source for a minimum of 12 to 24 hours before disposing of the chlorinated water.

(c) Disinfection of water service lines and water service pipes shall be completed pursuant to the requirements of the Vermont Plumbing Rules or the following method:
   (1) fill the water service line or water service pipe with a water/chlorine solution of 100 mg/L; and
   (2) allow the chlorinated water to rest in the water service line or water service pipe for a minimum of 24 hours before disposing of the chlorinated water.

(d) Disinfection of water storage tanks shall be completed pursuant to AWWA Standard C652.

(e) Chlorinated water used to disinfect or resulting from disinfection of potable water supplies shall not be discharged to a wastewater system or to surface water. Proper disposal of the chlorinated water is to the ground surface through sheet flow that infiltrates into the soil or disposal to a wastewater treatment facility, if authorized by the wastewater treatment facility.

Appendix A – Information for an Application

(a) For the purposes of this appendix, the term "project" means all components of all wastewater systems and potable water supplies that are required to be part of an application.

(b) When the application includes one or more existing or proposed lots, the latitude and longitude for the center of each existing or proposed lot identified in the application shall be reported on the application form using a global positioning system receiver using the NAD 83 coordinate system or a NAD 83 base map. The coordinates shall be reported in decimal degrees to five decimal places with an accuracy of +/- 50 feet. Because many lots are irregularly shaped, the center location can be approximate.

(c) When the application needs to identify proposed or existing buildings or structures or campgrounds, soil-based wastewater systems, sanitary sewer service lines, sanitary sewer collection lines, potable water supplies, or the subdivision of land, a site plan shall be included with the application that includes the following information:

(1) Preparer's signature, plan title, date, and revision date(s) on all plans.

(2) Legend or clear identification of all plan features.

(3) North arrow.

(4) Plan scale as required by Rules stated on the plans. A graphic representation may be shown but does not replace a stated scale.

(A) Except as required by Subsection (c)(4)(C), site plans shall be prepared to a scale not greater than 1-inch equals 100 feet.

(B) Site plans shall be prepared to a scale not greater than 1-inch equals 30 feet for those site plans identifying the limits of the infiltrative area for an in-ground leachfield; the limits of the stone and fill material for an at-grade leachfield; the limits of the fill material for a mound; the enclosure for a bottomless sand filter; and the area 25 feet downslope and 10 feet on all other sides from the limits of the stone and fill material for an at-grade leachfield, the limits of the fill material for a mound, and the enclosure for a bottomless sand filter.

(C) Notwithstanding Subsection (c)(4)(A), a site plan may have scale greater than 1-inch equals 100 feet, including the use of aerial photographs, for the purposes of:

(i) identifying the boundary line locations and dimensions when the size of the lot is greater than 10 acres;

(ii) identifying a site listed on the hazardous sites list maintained by the Waste Management Division of the Department that is located greater than 500 feet and within one third of a mile to a potable water supply; or

(iii) identification of surface drainage patterns.

(5) The location and elevation of the permanent benchmark established on the lot.

(6) All existing and proposed boundary lines and boundary line dimensions.

(7) For the lot on which a wastewater system or a potable water supply is proposed:

(A) Lot numbers or unique lot designations for subdivisions involving 2 or more lots.

(B) Campsite numbers or unique campsite designations for campgrounds.

(C) Existing and proposed permanent legal accesses.
(D) Existing and proposed driveways, parking lots, and roadways.
(E) Existing and proposed buildings or structures, or campgrounds.
(F) Designated Well Head Protection Area (WHPA).
(G) Surface water such as streams, lakes, ponds, reservoirs, and other water impoundments.
(H) Stormwater conveyance/treatment/control practices.
(I) Class 1 or Class II wetlands.
(J) Base flood elevation.
(K) Floodways.

(8) Contours shall be provided using the following specifications:
(A) 5-foot contour interval shall be provided for drawing isolation zones around leachfields, wastewater system components, potable water supply sources, and potable water supply components except when the component of the potable water supply is a water service line or a water service pipe, and except when the component of the wastewater system is a sanitary sewer service line connecting to a sanitary sewer collection line.
(B) 2-foot contour intervals shall be provided for that portion of the plan identifying the limits of the stone and fill material for an at-grade leachfield; the limits of the fill material for a mound; the enclosure for a bottomless sand filter; and the area 25 feet downslope and 10 feet on all other sides from the limits of the stone and fill material for an at-grade leachfield, the limits of the fill material for a mound, and the enclosure for a bottomless sand filter.
(C) At least 90 percent of the contours shall be accurate within one half contour interval and no inaccuracies shall exceed one contour interval.
(D) Photogrammetric contour maps may only be used to show the general contour of the land when it is necessary to show ground or groundwater flow to such items as hazardous waste sites and public water sources.

(d) For an application proposing a wastewater system, the following additional information shall be provided:
(1) Required information to be shown on the site plan for a soil-based wastewater system:
(A) Location of all components of the proposed wastewater system and replacement area.
(B) Location of all proposed, existing or permitted potable water sources and public water sources that are on the applicant's property.
(C) Location of all proposed, existing, or permitted potable water sources and public water sources that are off the applicant's property but that have an isolation zone identified in § 1-912(b) that ends 50 feet or less from the proposed leachfield.
(D) Location of any Zone 1 of a Public Community Water System Source Protection Area that are on the applicant's property or are off the applicant's property but within 50 feet of the applicant's nearest property line.

(E) Isolation zones identified in § 1-912(b) drawn around all proposed, existing, or permitted potable water sources and public water sources identified in Subsection (d)(1)(B) and (C).

(F) Location and identification of features and objects identified in Table 9-5 that are on the applicant's property.

(G) All soil test pit locations with corresponding numbers or letter designations conducted within 50 feet of a leachfield.

(H) All percolation test locations with corresponding numbers or letter designations conducted within 50 feet of a leachfield.

(I) Existing and proposed footing drains, curtain drains, and drainage pipes or tiles within 75 feet of a leachfield.

(J) Existing and proposed surface water drainage ditches, and surface water swales within 75 feet of a leachfield.

(K) Ledge outcrops and other site limitations that may interfere with the proper installation of the components of the wastewater system.

(2) Required information to be shown on the site plan for a water main, water service line, or water service pipe:

(A) Location of existing, proposed, or permitted water mains, water service lines, or water service pipes that are on the applicant's property or off the applicant's property but are within 50 feet of the applicant's nearest property line.

(B) Elevations and material specifications of the water main, water service line, or water service pipe when:

(i) a sanitary sewer collection line or sanitary sewer service line crosses a water main, water service line, or water service pipe; or

(ii) a sanitary sewer collection line or sanitary sewer service line is within the horizontal isolation distance to a water main, water service line, or water service pipe.

(3) Plans with details for components of a wastewater system.

(A) Preparer's signature, plan title, date, and revision date(s) on all plans.

(B) Septic tank effluent filter manufacturer and model number identified with the tank detail.

(C) Septic tank size, dimensions, riser to grade, and material specifications.

(D) Grease tank size, dimensions, and material specifications.

(E) Innovative/alternative system or component if the system or component has general, pilot, or experimental approval.

(F) Pump station including float material (mercury floats are prohibited), float elevations, venting, and visual and audio alarm location.

(G) Storage tank size, dimensions, riser to grade, and material specifications.

(H) Dosing siphon.

(I) Sanitary sewer service line, or force main when a component of a sanitary sewer service line, with minimum pipe slope for the service line, invert elevations at the building and at each component of the wastewater system, and pipe sizes and material specifications.

(J) Sanitary sewer collection line plan and profile, pipe invert elevations at each component of the wastewater system, and pipe sizes and material specifications.

(K) Sanitary sewer force main, when a component of a sanitary sewer collection line, plan and profile, pipe sizes and material specifications, and pipe invert elevations at each component of the wastewater system.

(L) Trench detail for a sanitary sewer service line, sanitary sewer collection line, and force main when a component of a sanitary sewer service line or sanitary sewer collection line.

(M) Sewer/water crossover detail with invert elevations of the sanitary sewer service line, sanitary sewer collection line, water service line, water service pipe, or water main.

(N) Manhole or cleanout detail that are included on a sanitary sewer collection line or sanitary sewer service line.

(O) Distribution box detail with flow equalization devices.

(P) Vertical cross-section view of the leachfield with bottom trench or bed, invert elevations for distribution piping, at-grade access and clean out ports, and top of field relative to original and proposed ground surface.

(Q) Sanitary sewer service line or sanitary sewer collection line crossing surface water.

(R) Proposed curtain drain.

(S) Erosion prevention and sediment control measures.

(4) Supporting data and narratives.

(A) Calculations for sizing each component of the wastewater system, when required.

(B) Flow metering and wastewater strength analysis, when required.

(C) Calculations to demonstrate all portions of the bottom of the leachfield maintain the depths of naturally occurring soil and fill material required pursuant to § 1-903 to the seasonal high-water table, induced water table, and bedrock.

(D) Hydrogeologic analysis to calculate the induced water table.

(E) Soil descriptions and percolation test results corresponding to the soil test pit and percolation site identified on the site plan.

(F) An application that includes a design of a leachfield based on monitoring of the water table to establish the seasonal high-water table shall include:

(i) all water table monitoring data; and

(ii) an analysis of the water table monitoring data.

(G) Specifications for mound fill material, fill material for sand filters, and bottomless sand filter fill material.

(H) Leakage testing procedure and required result for each component of a wastewater system.

(I) Innovative/alternative system or component manufacturer and model number, if applicable.

(J) Specifications on methods of installation, performance standards, and quality of workmanship.

(K) Operation and maintenance manuals when required by these Rules.

(L) When a constructed wetlands is a component of the wastewater system, a list of plant species.

(e) For an application proposing a potable water supply, the following additional information shall be provided.

(1) Required information to be shown on the site plan for a potable water supply with a potable water source.

(A) Location of all components of the proposed potable water system.

(B) Location of all proposed, existing, or permitted leachfields, replacement areas, and wastewater tanks that are on the applicant's property.

(C) Location of all proposed, existing, or permitted leachfields and wastewater tanks and replacement areas that are off the applicant's property but that have an isolation zone identified in § 1-1104(e) that ends 50 feet or less from the proposed potable water source.

(D) Isolation zones identified in § 1-1104(e) drawn around all proposed, existing, or permitted leachfields, replacement areas, and wastewater tanks identified in Subsection (e)(1)(B) and (C).

(E) Location and identification of all potential sources of contamination identified in Table 11-1 that are on the applicant's property or that are off the applicant's property but have an isolation distance that ends 50 feet or less from the proposed potable water source.

(F) Ledge outcrops and other site limitations that may interfere with the proper installation of the components of the potable water supply.

(G) Existing or permitted potable water supplies or public water supplies within the isolation distances for interference testing.

(2) Required information to be shown on the site plan for a potable water supply that is a water service line or a water service pipe.

(A) Location of sanitary sewer collection lines or sanitary sewer service lines that are on the applicant's property and location of sanitary sewer collection lines or sanitary sewer service lines that are off the applicant's property but within 50 feet of the applicant's nearest property line.

(B) Elevations and material specifications of the sanitary sewer collection line or sanitary sewer service line when:

(i) a water service line or water service pipe crosses a sanitary sewer collection line or sanitary sewer service line; or

(ii) a water service line or water service pipe is within the horizontal isolation distance to a sanitary sewer collection line or sanitary sewer service line.

(3) Plans with details for components of a potable water supply.

(A) Preparer's signature, plan title, date, and revision date(s) on all plans.

(B) Well construction and material specifications.

(C) Water service pipe or water service line size and material specifications.

(D) Water service pipe or water service line trench and material specifications.

(E) Potable water system treatment components and material specifications, if treatment is included in the design.

(F) Storage tank size, dimensions, riser to grade, overflow, and material specifications.

(G) Water service pipe or water service line crossing surface water.

(4) Supporting data and narratives.

(A) Calculations for sizing each component of the potable water supply, when required.

(B) Determining the long-term yield for potable water sources if required for the potable water supply.

(C) Calculations for determining the instantaneous peak demand if required for the potable water supply.
(D) Calculations for determining water storage if determining storage is required for the potable water supply.
(E) Water quality testing results.
(F) Flow metering analysis, when required.
(G) Well yield and method for determining the yield.
(H) Pressure and leakage testing of distribution system.
(I) Disinfection specifications for disinfecting potable water supply.
(J) Water system treatment components with manufacturer's make and model numbers, if treatment is included in the design.
(K) Surrounding well logs to demonstrate availability of water.
(L) Interference testing and analysis when required.
(M) Pump manufacturer with pump capabilities and model number.
(N) Specifications on methods of installation, performance standards, and quality of workmanship.
(O) Operation and maintenance manuals.

Appendix B – Examples

Examples B-1 Examples for Designing a Flow Equalization Tank

Example 1: The project discharges 1000 gallons per day on Friday and Saturday and 200 gallons per day for the other five days. Total flow is 3,000 gallons and is discharged over 7 days at 429 gallons per day.

Example 1 Table

Day	Flow into system	Flow out of system	Storage
1	1000	429	571
2	1000	429	1,142
3	200	429	913
4	200	429	684
5	200	429	455
6	200	429	226
7	200	429	0

The maximum storage per the table is 1142 gallons.
The system needs a storage tank of 1,142 X 1.5 = 1,713 gallons.

Example 2: The project discharges 1000 gallons per day on Monday and on Thursday and 200 gallons per day the other five days. Total flow is 3,000 gallons and is discharged over 7 days at 429 gallons per day.

Example 2 Table

Day	Flow into system	Flow out of system	Storage
1	1000	429	571
2	200	429	342
3	200	429	113
4	1000	429	684
5	200	429	455
6	200	429	226
7	200	429	0

The maximum storage per the table is 684 gallons.
The system needs a storage tank of 684 X 1.5 = 1026 gallons.

Examples B-2 Examples for Calculating the Induced Water Table Using the Simplified Method

Example 1: Calculate the linear loading rate (LLR) for the design of a mound for a 3-bedroom single-family residence with the following basis of design.

The design flow (DF) is 420 gallons per day (gpd). The site has 13 inches of a sandy loam over 10 inches of a silt loam. The sandy loam and silt loam have consistencies less dense than "firm." Seasonal high-water table is at 23 inches. The ground slope where the leachfield is proposed is 5 percent. The designer may use only the 13 inches of the sandy loam (the silt loam becomes the limiting soil condition); use the silt loam if the design is to use the 23 inches above the seasonal high-water table; or use both soil textures. These Rules require 6 inches of naturally occurring soil between ground surface and the induced water table.

(1) Calculate the LLR and System Length Based Solely on the Available Depth of Sandy Loam.

Calculate the LLR:
(h) = (13 inches - 6 inches) ÷ 12 inches per foot = 0.58 feet
(f) = 18.7 (from Table 9-14 for a sandy loam with a 5 percent slope)
LLR = (h)(f) = (0.58)(18.7) = 10.8 gallons per linear foot

Calculate the minimum system length (SL)
SL = DF ÷ LLR
SL = 420 gpd ÷ 10.8 gallons per linear foot
SL = 39 feet

(2) Calculate the LLR and System Length Based on the Most Limiting Soil or Silt Loam.

Calculate the LLR:
(h) = (13 inches + 10 inches - 6 inches) ÷ 12 inches per foot = 1.4 feet
(f) = 3.7 (from Table 9-14 for a silt loam with a 5 percent slope)
LLR = (h)(f) = (1.4)(3.7) = 5.18 gallons per linear foot

Calculate the minimum system length (SL):
SL = DF ÷ LLR
SL = 420 gpd ÷ 5.18 gallons per linear foot
SL = 81 feet

(3) Calculate the LLR and System Length Based on the 2 Textures of Sandy Loam and Silt Loam.

According to § 1-927(j), the LLR using 2 textures is:
LLR for the Sandy Loam + LLR for the Silt Loam
LLR for the Sandy Loam = [(13 inches - 6 inches) ÷ 12 inches](18.7) = 10.8 gallons per linear foot
LLR for the Silt Loam = (10 inches ÷ 12 inches)(3.7)
LLR = 3.1
System LLR = 10.8 gallons per linear foot + 3.1 gallons per linear foot
System LLR = 13.9 gallons per linear foot

Calculate the minimum system length (SL)
SL = DF ÷ LLR

SL = 420 gpd ÷ 13.9 gallons per linear foot
SL = 30 feet

Example 2: Calculate the linear loading rate (LLR) for the design of a mound for a 3-bedroom single-family residence with the following basis of design.

The design flow (DF) is 420 gallons per day (gpd). The site has 10 inches of a silt loam over 13 inches of a sandy loam. The silt loam and sandy loam have consistencies less dense than "firm." Seasonal high-water table is at 23 inches. The ground slope where the leachfield is proposed is 5 percent. The designer may use only the 10 inches of the silt loam (the sandy loam becomes the limiting soil condition); use the silt loam if the design is to use the 23 inches above the seasonal high-water table; or use both soil textures. These Rules require 6 inches of naturally occurring soil between ground surface and the induced water table.

(1) Calculate the LLR and System Length Based Solely on the Available Depth of Silt Loam.

Calculate the LLR:
(h) = (10 inches - 6 inches) ÷ 12 inches per foot = 0.33 feet
(f) = 3.7 (from Table 9-14 for a silt loam with a 5 percent slope)
LLR = (h)(f) = (0.33)(3.7) = 1.2 gallons per linear foot

Calculate the minimum system length (SL)
SL = DF ÷ LLR
SL = 420 gpd ÷ 1.2 gallons per linear foot
SL = 350 feet

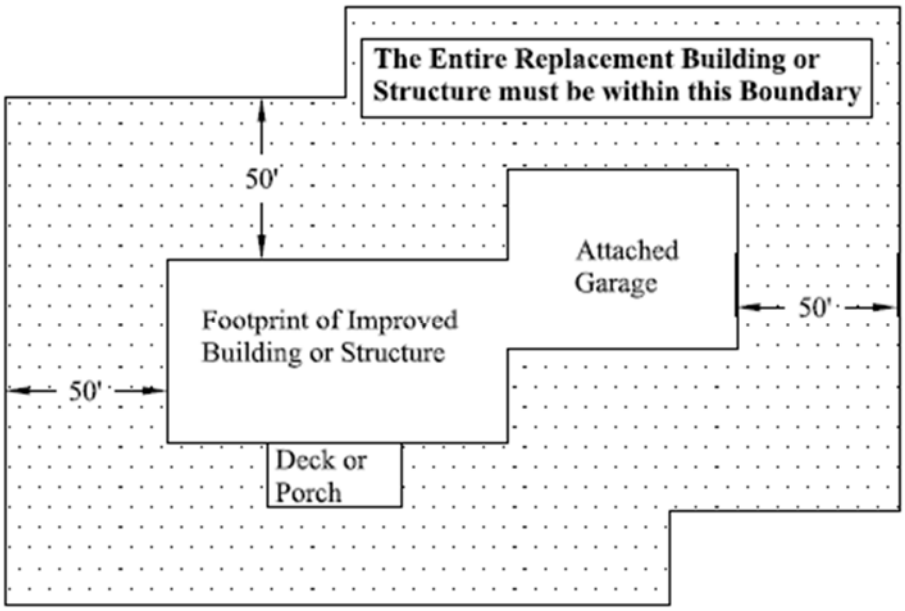
(2) Calculate the LLR and System Length Based on the 2 soil textures. Since the silt loam soil has an f-factor that is less than the underlying layer of sandy loam soil, the LLR shall be based on the f-factor for the silt loam soil.

Calculate the LLR:
(h) = (10 inches - 6 inches + 13 inches) ÷ 12 inches per foot = 1.4 feet
(f) = 3.7 (from Table 9-14 for a silt loam with a 5 percent slope)
LLR = (h)(f) = (1.4)(3.7) = 5.18 gallons per linear foot

Calculate the minimum system length (SL):
SL = DF ÷ LLR
SL = 420 gpd ÷ 5.18 gallons per linear foot
SL = 81 feet

Appendix C – Typical Details and Examples

Figure C-1 Example of 50-foot Calculation for Reconstruction



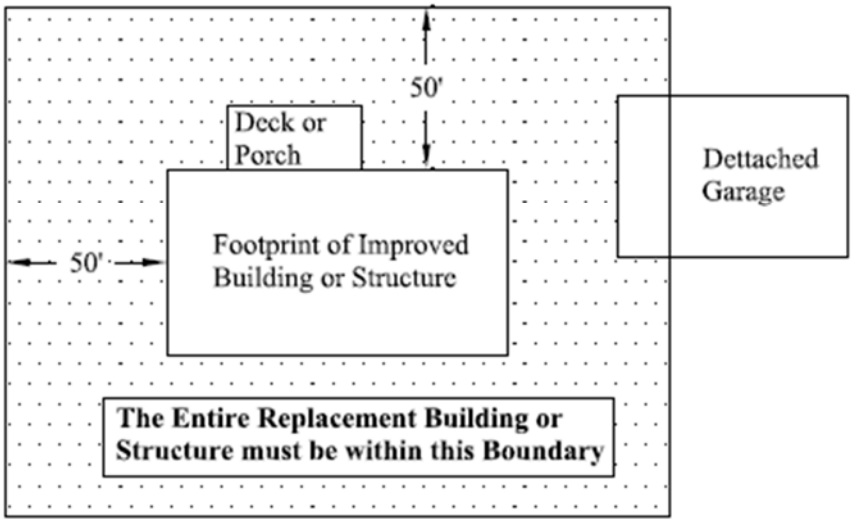
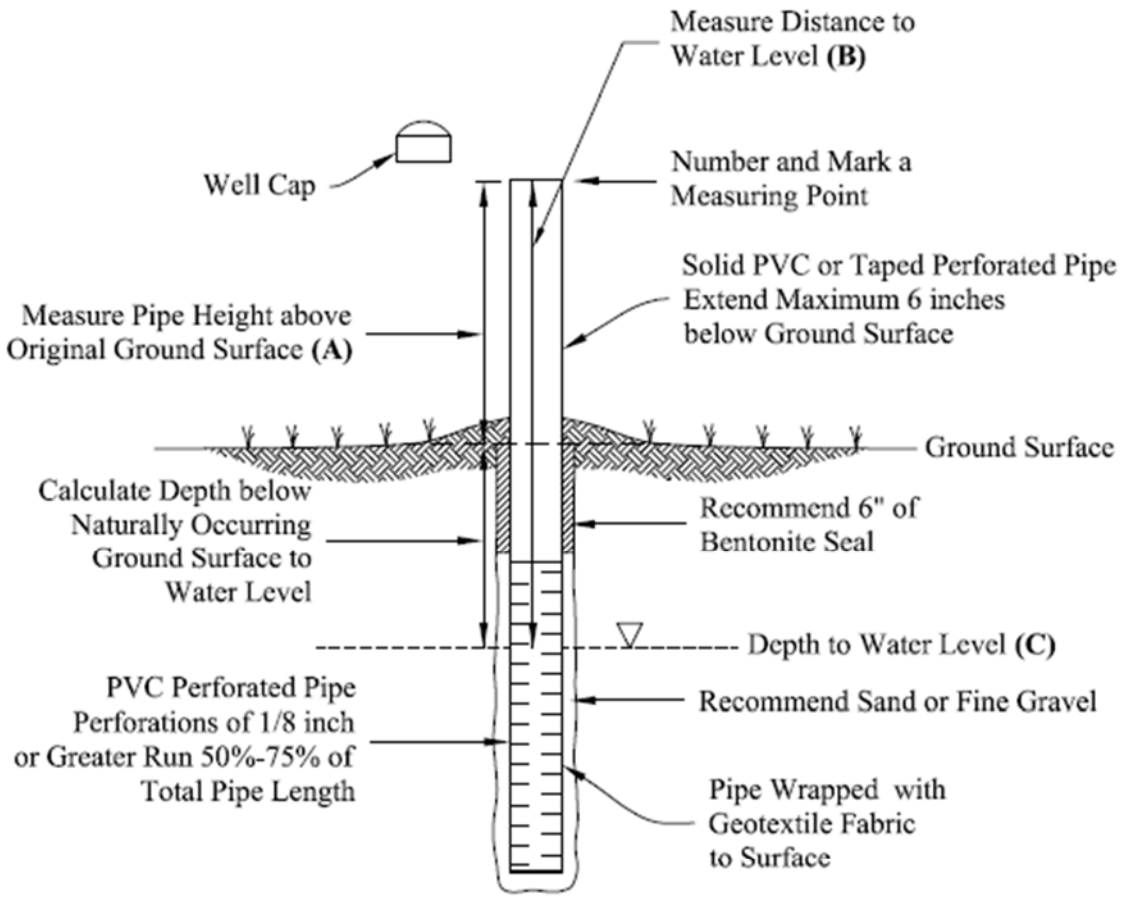


Figure C-2 Detail of Typical Groundwater Monitoring Well



Depth to Water Level {B-A=C}

Figure C-3 Detail of Typical Site that was Re-Graded

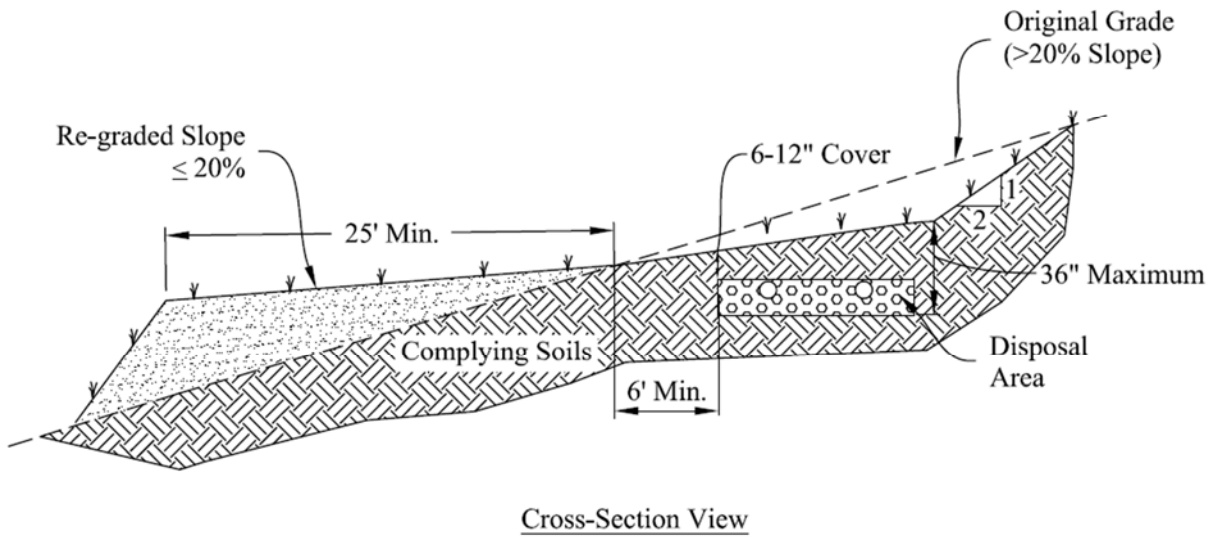


Figure C-4 Example for Drawing Isolation Zone Around a Drinking Water Source

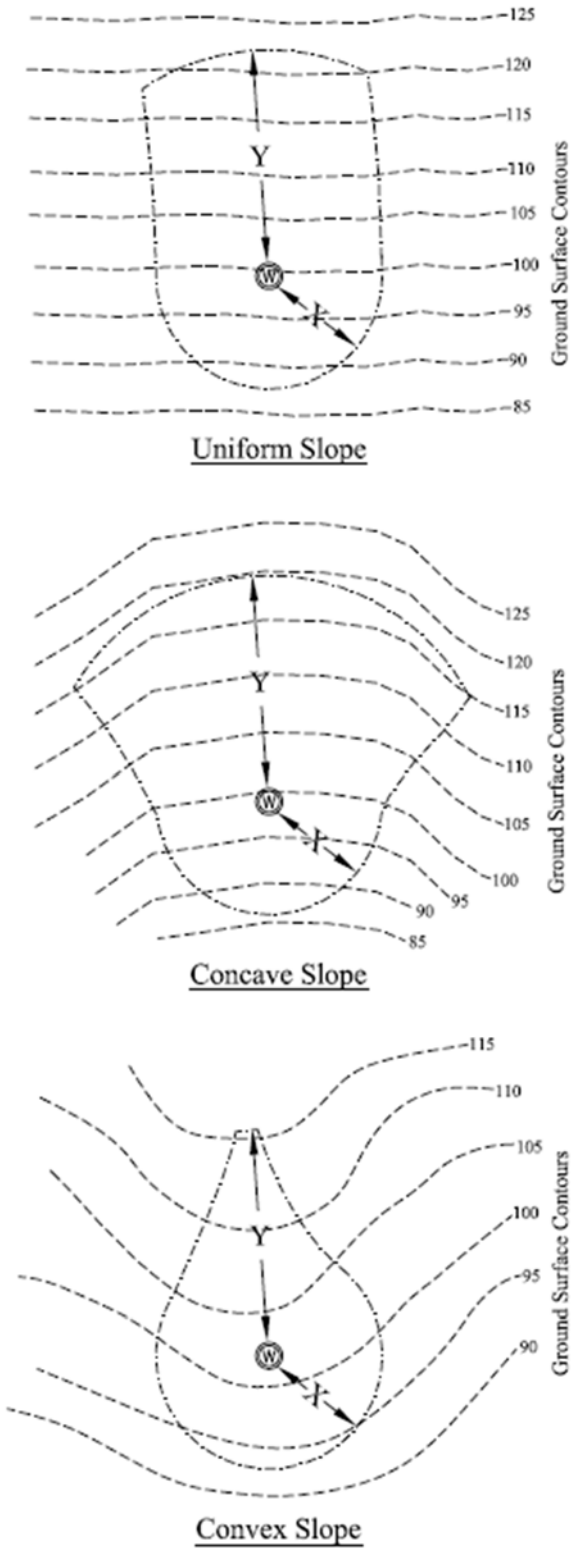


Figure C-5 Detail of Typical Time Dosing Pump Station

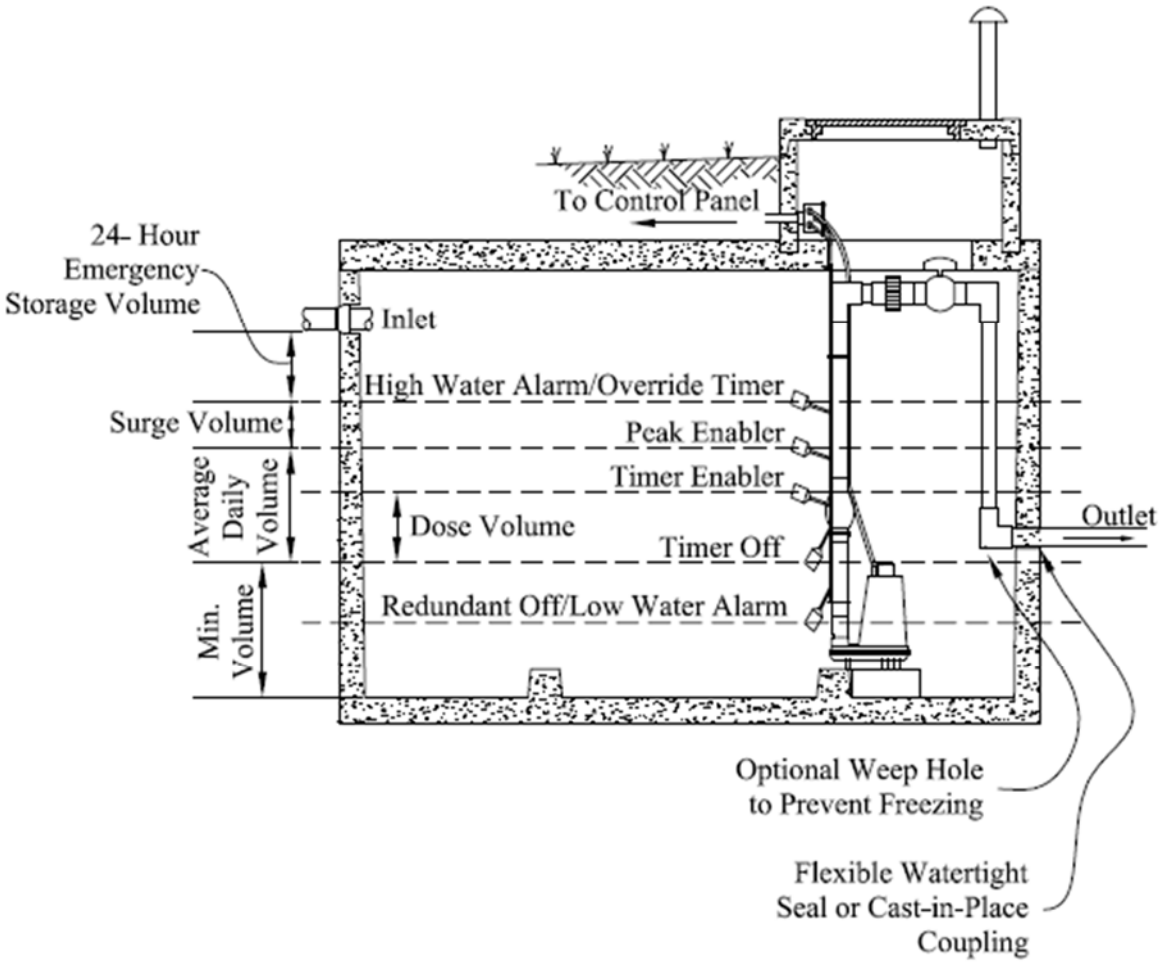
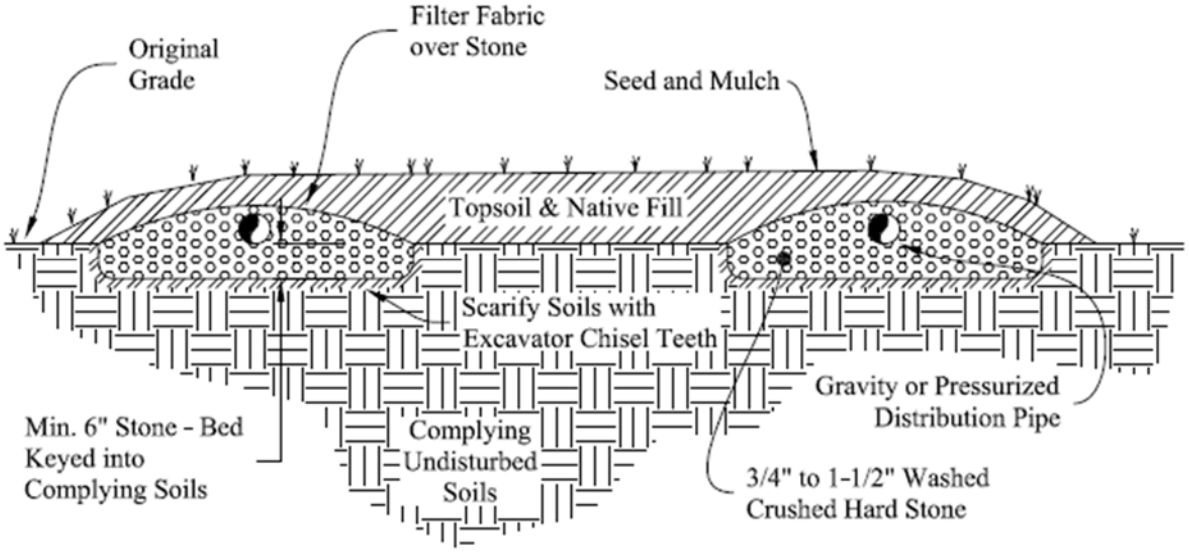


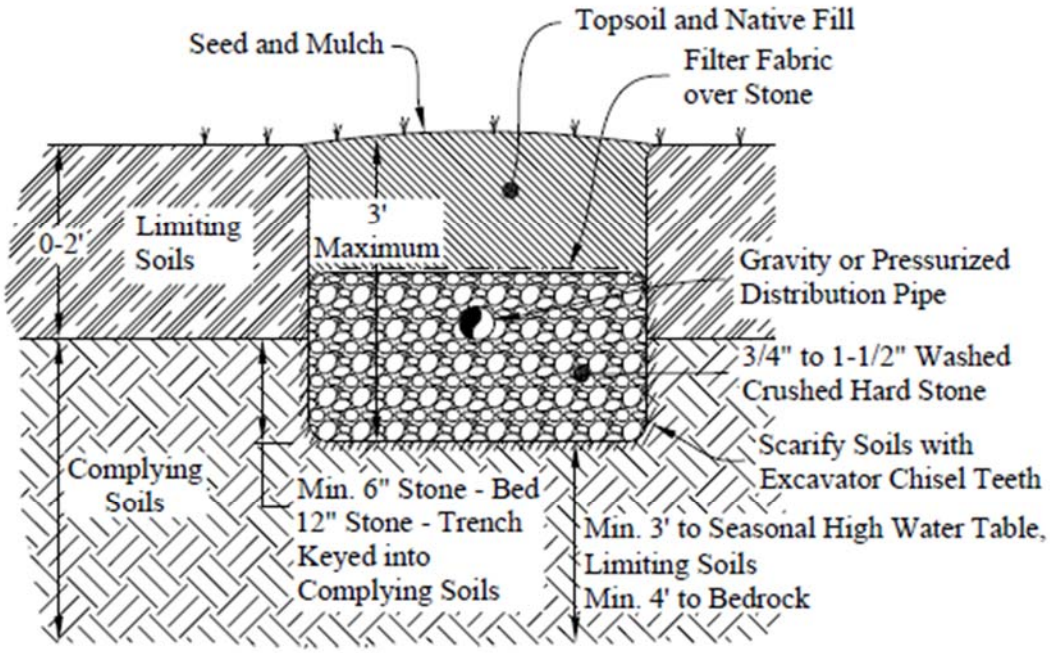
Figure C-6 Detail of Typical Shallow Trench Wastewater System



Cross-Section View

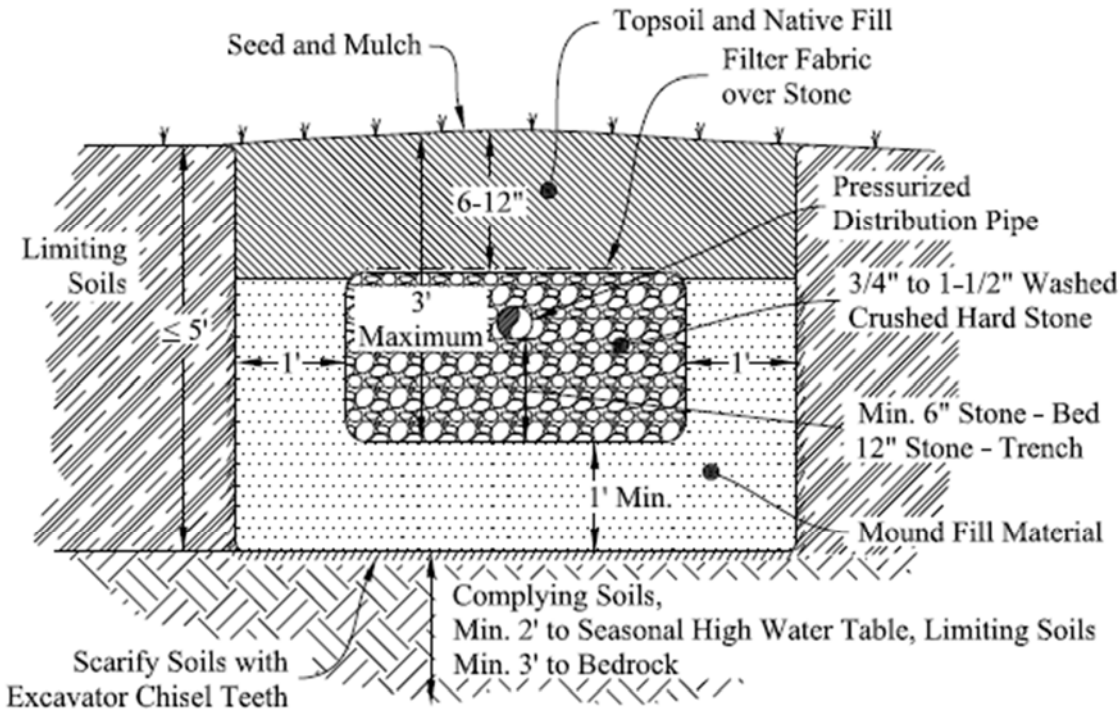
Bottom of Stone:
Min. 3' to Seasonal High Water Table,
Impervious Soils
Min. 4' to Bedrock

Figure C-7 Detail of Typical Trench Wastewater System With 24 Inches of Limiting Soil



Cross-Section View

Figure C-8 Detail of Typical Trench Wastewater System With 24 Inches to 5 Feet of Limiting Soil



Cross-Section View

Figure C-9 Detail of Typical At-Grade Leachfield with One Infiltration Area (0-3 % Site Slope)

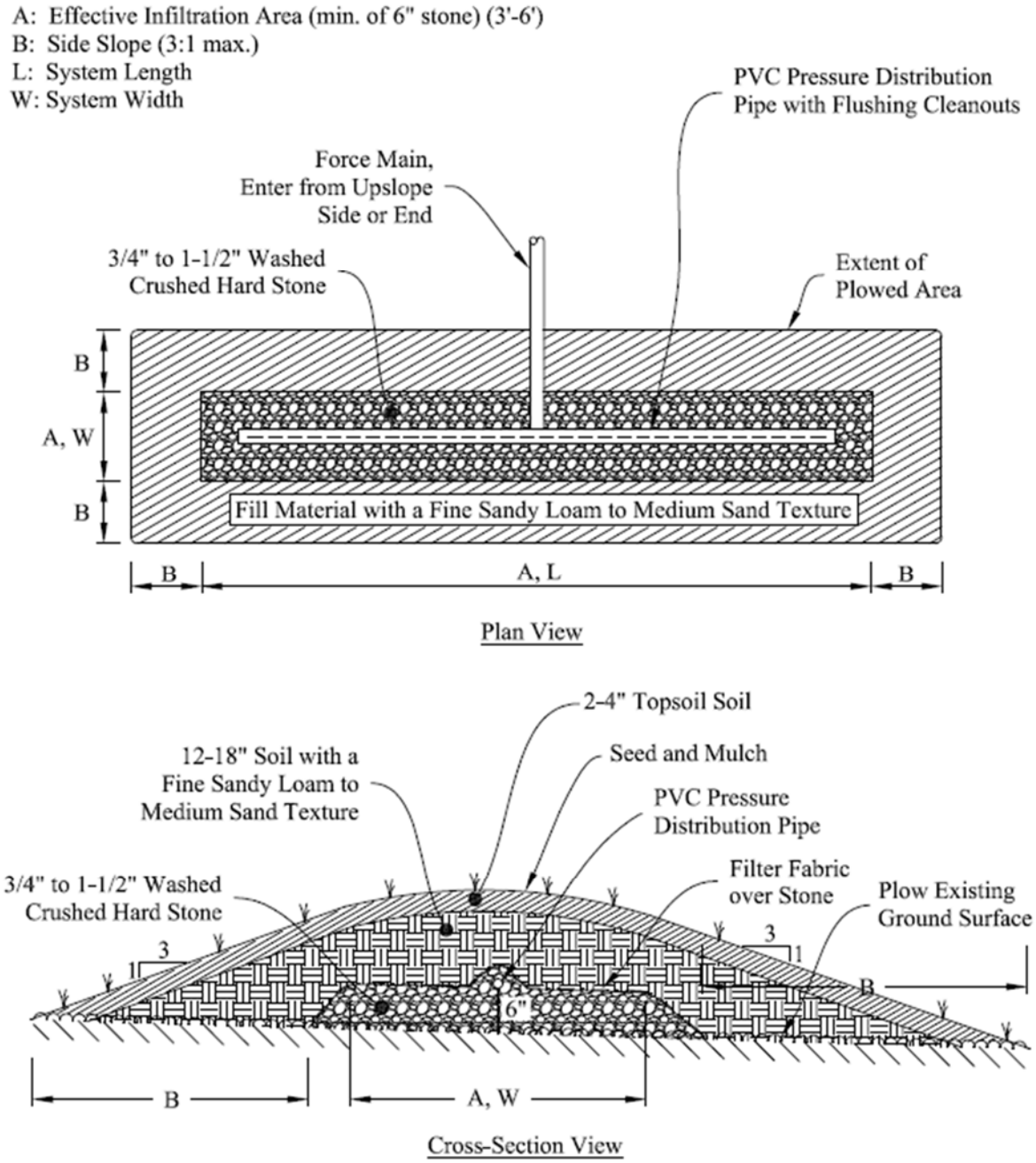


Figure C-10 Detail of Typical At-Grade Leachfield with Two Infiltration Areas (> 3 % Site Slope)

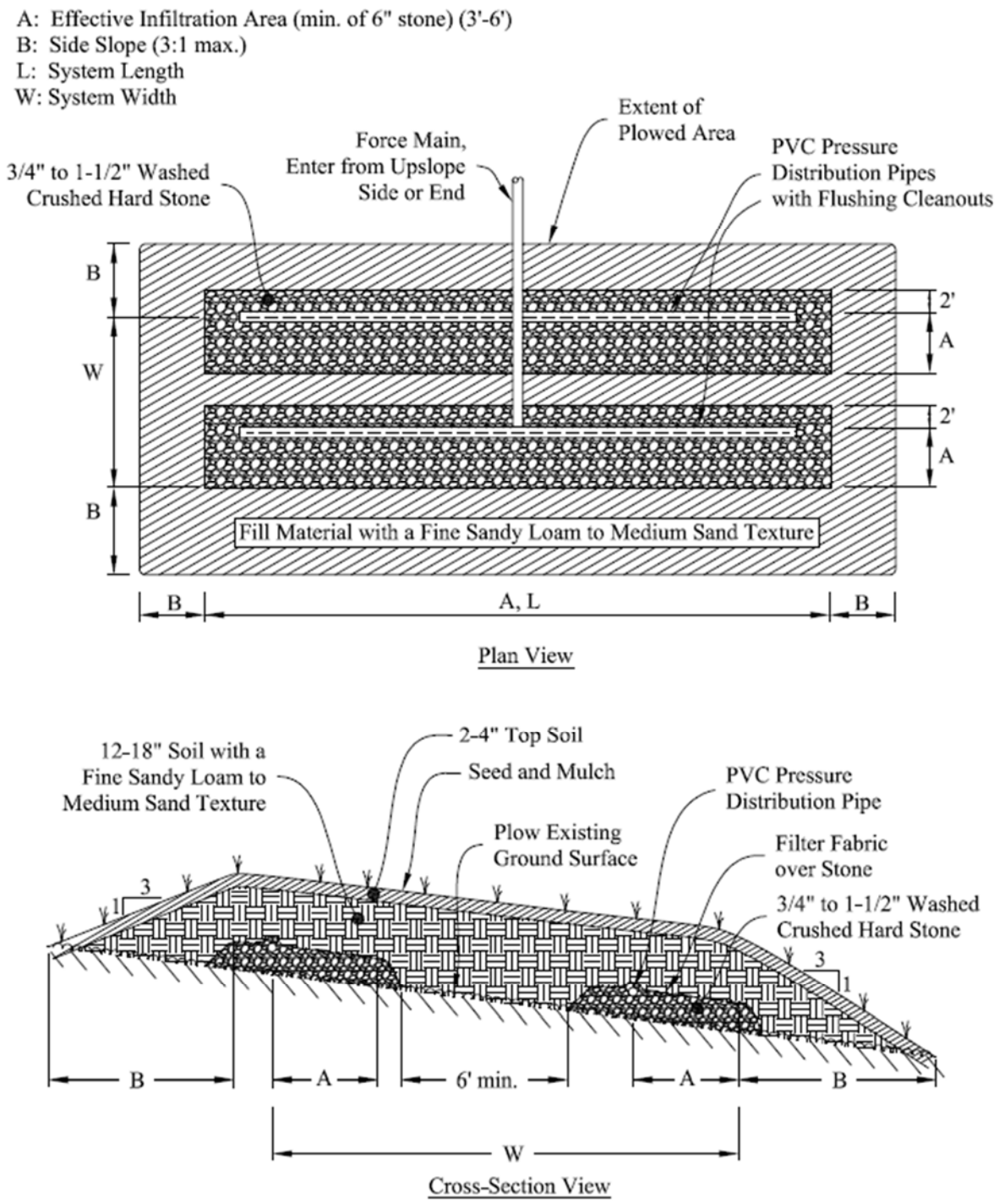


Figure C-11 Detail of Typical At-Grade Leachfield with Interfingering Infiltration Areas (> 3 % Site Slope)

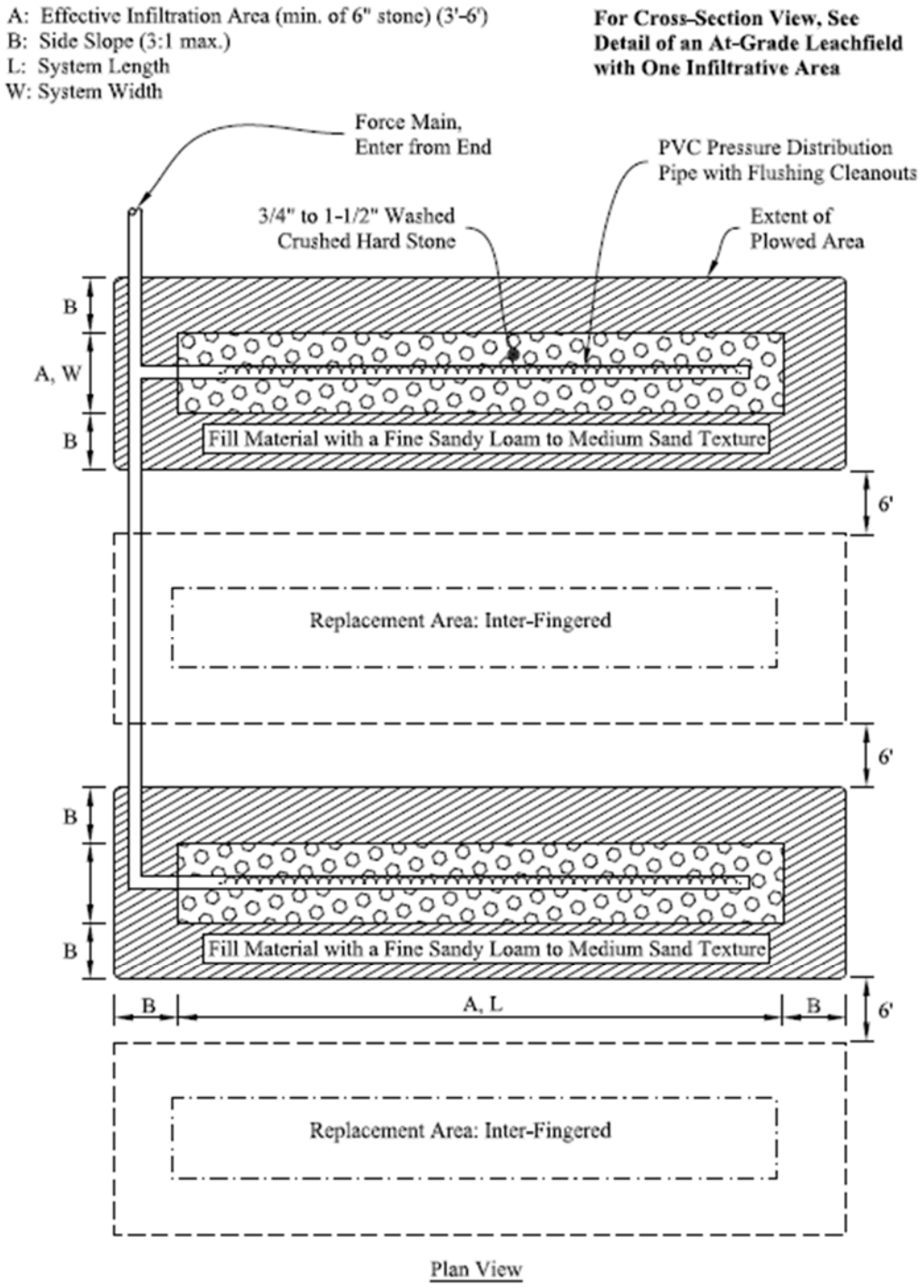


Figure C-12 Detail of Typical Bed in a Mound

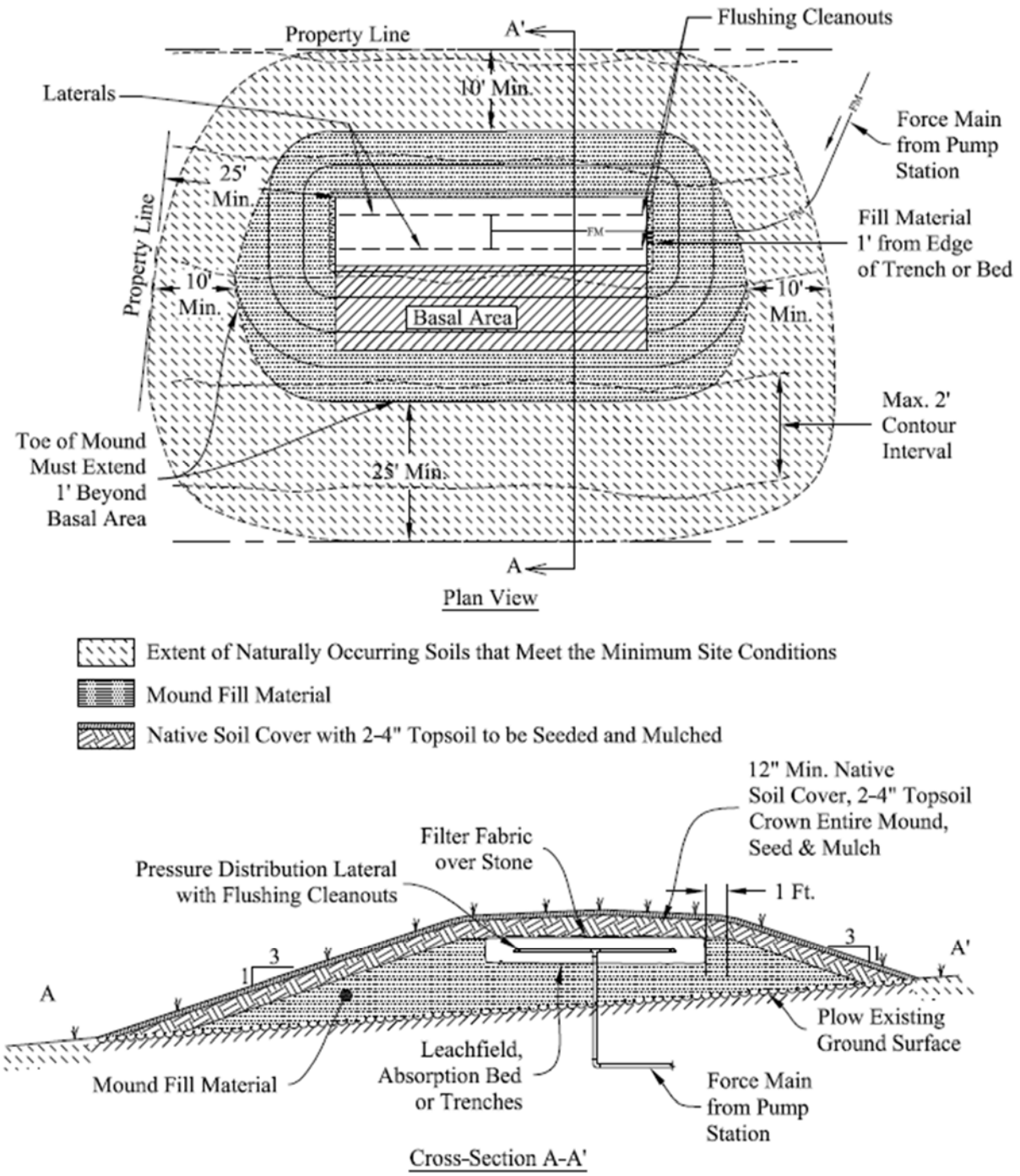


Figure C-13 Detail of Typical Leachfield in a Bottomless Sand Filter

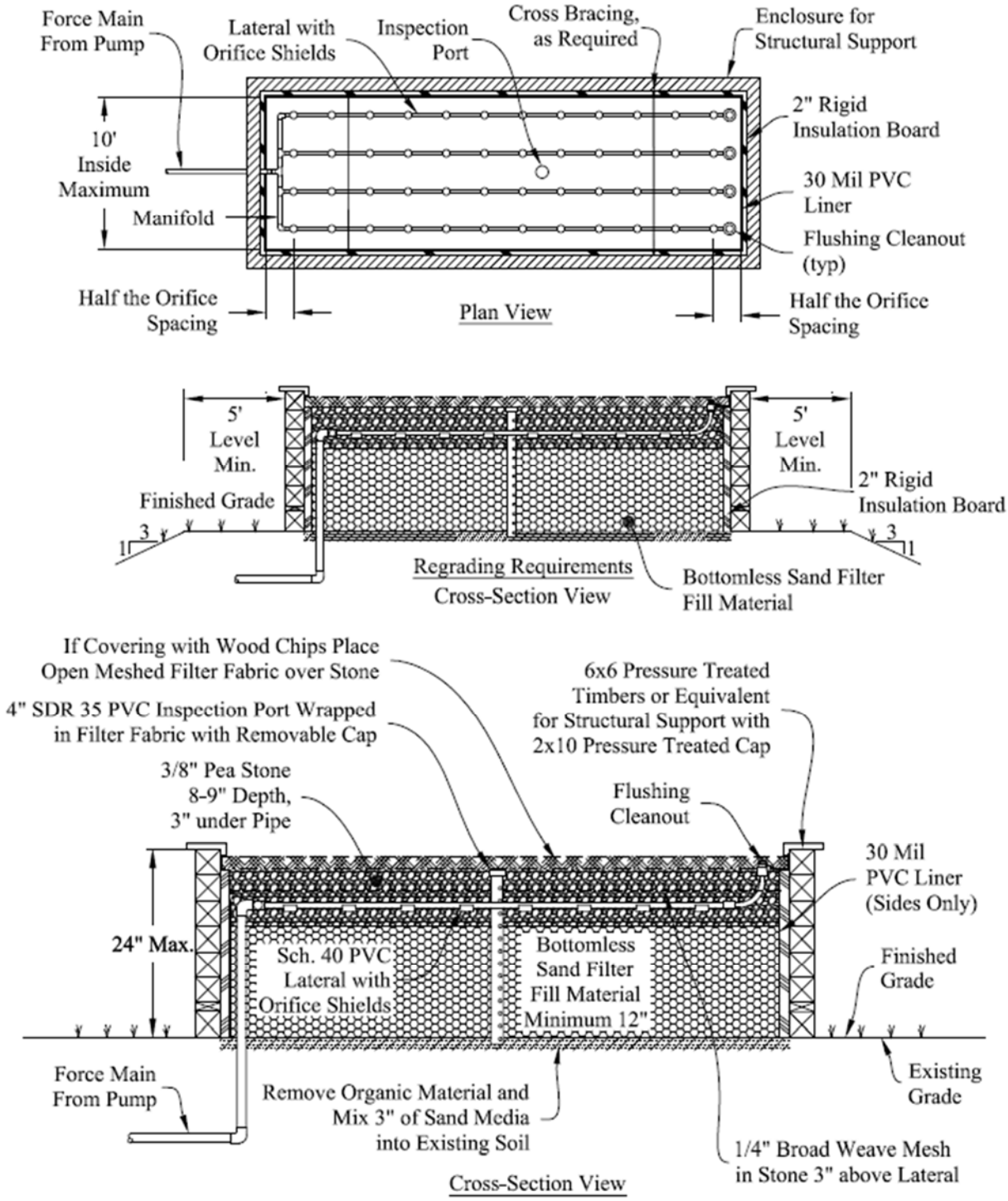
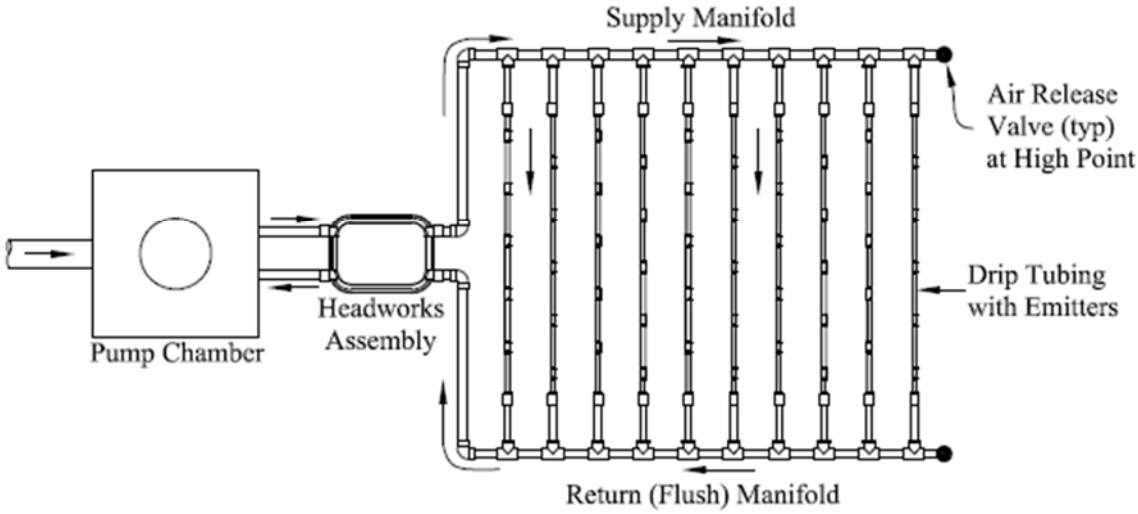
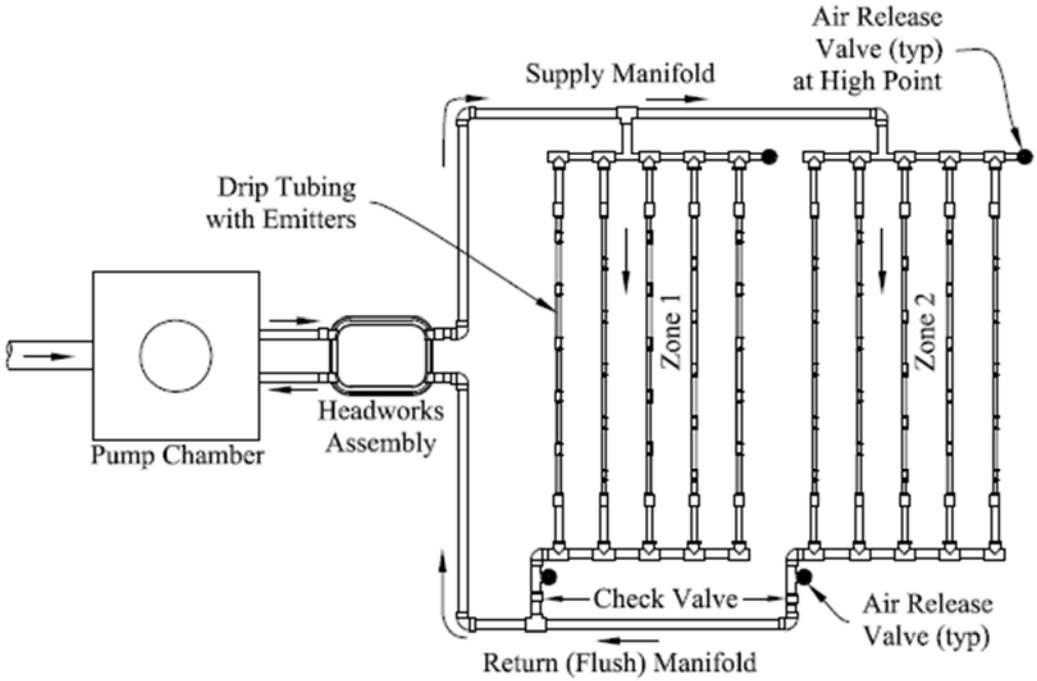


Figure C-14 Detail of Typical Leachfield using Subsurface Drip Distribution



Plan View

Typical Subsurface Drip Distribution - Two Zones



Plan View

Figure C-15 Example for Drawing Isolation Zone Around a Leachfield

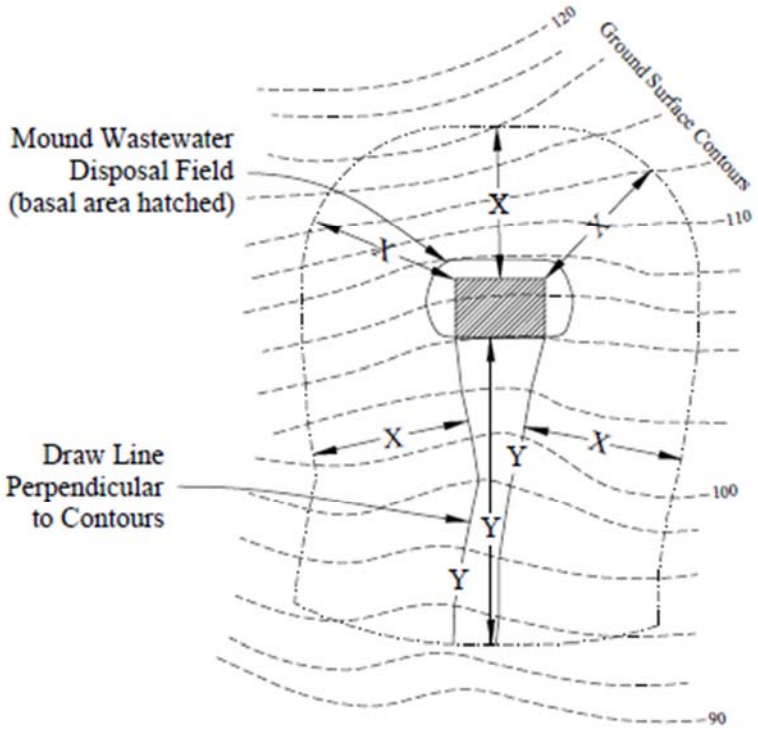


Figure C-16 Detail of Typical Drilled Bedrock Well

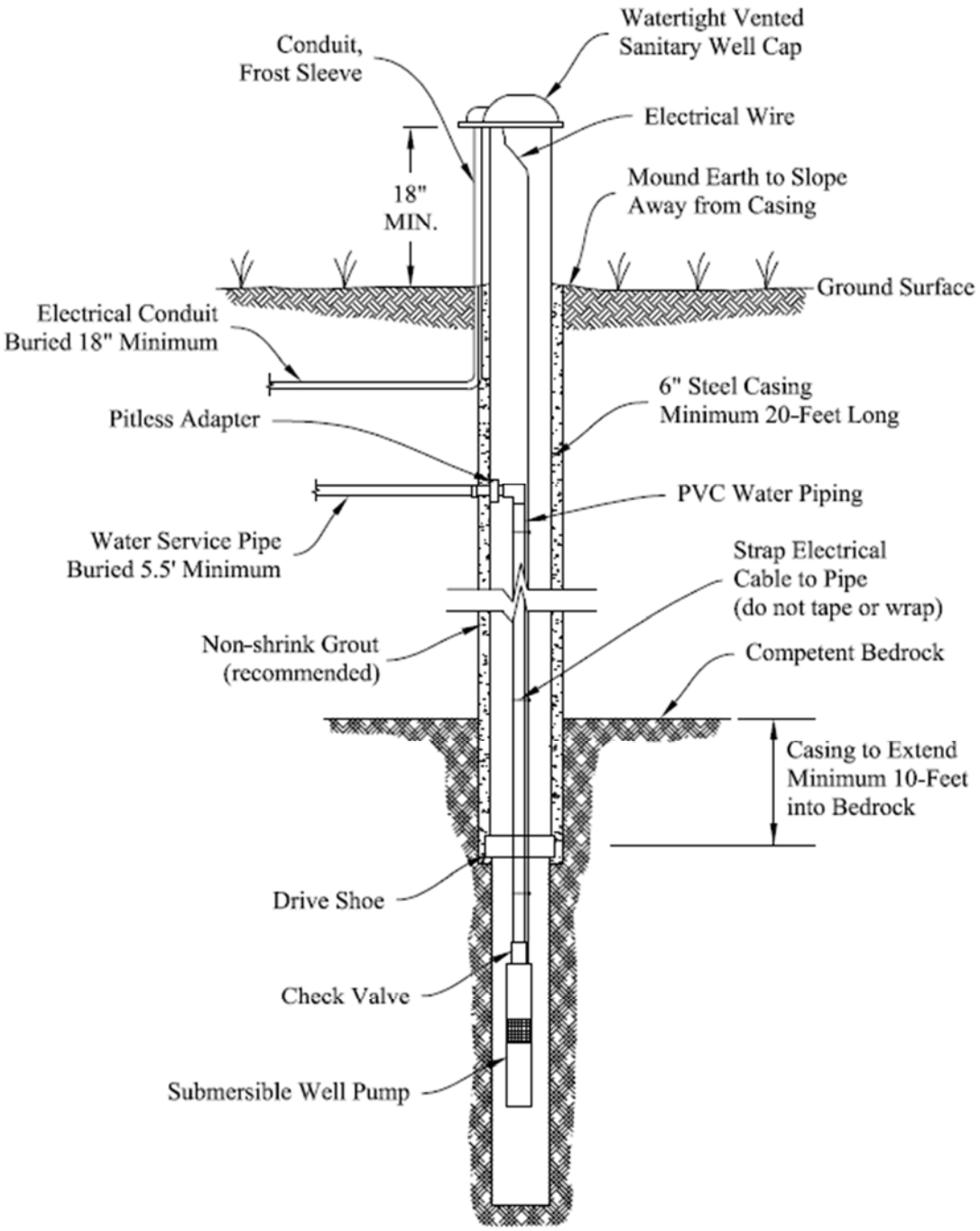


Figure C-17 Detail of Typical Driven Well

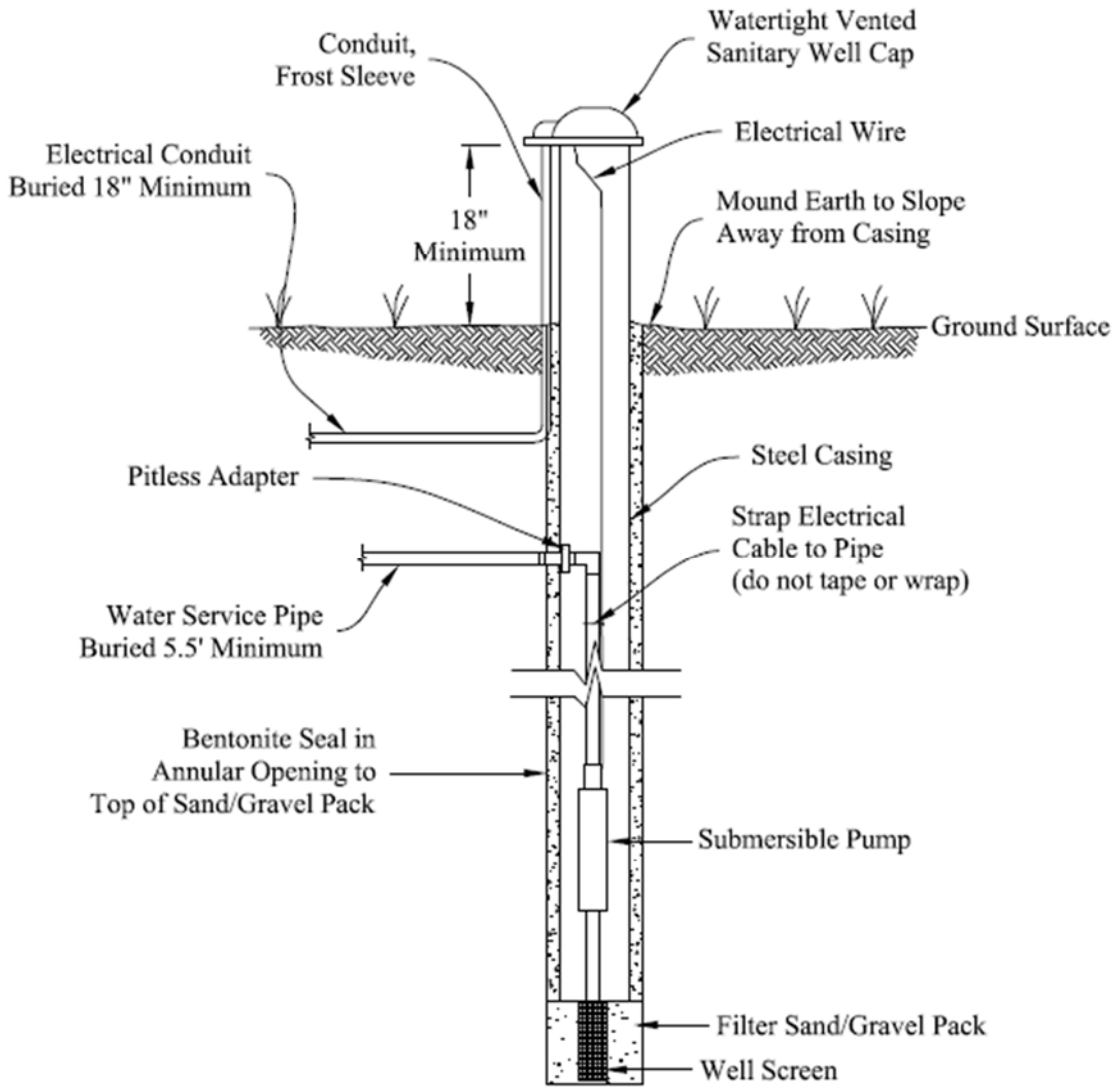
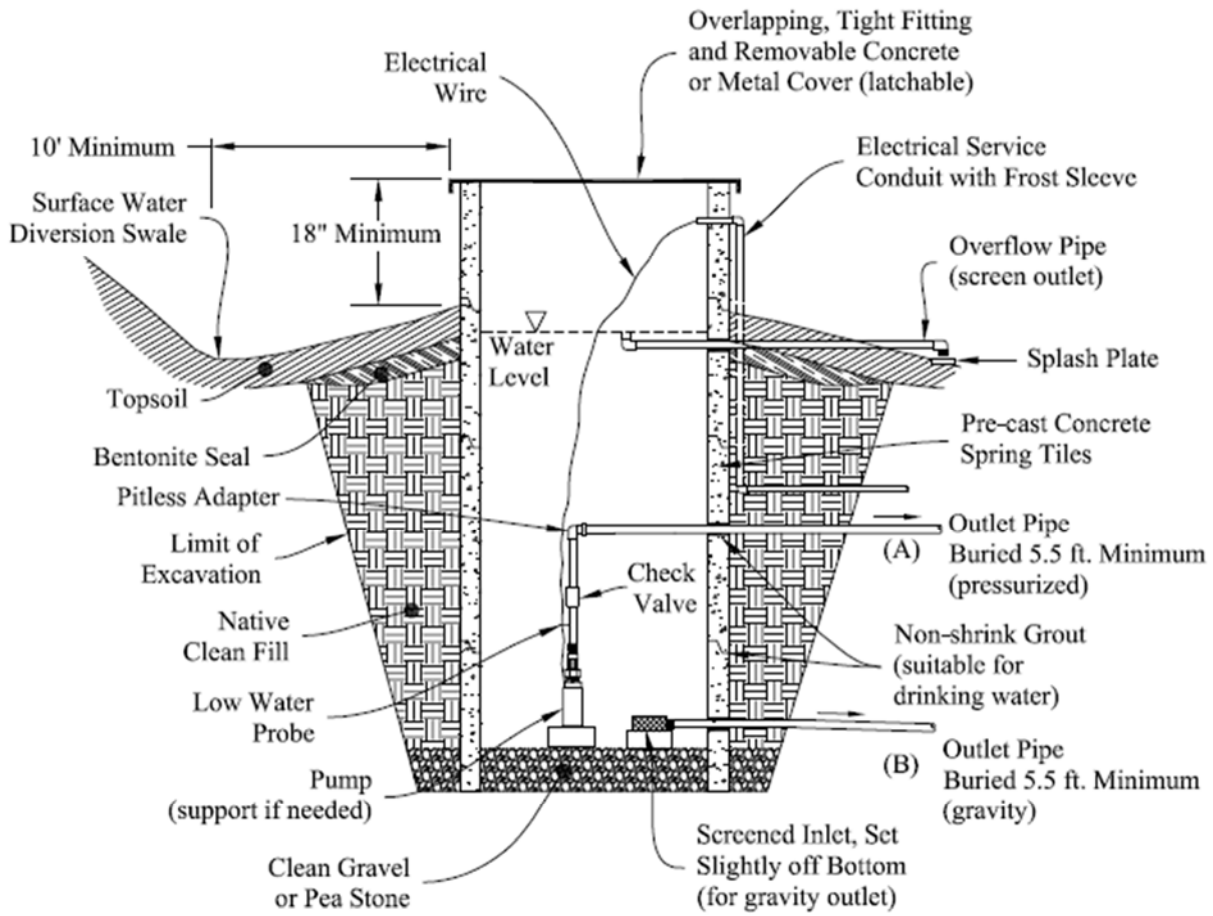


Figure C-18 Detail of a Typical Shallow Well



(A) For Designs with Pump
(B) For Designs that Gravity Flow

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Office of the Secretary

INTERAGENCY COMMITTEE ON ADMINISTRATIVE RULES (ICAR) MINUTES

Meeting Date/Location: September 10, 2018, Pavilion Building, 5th floor conference room, 109 State Street, Montpelier, VT 05609

Members Present: Chair Brad Ferland, Steve Knudson, John Kessler, Matt Langham and via phone were Ashley Berliner and Jen Mojo

Members Absent: Clare O'Shaughnessy, Dirk Anderson, and Diane Bothfeld

Minutes By: Melissa Mazza-Paquette

- 2:00 p.m. meeting called to order, welcome and introductions.
- Review and approval of minutes from the August 13, 2018 meeting.
- No additions/deletions to agenda. Agenda approved as drafted.
- No public comments made.
- Presentation of Proposed Rules on pages 2-5 to follow.
  1. Amendments to Subchapter XI, Low Emission Vehicle Program, Vermont Air Pollution Control Regulations, Agency of Natural Resources, page 2
  2. Rule Governing the Prescribing of Opioids for Pain, Agency of Human Services, Department of Health, page 3
  3. Regulations for the Designation and Operation of Home Health Agencies, Agency of Human Services, Department of Disabilities, Aging & Independent Living, page 4
  4. Wastewater and Potable Water Supply Rules, Agency of Natural Resources, page 5
- Next scheduled meeting is October 8, 2018 at 2:00 p.m.
- 3:38 p.m. meeting adjourned.

DRAFT

Proposed Rule: Amendments to Subchapter XI, Low Emission Vehicle Program, Vermont Air Pollution Control Regulations, Agency of Natural Resources,
Presented by: Megan O'Toole and Deirdra Ritzer

Motion made to accept the rule by John Kessler, seconded by Steve Knudson, and passed unanimously except for Jen Mojo who abstained, with the following recommendations:

1. Proposed Rule Filing, page 3, #10: Add reference to Section 177.
2. Proposed Rule Filing, page 3, #11: Add auto dealers if appropriate.
3. Proposed Rule Filing, page 5, #16: Add 'Low Emission Vehicle (LEV)'.
4. Adopting Page, page 1, #5: Add SOS Log # and title. Correct the date.
5. Economic Impact Analysis, page 1, #3, last line: Add 'not' between 'does' and 'change'.
6. Environmental Impact Analysis, page 2, #7: Delete the word 'negative' in the last line. Generally define what the effects are.
7. Public Input, page 1, #5: Include trade groups such as Auto Alliance if appropriate.
8. Scientific Information and Incorporation by Reference, page 2, #5: Add a phone number.

DRAFT

Proposed Rule: Rule Governing the Prescribing of Opioids for Pain, Agency of Human Services, Department of Health
Presented by: Shayla Livingston

Motion made to accept the rule by Steve Knudson, seconded by John Kessler, and passed unanimously except for Ashley Berliner who abstained, with the following recommendations:

1. Proposed Rule Filing, page 3, #9: Correct misspelled words in lines one and two (permenant and requiremnts).
2. Economic Impact Analysis, page 1, #3: Remove the 'to' in the last line and throughout the rule between 'Narcan rescue' and 'kit'.
3. Economic Impact Analysis, page 2, #5: Correct 'antogonist' to 'antagonist'.
4. Economic Impact Analysis, page 2, #9: Elaborate on the outcome of the meeting.
5. Public Input, page 1, #3: Include upcoming public hearing information.
6. Environmental Impact Analysis, page 2, #9: Explain why there's no impact.
7. Public Input Statement, page 2, #7: Change 'emendations' to 'recommendations.

DRAFT

Proposed Rule: Regulations for the Designation and Operation of Home Health Agencies, Agency of Human Services, Department of Disabilities, Aging & Independent Living
Presented by: Stuart Schurr

Motion made to accept the rule by Matt Langham, seconded by John Kessler, and passed unanimously except for Ashley Berliner who abstained, with the following recommendations:

1. Economic Impact Analysis, page 2, #3: Rework the last sentence for clear understanding, and correct the spelling 'curent'.
2. Public Input, page 1, #3: Delete what's included, include upcoming hearing and state that copies will be provided to interested parties.

DRAFT

Proposed Rule: Wastewater and Potable Water Supply Rules, Agency of Natural Resources
Presented by: Ernest Christianson and Diane Sherman

Motion made to accept the rule by Steve Knudson, seconded by Matt Langham, and passed unanimously except for Jen Mojo who abstained, with the following recommendations:

1. Proposed Rule Coversheet, page 3, #12: Include an estimate of the cost of water quality sampling and testing.
2. Economic Impact Analysis, page 2, #3: Reword. Include that there's currently an established fee with the Department of Health. If there is a basis for the prediction, please include. If appropriate, provide types of compliance costs and provide an estimate of sampling costs.
3. Environmental Impact Analysis, page 1, #4: Reword the second sentence as 'soil treatment of wastewater' is difficult to understand as written.
4. Incorporation by Reference, page 2, #5: Include a phone number.

DRAFT

Comments from Public Meetings

10-31-2018 1 pm Springfield Regional Office

No comments.

11/01/2018 2 pm Rutland, Asa Bloomer Building

Comments by John Lapre

1. Change to design flows for campgrounds, Table 8-1. Eliminating the 7-month category eliminated the flexibility for design flows. An application filed after adoption of the proposed Rules involving an existing campground permitted under a different set of Rules may potentially require the campground to require a permit under the Indirect Discharge Rules if there is an increase in the number of campsites. Will we apply the new design flows to existing campsites when evaluating any increase in design flow generated by an increase in the number of sites?
2. Designer qualifications, it seems easier to list what a design can do rather than two lists stating what a design may and may not do. Suggest having one list identifying what a designer can do.

Comments by Nicole Kesselring

1. Is the Public Water Supply Section and the Regional Office Program in agreement on the design flows?
2. Design flows, are they fully vetted between the proposed Wastewater System and Potable Water Supply Rules and the Public Water Supply Rule?

Comments by Craig Jewett

1. Mandatory water testing, when a potable water, has unintended consequences for treating and periodic inspection. Potable water supplies do not require the treatment system have an operator similar to Public supplies. Should the Public Water Supply Section review all treatment systems and use the Public Water Supply compliance section to be sure testing occurs? How will we ensure treatment systems are operating properly?
2. There is no safety factor, no formula, when metering design flow. Give thought to include guidance for a designer to determine a safety factor.
3. Metering needs to include attendance. Has thought been given how a multi-use building/resort can keep attendance records?
4. Are the potable water design standards vetted with the Public Water Supply Section, such as water storage tanks, how much of a tank needs to be above or below grade, and how this corresponds to the Water Supply Rule?
5. Any discussion on application fees such as municipal connections for reviews of a building with a design flow of 3000 gallons per day? A project involving a municipal connection is not the same review as that necessary for a 3000 gallon per day soil-based wastewater system. Change in use of a building with increase in flow has less review than a review involving new construction.

Comments by Blair Enman

1. Be certain all guidance documents are incorporated in the proposed Rules.
2. There is a discrepancy for 150 gpd/bedroom for Public and 140 under potables and I hope this was resolved.
3. Why are we involved in subdivisions?

4. In the Significant Changes to the Rules, § 304(7), design flows of less than 560, should that be less than or equal to.
5. In the Significant Changes to the Rules, § 304(18) & (20) are added statute exemptions. Should the sections identify the statute number?
6. In the Significant Changes to the Rules, § 304(a)(12), exemption for connecting to public water at the time of construction, perhaps choose different words for connecting to municipal water at the time of construction because often connections are made 3 months later.
7. In the Significant Changes to the Rules, the Declaratory rulings says this represents the final decision and leaves out the ability to appeal the decision to the Environmental Court. Clarification is in order.
8. Are we eliminating lists of all designers now that designers A, B, and BW are licensed by Secretary of State? The Division indicated in the past it will not maintain a list of Professional Engineers.
9. In the Significant Changes to the Rules, § 1-804(d), requiring 1 year of meter data, may be punitive for some people such as schools. Places that have high usage, such as ski areas, only need specific dates to cover high flows. One year of data may create problems for many people.
10. In the Significant Changes to the Rules, construction in a Class A, will more than one lot be allowed, such as a 3 lot subdivision, provided the design flow for each lot is less than 1000 gpd?
11. Diagrams, when placed on the web, will we be able to make changes or are the diagrams frozen in time.

11/01/2018 6 pm Rutland Town Office

Comments by Sheri Young

1. § 1-305(i) an applicant, should change description to say, “a surface water source may require”, not “will require”. Change the statement so not so wordy.
2. § 309(a) add “within reason” so it says, “the Secretary may include, within reason, any condition in a permit”.
3. § 311(f), for GPS coordinates, needs to include the accuracy and parameters for taking the readings. Are the coordinates taken at the corners or center for a well or wastewater system?
4. Installation certification needs changing because a designer cannot observe all portions of an installation. My insurance company states this is a problem.
5. § 312(b) should have 14 days rather than 30 days for review of failed wastewater systems.
6. Subchapter 5, § 501(a)(2), the program manager should make a decision within 30 days rather than 60 days because 60 days can be the entire construction season if an application takes 30 days to permit then have another 60 days to make a decision.
7. § 803(c), design flows for individual components, states sizing the components must be based on a minimum of 2 bedrooms for a single-family residence. How will this work for calculating storage for a holding tank serving a 1-bedroom residence when the holding tank is a best fix.
8. § 903(a)(2) eliminates cesspool, dry wells, and seepage pits. I hope there is an exemption to allow dry wells and gravel systems for water treatment backwash.
9. Page 120, soil testing 9” for testing soil. I’m working in Addison county and only considering the 8 inches of soil to design a system, so it’s a moot point what’s happening at 9 inches.
10. Hydrogeologist definition needs clarification. Some people may not be covered and there is no classification on the State or Federal level defining a hydrogeologist.

11/7/2018 1 pm Essex Act 250 Conference Room

Comment by Jeff Kenney

1. Can designers do test top analysis.

11/8/2018 1 pm St. Johnsbury Regional Office

No comments.

11/14/2018 2 pm Montpelier Meeting, Annex

Comments by Aaron Fuller

1. Page 23, subdivision of an improved lot requires plan drawn by designer or land surveyor and recorded and indexed, VT statute title 26 chapter 45 section 2503 no exemption for a definer for a designer to perform land surveying. Title 26 chapter 45 section 4
2. Professional engineer is defined. Land surveyor is not defined.
3. Sewer collection pipe, with 2 or less connections, a designer's license will allow for up to 3 connections. Class b license should allow for what license allows.
4. Manholes no longer allowed to be designed by a designer. A septic tank and manhole are similar for design and testing. A designer B should be able to design manholes.
5. Certification language in the Rules the same certification language in the application?
6. GPS coordinates, fails to describe the accuracy or orbit system.
7. Page 55 § 704(a)(9)(C) limiting manholes for designers may make systems less maintenance friendly.
8. § 706(a)(b)(c) minimum testing standards for manholes
9. Table 11-1 unconfined water systems, understanding well driller's rule requires wells to be drilled 20 feet into competent bedrock.

Comments by Joe Ducharme

1. Add definition for composting toilets to include testing standards NSF 41 or equivalent.
2. Add in definition storage requirement of 2 years for eradication of pathogens.
3. Add maintenance requirements.
4. § 803(g)(2) to increase design flow reduction from 25% to 50% for residential use similar to other states.
5. § 929 clarification to allow composting solids separate from liquids can be buried when in compliance for protecting public health and the environment.
6. Give Secretary ability to permit other uses of the solids or liquids from composting toilets when comply with public health and safety.

Comment by David Webb

1. Table 8-2 design flows will result in significant viability for existing design flows. Systems not failing due to hydraulic overload, more to poor maintenance practices. What is the basis for using the higher design flows. Design flows should be decreasing with use of low flow fixtures.

11/14/2018 6 pm Montpelier Meeting, Annex

No one attended.

From: Ashley Garrison <ashley.garrison@presbyeco.com>
Sent: Wednesday, November 21, 2018 4:11 PM
To: Christianson, Ernest
Cc: Lee Rashkin; Fred Vengrouskie; Jeanne Allen
Subject: Presby's Comments on Proposed Rule Changes
Attachments: PEI Comments on Proposed Rule Changes.pdf

Dear Mr. Christianson:

I am writing on behalf of Lee Rashkin to send you our company's comments on the Proposed Amended Wastewater System and Potable Water Supply Rules, which are attached to this email as a PDF.

Have a happy Thanksgiving,

Ashley Garrison

--
Ashley Garrison
Project Coordinator
Presby Environmental, Inc.
143 Airport Rd.
Whitefield, NH 03598
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www.PresbyEnvironmental.com

November 21, 2018

Ernest Christianson
Agency of Natural Resources
1 National Life Drive, Main 2
Montpelier, Vermont 05620-3521
ernest.christianson@vermont.gov

RE: Comments on Proposed Rule Changes

Dear Mr. Christianson,

Thank you for the opportunity to provide comment on the *Proposed Amended Wastewater System and Potable Water Supply Rules* posed on the Vermont Agency of Natural Resources, Department of Environmental Conservation website. It is our understanding that your Agency is revising the rules to increase clarity, incorporate legislative directives, expand options for system design, and create additional permitting exemptions in an effort to reduce administrative burdens. We would like to first congratulate you on completing such a daunting task.

As you are aware, modifications to any regulatory language have the potential for a negative impact on commerce and land use planning. The key is to find a balance between protecting the environment and our natural resources while allowing economic growth and prosperity. There are numerous individuals working within the state of Vermont as Engineers, Designers, and Installers. Care must be taken when modifying these rules to ensure that businesses operating within the state do not suffer negatively by inflicting unnecessary restrictions on the designs they are submitting. Land owners as well could suffer dramatically by limiting the number and type of available and proven technologies that could allow full utilization of the property they seek to improve. Products that are currently approved, and have proven their ability to function properly, should not receive any negative impact from the modifications set forth in the revised rule language.

A note of context for our comments, Presby Environmental plans to apply for secondary treatment approvals for two combined treatment and dispersal systems (Advanced Enviro-Septic and EnviroFin systems) in Vermont in the near future so we are very invested in how the state plans to address certain unique capabilities for our and other manufacturer's technologies in this category. The rules related to filtrate effluent do not appear to be geared for systems which passively distribute, treat and disperse filtrate effluent in the same footprint. We feel now would be the time to address these differences in technologies rather than needing to ask for exemptions in a brand new rule set. When an advanced treatment system undergoes testing protocols to meet

NSF/ANSI standards and the system tested does not utilize pressure or dosing applications, the state approvals for these systems should exempt their use as well, unless they are specified by the manufacturer of a proprietary product.

Also, sampling ports are designed to sample from single-point discharge systems and many innovative/alternative systems are not designed for single-point discharge. Therefore, requiring sampling ports in these systems could potentially cause the system to function in a way that they were not designed, or could provide inaccurate sampling results. Thus, we are requesting consideration for systems that have undergone third party testing and have proven results to the required level of treatment, be given an exemption from the sampling port requirements set forth in these regulations.

After extensive review of the proposed changes, Presby Environmental respectfully requests consideration of our comments. In an effort to simplify your review of our comments, we have listed our concerns on the following pages and have organized them by subchapter as outlined in the proposed rules.

Sincerely,

Lee Rashkin, CEO
lee.rashkin@presbyeco.com

Presby Environmental, Inc.'s Comments on the

Proposed Amended Wastewater System and Potable Water Supply Rules

Subchapter 1 – Purpose and Authority

Suggest putting the following statement which was removed back into the purpose statements: "While implementing the purposes of these Rules, it is the express intent of the Department to encourage innovation, allow maximum flexibility in design, and minimize the amount of time necessary to process applications."

By including this in the text of the document, it ties back into the objective of expanding options for system design and shows the changes to the regulations are in good faith.

Subchapter 2 – Definitions

In the introduction sentence for this section, the statement "If a term is not defined, it shall have its common meaning" was removed. There are numerous terms throughout the document that are not defined. Some of these terms do not have a common or easily locatable definition such as "Class A Watershed". Also, for the purpose of providing clarity, we are requesting that the system types all be defined which include in-ground, at-grade, mound, and bottomless sand filter systems. A list of terms to consider adding is provided at the end of this correspondence.

Subchapter 3 – Wastewater System and Potable Water Supply Permits

§ 1-301 Permit Required

(a) Suggest including the exact title and/or document number of the permit form. Also, suggest providing direction on where to get the form.

§ 1-305 Applications for Permits

(a) (1) Include the name of the form to be used and where it can be acquired.

(b) (2) (A) Define the minimum standard/process needed to comply with permanent legal access. Does it have to be surveyed, recorded, drawn up by an attorney. . . ? Consider modifying the rule language to include §1-310 Filing of Permit

(d)What is the minimum standard for flagging? Consider revising the rule language to include a reference to §1-311.

(n) Define the appeal process if an application is denied. This section should reference § 1-308 - Denial of an Application for a Permit, §1-502 – Appeal of Final Agency Decision, and § 1-501 - Administrative Reconsideration.

§ 1-306 Site Plans, Supporting Information, and Design Certification

(a) and (b) Having both sections (a) and (b) are somewhat repetitive. Suggest combining them into one as follows:

All site plans, detail sheets, accompanying narrative, and other supporting data for the design of a wastewater system or potable water supply that is required in a permit application shall be

prepared, signed, and dated by a designer. The submitted permit application shall include a design certification by the designer that states: *"I hereby certify that, in the exercise of my reasonable professional judgement, the design related information submitted with this application is true and correct and the design included in this application for a permit complies with the Vermont Wastewater System and Potable Water Supply Rules."*

§ 1-307 Required Notification of Presumptive Isolation Zones

In sections 307 (a) and (b) make reference to "on a form" "permit application", and "permit amendment." Need to cite the actual name of the "form" "application" and finally, state what constitutes an "amendment". Also, why would one not mail the form provided by the Secretary within 7 days of submitting the application instead of before submitting the application? This seems to make the process take longer.

§ 1-308 Denial of an Application for a Permit

Define the appeal process if an application is denied. This section should reference § 1-501 - Administrative Reconsideration and , §1-502 – Appeal of Final Agency Decision.

§ 1-309 Permit Conditions

(b) Different sampling requirements are cited that may be needed to obtain a permit but the only one that the rule gives guidance to is water quality sampling. Suggest including more detailed information on what would be required under the other sampling protocols for each type of sampling you have listed. As an example: require x number of samples at x frequency. Sampling will be a composite sample or a grab sample. Samples must be analyzed by a state certified lab etc. Our suggestion is to include a section on sampling protocols and reference that section in this paragraph.

Subchapter 4 – Approval of Innovative/Alternative Systems and Components

At what timeframe does an Innovative/Alternative system no longer classify as Innovative/Alternative? Is it 10 years of proven technology? 20 years of proven technology? The concept of something transitioning from Innovative/Alternative to mainstream should be addressed.

§ 1-401 Purpose and Decisions

(d) Denials do not include a reference for appeal. Should also state the process for appealing a denial or refer to the section of the document that discusses the appeal process.

(e) "Manufacturers granted approval may seek renewal of approvals": The renewal process should be outlined. Do all systems have to re-apply for approval? Is continued approval automatic? What needs to be included in a "renewal package"? Provide more detail on the renewal process.

(f) "revocation of an approval": Define the difference between a denial and a revocation.

(h) (4) (e) "ensuring an adequate supply of trained individuals": What's the criteria for determining compliance with this rule? What is considered an "adequate supply"?

§ 1-402 General Use Approval
Need to define General Use Approval. Should include the definition in section 201 or as an introductory paragraph under this section.

(a) (3) "demonstrated reliability and performance": What is the criteria used to determine if a product has demonstrated acceptable reliability and performance? Section needs to be more specific on the expectations of what is required to meet this standard.

§ 1-403 Pilot Approval
Need to define pilot approval. Should include the definition in **§** 201 or as an introductory paragraph under this section. How long does something have to be under Pilot Approval before it can move up to General Use Approval?

§ 1-404 Experimental Approval
Need to define experimental approval. Should include the definition in **§** 201 or as an introductory paragraph under this section. How long does something have to be Experimental before it moves up to Pilot or General Use?

(d) Define monitoring, what type of monitoring is required, what is the monitoring frequency, what is being monitored?

(d) (2) For testing requirements, be more specific. What is the sampling protocol? What type of testing is to be done? Language leaves a lot up to the imagination.

§ 1-405 Application Process for Innovative/Alternative Systems and Components
"on a form" and "application form": What form? Specify the form to be used? Does the form actually exist or is it something that has yet to be developed? Where does one get this form? The way it is written, the Secretary will prepare the form for submission. May want to change this language if the Secretary isn't completing the application.

(5) (C) Change the number of known systems as not all states require as much recordkeeping by the manufacturer.

(6) (B) "plans and cross sections": Plans and cross sections should be defined to the extent that the minimum standards for plans and cross sections can be determined.

(6) (F) “treatment must have sampling ports”: Allow for the request of a waiver if system met treatment standards in bench testing.

§ 1-406 Renewal Application Process for Innovative/Alternative Systems and Components
Reference to "application" and "form": Specify application and form requirements. When is this done? Who does it? If the form does not yet exist, should it not exist prior to implementation of the rules? If so, change reference to "prepared by the Secretary" to the title of the form and where to access it.

(4) Suggest changing to “manual updates as needed to conform to state rules and depict rule exemptions provided by the state approval.”

(7) Reference to "the monitoring of the distribution of the innovative/alternative system or component" and reference to "annual reporting requirements": Be more specific. What are manufacturers monitoring for? Are the annual reporting requirements defined? What are the minimum requirements needed to comply?

Subchapter 5 – Appeals; Enforcement

All sections under this subchapter only reference permit applications; what about product approvals? Where is the language for the Appeals on that portion of the regulations? Is the process the same or different? Need to ensure that an appeal process is outlined for the product approval process.

Subchapter 8 – General Technical Standards for Wastewater Systems and Potable Water Supplies

§ 1-801 Basic Requirements
Suggest organizing item in this section by whether it is wastewater or potable water and avoid intermingling them for ease of reading.

(a) & (c) Reference to a 500' distance from building containing water/wastewater service and building utilizing that service. Why is there a limit on the distance to a building with service on the same lot?

§ 1-803 Design Flows
Table 8-1 There is a typo for 13 Living Units Wastewater System GPD listed as 3848. Should be 3484 as that is what it was in previous regulations.

Note at the end of the section references high strength wastewater, recommend referencing § 1-805.

Subchapter 9 – Specific Technical Standards for Wastewater Systems

§ 1-902 Replacement Area
(b) (1), (2), and (3)Wastewater systems designed to protect the soil interface from biomat formation should not be required to have a separate replacement area. Suggest inclusion of a section for exemption from replacement area if system is designed to protect the receiving surface from biomat formation.

§ 1-903 General Requirements for Soil-Based Wastewater Systems
(d) (4) “Ground slope for a bottomless sand filter shall not exceed 5%”: In-ground is 30% and at-grade is 20%. Why are bottomless sand filters held to a different standard? Change to 20% or 30% depending on installation depth.

(h) (1) and (2) What is a Class A watershed? Setting a design flow maximum per site at 1000 gpd. Class A watershed is not defined. Unable to find anything on VT NRCS that defines Class A watersheds. How is a designer/installer supposed to know if they are in a Class A Watershed? Is this saying that no system over 1,000 gpd is allowed? Does this mean that no one can build anything on these sites that require more than 1,000 gpd? Are there alternative options? What are the alternatives?

(i) (2) Request adding a statement regarding non mechanical systems receiving a reduction to 18" if disposing of filtrate effluent prior to contact with the receiving soils.

(j) (3) Does mound fill material differ from fill material? If yes, then include a definition for mound fill material in section 201.

(r) (A) (iii) Why are bottomless sand filters limited to 1,000 gpd flow? They should be limited to the amount based on if they are in-ground, at-grade, or mound.

§ 1-904 Filtrate Effluent

(b) Requires pressure distribution to reduce application rate for leachfield sizing. Passive systems designed to include the process of converting influent to filtrate effluent are given a disadvantage even when meeting NSF/ANSI Standard 40. Suggest modifying text to read as follows:

When a wastewater system designed to dispose of filtrate effluent is designed using pressure distribution pursuant to § 1-914, or passively disperses treated effluent certified to NSF/ANSI Standard 40, the wastewater systems may use up to twice the application rate of soil for sizing the leachfield required by § 1-911.

§ 1-907 2-year Time of Travel Management Zone
(c) (4) Suggest changing "effluent" to "septic tank effluent"

§ 1-908 Septic Tanks
(b) (7) Effluent filters should not be required for NSF/ANSI 40 certified passive treatment system tested without filters. Reason being that unmaintained filters obstruct air flow within the system. Suggest including an exemption for NSF/ANSI Standard 40 systems tested without effluent systems for the purpose of increased air flow for system ventilation to ensure adequate aerobic treatment; this will also ensure that the NSF/ANSI tested systems are used in the manner in which they were tested.

(b) (7) Define the minimum standard for effluent filters.

§ 1-910 Soil Evaluation
(c) The number of evaluations stated are based on 600 gpd or less; what happens if treatment is going to be for more than 600 gpd? This should also be outlined. Suggest including the number of required soil excavations for all possible sizes exceeding 600 gpd.

(c) (2) Why do bottomless sand filters require 3 soil excavations? Testing should not be based on the type of technology used but on the technologies' application to the site, i.e. in-ground, at-grade, or mound. Suggest modifying the requirement for additional evaluations for bottomless sand filters to be based on the installation configuration, i.e. at-grade, in-ground, or mound.

§ 1-911 Maximum Application Rates for Leachfields
(b) Why is the maximum application rate for the bottomless sand filter technology different?

Table 9-3 Bottomless sand filters sizing are not applicable in soils past loam. Suggest setting same as in-ground or at-grade loading rates depending on the application of the technology.

§ 1-914 Dosing and Pressure Distribution
(a) (1) Dosing is required when system proposes more than 500 linear feet of distribution piping. Request modification to include the following additional language:

(3) Designs utilizing proprietary treatment products may not require dosing or pressure distribution per the manufacturer's approved design and installation manual.

§ 1-916 Flow Equalization
(c) (B)This requires that systems that use flow equalization must be pressure distributed. Not all technologies require flow equalization devices based on daily design flow but instead equally distribute flow throughout the design configuration. Language proposed must understand that some systems require pressure distribution, and some do not. Request modifying the language to include the following statement: "unless otherwise specified in the manufacturer's approved design and installation manual."

§ 1-917 In-ground Trenches and Trenches in Mounds
(a) (2) (C) Request allowing for a 50% increase in AR if effluent is treated to secondary standards.

(c) (3) (A) Request adding an exemption for septic tank effluent that is treated to secondary standards prior to reaching the receiving soils.

(c) (6) Include approved proprietary products statement such as:
(D) Approved distribution piping as specified in a proprietary products' approved installation and design manual.

§ 1-918 In-ground Beds and Beds in Mounds and Beds in Bottomless Sand Filters
(a) (1) (C) Request allow for a 50% increase in AR if effluent is treated to secondary standards.

(b) (5); Include the statement "unless otherwise specified by the manufacturer of a proprietary product".

(b) (7) Include the statement "unless otherwise specified by the manufacturer of a proprietary product".

(c) (1) (A) Add exemption for septic tank effluent that is treated to secondary standards prior to reaching the receiving soils.

(c) (2) (A) Add exemption for septic tank effluent that is treated to secondary standards prior to reaching the receiving soils.

(c) (11) Include "unless otherwise specified by the manufacturer of a proprietary product."

§ 1-919 Additional Design Requirements for In-Ground Leachfields
(b) Add exemption for septic tank effluent that is treated to secondary standards prior to reaching the receiving soils.

(e)(1) Include the following statement "or treated to secondary standards prior to contact with the receiving soils."

§ 1-920 At-grade Leachfields
(c)(2) add exemption for septic tank effluent that is treated to secondary standards prior to reaching the receiving surface.

(f) (6) include "or utilize effluent treated to secondary standards."

(f) (7) Why are in ground systems limited to 2000 gpd but at-grade systems can go to 3,000 gpd? What about system designs that split flow equally between multiple beds? Then it is not dual alternating but simply multiple bed distribution. Modify requirement for "dual alternating" leachfields to include other design layouts that provides the same benefit such as multiple bed distribution that distributes the flow equally between all beds.

(f) (12) (A) Include "or for proprietary products, designed in accordance with manufacturers state approved design and installation manual."

§ 1-921 Leachfields in Mounds
(c) Use of curtain drains exemption for effluent treated to secondary standards. Include an exemption for treated effluent such as: or utilize effluent treated to secondary standards

(3) (1) & (2) No sizing reduction provided for effluent treated to secondary treatment levels include the following statement: Allow for a 50% increase in AR if effluent is treated to secondary standards prior to contact with the receiving soils.

(f), (h), and (C); Sizing reduction needed for effluent treated to secondary standards. Allow for a 50% increase in AR if effluent is treated to secondary standards prior to contact with the receiving soils.

(j) Should not require pressure distribution if system is a proprietary product installed in a mound configuration if that proprietary product treats effluent to secondary standards without pressure distribution. Include the following language: "if treatment products were tested without pressure distribution, pressure distribution will not be required unless otherwise specified by the

manufacturer of a proprietary product".

§ 1-922 Leachfields in Bottomless Sand Filters

(b) include the following "unless effluent is treated to secondary standards prior to contact with the receiving soils, at which time, a 50% increase may be applied to the system application rate."

(e) (1) Change "shall use" to "may use". Bottomless sand filters (BSF) need to be better defined to determine the necessity of this recommendation/requirement. Are all BSF in mounds required to be pressure distribution systems like would be required of a leachfield in a mound?

Terms to Define: We have taken the opportunity to identify terms used throughout the proposed regulatory language that are not included in §201. We are requesting that you give serious consideration to defining the terms below giving a brief description, referencing the terms used in the document, and emphasizing the terms minimum standards. The average American reads at a 7th or 8th grade level. It can be hard to reach that level in a complicated document like a regulation. Clearly defining, establishing minimum standards for the term used, and referencing where the terms are used in the document is essential in meeting the goal of writing on a level that most people can easily understand.

Alternative design standard
Application
Appeal
At-grade leachfield
Biologic constituents
Bottomless Sand Filter
Class A Watershed
Component
Contamination
Curtain drain
Degradation
Design
Design certification
Detail sheets
Diversion ditches
Dosing
Effective infiltration area
Effluent filter
Effluent sampling
Experimental Approval
Fill material
Filter fabric
Flow equalization
Flow equalization device
General Use Approval
Grease tank
Groundwater sampling
Horizontal Isolation Distance
Horizontal Isolation Zone
Hydrogeological analysis
Hydraulic gradient
In-ground leachfield
Infiltrative surface
Innovative/Alternative System
Installation certification
Monitoring
Monitoring pipes
Monitoring wells
Mound
Mound fill material
Munsell ® Soil Color
Percolation testing
Permit
Permit amendment
Pilot Approval
Porosity
Pressure Distribution
redoximorphic features
Regional office program Manager
Sampling ports
Saturated hydraulic Conductivity
Septic tank
Shallow excavation
Site modification
Site plan
Soil evaluation
Time dosing
Variance
Water metering
Water quality sampling
Water table
Water table monitoring
Water table monitoring Proposal
2-year Time of Travel Management Zone

From: Abraham Noe-Hays <compostingtoilet@gmail.com>
Sent: Friday, November 23, 2018 10:36 PM
To: ernest.christianson@state.vt.us; Christianson, Ernest
Subject: Fwd: Public comment on draft Wastewater System and Potable Water Supply Rules from the Rich Earth Institute
Attachments: 2017 WE-Stand Draft Document.pdf; 51_Fewless_2011_Source-Separation-and-Treatment-of-Anthropogenic-Urine_WERF-INFR4SG09bPDF.pdf; Rich Earth Institute -- comments on Wastewater System and Potable Water Supply Rule November 2018.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Hi, Ernie. Given the impending end of the comment period, I'm just resending you this same email from a different address, in case there was any delivery problem from the first.

---------- Forwarded message ---------
From: **Abraham Noe-Hays - Rich Earth Institute** <abe@richearthinstitute.org>
Date: Fri, Nov 23, 2018 at 10:33 PM
Subject: Public comment on draft Wastewater System and Potable Water Supply Rules from the Rich Earth Institute
To: <ernest.christianson@state.vt.us>, <ernest.christianson@vermont.gov>

Hello, Ernie. I've attached our comments, as well as two supporting documents referenced in the text of the comments.

Thanks very much,
Abe

Abraham Noe-Hays
Research Director
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44 Fuller Drive
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Our Vision: A world with clean water and fertile soil achieved by reclaiming the nutrients from our bodies as elements in a life sustaining cycle.

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Fertilizer from Urine: Clean Rivers, Sustainable Farms.

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Ernest Christianson
Agency of Natural Resources
1 National Life Drive, Main 2
Montpelier, Vermont 05620-3521

November 23, 2018

Dear Mr. Christianson:

Please find below **in bold** our suggested changes to the proposed Wastewater System and Potable Water Supply Rules.

PROPOSED CHANGE #1:

§ 1-928

(xx) The Secretary shall approve the use of holding and pump out tanks as a supplementary system, whether or not the building or structure is publicly owned, when:

(1)The use of the tank is for storing a source-separated waste fraction (.e.g. urine), and

(2) The remaining wastewater from the building, structure, or campground is delivered to an approved wastewater system (e.g. a soil-based wastewater system or sanitary sewer service line that conveys wastewater to a wastewater treatment facility or indirect discharge system)

RATIONALE:

We propose changes to the holding tank regulations in § 1-928 to allow supplemental holding tanks for collecting certain wastewater fractions, for instance source-separated urine. The purpose of such a system is to improve the environmental performance of existing soil-based or sewered wastewater systems by reducing the discharge of nutrients such as nitrogen and phosphorus, hormones, and pharmaceuticals into surface- and groundwater. Urine collected in a holding tank can be collected by a service provider and then be processed into agricultural amendments or other products for beneficial reuse, or transported to a wastewater facility with nutrient removal capabilities.

A holding tank, as described in the proposed language, would only receive a fraction of the total flow (for instance urine and an incidental volume of urinal rinse water), and would not replace the need for a soil- or sewer-based system for the building's remaining wastewater. It would only be allowed where the remaining wastewater was handled by an approved system (e.g. soil-based system, sewer, or even a holding tank approved under one of the other relevant sections).

Under the other terms of § 1-928, holding tanks in lieu of soil-based or sewered systems are only considered when other options are not viable. In contrast, the supplemental holding tanks we

propose for source-separated materials such as urine would be appropriate to any building, and would ideally be paired with highly-functional soil-based or sewered systems, in order to reduce those systems' nutrient, hormone, and pharmaceutical emissions.

Examples of fixtures that would connect to a urine holding tank include urine-diverting flush toilets such as the porcelain EcoFlush model (https://www.wostman.se/en/ecoflush/). This type of toilet has a divided bowl which flushes feces and toilet paper down a rear drain while diverting urine to a dedicated drain line located at the front of the bowl. The University of Michigan has installed such a toilet in their GG Brown Memorial Laboratories building of the College of Engineering, and has been monitoring its successful operation since 2016. Other fixtures include urine-diverting composting toilets, and waterless urinals.

The 2017 ANSI/IAPMO Water Efficiency and Sanitation Standard (WE-STAND) describes and allows urine holding tanks for use in conjunction with urine-diverting composting toilets. (Draft language attached to this communication. Final language is nearly identical, but behind a paywall.)

Within the wastewater industry, there is recognition of the substantial environmental benefits of diverting human urine from the wastewater stream. The wastewater industry group Water Environment Research Foundation (WERF, now WE&RF), published a report in 2011 called "Source Separation And Treatment Of Anthropogenic Urine", which states in its abstract:

> Anthropogenic urine, although only 1% of domestic wastewater flow, is responsible for 50-80% of the nutrients and a substantial portion of the pharmaceuticals and hormones present in the influent to wastewater treatment plants. Source separation and treatment of urine enables recovery of nitrogen and phosphorus, thus largely minimizing the energy requirements for nutrient removal at wastewater treatment plants, allowing for capture and reuse of nutrients, and creating a more efficient means for removal of pharmaceuticals and hormones. The goal of this research was to investigate the global status of urine source separation and treatment technologies and to advise a path forward for further research.
>
> Results from the literature review validate urine source separation as a means to recover nutrients, conserve water, and decrease overall energy requirements for both nutrient and micropollutant removal as compared to conventional wastewater treatment. Research has matured beyond the laboratory scale to include pilot projects in office buildings, private homes, and schools. Continued research is necessary to create marketable products, to develop life cycle and/or cost-benefit analysis, to determine social acceptance in the U.S. as most surveys and projects have been conducted in Europe, and to assess the most appropriate means and setting for urine treatment.
>
> Benefits:
> ♦ Describes the current global status of urine source separation and treatment technologies, pilot projects, and research groups.
> ♦ Shows that urine treatment can result in a safe, nutrient-rich, micropollutant-free fertilizer.
> ♦ Illustrates that urine diversion toilets and storage tanks have been developed for urban water management to the point that inclusion into larger pilot projects is feasible with proper oversight.
> ♦ Assesses the potential for urine diversion to reduce the energy requirements in wastewater treatment plants, and to improve water quality by allowing for more efficient removal of nutrients and micropollutants.

♦ Advises a path forward in the development of urine source separation and treatment in the U.S.

Our organization, the Rich Earth Institute, holds a VT Solid Waste Management permit to process human urine into agricultural amendments, and currently processes about 7,000 gallons of urine per year. We operate the nation's first (but not only) community-scale urine recycling program. Participants typically collect urine in portable urinals, which they transport to a collection point operated by the Institute. Increasingly, participants are interested in more permanent installations involving holding tanks that the Institute would regularly pump out with its licensed pump truck.

In partnership with the Windham Regional Commission, we are also conducting the Village Sanitation Pilot Study (https://www.villagesanitationvt.com/about-the-vsps), working with two villages (Westminster West and West Dummerston) to evaluate how innovative technologies could be coupled with existing systems to help address their wastewater management needs and protect their waters from nutrient pollution. Preliminary site visits with households with functioning soil-based systems have shown that urine-diverting flush toilets, coupled with holding tanks, are a viable and desired option for many who are seeking to conserve water and protect water quality.

Passed in 2015, Act 64 Legislative Law for Improving Water Quality was enacted to "manage and regulate waters of the State to improve and not degrade the quality of State waters". Two major components of Act 64 are the implementation of TMDLs and the management of nutrients in agricultural operations. Ecological sanitation, specifically urine diversion, offers a unique solution that reduces nutrient contributions from wastewater and can be incorporated into best management practices for managing nutrients in agricultural systems. Urine diversion is a cost-effective practice that can help to better manage nutrients for beneficial use, while leveraging the utility and value of existing infrastructure. Source-separation of urine eliminates the majority of nutrients from wastewater, in a relatively hygienic form that can be further sanitized and converted to fertilizer for local use or export.

Diversion of urine lowers the nutrient loading rate to the system managing the remaining wastewater, not only reducing nutrient emissions, but potentially benefiting the operation of on-site or centralized systems. Urine has a COD of 10,000 mg/L (Udert, K. M., Tove A. Larsen, and Willi Gujer. "Fate of major compounds in source-separated urine." *Water Science and Technology* 54.11-12 (2006): 413-420.
URL: https://pdfs.semanticscholar.org/f555/47516985304354f905b1fcccb6b608a6c580.pdf) Given that very high strength, the act of separating urine from the wastewater stream lowers the strength of the remaining wastewater, even accounting for reductions in flush volume.

PROPOSED CHANGE #2:

§ 1-928

(f) Any building or structure or campground served by a holding and pump out tank, other than a marine holding and pump out tank **[or urine holding and pump out tank],** shall have a water meter, or meters, installed that measures all water that will be discharged as wastewater from the building or structure or campground.

(g) A permit issued for the use of a holding and pump out tank shall require a designer to periodically inspect the tank, visible piping, and alarms and meet the following requirements:

(4) Unless permitting a marine holding and pump out tank **[or a supplemental holding and pump out tank pursuant to Section (xx proposed above)]**, the designer shall also inspect the water meter or meters and verify that they are installed, calibrated, and measuring all water that is discharged as wastewater.

(5) Unless permitting a marine holding and pump out tank **[or a supplemental holding and pump out tank pursuant to Section (xx proposed above)]**, the designer shall read the meters and compare the metered flow to the pumping records.

RATIONALE:

Urine contains minerals and salts that can rapidly precipitate and form pipe-blocking obstructions where flowing urine encounters turbulence or impediments to its free and rapid flow from fixture to holding tank. For this reason the 2017 ANSI Water Efficiency and Sanitation Standard specifies a minimum ½”-per-foot slope for urine drain pipes, steeper than standard plumbing, to adequately convey the soft mineral sludge that typically forms in urine drain pipes. Since pipes dedicated to urine conveyance experience very low flows and are not periodically washed by wastewater surges, it is important that the natural flow is encouraged and not impeded. Any flow-measuring device would be prone to accumulating such precipitation, compromising the accuracy of the device and potentially blocking the urine drain pipe.

Additionally, urine pipe flow rates are very low, further complicating metering, with a typical urination event producing under 0.1 gallons and taking around a minute to produce and fully drain through the pipe.

If there are concerns about illicit disposal of urine tank contents, it is worth noting that these tanks are supplemental, installed in addition to a functioning wastewater system that would accept the urine under a conventional configuration, and there would be little incentive to remove urine illicitly.

PROPOSED CHANGE #3:

Could a design flow be added to Table 8-3 for the expected flow for handwashing only, using a high-efficiency sink faucet, applicable to structures with a composting or incinerating toilet?

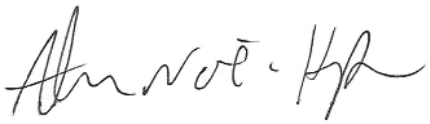
We and our colleagues at Full Circle Compost Consulting (Putney, VT) and Nutrient Networks (West Wareham, MA), doing business throughout New England, have received numerous inquiries from organizations and individuals wanting to provide toilet facilities in low-use locations without access to existing wastewater disposal, where composting toilets were an appropriate solution. However, the need to provide disposal for small volumes of handwashing water could not be met without building a complete soil-based system, which typically requires a minimum 1000-gallon septic tank, and there is no listed design flow for handwashing only.

It appears that the proposed rules already allow the Secretary to approve a design flow for uses not otherwise listed, but this requires daily water meter readings and composite wastewater sampling and testing, and for a setting like handwashing for a single composting toilet in a low-use location this has been prohibitive.

In our reading of the proposed rules, it appears that if a design flow were established for wastewater systems receiving only handwashing water, a soil-based system could be permitted with a sub-1000-gallon septic tank and small leach field, with each component sized for the calculated design flow for handwashing only. We see nothing in the rules that sets a minimum size for the leachfield that would be larger than would otherwise be calculated based on design flow, and § 1-908 (a)(2) allows the Secretary to reduce the size of the septic tank to the expected 1-day flow volume. **If this reading is not correct, could the rules be modified to allow this type of system?**

Furthermore, in the case of handwashing only, do the rules allow or could they be amended to allow a filter in place of the septic tank?

Thank you,



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FINAL REPORT

Source Separation and Treatment of Anthropogenic Urine

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SOURCE SEPARATION AND TREATMENT OF ANTHROPOGENIC URINE

by:

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2011

WERF

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Colorado State University

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ABSTRACT AND BENEFITS

Abstract:

Anthropogenic urine, although only 1% of domestic wastewater flow, is responsible for 50-80% of the nutrients and a substantial portion of the pharmaceuticals and hormones present in the influent to wastewater treatment plants. Source separation and treatment of urine enables recovery of nitrogen and phosphorus, thus largely minimizing the energy requirements for nutrient removal at wastewater treatment plants, allowing for capture and reuse of nutrients, and creating a more efficient means for removal of pharmaceuticals and hormones. The goal of this research was to investigate the global status of urine source separation and treatment technologies and to advise a path forward for further research.

Results from the literature review validate urine source separation as a means to recover nutrients, conserve water, and decrease overall energy requirements for both nutrient and micropollutant removal as compared to conventional wastewater treatment. Research has matured beyond the laboratory scale to include pilot projects in office buildings, private homes, and schools. Continued research is necessary to create marketable products, to develop life cycle and/or cost-benefit analysis, to determine social acceptance in the U.S. as most surveys and projects have been conducted in Europe, and to assess the most appropriate means and setting for urine treatment.

Benefits:

- Describes the current global status of urine source separation and treatment technologies, pilot projects, and research groups.
- Shows that urine treatment can result in a safe, nutrient-rich, micropollutant-free fertilizer.
- Illustrates that urine diversion toilets and storage tanks have been developed for urban water management to the point that inclusion into larger pilot projects is feasible with proper oversight.
- Assesses the potential for urine diversion to reduce the energy requirements in wastewater treatment plants, and to improve water quality by allowing for more efficient removal of nutrients and micropollutants.
- Advises a path forward in the development of urine source separation and treatment in the U.S.

Keywords: Urine diversion, urine treatment, sustainable wastewater management, nutrient recovery, pharmaceutical/hormone removal.

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LIST OF ACRONYMS

BOD	Biological Oxygen Demand
CSO	Combined Sewer Overflow
COD	Chemical Oxygen Demand
CECs	Contaminants of Emerging Concern
PPCPs	Pharmaceuticals and Personal Care Products
SSO	Sanitary Sewer Overflow
TSS	Total Suspended Solids
WWT	Wastewater Treatment
WWTP	Wastewater Treatment Plant
UD	Urine Diversion
UDT	Urine Diversion Toilet
UDDT	Urine Diversion Dehydration Toilet
U.S. EPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

Anthropogenic urine comprises only 1% of domestic wastewater, but contributes 75-80% of the nitrogen, 50-55% of the phosphorus, and a substantial portion of the pharmaceuticals/ hormones and subsequent metabolites. As a result, research to date (largely conducted in Europe) has focused on the potential for urine diversion to reduce the environmental impact of these contaminants, decrease the energy and cost requirements of wastewater treatment, and provide a means to close the anthropogenic nutrient cycle either through nutrient recovery or direct urine reuse. Urine diversion toilets (NoMix toilets) and waterless urinals have been developed by several manufacturers and have been improved through European pilot project feedback. Additionally, urine treatment technologies have been developed to the point of inclusion into small and mid-scale pilot projects. The most notable of which are the use of struvite precipitation at GTZ headquarters in Eschborn, Germany and the use of electrodialysis and ozonation at the Basel-Canton Library in Switzerland. These projects are managed by Ecosan and Eawag, respectively; two of the predominant research groups engaged in urine diversion technological and social development. User feedback has been a crucial part of the development of urine diversion, as toilet use is a sensitive topic. A review of European pilot projects indicates that 80% of users like the idea of urine diversion, 75-85% were satisfied with design, hygiene, and seating comfort of NoMix toilets, 85% thought that urine-based fertilizer was a good idea (50% of farmers), and 70% would purchase food grown with urine-based fertilizer. However, 60% of users also encountered problems, indicating that NoMix toilets require further development. Research and pilot projects have also explored the potential for direct urine reuse, with development of storage parameters to ensure sanitization as well as study of plant yield when utilizing urine as fertilizer. Urine diversion technology is developed to the point that, with proper operation and maintenance, mid- to large-scale pilot projects are possible. However, in addition to necessary improvements or adaptations to urine diversion toilets, several knowledge gaps exist which may hinder the progress of urine diversion in the U.S. Specifically, whole life costs of urine diversion on several scales and life cycle assessments with energy, contaminant, and water balances may be necessary to justify further research. These assessments may take into account other decentralized wastewater treatment scenarios, and should account for the potential to address aging and deteriorating U.S. wastewater infrastructure in a sustainable manner. Pilot projects and social surveys, although extensively conducted in Europe, are lacking in the U.S. These may be conducted either after a simplified set of life cycle and cost assessments is executed, or during the development of more thorough assessments.

CHAPTER 1.0

URINE SOURCE SEPARATION IN THE CONTEXT OF SUSTAINABLE WASTEWATER MANAGEMENT

1.1 Introduction

Sustainability in wastewater management involves not only protection of human health and the environment, but also efficient and effective long-term water management, minimization of energy requirements, and closing the loop on natural resource cycles. To address future demands of wastewater treatment (e.g. contaminants of emerging concern, more stringent phosphorus regulations, increased population, water quality impairments associated with combined or sanitary sewer overflows, etc.), improvements to conventional, end-of-pipe treatment can be made, and/or source separation of wastewater streams can be implemented. Of these options, source separation has emerged as an innovative option for addressing aging infrastructure with great potential for meeting sustainability criteria defined by the U.S. EPA (U.S. EPA, 2010a).

On the domestic scale, three wastewater streams can be differentiated:graywater, blackwater, and urine (or 'yellow water' if urine is diluted). Graywater is defined in this report as wastewater from showers, laundry, and non-kitchen sinks. Blackwater includes wastewater from kitchens and toilets. In the context of urine diversion (UD), blackwater is a mix of feces and kitchen wastewater. Feces, urine, and graywater differ greatly in terms of nutrient content, chemical oxygen demand (COD), biological oxygen demand (BOD), and total suspended solids (TSS). For example, urine contributes most of the nitrogen, phosphorus, and potassium of these sources, but the least carbon (measured by COD and BOD; Meinziger et al., 2009).

Separation of these wastewater streams provides the opportunity for treatment of each to maximize water reuse, capture nutrients, and minimize energy input for wastewater management (Figure 1-1). Prior to mixing with other domestic wastewater streams, graywater requires only minimal treatment for reuse as irrigation water, and research has indicated that constructed wetlands are a feasible treatment system (Masi et al., 2010; Jokerst et al., 2010). Blackwater, due to its high organic and solids content, can be treated in an anaerobic digester. Anaerobic digestion requires less energy than aerobic treatment (due to absence of aeration), produces energy in the form of biogas containing methane, and generates an organic fertilizer high in nitrogen and phosphorus rather than sewage sludge (Wendland et al., 2007). Research conducted at Colorado State University indicates that the concept of neighborhood-scale anaerobic digestion applied to blackwater shows promise (Gallagher and Sharvelle, 2011).

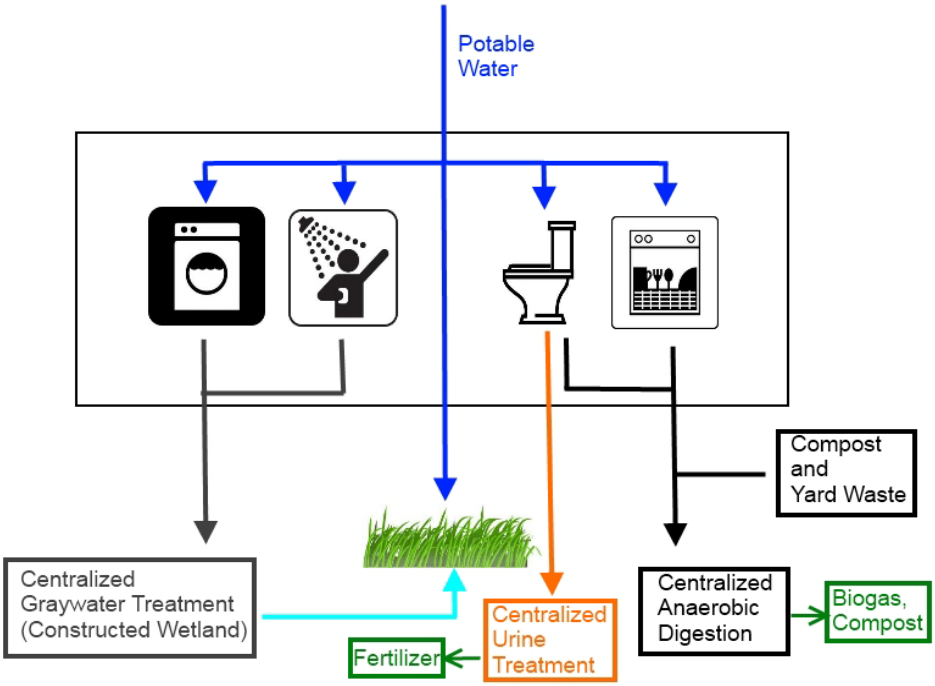

Figure 1-1. Potential Decentralized Wastewater Treatment Scenario.

Source separation of urine, blackwater, and graywater has been under investigation since the 1990s, but until recently was only considered for wastewater treatment in rural and under-developed areas (Larsen, 2009). Recent developments, however, have revealed that source separation could be a solution for sustainable wastewater management in urban and industrialized areas as well (Brown et al,. 2010; Hellstrom et al., 2008; Larsen et al., 2009; Remy and Jekel, 2008). Urine, in particular, has been examined because of the potential for nutrient recovery, prevention of environmental contamination from nutrients and pharmaceuticals/ hormones, and improved centralized wastewater treatment efficiency. While source collection and treatment of urine offers advantages over traditional wastewater treatment methods, technologies for doing so are still in the development phase and have not been demonstrated on a large scale, particularly in the United States.

1.2 Objectives

The purpose of this document is to provide a thorough assessment of urine diversion technology, treatment options, and pilot projects to date and to propose a path forward for further development of the urine diversion concept in industrialized countries. An introduction to urine quality and potential effects of urine diversion is included in Chapter 1.0. Chapter 2.0 provides an overview of urine diversion toilets and waterless urinals as well as a discussion of available treatment technologies. The goal, technical maturity, and effectiveness of treatment methods is discussed, and the most advanced technologies are noted. Chapter 3.0 summarizes pilot projects conducted in urine diversion. Details of each project (number of users, treatment system employed, etc.) are included as well as a summary of feedback (social, technical, economic, etc.). Chapter 4.0 provides recommendations for a path forward in urine source separation research by summarizing obstacles to large-scale implementation of urine diversion, identifying research needs, and proposing further studies.

1.3 Urine Quality

A brief summary of urine quality (Table 1-1) is necessary to evaluate the potential value of urine diversion. On average, an adult produces 0.8-1.5 L of urine per day, and a child produces approximately half this amount (WHO, 2006). The quality of urine excreted per capita depends on diet, but common design figures have emerged in the scientific community. While urine is only 1% of total domestic wastewater, it contributes 50-80% of the total nutrients (75-80% of the nitrogen, 50-55% of the phosphorus, and 70% of the potassium), and the majority of the pharmaceuticals and subsequent metabolites (Larsen and Gujer, 1996; Winker et al., 2008). Macronutrients (nitrogen, potassium, phosphorus, and sulfur) consumed by adults are largely excreted. In total, this amounts to 4 kg N/cap/yr, 0.36 kg P/cap/yr and 1.0 kg K/cp/yr excreted in urine (Von Munch and Winker, 2009). Remaining anthropogenic nitrogen and phosphorus, pharmaceuticals, and natural and artificial hormones are excreted in feces. The exact proportion of pharmaceuticals and subsequent metabolites excreted in urine and feces respectively is still under investigation, but studies indicate that urine source separation can still provide an effective means for removal (Lienert et al., 2006; Winker et al., 2007).

Pathogens are not present in urine in the bladder of a healthy human (Von Munch and Winker, 2009). Of the few diseases transmitted by pathogens in excreted urine, only *Schistosoma haematobium* is of concern, and is only of concern in areas where this is an endemic disease (primarily Africa and the Middle East) and in cases when urine is directly applied to agriculture (WHO, 2006). The majority of pathogens, should they be present in the population, are excreted via feces. As a result, sterilization of urine is generally only necessary if potential for cross-contamination exists. Finally, the concentration of heavy metals present in urine is typically much lower than other wastewater streams (blackwater, graywater) and in other organic fertilizers (Jonsson, 1997). Storage of urine does impact quality, especially with regards to nutrients. Changes in the chemical makeup of urine occur during storage as a result of bacterial hydrolysis. Nitrogen is converted from urea to ammonia and precipitation of phosphate, magnesium, and calcium occurs. This process and urine stabilization techniques are discussed in Sections 2.2 and 2.4.1, respectively.

Table 1-1. Chemical Composition of Fresh Urine (N/A – Not Available).

Substance	Amount (mg/L) NASA 1990	Amount (mg/L) Fresh Urine Eawag (2007)	Average Amounts (mg/L) for Fresh Urine Udert et. al. (2006)
Urea (H_2NCONH_2)	4800-23300	N/A	7700
Chloride	1870-8400	4970	3800
Sodium	1170-4390	3450	2600
Potassium	750-2610	2737	2200
Total Phosphorus	470-1600	800-2000	740
Total Ammonia	200-960	463	480
Total N	N/A	8830	9200
Sulfur, organic	48-470	N/A	N/A
Sulfate	N/A	N/A	1500
Calcium	30-390	233	190
Magnesium	47-160	119	100
pH	N/A	6.2	6.2
COD	N/A	N/A	10000

1.4 Benefits of Urine Source Separation and Treatment

Conventional wastewater treatment has many advantages, and has consistently provided a sanitary method for managing wastewater in the U.S. However, alternative methods for wastewater treatment have emerged as knowledge of environmental impacts grows, public concern with environmental sustainability increases, and resource efficiency becomes a central concern in urban water management. In addition, as major water infrastructure improvements are forthcoming, engineers are looking toward implementation of new concepts for water and wastewater management (U.S. EPA, 2007). Urine separation addresses many of the goals associated with sustainable wastewater treatment. The primary benefits of urine source separation include (detailed in Sections 1.4.1 through 1.4.6):

- Decreases environmental contamination from nutrients and enables nutrient recovery
- Decreases environmental contamination from pharmaceuticals and hormones (micropollutants)
- Energy savings at wastewater treatment facilities
- More efficient anaerobic digestion of blackwater
- Water conservation
- Addresses deteriorating infrastructure if utilized with other decentralized separation/treatment systems

1.4.1 Prevents Environmental Contamination from Anthropogenic Nutrients and Enables Nutrient Recovery

The flow of nutrients (and anthropogenic pharmaceuticals/hormones) in modern society is generally linear with conventional wastewater treatment (WWT) (Figure 1-2), resulting in nutrients and micropollutants ending up as contaminants in aquatic ecosystems. Metabolized nitrogen is insignificant in terms of the global nitrogen cycle, and metabolized phosphorus is of minor importance to the global phosphorus cycle, but both are substantial in terms of water pollution control (Larsen et al., 2007). (The primary source of nutrients to surface water is agricultural runoff, (U.S. EPA, 2004).) Anthropogenic nutrients in wastewater treatment plant discharge are a substantial contributor to water pollution (Carey and Migliaccio, 2009), but are costly and difficult to remove by traditional, end-of-pipe wastewater treatment methods (primarily due to dilution and subsequent high volume flows; Larsen, 2004). Inefficient removal contributes to eutrophication and associated ecological problems. Several studies have indicated that urine diversion could be a more sustainable method for nutrient removal compared to conventional methods in terms of resource and energy consumption (Remy and Jekel, 2008; Larsen and Gujer, 1996; Wilsenach and Loosdrecht 2006; Jonsson, 2002).

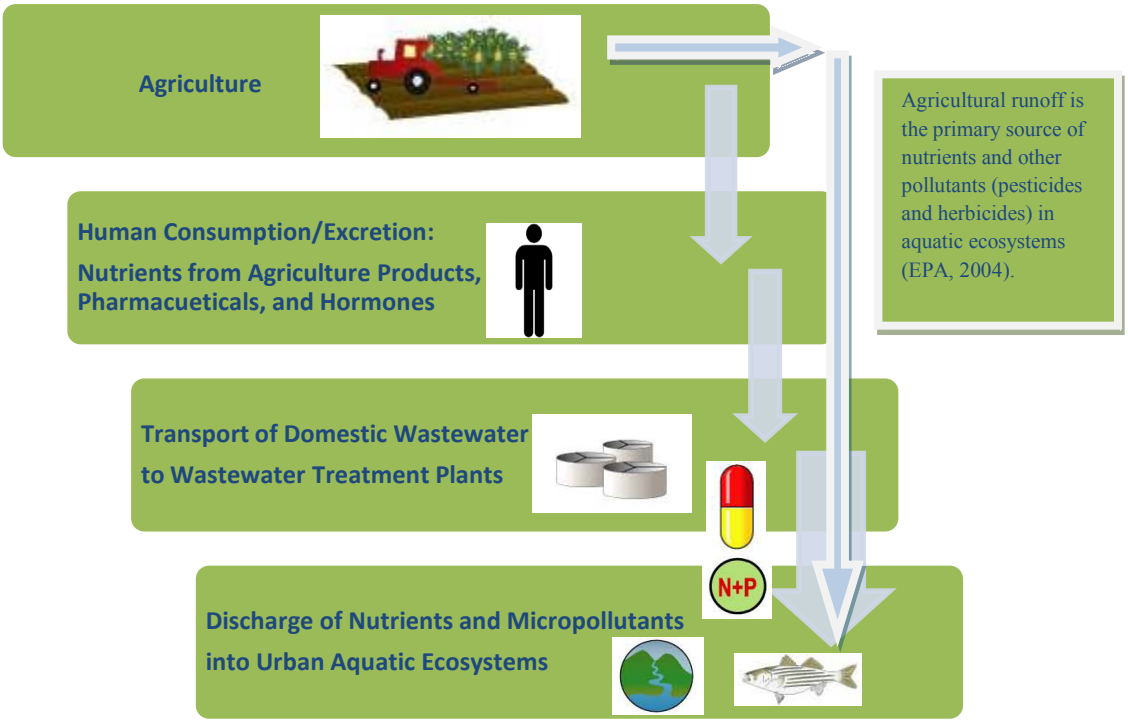

Figure 1-2. Flow of Nutrients and Micropollutants with Current Wastewater Management Practices.

Human waste source separation and treatment could provide an opportunity to recycle nutrients (Figure1- 3). Although it is not likely that the nutrients present in urine could meet the high demands of agriculture in the U.S., conventional wastewater treatment systems expend tremendous energy to remove nutrients and urine separation enables treating nutrients as a resource through recovery and reuse.

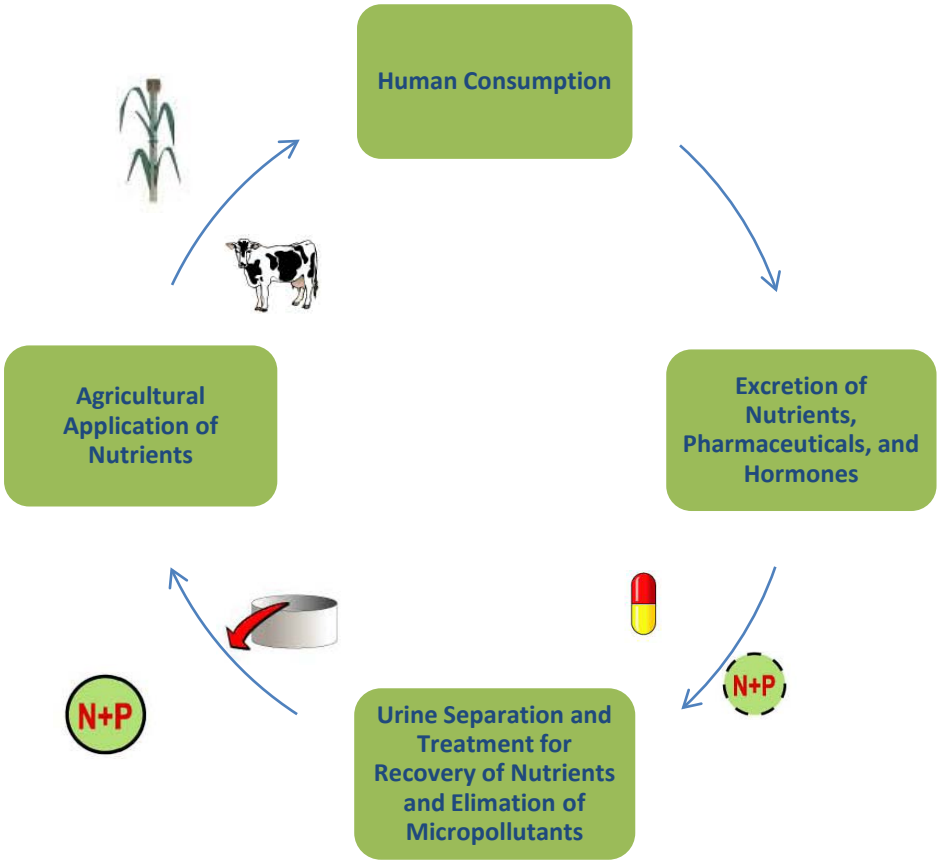

Figure 1-3. Flow of Anthropogenic Nutrients, Pharmaceuticals, and Hormones with Implementation of Urine. Source Separation and Treatment

Nutrient recycling is possible through direct urine application or advanced treatment. Urine treatment offers the ability to capture nutrients in the absence of pathogens (e.g. prior to combination with fecal material). In addition, some technologies employed for nutrient recovery have been shown to create a fertilizer largely free of micropollutants (Escher, 2006). Feasibility of either direct application of urine or creation of a urine-based fertilizer depends on the location of storage/treatment relative to application sites, availability and cost-benefit ratio of advanced treatment technologies, and degree of public acceptance. In industrialized countries, it is likely that because transport is difficult and public acceptance of direct reuse may be limited, creation of a urine-based fertilizer is probably preferable.

Recovering nutrients secreted in urine and feces through advanced processes may require less energy than current production of industrial fertilizers and may help address growing agricultural demand for nutrients and depleting phosphorus reserves (Wilsenach and Loosdrecht,

2003; Von Munch and Winker, 2009). This is especially true in developing countries, where commercial fertilizer is in high demand and is largely unaffordable. Industrial production of nitrogen-based fertilizers involves the conversion of atmospheric nitrogen (abundant and easily accessible) to ammonia or nitrate and requires 35-50 MJ kgN^{-1}, which is typically provided by fossil fuels (Maurer, 2002). In addition, there are energy requirements for nitrogen removal in wastewater treatment plants (WWTPs). In WWTPs, removal of nitrogen usually involves a biological nitrification/denitrification process, which requires energy for aeration. Although it may be difficult to economically justify removal of nitrogen from urine given existing efficient industrial means of fixing nitrogen, it may be justifiable through decreased wastewater treatment costs and lower regulatory limits on nitrogen discharge.

It may be, in the near term, more justifiable to recover phosphorus from urine. It is estimated that, due to increased global populations and changes in diet related to development, current global phosphorus reserves may be depleted in 50-100 years (Cordell et al., 2009). Research has shown that a sustainable future for the phosphorus industry requires recovery/recycling (Driver, 1999). Although phosphorus recycling is currently expensive, U.S. regulatory progress could drive down costs and encourage urine diversion as a means to recover phosphorus (Carey and Migliaccio, 2009).

1.4.2 Decreases Environmental Contamination from Micropollutants

Pharmaceuticals and hormones excreted from human metabolism, although not currently regulated, are known to be present in U.S. surface waterbodies, have known effects on aquatic ecosystems, and are costly and difficult to remove at the scale of conventional wastewater treatment (Kolpin et al., 2002). In addition, it is well understood in the water treatment community that effluent from wastewater treatment plants often becomes a portion of the influent to water treatment plants downstream, to the point that a drop of water is used many times in multiple urban centers. Currently, at the observed concentrations, the potential effects to human health are not well understood. The exact portions and relative ecotoxicity of micropollutants respectively in urine and feces are still under investigation (Battaglin and Koplin, 2009; Lienert et al., 2007; Winker et al., 2008), but it is largely recognized that urine diversion would help address micropollutant removal. It has been estimated that diverting urine from wastewater could reduce the ecotoxicological hazard posed by micropollutants in the environment by as much as 50% (Larsen, 2007).

Current municipal WWTPs are generally not equipped for removal of pharmaceuticals (although some removal does occur through adsorption and biological modification). As a result, some of the most frequently detected compounds in a recent USGS survey of U.S. streams were nonprescription drugs, antibiotics, other prescription drugs, and reproductive hormones (Kolpin, 2002). Concerns about pharmaceuticals and personal care products (PPCPs) have been raised by the U.S. EPA and research has shown that even low exposure to some pharmaceuticals and hormones can cause harmful effects to aquatic organisms (Daughton and Ternes, 1999). Another potential route of exposure is through agricultural application of municipal sludge. A comparison of human pharmaceutical concentrations in raw municipal wastewater and urine revealed that urine separation and treatment is a promising approach to reduce the environmental impact of pharmaceuticals (Winker, 2008; Zhang and Geissen, 2010). Multiple sources also indicate that municipal wastewater effluent is a significant contributor to pharmaceuticals and hormones in the environment (Daughton and Ternes, 1999; Eawag, 2009).

Although some connections have been made between various anthropogenic hormones and pharmaceuticals and adverse effects in marine organisms, the degree of the problem has not yet been thoroughly evaluated. This is because analytical methods have only recently been developed that enable accurate assessment via ecotoxicological studies (Kolpin, 2002). It is largely recognized, however, that because of the large number of medicines and hormones secreted in urine and feces, cautionary measures could be beneficial (Larsen et al., 2007). Therefore, urine source separation could improve water quality by preventing pharmaceuticals and hormones from entering aquatic ecosystems. Technologies for removing micropollutants (e.g. membrane filtration, reverse osmosis, ozonation) are costly and energy-intensive. By removing urine from domestic wastewater, these technologies can be employed for a much smaller volume, potentially decreasing capital cost, maintenance, and energy requirements (Larsen et al., 2004; Dodd et al., 2008).

1.4.3 Energy Savings at Wastewater Treatment Facilities

Due to the high nutrient content of urine, diversion would substantially change the composition of wastewater (Larsen and Gujer, 1996). Specifically, although flow would not be decreased by more than approximately 1%, the nutrient content would be much lower. Larsen and Gujer (1996) estimate the degree to which the nutrient load delivered to wastewater treatment plants would be affected should urine be diverted. Specifically, it was found that with negligible flow change, diverting urine would change the ratio of COD:TKN:TP (chemical oxygen demand: total kjeldahl nitrogen: total phosphorus) from 100:10:1.25 to 100:1.4:0.6.

Research to date is preliminary, and largely based on modeling of specific scenarios, but does indicate a potential for substantial savings of resources and energy as well as improved ecological sustainability as a result of urine diversion (Wilsenach and Loosdrecht, 2003 and 2004; Jonsson, 2002; Remy and Jekel, 2008; Larsen and Gujer, 1996). Current wastewater treatment technologies are able to adapt to more stringent nitrogen regulations, but the advantage of urine separation is that equal effluent quality can be achieved with lower input of energy and capital (Wilsenach and Loosdrecht, 2003). In addition, it is expected that phosphorus regulations in the U.S. may soon become more stringent, and difficulty meeting requirements may provide further incentive for urine diversion (Carey and Migliaccio, 2009). It should be noted, however, that removal of nutrients from WWTP influent may alter ratios necessary for biological treatment and that further research would be necessary to consider the potential for negative impacts.

Because removal of pharmaceuticals and hormones from domestic wastewater is not currently necessary from a regulatory standpoint, and because there is still some debate about the exact proportion of these contaminants present in urine, micropollutant removal should be considered an “added bonus”. Contaminants of emerging concern have lately received a higher level of attention by the U.S. EPA and others engaged in water management and research as well as within the popular press, but negative effects (to human health and the environment) must be validated before regulations will be implemented. Should discharge limits be set, urine diversion may be an efficient way to address removal of pharmaceuticals and hormones. Technologies for removing micropollutants can be energy intensive and expensive. Reducing the flow needing treatment would likely result in substantial capital savings.

1.4.4 More Efficient Anaerobic Digestion of Blackwater

Urine source separation enables more efficient anaerobic digestion of blackwater via an increase in organic content and reduction of ammonia and salts, which result in toxicity to organisms which generate methane in anaerobic digestion (Rittman and McCarty, 2001). Anaerobic digestion is used to generate biogas from high organic waste. Domestic wastewater is too low strength for anaerobic digestion, but application to kitchen wastewater and feces (e.g. blackwater) is feasible (Wendland et al., 2007). If anaerobic digestion were applied for treatment of blackwater in combination with urine diversion, the added benefits of biogas generation, complete nutrient reuse, and complete removal of anthropogenic pharmaceuticals could be realized.

1.4.5 Water Conservation

Urine diversion technology conserves water through the use of waterless urinals and dual flush toilets, which can minimize the volume of water used for flushing. Using rainwater for flushing, instead of potable water, is also possible and potentially beneficial, as rainwater lacks calcium and magnesium, which contribute to urine scale (precipitation of magnesium ammonium phosphate). Data from von Munch and Winker (2009) indicates the potential water savings with urine diversion technology. Specifically, UDDTs and waterless urinals use no flushing water, and UDTs use 0.5-2 liters per urine flush. In contrast, conventional urinals use four liters per flush and conventional flush toilets use up to 8-12 liters per flush. Use of dual flush, vacuum-assisted, or EPA WaterSense approved non-UD toilets can lower water use. For example, a commercially available American Standard EPA WaterSense toilet cites water use as four liters per flush.

Urine diversion may also increase potable water conservation through increasing water recycling opportunities. According to the U.S. EPA, water recycling provides tremendous environmental benefits, including decreased water diversion from sensitive ecosystems and decreased wastewater discharge to the environment. Reclaimed wastewater (a type of recycled water) is domestic wastewater that has received secondary treatment as well as any additional treatment that may be necessary to meet end use regulations. Although reclaimed wastewater has been widely used for nonpotable purposes, impacts of salinity and sodicity have emerged as potential drawbacks for its reuse as irrigation water (Parsens et al., 2010). Studies have shown that the increased sodium present in reclaimed wastewater can impair grass growth and cause needle burn in conifers (Qian, 2005). To evaluate the potential effect of removing urine from wastewater, the amount of sodium in urine can be compared to the amount of sodium in various reclaimed wastewaters (Table 1-2). Calcium and magnesium concentrations are also included (Table 1-2), as the sodium adsorption ratio (SAR), used to measure the potential impact of reclaimed wastewater, is a function of sodium (Na), Calcium (Ca), and Magnesium (Mg) concentrations. Urine has a high salt content (Table 1-2), and therefore the removal of urine from wastewater has the potential to improve the quality of reuse water for irrigation.

Table 1-2. Na, Ca, and Mg Content of Urine and Reclaimed Wastewater.

	Fresh urine (Von Munch and Winker, 2009)	Fresh Urine (NASA, 1990)	Reclaimed wastewater: Colorado (Qian et al., 2005)	Reclaimed wastewater: California (Sheikh et al., 1990)	Reclaimed wastewater: Central Iran (Heidarpour et al., 2007)	Reclaimed wastewater: Texas (Duan et al., 2007)
Na (mg/L)	3450	1170-4390	99	78-415	202	117
Ca (mg/L)	230	30-390	61	17-61	64	52
Mg (mg/L)	120	47-158	15	16-40	24	24

1.4.6 Addresses Deteriorating Infrastructure if Utilized with Other Decentralized Separation/Treatment Systems

Decentralized wastewater treatment has emerged as a potential sustainable alternative to conventional wastewater treatment. It limits the need to maintain long series of pipes, provides an alternative to elaborate storage systems for combined or sanitary sewer overflows, may allow for more efficient treatment of separated flows, and can provide increased water reuse opportunities. Urine diversion, in many pilot projects attempting complete on-site wastewater treatment, is often paired with anaerobic digestion of blackwater and may also be paired with graywater recycling (after simple treatment). Other options exist, but are beyond the topic of this research. In the U.S., serious concerns have been raised about poorly maintained and/or failing septic systems, and their impact on water quality. Waste source separation and decentralized treatment may be an ideal option for sustainably addressing wastewater in homes without access to sanitary sewers. It may also prove to be a more efficient (in terms of energy and cost) method than centralized wastewater treatment, as separated flows can be treated according to specific parameters prior to mixing with more or less contaminated streams.

1.4.7 Summary of Advantages

Urine diversion may be a more efficient means to prevent environmental contamination from nutrients (while also enabling nutrient recovery) and decrease environmental contamination from pharmaceuticals/hormones (micropollutants) when compared to energy/cost requirements to achieve similar levels of removal at WWTPs. This may be more notable with increasingly stringent phosphorus regulations for WWTPs in the U.S. or with increased emphasis on sustainability in addressing aging U.S. water infrastructure. Urine diversion may also be more attractive if increased association is found between pharmaceuticals/hormones and ecological or human health effects. Finally, urine diversion makes anaerobic digestion of blackwater more efficient and may better conserve water or increase reuse opportunities.

1.5 Obstacles to Urine Diversion- Preliminary Discussion

Despite the many conceptual advantages of urine diversion, several considerations (economic, political, and social) stand in the way of continued technical development. A primary obstacle is lack of a clear, quantitative justification for urine diversion. Limited information has been developed regarding reduced energy needs in wastewater treatment, but other factors may be hard to quantify, such as:

- Nutrient recovery and reuse: There are only two pilot projects in which a urine-based fertilizer was developed, although there are several smaller, lab-scale studies. Results

from the pilot project fertilizer reuse cases are currently limited. Estimates have been made as to the degree to which urine could substitute fertilizer needs, but as long as the cost of fertilizer remains low, there exists little motivation to use urine or urine-based fertilizer. In addition, direct urine reuse may prove to have disadvantages due to its high sodium content, although this is not mentioned in the literature to date.

- Urine treatment: Although most research groups have determined that decentralized treatment of urine is a more feasible option than centralized, little research has been published to compare urine treatment to direct urine reuse. Transport of urine has sustainability and social implications.
- Infrastructure costs: UD technology is still in its infancy so costs are currently much higher than conventional sanitation. In addition, in many cases it has been proposed that urine diversion be included in a more complete decentralized wastewater system. A life cycle assessment/ economic analysis would have to consider urine diversion in the context of both conventional sanitation or as part of a more decentralized, sustainable system.
- Environmental impact: An externality exists in which the market fails to account for damage done by discharges of nutrients and CECs. The potential for more stringent wastewater regulations (particularly phosphorus) will make a difference, and further validating the risk of pharmaceuticals and hormones may also make a difference.

Perhaps most significant to this stage of development are technical issues which need to be accounted for in the design of further pilot projects and minimal validation of the perceived benefits of urine diversion. Compatibility with established infrastructure is one example. Issues with UD toilets and waterless urinals such as odor, precipitation (and subsequent clogging of pipes), difficulty of use (or unwillingness of users to modify behavior), and increased operations and maintenance not only discourage new pilot projects, but may also cause negative impressions of the technology among pilot project users. Lack of clear quantification (through realized benefits) of energy savings at wastewater treatment plants is also an inhibiting factor. Social issues which require further study include safety and acceptance of urine or urine-based fertilizer in agriculture or urban landscapes (this also has legal implications), and the willingness of users to accept the current inconveniences of UD technology for the greater perceived environmental benefits. It is the purpose of this report to identify the current state of knowledge on these issues and provide a recommendation for the path forward for consideration of UD in the U.S.

CHAPTER 2.0

URINE DIVERSION: SEPARATION AND TREATMENT TECHNOLOGY

Several toilets and urinals are available for separate collection of urine, and technologies are being tested and/or developed which enable nutrient recovery from urine. Systems are also in place for direct urine application after a designated storage period. This chapter details these technologies, indicating technical maturity, current issues, and potential for further development.

2.1 Waste Source Separation Technologies

Methods for separation of urine from feces with no or minimal dilution include urine diversion dehydration toilets, urine diversion toilets, and waterless urinals. Urine diversion dehydration toilets (UDDTs) do not utilize water for flushing; instead, the urine is drained into a storage container and a separate straight drop allows for feces collection. The feces are ventilated for drying, and composted separately. UDDTs are often used in developing countries where water is scarce and demand for cheap fertilizer is high. The first water-flushed urine diversion (UD) toilets were developed in the 1990's in Sweden (Larson and Lienert, 2007). Manufacturers include Wost Man Ecology, Dubbletten (www.dubbletten.nu/english-presentation/WCdubblettenenng.htm), Gustavsberg, and Roediger (www.roevac.com). All UD toilets have separate outlets for urine and feces, but they can differ in flushing mechanisms. The Dubbletten toilet (Figure 2-1), for example, has a physical barrier between the front and rear portions of the toilet (preventing overflows of flushing water contaminated with bacteria).

Figure 2-1. Dubbletten Urine Diversion Toilet.
Reprinted with permission from Dubbletten.

As with all UD toilets, feces are collected in the back, and urine is collected in the front. Separate flush volumes for each section allow for minimal dilution of urine, with adequate volumes for flushing of feces. In most other models, a single flush rinses the entire bowl, meaning less control over minimizing urine dilution. The Roediger NoMix toilet (Figure 2-2), employs a mechanism which allows for almost completely undiluted collection of urine. To achieve this, urine collection is initiated when the user sits, opening a valve to the urine collection opening. When the user stands, the valve closes, and a full flush rinses the entire toilet basin.

Figure 2-2. Roediger NoMixToilet.
Reprinted with permission from Roevac.

The primary features of waterless urinals (Figure 2-3) are: 1) a drain trap insert siphon which collects and discharges urine without using water, and 2) a hydrostatic float which seals the insert and prevents odors from escaping. Manufacturers of waterless urinals include Ernst, Uridan, Keramag (www.pro.keramag.com), and Urimat.

Figure 2-3. Keramag Waterless Urinal.
Reprinted with permission from Keramag.

A detailed list of worldwide manufacturers of waterless urinals, UDD, and UD toilets is available through the organization ECOSAN (http://www.gtz.de/en/dokumente/gtz2010-en-urine-diversion-appendix-suppliers-lists-2010-02-17.pdf). Feedback related to UD toilets and waterless urinals, including maintenance requirements and both technical and social issues, is included in the pilot studies portion of this report (Chapter 3.0).

2.2 Effects of Spontaneous Transformation Processes during Urine Storage

Before investigating urine treatment technologies, it is important to understand the qualitative differences between fresh and stored urine (Table 2-1). Udert et al. (2006) thoroughly investigated the spontaneous transformation processes of urine and their results are summarized in this section. Urine from a healthy person is generally stable and free of microorganisms. Once urine has been diverted and stored, however, contact with bacteria within the collection system or via cross-contamination with feces is likely (Udert et al., 2006). The high fraction of biodegradable organic compounds may be a substrate for aerobic or anaerobic microorganisms in urine, resulting in urea hydrolysis, among other impacts. Microbial urea hydrolysis, mineral precipitation, and ammonia volatilization are the primary contributors to the transformation of urine once it has been excreted, diverted, and stored (Udert et al., 2006)

Urea-hydrolyzing bacteria have the greatest influence on the alteration of urine quality, by catalyzing the hydrolysis of urea to ammonia and bicarbonate. Prior to this transformation, approximately 85% of the nitrogen in urine is fixed as urea and approximately 5% as ammonia,

compared to 90% as ammonia after urea hydrolysis (Udert et al., 2006).The effects of this shift include a rapid rise in pH, from about 6 to 9, volatilization of ammonia (should the urine not be in a closed storage tank designed to minimize volatilization), and the precipitation of struvite, hydroxyapatite, and occasionally calcite (Udert et al., 2003).

Table 2-1. Composition of Fresh and Stored Urine.

Parameter	Fresh urine[1]	Fresh urine[2] (average values)	Fresh urine[2] (data range)	Stored urine[2] (simulated values)
pH	6.2	6.2		9.1
Total Nitrogen (mg/L)	8830	9200		9200
NH_4^+ and NH_3 (mgN/L)	460	480		8100
NO_3 and NO_2 (mgN/L)	0.06			
COD (mg/L)	6000	10,000		10,000
TP (mg/L)	800-2000	740		540
K	2740	2200	1300-3100	2200
SO_4 (mg/L)	1500	1500		1500
Na (mg/L)	3450	2600	1800-5800	2600
Mg (mg/L)	120	100		0
Cl (mg/L)	4970	3800	2300-7700	3800
Ca (mg/L)	230	190		0
Urea (mgN/L)		7700		0
Total carbonate		0		3200
Alkalinity		22		490

[1]Von Munch and Winker, 2009; [2]Udert et al., 2006

A shift in pH and subsequent precipitation has several impacts on the choice of urine treatment/reuse technologies. First, up to 33% of total ammonia is volatile, so ammonia losses and odor issues will occur during transport and land application of stored urine (the buffer capacity is so high that acid addition to prevent this is uneconomical). Another issue is a shift in phosphorus concentration, which is a strong function of precipitation. In undiluted urine, 30% of soluble phosphorus is incorporated in the solid phase of the precipitates (Udert et al., 2003), but this percentage increases with dilution. Phosphorus precipitation is limited by calcium and magnesium concentrations, and typically all calcium and magnesium is precipitated in stored urine. The hardness and volume of flushing water are therefore factors to consider in urine collection choices as the partitioning of phosphorus into soluble and solid phases is important when considering possible recovery methods. Addition of calcium and magnesium is also a promising phosphorus recovery method. Precipitation may affect the potassium concentration, but not notably.

Both precipitation and biological reduction affect sulfur concentration. Precipitation is negligible, but due to the seriousness of sulfide gas production, the biological reduction of sulfur necessitates further investigation (Udert et al., 2006). Because sulfur is the most favorable electron acceptor in stored urine (nitrate, nitrite, and oxygen are absent and iron concentrations are very low), sulfate reducing bacteria (if present) will reduce sulfate to hydrogen sulfide. Hydrogen sulfide is a corrosive gas with issues related to both odor and toxicity.

2.3 Urine Treatment Goals

The purpose of urine diversion and treatment is generally to create nutrient capture opportunities or to eliminate constituents that may have negative effects if released to the aquatic environment (i.e. nutrients and contaminants of emerging concern). For example, sterilization and stabilization might be necessary (Sections 2.4.1 and 2.4.3) as a precursor for creation of fertilizer or to allow for direct application of urine. Other processes, such as electrodialysis and nanofiltration, can be used to create a fertilizer which is free of micropollutants and nutrient-rich. A variety of urine treatment technologies have been developed since the concept of urine diversion was first introduced in the 1990s (Table 2-2). Many of these technologies have been employed in other aspects of water and wastewater treatment and were adapted to address the parameters specific to urine.

Table 2-2. Technologies Available for Primary Urine Treatment Goals.

TREATMENT GOAL (text reference)	PROPOSED TECHNOLOGIES (that have at least advanced to lab-scale experiments)	TECHNOLOGIES IMPLEMENTED IN URINE DIVERSION PILOT PROJECTS
Sterilization (2.4.3)	Storage	Storage
Stabilization (2.4.1)	Acidification, Partial Nitrification	
Volume Reduction to Concentrate Nutrients	Evaporation, Freeze-Thaw, Reverse Osmosis	Evaporation
Nutrient Removal (2.4.2)	Annamox (N removal), Electrocoagulation (P removal)	
Phosphorus Recovery (2.4.5)	Struvite Precipitation	Struvite Precipitation
Nitrogen Recovery (2.4.5)	Ammonia Stripping, Ion Exchange, IBDU Precipitation, Struvite Precipitation	Struvite Precipitation
Removal of Micropollutants (2.4.6)	Ozonation, Electrodialysis, Nanofiltration	
Creating a Fertilizer Free of Micropollutants (2.4.5 and 2.4.6)	Struvite Precipitation, Electrodialysis and Ozonation,	Struvite Precipitation, Electrodialysis and Ozonation
Optimizing Nitrogen and Phosphorus Recovery (2.4.5)	Struvite Precipitation with Zeolite Adsorption	

In 2006, Eawag conducted an extensive literature search for those methods which could be applied in practice, and tested additional processes which showed promise. Information on urine treatment technologies included in this report is largely based on Eawag's extensive research (e.g. Maurer et al., 2006) and supplemented by research and pilot projects conducted since. Also included in this section is experiential research related to direct urine reuse. At the time of the Eawag study, Maurer et al. (2006) determined that there is no single process which can achieve all desirable goals (sterilization, stabilization, nutrient elimination/recycling, and micropollutant removal); however, specific technical solutions can either act in isolation or in combination depending on the overall treatment goal. In fact, most urine treatment research conducted since the study by Eawag involves a combination of technologies to produce fertilizer from urine. In addition, a few urine treatment technologies have advanced to pilot study scale, but substantial work is still necessary to create marketable products. Despite limited pilot studies, laboratory research and pilot studies continue to advance the state of urine treatment technology.

2.4 Urine Treatment Technologies

2.4.1 Stabilization: Acidification or Biological Treatment

Stabilizing urine is sometimes a necessary pretreatment measure and entails preventing the hydrolysis of urea , thereby preventing odor issues which result from ammonia formation and breakdown of organic matter, clogging of pipes (from precipitates), and volatilization of ammonia. Urease inhibitors, acidification (Hellstrom et al., 1999), microfiltration, and ultrafiltration have been considered as potential methods for stabilization. Studies conducted by Eawag during its Novaquatis project revealed that sterile filtration was not able to remove enzymes responsible for decomposition (present in dissolved form and could pass through filter). Both chemical acidification and biological processes prevent ammonia volatilization and odor issues.

Addition of strong acid to fresh urine may be an option for urine stabilization. Studies by Hellstrom et al. (1999) concluded that a one-time addition of 60 meq sulfuric or acetic acid at the beginning of a storage period could inhibit the decomposition of urea for more than 100 days in cans with multi-time dosages of urine. The low pH also inhibited pathogens. Acid addition should occur prior to the start of urea decomposition, as post-hydrolysis acid requirements are infeasible (600-650 meq of acid was required for stabilization after complete urea decomposition).

Biological treatment can also be employed to stabilize urine. Readily degradable organic substances are broken down and nitrification (conversion of ammonia to nitrate/nitrite by aerobic bacteria) occurs, lowering the pH and reducing volatilization of ammonia. Bioreactor configurations have been tested by Eawag (Udert et al., 2003d), yielding varying degrees of nitrification and resulting in production of an odorless ammonium nitrate or nitrite solution. The nitrate solution could be used as a fast acting liquid fertilizer (EAWAG, 2007). Of note is that biological nitrification of high nitrogen waste streams is problematic due to formation of hydrogen ions during nitrification and sensitivity of nitrifying organisms to pH (Jackson et al., 2009). Jackson et al. (2009) was able to achieve nitrification rates of 60-80% from biological treatment of a high-nitrogen waste stream for water reuse applications.

Urine can be processed through the anammox reaction (anaerobic ammonium oxidation reactor) (Udert et al., 2003d- nitrification and auto denit). In this process, ammonium is converted to nitrite, which is directly converted to nitrogen gas. However, this process has been found to be unstable and requires tight process controls so design of small on-site reactors is difficult (Udert et al, 2008). Specifically, low bacterial diversity hinders process stability and resilience. In addition, urine contains high levels of biodegradable organic matter which encourages the growth of heterotrophic bacteria. Additional details related to optimizing nitrification/annamox for source-separated urine are presented in Udert et al., 2008. Eawag is continuing an investigation of nitritation (partial nitrification of ammonium to nitrite under oxic conditions)/annamox treatment of urine and details can be found through their website (http://www.eawag.ch/forschung/eng/schwerpunkte/abwasser/abwasserbehandlung_haushalt/stickstoffentfernung/index_EN).

2.4.2 Nutrient Removal

In the case where it is not deemed necessary to recover nutrients (because fertilizer is cheap and abundant), but where nutrient removal is desired (to meet regulations or protect water

quality), treatment technologies employed in conventional wastewater treatment for nutrient removal can be considered. For example, biological or physico-chemical means (chemical precipitation) might be possible for P-removal. Zheng et al. (2009) investigated the use of iron plate electrodes for phosphorus removal by electrocoagulation, focusing on the effects of a number of operation parameters. Biological removal of phosphorus has not yet been studied for removal of phosphorus from source separated urine (Maurer et al., 2006).

Nitrification/denitrification is an option for nitrogen removal (Maurer et al., 2006), but Jackson et el. (2009) encountered kinetic and stoichiometric limitations during a loading rate study of high nitrogen waste streams. To date, the only method thoroughly investigated for nitrogen removal from source-separated urine is the annamox process, the difficulties of which were detailed in the previous section.

2.4.3 Sterilization

Storage is the primary method of urine sterilization investigated in both laboratory studies and pilot projects. The risk of transmission of infectious diseases from diverted urine is largely dependent on cross-contamination with feces and the time, pH, and temperature in which urine is stored before potential use as fertilizer (Schonning et al., 2002; Hoglund et al., 2002a,b). Research conducted at the Swedish Center for Infectious Disease Control indicates that "enteric viruses may persist for a long time in urine and that they pose a greater risk than bacterial and protozoan pathogens in relation to the handling and reuse of source-separated urine" but that urine can be used as fertilizer in agriculture with minimal risk for transmission of microbial diseases if either storage at high temperatures (20°C) for at least six months is employed or if a suitable crop and safe application technique is selected (Hoglund et al., 2002b). Difficulties associated with extended urine storage for sterilization include precipitation of phosphorus compounds and ammonia volatilization (Udert et al., 2006). Other processes with potential foAr urine sterilization, but which require further study specific to urine, are UV, membrane processes (except for reverse osmosis), high temperature evaporation, acidification, and biological processes (Maurer et al., 2006). Vinneras et al. (2008) also studied the inactivation of bacteria and viruses in source separated urine relative to variations in storage temperature and urine dilution rate. The study validated Hoglund's recommended storage parameters (20°C for six months) for unrestricted use.

2.4.4 Direct Urine Reuse

Direct urine reuse has been of interest to organizations investigating sustainable strategies for wastewater management in both developed and developing countries as well as to individuals/groups wishing to "naturally" fertilize home gardens and landscaping. Evidence of the latter can be found on a number of organic gardening blogs (www.planetgreen.com, www.urbanorganics.org, etc.) or in various mainstream publications (Allen and Conant, 2010). The only "treatment" method involved in direct urine application is storage to eliminate pathogens that may result from inadvertent cross-contamination with feces. Methods for direct application of urine have been developed through both formal studies (e.g. Pradhan et al., 2007 and 2009) and through grassroots development (i.e. organic gardening forums). A book on the subject by Carol Steinfeld entitled "Liquid gold: the lore and logic of using urine to grow plants", was published in 2004. (Steinfeld is project director for Ecowaters, a nonprofit public information project focusing on ecological sanitation projects.) In some cases, urine is collected and applied without storage, especially in individual homes with on-site use (landscaping). Combing urine with wood ash has also been investigated with good results (Pradhan et al.,

2009). Valuable feedback from pilot projects involving stored and direct-applied urine is available through several studies (Wohlsager et al., 2010; Von Arx and Conradin, 2007; Kirchmann and Pettersson, 1995; Rodhe et al., 2004; Steinfeld, 2004). Results were generally good, with recommendations of six months for storage (closed storage to prevent ammonia losses) and validation of urine nutrient content, low heavy metal content, presence of pharmaceuticals/hormones, and high salt levels. Additionally, Jonsson et al. (2004) published a detailed set of guidelines on the use of urine and feces in crop production.

A large urban urine diversion project with reuse is currently being operated in Burkina Faso. Over 900 households and at least 11 public building have UDDTs and approximately 800 gardeners and small farmers are trained to utilize stored urine. Urine is transferred to local "eco-stations" where it is stored for one month in closed containers (Figure 2-4) before transfer to local gardeners or farmers (Figure 2-5).

Figure 2-4. Urine Storage Tanks in Sustainable Sanitation Alliance Burkina Faso Project (2009).
Reprinted with permission from CREPA (Centre Régional pour l'Eau Potable et l'Assainissement).

Figure 2-5. Transfer and Application of Stored Urine at the Sustainable Sanitation Alliance Burkina Faso Project (2009).
Reprinted with permission from CREPA (Centre Régional pour l'Eau Potable et l'Assainissement).

As mentioned, urine reuse is currently being practiced at the scale of single homes in the U.S., as well as in other countries. Laura Allen of Greywater Action, a collaborative group promoting sustainable water culture and infrastructure, posted a series of pictures on www.greywateraction.org detailing a urine reuse system at a home in Oakland, California (Figures 2-6 through 2-8). In this case, the urine is diluted with water (3:1, water:urine), before landscape application (occurs as urine is generated). Feces, collected separately, are composted for a full year before landscape application. The collection area is below the toilet in a sectioned-off portion of the crawl space and access is provided through an outside hatch. A passive vent connects the toilet storage area to the roof of the house. The feces bucket is emptied twice per month into a feces-only compost bin.

Figure 2-6. UD Composting Toilet in Oakland, CA.
Reprinted with permission from Greywater Action.

Figure 2-7. Feces Collection Bucket Located Under Composting Toilet.
Reprinted with permission from Greywater Action.

Figure 2-8. Outdoor Access to Collected Urine and Feces.
Reprinted with permission from Greywater Action.

In developing countries without adequate sanitation, recycling of nutrients in urine (and feces) can be a sustainable way to provide wastewater management. With this in mind, C. Schonning and T. Stenstrom developed the "Guidelines for the safe use of urine and feces in ecological sanitation systems" (available through www.ecosanres.org). As previously mentioned and validated by Schonning and Stenstrom, the primary method for sanitation recommended is storage (in a closed vessel to prevent ammonia losses). Other recommendations include handling and application techniques (again, to prevent human health risk related to pathogens).

Winker et. al. (2009) compared the potential values and risks of fertilizer products from new sanitation systems, and proposed that direct stored urine reuse is "perhaps the most promising product" due to its nutrient content and low NH_3 emissions (less than 10%) after field application when compared to liquid slurry (Rodhe et al., 2004). Potential drawbacks to direct reuse of urine include transportation (should off-site use be desired), spontaneous precipitation (if stored, the precipitate would have to be recovered to reclaim phosphorus), sodium content (e.g. potential for accumulation and crop/plant damage), and pharmaceuticals/hormones (could possibly enter the food chain, runoff into water bodies, or leach into groundwater). Winker (2010) investigated the potential impacts of pharmaceutical residues in urine when considering direct application for fertilizer and found that:

- Pharmaceutical residues remain after urine storage.
- Polar and persistent compounds can be taken up by plants and thereby enter the food chain.
- Low levels of pharmaceuticals are unlikely to negatively affect plant growth.
- Evaluating pharmaceutical toxicity related to ingestion of urine-fertilized plants is difficult and yet to be determined.

Possibly because wastewater treatment plant biosolids/effluent and animal manure from operations where antibiotic and hormone treatment is commonplace are already being used in agriculture, because these compounds aren't currently regulated by the Clean Water Act, and because the presence of pharmaceuticals/hormones may not be a high concern in areas currently without adequate sanitation; these issues have not been as well researched.

2.4.5 Nutrient Recovery

Nutrient recovery includes technologies which either reduce the volume of urine or isolate the nutrients in a smaller volume of liquid or solid. Technologies which have shown promise as methods for nutrient recycling include evaporation, struvite precipitation, selective adsorption, and ammonia stripping. Evaporation is a method of volume reduction, and allows for concentration and subsequent transport or storage of concentrated nutrients. Struvite precipitation is a method for directly recovering nutrients by creating a solid fertilizer product. Selective adsorption utilizes an adsorbent medium to recover nitrogen in a form which can be directly used as a soil conditioner. Ammonia stripping produces a liquid solution of ammonia or ammonium sulfate (can be converted to or directly used as fertilizer).

2.4.5.1 Evaporation

Evaporation (Figure 2-9) is the most technically mature method to reduce urine volume (thereby concentrating nutrients), although other methods, such as freeze-thaw (Lind et al., 2001; Ganrot et al., 2008), have been tested (Maurer et al., 2006). Eawag tested evaporation of non-hydrolyzed urine and achieved volume reduction by a factor of 10 at 200 mbar and 78°C. The purpose of volume reduction is to concentrate nutrients for transportation and/or storage. For example, volume reduction could be applied in cases where urine is going to be transported and directly applied, or in cases (such as on the International Space Station) where volume reduction via evaporation allows for recovery of water and storage of remaining urine constituents. Evaporation is employed for urine treatment in the NASA International Space Station Environmental Control and Life Support System (Wieland, 2005). Ammonia losses and high energy demand are the primary concerns with evaporation. Stabilization practices can prevent ammonia loss and energy recovery can address high energy demand (NASA has achieved 85% energy recovery with its International Space Station vapor compression distillation system). Another issue with use of evaporation as the sole treatment method is the need of further treatment if a fertilizer free of micropollutants is desired.

Figure 2-9. Simple Process Diagram for Evaporation.

2.4.5.2 Struvite Precipitation

Struvite precipitation (Figure 2-10) is the most effective method of concentrating nutrients present in urine (Maurer et al., 2006) and is currently being tested in an office building in Germany (see pilot projects, Section 3.2.2). Struvite is magnesium ammonium phosphate ($MgNH_4PO_4$ with 6 waters of hydration), and is also known as MAP. It is a commonly used slow-release fertilizer, and may also be converted to a potentially more marketable "enhanced

struvite" (two parts slow release ($MgHPO_4$), one part easily soluble ($(NH_4)2HPO_4$)). Precipitation of struvite is triggered by the addition of magnesium (several forms are available). The process by which this occurs is as follows:

1. Addition of magnesium oxide or magnesium chloride causes a rise in pH.

2. Phosphate equilibrium shifts towards PO_4^{3-} (most phosphate in urine is in the form H_2PO_4 or HPO_4^{2-}) .

3. Phosphorus then precipitates with magnesium as struvite.

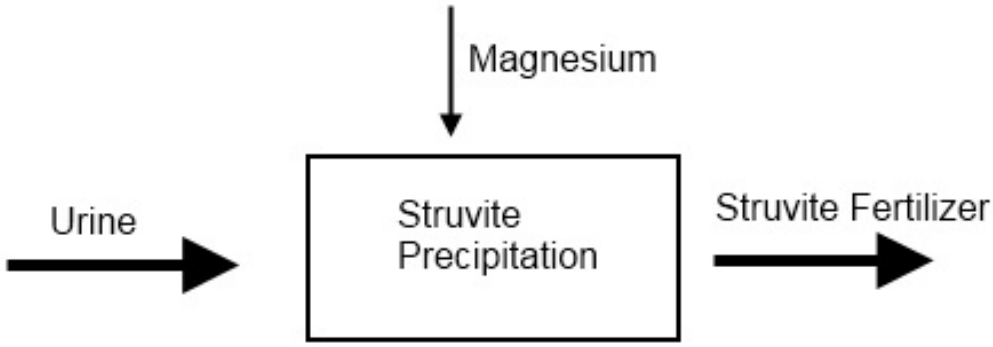

Figure 2-10. Simple Process Diagram for Struvite Precipitation.

Laboratory studies by Eawag revealed that the more that urine is diluted with flushing water, the lower the yield of struvite, but this can be somewhat offset by adding magnesium. Struvite precipitation can result in 95-98% recovery of phosphorus (Ronteltap et al., 2007; Wilsenach et al., 2007). Laboratory studies have also shown that pharmaceuticals and hormones stay in solution, resulting in a fertilizer free of micropollutants (Ronteltap et al., 2007). In addition, although the heavy metal content of urine is already lower than most commercial fertilizers, the majority of heavy metals also stay in solution, so that only 20-40% of heavy metals contained in urine would end up in struvite. The simplicity of this process, and the end result: a fertilizer primarily free of pharmaceuticals, hormones, and metals, make this an ideal candidate for nutrient recovery. A number of studies are available for additional details on struvite precipitation from human urine (Liu et al., 2008; Ronteltap et al., 2007, 2010; Wilsenach et al., 2007; Kabdasli et al., 2006; Ban and Dave, 2004; Lind et al., 2000).

2.4.5.3 Selective Adsorption

Studies have indicated that zeolite can be used for nitrogen recovery, and that, if combined with struvite precipitation for phosphorus recovery, significant nutrient recovery can be realized (Ganrot et al., 2008, Lind et al., 2000). The process by which nitrogen is recovered by zeolites is selective adsorption (Figure 2-11). Selective adsorption relies on the ion exchange potential of a resin. The resin has active groups in the form of electrically charged sites which can adsorb ions. In the case of nitrogen, it is useful if the relative concentration of nitrogen and its affinity for the sites is high. Natural zeolites, especially clinoptilolite, as well as natural wollastonite show excellent ammonium adsorbent qualities in contact with human urine (Lind et al., 2000). Zeolites can also be made from silica and alumina (widely available). Once zeolite has

adsorbed the nitrogen from urine, it can be used as a soil conditioner. 64-80% of the nitrogen in urine can be recovered with use of zeolite adsorption (Maurer et al., 2006).

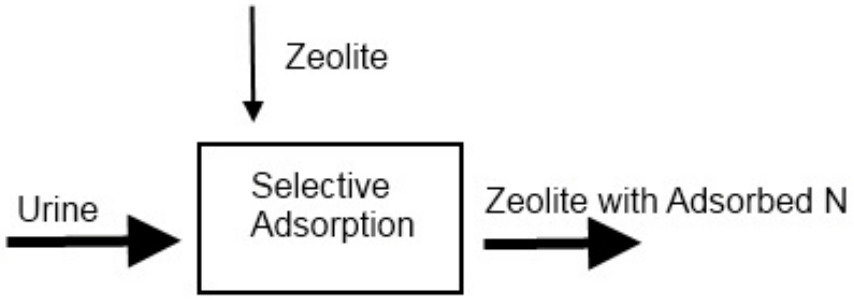

Figure 2-11. Simple Process Diagram for Selective Adsorption with Zeolite.

This process does not enable phosphorus recovery, but can be combined with struvite precipitation to optimize recovery of both phosphorus and nitrogen. Lind et al. (2000) achieved almost complete recovery of potassium and phosphorus and 65-80% recovery of nitrogen by combining struvite precipitation with zeolite adsorption. Ban and Dave (2004) projected 99% recovery of P and 90% recovery of N using struvite precipitation and zeolite adsorption, but acknowledged a need for further verification and pilot experiments. Ganrot et al. (2008) recovered greater than 97% of P and 50-60% of N by using struvite precipitation and pretreated (washed or washed and thermally treated) zeolite.

2.4.5.4 Ammonia Stripping

Ammonia stripping is a physicochemical process reliant on mass transfer of ammonia between liquid and gas phases (Figure 2-12). Because of the low volatility of ammonia, pH and temperature must be optimized (Kabakci et al., 2007). In experiments conducted by Kabakci et al. (2007), ammonia was stripped with air in a batch system and absorbed in sulfuric acid solution with an estimated ammonia recovery of 97%. Based on these experiments, it was concluded that stripping and absorption is an effective means for ammonia recovery from urine. The end product, an ammonia sulfate solution, could be directly applied as fertilizer. If converted to crystalline form (ammonium sulfate, a well known fertilizer), approximately 8-10% of ammonia would be lost. Behrendt et al. (2002) also used batch experiments to design an ammonia stripping unit for recovery of nitrogen from urine with promising results in terms of ammonia recovery. Results also indicate that, relative to conventional wastewater treatment plants with nitrogen removal, the unit size for ammonia stripping and adsorption is small.

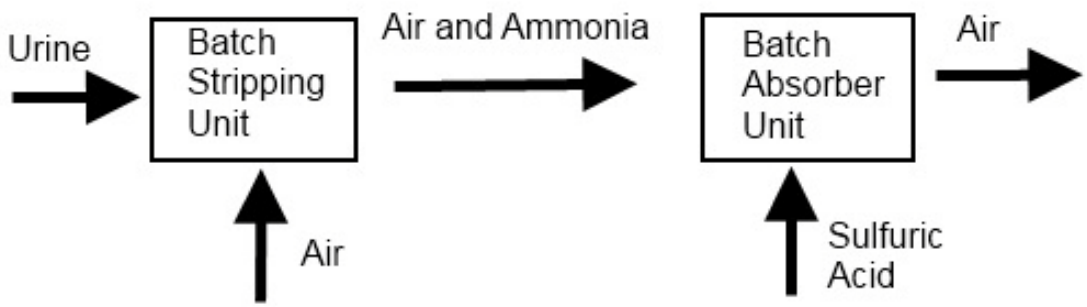

Figure 2-12. Simple Process Diagram for Ammonia Stripping.

2.4.6 Micropollutant Removal

Electrodialysis, nanofiltration, and ozonation have been specifically tested for removal of micropollutants from source-separated urine (Maurer, 2006), although other possible removal mechanisms exist, including biological transformation/degradation, sorption, and stripping (Larsen, 2004). Eawag researchers, after studying various methods to produce a fertilizer from urine, have proposed that a combination of electrodialysis and ozonation is a promising option due to its ability to effectively separate micropollutants from nutrients and then eliminate any remaining micropollutants in the nutrient solution (Lazarova and Spendlingwimmer, 2008). Electrodialysis and nanofiltration are membrane processes which enable separation of nutrients from micropollutants. This is desirable when creating a fertilizer product from urine. Ozonation (or chemical oxidation) has been shown to effectively eliminate micropollutants. Descriptions of processes included in this section were referenced from Metcalf and Eddy (2006).

Electrodialysis is an electrically driven process through which mineral salts and other species are transported through ion selective membranes from one solution into another (via electrical potential differences) (Figure 2-13). Positive ions are attracted to the cathode, and negative ions are attracted to the anode. Low-molecular weight nutrients migrate to the concentrate and pharmaceuticals/hormones (higher-molecular-weight) remain in the diluent. Electrodialysis does not remove colloidal matter, non-ionized matter, or bacteria. Pronk et al. (2006a and 2007) tested electrodialysis for the separation of micropollutants from nutrients, and achieved almost complete separation. Ozonation was added as a secondary step for elimination of remaining micropollutants. The dose of ozone required was higher than in other applications, but effectively eliminated pharmaceuticals. A combination of electrodialysis and ozonation were tested to the point of technical maturity in the Eawag laboratories and is being tested in a pilot project (Basel-Landschaft Cantonal Library) (Section 3.2.1).

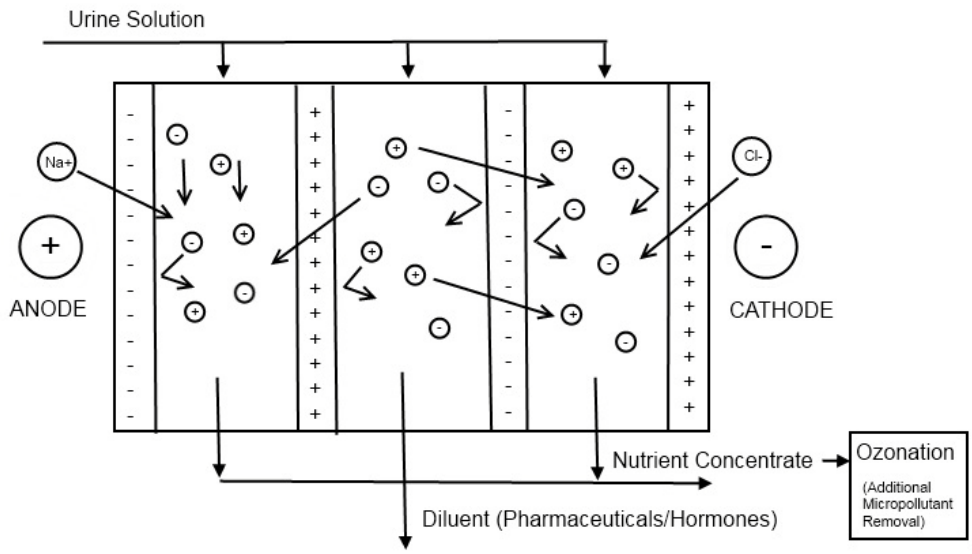

Figure 2-13. Simple Process Diagram for Electrodialysis with Ozonation as a Second Step.

Nanofiltration enables separation of dissolved ions through a hydrostatic pressure differential (Figure 2-14). Nanofiltration removes particles in the 300-1000 molecular weight range, rejects selected salts and most organics and microorganisms, and operates with higher recovery rates and at lower pressures than reverse osmosis systems. Pore sizes range from 0.001-0.003 µm. Nanofiltration membranes reject on two levels of selectivity: 1) noncharged soluble organics are rejected based on size and shape, and 2) charged soluble salts smaller than the membrane pores are rejected because the water is more soluble in the membrane than is a specific salt. Pronk et al. (2006) tested nanofiltration as a means to separate pharmaceuticals from nutrients in source-separated urine. It was concluded, through laboratory experiments, that nanofiltration can be used to produce a permeate which contains a large portion of the nitrogen and a reduced portion of the micropollutants present in urine, but that it is only effective if urea when fresh urine is not hydrolyzed. Laboratory studies of three different membranes revealed that nanofiltration is not ideal for urine treatment if full nutrient recovery is a primary goal, as the membrane was not permeable to phosphate and half of the ammonium was able to pass through. Pronk et al. (2006) also concluded that non-hydrolyzed urine increased nitrogen yield because urea was permeated better than ammonia. Adding a second step (i.e. struvite precipitation) would enable generation of a second product containing the majority of the phosphorus.

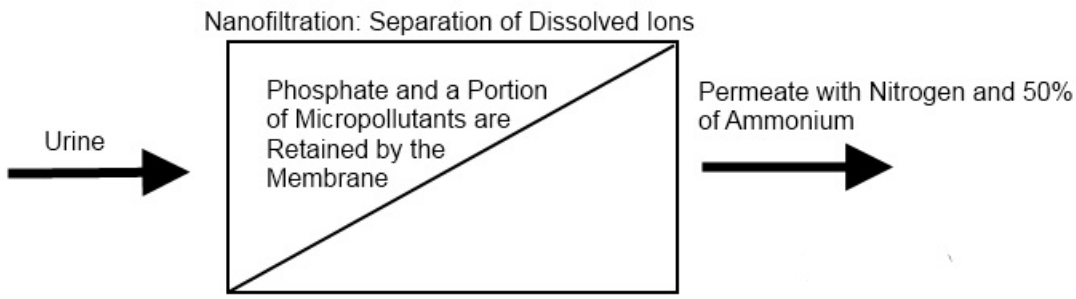

Figure 2-14. Simple Process Diagram for Nanofiltration.

Ozone can both directly oxidize micropollutants and create hydroxyl radicals (which react with micropollutants) (U.S. EPA, 2010). Dodd et al. (2008) conducted bench-scale, semibatch experiments to examine physical-chemical constraints on 1) ozone absorption and micropollutant oxidation during ozonation of source-separated hydrolyzed urine and 2) the concentrate and diluate streams produced via electrodialysis of hydrolyzed urine. Besides operational analysis, Dodd et al. (2008) estimated per capita energy requirements for treatment of source-separated urine under hypothetical scenarios of ozonation with and without electrodialysis and compared these estimates to energy requirements for comparable end-of-pipe treatment. Suggestions were made for increased operational efficiency, and it was generally concluded that the high energy costs of ozonation could be offset with inclusion of electrodialysis for nutrient recovery. Additional details about membrane and advanced oxidation treatment of urine can be found in: Lazarova and Spendlingwimmer (2008), Larsen et al. (2004), Pronk et al. (2006a/b, 2007), Dodd et al. (2008), Escher et al. (2006).

2.5 Urine Treatment Technology Applications

A significant amount of research has been conducted to investigate potential treatment options for source separated urine, but only two treatment technologies have advanced beyond the laboratory. The combination of electrodialysis and ozonation operated smoothly for the duration of Eawag's pilot plant at Canton Basel-Landschaft and allowed for nutrient recovery with separation from micropollutants. Fertilizer generated from the system was tested on fodder maize, with good results (better than cattle slurry, but 13% less yield than ammonium nitrate; possibly due to ammonia losses during application) (Eawag, 2007). During the duration of the pilot project, Eawag also intends to investigate other methods for urine treatment, including struvite precipitation.

Struvite precipitation is currently utilized at GTZ headquarters in Eschborn, Germany (Figures 2-15 and 2-16). Results will soon be available, but progress to date is promising. Currently, struvite precipitation is the only commercially available urine treatment technology (www.huber.de), and is the most commonly employed in developing countries. However, research continues to develop new methods for urine treatment, and to date no life cycle assessments have been conducted to determine the feasibility of large-scale application of either the electrodialysis/ozonation combination or struvite precipitation.

Figure 2-15 Struvite Produced from Urine at GTZ Headquarters (M. Winker, 2010).
Reprinted with permission from GTZ.

Figure 2-16 MAP (Struvite) Reactor at GTZ Headquarters (M.Winker, 2010).
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2.6 Summary

The following technologies, grouped by treatment objective, have been investigated for urine treatment:

- *Stabilization*: urease inhibitors, acidification, microfiltration, and ultrafiltration
- *Nutrient removal*: electrocoagulation (phosphorus), nitrification/denitrification (nitrogen), annamox process (nitrogen)
- *Sterilization*: storage
- *Nutrient recovery*: struvite precipitation (phosphorus), selective adsorption (nitrogen), evaporation, freeze-thaw, ammonia stripping (nitrogen)
- *Micropollutant removal*: electrodialysis, nanofiltration, and ozonation

Acidification and biological methods show the most promise for stabilization, but both have difficulties in practice. Nutrient removal has not been extensively researched for diverted urine, primarily because a significant advantage of urine diversion is the ability to recover nutrients. Storage has proven effective for sanitizing urine before direct reuse, and a number of projects have been initiated which validate the direct use of urine on landscapes or food crops. If nutrient recovery is desired, instead of direct urine reuse (for issues of social acceptance, transport, or separation of nutrients from micropollutants), the most promising technologies are struvite precipitation (potentially combined with zeolite adsorption) and a combination of electrodialysis and ozonation. Struvite alone allows for substantial phosphorus recovery, and a zeolite adsorption allows for additional nitrogen recovery. Electrodialysis and ozonation result in a nutrient solution without micropollutants. Chapter 3.0 outlines key research groups engaged in urine diversion development as well as pilot projects utilizing various waste source separation and urine treatment technologies.

CHAPTER 3.0

PILOT PROJECTS

Two significant research groups in the field of sustainable wastewater management (also known as ecological sanitation) are the Swiss Federal Institute of Aquatic Science and Technology (Eawag) and the ECOSAN program (Recycling Oriented Wastewater Management and Sanitation Systems). Research conducted by Eawag through the Novaquatis project incorporates social, economic, and technical aspects of urine diversion and treatment, as well as investigations of physical, chemical, and biological treatment methods. The ECOSAN Program (Recycling Oriented Wastewater Management and Sanitation Systems), operated by GTZ in Germany, is conducting a wide variety of research in the field of ecological sanitation, including urine diversion. As part of its research, GTZ has compiled a list of sustainable sanitation operations (http://www.gtz.de/en/dokumente/gtz2010-en-worldwide-ecosan-project-list-22-March.pdf), and additional details for many of these projects can be found through the Sustainable Sanitation Alliance (SuSanA) website (http://www.susana.org/lang-en/case-studies). SuSanA is an informal network of organizations engaged in projects and/or research involving sustainable sanitation. In addition, NASA has researched membrane-based methods for treatment of urine on space missions for water reclamation, and the Institute for Sustainable Futures at the University of Technology (Sydney, Australia) has embarked on both an on-campus and residential pilot project involving urine diversion. These research groups have laid the foundation for further development, optimization, and application of urine separation and treatment technologies.

3.1 Research Groups

3.1.1 Swiss Federal Institute of Aquatic Science and Technology (Eawag)

Eawag, based in Switzerland, is an internationally linked aquatic research institute investigating "ecological, economical, and socially responsible management of water" (Larsen, 2007). The Eawag 2000-2006 project "Novaquatis" (Larsen and Lienert, 2007) investigated urine source separation (NoMix technology) as a way to remove/reuse nutrients and remove micropollutants for improved water quality. Findings include aspects of social acceptance, sanitary technology competence, storage and transport potential, urine treatment and fertilizer production, the significance of micropollutants, feasibility of urine-based fertilizer, impact of urine diversion on wastewater management, effect of implementation of urine diversion in rapidly-industrializing regions, feedback from pilot projects, and a practical guide for consideration of urine diversion. Specific conclusions and findings of these studies are incorporated throughout this report. Generally, it was found that:

- NoMix technology decreases water pollution and conserves resources
- Public attitudes are favorable (in Europe, primarily Switzerland)
- Urine transport is problematic; but it is worth finding a solution or treating urine on-site
- Methods have been developed for treating urine and removing micropollutants

Eawag has conducted multiple pilot projects employing urine diversion and lab experiments for urine treatment. In 2010, a $3 million dollar grant was awarded by the Bill and Melinda Gates Foundation to Eawag and the eThekwini Water and Sanitation Utility (EWS) in South Africa to continue the development of practical, community scale nutrient recovery systems (e.g. struvite reactors). Eawag continually updates its research findings through its website (http://www.eawag.ch/index_EN), especially through annual reports and biannual newsletters (http://www.eawag.ch/medien/publ/index_EN).

3.1.2 "Sustainable Sanitation- ECOSAN"

The German Technical Cooperation (GTZ) is a federally funded organization working for international collaboration in sustainable development. The German Federal Ministry for Economic Cooperation and Development (BMZ) commissions most of GTZ's projects, but GTZ also operates on behalf of other German ministries, other governments, and other international organizations such as the United Nations, the European Union, and the World Bank. Because of a focus on public-benefit, all surpluses are used for international cooperation projects for sustainable development. GTZ started the international ECOSAN program in 2001. Ecological sanitation (ECOSAN) is sanitation based on ecosystem approaches and closure of material flow cycles rather than on disposal-oriented, expensive, and energy intensive technologies. The over-arching concept is that human excrement and household wastewater are recoverable resources and that through recovery and reuse, soil fertility and food security will be improved, renewable energy can be produced, and consumption and pollution of water resources will be reduced. It is thought that these methods can also help meet the United Nations' Millennium Development Goals (improved sanitation, reduced child mortality, enhanced primary education). Technologies utilized by ECOSAN include urine-diversion dehydration (UDD) toilets, composting, rainwater harvesting, constructed wetlands, vacuum sewers, and biogas reactors.

3.2 Pilot Projects

Pilot projects involving sustainable sanitation methods have been employed in both rural and urban areas around the world. Because the purpose of this document is to discuss the potential for urine diversion in the U.S. and other similarly developed countries, the pilot projects detailed in this report will be those most relevant to the level of technological advancement and social experience expected by U.S. citizens (Table 3-1) (data largely from Eawag, 2007).

Table 3-1. Summary of Select Pilot Projects.

Location	Number of UD toilets	Number of waterless urinals	Urine volume (L/week)	Urine tank size (m^3)	Urine treatment	Application or reuse	Technical feedback available	Social feedback available
GTZ headquarters, Eschborn, Germany: office building	56	25	8000	10	Struvite precipitation	Field studies	Limited; additional feedback available in 2011	Yes
Basel-Landshcaft Cantonal Library, Switzerland	10	2	100	1.7	Electrodialysis and ozonation	Field studies	Limited	Yes
SolarCity, Linz, Austria: apartment	88	12	Approx.2500	16	None	Sewer system, treatment/ reuse to be initiated	Yes	Yes
SolarCity, Linz, Austria: school	18		Approx.1500	6	None	Sewer system, treatment/ reuse to be initiated	Yes	Yes
Kinglake West, Sydney, Australia: individual households	N/A	N/A	N/A	N/A	None	Trial application at turf farm	No	Projected to be available in 2011

3.2.1 Eawag Pilot Projects

Eawag conducted several pilot projects with urine diversion toilets throughout the Novaquatis project (the Basel-Landschaft Cantonal Library being the most significant, and included in table 2-2). During the course of these pilot projects (detailed in this section), Eawag assisted in the development of the Roediger NoMix toilet (www.roevac.com) along with a variety of waterless urinals, which were then utilized in the projects. The experience gained in Eawag's Novaquatis pilot projects was communicated to the manufacturer, with the intent of aiding product development.

The first UD toilet was installed in 1997 in the former Eawag office building. Two additional toilets and a urine storage tank were installed in 2000. Acceptance was generally high, although Eawag employees did note the technical immaturity of the toilets (specifics were not detailed). Collected urine aided in the development of urine treatment technologies. In 2006, the current Eawag office building was built, and included UD technology throughout. Rainwater is collected on the roof to flush toilets, and urine collected from waterless urinals and UD toilets is currently being used for research purposes.

In 2001, four private apartments in an urban housing development were fitted with Roediger UD toilets and a urine storage tank. The housing developers wanted to incorporate

ecological concepts in their housing design. Eawag's goal was to assess the daily use and social acceptance of UD toilets. Communication with Roediger resulted in improvement in ceramics, which failed in two of the toilets. Social acceptance varied, with some parties remaining skeptical, some negative, and some fairly accepting (especially in regard to environmental aspects). A child in one of the apartments had difficulty using the UD toilet.

From 2002 to 2005 the University of Applied Sciences Northwestern Switzerland (in collaboration with Eawag) operated three types of UD toilets and six types of waterless urinals. User acceptance was high and the UD toilets and waterless urinals generally functioned well. Users were willing to alter behavior (e.g. sitting to urinate). Toilets were regularly flushed with an acidic cleaner to prevent blockages. Unpleasant odors were reported from the waterless urinals, and were probably linked to inadequate or improper cleaning. The urine collected from the college had lower than expected amounts of phosphorus and nitrogen, potentially due to dilution. Eawag has observed this phenomenon in other pilot projects.

The pilot project at the Basel-Landschaft cantonal library (built in 2005) is noteworthy in that it also included an electrodialysis/ozonation urine treatment system to create a fertilizer from urine. This project was initiated by local wastewater authorities to test and optimize urine diversion. Urine from approximately 200,000 visitors per year was collected and transported by truck to an electrodialysis and ozonation processing system, which concentrates nutrients separately from pharmaceuticals. The product is free of pathogens and stable, and was used in field experiments in 2006. In addition, approximately 500 users over various age and social groups were interviewed, with generally positive feedback.

These pilot projects enabled development of a "practical guide" (Larsen and Lienert, 2007) which provides general information about implementing urine diversion. Findings were also summarized in "Pilot Projects in Bathrooms: A New Challenge for Wastewater Professionals" published by Water Practice and Technology (Lienert and Larsen, 2007), along with invaluable recommendations for future research. A brief summary of Eawag's findings follows.

3.2.1.1 Eawag Pilot Projects Feedback: Technical Aspects

Despite the fact that over 135,000 UD toilets have been installed in Sweden, design related problems still exist (Lienert and Larsen, 2007). Most significantly, urine scale, caused by spontaneous precipitation of salts (section 2.2), leads to significant pipe blockages (Figure 3-1). Ureolytic bacteria (present in pipes and collection tanks) hydrolyze urea in urine, causing a rise in pH (from about 6 to 9). As a result, various salts crystallize, resulting in deposits (e.g. urine scale). These precipitates, which include struvite and various calcium phosphates, accumulate in pipes (Figure 3-1) and can cause blockages after only a few thousand uses (Larsen and Lienert, 2007).

Figure 3-1. Urine Scale (Kai Udert, 2002).
Reprinted with permission from Eawag.

Currently, waterless urinals have exchangeable traps which make urine scaling less problematic as compared to UD toilets. Essentially, the trap is a compartment of the urinal designed to accommodate precipitates and then be removed and replaced. This concept could also be incorporated into UD toilets (Lienert and Larsen, 2007). Through its pilot projects, Eawag found that scaling could be slowed by reducing urine residence time (e.g. using sloped pipes with large diameters) and with regular flushing with a 10% citric acid solution. Strong acid, caustic soda, or mechanical means (e.g. steel brushes, plumber's snake, jet cleaning) can be used to remove blockages if they occur. Another preventative option is to use soft flushing water (e.g. rain or possibly recycled or graywater), which decreases the precipitation potential of urine as compared to tap water (Udert et al., 2003c). Avoiding dilution of urine does not prevent precipitation (Lienert and Larsen, 2007) because the mass concentration of precipitates decreases with water volume (Udert et al., 2003a). Eawag conducted studies through Novaquatis to understand the mechanisms behind precipitation, and believe that the sanitary industry "needs much ingenuity to find elegant solutions" (Lienert and Larsen, 2007).

Eawag found that undiluted urine requires less storage volume and is best for further treatment. With this in mind, it employed the Roediger NoMix UD toilet (Figure 3-2), which has a closing mechanism for the urine drain that only opens when the user sits (middle diagram of Figure 3-2). When the user stands (lower diagram of Figure 3-2), the valve closes, and the entire bowl is flushed. This allows for collection of undiluted urine, but requires that all users sit. Through social surveys, Eawag found that 75% of women were willing to sit on public UD toilets and that education and increased hygiene could increase this number (Lienert and Larsen, 2007). The majority of men were also willing to sit to urinate (Larsen and Lienert, 2007). Other issues with UD toilets include odor and difficulties with both children and adults finding an appropriate sitting position. Modification of the size of the urine and fecal compartments and inclusion of a child seat may improve these issues. Odor from waterless urinals is controlled using stench traps and an efficient ventilation system is recommended by Eawag. Odor from

indoor storage tanks is inevitable, so good ventilation and placement of an odor trap between pipes and the storage tank is also recommended.

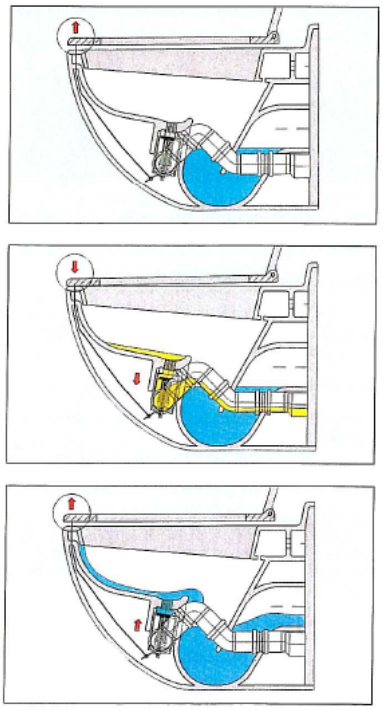

Figure 3-2. Roediger NoMix Toilet Operation Sequence.
Reprinted with permission from Roevac.

3.2.1.2 Eawag Pilot Projects Feedback: Social

Eawag's Novaquatis project included a segment devoted to determining the social acceptance of urine diversion technology. The following conclusions are from the Novaquatis final report (Larsen and Lienert, 2007):

♦ Habits/ergonomics are an issue: Men may need to sit depending on the UD model employed, some women and children have difficulty with the correct sitting position, and the cleaning needs may be higher than with conventional toilets

♦ The majority of users were positive about UD technology: Eawag conducted surveys of approximately 1250 users at two of its urine diversion pilot projects: the vocational college and the Eawag building. 72% of responders liked the idea of urine diversion, and 86% would move into an apartment with a UD toilet. Some complaints (not a majority) were associated with design, hygiene, and odor. Additional user feedback from 501 users of UD toilets/waterless urinals at the Basel-Landschaft Cantonal Library in Liestel was similar. Eawag also conducted a citizen focus group study. Volunteers familiarized themselves with urine diversion through an interactive computer tool and visited a urine diversion toilet, and were subsequently asked questions. The majority liked the idea of UD toilets, would move into an apartment with a UD toilet, and would buy food grown with a urine-based fertilizer. About half of the survey participants would buy a UD toilet.

♦ About 50% of surveyed farmers were positive about urine-based fertilizer: Eawag conducted a survey of Swiss-German farmers. 57% liked the idea of a urine-based fertilizer. 30% were concerned about potential for residual micropollutants (pharmaceuticals and hormones).

3.2.1.3 Urine Treatment: Centralized Versus Decentralized

Eawag concluded that installing new pipes or transporting urine by tanker from basement storage tanks to centralized treatment facilities would be both complex and costly. A method was developed to transport urine via the existing sewer system in Switzerland (Rauch et al., 2003, Rossi et al., 2009), but limitations (primarily related to lack of definition of initial markets and confirmation that market is large enough to justify commercial production) prevented interest in development by the sanitary industry (Larsen and Lienert, 2007). The potential and cost-effectiveness of decentralized processes was not considered in the Novaquatis project, but the difficulties and cost of urine transport merit its consideration (Larsen and Lienert, 2007).

3.2.2 GTZ Office Building: SANIRESCH (SANItary Recycling ESCHborn)

GTZ implemented a system for urine, graywater (wash basin and kitchen water), and brownwater (feces and flush water in SANIRESCH project descriptions) diversion in its headquarters in Eschborn, Germany during a 2004-2006 renovation as a demonstration and research project on sustainable sanitation (Figure 3-3). A dedicated website (http://www.saniresch.de/) provides details and an extensive photo gallery, and additional background information can be found through the GTZ website's sustainable infrastructure theme (http://www.gtz.de/en/themen/8524.htm). UD toilets, waterless urinals, separate piping systems for urine, graywater, and brownwater, and urine storage tanks make up the sanitation system. MAP (struvite precipitation) is employed for urine treatment, and membrane bioreactors will be used to treat brownwater and graywater. The goals of the project include exploration and/or further development of the following themes:

- Treatment of separated wastewater streams
- Reuse in agriculture
- Sanitary equipment and installations
- Operation and maintenance
- User acceptance
- Environmental and health risks of reuse
- Economics and resource efficiency
- Legal conditions and transferability of sustainable sanitation technologies

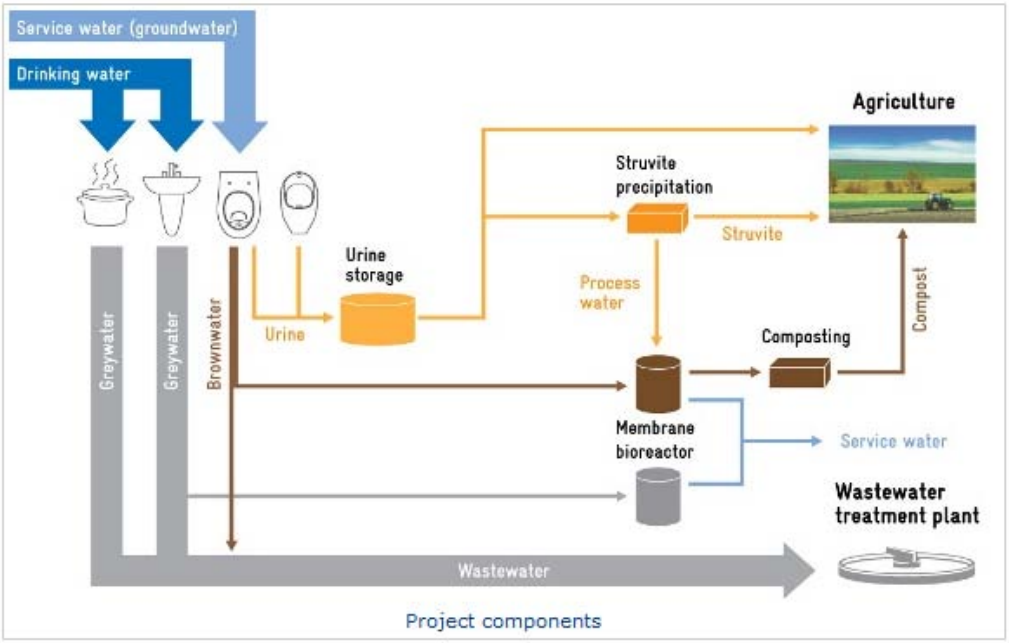

Figure 3-3. Components of the SANIRESCH Project (diagram available through www.saniresch.de).
Reprinted with permission from GTZ.

3.2.2.1 Sanitary and In-House Installations

23 Keramag waterless urinals (http://pro.keramag.com/en/pro.html) and 48 Roevac NoMix toilets (http://www.roevac.com/page/en) were installed in GTZ headquarters for wastewater source separation (Figure 3-4).

Figure 3-4. Sanitary Installations in the SANIRESCH Project
clockwise: cleaned UD toilet valve, UD toilet, urinal smell stop, waterless urinals).
Reprinted with permission from GTZ.

An informative slide show with notes detailing the components of this project component is available throught a GTZ flickr site (http://www.flickr.com/photos/gtzecosan/collections/72157623545998067/). Additionally, a description of the Roediger NoMix toilet's function is provided through the SANIRESCH website (http://www.saniresch.de/images/stories/downloads/Broschure%20NO-Mix%20Toilet%20NEW%20EN[1].pdf). It is the same toilet employed in Eawag's pilot projects, with a urine drain valve that only opens when the user sits, allowing for undiluted collection of urine. Initially, the toilets were cleaned as if they were normal toilets, resulting in clogging of valves. Issues with cleaning the waterless urinal smell stops (Figure 3-5) were also encountered (precipitation occurred in the rubber part of the smell stop, which required extra attention). Cleaning and maintenance improvements of both the NoMix toilets and waterless urinals have since been made, and details are available on GTZ's flickr site (see address above).

Figure 3-5. Waterless Urinal Smell Stops (M.Winker, 2009).
Reprinted with permission from GTZ.

3.2.2.2 Wastewater Treatment

All wastewater treatment components were developed by HUBER Technology, a company specializing in wastewater treatment (http://www.huber.de/). Urine is treated in a MAP (struvite) precipitation reactor (Figure 3-6), which was installed in May of 2010. Details of the reactor's operations are provided by HUBER and available through the SANIRESCH website (http://www.saniresch.de/images/stories/downloads/Description_MAPPrecipitationReactor_July2010.pdf). The quality of the struvite will be analyzed by supporting universities, with a focus on the fate of both trace and ultra trace elements (especially pharmaceuticals). The quality of stored urine will also be analyzed, with a focus on pharmaceutical persistence. Lab studies will be used to simulate storage conditions (primarily pH), allowing for optimization of urine storage. Brownwater is not yet being treated, but will be treated with a membrane bioreactor (after solids removal). An ultrafiltration unit will retain all solid particles, bacteria, and viruses and the permeate will be suitable irrigation water. A membrane bioreactor will also be used to treat graywater. The treated graywater will meet EU regulations for bathing waters, and may be used on-site for toilet flushing.

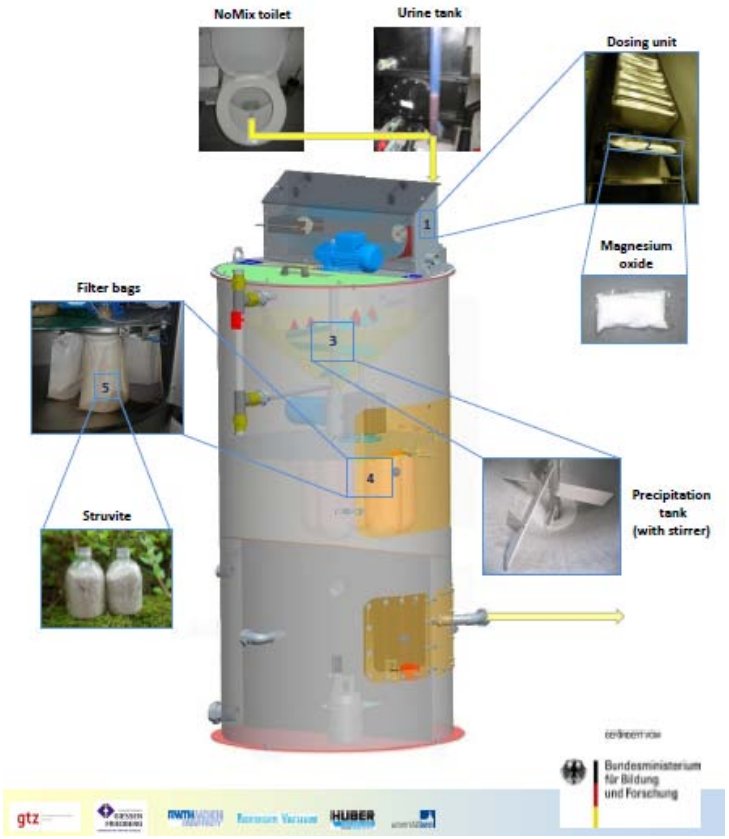

Figure 3-6. HUBER MAP Precipitation Unit Installed at GTZ Headquarters.
Reprinted with permission from GTZ.

GTZ is monitoring several operational aspects with the help of the University of Applied Sciences Giessen Friedberg and RWTH Aachen Institute for Environmental Engineering:

- Remote monitoring of the treatment plants
- Elimination of disturbances and breakdowns
- Regular inspection and maintenance
- Refilling consumables
- Transport of product for future use
- Analysis of urine, brownwater, and graywater

An overview of the operations and maintenance associated with the first three months of the MAP reactor's operation was presented in August of 2010. An English version of the results was not available at the time of this project's completion, but will shortly be available through the SANIRESCH website (see web address above).

3.2.2.3 Other Project Components

- Agriculture: Field and greenhouse experiments were initiated in March of 2010 which involved application of urine and struvite. These experiments are ongoing, with limited results to date. The legality of urine separation, treatment, and reuse will also be investigated as well as the attitudes of farmers and consumers of crops fertilized with urine-based products.

- Acceptance: A survey of users and the cleaning/maintenance staff was conducted. Users were generally pleased with the environmental aspects of the project (e.g. resource recovery and water conservation), but were unhappy with the downsides of the UD toilet's technical design. Because sitting to urinate on a public toilet was a hygiene issue for both men and women, it was proposed that willingness could be increased by providing disinfection products.
- Economic feasibility: Investment and operations costs will be determined and compared to other source separation sanitation systems and to conventional systems. Direct urine reuse will also be compared to struvite production. A master's thesis, authored by Andres Paez at the Hamburg Institute of Technology Institute of Wastewater Management and Water Protection, consisted of an economic feasibility study of the SANIRESH project (http://www.saniresch.de/images/stories/downloads/MasterThesisAndresLazo.pdf). It was concluded that the sanitation system used in the GTZ building in Eschborn is economically disadvantageous when compared to a conventional system, although several factors which may reduce this differential were cited (e.g. increase in number of daily uses, resource recovery, water conservation, efficiency of operations at the SANIRESCH project, etc.).
- International adaptability: GTZ will also consider the feasibility of applying sustainable sanitation methods in other countries, with a focus on developing and emerging countries.

The SANIRESCH project is still in operation, but the lessons learned to date will be invaluable in the planning and implementation of future urine diversion pilot projects.

3.2.3 LINZ AG SolarCity

A medium scale urban urine diversion and graywater treatment system has been operating in a development in Linz, Austria (called SolarCity) since 2006 (Figure 3-7). The overarching objective was creation of a sustainable settlement. Other objectives include development of an innovative solution for water supply and wastewater treatment that has lower infrastructure costs than conventional systems and that enables nutrient recovery as well as research into the treatment of micropollutants in urine. The goal of the system is to treat the wastewater from approximately 460 population equivalents through urine separation, compost filters, and constructed wetlands. Roediger NoMix toilets were employed for urine diversion, as well as Hellbrok waterless urinals (http://www.hellbrok.com/english/hellbrok.php). Compost filters are used as pretreatment of brownwater and graywater (mixed), followed by constructed wetlands. Currently, the sustainable sanitation concepts proposed for this project are not yet fully functional. For example, urine reuse is not employed for legal reasons and the composting process of the compost filter material is not functional. However, it is intended to implement nutrient recycling and on-site infiltration of the treated graywater-brownwater mixture in the future. Limited feedback is available to date as urine is currently sent to the sanitary sewer, but social surveys have been conducted regarding toilet operation and maintenance. Initial surveys found that increased cleaning requirements were manageable, but that the NoMix toilet design needs improvement. Specifically, children at a day nursery and school had difficulty sitting far enough back on the toilets to defecate. Additional details can be found through the SuSanA website (http://www.susana.org/lang-en/case-studies) or through conference proceedings from the 11th International Conference on Urban Drainage. (http://www2.gtz.de/Dokumente/oe44/ecosan/en-experiences-from-the-ecosan-full-scale-pilot-project-2008.pdf).

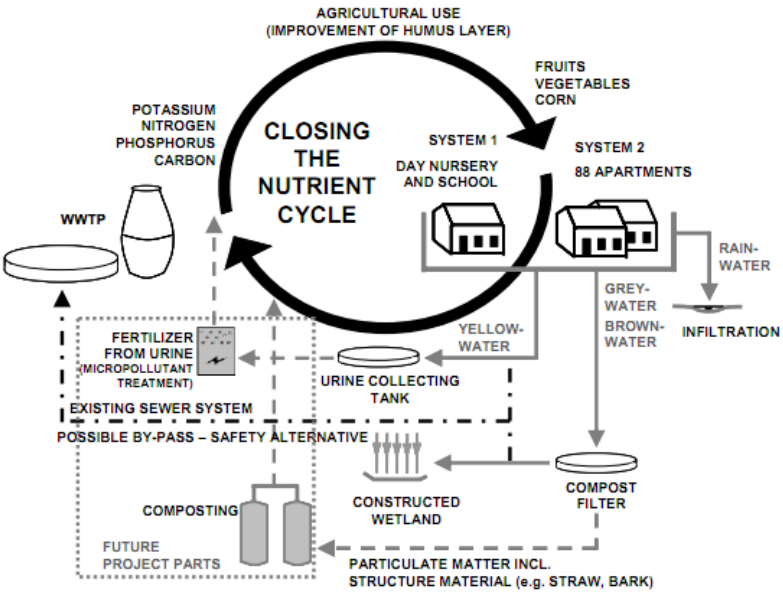

Figure 3-7. Conceptual Design of SolarCity in Linz, Austria.
Reprinted with permission from Schinagl Verena.

3.2.4 Kinglake West: Yarra Valley Water/University of Technology (Sydney, Australia) Institute for Sustainable Futures

Following bushfires in 2009, Yarra Valley Water in Sydney, Australia offered incentives for homeowners to replace old septic tank systems with more sustainable sewerage systems. The new systems integrate urine diversion with graywater recycling and STEP/STEG septic systems for local treatment and recycling of wastewater. The collected urine will be applied on a trial basis at a local turf farm. The University of Technology Institute for Sustainable Futures will perform social research to gather data on the experiences, practices, and attitudes of UD toilet users in Australia. Both pre- and post- installation interviews were conducted and it was found that residents were willing to adapt and deal with the inconvenience of a still not fully mature technology when supported by the water authority. Residents are currently keeping track of their experiences and thoughts for a follow-up focus group planned for early 2011. In addition, residents were given instruction manuals detailing operations/maintenance and trouble-shooting. As of December, 2010, additional details were limited.

3.3 Summary of Pilot Project Feedback

Several pilot projects relevant to application of UD technology in the United States were detailed in this section (Table 3-1). In addition to the pilot projects presented in this report, many projects involving urine diversion and direct urine reuse have been employed throughout the world. Both Eawag and ECOSAN have detailed these projects and incorporated feedback into progressively more advanced pilot projects.

General conclusions from the pilot projects detailed in this report include:

- Further pilot projects are necessary to continue the development of urine source separation technology.

- Several improvements to UD toilets are needed, primarily methods for preventing or removing mineral deposits (urine scale) and for increasing user acceptance. Odor can also sometimes be an issue, but can be mitigated with proper maintenance. Ease of use, especially for children, is a key issue.
- UD technology requires increased cleaning and maintenance.
- If necessary maintenance is undertaken, pilot projects can be readily implemented in public buildings.
- Acceptance of NoMix toilets and waterless urinals in Europe is high in public facilities, but less so in private homes. With adequate education, pilot projects are possible in private homes.
- User surveys should be employed in pilot studies.
- Costs of UD technology are currently much higher than conventional sanitation.

Additionally, a review of the acceptance of urine diversion in 7 European countries (Lienert and Larsen, 2009) revealed that 80% of users like the idea of urine diversion, 75-85% were satisfied with design, hygiene, and seating comfort of NoMix toilets, 85% thought that urine-based fertilizer was a good idea (50% of farmers), and 70% would purchase food grown with urine-based fertilizer. 60% of users also encountered problems, however, indicating that NoMix toilets require further development.

Implementing urine diversion pilot projects in the U.S. may present new challenges, and it is recommended that proper care be taken with design, implementation, and operation so as to avoid any unnecessary negative associations by users. In addition, it would be beneficial to synthesize energy, contaminant, and water balance data to determine if urine diversion (alone or as part of a decentralized/semi-centralized wastewater treatment system) may be a beneficial alternative to “business as usual” (wastewater treatment plants and septic systems) in the U.S.

CHAPTER 4.0

THE PATH FORWARD FOR UD IN THE U.S.

4.1 Urine Diversion: What is Known?

Urine diversion has several benefits that may justify further development in the U.S. The ability to address aging infrastructure through decentralized treatment options, the possibility of reducing energy requirements for nutrient removal in WWTPs, the ability to recover nutrients, and the potential to prevent micropollutants from entering aquatic ecosystems and drinking water supplies being the primary motivators. Although knowledge gaps exist and exact quantification of benefits is not always defined, it is known that urine diversion has these benefits. In addition, urine diversion technology has been developed to the point that, with proper maintenance and operation, pilot projects are possible in the U.S. Despite progress in UD development and understanding of potential benefits (most notably in Europe), several key areas require further research before implementation in the U.S.

4.2 Knowledge Gaps

Urine diversion has been extensively researched for adapting wastewater treatment in Europe and for implementation in developing countries. However, research gaps do still exist, mid- to large-scale pilot projects are few, and pilot projects in the U.S. are lacking. Additional questions include:

♦ What is the learning curve for use of urine diversion toilets? Is it unrealistic to expect children to use these toilets?
♦ Will removal of urine-sourced nutrients from WWTP influent have negative impacts on biological treatment processes? Are the energy savings projected by preliminary studies to occur with removal of nutrients from WWTP influent achievable in practice?
♦ What are the costs of implementing urine diversion? What are the costs for treatment?
♦ How will data from smaller pilot projects and experiments translate into larger scale operations?
♦ What will the socio-economic factors be in the U.S.? Will acceptance be comparable to Europe with adequate outreach and education?
♦ Are there areas in the U.S. where urine diversion might best be implemented? For example, in areas where water quality impacts of WWTP effluent or failing septic systems are at critical levels.
♦ Because urine contains a high level of sodium, does direct urine reuse have negative implications in terms of sodium adsorption ratio?

A crucial question is how urine diversion, on its own or in the context of de- or semi-centralized wastewater treatment, compares to maintaining or upgrading current U.S. wastewater treatment practices (for more stringent nutrient removal or for micropollutant removal). Several inquiries are involved in this question (Table 4-1). In some cases, a large amount of information is available, but further research is necessary (column A). In other cases, limited information is

available or additional work is needed to synthesize available data to form conclusions (column B). Finally, in some cases little to no information is available (column C).

Table 4-1. Knowledge Gaps in Consideration of the Feasibility of Urine Diversion in the U.S.

KNOWLEDGE GAP	A Small knowledge gap	B Necessitates gathering or synthesizing data	C Large knowledge gap
Best technology for treatment	√		
Whole life costs for implementation at different scales (household, apartment, neighborhood, multiple neighborhood, public building, etc.)		√	
How to deal with technical problems associated with UD toilets and urine storage	√		
Ability of urine-based fertilizer to meet agricultural needs in U.S.		√	
Life cycle assessment of urine-based fertilizer as compared to commercially produced fertilizer		√	
Quantify benefits of micropollutant removal (e.g. pharmaceuticals and hormones)			√
Life cycle assessment of UD in terms of nutrient removal: in comparison to energy and chemical requirements of conventional wastewater treatment plants		√	
Carbon footprint of urine treatment and fertilizer development/ urine reuse as compared to conventional wastewater treatment/commercial fertilizer production			√
Water balance: UD versus practice as usual	√		
Synthesized life cycle assessment of UD (water, contaminant, and energy balance)		√	
U.S. demonstration projects			√

Addressing knowledge gaps may involve a multi-phase approach with interdisciplinary elements. These phases could progress as follows:

I. Whole life cost analysis: Determine the whole life costs for implementation at different scales (household, public building, neighborhood, multiple neighborhood, etc.) with and without other decentralized treatment technologies such as constructed wetlands and anaerobic digestion. An important component would be to identify infrastructure needed for implementation of UD, including that required for generation and sale of associated fertilizer products. These costs should be compared to the cost of achieving the same level of nutrient removal from WWTPs. A sensitivity analysis should then be utilized to determine which factors have the most affect on total costs and to drive the direction of research to reduce those costs. Because several pilot projects have been initiated, the cost of urine diversion toilets, waterless urinals, and vacuum sewerage (if employed) is available. It is also possible to determine the cost of a struvite reactor as this technology has been commercially developed (Huber Technology). Additional research is required to develop costs for a completely decentralized system. Although, for example, it is possible to estimate the costs for a constructed wetland, anaerobic digester, and struvite reactor, as well as associated pipes, operation and maintenance costs would need to be developed and calculations would need to be performed to size these treatment units depending on the volume of each wastewater stream generated.

II. Initial water/contaminant/energy balance: To justify development of urine diversion in the U.S., economics and engineering perspectives would be key components of this analysis. At this time, it is not totally clear how much water or energy can be saved through urine diversion technology. Nor have extensive mass balances been done to determine the potential reduction in nitrogen, phosphorus, and salt loading which can be achieved through implementation of the technology in the U.S. This data is required in order to carry out life cycle assessments as proposed below.

III. Pilot projects (small to mid-scale): Should questions arise that cannot be answered with existing research/ pilot projects, or to validate findings to date. This may also be necessary to investigate the acceptance of urine diversion in the U.S. Successful European pilot projects could be mimicked to understand social and technical issues in the U.S.

IV. Thorough life cycle assessment of urine diversion: This step will involve a multidisciplinary team potentially comprised of experts in agriculture, environmental policy, aquatic ecology, engineering, and economics. Parameters considered in the life cycle assessment would include water savings, energy, water quality, cost of synthetic fertilizers, green house gas emissions among others.

V. Pilot projects (large scale): GTZ headquarters in Eschborn is the largest known pilot project to date. It may prove useful to design a larger scale pilot project incorporating other decentralized treatment/reuse technologies or to design a pilot project involving a neighborhood.

4.3 Implementation of Urine Diversion Technology in the U.S.

Although questions remain about urine diversion, it is possible to project how it could be incorporated into current U.S. infrastructure if determined appropriate and economically viable. Urine diversion technology could be implemented at various scales; single household, multi-resident (cluster), or city wide. Large scale or city wide facilities for urine collection, treatment,

and nutrient extraction are likely not feasible as a result of technical issues associated with the transport of urine (Section 3.2.1.1). Therefore, smaller scale systems must be considered. While there will always be a small population of environmentally conscious homeowners who will install urine diversion toilets, store urine, and apply it to their yard and/or landscape as fertilizer (See Section 2.4.4), this is not likely to become widespread in the U.S. Household scale systems require increased maintenance for homeowners and application of the urine product is not trivial. The average homeowner is not likely to adopt the technology. Therefore, the most probable method of implementation of urine diversion technology in the U.S. would be at the neighborhood scale, in apartments, or in commercial or institutional buildings (offices, hospitals, educational institutions, etc.).

While apartment, commercial, and institutional buildings may be amenable to retrofit for separate urine collection, retrofit would be a barrier in existing development. Even at the cluster scale, problems associated with urine scaling (Section 3.2.1.1) would still need to be addressed. However, some progress has been made toward solving this problem and it is anticipated that maintaining smaller, cluster systems is feasible as compared to very large scale municipal systems. A market for the urine based fertilizer would need to develop at a localized level. Fertilizer products or ingredients to manufacture fertilizers would need to be collected at each cluster treatment facility, and transported either to a distribution site or to a centralized production facility. A localized source of fertilizer may be highly advantageous in areas with nearby agriculture or a substantial demand for grounds upkeep within urban areas. However, in other areas the fertilizer product may require transport to locations with higher demand. These issues need to be addressed in a life cycle analysis as identified in Table 4-1, which compares both the cost and transportation requirements (carbon footprint) for synthetic fertilizers and urine based fertilizer.

4.4 Conclusion

Results from the world-wide search and review of urine diversion knowledge and technology suggest urine source separation as a means to recover nutrients, conserve water, and decrease overall energy requirements for both nutrient and micropollutant removal as compared to conventional wastewater treatment. Initial findings also indicates that urine diversion may be a sustainable method, in combination with other source-separation/decentralized treatment methods, to address deteriorating water infrastructure in the U.S. Research has matured beyond the laboratory scale to include pilot projects in office buildings, private homes, and schools, but the majority of the projects relevant to development of urine diversion in the U.S. have been conducted in Europe. Despite high social acceptance in Europe, and the advancement to date of urine diversion technology, continued research is necessary to create marketable products, develop life cycle and/or cost-benefit analysis (relative to U.S. parameters), determine social acceptance in the U.S., and assess the most appropriate means and setting for urine treatment.

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WASTEWATER UTILITY

Alabama
Montgomery Water Works & Sanitary Sewer Board

Alaska
Anchorage Water & Wastewater Utility

Arizona
Avondale, City of
Glendale, City of,
Mesa, City of
Peoria, City of
Phoenix Water Services Dept.
Pima County Wastewater Reclamation Department
Tempe, City of

Arkansas
Little Rock Wastewater

California
Central Contra Costa Sanitary District
Corona, City of
Crestline Sanitation District
Delta Diablo Sanitation District
Dublin San Ramon Services District
East Bay Dischargers Authority
East Bay Municipal Utility District
Fairfield-Suisun Sewer District
Fresno Department of Public Utilities
Inland Empire Utilities Agency
Irvine Ranch Water District
Las Gallinas Valley Sanitary District
Las Virgenes Municipal Water District
Livermore, City of
Los Angeles, City of
Montecito Sanitary District
Napa Sanitation District
Novato Sanitary District
Orange County Sanitation District
Palo Alto, City of
Riverside, City of
Sacramento Regional County Sanitation District
San Diego, City of
San Francisco Public Utilities, City & County of
San Jose, City of
Sanitation Districts of Los Angeles County
Santa Barbara, City of
Santa Cruz, City of
Santa Rosa, City of
South Bayside System Authority
South Coast Water District
South Orange County Wastewater Authority
Stege Sanitary District
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Union Sanitary District
West Valley Sanitation District

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Boulder, City of
Greeley, City of
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Metro Wastewater Reclamation District, Denver
Platte Canyon Water & Sanitation District

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District of Columbia Water & Sewer Authority

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Sewerage & Water Board of New Orleans

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Maryland
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Howard County Bureau of Utilities
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Massachusetts
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Massachusetts Water Resources Authority (MWRA)
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Oregon
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Water Environment Services

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Spartanburg Water

Tennessee
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Utah
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Lynchburg Regional Wastewater Treatment Plant
Prince William County Service Authority
Richmond, City of
Rivanna Water & Sewer Authority

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Seattle Public Utilities
Sunnyside, Port of
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Wisconsin
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Kenosha Water Utility
Madison Metropolitan Sewerage District
Milwaukee Metropolitan Sewerage District
Racine Water & Wastewater Utility
Sheboygan, City of
Wausau Water Works

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Barwon Water
Central Highlands Water
City West Water
Coliban Water Corporation
Cradle Mountain Water
Gippsland Water
Gladstone Area Water Board
Gosford City Council
Hunter Water Corporation
Melbourne Water
Onstream
Power & Water Corporation
Queensland Urban Utilities
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Sydney Water
Unity Water
Wannon Regional Water Corporation
Water Corporation
Water Distribution Brisbane City Council
Western Water
Yarra Valley Water

Canada
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Georgia
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Tennessee
Chattanooga Stormwater Management

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Ohio River Valley Sanitation Commission
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CHAPTER 1
ADMINISTRATION

101.0 Title, Scope, and General.

101.1 Title. This document shall be known as the "Water Efficiency and Sanitation Standard (WEStand)," shall be cited as such, and will be referred to herein as "this standard."

101.2 Purpose. The purpose of this standard is to provide minimum requirements to optimize water use practices attributed to the built environment while maintaining protection of the public health, safety and welfare. This standard is not intended to circumvent the health, safety and general welfare requirements of the codes referenced in Section 101.6.

101.3 Plans Required. The Authority Having Jurisdiction shall be permitted to require the submission of plans, specifications, drawings, and such other information as the Authority Having Jurisdiction may deem necessary, prior to the commencement of, and at any time during the progress of, any work regulated by this standard. The issuance of a permit upon plans and specifications shall not prevent the Authority Having Jurisdiction from thereafter requiring the correction of errors in said plans and specifications or from preventing construction operations being carried on thereunder when in violation of this standard or of any other pertinent ordinance or from revoking any certificate of approval when issued in error.

101.4 Scope. The provisions of this standard applies to the erection, installation, alteration, repair, relocation, replacement, addition to, use, or maintenance of plumbing and mechanical systems covered by the scope of this standard within this jurisdiction.

101.4.1 Repairs and Alterations. In existing buildings or premises in which plumbing and mechanical installations that were designed and installed in accordance with this standard are to be altered, repaired, or renovated, deviations from the provisions of this standard are permitted, provided such deviations are found to be necessary and are first approved by the Authority Having Jurisdiction.

101.4.2 Existing Construction. No provision of this standard shall be deemed to require a change in any portion of a plumbing or mechanical system or any other work regulated by this standard in or on an existing building or lot when such work was installed and is maintained in accordance with law in effect prior to the effective date of this standard, except when any such plumbing or mechanical system is determined by the Authority Having Jurisdiction to be in fact dangerous, unsafe, insanitary, a nuisance or a menace to life, health, or property.

101.5 Appendices. The provisions in the appendices are intended to augment the requirements of this standard and shall not be considered part of this standard unless formally adopted as such.

101.6 Referenced Codes and Standards. The codes and standards referenced elsewhere in this standard shall be considered part of the requirements of this standard to the prescribed extent of each such reference.

101.6.1 Building. The provisions of the building code shall apply to the construction, alteration, movement, enlargement, replacement, repair, use and occupancy, location, maintenance, removal and demolition of every structure or any appurtenances connected or attached to such buildings or structures.

101.6.2 Electrical. The provisions of the electrical code shall apply to the installation of electrical systems, including but not limited to, alterations, repair, replacement, equipment, appliances, fixtures, fittings, and appurtenances thereto.

101.6.3 Mechanical. The provisions of the mechanical code shall apply to the installation, alterations, repair and replacement of mechanical systems, including equipment, appliances, including ventilating, heating, cooling, air-conditioning and refrigeration systems. Where a mechanical code is not adopted or where the content of the mechanical code adopted by the jurisdiction is not applicable, then mechanical code shall mean the Uniform Mechanical Code (UMC) promulgated by the International Association of Plumbing and Mechanical Officials (IAPMO).

101.6.4 Plumbing. The provisions of the plumbing code shall apply to the installation, alteration, repair and replacement of plumbing systems, including equipment, appliances, fixtures, fittings and appurtenances. Where a plumbing code is not adopted or where the content of the plumbing code adopted by the jurisdiction is not applicable, then plumbing code shall mean the Uniform Plumbing Code (UPC) promulgated by the International Association of Plumbing and Mechanical Officials (IAPMO).

101.6.5 Solar. Solar energy systems shall be installed in accordance with the Uniform Solar Energy Code (USEC) promulgated by the International Association of Plumbing and Mechanical Officials (IAPMO).

101.6.6 Swimming Pool. The provisions of the swimming pool code shall apply to the erection, installation, alteration, repair, relocation, replacement, addition to, use and maintenance of swimming pools, spas, or hot tub systems. Where a swimming pool code is not adopted or where the content of the swimming pool code adopted by the jurisdiction is not applicable, then swimming pool code shall mean the Uniform Swimming Pool, Spa & Hot Tub Code (USPSHTC) promulgated by the International Association of Plumbing and Mechanical Officials (IAPMO).

101.7 Conflicts. Where, in any specific case, different sections of this standard or referenced standards specify

different materials, methods of construction, or other requirements, the most restrictive shall govern as determined by the Authority Having Jurisdiction. When there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable.

102.0 Alternate Materials, Designs, and Methods of Construction Equivalency.

102.1 General. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard. Technical documentation shall be submitted to the Authority Having Jurisdiction to demonstrate equivalency. The Authority Having Jurisdiction shall have the authority to approve or disapprove the system, method, or device for the intended purpose.

However, the exercise of this discretionary approval by the Authority Having Jurisdiction shall have no effect beyond the jurisdictional boundaries of said Authority Having Jurisdiction. Any alternate material or method of construction so approved shall not be considered as conforming to the requirements, intent or both of this standard for any purpose other than that granted by the Authority Having Jurisdiction when the submitted data does not prove equivalency. [UPC:301.3]

103.0 Plans and Specifications.

103.1 Construction Documents. Construction documents, engineering calculations, diagrams, and other data shall be submitted in two or more sets with each application for a permit. The construction documents, computations, and specifications shall be prepared by, and the plumbing designed by, a registered design professional. Construction documents shall be drawn to scale with clarity to identify that the intended work to be performed is in accordance with the code.

Exception: The Authority Having Jurisdiction shall be permitted to waive the submission of construction documents, calculations, or other data where the Authority Having Jurisdiction finds that the nature of the work applied for is such that reviewing of construction documents is not necessary to obtain compliance with this standard. [UPC:104.3.1]

103.2 Supplemental Information. Supplemental information necessary to verify compliance with this standard, such as calculations, worksheets, compliance forms, product listings, or other data, shall be made available when required by the Authority Having Jurisdiction.

104.0 Permit Issuance.

104.1 Permit Issuance. The application, construction documents, and other data filed by an applicant for a permit shall be reviewed by the Authority Having Jurisdiction. Such plans shall be permitted to be reviewed by other departments of this jurisdiction to verify compliance with applicable laws under their jurisdiction. Where the Authority Having Jurisdiction finds that the work described in an application for permit and the plans, specifications, and other data filed therewith are in accordance with the requirements of the code and other pertinent laws and ordinances, and that the fees specified in Section 104.3 have been paid, the Authority Having Jurisdiction shall issue a permit therefore to the applicant. [UPC:104.4]

104.2 Approved Plans or Construction Documents. Where the Authority Having Jurisdiction issues the permit where plans are required, the Authority Having Jurisdiction shall endorse in writing or stamp the construction documents "APPROVED." Such approved construction documents shall not be changed, modified, or altered without authorization from the Authority Having Jurisdiction, and the work shall be done in accordance with approved plans. [UPC:104.4.1]

104.3 Permit Fees. The fees shall be determined and adopted by the Authority Having Jurisdiction.

105.0 Inspections.

105.1 General. Plumbing and mechanical systems for which a permit is required by this standard or the applicable code shall be inspected by the Authority Having Jurisdiction. No portion of any plumbing or mechanical system shall be concealed until inspected and approved. Neither the Authority Having Jurisdiction nor the jurisdiction shall be liable for expense entailed in the removal or replacement of material required to permit inspection. When the installation of a plumbing or mechanical system is complete, an additional and final inspection shall be made.

106.0 Connection Approval.

106.1 Connections. No person shall make connection to any plumbing system regulated by this standard for which a permit is required unless approved by the Authority Having Jurisdiction.

106.2 Energy Connections. No person shall make connections from a source of energy or fuel to any system or equipment regulated by this standard and for which a permit is required until approved by the Authority Having Jurisdiction.

106.3 Temporary Connections. The Authority Having Jurisdiction shall be permitted to authorize temporary connection of the plumbing or mechanical equipment to the source of energy or fuel for the purpose of testing the equipment.

107.0 Maintenance.

107.1 General. Plumbing and mechanical systems, materials, and appurtenances, both existing and new, and parts thereof shall be maintained in proper operating condition in accordance with the original design and in a safe and hazard-free condition. Devices or safeguards that are required by this standard shall be maintained in conformance with the standard edition under which installed. The owner or the owner's designated agent shall be responsible for maintenance of plumbing and mechanical systems and equipment. To deter-

mine compliance with this subsection, the Authority Having Jurisdiction shall be permitted to cause a plumbing or mechanical system or equipment to be reinspected.

107.2 Information Required. Information, such as manufacturer's instructions, owner's manuals or other information shall be provided for all products and systems that require regular maintenance to achieve the effective use of energy and water. A maintenance schedule that includes clear instructions of the maintenance action and makes reference to the owner's manual shall be required and made available.

DRAFT

DRAFT

CHAPTER 2
DEFINITIONS

201.0 General. For the purpose of this standard, the following terms have the meanings indicated in this chapter.

No attempt is made to define ordinary words, which are used in accordance with their established dictionary meanings, except where a word has been used loosely and it is necessary to define its meaning as used in this standard to avoid misunderstanding.

The definitions of terms are arranged alphabetically according to the first word of the term.

202.0 Definition of Terms.

203.0 –A–

Accessible. Where applied to a fixture, connection, appliance, or equipment, "accessible" means having access thereto, but which first may require the removal of an access panel, door, or similar obstruction. [UPC:203.0]

Alternate Water Source. Non-potable source of water that includes but not limited to gray water, on-site treated non-potable water, rainwater, and reclaimed (recycled) water.

Authority Having Jurisdiction. The organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, installations, or procedures. The Authority Having Jurisdiction shall be a federal, state, local, or other regional department or an individual such as a plumbing official, mechanical official, labor department official, health department official, building official, or others having statutory authority. In the absence of a statutory authority, the Authority Having Jurisdiction may be some other responsible party. This definition shall include the Authority Having Jurisdiction's duly authorized representative. [UPC:203.0]

204.0 –B–

Bottle Filling Station. A plumbing fixture that is connected to the potable water distribution and building drainage system that is designed and intended for filling personal use drinking water bottles or containers not less than 10 inches (250 mm) in height. Such fixtures can be separate from or integral to a drinking fountain and can incorporate a water filter and a cooling system for chilling the drinking water.

Branch. A part of the piping system other than a main, riser, or stack.

Building Code. The building code that is adopted by the jurisdiction.

205.0 –C–

Catch Can Test. Method to measure the precipitation rate of an irrigation system by placing catchment containers at various random positions in the irrigation zone for a prescribed amount of time during irrigation application. The volumes of water in the containers are measured, averaged and calculated to determine precipitation rate. Tests are conducted using irrigation industry accepted practices.

Combination Ovens. A device that combines the function of hot air convection (oven mode) and saturated and superheated steam heating (steam mode), or both, to perform steaming, baking, roasting, rethermalizing, and proofing of various food products. In general, the term combination oven is used to describe this type of equipment, which is self contained. The combination oven is also referred to as a combination oven/steamer, combi or combo.

Commode. The composting toilet fixture for collecting, containing, or transporting excreta to the compost processor.

Compost Additives. Any material such as sawdust, wood shavings, and other compostable material added to the commode or compost processor to maintain operational conditions within the composting toilet system.

Composting Toilet System. A system designed to safely collect and process excreta and compost additives into humus through aerobic decomposition.

Compost Processor. The site of aerobic decomposition transforming excreta and compost additives into humus.

Condensate. Liquid water separated from a gaseous state due to changes in temperature or pressure, or both, and remains liquid at standard conditions.

Cycles of Concentration for Cooling Towers. Cycles of concentration equals the specific conductance of the water in the cooling tower basin divided by the combined flow weighted average specific conductance of the makeup water(s) to the cooling tower.

206.0 –D–

Debris Excluder. A device installed on the rainwater catchment conveyance system to prevent the accumulation of leaves, needles, or other debris in the system.

Dedicated Meter. A water measuring device used at a subsection or end use of a water supply system for any of the following purposes: billing, water management, collecting and analyzing water usage data, detection of leaks, equipment failure, water waste, and irregular or abnormal use for a specific application. Also called a submeter.

Desiccation. The process of dehydrating excreta or leachate.

Diverted Urine. Urine that is collected and has not made contact with feces.

Dry Weather Runoff. Water that flows along a surface, in a channel or sub-surface including groundwater seepage, and is not associated with a rainwater catchment system or stormwater catchment system.

207.0 –E–

Energy Star. A joint program of the U.S. Environmental

Protection Agency and the U.S. Department of Energy. Energy Star is a voluntary program designed to identify and promote energy-efficient products and practices.

Evapotranspiration (ET). The water transpired from vegetation, evaporated from the soil, water, and plant surfaces. Evapotranspiration rates are values expressed in inches per unit of time (day, week, month, or year). Evapotranspiration rates vary by components of weather conditions, including insolation, humidity, temperatures and wind, and time of year.

Excreta. Includes but is not limited to urine, feces, menses, toilet paper, and other human body emissions and biodegradable cleaning products.

208.0 –F–

Food Steamers (Steam Cookers). A cooking appliance wherein heat is imparted to food in a closed compartment by direct contact with steam. The compartment can be at or above atmospheric pressure. The steam can be static or circulated.

209.0 –G–

Gang Showers. Shower compartments designed and intended for use by multiple persons simultaneously.

Geothermal. Renewable energy generated by deep-earth.

Gray Water. Untreated waste water that has not come into contact with toilet waste, kitchen sink waste, dishwasher waste or similarly contaminated sources. Gray water includes waste water from bathtubs, showers, lavatories, clothes washers and laundry tubs. Also known as grey water, graywater, and greywater.

Gray Water Diverter Valve. A valve that directs gray water to the sanitary drainage system or to a subsurface irrigation system.

Ground Source Heat Pump. A heat pump that uses the thermal energy of the ground or groundwater to provide space conditioning or water heating.

210.0 –H–

Humus. The biologically decomposed, soil-like output of the compost processor.

Hydrozone. A grouping of plants with similar water requirements that are irrigated by the same irrigation zone.

211.0 –I–

Irrigation Control System. An irrigation control system consists of a combination of a programmable controller using one or more inputs or sensors that, in combination, estimate or measure the availability of moisture for plants in order to operate an irrigation system, in such a manner that the system replenishes water as needed while minimizing excess water use. A properly programmed irrigation control system requires initial site specific set-up and will make irrigation schedule adjustments, including run times and required cycles throughout the irrigation season without human intervention.

Irrigation Demand. The amount of water not supplied by natural precipitation that is needed to maintain landscape plant life in good condition. Irrigation demand is calculated by subtracting natural effective precipitation from the ET rate adjusted by the landscape coefficient which includes the functional purpose and desired quality of the plant being irrigated.

Irrigation Emission Device. The various landscape irrigation equipment terminal fittings or outlets that emit water for irrigating vegetation in a landscape.

Irrigation Zone. The landscape area that is irrigated by a set of landscape irrigation emission devices installed on the same water supply line downstream of a single valve.

212.0 –J–

No Definitions.

213.0 –K–

Kitchen and Bar Sink Faucets. A faucet that discharges into a kitchen or bar sink in domestic or commercial installations. Supply fittings that discharge into other type sinks, including clinic sinks, floor sinks, service sinks and laundry trays are not included.

214.0 –L–

Lavatory. 1) a basin or vessel, for washing. 2) a plumbing fixture, as defined in (1), especially placed for use in personal hygiene. Principally not used for laundry purposes and never used for food preparation, or utensils, in food services. 3) a fixture designed for the washing of the hands and face. Sometimes called a wash basin.

Lavatory Faucet. A faucet that discharges into a lavatory basin in a domestic or commercial installation.

Leachate. Liquid draining from the compost processor.

Listed (Third-party Certified). Equipment or materials included in a list published by a listing agency (accredited conformity assessment body) that maintains periodic inspection on current production of listed equipment or materials and whose listing states either that the equipment or material complies with approved standards or has been tested and found suitable for use in a specified manner. [UPC:214.0]

Listing Agency. An agency accredited by an independent and authoritative conformity assessment body to operate a material and product listing and labeling (certification) system and that is accepted by the Authority Having Jurisdiction, which is in the business of listing or labeling. The system includes initial and ongoing product testing, a periodic inspection on current production of listed (certified) products, and makes available a published report of such listing in which specific information is included that the material or product conforms to applicable standards and found safe for use in a specific manner. [UPC:214.0]

Low Application Rate Irrigation. A means of irrigation using Low Precipitation Rate Sprinkler Heads or Low Flow Emitters in conjunction with cycling irrigation schedules to apply water at a rate less than the soil absorption rate.

Low Flow Emitter. Low flow irrigation emission device designed to dissipate water pressure and discharge a small uniform flow or trickle of water at a constant flow rate. To be

classified as a Low Flow Emitter: drip emitters shall discharge water at less than 4 gallons (15 L) per hour per emitter; micro-spray, micro-jet and misters shall discharge water at a maximum of 30 gallons (113 L) per hour per nozzle.

Low Precipitation Rate Sprinkler Heads. Landscape irrigation emission devices or sprinkler heads with maximum precipitation rate of 1 inch per hour over the applied irrigation area.

215.0 –M–

Main. The principal artery of a system of continuous piping to which branches may be connected.

Maintenance. The upkeep of property or equipment by the owner of the property in compliance with the requirements of this standard.

Mechanical Code. The mechanical code that is adopted by the jurisdiction. Where a mechanical code is not adopted or where the content of the mechanical code adopted by the jurisdiction is not applicable, then mechanical code shall mean the Uniform Mechanical Code (UMC) promulgated by the International Association of Plumbing and Mechanical Officials (IAPMO).

Metering Faucet. A self-closing faucet that dispenses a specific volume of water for each actuation cycle. The volume or cycle duration can be fixed or adjustable.

Modified Evapotranspiration. Numeric values, expressed in inches/hr., of evapotranspiration rates, derived by altering ETo rates by applying factors of specific needs of the vegetation and local climate conditions. Modified evapotranspiration rates are used as a factor in estimating the irrigation water needs of landscapes. Common usage includes reference evapotranspiration as the base rate, modified by coefficients or factors for specific plant types and densities.

Mulch. Organic materials, such as wood chips and fines, tree bark chips, and pine needles that are used in a mulch basin to conceal gray water outlets and permit the infiltration of gray water.

Mulch Basin. A subsurface catchment area for gray water that is filled with mulch and of sufficient depth and volume to prevent ponding, surfacing or runoff.

Multi-Occupant Spaces. Indoor spaces used for presentations and training, including classrooms and conference rooms.

216.0 –N–

No Definitions.

217.0 –O–

On-Site Treated Non-Potable Water. Non-potable water, that has been collected, treated, and intended to be used on-site and is suitable for direct beneficial use.

Owner's Manual. A manual provided to the owner containing instructions for all management aspects of that system.

218.0 –P–

Plumbing Code. The plumbing code that is adopted by the jurisdiction. Where a plumbing code is not adopted or where the content of the plumbing code adopted by the jurisdiction is not applicable, then plumbing code shall mean the Uniform Plumbing Code (UPC) promulgated by the International Association of Plumbing and Mechanical Officials (IAPMO).

Potable Water. Water that is satisfactory for drinking, culinary, and domestic purposes and that meets the requirements of the Health Authority Having Jurisdiction.

Precipitation Rate. The sprinkler head application rate of water applied to landscape irrigation zone, measured as inches (millimeters) per hour. Precipitation rates of sprinkler heads are calculated according to the flow rate, pattern and spacing of the sprinkler heads.

Pre-Rinse Spray Valve. A handheld device for use with commercial dishwashing and ware washing equipment that sprays water on dishes, flatware, and other food service items for the purpose of removing food residue before cleaning and sanitizing the items.

Public Water System. A system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of twenty-five individuals daily for at least 60 days per year.

219.0 –Q–

Quick-Disconnect Device. A hand-operated device that provides a means for connecting and disconnecting a hose to a water supply and that is equipped with a means to shut off the water supply when the device is disconnected.

220.0 –R–

Rainwater. Natural precipitation that has contacted a rooftop or other man-made above ground surface.

Rainwater Catchment System. A system that collects and stores rainwater for the intended purpose of beneficial use. Also known as Rain Water Harvesting System.

Recirculation System. A system of hot water supply and return piping with shutoff valves, balancing valves, circulating pumps, and a method of controlling the circulating system.

Reclaimed (Recycled) Water. Non-potable water provided by a water/wastewater utility that, as a result of treatment of domestic wastewater, meets requirements of the Authority Having Jurisdiction for its intended uses.

Reference Evapotranspiration (ETo). Numeric value, expressed in inches/hr., calculated as the water necessary to produce maximum biomass based upon a cool-season turf grass 4-6 inches tall. Common sources for obtaining local reference evapotranspiration rates are local agriculture extension services, state departments of agriculture, water agencies, irrigation professionals, the United States Geological Survey, and internet websites.

Reverse Osmosis Reject Water. Water that does not pass through a membrane of a reverse osmosis system.

Roof Washer. A device or method for removal of sediment and debris from a collection surface by diverting initial rainfall from entry into the cistern(s). Also known as a first flush device.

Run Out. The developed length of pipe that extends away from the circulating loop system to a fixture(s).

221.0 –S–

Secondary Composting. Additional retention and continued decomposition of humus removed from compost processors in order to meet a safe retention time.

Self Closing Faucet. A faucet that closes itself after the actuation or control mechanism is deactivated. The actuation or control mechanism can be mechanical or electronic.

Single Occupant Spaces. Private offices, workstations in open offices, reception workstations, and ticket booths.

Site-Built. Constructed at the site of use.

Soil Absorption Rate. The rate of the soil's ability to allow water to percolate or infiltrate the soil and be retained in the root zone of the soil, expressed as inches (millimeters) per hour.

Sprinkler Head. Landscape irrigation emission device discharging water in the form of sprays or rotating streams, not including Low Flow Emitters.

Storage Tank (rainwater, stormwater or dry weather runoff). The central component of the rainwater, stormwater or dry weather runoff catchment system used for storing water at atmospheric pressure. Also known as a cistern or rain barrel.

Stormwater. Natural precipitation that has contacted a surface at grade, below grade, or above ground parking surfaces.

Stormwater Catchment System. A system that collects and stores stormwater for a beneficial use.

Submeter. A meter installed subordinate to a site meter. Also known as a dedicated meter.

Subsoil Irrigation Field. Gray water irrigation field installed in a trench within the layer of soil below the topsoil. This system is typically used for irrigation of deep rooted plants.

Subsurface Irrigation Field. Gray water irrigation field installed below finished grade within the topsoil.

Surge Tank. A reservoir to modify the fluctuation in flow rates to allow for uniform distribution of gray water to the points of irrigation.

222.0 –T–

Transfer. The controlled transfer of excreta or partially processed humus between commode and composting processor or between multi-stage composting processors.

223.0 –U–

Urine Diversion. Separation of urine from other excreta that occurs at the commode.

224.0 –V–

Vectors. An organism that has the potential to transmit disease.

225.0 –W–

WaterSense. A voluntary program of the U.S. Environmental Protection Agency designed to identify and promote water-efficient products and practices.

Water Closet. A fixture with a water-containing receptor that receives liquid and solid body waste and on actuation conveys the waste through an exposed integral trap into a drainage system. Also referred to as a toilet.

Water Factor (WF). A measurement and rating of appliance water efficiency, most often used for residential and light commercial clothes washers, as follows:

Clothes Washer (residential and commercial). The quantity of water in gallons used to complete a full wash and rinse cycle per measured cubic foot capacity of the clothes container.

Water/Wastewater Utility. A public or private entity which may treat, deliver or do both functions to reclaimed (recycled) water, potable water, or both to wholesale or retail customers.

226.0 –X–

No definitions.

227.0 –Y–

No definitions.

228.0 –Z–

No definitions.

CHAPTER 3
GENERAL REGULATIONS

301.0 Scope.

This chapter covers the general requirements for plumbing and mechanical systems covered by this standard. Such systems shall be in accordance with the requirements of this standard, the plumbing code and the mechanical code.

302.0 Approval.

302.1 Minimum Standards. Pipe, pipe fittings, traps, fixtures, material, and devices used in a plumbing system shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) and shall comply with the approved applicable recognized standards referenced in this standard, and shall be free from defects. Unless otherwise provided for in this standard, materials, fixtures, or devices used or entering into the construction of plumbing systems, or parts thereof, shall be submitted to the Authority Having Jurisdiction for approval [UPC:301.2]

302.1.1 Plastic Pipe, Plastic Pipe Fittings, and Components. Plastic pipe, plastic pipe fittings, and components other than those for gas shall comply with NSF 14. [UPC:301.2.3]

302.2 Mechanical Systems. Mechanical equipment and appliances shall be approved by the Authority Having Jurisdiction or comply with the applicable nationally referenced standards as evidenced by the listing and label of an approved agency.

303.0 Installation.

303.1 Plumbing and Mechanical Systems. Plumbing and mechanical systems covered by this standard shall be installed in a manner conforming to the plumbing, mechanical, other applicable codes, and the manufacturer's installation and operating instructions.

303.2 Rehabilitation of Piping Systems. When pressure piping systems are rehabilitated using an epoxy lining system it shall meet ASTM F2831.

303.3 Qualifications. Where permits are required, the Authority Having Jurisdiction shall have the authority to require contractors, installers, or service technicians to demonstrate competency. Where determined by the Authority Having Jurisdiction, the contractor, installer or service technician shall be licensed to perform such work.

304.0 Disposal of Liquid Waste.

304.1 Disposal. It shall be unlawful for any person to cause, suffer, or permit the disposal of sewage, human excrement, or other liquid wastes, in any place or manner, except through and by means of an approved drainage system, installed and maintained in accordance with the provisions of the plumbing code and this standard.

Exception: Composting toilets.

304.2 Connections to Plumbing System Required. Plumbing fixtures, drains, appurtenances, and appliances, used to receive or discharge liquid wastes or sewage, shall be connected properly to the drainage system of the building or premises, in accordance with the requirements of the plumbing code and this standard.

Exception: Composting toilets.

305.0 Abandonment.

305.1 General. Every abandoned system or part thereof covered under the scope of this standard shall be disconnected from any remaining systems, drained, plugged, and capped in an approved manner.

305.2 Underground Tank. Every underground water storage tank that has been abandoned or otherwise discontinued from use in a system covered under the scope of this standard shall be completely drained and filled with earth, sand, gravel, concrete, or other approved material or removed in a manner satisfactory to the Authority Having Jurisdiction.

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CHAPTER 4

WATER EFFICIENCY AND CONSERVATION

401.0 General.

401.1 Scope. The provisions of this chapter establish the means of conserving potable and non-potable water used in and around a building.

402.0 Water-Conserving Plumbing Fixtures and Fittings.

402.1 General. The maximum water consumption of fixtures and fixture fittings shall comply with the flow rates specified in Table 402.1 and Section 402.2 through Section 402.9.

402.2 Water Closets. No water closet shall have a flush volume exceeding 1.6 gallons (6.0 L) per flush (gpf).

402.2.1 Gravity, Pressure Assisted and Electro-Hydraulic Tank Type Water Closets. Gravity, pressure assisted, and electro-hydraulic tank type water closets shall have a maximum effective flush volume of not more than 1.28 gallons (4.8 L) of water per flush in accordance with ASME A112.19.2/CSA B45.1 or ASME A112.19.14 and shall also be listed to the EPA WaterSense Tank-Type High Efficiency Toilet Specification. The effective flush volume for dual flush toilets is defined as the composite, average flush volume of two reduced flushes and one full flush.

402.2.2 Flushometer-Valve Activated Water Closets. Flushometer-valve activated water closets shall have a maximum flush volume of not more than 1.6 gallons (6.0 L) of water per flush in accordance with ASME A112.19.2/CSA B45.1.

402.3 Urinals. Urinals shall have a maximum flush volume of not more than 0.5 gallon (1.9 L) of water per flush in accordance with ASME A112.19.2/CSA B45.1 or CSA B45.5/IAPMO Z124. Flushing urinals shall be listed to the EPA WaterSense Flushing Urinal Specification.

402.3.1 Nonwater Urinals. Nonwater urinals shall comply with ASME A112.19.3/CSA B45.4, ASME A112.19.19 or CSA B45.5/IAPMO Z124. Nonwater urinals shall be cleaned and maintained in accordance with the manufacturer's instructions after installation. Where nonwater urinals are installed they shall have a water distribution line roughed-in to the urinal location at a height not less than 56 inches (1422 mm) above finished floor to allow for the installation of an approved backflow prevention device in the event of a retrofit. Such water distribution lines shall be installed with shutoff valves located as close as possible to the distributing main to prevent the creation of dead ends. Where nonwater urinals are installed, not less than one water supplied fixture rated at not less than 1 drainage fixture unit (DFU) shall be installed upstream on the same drain line to facilitate drain line flow and rinsing.

Exception: Nonwater urinals used as part of a composting toilet system.

402.4 Residential Kitchen Faucets. The maximum flow rate of residential kitchen faucets shall not exceed 1.8 gallons per minute (gpm) (6.8 L/m) at 60 pounds-force per square inch (psi) (414 kPa). Kitchen faucets are permitted to temporarily increase the flow above the maximum rate, but not to exceed 2.2 gpm (8.3 L/m) at 60 psi (414 kPa), and must revert to a maximum flow rate of 1.8 gpm (6.8 L/m) at 60 psi (414 kPa) upon valve closure.

402.5 Lavatory Faucets. The maximum water flow rate of faucets shall be in accordance with Section 402.5.1 and Section 402.5.2.

402.5.1 Lavatory Faucets in Residences, Apartments, and Private Bathrooms in Lodging Facilities, Hospitals, and Patient Care Facilities. The flow rate for lavatory faucets installed in residences, apartments, and private bathrooms in lodging, hospitals, and patient care facilities (including skilled nursing and

TABLE 402.1
MAXIMUM FIXTURE AND FIXTURE FITTINGS FLOW RATES

FIXTURE TYPE	FLOW RATE
Showerheads	2.0 gpm @ 80 psi[1]
Kitchen faucets residential[5]	1.8 gpm @ 60 psi
Lavatory faucets residential	1.5 gpm @ 60 psi
Lavatory faucets other than residential	0.5 gpm @ 60 psi
Metering faucets	0.25 gallons/cycle
Metering faucets for wash fountains	One (1) 0.25 gal per cycle fixture fitting for each 20 inches rim space
Wash fountains	One (1) 2.2 gpm @ 60 psi fixture fitting for each 20 inches rim space
Water Closets - other than remote locations[4]	1.28 gallons/flush[2]
Water Closets - remote locations[4]	1.6 gallons/flush
Urinals	0.5 gallons/flush[3]
Commercial Pre-Rinse Spray Valves	1.3 gpm @ 60 psi

[1] For multiple showerheads serving one shower compartment see Section 402.6.2
[2] Shall also be listed to EPA WaterSense Tank-Type High Efficiency Toilet Specification.
[3] Shall also be listed to EPA WaterSense Flushing Urinal Specification. Nonwater urinals shall meet the specifications listed in Section 402.3.1.
[4] Remote location is where a water closet is located at least 30 feet upstream of the nearest drain line connections or fixtures, and is located where less than 1.5 drainage fixture units are upstream of the water closet's drain line connection.
[5] See Section 402.4.

long-term care facilities) shall not exceed 1.5 gpm (5.7 L/m) at 60 psi (414 kPa) in accordance with ASME A112.18.1/CSA B125.1 and shall be listed to the U.S. EPA WaterSense High-Efficiency Lavatory Faucet Specification.

402.5.2 Lavatory Faucets in Other Than Residences, Apartments, and Private Bathrooms in Lodging Facilities. Lavatory faucets installed in bathrooms of buildings or occupancies other than those specified in Section 402.5.1 shall be in accordance with Section 402.5.2.1 or Section 402.5.2.2.

402.5.2.1 Maximum Flow Rate. The flow rate shall not exceed 0.5 gpm (1.9 L/m) at 60 psi (414 kPa) in accordance with ASME A112.18.1/CSA B125.1.

402.5.2.2 Metering Faucets. Metering faucets shall deliver not more than 0.25 gallons (1.0 L) of water per cycle.

402.6 Showers.

402.6.1 Showerheads. Showerheads shall comply with the requirements of the Energy Policy Act of 1992, except that the flow rate shall not exceed 2.0 gpm (7.6 L/m) at 80 psi (552 kPa), when listed to ASME A112.18.1/CSA B125.1 and the EPA WaterSense Specification for Showerheads.

402.6.2 Multiple Showerheads Serving One Shower Compartment. The total allowable flow rate of water from multiple showerheads flowing at any given time, with or without a diverter, including rain systems, waterfalls, bodysprays, and jets, shall not exceed 2.0 gpm (7.6 L/m) per shower compartment, where the floor area of the shower compartment is less than 1800 square inches (1.161 m^2). For each increment of 1800 square inches (1.161 m^2) of floor area thereafter or part thereof, additional showerheads are allowed, provided the total flow rate of water from all flowing devices shall not exceed 2.0 gpm (7.6 L/m) for each such increment.

Exceptions:

(1) Gang showers in non-residential occupancies. Singular showerheads or multiple shower outlets serving one showering position in gang showers shall not have more than 2.0 gpm (7.6 L/m) total flow.

(2) Where provided, shower compartments required for persons with disabilities in accordance with Table 1201.1 shall not have more than 4.0 gpm (15.0 L/m) total flow, where one outlet is the hand shower. The hand shower shall have a control with a nonpositive shutoff feature.

402.6.3 Bath and Shower Diverters. Tub spout bath and shower diverters, while operating in the shower mode, shall perform with zero leakage.

402.6.4 Shower Valves. Shower valves shall meet the temperature control performance requirements of ASSE 1016/ASME A112.1016/CSA B125.16 when tested for the rated flow rate of the installed showerhead.

402.6.4.1 Control valves for showers and tub-shower combinations shall be tagged, labeled, or marked with the manufacturer's minimum rated flow and such marking shall be visible after installation.

402.7 Commercial Pre-Rinse Spray Valves. The flow rate for a pre-rinse spray valve installed in a commercial kitchen to remove food waste from cookware and dishes prior to cleaning shall not be more than 1.28 gpm (4.8 L/m) at 60 psi (414 kPa). Where pre-rinse spray valves with maximum flow rates of 1.0 gpm (3.8 L/m) or less are installed, the static pressure shall be not less than 30 psi (207 kPa). Commercial kitchen pre-rinse spray valves shall be equipped with an integral automatic shutoff. Pre-rinse spray valves shall be listed to the EPA WaterSense Commercial Pre-rinse Spray Valve Specification.

402.8 Emergency Safety Showers and Eye Wash Stations. Emergency safety showers and emergency eye wash stations shall not be limited in their water supply flow rates.

402.9 Drinking Fountains and Bottle Filling Stations. Bottle filling stations shall be included on or used as a substitute to meet the requirements of drinking fountains in at least 50 percent of the requirements for drinking fountains. Bottle filling stations and drinking fountains shall be self closing.

402.10 Installation. Water-conserving fixtures and fixture fittings shall be installed in accordance with the manufacturers' instructions to maintain their rated performance.

403.0 Composting Toilet and Urine Diversion Systems.

403.1 General. The provisions of this section shall apply to the design, construction, performance, alteration, and repair of composting toilet and urine diversion systems.

403.2 Design and Construction Requirements. Composting toilets, composting toilet systems, and urine diversion systems shall meet the design, construction, and performance requirements of Section 403.2.1 or Section 403.2.2.

403.2.1 Listed Composting Toilets and Composting Toilet Systems. Composting toilets and composting toilet systems shall be listed to NSF 41.

403.2.2 Alternative Design Systems. Where approved by the Authority Having Jurisdiction, composting toilet and urine diversion systems for residential and commercial applications shall comply with the provisions of Section 403.3 through Section 403.9.

403.3 System Materials and Components. Pipe, pipe fittings, traps, fixtures, material, and devices used in composting toilet and urine diversion systems that are expected to contact leachate or diverted urine shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body), unless otherwise approved by the Authority Having Jurisdiction. Materials and components shall comply to approved applicable recognized standards referenced in this standard and the plumbing code, and shall be free from defects. Unless otherwise provided for in this standard, materials, fixtures, or devices used or entering into the construction of plumbing systems, or parts thereof,

shall be submitted to the Authority Having Jurisdiction for approval.

403.4 System Design. Composting toilet and urine diversion systems complying with Section 403.0 shall be designed by a person registered or licensed to perform plumbing design work or who demonstrates competency to design composting toilet and urine diversion systems.

403.5 Permit. It shall be unlawful for any person to construct, install, alter, or cause to be constructed, installed, or altered any composting toilet and urine diversion system in a building or on a premise without first obtaining a permit to do such work from the Authority Having Jurisdiction.

403.6 Maintenance and Inspection. Composting toilet and urine diversion systems and components shall be maintained and inspected in accordance with Section 403.6.1 through Section 403.6.3.

403.6.1 Maintenance Responsibility. The required maintenance and inspection of composting toilet and urine diversion systems shall be the responsibility of the property owner, unless otherwise required by the Authority Having Jurisdiction. The property owner is responsible for retaining test result records in accordance with Section 403.8.5.2 and making them available to the Authority Having Jurisdiction upon request. Upon transfer of property or tenancy, all test records shall be transferred and humus shall be re-tested after its first treatment period and a record retained.

403.6.2 Operation. Composting toilet and urine diversion systems shall be operated in a safe and sanitary condition in accordance with the owner's manual in accordance with Section 403.7.

403.6.3 Inspection. In the event of a nuisance complaint or documented system failure, the composting toilet and urine diversion system shall be made available for inspection and the owner or owner's agent shall conduct sufficient repairs or alterations to the composting toilet system. At the request of the Authority Having Jurisdiction, results of all laboratory testing and new tests in accordance with Section 403.8.5 following repairs to alleviate dangerous or unsanitary conditions shall be provided at the owner's expense.

403.7 Operation and Maintenance Manual. An owner's manual shall present clear instructions for maintenance and be transferred to the new owner upon transfer of property or tenancy. The owner's manual shall include:

(1) Schedule for addition of necessary compost additives.
(2) Source or provider of necessary compost additives. Source may be on-site.
(3) Schedule and instructions for all regular maintenance tasks.
(4) Expected input of and capacity for excreta and compost additives to compost toilet system specifying loading of commode(s) and compost processor(s).
(5) Plan for container transfer and cleaning where transfer is used.
(6) Expected schedule for removing humus from composting processors and where used secondary composting bins.
(7) Plan for on-site disposal of humus or professional removal.
(8) Plan for managing leachate.
(9) Plan for microbial testing in accordance with Section 403.8.5.2.

403.8 Composting Toilet System Design Requirements. The design and installation of composting toilet systems shall be in accordance with Section 403.8.1 through Section 403.8.6.

403.8.1 Durability. All components expected to contact excreta or leachate shall be constructed of corrosion-resistant material such as stainless steel or durable polymers (ABS, PVC Schedule 40, Polypropylene, High-density polyethylene, Fiber-reinforced polyester, or material of equivalent durability). Concrete in contact with excreta or leachate shall meet requirements of Section 403.8.2.

403.8.2 Concrete Construction. Concrete construction shall be reinforced, watertight and able to withstand loading weight. Where drainage is required, the processor floor shall be sloped not less than ¼-inch per foot. The flange of each sub-drain shall be set level.

403.8.3 Commodes.

403.8.3.1 Structure. Commodes shall be designed to support users.

403.8.3.2 Odor. Commode design or use shall mitigate the infiltration of odors into the building during normal operation and in the event of temporary power failure.

403.8.3.3 Contact. Commodes shall transport excreta into the compost processor or contain excreta for transfer as designed according to the owner's manual.

403.8.3.4 Vectors. Commodes shall limit vectors and prevent human contact except for regular maintenance as designed according to the owner's manual.

403.8.4 Compost Processors. Compost processors shall be designed in accordance with Sections 403.8.4.1 through 403.8.4.9 and shall maintain unsaturated aerobic composting conditions within the compost mass, through the drainage, absorption, or desiccation of leachate, and aeration of the processor.

403.8.4.1 Leachate. Leachate shall be collected for removal or recirculation within the processor, evaporated, or drained to an approved plumbing drainage system or other location approved by the Authority Having Jurisdiction. Leachate storage tanks shall be constructed and installed in accordance with the following:

403.8.4.1.1 Venting. Leachate storage tanks shall be vented as required for pressure equalization. When required, vents shall be installed on leachate storage tanks and shall extend from the top of the tank. The connection of storage tank vents to the plumbing venting system shall be six inches above the flood level rim of the highest fixture. Vents extending to the outdoor shall terminate no less than 12-inches above grade. The vent terminal shall be directed downward and covered with a 3/32 inch mesh screen to prevent the entry of vermin and insects.

403.8.4.1.1.1 Vent Size. Pressure equalization vents that prevent nitrogen loss by the use of restrictions, or of piping or tubing that is less than the minimum pipe diameter required in the plumbing code shall be approved by the Authority Having Jurisdiction.

403.8.4.1.2 Overflow. Where storage tank overflows are installed they shall be connected to the plumbing drainage system.

403.8.4.1.2.1 Backwater Valve. Storage tank overflows shall be provided with a backwater valve or check valve at the point of connection to the plumbing drainage system when connected to a public sewer system. The backwater valve shall be accessible for inspections and maintenance.

403.8.4.1.3 Construction. Leachate storage tanks shall be constructed of polyethylene terephthalate (PET), polyethylene napthalate (PEN), polyamide (Nylon) or a blend of PET, PEN, ethyl vinyl alcohol (EVOH), Nylon, HDPE, or other tanks listed or certified to US 49 CFR Section 178.274 Specifications for UN Portable Tanks.

403.8.4.1.4 Above Grade. Above grade storage tanks are prohibited where subject to freezing conditions, or shall be provided with an adequate means of freeze protection. The above grade leachate storage tank shall be provided with a high-water alarm. The alarm shall report when 80 percent volume is reached.

403.8.4.1.5 Below Grade. Leachate storage tanks installed below grade shall be structurally designed to withstand all anticipated earth or other loads. Tank covers shall be capable of supporting an earth load of not less than 300 pounds per square foot (lb/ft^2) (1465 kg/m^2) when the tank is designed for underground installation. Below grade leachate tanks installed underground shall be provided with manholes. The manhole opening shall be a minimum diameter of 20 inches (508 mm) and located a minimum of 4 inches (102 mm) above the surrounding grade. The surrounding grade shall be sloped away from the manhole. Underground tanks shall be ballasted, anchored, or otherwise secured, to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down system should meet or exceed the buoyancy force of the tank. The below grade leachate storage tank level shall be provided with a high-water alarm.

403.8.4.1.6 Marking. Where openings are provided to allow a person to enter the tank, the opening shall be marked with the following words: "DANGER-CONFINED SPACE."

403.8.4.1.7 Openings. All openings shall be covered and secured to prevent tampering. Openings shall be screened or covered to prevent rodent infiltration and be protected against unauthorized human entry.

403.8.4.2 Vectors. The compost processor shall be designed and installed to limit vector access through management as required in the owner's manual.

403.8.4.3 Transfer. Where unfinished excreta or diverted urine is transferred between processors or from commode to processor, transfer and cleaning of containers and provisions for limiting user exposure shall be according to the owner's manual.

403.8.4.4 Watertightness. Processors shall be constructed of watertight material in accordance with Section 403.8.1.

403.8.4.5 Rodentproofing. The compost processor shall be protected to prevent the entrance of insects, birds, or rodents. No unsecured opening other than vents, drainage, or commode may exceed ½-inch in the least dimension.

403.8.4.6 Active Conditions. The compost processor or processors shall be sized to compost excreta for a minimum of one year of biologically active conditions. Biologically active conditions are at or above a daily average of 42°F (6°C).

Exception: Systems with shorter retention shall be permitted where either,

(a) humus from the compost processor has been tested according to Section 403.8.5.2 and there is either a secondary composting stage where humus is retained in a well maintained compost bin or other facility designated for the exclusive purpose of containing humus removed from the compost processor, or

(b) humus is removed off site for processing or disposal at an approved facility.

403.8.4.7 Secondary Composting. Humus to be transferred to secondary composting shall first be tested according to Section 403.8.5.2. Secondary composting shall be labeled and protected from human contact. Contact with precipitation and surface waters is prohibited.

403.8.4.8 Ventilation. Negative ventilation between the commode and compost processor shall be provided when the compost processor is connected directly to the commode without a trap. Commodes that are not connected to the compost processor do not require a vent.

403.8.4.8.1 Vent Terminals. Vent stacks shall terminate exterior the building as required by the plumbing or mechanical code.

403.8.4.9 Sizing. The compost processor shall be sized to accommodate the maximum daily adult usage as specified by the manufactures published ratings. Site built compost processors shall be sized to hold a minimum of 10 gallons of material per person per year while allowing for the removal of the humus, or as specified by the system designer.

403.8.5 Testing. Composting toilet systems shall be tested in accordance with Section 403.8.5.1 and Section 403.8.5.2

403.8.5.1 Compost Processors. Compost processors shall be tested for water tightness by filling the system to the maximum designed liquid storage capacity of the unit for a duration of 24 hours.

403.8.5.2 Humus. The owner or owner's agent of the composting toilet system shall verify user's compliance with the manufacturer's maintenance and operation manual in accordance with Section 403.7 by submitting a sample of the humus from the first treatment period after a minimum of one year of biologically active conditions to a certified laboratory before removal of humus from the composting processor. Where multiple compost processors are used, the humus sample shall be removed from the last compost processor. The sample collection shall be tested in accordance with EPA/625/R-92/013, Appendix F, Section 1.2. Humus shall not have a moisture content exceeding 75 percent by weight, and shall not exceed 200 fecal coliforms/gram.

403.8.6 Humus Removal. Humus shall be removed according to the owner's manual. Humus from the compost processor used around ornamental shrubs, flowers, trees, or fruit trees shall be mixed with soil or mulch and covered with no less than 3 inches of cover material. Depositing humus from any composting toilet system around any edible vegetable or vegetation shall be prohibited.

403.9 Urine Diversion System Design Requirements. The design and installation of urine diversion systems shall be in accordance with Section 403.9.1 through Section 403.9.13.

403.9.1 Purpose. The purpose of this section is to enable the installation of urine diversion and collection systems to improve the function of composting toilet systems and prevent nutrient pollution of ground and surface waters.

403.9.2 Material Requirements. Material used for urine diversion shall be stainless steel or non-metallic pipe. Concrete piping is prohibited.

403.9.3 Identification. All urine diversion piping shall be identified.

403.9.4 Change of Direction. Changes in direction of urine diversion piping shall be made by a long-sweep 90 degree fitting or other approved fittings of equivalent sweep.

403.9.5 Sizing. Pipe sizes shall be in accordance with the plumbing code. Each urine diversion fixture shall be rated as one drainage fixture unit. Piping or tubing for urine diversion that is less than the minimum pipe diameter required in the plumbing code shall be approved by the Authority Having Jurisdiction.

403.9.6 Traps. Fixtures discharging into urine diversion piping connected to the plumbing drainage system shall be trapped and vented according to the plumbing code.

403.9.7 Grade of Horizontal Piping. Urine diversion piping shall be installed at a minimum grade of ½-inch per foot, or 4 percent toward the point of disposal.

403.9.8 Cleanouts. A cleanout shall be provided at the upper terminal of each drain line, every 50 feet and at an aggregate horizontal change of direction exceeding 135 degrees.

403.9.9 Venting. Commode fixtures without traps that require ventilation shall be connected to either a dry toilet ventilation stack or a urine diversion ventilation stack. Nonwater urinals used as urine diversion systems shall be connected to a dry toilet ventilation stack or a urine diversion ventilation stack.

403.9.10 Discharge. A urine-diversion system shall be diverted to a storage tank or discharge to an approved plumbing drainage system.

403.9.11 Urine Storage Tanks. Urine storage tanks shall be constructed and installed in accordance with Section 403.9.11.1 through Section 403.9.11.8.

403.9.11.1 Venting. Urine storage tanks shall be vented as required for pressure equalization. When required, vents shall be installed on urine storage tanks and shall extend from the top of the tank. The connection of storage tank vents to the plumbing venting system shall be six inches above the flood level rim of the highest fixture. Vents extending to the outdoor shall terminate no less than 12-inches above grade. The vent terminal shall be directed downward and covered with a 3/32 inch mesh screen to prevent the entry of vermin and insects.

403.9.11.1.1 Vent Size. Pressure equalization vents that prevent nitrogen loss by the use of restrictions, or of piping or tubing that is less than the minimum pipe diameter required in the plumbing code shall be approved by the Authority Having Jurisdiction.

403.9.11.2 Traps. Urine storage tanks shall prevent odors and nitrogen loss from the tank inlet by means of a P-trap, mechanical trap, submerged inlet piping, or other means approved by the Authority Having Jurisdiction. Submerged inlet piping shall remain submerged during use and after pumpout.

Exception: Tanks of five gallons or less connected to fixtures with active ventilation or having an integrated seal.

403.9.11.3 Overflow. Where storage tank overflows are installed they shall be connected to a plumbing drainage system.

403.9.11.3.1 Backwater Valve. Storage tank overflows shall be provided with a backwater valve or check valve at the point of connection to the plumbing drainage system when connected to a public sewer system. The backwater valve shall be accessible for inspections and maintenance.

403.9.11.4 Construction. Urine storage tanks shall be constructed of polyethylene terephthalate (PET), polyethylene napthalate (PEN), polyamide

(Nylon) or a blend of PET, PEN, ethyl vinyl alcohol (EVOH), Nylon, HDPE, or other tanks listed or certified to US 49 CFR Section 178.274 Specifications for UN Portable Tanks.

403.9.11.5 Above Grade. Above grade storage tanks shall be prohibited where subject to freezing conditions, or shall be provided with an adequate means of freeze protection. The above grade urine storage tank shall be provided with a high-water alarm. The alarm shall report when 80 percent volume is reached.

403.9.11.6 Below Grade. Urine storage tanks installed below grade shall be structurally designed to withstand all anticipated earth or other loads. Tank covers shall be capable of supporting an earth load of not less than 300 pounds per square foot (lb/ft^2) (1465 kg/m^2) when the tank is designed for underground installation. Below grade urine tanks installed underground shall be provided with manholes. The manhole opening shall be a minimum diameter of 20 inches (508 mm) and located a minimum of 4 inches (102 mm) above the surrounding grade. The surrounding grade shall be sloped away from the manhole. Underground tanks shall be ballasted, anchored, or otherwise secured, to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down system should meet or exceed the buoyancy force of the tank. The below grade urine storage tank level shall be provided with a high-water alarm. The alarm shall report when 80 percent volume is reached.

403.9.11.7 Marking. Where openings are provided to allow a person to enter the tank, the opening shall be marked with the following words: "DANGER-CONFINED SPACE."

403.9.11.8 Openings. All openings shall be covered and secured to prevent tampering. Openings shall be screened or covered to prevent rodent infiltration and be protected against unauthorized human entry.

403.9.12 Maintenance Plan. Every urine diversion system shall have a maintenance plan that includes both a pumpout schedule and contract, or an onsite discharge plan. The maintenance plan shall also include a pipe cleaning schedule.

403.9.13 Treatment, Reuse, and Disposal. Where urine is to be reused onsite, a treatment method for sanitization shall be included in the owner's manual. Approved methods of treatment shall include:

(1) Retention without addition for six months before usage. Two or more holding tanks shall be required for retention,
(2) Application to the compost processor,
(3) Pasteurization to 158° F. (70°C) for thirty minutes, or
(4) Other method approved by the Authority Having Jurisdiction.

404.0 Appliances.

404.1 Dishwashers. Residential and commercial dishwashers shall be in accordance with the Energy Star program requirements.

404.2 Clothes Washers. Residential clothes washers shall be in accordance with the Energy Star program requirements. Commercial clothes washers shall be in accordance with Energy Star program requirements, where such requirements exist.

405.0 Pressure Regulator.

405.1 Installation. Pressure regulators shall be installed in accordance with the plumbing code.

406.0 Water Softeners and Treatment Devices.

406.1 Water Softeners. Actuation of regeneration of water softeners shall be listed to NSF 44. Water softeners shall have a rated salt efficiency exceeding 3400 grains (gr) (0.2200 kg) of total hardness exchange per pound (lb) (0.5 kg) of salt, based on sodium chloride (NaCl) equivalency, and shall not generate more than 4 gallons (15.1 L) of water per 1000 grains (0.0647 kg) of hardness removed during the service cycle.

406.2 Water Softener Limitations. In residential buildings, where the supplied potable water hardness is equal to or less than 8 grains per gallon (gr/gal) (137 mg/L) measured as total calcium carbonate equivalents, water softening equipment that discharges water into the wastewater system during the service cycle shall not be allowed, except as required for medical purposes.

406.3 Point-of-Use Reverse Osmosis Water Treatment Systems. Reverse osmosis water treatment systems installed in residential occupancies shall be equipped with automatic shutoff valves to prevent discharge when there is no call for producing treated water. Reverse osmosis water treatment systems shall be listed to meet NSF58.

406.4 Drinking Water Treatment Systems. Drinking water treatment systems shall be listed to WQA/ASPE S-803.

407.0 Occupancy Specific Water Efficiency Requirements.

407.1 Commercial Food Service.

407.1.1 Ice Makers. Ice makers shall be air cooled and shall be in accordance with Energy Star for energy use for commercial ice machines. Ice makers producing cubed-type ice shall not exceed 20 gallons of water per 100 pounds of ice produced. Ice makers producing nugget and flake ice shall not exceed 14 gallons of water per 100 pound of ice produced.

407.1.2 Food Steamers. Boilerless type steamers shall not consume more than 2.0 gallons (7.6 L) per compartment. Boiler type steamers shall not consume more than 1.5 gallons (5.7 L) per pan per hour.

407.1.3 Combination Ovens. Combination ovens shall not use water in the convection mode except when

utilizing a moisture nozzle for food products in the oven. The total amount of water used by the moisture nozzle in the convection mode shall not exceed a half a gallon per hour per oven cavity. When operating in the steamer mode, combination ovens shall not use more than 1.5 gallons (5.7 L) per hour per pan.

407.1.4 Grease Interceptors. Grease interceptor maintenance procedures shall not include post-pumping/cleaning refill using potable water. Refill shall be by connected appliance accumulated discharge only.

407.1.5 Dipper Well Faucets. Where dipper wells with a permanent water supply are installed, the water supply to a dipper well shall have a shutoff valve and flow control. The flow of water into a dipper well shall be limited by at least one of the following methods:

(1) **Maximum Continuous Flow.** Water flow shall not exceed the water capacity of the dipper well in one minute at supply pressure of 60 psi (414 kPa), and the maximum flow shall not exceed 0.2 gpm (0.8 L/m) at a supply pressure of 60 psi (414 kPa). The water capacity of a dipper well shall be the maximum amount of water that the fixture can hold before water flows into the drain.

(2) **Metered or Sensor Activated Flow.** The volume of water dispensed into a dipper well in each activation cycle of a self closing fixture fitting shall not exceed the water capacity of the dipper well, and the maximum flow shall not exceed 0.2 gpm (0.8 L/m) at a supply pressure of 60 psi (414 kPa).

407.1.6 Food Waste Devices. Where food waste devices exist they shall be installed in accordance with Section 407.1.6.1 through Section 407.1.6.5.

407.1.6.1 Pulpers and Mechanical Strainers. The water use for the pulpers or mechanical strainers shall not exceed 2 gpm. A flow restrictor shall be installed on the water supply to limit the water flow.

407.1.6.2 Food Waste Disposers. The water use for the food waste grinder shall not exceed the 8 gpm under full load condition and 1 gpm under no-load condition. Flow restrictors shall be installed on the water supply to limit the water flow rate to a maximum of 8 gpm. A load sensing device shall be installed to monitor current demand and regulate water flow.

407.1.6.3 Time Out and Shut Off. Pulpers, mechanical strainers, and food waste disposers shall have a time out system with push button to reactivate. The maximum allowable run time cycle shall be 10 minutes.

407.1.6.4 Sink Drain Outlets. Where a strainer or basket is installed they shall be readily removable.

407.1.6.5 Strainer Baskets. Strainer (scrapper) baskets shall either fit over a sink compartment or be attached to a drain system. The strainer baskets shall be readily removable for emptying.

407.2 Medical and Laboratory Facilities.

407.2.1 X-Ray Film Processing Units. Processors for X-ray film exceeding 6 inches (152 mm) in any dimension shall be equipped with water recycling units.

407.2.2 Exhaust Hood Liquid Scrubber Systems. Liquid scrubber systems for exhaust hoods and ducts shall be of the recirculation type. Liquid scrubber systems for perchloric acid exhaust hoods and ducts shall be equipped with a timer-controlled water recirculation system. The collection sump for perchloric acid exhaust systems shall be designed to automatically drain after the wash down process has completed.

408.0 Leak Detection and Control.

408.1 General. Where installed, leak detection and control devices shall comply with IAPMO IGC115. Note: Leak detection and control devices help protect property from water damage and also conserve water by shutting off the flow when leaks are detected.

409.0 Fountains and Other Water Features.

409.1 Use of Alternate Water Source for Special Water Features. Special water features such as ponds and water fountains shall be provided with reclaimed (recycled) water, rainwater, or on-site treated non-potable water where the source and capacity is available on the premises and approved by the Authority Having Jurisdiction.

410.0 Meters.

410.1 Required. A water meter shall be required for each building site connected to a public water system, including municipally supplied reclaimed (recycled) water. In other than single-family houses, a dedicated meter shall be installed in accordance to Table 410.1.

410.2 Approval. Dedicated meters other than water utility meters used for billing purposes shall be approved by the Authority Having Jurisdiction for the intended use.

410.3 Remote Data Transfer Requirements. Where more than 10 non-utility-owned water meters are located at a building site, the meters shall include remote data transfer capability to collect and analyze the data at a single location.

411.0 HVAC Water Efficiency.

411.1 Once-Through Cooling. Once-through cooling using potable water is prohibited.

411.2 Cooling Towers and Evaporative Coolers. Cooling towers and evaporative coolers shall be equipped with makeup water and blow down meters, conductivity controllers and overflow alarms. Cooling towers shall be equipped with efficiency drift eliminators that achieve drift reduction to 0.002 percent of the circulated water volume for counterflow towers and 0.005 percent for cross-flow towers.

411.3 Cooling Tower Makeup Water. Not less than five cycles of concentration is required for air-conditioning

TABLE 410.1
DEDICATED WATER METERING REQUIREMENTS

APPLICATION	REQUIREMENTS
Cooling Towers	The makeup water supply to cooling towers, evaporative condensers, and fluid coolers. Cooling towers sharing a common basin can be grouped together using one meter.
Evaporative Coolers	The makeup water supply to an evaporative cooler having an air flow exceeding 30 000 cubic feet per minute (ft^3/min) (50 970.3 m^3/hr).
Fluid Coolers and Chillers – Open Systems	The makeup water supply on water-cooled fluid coolers and chillers not utilizing closed-loop recirculation.
Hydronic Cooling Systems – Closed Loop	Systems with 50 ton (175 843W) or greater of cooling capacity and where a make-up water supply is connected.
Hydronic Heating Systems	The makeup water supply to one or more boilers collectively exceeding 1 000 000 British thermal units per hour (Btu/h) (293 071 W).
Industrial Processes	The water supply to an industrial water-using process where the average consumption exceeds 1000 gallons per day (gal/d) (3 785 L/d). Like equipment sharing one common water supply can be grouped together using one meter. **Exception:** Processes using untreated water where the water is directly returned to the original source after use.
Landscape Irrigation	Landscape irrigation water where either of the following conditions exist: 1. Total accumulated landscape area with in-ground irrigation system exceeds 2500 sq. ft. (232 m^2), or 2. Total accumulated landscape area using an automatic irrigation controller exceeds 1500 sq. ft. (139 m^2) **Exception:** Where the water purveyor provides a separate water supply meter that serves only the irrigation system, an additional dedicated meter is not required.
Onsite Water Collection Systems	Potable or reclaimed water supplies for supplementing onsite alternative water collection systems.
Ornamental Water Features	Potable or reclaimed water supplies for ornamental water features where the water feature uses an automatic refill valve.
Pools and Spas	A makeup water supply to a swimming pool or spa. **Exception:** Where the pool or spa has less than 100 square feet (9 m^2) of water surface and is refilled from a hose bibb without an automatic refill valve.
Roof Spray Systems	Roof spray systems for irrigating vegetated roofs or thermal conditioning covering an area greater than 300 square feet (28 m^2). **Exception:** Temporary above-surface spray systems connected to a hose bibb and without an automatic controller are not required to have a dedicated meter
Tenant Buildings - Common Areas	Water supplies used in common areas of a site. The dedicated meter for common area water use shall not include water supplied inside tenant space. Water supplies for sanitary fixtures and other water use in common areas can be grouped together for metering requirements, except where dedicated water meter installations are otherwise required.
Tenant Spaces - Residential	All water supplies to each residential tenant space for indoor water use. **Exception:** Where a water purveyor has individual meters for each tenant space, and the other meter requirements included in Table 410.1 do not apply, no additional dedicated meter is required.
Tenant Spaces - Non-residential, car washes	All water supplies to individual non-residential tenant spaces for indoor water use where any of the following conditions exist: 1. The nominal size of a water supply pipe(s) to the individual tenant space is greater than 1/2", or 2. Water consumption within in the tenant space is estimated or expected to average greater than 1000 gallons/day (3 785L/d). Where water is supplied to tenant space that is not required to have dedicated meter, the water supply pipe (s) shall be accessible to install a meter. **Exception:** Where a water purveyor has individual meters for each tenant space and the other meter requirements included in Table 410.1 do not apply, no additional dedicated meter is required.

cooling tower makeup water having a total hardness of less than 11 gr/gal (188 mg/L) expressed as calcium carbonate. Not less than 3.5 cycles of concentration is required for air-conditioning cooling tower makeup water having a total hardness equal to or exceeding 11 gr/gal (188 mg/L) expressed as calcium carbonate.

Exception: Where silicon dioxide concentrations measured as silicon dioxide would exceed 120 mg/L, the tower's cycles of concentration shall be permitted to be set to ensure that this level of 120 mg/L is not exceeded, even if the cycles of concentration are lower than levels specified in this section.

411.4 Evaporative Cooler Water Use. Evaporative cooling systems (also known as swamp coolers) shall use less than 3.5 gallons (13.2 L) of water per ton-hour of cooling when system controls are set to maximum water use. Water use, expressed in maximum water use per ton-hour of cooling, shall be marked on the device and included in product user manuals, product information literature, and installation instructions. Water use information shall be readily available at the time of code compliance inspection.

411.4.1 Overflow Alarm. Cooling systems shall be equipped with an overflow alarm to alert building owners, tenants, or maintenance personnel when the water refill valve continues to allow water to flow into the reservoir when the reservoir is already full. The alarm shall have a minimum sound pressure level rating of 85 dBa measured at a distance of ten feet.

411.4.2 Automatic Pump Shut-Off. Cooling systems shall automatically cease pumping water to the evaporation pads when airflow across evaporation pads ceases.

411.4.3 Cooler Reservoir Discharge. A water quality management system (either timer or water quality sensor) is required. Where timers are used, the time interval between discharge of reservoir water shall be set to 6 hours or greater of cooler operation. Where water quality sensors are used, the discharge of reservoir water shall be set for greater 800 ppm or greater of Total Dissolved Solids (TDS). Continuous discharge or continuous bleed systems are prohibited.

411.4.4 Discharge Water Reuse. Discharge water shall be reused where appropriate applications exist on site. Where a nonpotable water source system exists on site, evaporative cooler discharge water shall be collected and discharged to such collection system.

Exception: Where the reservoir water adversely affects the quality of the nonpotable water supply making the nonpotable water unusable for its intended purposes.

411.4.5 Discharge Water to Drain. Where discharge water is not recovered for reuse, the sump overflow line shall not be directly connected to a drain. Where the discharge water is put into a sanitary drain, a minimum 6 inch (152 mm) air gap is required between the termination of the discharge line and the drain opening. The discharge line shall terminate in a location that is readily visible to the building owner, tenants, or maintenance personnel.

411.5 Use of Reclaimed (Recycled) and On-Site Treated Non-Potable Water for Cooling. Reclaimed (recycled) or on-site treated non-potable water used for industrial and commercial cooling or air-conditioning shall be approved for use by the water/wastewater utility and the Authority Having Jurisdiction.

411.5.1 Drift Eliminator. A drift eliminator shall be utilized in a cooling system, utilizing alternate sources of water, where the aerosolized water may come in contact with employees or members of the public.

411.5.2 Disinfection. A biocide shall be used to treat the cooling system recirculation water where the recycled water may come in contact with employees or members of the public.

412.0 Condensate Recovery. Where condensate is used for on-site treated non-potable water, it shall be collected, stored, and treated in accordance with Section 504.0.

412.1 Condensate Drainage Recovery. Condensate from air-conditioning, boiler and steam systems used to supply water for non-potable water systems shall be in accordance with Section 504.0.

413.0 Water-Powered Sump Pumps. Sump pumps powered by potable or reclaimed (recycled) water pressure shall only be used as an emergency backup pump. The water-powered pump shall be equipped with a battery powered alarm having a minimum rating of 85 dBa at 10 feet (3048 mm). Water-powered pumps shall have a water efficiency factor of pumping at least 1.4 gallons (5.3 L) of water to a height of 10 feet (3048 mm) for every gallon of water used to operate the pump, measured at a water pressure of 60 psi (414 kPa). Pumps shall be clearly labeled as to the gallons of water pumped per gallon of potable water consumed.

Water-powered stormwater sump pumps shall be equipped with a reduced pressure principle backflow prevention assembly.

414.0 Landscape Irrigation Systems.

414.1 General. Where landscape irrigation systems are installed, they shall use low application irrigation methods and comply with Sections 413.2 through 413.13. Requirements limiting the amount or type of plant material used in landscapes shall be established by the Authority Having Jurisdiction.

Exception: Plants grown for food production.

414.2 Maximum Velocity. Velocity of water flow shall not exceed 5 feet per second (1.5 m/s) for thermoplastic irrigation pipes. Velocity of water flow shall not exceed 7.5 feet per second (2.3 m/s) for metal irrigation pipes.

414.3 Backflow Protection. Potable water and reclaimed water supplies to landscape irrigation systems shall be protected from backflow in accordance with the plumbing code and Authority Having Jurisdiction.

414.4 Use of Alternate Water Sources for Landscape Irrigation. Where available by pre-existing treatment,

storage or distribution network, and where approved by the Authority Having Jurisdiction, alternative water source(s) complying with Chapter 5 shall be utilized for landscape irrigation. Where adequate capacity and volumes of pre-existing alternative water sources are available, the irrigation system shall be designed to use minimum of 75 percent of alternative water for the annual irrigation demand before supplemental potable water is used.

414.4.1 Master Valve. Where continuously pressurized alternate water sources supply an existing irrigation system, a master valve shall be installed at the point where the alternate water sources supply piping connects to the existing irrigation system downstream of the backflow preventer where required.

414.4.2 Identification. Where alternate water sources supply an existing irrigation system, the existing sprinkler heads, valve boxes, the continuously pressurized line supplying the irrigation master valve, or any other components required by the Authority Having Jurisdiction, shall be colored purple. The piping supplying the irrigation master valve shall be identified in accordance with Chapter 5.

414.4.2.1 Additional Zones. Newly installed zones shall have purple pipe.

414.5 Irrigation Control Systems. Where installed as part of a landscape irrigation system, irrigation control systems shall:

414.5.1 Automatically adjust the irrigation schedule to respond to plant water needs determined by weather or soil moisture conditions.

414.5.2 Utilize on-site sensors to inhibit or suspend irrigation during a rainfall or freezing conditions.

414.5.3 Utilize either one or more on-site sensors or a weather-based irrigation controller listed to the US EPA WaterSense Weather Based Irrigation Controllers Specification to suspend irrigation when adequate soil moisture is present for plant growth.

414.5.4 Have the capability to program multiple and different run times for each irrigation zone to enable cycling of water applications and durations to mitigate water flowing off of the intended irrigation zone.

414.5.5 Be capable of indicating to the user when it is not receiving a signal or local sensor input.

414.5.6 Be capable of allowing for a manual operation troubleshooting test cycle and shall automatically return to sensor input mode within some period of time as designated by the manufacturer, even when the switch is still positioned for manual operation.

414.5.7 The site specific settings of the irrigation control system affecting the irrigation and shall be posted at the control system location. The posted data, where applicable to the settings of the controller, shall include:

(1) Precipitation rate for each zone.

(2) Plant evapotranspiration coefficients for each zone.

(3) Soil absorption rate for each zone.

(4) Rain sensor settings.

(5) Soil moisture setting.

(6) Peak demand schedule including run times for each zone and the number of cycles to mitigate runoff and monthly adjustments or percentage.

414.6 Low Flow Irrigation. Irrigation zones using low flow irrigation emitters shall comply with ASABE/ICC 802 Landscape Irrigation Sprinkler and Emitter Standard and be equipped with filters sized according to manufacturer's recommendation for the specific low flow emitter, and with a pressure regulator installed upstream of the irrigation emission devices as necessary to reduce the operating water pressure meeting manufacturers' equipment requirements.

414.7 Mulched Planting Areas. Only low flow emitters are allowed to be installed in mulched planting areas with vegetation taller than 12 inches (305 mm).

414.8 System Performance Requirements. The landscape irrigation system shall be designed and installed to:

(1) Prevent irrigation water from runoff out of the irrigation zone.

(2) Prevent water in the supply-line drainage from draining out between irrigation events.

(3) Not allow irrigation water to be applied onto or enter non-targeted areas including: adjacent property and vegetation areas, adjacent hydrozones not requiring the irrigation water to meet its irrigation demand, non-vegetative areas, impermeable surfaces, roadways, and structures.

Exception: Landscape features outside of the public right of way such as paved walkways, jogging paths, and golf cart paths, are exempted from this requirement where run off drains into the same hydrozone without puddling.

414.9 Narrow or Irregularly Shaped Landscape Areas. Narrow or irregularly shaped landscape areas, less than 4 feet (1219 mm) in any direction across any opposing boundaries shall not be irrigated by any irrigation emission device except low flow emitters.

414.10 Sloped Areas. Where soil surface rises more than 1 foot (305 mm) per 4 feet (1219 mm) of length, the irrigation zone system average precipitation rate shall not exceed 0.75 inches (19 mm) per hour as verified through either of the following methods:

(a) manufacturer documentation that the precipitation rate for the installed sprinkler head does not exceed 0.75 inches (19 mm) per hour where the sprinkler heads are installed no closer than the specified radius and where the water pressure of the irrigation system is no greater than the manufacturer's recommendations.

(b) catch can testing in accordance with the requirements of the Authority Having Jurisdiction and where emitted water volume is measured with a minimum of 6 catchment containers at random places within the irrigation zone for a minimum of 15 minutes to determine the average precipitation rate, expressed as inches per hour.

414.11 Sprinkler Head Installations. All installed sprinkler heads shall be low precipitation rate sprinkler heads.

414.11.1 Sprinkler Heads in Common Irrigation Zones. Sprinkler heads installed in irrigation zones served by a common valve shall be limited to applying water to plants with similar irrigation needs, and shall have matched precipitation rates (identical inches of water application per hour as rated or tested, plus or minus 5 percent).

414.11.2 Sprinkler Head Pressure Regulation. Sprinkler heads shall utilize pressure regulating devices (as part of irrigation system or integral to the sprinkler head) to maintain manufacturer's recommended operating pressure for each sprinkler and nozzle type.

414.11.3 Pop-up Type Sprinkler Heads. Where pop-up type sprinkler heads are installed, the sprinkler heads shall pop-up to a height above vegetation level and of not less than 4 inches (102 mm) above the soil level when emitting water. Sprinkler heads shall comply with the requirements of standard ASABE/ICC 802-2014.

414.12 Irrigation Zone Performance Criteria. Irrigation zones shall be designed and installed to ensure the average precipitation rate of the sprinkler heads over the irrigated area does not exceed 1.0 inch per hour as verified through either of the following methods:

(a) manufacturer's documentation that the precipitation rate for the installed sprinkler head does not exceed 1.0 inches per hour where the sprinkler heads are installed no closer that the specified radius and where the water pressure of the irrigation system is no greater than the manufacturer's recommendations.

(b) catch can testing in accordance with the requirements of the Authority Having Jurisdiction and where emitted water volume is measured with a minimum of 6 catchment containers at random places within the irrigation zone for a minimum of 15 minutes to determine the average precipitation rate, expressed as inches per hour.

414.13 Qualifications. The Authority Having Jurisdiction shall have the authority to require landscape irrigation contractors, installers, or designers to demonstrate competency. Where required by the Authority Having Jurisdiction, the contractor, installer, or designer shall be certified to perform such work.

414.14 Outside Hose Bibbs. Outside hose bibbs shall be allowed on irrigation pipe downstream of the backflow preventer. Hose bibbs supplying water from the irrigation system shall be indicated by posted signs marked with the words: "CAUTION: NON-POTABLE WATER. DO NOT DRINK." and the symbol in Figure 503.9.

414.15 Excavation and Backfill.

414.15.1 Depth of Irrigation Pipe. Irrigation pipe downstream from the backflow preventer shall be buried at a minimum depth according to Section 414.15.1.1 and Section 414.15.1.2.

414.15.1.1 Landscape Areas. Irrigated landscaped areas not exceeding 10,000 square feet (929 m^2) shall have irrigation main lines buried a minimum of 12 inches (305 mm) and irrigation lateral lines buried a minimum of 8 inches (203 mm). Irrigated landscaped areas greater than 10,000 square feet (929 m^2) shall have irrigation main lines buried a minimum of 18 inches (457 mm) and irrigation lateral lines buried a minimum of 12 inches (305 mm).

414.15.1.2 Vehicular Surfaces. Irrigation pipe installed under vehicular paving and pervious pavers, including landscaped fire lanes, shall be sleeved with a minimum of one 1-inch pipe (25 mm) size greater than the irrigation pipe and buried at a minimum depth of 24 inches (610 mm) in all cases.

414.15.2 Backfill. All excavation for irrigation pipe installation shall be backfilled in thin layers to 12 inches (305 mm) with clean earth, which shall not contain stones, boulders, cinderfill, frozen earth, construction debris, or other materials that would damage or break the piping. Fill shall be properly compacted. Suitable precautions shall be taken to ensure permanent stability for pipe laid in filled or made ground.

415.0 Trap Seal Protection.

415.1 Water Supplied Trap Primers. Water supplied trap primers shall be electronic or pressure activated and shall use no more than 30 gallons (114 L) per year per drain. Where an alternate water source, as defined by this code, is used for fixture flushing or other uses in the same room, the alternate water source shall be used for the trap primer water supply.

Exception: Flushometer tailpiece trap primers complying with IAPMO PS 76 are exempted from the provisions of this section.

415.2 Drainage Type Trap Seal Primer Devices. Drainage type trap seal primer devices shall not be limited in the amount of water they discharge.

416.0 Vehicle Wash Facilities.

416.1 Automatic. The maximum make-up water use for automobile washing shall not exceed 40 gallons (151 L) per vehicle for in-bay automatic car washes and 35 gallons (132 L) for conveyor and express type car washes.

416.2 Self-Service. Spray wands and foamy brushes shall use no more than 3.0 gpm (11.36 L/m).

416.3 Reverse Osmosis. Spot-free reverse osmosis discharge (reject) water shall be recycled.

416.4 Towel Ringers. Towel ringers shall have a positive shut-off valve. Spray nozzles shall be replaced annually.

Exemption: Bus and large commercial vehicles washes are exempt from the requirements in this section.

417.0 Swimming Pools, Spas, and Hot Tubs.

417.1 Practices. The following sections outline common practices for reducing energy consumption in regards to pool, spa, and hot tub equipment.

417.2 On and Off Switch. Pool, spa, and hot tub heaters shall be equipped with a readily accessible on and off switch

to allow shutting off the heater without adjusting the thermostat setting. Pool heaters fired by natural gas shall not have continuously burning pilot lights. [ASHRAE 90.1:7.4.5.1]

417.3 Covers. Heated pools and inground permanently installed spas, and portable spas, shall be provided with a vapor retardant cover.

Exception: Where more than 70 percent of the energy for heating, computed over an operating season, is from site-recovered energy such as from a heat pump or solar energy source.

417.3.1 Portable Spas. Portable spa covers shall meet the requirements of APSP-14.

417.4 Time Switches. Time switches shall be installed on swimming pool, spa, and hot tub heaters and pumps.

Exceptions:

(1) Where public health standards require 24-hour pump operation.

(2) Where pumps are required to operate solar and waste heat recovery pool heating systems. [ASHRAE 90.1:7.4.5.3]

DRAFT

CHAPTER 5

ALTERNATE WATER SOURCES FOR NON-POTABLE APPLICATIONS

501.0 General.

501.1 Scope. The provisions of this chapter shall apply to the construction, alteration, and repair of alternate water source systems for non-potable applications.

501.1.1 Allowable Use of Alternate Water. Where approved or required by the Authority Having Jurisdiction, alternate water sources (reclaimed (recycled) water, gray water and onsite treated non-potable water) used in lieu of potable water shall be in accordance with the provisions of this chapter.

501.2 System Design. Alternate water source systems shall be designed in accordance with this chapter by a person registered or licensed to perform plumbing design work or who demonstrates competency to design the alternate water source system as required by the Authority Having Jurisdiction. Components, piping, and fittings used in any alternate water source system shall be listed.

Exceptions:

(1) A person registered or licensed to perform plumbing design work is not required to design gray water systems having a maximum discharge capacity of 250 gallons per day (gal/d) (15.77 L/s) for single family and multi-family dwellings.

(2) A person registered or licensed to perform plumbing design work is not required to design an on-site treated non-potable water system for single family dwellings having a maximum discharge capacity of 250 gal/d (15.77 L/s).

501.3 Permit. It shall be unlawful for any person to construct, install, alter, or cause to be constructed, installed, or altered any alternate water source system in a building or on a premise without first obtaining a permit to do such work from the Authority Having Jurisdiction.

501.4 Component Identification. System components shall be properly identified as to the manufacturer.

501.5 Maintenance and Inspection. Alternate water source systems and components shall be inspected and maintained in accordance with Section 501.5.1 through Section 501.5.3.

501.5.1 Frequency. Alternate water source systems and components shall be inspected and maintained in accordance with Table 501.5 unless more frequent inspection and maintenance is required by the manufacturer.

501.5.2 Maintenance Log. A maintenance log for gray water and on-site treated non-potable water systems is required to have a permit in accordance with Section 501.3 and shall be maintained by the property owner and be available for inspection. The property owner or designated appointee shall ensure that a record of testing, inspection and maintenance as required by Table 501.5 is maintained in the log. The log will indicate the frequency of inspection and maintenance for each system.

501.5.3 Maintenance Responsibility. The required maintenance and inspection of alternate water source systems shall be the responsibility of the property owner, unless otherwise required by the Authority Having Jurisdiction.

TABLE 501.5
MINIMUM ALTERNATE WATER SOURCE TESTING, INSPECTION, AND MAINTENANCE FREQUENCY

DESCRIPTION	MINIMUM FREQUENCY
Inspect and clean filters and screens, and replace (if necessary)	Every 3 months
Inspect and verify that disinfection, filters and water quality treatment devices and systems are operational and maintaining minimum water quality requirements as determined by the Authority Having Jurisdiction	In accordance with manufacturer's instructions, and the Authority Having Jurisdiction
Inspect pumps and verify operation	After initial installation and every 12 months thereafter
Inspect valves and verify operation	After initial installation and every 12 months thereafter
Inspect pressure tanks and verify operation	After initial installation and every 12 months thereafter
Clear debris from and inspect storage tanks, locking devices, and verify operation	After initial installation and every 12 months thereafter
Inspect caution labels and marking	After initial installation and every 12 months thereafter
Inspect and maintain mulch basins for gray water irrigation systems	As needed to maintain mulch depth and prevent ponding and runoff
Cross-connection inspection and test*	After initial installation and every 12 months thereafter

* The cross-connection test shall be performed in the presence of the Authority Having Jurisdiction in accordance with the requirements of this Chapter.

501.6 Operation and Maintenance Manual. An operation and maintenance manual for gray water and on-site treated water systems required to have a permit in accordance with Section 501.3 shall be supplied to the building owner by the system designer. The operating and maintenance manual shall include the following:

(1) Detailed diagram of the entire system and the location of system components.

(2) Instructions on operating and maintaining the system.

(3) Details on maintaining the required water quality as determined by the Authority Having Jurisdiction.

(4) Details on deactivating the system for maintenance, repair, or other purposes.

(5) Applicable testing, inspection, and maintenance frequencies as required by Table 501.5.

(6) A method of contacting the manufacturer(s).

501.7 Minimum Water Quality Requirements. The minimum water quality for alternate water source systems shall meet the applicable water quality requirements for the intended application as determined by the Authority Having Jurisdiction. In the absence of water quality requirements for on-site treated non-potable water and reclaimed (recycled) water systems, the EPA/625/R-04/108 contains recommended water reuse guidelines to assist regulatory agencies develop, revise, or expand alternate water source water quality standards.

Exception: Water treatment is not required for gray water used for subsurface irrigation.

501.8 Material Compatibility. Alternate water source systems shall be constructed of materials that are compatible with the type of pipe and fitting materials, water treatment, and water conditions in the system.

501.9 System Controls. Controls for pumps, valves, and other devices that contain mercury that come in contact with alternate water source water supply are prohibited.

501.10 Commercial, Industrial, and Institutional Restroom Signs. A sign shall be installed in all restrooms in commercial, industrial, and institutional occupancies using reclaimed (recycled) water and on-site treated water for water closets, urinals, or both. Each sign shall contain ½ inch (12.7 mm) letters of a highly visible color on a contrasting background. The location of the sign(s) shall be such that the sign(s) shall be visible to all users. The location of the sign(s) shall be approved by the Authority Having Jurisdiction and shall contain the following text:

TO CONSERVE WATER, THIS BUILDING USES *_____* TO FLUSH TOILETS AND URINALS.

501.10.1 Equipment Room Signs. Each room containing reclaimed (recycled) water and on-site treated water, equipment shall have a sign posted in a location that is visible to anyone working on or near non-potable water equipment with the following wording in 1 inch (25.4 mm) letters:

CAUTION: NON-POTABLE *_____*, DO NOT DRINK. DO NOT CONNECT TO DRINKING WATER SYSTEM. NOTICE: CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM.

_____ Shall indicate RECLAIMED (RECYCLED) WATER or ON-SITE TREATED WATER accordingly.

501.11 Inspection and Testing. Alternate water source systems shall be inspected and tested in accordance with Section 501.11.1 and Section 501.11.2.

501.11.1 Supply System Inspection and Test. Alternate water source systems shall be inspected and tested in accordance with the plumbing code for testing of potable water piping.

501.11.2 Annual Cross-Connection Inspection and Testing. An initial and subsequent annual inspection and test shall be performed on both the potable and alternate water source systems. The potable and alternate water source system shall be isolated from each other and independently inspected and tested to ensure there is no cross-connection in accordance with Section 501.11.2.1 through Section 501.11.2.4.

501.11.2.1 Visual System Inspection. Prior to commencing the cross-connection testing, a dual system inspection shall be conducted by the Authority Having Jurisdiction and other authorities having jurisdiction as follows:

(1) Meter locations of the alternate water source and potable water lines shall be checked to verify that no modifications were made, and that no cross-connections are visible.

(2) Pumps and equipment, equipment room signs, and exposed piping in equipment room shall be checked.

(3) Valves shall be checked to ensure that valve lock seals are still in place and intact. Valve control door signs shall be checked to verify that no signs have been removed.

501.11.2.2 Cross-Connection Test. The procedure for determining cross-connection shall be followed by the applicant in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction to determine whether a cross-connection has occurred as follows:

(1) The potable water system shall be activated and pressurized. The alternate water source system shall be shut down, depressurized, and drained.

(2) The potable water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the alternate water source system is empty. The minimum period the alternate water source system is to remain depressurized shall be determined on a case-by-case basis, taking into account the size and complexity of the potable and the alternate water source distribution systems, but in no case shall that period be less than 1 hour.

(3) The drain on the alternate water source system shall be checked for flow during the test and all fixtures, potable and alternate water source, shall be tested and inspected for flow. Flow from any alternate water source system outlet indicates a cross-connection. No flow from a potable water outlet shall indicate that it is connected to the alternate water source system.

(4) The potable water system shall then be depressurized and drained.

(5) The alternate water source system shall then be activated and pressurized.

(6) The alternate water source system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the potable water system is empty. The minimum period the potable water system is to remain depressurized shall be determined on a case-by-case basis, but in no case shall that period be less than 1 hour.

(7) All fixtures, potable and alternate water source, shall be tested and inspected for flow. Flow from any potable water system outlet indicates a cross-connection. No flow from an alternate water source outlet will indicate that it is connected to the potable water system.

(8) The drain on the potable water system shall be checked for flow during the test and at the end of the test.

(9) If there is no flow detected in any of the fixtures which would indicate a cross-connection, the potable water system shall be repressurized.

501.11.2.3 Discovery of Cross-Connection. In the event that a cross-connection is discovered, the following procedure, in the presence of the Authority Having Jurisdiction, shall be activated immediately:

(1) The alternate water source piping to the building shall be shut down at the meter, and the alternate water source riser shall be drained.

(2) Potable water piping to the building shall be shut down at the meter.

(3) The cross-connection shall be uncovered and disconnected.

(4) The building shall be retested following procedures listed in Section 501.11.2.1 and Section 501.11.2.2.

(5) The potable water system shall be chlorinated with 50 parts-per-million (ppm) chlorine for 24 hours.

(6) The potable water system shall be flushed after 24 hours, and a standard bacteriological test shall be performed. If test results are acceptable, the potable water system shall be recharged.

501.11.2.4 Annual Inspection. An annual inspection of the alternate water source system, following the procedures listed in Section 501.11.2.1 shall be required. Annual cross-connection testing, following the procedures listed in Section 501.11.2.2 shall be required by the Authority Having Jurisdiction, unless site conditions do not require it. In no event shall the test occur less than once in 4 years. Alternate testing requirements shall be approved by the Authority Having Jurisdiction.

501.12 Separation Requirements. All underground alternate water source service piping other than gray water shall be separated from the building sewer in accordance with the plumbing code. Treated non-potable water pipes run or laid in the same trench as potable water pipes shall have a 12 inch (305 mm) minimum vertical and horizontal separation when both pipe materials are approved for use within a building. Where horizontal piping materials do not meet this requirement the minimum separation shall be increased to 60 inches (1524 mm). The potable water piping shall be installed at an elevation above the treated non-potable water piping.

501.13 Abandonment. All alternate water source systems that are no longer in use or fails to be maintained in accordance with Section 501.5 shall be abandoned. Abandonment shall comply with Section 305.0.

501.14 Sizing. Unless otherwise provided for in this standard, alternate water source piping shall be sized in accordance with the plumbing code for sizing potable water piping.

502.0 Gray Water Systems.

502.1 General. The provisions of this section shall apply to the construction, alteration, and repair of gray water systems.

502.2 Gray Water System.

502.2.1 Discharge. Gray water diverted away from a sewer or private sewage disposal system, shall discharge to a subsurface irrigation or subsoil irrigation system, or shall discharge to a mulch basin for single family and multi-family dwellings. Gray water shall not be used to irrigate root crops or food crops intended for human consumption that come in contact with soil.

502.2.2 Surge Capacity. Gray water systems shall be designed to have the capacity to accommodate flow rates entering the system and distribute the total amount of estimated gray water entering the system on a daily basis to a subsurface irrigation field, subsoil irrigation field, or mulch basin without surfacing, ponding, or runoff. A surge tank is required for systems that are unable to accommodate peak flow rates and distribute the total amount of gray water by gravity drainage. The water discharge for gray water systems shall be determined in accordance with Section 502.8.1 or Section 502.8.2. Systems that produce more gray water than needed by the landscape shall discharge excess water into the sewer or private sewage disposal system.

502.2.3 Diversion. The gray water system shall connect to the sanitary drainage system downstream of fixture traps and vent connections through a gray water diverter valve. The gray water diverter shall comply with IAPMO PS 59 and be installed in an accessible location and clearly indicate the direction of flow.

502.2.4 Backwater Valves. Gray water drains subject to backflow shall be provided with a backwater valve so located as to be accessible for inspection and maintenance.

502.3 Connections to Potable and Reclaimed (Recycled) Water Systems. Gray water systems shall have no

direct connection to any potable water supply, on-site treated non-potable water supply, or reclaimed (recycled) water systems. Potable, on-site treated non-potable, or reclaimed (recycled) water is permitted to be used as makeup water for a non-pressurized storage tank provided the connection is protected by an airgap in accordance with the plumbing code.

502.4 Location. No gray water system or part thereof shall be located on any lot other than the lot that is the site of the building or structure that discharges the gray water, nor shall any gray water system or part thereof be located at any point having less than the minimum distances indicated in Table 502.4.

502.5 Plot Plan Submission. No permit for any gray water system shall be issued until a plot plan with appropriate data satisfactory to the Authority Having Jurisdiction has been submitted and approved.

502.6 Prohibited Location. Gray water systems are prohibited where there is insufficient lot area or inappropriate soil conditions for adequate absorption to prevent the ponding, surfacing or runoff of the gray water, or on any property in a geologically sensitive area as determined by the Authority Having Jurisdiction.

502.7 Drawings and Specifications. The Authority Having Jurisdiction shall require any or all of the following information to be included with or in the plot plan before a permit is issued for a gray water system, or at any time during the construction thereof:

(1) Plot plan drawn to scale and completely dimensioned, showing lot lines and structures, direction and approximate slope of surface, location of all present or proposed retaining walls, drainage channels, water supply lines, wells, paved areas and structures on the plot, number of bedrooms and plumbing fixtures in each structure, location of private sewage disposal system and expansion area or building sewer connecting to the public sewer, and location of the proposed gray water system.

(2) Details of construction necessary to ensure compliance with the requirements of this chapter, together with a full description of the complete installation, including installation methods, construction, and materials as required by the Authority Having Jurisdiction.

(3) Details for all holding tanks shall include all dimensions, structural calculations, bracings, and such other pertinent data as required.

(4) A log of soil formations and groundwater level as determined by test holes dug in proximity to any proposed irrigation area, together with a statement of water absorption characteristics of the soil at the proposed site as determined by approved percolation tests.

Exception: The Authority Having Jurisdiction shall permit the use of Table 502.10 in lieu of percolation tests.

(5) Distance between the plot and any surface waters such as lakes, ponds, rivers or streams, and the slope between the plot and the surface water, if in close proximity.

502.8 Procedure for Estimating Gray Water Discharge. Gray water systems shall be designed to distribute the total amount of estimated gray water on a daily basis. The water discharge for gray water systems shall be determined in accordance with Section 502.8.1 or Section 502.8.2.

TABLE 502.4
LOCATION OF GRAY WATER SYSTEM

MINIMUM HORIZONTAL DISTANCE IN CLEAR REQUIRED FROM:	SURGE TANK (feet)	SUBSURFACE AND SUBSOIL IRRIGATION FIELD AND MULCH BED (feet)
Building structures[1]	5[2, 9]	2[3, 8]
Property line adjoining private property	5	5[8]
Water supply wells[4]	50	100
Streams and lakes[4]	50	50[5]
Sewage pits or cesspools	5	5
Sewage disposal field	5	4[6]
Septic tank	0	5
On-site domestic water service line	5	5
Pressurized public water main	10	10[7]

For SI units: 1 foot = 304.8 mm

Note: Where irrigation or disposal fields are installed in sloping ground, the minimum horizontal distance between any part of the distribution system and the ground surface shall be 15 feet (4572 mm).

1 Including porches and steps, whether covered or uncovered, breezeways, roofed carports, roofed patios, carports, covered walks, covered driveways, and similar structures or appurtenances.

2 The distance shall be permitted to be reduced to 0 feet for aboveground tanks when first approved by the Authority Having Jurisdiction.

3 Reference to a 45 degree (0.79 rad) angle from foundation.

4 Where special hazards are involved, the distance required shall be increased as directed by the Authority Having Jurisdiction.

5 These minimum clear horizontal distances shall also apply between the irrigation or disposal field and the ocean mean higher high tide line.

6 Add 2 feet (610 mm) for each additional foot of depth in excess of 1 foot (305 mm) below the bottom of the drain line.

7 For parallel construction or for crossings, approval by the Authority Having Jurisdiction shall be required.

8 The distance shall be permitted to be reduced to 1½ feet (457 mm) for drip and mulch basin irrigation systems.

9 The distance shall be permitted to be reduced to 0 feet for surge tanks of 75 gallons (284 L) or less.

502.8.1 Single Family Dwellings and Multi-Family Dwellings. The gray water discharge for single family and multi-family dwellings shall be calculated by water use records, calculations of local daily per person interior water use, or the following procedure:

(1) The number of occupants of each dwelling unit shall be calculated as follows:

First Bedroom	2 occupants
Each additional bedroom	1 occupant

(2) The estimated gray water flows of each occupant shall be calculated as follows:

Showers, bathtubs and lavatories	25 gallons (95 L) per day/ occupant
Laundry	15 gallons (57 L) per day/ occupant

(3) The total number of occupants shall be multiplied by the applicable estimated gray water discharge as provided above and the type of fixtures connected to the gray water system.

502.8.2 Commercial, Industrial, and Institutional Occupancies. The gray water discharge for commercial, industrial, and institutional occupancies shall be calculated by utilizing the procedure in Section 502.8.1, water use records, or other documentation to estimate gray water discharge.

502.9 Gray Water System Components. Gray water system components shall be in accordance with Section 502.9.1 through Section 502.9.7.

502.9.1 Surge Tanks. Where installed, surge tanks shall comply with the following:

(1) Surge tanks shall be constructed of solid, durable materials not subject to excessive corrosion or decay and shall be watertight. Surge tanks constructed of steel shall be approved by the Authority Having Jurisdiction, provided such tanks comply with approved applicable standards.

(2) Each surge tank shall be vented as required by the plumbing code. The vent size shall be determined based on the total gray water fixture units as outlined in the plumbing code.

(3) Each surge tank shall have an access opening with lockable gasketed covers or approved equivalent to allow for inspection and cleaning.

(4) Each surge tank shall have its rated capacity permanently marked on the unit. In addition, a sign stating GRAY WATER, DANGER — UNSAFE WATER shall be permanently marked on the holding tank.

(5) Each surge tank shall have an overflow drain. The overflow drains shall have permanent connections to the building drain or building sewer, upstream of septic tanks, if any. The overflow drain shall not be equipped with a shutoff valve.

(6) The overflow drainpipes shall not be less in size than the inlet pipe. Unions or equally effective fittings shall be provided for all piping connected to the surge tank.

(7) Surge tank shall be structurally designed to withstand anticipated earth or other loads. Surge tank covers shall be capable of supporting an earth load of not less than 300 pounds per square foot (lb/ft^2) (1465 kg/m^2) when the tank is designed for underground installation.

(8) If a surge tank is installed underground, the system shall be designed so that the tank overflow will gravity drain to the existing sewer line or septic tank. The tank shall be protected against sewer line backflow by a backwater valve installed in accordance with the plumbing code.

(9) Surge tanks shall be installed on dry, level, well-compacted soil if underground or on a level 3 inch (76 mm) thick concrete slab if aboveground.

(10) Surge tanks shall be anchored to prevent against overturning when installed aboveground. Underground tanks shall be ballasted, anchored, or otherwise secured, to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down system shall meet or exceed the buoyancy forces of the tank.

502.9.2 Gray Water Pipe and Fitting Materials. Aboveground and underground building drainage and vent pipe and fittings for gray water systems shall comply with the requirements for aboveground and underground sanitary building drainage and vent pipe and fittings in the plumbing code. These materials shall extend not less than 2 feet (610 mm) outside the building.

502.9.3 Subsoil Irrigation Field Materials. Subsoil irrigation field piping shall be constructed of perforated high-density polyethylene pipe, perforated ABS pipe, perforated PVC pipe, or other approved materials, provided that sufficient openings are available for distribution of the gray water into the trench area. Material, construction, and perforation of the pipe shall be in compliance with the appropriate absorption field drainage piping standards and shall be approved by the Authority Having Jurisdiction.

502.9.4 Subsurface Irrigation Field and Mulch Basin Supply Line Materials. Materials for gray water piping outside the building for non-pressure gravity systems shall be ABS, polyethylene, PVC or other approved DWV pipe. Pressure systems shall be pressure rated polyethylene or PVC or other approved pressure rated pipe. Drip feeder lines shall be PVC or polyethylene tubing.

502.9.5 Valves. Valves shall be accessible.

502.9.6 Trap. Gray water piping discharging into the surge tank or having a direct connection to the sanitary drain or sewer piping shall be downstream of an approved water seal type trap(s). If no such trap(s) exists, an approved vented running trap shall be installed upstream of the connection to protect the building from any possible waste or sewer gases.

502.9.7 Backwater Valve. A backwater valve shall be installed on all gray water drain connections to the sanitary drain or sewer.

502.10 Subsurface Irrigation System Zones. Each zone in an irrigation or disposal field having one or more valved zones shall be of adequate size to receive the gray water anticipated in that zone.

502.10.1 Required Area of Subsurface Irrigation Fields, Subsoil Irrigation Fields and Mulch Basins. The minimum effective irrigation area of subsurface irrigation fields, subsoil irrigation fields, and

mulch basins shall be determined by Table 502.10 for the type of soil found in the excavation, based upon a calculation of estimated gray water discharge pursuant to Section 502.8. For a subsoil irrigation field, the area shall be equal to the aggregate length of the perforated pipe sections within the valved zone multiplied by the width of the proposed subsoil irrigation field.

502.10.2 Determination of Maximum Absorption Capacity. The irrigation field and mulch basin size shall be based on the maximum absorption capacity of the soil and determined using Table 502.10. For soils not listed in Table 502.10, the maximum absorption capacity for the proposed site shall be determined by percolation tests or other method acceptable to the Authority Having Jurisdiction. A gray water system is prohibited where the percolation test shows the absorption capacity of the soil is unable to accommodate the maximum discharge of the proposed gray water irrigation system.

502.10.3 Groundwater Level. No excavation for an irrigation field, disposal field, or mulch basin shall extend within 3 feet (914 mm) vertical of the highest known seasonal groundwater level, nor to a depth where gray water contaminates the groundwater or surface water. The applicant shall supply evidence of groundwater depth to the satisfaction of the Authority Having Jurisdiction.

502.11 Subsurface and Subsoil Irrigation Field, and Mulch Basin Design and Construction. Subsurface and subsoil irrigation field, and mulch basin design and construction shall be in accordance with Section 502.11.1 through Section 502.11.3. Where a gray water irrigation system design is predicated on soil tests, the subsurface or subsoil irrigation field or mulch basin shall be installed at the same location and depth as the tested area.

502.11.1 Subsurface Irrigation Field. A subsurface irrigation field shall be in accordance with Section 502.11.1.1 through Section 502.11.1.6.

TABLE 502.10
DESIGN OF SIX TYPICAL SOILS

TYPE OF SOIL	MINIMUM SQUARE FEET OF IRRIGATION AREA PER 100 GALLONS OF ESTIMATED GRAY WATER DISCHARGE PER DAY	MAXIMUM ABSORPTION CAPACITY IN GALLONS PER SQUARE FOOT OF IRRIGATION/ LEACHING AREA FOR A 24-HOUR PERIOD
Coarse sand or gravel	20	5.0
Fine sand	25	4.0
Sandy loam	40	2.5
Sandy clay	60	1.7
Clay with considerable sand or gravel	90	1.1
Clay with small amounts of sand or gravel	120	0.8

For SI units: 1 square foot = 0.0929 m^2, 1 gallon per day = 0.000043 L/s

TABLE 502.11.1
SUBSURFACE IRRIGATION DESIGN CRITERIA FOR SIX TYPICAL SOILS

TYPE OF SOIL	MAXIMUM EMITTER DISCHARGE	MINIMUM NUMBER OF EMITTERS PER GALLON OF ESTIMATED GRAY WATER DISCHARGE PER DAY*
	gallon/day	gallon/day
Sand	1.8	0.6
Sandy loam	1.4	0.7
Loam	1.2	0.9
Clay loam	0.9	1.1
Silty clay	0.6	1.6
Clay	0.5	2.0

For SI units: 1 gallon per day = 0.000043 L/s

* The estimated gray water discharge per day shall be determined in accordance with Section 502.8.

502.11.1.1 Minimum Depth. Supply piping, including drip feeders, shall be not less than 2 inches (51 mm) below finished grade and covered with mulch or soil.

502.11.1.2 Filter. Not less than 140 mesh (115 micron) filter with a capacity of 25 gallons per minute (gpm) (1.58 L/s), or equivalent shall be installed. Where a filter backwash is installed, the backwash and flush discharge shall discharge into the building sewer or private sewage disposal system. Filter backwash and flush water shall not be used for any purpose.

502.11.1.3 Emitter Size. Emitters shall be installed in accordance with the manufacturer's installation instructions. Emitters shall have a flow path of not less than 1200 microns (μ) (1200 μm) and shall not have a coefficient of manufacturing variation (Cv) exceeding 7 percent. Irrigation system design shall be such that emitter flow variation shall not exceed 10 percent.

502.11.1.4 Number of Emitters. The minimum number of emitters and the maximum discharge of each emitter in an irrigation field shall be in accordance with Table 502.11.1.

502.11.1.5 Controls. The system design shall provide user controls, such as valves, switches, timers, and other controllers, to rotate the distribution of gray water between irrigation zones.

502.11.1.6 Maximum Pressure. Where pressure at the discharge side of the pump exceeds 20 pounds-force per square inch (psi) (138 kPa), a pressure-reducing valve able to maintain downstream pressure not exceeding 20 psi (138 kPa) shall be installed downstream from the pump and before any emission device.

502.11.2 Mulch Basin. A mulch basin shall be in accordance with Section 502.11.2.1 through Section 502.11.2.4.

502.11.2.1 Single Family and Multi-Family Dwellings. The gray water discharge to a mulch basin is limited to single family and multi-family dwellings.

502.11.2.2 Size. Mulch basins shall be of sufficient size to accommodate peak flow rates and distribute the total amount of estimated gray water on a daily basis without surfacing, ponding or runoff. Mulch basins shall have a depth of not less than 10 inches (254 mm) below finished grade. The mulch basin size shall be based on the maximum absorption capacity of the soil and determined using Table 502.10.

502.11.2.3 Minimum Depth. Gray water supply piping, including drip feeders, shall be a minimum 2 inches (51 mm) below finished grade and covered with mulch.

502.11.2.4 Maintenance. The mulch basin shall be maintained periodically to retain the required depth and area, and to replenish the required mulch cover.

502.11.3 Subsoil Irrigation Field. Subsoil irrigation fields shall be in accordance with Section 502.11.3.1 through Section 502.11.3.3.

502.11.3.1 Minimum Pipe Size. Subsoil irrigation field distribution piping shall be not less than 3 inches (80 mm) diameter.

502.11.3.2 Filter Material and Backfill. Filter material, clean stone, gravel, slag, or similar material acceptable to the Authority Having Jurisdiction, varying in size from ¾ of an inch (19.1 mm) to 2½ inches (64 mm) shall be placed in the trench to the depth and grade in accordance with Table 502.11.3. The perforated section of subsoil irrigation field distribution piping shall be laid on the filter material in an approved manner. The perforated section shall then be covered with filter material to the minimum depth in accordance with Table 502.11.3. The filter material shall then be covered with porous material to prevent closure of voids with earth backfill. No earth backfill shall be placed over the filter material cover until after inspection and acceptance.

502.11.3.3 Subsoil Irrigation Field Construction. Subsoil irrigation fields shall be constructed in accordance with Table 502.11.3. Where necessary on sloping ground to prevent excessive line slopes, irrigation lines shall be stepped. The lines between each horizontal leaching section shall be made with approved watertight joints and installed on natural or unfilled ground.

502.12 Gray Water System Color and Marking Information. Pressurized gray water distribution systems shall be identified as containing non-potable water in accordance with the plumbing code.

502.13 Special Provisions.

502.13.1 Other Collection and Distribution Systems. Other collection and distribution systems shall be approved by the local Authority Having Jurisdiction, as allowed by Section 102.0 of this standard and the plumbing code.

502.13.2 Higher Requirements. Nothing contained in this chapter shall be construed to prevent the Authority Having Jurisdiction from requiring compliance with higher requirements than those contained herein, where such higher requirements are essential to maintain a safe and sanitary condition.

TABLE 502.11.3
SUBSOIL IRRIGATION FIELD CONSTRUCTION

DESCRIPTION	MINIMUM	MAXIMUM
Number of drain lines per valved zone	1	-
Length of each perforated line	-	100 feet
Bottom width of trench	12 inches	18 inches
Spacing of lines, center to center	4 feet	-
Depth of earth cover of lines	10 inches	-
Depth of filter material cover of lines	2 inches	-
Depth of filter material beneath lines	3 inches	-
Grade of perforated lines level	level	3 inches per 100 feet

For SI units: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 inch per foot = 83.3 mm/m

502.14 Testing. Building drains and vents for gray water systems shall be tested in accordance with the plumbing code. Surge tanks shall be filled with water to the overflow line prior to and during inspection. Seams and joints shall be left exposed, and the tank shall remain watertight. A flow test shall be performed through the system to the point of gray water discharge. Lines and components shall be watertight up to the point of the irrigation perforated and drip lines.

502.15 Maintenance. Gray water systems and components shall be maintained in accordance with Table 501.5.

503.0 Reclaimed (Recycled) Water Systems.

503.1 General. The provisions of this section shall apply to the installation, construction, alteration, and repair of reclaimed (recycled) water systems intended to supply uses such as water closets, urinals, trap primers for floor drains and floor sinks, aboveground and subsurface irrigation, industrial or commercial cooling or air conditioning and other uses approved by the Authority Having Jurisdiction.

503.2 Permit. It shall be unlawful for any person to construct, install, alter, or cause to be constructed, installed, or altered any reclaimed (recycled) water system within a building or on a premises without first obtaining a permit to do such work from the Authority Having Jurisdiction.

503.2.1 Plumbing Plan Submission. No permit for any reclaimed (recycled) water system shall be issued until complete plumbing plans, with appropriate data satisfactory to the Authority Having Jurisdiction, have been submitted and approved.

503.3 System Changes. No changes or connections shall be made to either the reclaimed (recycled) water system or the potable water system within any site containing a reclaimed (recycled) water system without approval by the Authority Having Jurisdiction.

503.4 Connections to Potable or Reclaimed (Recycled) Water Systems. Reclaimed (recycled) water systems shall have no connection to any potable water supply or alternate water source system. Potable water is permitted to be used as makeup water for a reclaimed (recycled) water storage tank provided the water supply inlet is protected by an airgap or reduced-pressure principle backflow preventer complying with the plumbing code.

503.5 Initial Cross-Connection Test. A cross-connection test is required in accordance with Section 501.11.2. Before the building is occupied or the system is activated, the installer shall perform the initial cross-connection test in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction. The test shall be ruled successful by the Authority Having Jurisdiction before final approval is granted.

503.6 Reclaimed (Recycled) Water System Materials. Reclaimed (recycled) water supply and distribution system materials shall comply with the requirements of the plumbing code for potable water supply and distribution systems, unless otherwise provided for in this section.

503.7 Reclaimed (Recycled) Water System Color and Marking Information. Reclaimed (recycled) water systems shall have a colored background in accordance with the plumbing code. Reclaimed (recycled) water systems shall be marked or field-marked, in lettering in accordance with the plumbing code, with the words: "CAUTION: NON-POTABLE RECLAIMED (RECYCLED) WATER, DO NOT DRINK."

503.8 Valves. Valves, except fixture supply control valves, shall be equipped with a locking feature.

503.9 Installation.

503.9.1 Hose Bibbs. Hose bibbs shall not be allowed on reclaimed (recycled) water piping systems located in areas accessible to the public. Access to reclaimed (recycled) water at points in the system accessible to the public shall be through a quick-disconnect device that differs from those installed on the potable water system. Hose bibbs supplying reclaimed (recycled) water shall be indicated by posted signs marked with the words: "CAUTION: NON-POTABLE RECLAIMED WATER, DO NOT DRINK," and the symbol in Figure 503.9.

FIGURE 503.9

503.9.2 Required Appurtenances. The reclaimed (recycled) water system and the potable water system within the building shall be provided with the required appurtenances (valves, air/vacuum relief valves, etc.) to allow for deactivation or drainage as required for cross-connection test in Section 501.11.2.

503.9.3 Same Trench as Potable Water Pipes. Reclaimed (recycled) water pipes run or laid in the same trench as potable water pipes shall have 12 inches (305 mm) minimum vertical and horizontal separation when both pipe materials are approved for use within a building. When piping materials do not meet this requirement the minimum horizontal separation shall be increased to 60 inches (1524 mm). The potable water piping shall be installed at an elevation above the reclaimed (recycled) water piping. Reclaimed (recycled) water pipes laid in the same trench or crossing building sewer or drainage piping shall be installed in accordance with the plumbing code for potable water piping.

503.10 Signs. Rooms and water closet tanks in buildings using reclaimed (recycled) water shall be in accordance with Section 501.10.

503.11 Inspection and Testing. Reclaimed (recycled) water systems shall be inspected and tested in accordance with Section 501.11.

504.0 On-Site Treated Non-Potable Water Systems.

504.1 General. The provisions of this section shall apply to the installation, construction, alteration, and repair of on-site treated non-potable water systems intended to supply uses such as water closets, urinals, trap primers for floor drains and floor sinks, above and below ground irrigation, and other uses approved by the Authority Having Jurisdiction.

504.2 Plumbing Plan Submission. No permit for any on-site treated non-potable water system shall be issued until complete plumbing plans, with appropriate data satisfactory to the Authority Having Jurisdiction, have been submitted and approved.

504.3 System Changes. No changes or connections shall be made to either the on-site treated non-potable water system or the potable water system within any site containing an on-site treated non-potable water system without approval by the Authority Having Jurisdiction.

504.4 Connections to Potable or Reclaimed (Recycled) Water Systems. On-site treated non-potable water systems shall have no connection to any potable water supply or reclaimed (recycled) water source system. Potable or reclaimed (recycled) water is permitted to be used as makeup water for a non-pressurized storage tank provided the makeup water supply is protected by an airgap in accordance with the plumbing code.

504.5 Initial Cross-Connection Test. A cross-connection test is required in accordance with Section 501.11.2. Before the building is occupied or the system is activated, the installer shall perform the initial cross-connection test in the presence of the Authority Having Jurisdiction and other authorities

having jurisdiction. The test shall be ruled successful by the Authority Having Jurisdiction before final approval is granted.

504.6 On-Site Treated Non-Potable Water System Materials. On-site treated non-potable water supply and distribution system materials shall comply with the requirements of the plumbing code for potable water supply and distribution systems, unless otherwise provided for in this section.

504.7 On-Site Treated Non-Potable Water Devices and Systems. Devices or equipment used to treat on-site treated nonpotable water in order to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) or approved for the intended application. Devices or equipment used to treat on-site treated non-potable water for use in water closet and urinal flushing, surface irrigation and similar applications shall be listed or labeled to IAPMO IGC207, NSF 350 or approved by the Authority Having Jurisdiction.

504.8 On-Site Treated Non-Potable Water System Color and Marking Information. On-site treated water systems shall have a colored background in accordance with the plumbing code. On-site treated water systems shall be marked or field-marked, in lettering in accordance with the plumbing code, with the words: "CAUTION: ON-SITE TREATED NON-POTABLE WATER, DO NOT DRINK."

504.9 Valves. Valves, except fixture supply control valves, shall be equipped with a locking feature.

504.10 Design and Installation. The design and installation of on-site treated non-potable systems shall be in accordance with Section 504.10.1 through Section 504.10.5.

504.10.1 Listing Terms and Installation Instructions. On-site treated non-potable water systems shall be installed in accordance with the terms of its listing and the manufacturer's installation instructions.

504.10.2 Minimum Water Quality. On-site treated non-potable water supplied to toilets or urinals or for other uses in which it is sprayed or exposed shall be disinfected. Acceptable disinfection methods shall include chlorination, ultraviolet sterilization, ozone, or other methods as approved by the Authority Having Jurisdiction. The minimum water quality for on-site treated non-potable water systems shall meet the applicable water quality requirements for the intended applications as determined by the Authority Having Jurisdiction.

504.10.3 Deactivation and Drainage. The on-site treated non-potable water system and the potable water system within the building shall be provided with the required appurtenances (valves, air/vacuum relief valves, etc.) to allow for deactivation or drainage as required for cross-connection test in accordance with Section 501.11.2.

504.10.4 Near Underground Potable Water Pipe. On-site treated non-potable water pipes run or laid in the same trench as potable water pipes shall have 12 inches (305 mm) minimum vertical and horizontal separation when both pipe materials are approved for use within a building. Where piping materials do not meet this requirement the minimum separation shall be increased to 60 inches (1524 mm). The potable water piping shall be installed at an elevation above the on-site treated non-potable water piping.

504.10.5 Required Filters. A filter permitting the passage of particulates no larger than 100 microns (100 μm) shall be provided for on-site treated non-potable water supplied to water closets, urinals, trap primers, and drip irrigation system.

504.11 Signs. Signs in buildings using on-site treated non-potable water shall be in accordance with Section 501.10.

504.12 Inspection and Testing. On-site treated non-potable water systems shall be inspected and tested in accordance with Section 501.11.

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CHAPTER 6

NONPOTABLE RAINWATER CATCHMENT SYSTEMS

601.0 General.

601.1 Scope. The provisions of this chapter shall apply to the construction, alteration, and repair of non-potable rainwater catchment systems.

601.1.1 Allowable Use of Rainwater. Where approved or required by the Authority Having Jurisdiction, rainwater used in lieu of potable water shall be in accordance with the provisions of this chapter.

601.2 System Design. Rainwater catchment systems shall be designed in accordance with this chapter by a person registered or licensed to perform plumbing design work or who demonstrates competency to design rainwater catchment systems as required by the Authority Having Jurisdiction. Components, piping, and fittings used in any rainwater catchment systems shall be listed.

Exceptions:

(1) A person registered or licensed to perform plumbing design work is not required to design rainwater catchment systems used for irrigation with a maximum storage capacity of 360 gallons (1363 L).

(2) A person registered or licensed to perform plumbing design work is not required to design rainwater catchment systems for single family dwellings where all outlets, piping, and system components are located on the exterior of the building.

601.3 Permit. It shall be unlawful for any person to construct, install, alter, or cause to be constructed, installed, or altered any rainwater catchment system in a building or on a premise without first obtaining a permit to do such work from the Authority Having Jurisdiction.

Exceptions:

(1) A permit is not required for exterior rainwater catchment systems used for outdoor drip and subsurface irrigation with a maximum storage capacity of 360 gallons (1363 L).

(2) A plumbing permit is not required for rainwater catchment systems for single family dwellings where all outlets, piping, and system components are located on the exterior of the building. This does not exempt the need for permits if required for electrical connections, tank supports, or enclosures.

601.4 Component Identification. System components shall be properly identified as to the manufacturer.

601.5 Maintenance and Inspection. Rainwater catchment systems and components shall be inspected and maintained in accordance with Section 601.5.1 through Section 601.5.3.

601.5.1 Frequency. Rainwater catchment systems and components shall be inspected and maintained in accordance with Table 601.5 unless more frequent inspection and maintenance is required by the manufacturer.

601.5.2 Maintenance Log. A maintenance log for rainwater catchment systems is required to have a permit in accordance with Section 601.3 and shall be maintained by the property owner and be available for inspection. The property owner or designated appointee shall ensure that a record of testing, inspection and maintenance as required by Table 601.5 is maintained in the log. The log will indicate the frequency of inspection and maintenance for each system.

601.5.3 Maintenance Responsibility. The required maintenance and inspection of rainwater catchment systems shall be the responsibility of the property owner, unless otherwise required by the Authority Having Jurisdiction.

TABLE 601.5
MINIMUM ALTERNATE WATER SOURCE TESTING, INSPECTION, AND MAINTENANCE FREQUENCY

DESCRIPTION	MINIMUM FREQUENCY
Inspect and clean filters and screens, and replace (if necessary)	Every 3 months
Inspect and verify that disinfection, filters and water quality treatment devices and systems are operational and maintaining minimum water quality requirements as determined by the Authority Having Jurisdiction	In accordance with manufacturer's instructions, and the Authority Having Jurisdiction
Inspect and clear debris from rainwater gutters, downspouts, and roof washers	Every 6 months
Inspect and clear debris from roof or other aboveground rainwater collection surfaces	Every 6 months
Remove tree branches and vegetation overhanging roof or other aboveground rainwater collection surfaces	As needed
Inspect pumps and verify operation	After initial installation and every 12 months thereafter
Inspect valves and verify operation	After initial installation and every 12 months thereafter
Inspect pressure tanks and verify operation	After initial installation and every 12 months thereafter
Clear debris from and inspect storage tanks, locking devices, and verify operation	After initial installation and every 12 months thereafter
Inspect caution labels and marking	After initial installation and every 12 months thereafter
Cross-connection inspection and test*	After initial installation and every 12 months thereafter
Test water quality of rainwater catchment systems required by Section 602.9.4 to maintain a minimum water quality	Every 12 months. After system renovation or repair.

* The cross-connection test shall be performed in the presence of the Authority Having Jurisdiction in accordance with the requirements of this Chapter.

601.6 Operation and Maintenance Manual. An operation and maintenance manual for rainwater catchment systems required to have a permit in accordance with Section 601.3 shall be supplied to the building owner by the system designer. The operating and maintenance manual shall include the following:

(1) Detailed diagram of the entire system and the location of system components.

(2) Instructions on operating and maintaining the system.

(3) Details on maintaining the required water quality as determined by the Authority Having Jurisdiction.

(4) Details on deactivating the system for maintenance, repair, or other purposes.

(5) Applicable testing, inspection, and maintenance frequencies as required by Table 601.5.

(6) A method of contacting the manufacturer(s).

601.7 Minimum Water Quality Requirements. The minimum water quality for rainwater catchment systems shall meet the applicable water quality requirements for the intended application as determined by the Authority Having Jurisdiction. Water quality for non-potable rainwater catchment systems shall comply with Section 605.9.4.

Exceptions:

(1) Water treatment is not required for rainwater catchment systems used for aboveground irrigation with a maximum storage capacity of 360 gallons (1363 L).

(2) Water treatment is not required for rainwater catchment systems used for subsurface or drip irrigation.

601.8 Material Compatibility. Rainwater catchment systems shall be constructed of materials that are compatible with the type of pipe and fitting materials, water treatment, and water conditions in the system.

601.9 System Controls. Controls for pumps, valves, and other devices that contain mercury that come in contact with rainwater supply are prohibited.

601.10 Separation Requirements. All underground rainwater catchment service piping shall be separated from the building sewer in accordance with the plumbing code. Treated non-potable water pipes run or laid in the same trench as potable water pipes shall have a 12 inch (305 mm) minimum vertical and horizontal separation when both pipe materials are approved for use within a building. Where horizontal piping materials do not meet this requirement the minimum separation shall be increased to 60 inches (1524 mm). The potable water piping shall be installed at an elevation above the treated non-potable water piping.

601.11 Abandonment. All rainwater catchment systems that are no longer in use or fails to be maintained in accordance with Section 601.5 shall be abandoned. Abandonment shall comply with Section 305.0.

601.12 Sizing. Unless otherwise provided for in this standard, rainwater catchment piping shall be sized in accordance with the plumbing code for sizing potable water piping.

602.0 Non-Potable Rainwater Catchment Systems.

602.1 General. The provisions of this section shall apply to the installation, construction, alteration, and repair of rainwater catchments systems intended to supply uses such as water closets, urinals, trap primers for floor drains and floor sinks, irrigation, industrial processes, water features, cooling tower makeup and other uses approved by the Authority Having Jurisdiction. Additional design criteria can be found in the ARCSA/ASPE 63 Standard.

602.2 Plumbing Plan Submission. No permit for any rainwater catchment system requiring a permit shall be issued until complete plumbing plans, with appropriate data satisfactory to the Authority Having Jurisdiction, have been submitted and approved.

602.3 System Changes. No changes or connections shall be made to either the rainwater catchment system or the potable water system within any site containing a rainwater catchment system requiring a permit without approval by the Authority Having Jurisdiction.

602.4 Connections to Potable or Reclaimed (Recycled) Water Systems. Rainwater catchment systems shall have no direct connection to any potable water supply or alternate water source system. Potable or reclaimed (recycled) water shall be permitted to be used as makeup water for a rainwater catchment system provided the potable or reclaimed (recycled) water supply connection is protected by an airgap or reduced-pressure principle backflow preventer in accordance with the plumbing code.

602.5 Initial Cross-Connection Test. Where any portion of a rainwater catchment system is installed within a building, a cross-connection test is required in accordance with 602.11.2. Before the building is occupied or the system is activated, the installer shall perform the initial cross-connection test in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction. The test shall be ruled successful by the Authority Having Jurisdiction before final approval is granted.

602.6 Sizing. The design and size of rainwater drains, gutters, conductors, and leaders shall be in accordance with the plumbing code.

602.7 Rainwater Catchment System Materials. Rainwater catchment system materials shall be in accordance with Section 602.7.1 through Section 602.7.4.

602.7.1 Water Supply and Distribution Materials. Rainwater catchment water supply and distribution materials shall comply with the requirements of the plumbing code for potable water supply and distribution systems, unless otherwise provided for in this section.

602.7.2 Rainwater Catchment System Drainage Materials. Materials used in rainwater catchment drainage systems, including gutters, downspouts, conductors, and leaders shall comply with the requirements of the plumbing code for storm drainage.

602.7.3 Storage Tanks. Rainwater storage tanks shall be in accordance with Section 602.9.5.

602.7.4 Collections Surfaces. The collection surface shall be constructed of a hard, impervious material.

602.8 Rainwater Catchment Water System Color and Marking Information. Rainwater catchment systems shall have a colored background in accordance with the plumbing code. Rainwater catchment systems shall be marked or field-marked, in lettering in accordance with the plumbing code, with the words: "CAUTION: NON-POTABLE RAINWATER, DO NOT DRINK."

602.9 Design and Installation.

602.9.1 Outside Hose Bibbs. Outside hose bibbs shall be allowed on rainwater piping systems. Hose bibbs supplying rainwater shall be indicated by posted signs marked with the words: "CAUTION: NON-POTABLE RAINWATER, DO NOT DRINK" and the symbol in Figure 602.9.

602.9.2 Deactivation and Drainage for Cross-connection Test. The rainwater catchment system and the potable water system within the building shall be provided with the required appurtenances (e.g., valves, air or vacuum relief valves, etc.) to allow for deactivation or drainage as required for cross-connection test in Section 601.11.2.

602.9.3 Collection Surfaces.

602.9.3.1 Rainwater Catchment System Surfaces. Rainwater shall be collected from roof surfaces or other manmade, aboveground collection surfaces.

602.9.3.2 Other Surfaces. Natural precipitation collected from surface water runoff, vehicular parking surfaces or manmade surfaces at or below grade shall comply with the stormwater requirements for on-site treated non-potable water systems in Section 504.0.

602.9.3.3 Prohibited Discharges. Overflows and bleed-off pipes from roof-mounted equipment and appliances shall not discharge onto roof surfaces that are intended to collect rainwater.

FIGURE 602.9

602.9.4 Minimum Water Quality. The minimum water quality for harvested rainwater shall meet the applicable water quality requirements for the intended applications as determined by the Authority Having Jurisdiction. In the absence of water quality requirements determined by the Authority Having Jurisdiction, the minimum treatment and water quality shall also comply with Table 602.9.4.

Exception: No treatment is required for rainwater used for subsurface or non-sprinkled surface irrigation where the maximum storage volume is less than 360 gallons (1363 L).

602.9.4.1 Maintenance. Non-potable water shall be tested every 12 months and a record of the test results shall be maintained by the system owner for a period of two (2) years.

602.9.4.2 Treatment. If the quality of the tested water cannot consistently be maintained at the minimum levels specified in Table 602.9.4, then the system shall be equipped with an appropriate treatment device meeting applicable NSF Standard referenced in Table 901.1.

602.9.5 Rainwater Storage Tanks. Rainwater storage tanks shall be constructed and installed in accordance with Section 602.9.5.1 through Section 602.9.5.8.

602.9.5.1 Construction. Rainwater storage shall be constructed of solid, durable materials not subject to excessive corrosion or decay and shall be watertight. Storage tanks shall be approved by the Authority Having Jurisdiction, provided such tanks comply with approved applicable standards.

602.9.5.2 Location. Rainwater storage tanks shall be installed above or below grade.

602.9.5.3 Above Grade. Above grade storage tanks shall be of an opaque material, approved for aboveground use in direct sunlight or shall be shielded from direct sunlight. Tanks shall be installed in an accessible location to allow for inspection and cleaning. The tank shall be installed on a foundation or platform that is constructed to accommodate all loads in accordance with the building code.

602.9.5.4 Below Grade. Rainwater storage tanks installed below grade shall be structurally designed to withstand all anticipated earth or other loads. Holding tank covers shall be capable of supporting an earth load of not less than 300 pounds per square foot (lb/ft^2) (1465 kg/m^2) when the tank is designed for underground installation. Below grade rainwater tanks installed underground shall be provided with manholes. The manhole opening shall not be less than 20 inches (508 mm) in diameter and located not less than 4 inches (102 mm) above the surrounding grade. The surrounding grade shall be sloped away from the manhole. Underground tanks shall be ballasted, anchored, or otherwise secured, to prevent

TABLE 602.9.4
MINIMUM WATER QUALITY

APPLICATION	MINIMUM TREATMENT	MINIMUM WATER QUALITY
Car washing	Debris excluder or other approved means in compliance with Section 602.9.10, and 100 Micron (100 μm) in compliance with Section 602.9.11 for drip irrigation.	N/A
Subsurface and drip irrigation	Debris excluder or other approved means in compliance with Section 602.9.10, and 100 Micron (100 μm) in compliance with Section 602.9.11 for drip irrigation.	N/A
Spray irrigation where the maximum storage volume is less than 360 gallons (1363 L)	Debris excluder or other approved means in compliance with Section 602.9.10, and Disinfection in accordance with Section 602.9.8.	N/A
Spray irrigation where the maximum storage volume is equal to or greater than 360 gallons (1363 L)	Debris excluder or other approved means in compliance with Section 602.9.10.	Escherichia coli: < 100 CFU/100 mL, and Turbidity: < 10 NTU
Urinal and water closet flushing, clothes washing, and trap priming	Debris excluder or other approved means in compliance with Section 602.9.10, and 100 Micron (100 μm) in compliance with Section 602.9.11.	Escherichia coli: < 100 CFU/100 mL, and Turbidity: < 10 NTU
Ornamental fountains and other water features	Debris excluder or other approved means in compliance with Section 602.9.10.	Escherichia coli: < 100 CFU/100 mL, and Turbidity: < 10 NTU
Cooling tower make up water	Debris excluder or other approved means in compliance with Section 602.9.10, and 100 Micron (100 μm) in compliance with Section 602.9.11.	Escherichia coli: < 100 CFU/100 mL, and Turbidity: < 10 NTU

the tank from floating out of the ground when empty. The combined weight of the tank and hold down system should meet or exceed the buoyancy force of the tank.

602.9.5.5 Drainage and Overflow. Rainwater storage tanks shall be provided with a means of draining and cleaning. The overflow drain shall not be equipped with a shutoff valve. The overflow outlet shall discharge as required by the plumbing code for storm drainage systems. Where discharging to the storm drainage system, the overflow drain shall be protected from backflow of the storm drainage system by a backwater valve or other approved method.

602.9.5.5.1 Overflow Outlet Size. The overflow outlet shall be sized to accommodate the flow of the rainwater entering the tank and not less than the aggregate cross-sectional area of all inflow pipes.

602.9.5.6 Opening and Access Protection.

602.9.5.6.1 Animals and Insects. Rainwater tank openings shall be protected to prevent the entrance of insects, birds, or rodents into the tank.

602.9.5.6.2 Human Access. Rainwater tank access openings exceeding 12 inches (305 mm) in diameter shall be secured to prevent tampering and unintended entry by either a lockable device or other approved method.

602.9.5.7 Marking. Rainwater tanks shall be permanently marked with the capacity and the language: "NON-POTABLE RAINWATER." Where openings are provided to allow a person to enter the tank, the opening shall be marked with the following language: "DANGER-CONFINED SPACE."

602.9.5.8 Storage Tank Venting. Where venting by means of drainage or overflow piping is not provided or is considered insufficient, a vent shall be installed on each tank. The vent shall extend from the top of the tank and terminate a minimum of 6 inches (152 mm) above grade and shall be a minimum of 1-½ inches (38 mm) in diameter. The vent terminal shall be directed downward and covered with a $^{3}/_{32}$ inch (2.4 mm) mesh screen to prevent the entry of vermin and insects.

602.9.6 Pumps. Pumps serving rainwater catchment systems shall be listed. Pumps supplying water to water closets, urinals, and trap primers shall be capable of

delivering not less than 15 psi (103 kPa) residual pressure at the highest and most remote outlet served. Where the water pressure in the rainwater supply system within the building exceeds 80 psi (552 kPa), a pressure reducing valve reducing the pressure to 80 psi (552 kPa) or less to all water outlets in the building shall be installed in accordance with the plumbing code.

602.9.7 Roof Drains. Primary and secondary roof drains, conductors, leaders, and gutters shall be designed and installed in accordance with the plumbing code.

602.9.8 Water Quality Devices and Equipment. Devices and equipment used to treat rainwater to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) and approved for the intended application.

602.9.9 Freeze Protection. Tanks and piping installed in locations subject to freezing shall be provided with an adequate means of freeze protection.

602.9.10 Debris Removal. The rainwater catchment conveyance system shall be equipped with a debris excluder or other approved means to prevent the accumulation of leaves, needles, other debris and sediment from entering the storage tank. Devices or methods used to remove debris or sediment shall be accessible and sized and installed in accordance with manufacturer's installation instructions.

602.9.11 Required Filters. A filter permitting the passage of particulates no larger than 100 microns (100 μm) shall be provided for rainwater supplied to water closets, urinals, trap primers, and drip irrigation system.

602.9.12 Roof Gutters. Gutters shall maintain a minimum slope and be sized in accordance with the plumbing code.

602.10 Signs. Signs in buildings using rainwater water shall be in accordance with Section 602.10.1 and Section 602.10.2

602.10.1 Commercial, Industrial, and Institutional Restroom Signs. A sign shall be installed in all restrooms in commercial, industrial, and institutional occupancies using rainwater for water closets, urinals, or both. Each sign shall contain ½ inch (12.7 mm) letters of a highly visible color on a contrasting background. The location of the sign(s) shall be such that the sign(s) shall be visible to all users. The location of the sign(s) shall be approved by the Authority Having Jurisdiction and shall contain the following text:

TO CONSERVE WATER, THIS BUILDING USES RAINWATER TO FLUSH TOILETS AND URINALS.

602.10.2 Equipment Room Signs. Each room containing non-potable rainwater equipment shall have a sign posted in a location that is visible to anyone working on or near non-potable water equipment with the following wording in 1 inch (25.4 mm) letters:

CAUTION: NON-POTABLE RAINWATER, DO NOT DRINK. DO NOT CONNECT TO DRINKING WATER SYSTEM. NOTICE: CONTACT BUILDING MANAGEMENT BEFORE PERFORMING ANY WORK ON THIS WATER SYSTEM.

602.11 Inspection and Testing. Rainwater catchment systems shall be inspected and tested in accordance with Section 602.11.1 and Section 602.11.2.

602.11.1 Supply System Inspection and Test. Rainwater catchment systems shall be inspected and tested in accordance with the applicable provisions of the plumbing code for testing of potable water and storm drainage systems. Storage tanks shall be filled with water to the overflow opening for a period of 24 hours and during inspection or by other means as approved by the Authority Having Jurisdiction. All seams and joints shall be exposed during inspection and checked for water tightness.

602.11.2 Annual Cross-Connection Inspection and Testing. An initial and subsequent annual inspection and test shall be performed on both the potable and rainwater catchment system. The potable and rainwater catchment system shall be isolated from each other and independently inspected and tested to ensure there is no cross-connection in accordance with Section 602.11.2.1 through Section 602.11.2.4.

602.11.2.1 Visual System Inspection. Prior to commencing the cross-connection testing, a dual system inspection shall be conducted by the Authority Having Jurisdiction and other authorities having jurisdiction as follows:

(1) Meter locations of the rainwater and potable water lines shall be checked to verify that no modifications were made, and that no cross-connections are visible.

(2) Pumps and equipment, equipment room signs, and exposed piping in equipment room shall be checked.

(3) Valves shall be checked to ensure that valve lock seals are still in place and intact. Valve control door signs shall be checked to verify that no signs have been removed.

602.11.2.2 Cross-Connection Test. The procedure for determining cross-connection shall be followed by the applicant in the presence of the Authority Having Jurisdiction and other authorities having jurisdiction to determine whether a cross-connection has occurred as follows:

(1) The potable water system shall be activated and pressurized. The rainwater catchment system shall be shut down, depressurized, and drained.

(2) The potable water system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the rainwater catchment system is empty. The minimum period the rainwater catchment system

is to remain depressurized shall be determined on a case-by-case basis, taking into account the size and complexity of the potable and the rainwater catchment distribution systems, but in no case shall that period be less than 1 hour.

(3) The drain on the rainwater catchment system shall be checked for flow during the test and all fixtures, potable and alternate water source, shall be tested and inspected for flow. Flow from any rainwater catchment system outlet indicates a cross-connection. No flow from a potable water outlet shall indicate that it is connected to the rainwater catchment system.

(4) The potable water system shall then be depressurized and drained.

(5) The rainwater catchment system shall then be activated and pressurized.

(6) The rainwater catchment system shall remain pressurized for a minimum period of time specified by the Authority Having Jurisdiction while the potable water system is empty. The minimum period the potable water system is to remain depressurized shall be determined on a case-by-case basis, but in no case shall that period be less than 1 hour.

(7) All fixtures, potable and rainwater, shall be tested and inspected for flow. Flow from any potable water system outlet indicates a cross-connection. No flow from a rainwater outlet will indicate that it is connected to the potable water system.

(8) The drain on the potable water system shall be checked for flow during the test and at the end of the test.

(9) If there is no flow detected in any of the fixtures which would indicate a cross-connection, the potable water system shall be repressurized.

602.11.2.3 Discovery of Cross-Connection. In the event that a cross-connection is discovered, the following procedure, in the presence of the Authority Having Jurisdiction, shall be activated immediately:

(1) The rainwater piping to the building shall be shut down at the meter, and the rainwater riser shall be drained.

(2) Potable water piping to the building shall be shut down at the meter.

(3) The cross-connection shall be uncovered and disconnected.

(4) The building shall be retested following procedures listed in Section 602.11.2.1 and Section 602.11.2.2.

(5) The potable water system shall be chlorinated with 50 parts-per-million (ppm) chlorine for 24 hours.

(6) The potable water system shall be flushed after 24 hours, and a standard bacteriological test shall be performed. If test results are acceptable, the potable water system shall be recharged.

602.11.2.4 Annual Inspection. An annual inspection of the rainwater catchment system, following the procedures listed in Section 602.11.2.1 shall be required. Annual cross-connection testing, following the procedures listed in Section 602.11.2.2 shall be required by the Authority Having Jurisdiction, unless site conditions do not require it. In no event shall the test occur less than once in 4 years. Alternate testing requirements shall be approved by the Authority Having Jurisdiction.

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CHAPTER 7

WATER HEATING DESIGN, EQUIPMENT AND INSTALLATION

701.0 General.

701.1 Scope. The provisions of this chapter shall establish the means of conserving potable and non-potable water and energy associated with the generation and use of hot water in a building. This includes provisions for the hot water distribution system, which is the portion of the potable water distribution system between a water heating device and the plumbing fixtures, including all dedicated return piping and appurtenances to the water heating device in a recirculation system.

701.2 Insulation. Hot water supply and return piping shall be thermally insulated. The wall thickness of the insulation shall be equal to the nominal diameter of the pipe up to 2 inches (50 mm). The wall thickness shall be not less than 2 inches (50 mm) for nominal pipe diameters exceeding 2 inches (50 mm). The conductivity of the insulation [k-factor (Btu•in/(h•ft²•°F))], measured radially, shall be less than or equal to 0.28 [Btu•in/(h•ft²•°F)] [0.04 W/(m•k)]. Hot water piping to be insulated shall be installed such that insulation is continuous. Pipe insulation shall be installed to within ¼ inch (6.4 mm) of all appliances, appurtenances, fixtures, structural members, or a wall where the pipe passes through to connect to a fixture within 24 inches (610 mm).

Exceptions:

(1) Where the hot water pipe is installed in a wall that is not of sufficient width to accommodate the pipe and insulation, the insulation thickness shall be the maximum thickness that the wall can accommodate and not less than ½ inch (12.7 mm) thick.

(2) Hot water supply piping exposed under sinks, lavatories, and similar fixtures.

(3) Where hot water distribution piping is installed within attic, crawlspace, or wall insulation.

701.2.1 Pipe Supports. Pipe supports shall be installed on the outside of the pipe insulation.

Exception: Vertical supports, and horizontal and vertical anchors shall be installed on the pipe inside the pipe insulation.

701.2.2 Building Cavities. Building cavities used for hot water supply and return piping shall be large enough to accommodate the combined diameter of the pipe plus the insulation, plus any other objects in the cavity that the piping must cross.

701.3 Recirculation Systems.

701.3.1 Pump Operation.

701.3.1.1 For Low-Rise Residential Buildings. Circulating hot water systems shall be arranged so that the circulating pump(s) can be turned off (automatically or manually) when the hot water system is not in operation. [ASHRAE 90.2:7.2]

701.3.1.2 For Pumps Between Boilers and Storage Tanks. When used to maintain storage tank water temperature, recirculating pumps shall be equipped with controls limiting operation to a period from the start of the heating cycle to a maximum of 5 minutes after the end of the heating cycle. [ASHRAE 90.1:7.4.4.4]

701.3.2 Recirculation Pump Controls. Pump controls shall include on-demand activation or time clocks combined with temperature sensing. Time clock controls for pumps shall not let the pump operate more than 15 minutes every hour. Temperature sensors shall stop circulation when the temperature set point is reached and shall be located on the circulation loop at or near the last fixture. The pump, pump controls and temperature sensors shall be accessible. Pump operation shall be limited to the building's hours of operation.

701.3.3 Temperature Maintenance Controls. For other than low-rise residential buildings, systems designed to maintain usage temperatures in hot-water pipes, such as recirculating hot-water systems or heat trace, shall be equipped with automatic time switches or other controls that can be set to switch off the usage temperature maintenance system during extended periods when hot water is not required. [ASHRAE 90.1:7.4.4.2]

701.3.4 System Balancing. Systems with multiple recirculation zones shall be balanced to uniformly distribute hot water, or they shall be operated with a pump for each zone. The circulation pump controls shall comply with the provisions of Section 701.3.2.

701.3.5 Flow Balancing Valves. Flow balancing valves shall be a factory preset automatic flow control valve, a flow regulating valve, or a balancing valve with memory stop.

701.3.6 Air Elimination. Provision shall be made for the elimination of air from the return system.

701.3.7 Gravity or Thermosyphon Systems. Gravity or thermosyphon systems are prohibited.

702.0 Service Hot Water – Low-Rise Residential Buildings.

702.1 General. The service water heating system for single-family houses, multi-family structures of three stories or fewer above grade, and modular houses shall be in accordance with Section 702.2 through Section 702.7. The service water heating system of all other buildings shall be in accordance with Section 703.0.

702.2 Water Heaters and Storage Tanks. Residential-type water heaters, pool heaters, and unfired water heater storage tanks shall meet the minimum performance requirements specified by federal law.

Unfired storage water heating equipment shall have a heat loss through the tank surface area of less than 6.5 British thermal units per hour per square foot (Btu/h•ft²) (20.5 W/m²). [ASHRAE 90.2:7.1]

702.3 Recirculation Systems. Recirculation systems shall meet the provisions in Section 701.3.

702.4 Central Water Heating Equipment. Service water heating equipment (central systems) that does not fall under the requirements for residential-type service water heating equipment addressed in Section 702.0 shall meet the applicable requirements for service water-heating equipment found in Section 703.0. [ASHRAE 90.2:7.3]

702.5 Insulation. Insulation for hot water and return piping shall comply with the provisions of Section 701.2.

702.6 Hard Water. Where water has hardness equal to or exceeding 9 grains per gallon (gr/gal) (154 mg/L) measured as total calcium carbonate equivalents, the water supply line to water heating equipment in new one- and two family dwellings shall be roughed-in to allow for the installation of water treatment equipment.

702.7 Maximum Length and Volume of Hot Water. The maximum length and volume of water contained in a hot water branch shall comply with Section 702.7.1. The water volume shall be calculated using Table 702.7.

702.7.1 Maximum Length / Volume of Hot Water in a Branch. The maximum length of a branch between and source of hot water and the fixture fitting shall not exceed 15 feet or the volume shall not exceed 24 oz. Water heaters, recirculation loops and electrically heat traced pipe shall be considered sources of hot water. Where a fixture fitting shut off valve (supply stop) is installed ahead of the fixture fitting, the maximum length is measured between the source of hot water and the fixture fitting shut off valve (supply stop)

Exceptions:

1. The maximum length of the branch between any source of hot water and a kitchen sink and dishwasher located on an island or a peninsula where the floor is a concrete slab shall not exceed 25 feet or the volume shall not exceed 40 oz.

2. The maximum length of the branch to a stand-alone tub shall not exceed 25 feet.

702.7.2 Hot Water System Submeters. Where a hot water pipe from a circulation loop or electric heat trace line is equipped with a submeter, the hot water distribution system downstream of the submeter shall have either an end-of-line hot water circulation pump or shall be electrically heat traced. The maximum volume of water in any branch from the circulation loop or electric heat trace line downstream of the submeter shall not exceed 16 oz (473 mL).

If there is no circulation loop or electric heat traced line downstream of the submeter, the submeter shall be located within 2 feet (610 mm) of the central hot water system; or the branch line to the submeter shall be circulated or heat traced to within 2 feet of the submeter. The maximum volume from the submeter to each fixture shall not exceed 32 oz (946 mL).

The circulation pump controls shall comply with the provisions of Section 701.3.2.

703.0 Service Hot Water – Other Than Low-Rise Residential Buildings.

703.1 General. The service hot water, other than single-family houses, multi-family structures of three stories or fewer above grade, and modular houses, shall comply with this section.

703.2 Service Water Heating.

703.2.1 New Buildings. Service water heating systems and equipment shall comply with the requirements of this section as described in Section 703.3. [ASHRAE 90.1:7.1.1.1]

703.2.2 Additions to Existing Buildings. Service water heating systems and equipment shall comply with the requirements of this section.

Exception: When the service water heating to an addition is provided by existing service water heating systems and equipment, such systems and equipment shall not be required to comply with this standard. However, any new systems or equipment installed must comply with

TABLE 702.7
WATER VOLUME FOR DISTRIBUTION PIPING MATERIALS

OUNCES OF WATER PER FOOT LENGTH OF PIPING													
NOMINAL SIZE (inch)	COPPER M	COPPER L	COPPER K	CPVC CTS SDR 11	CPVC SCH 40	PEX-AL-PEX	PE-AL-PE	CPVC SCH 80	PEX CTS SDR 9	PE-RT SDR 9	PP SDR 6	PP SDR 7.3	PP SDR 11
⅜	1.06	0.97	0.84	NA	1.17	0.63	0.63	NA	0.64	0.64	0.91	1.09	1.24
½	1.69	1.55	1.45	1.25	1.89	1.31	1.31	1.46	1.18	1.18	1.41	1.68	2.12
¾	3.43	3.22	2.90	2.67	3.38	3.39	3.39	2.74	2.35	2.35	2.23	2.62	3.37
1	5.81	5.49	5.17	4.43	5.53	5.56	5.56	4.57	3.91	3.91	3.64	4.36	5.56
1¼	8.70	8.36	8.09	6.61	9.66	8.49	8.49	8.24	5.81	5.81	5.73	6.81	8.60
1½	12.18	11.83	11.45	9.22	13.20	13.88	13.88	11.38	8.09	8.09	9.03	10.61	13.47
2	21.08	20.58	20.04	15.79	21.88	21.48	21.48	19.11	13.86	13.86	14.28	16.98	21.39

For SI units: 1 foot = 304.8 mm, 1 ounce = 29.573 mL

specific requirements applicable to those systems and equipment. [ASHRAE 90.1:7.1.1.2]

703.2.3 Alterations to Existing Buildings. Building service water heating equipment installed as a direct replacement for existing building service water heating equipment shall comply with the requirements of Section 703.0 applicable to the equipment being replaced. New and replacement piping shall comply with Section 703.4.3.

Exception: Compliance shall not be required where there is insufficient space or access to meet these requirements. [ASHRAE 90.1:7.1.1.3]

703.3 Compliance Path(s).

703.3.1 General. Compliance shall be achieved by meeting the requirements of Section 703.1, General; Section 703.4, Mandatory Provisions; Section 703.5, Prescriptive Path; and Section 703.6, Submittals. [ASHRAE 90.1:7.2.1]

703.3.2 Energy Cost Budget Method. Projects using the Energy Cost Budget Method (Section 11 of ASHRAE 90.1) for demonstrating compliance with the standard shall meet the requirements of Section 703.4, Mandatory Provisions, in conjunction with Section 11 of ASHRAE 90.1, Energy Cost Budget Method. [ASHRAE 90.1:7.2.2]

703.4 Mandatory Provisions.

703.4.1 Load Calculations. Service water heating system design loads for the purpose of sizing systems and equipment shall be determined in accordance with manufacturers' published sizing guidelines or generally accepted engineering standards and handbooks acceptable to the adopting authority (e.g., ASHRAE Handbook – HVAC Applications). [ASHRAE 90.1:7.4.1]

703.4.2 Equipment Efficiency. Water heating equipment, hot-water supply boilers used solely for heating potable water, pool heaters, and hot-water storage tanks shall meet the criteria listed in Table 703.4.2. Where multiple criteria are listed, all criteria shall be met. Omission of minimum performance requirements for certain classes of equipment does not preclude use of such equipment where appropriate. Equipment not listed in Table 703.4.2 has no minimum performance requirements.

Exceptions: Water heaters and hot-water supply boilers having more than 140 gallons (530 L) of storage capacity are not required to meet the standby loss (SL) requirements of Table 703.4.2 when:

(1) The tank surface is thermally insulated to R-12.5.

(2) A standing pilot light is not installed.

(3) Gas- or oil-fired storage water heaters have a flue damper or fan-assisted combustion. [ASHRAE 90.1:7.4.2]

703.4.3 Insulation. Insulation of hot water and return piping shall meet the provisions in Section 701.2.

703.4.4 Hot Water System Design.

703.4.4.1 Recirculation Systems. Recirculation systems shall meet the provisions in Section 701.3.

703.4.4.4 Maximum Volume of Hot Water. The maximum volume of water contained in hot water distribution lines between the water heater and the fixture stop or connection to showers, kitchen faucets, and lavatories shall be determined in accordance with Section 702.7.

703.4.5 Service Water Heating System Controls.

703.4.5.1 Temperature Controls. Temperature controls shall be provided that allow for storage temperature adjustment from 120°F (49°C) or lower to a maximum temperature compatible with the intended use.

Exception: When the manufacturers' installation instructions specify a higher minimum thermostat setting to minimize condensation and resulting corrosion. [ASHRAE 90.1:7.4.4.1]

703.4.5.2 Outlet Temperature Controls. Temperature controlling means shall be provided to limit the maximum temperature of water delivered from lavatory faucets in public facility restrooms to 110°F (43°C). [ASHRAE 90.1:7.4.4.3]

703.4.6 Heat Traps. Vertical pipe risers serving storage water heaters and storage tanks not having integral heat traps and serving a nonrecirculating system shall have heat traps on both the inlet and outlet piping as close as practical to the storage tank. A heat trap is a means to counteract the natural convection of heated water in a vertical pipe run. The means is either a device specifically designed for the purpose or an arrangement of tubing that forms a loop of 360 degrees (6.28 rad) or piping that from the point of connection to the water heater (inlet or outlet) includes a length of piping directed downward before connection to the vertical piping of the supply water or hot-water distribution system, as applicable. [ASHRAE 90.1:7.4.6]

703.5 Prescriptive Path.

703.5.1 Space Heating and Water Heating. The use of a gas-fired or oil-fired space-heating boiler system otherwise complying with Section 703.0 to provide the total space heating and water heating for a building is allowed when one of the following conditions is met:

(1) The single space-heating boiler, or the component of a modular or multiple boiler system that is heating the service water, has a standby loss in Btu/h (kW) not exceeding $(13.3 \times \text{pmd} + 400)/n$, where (pmd) is the probable maximum demand in gallons per hour, determined in accordance with the procedures described in generally accepted engineering standards and handbooks, and (n) is the fraction of the year when the outdoor daily mean temperature is greater than 64.9°F (18.28°C).

The standby loss is to be determined for a test period of 24 hours duration while maintaining a boiler water temperature of at least 90°F (32°C) above ambient, with an ambient temperature

TABLE 703.4.2
PERFORMANCE REQUIREMENTS FOR WATER HEATING EQUIPMENT [ASHRAE 90.1: TABLE 7.8]

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)	SUBCATEGORY OR RATING CONDITION	PERFORMANCE REQUIRED[1]	TEST PROCEDURE[2,3]
Electric Table Top Water Heaters	≤12 kW	Resistance ≥20 gal	0.93–0.00035V EF	DOE 10 CFR Part 430
Electric water heaters	≤12 kW	Resistance ≥20 gal	0.97–0.00035V EF	DOE 10 CFR Part 430
	>12 kW	Resistance ≥20 gal	$0.3 + 27\sqrt{Vm}$ %h	Section G.2 of CSA Z21.10.3
	≤24 Amps and ≤250 Volts	Heat Pump	0.93–0.00035V EF	DOE 10 CFR Part 430
Gas storage water heaters	≤75 000 Btu/h	≥20 gal	0.62–0.0005V EF	DOE 10 CFR Part 430
	>75 000 Btu/h	<4000 (Btu/h)/gal	80% E_t $(Q/799 + 16.6\sqrt{V})SL$, Btu/h	Sections G.1 and G.2 of CSA Z21.10.3
Gas instantaneous water heaters	>50 000 Btu/h and <200 000 Btu/h	≥4000 (Btu/h)/gal and <2 gal	0.62–0.0005V EF	DOE 10 CFR Part 430
	≥200 000 Btu/h[4]	≥4000 (Btu/h)/gal and <10 gal	80% E_t	Sections G.1 and G.2 of CSA Z21.10.3
	≥200 000 Btu/h	≥4000 (Btu/h)/gal and ≥10 gal	80% E_t $(Q/799 + 16.6\sqrt{V})$ SL, Btu/h	
Electronic instantaneous water heaters[5]	≤ 12 kW	≥ 4000 (Btu/h)/gal and < 2 gal	0.93 – (0.00132•V) EF	DOE 10 CFR Part 430
	> 12 kW	≥ 4000 (Btu/h)/gal and < 2 gal	95% Et	Section G.2 of CSA Z21.10.3
Oil storage water heaters	≤105 000 Btu/h	≥20 gal	0.59-0.0005V EF	DOE 10 CFR Part 430
	>105 000 Btu/h	<4000 (Btu/h)/gal	80% E_t $(Q/799 + 16.6\sqrt{V})$ SL, Btu/h	Sections G.1 and G.2 of CSA Z21.10.3
Oil instantaneous water heaters	≤210 000 Btu/h	≥4000 (Btu/h)/gal and <2 gal	0.59–0.0005V EF	DOE 10 CFR Part 430
	>210 000 Btu/h	≥4000 (Btu/h)/gal and <10 gal	80% E_t	Sections G.1 and G.2 of CSA Z21.10.3
	>210 000 Btu/h	≥4000 (Btu/h)/gal and ≥10 gal	78% E_t $(Q/799 + 16.6\sqrt{V})$ SL, Btu/h	
Hot-water supply boilers, gas and oil	≥300 000 Btu/h and <12 500 000 Btu/h	≥4000 (Btu/h)/gal and <10 gal	80% E_t	Sections G.1 and G.2 of CSA Z21.10.3
Hot-water supply boilers, gas	—	≥4000 (Btu/h)/gal and ≥10 gal	80% E_t $(Q/799 + 16.6\sqrt{V})$ SL, Btu/h	
Hot-water supply boilers, oil	—	≥4000 (Btu/h)/gal and ≥10 gal	78% E_t $(Q/799 + 16.6\sqrt{V})$ SL, Btu/h	
Pool heaters, oil and gas	All	—	78% E_t	ASHRAE 146
Heat pump pool heaters	All		4.0 COP	AHRI 1160
Unfired storage tanks	All		R-12.5	(none)

For SI units: 1 gallon = 3.785 L, 1000 British thermal units per hour = 0.293 kW, 1 degree Fahrenheit = t/c° = (t/°F-32)/1.8

[1] Energy factor (EF) and thermal efficiency (E_t) are minimum requirements, while standby loss (SL) is maximum Btu/h (W) based on a 70°F (21°C) temperature difference between stored water and ambient requirements. In the EF equation, V is the rated volume in gallons. In the SL equation, V is the rated volume in gallons and Q is the nameplate input rate in Btu/h.

[2] Section 12 of ASHRAE 90.1 contains a complete specification, including the year version, of the referenced test procedure.

[3] Section G1 is titled "Test Method for Measuring Thermal Efficiency" and Section G2 is titled "Test Method for Measuring Standby Loss."

[4] Instantaneous water heaters with input rates below 200 000 Btu/h (58.6 kW) must comply with these requirements if the water heater is designed to heat water to temperatures of 180°F (82°C) or higher.

[5] Not part of ASHRAE 90.1 Table 7-8.

between 60°F (16°C) and 90°F (32°C). For a boiler with a modulating burner, this test shall be conducted at the lowest input.

(2) It is demonstrated to the satisfaction of the Authority Having Jurisdiction that the use of a single heat source will consume less energy than separate units.

(3) The energy input of the combined boiler and water heater system is less than 150 000 Btu/h (44 kW). [ASHRAE 90.1:7.5.1]

703.5.2 Service Water Heating Equipment. Service water heating equipment used to provide the additional function of space heating as part of a combination (integrated) system shall satisfy all stated requirements for the service water heating equipment. [ASHRAE 90.1:7.5.2]

703.5.3 Heat Recovery for Service Water Heating.

703.5.3.1 Condenser heat recovery systems shall be installed for heating or preheating of service hot water provided all of the following are true:

(1) The facility operates 24 hours a day.

(2) The total installed heat rejection capacity of the water-cooled systems exceeds 6 000 000 Btu/h (1758 kW) of heat rejection.

(3) The design service water heating load exceeds 1 000 000 Btu/h (293 kW). [ASHRAE 90.1:6.5.6.2.1]

703.5.3.2 The required heat recovery system shall have the capacity to provide the smaller of:

(1) Sixty percent of the peak heat rejection load at design conditions.

(2) Preheat of the peak service hot water draw to 85°F (29°C). [ASHRAE 90.1:6.5.6.2.2]

Exceptions:

(a) Facilities that employ condenser heat recovery for space heating with a heat recovery design exceeding 30 percent of the peak water-cooled condenser load at design conditions.

(b) Facilities that provide 60 percent of their service water heating from site-solar or site-recovered energy or from other sources.

703.6 Submittals.

703.6.1 General. The Authority Having Jurisdiction shall require submittal of compliance documentation and supplemental information, in accordance with Section 103.0 of this standard and the applicable mechanical and building codes.

704.0 Hard Water.

704.1 Softening and Treatment. Where water has hardness equal to or exceeding 10 gr/gal (171 mg/L) measured as total calcium carbonate equivalents, the water supply line to water heating equipment and the circuit of boilers shall be softened or treated to prevent accumulation of lime scale and consequent reduction in energy efficiency.

705.0 Drain Water Heat Exchangers. Drain water heat exchangers shall comply with IAPMO PS-92. The heat exchanger shall be accessible.

706.0 Heat Recovery from Steam Boiler Blowdown. Where heat recovery can be used beneficially to heat boiler makeup water or for other purposes, boiler blowdown from steam boilers exceeding 15 psi and 3.4 million BTU's per hour (100 HP) shall be directed to a heat recovery system that reduces the temperature of the blowdown discharge to below 140°F without using tempering water.

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CHAPTER 8
INSTALLER QUALIFICATIONS

801.0 General.

801.1 Scope. The provisions of this chapter address minimum qualifications of installers of systems covered within the scope of this standard.

802.0 Qualifications.

802.1 General. Where permits are required, the Authority Having Jurisdiction shall have the authority to require contractors, installers, or service technicians to demonstrate competency. Where determined by the Authority Having Jurisdiction, the contractor, installer, or service technician shall be licensed to perform such work.

802.1.1 Certifications. Reserved.

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CHAPTER 9
REFERENCED STANDARDS

901.0 General.

901.1 Standards. The standards listed in Table 901.1 are intended for use as a guide in the design, testing, and installation of materials, devices, appliances and equipment regulated by this supplement. These standards are mandatory when required by sections in this supplement.

TABLE 901.1
REFERENCED STANDARDS

STANDARD NUMBER-YEAR	STANDARD TITLE	REFERENCED SECTION
AHRI 1160 (I-P)-2014	Performance Rating of Heat Pump Pool Heaters	Table 703.4.2
APSP-14 2014*	Portable Electric Spa Energy Efficiency	417.3.1
ARCSA/ASPE 63-2013*	Rainwater Catchment Systems	602.1, A 104.9.1
ASABE/ICC 802-2014*	Landscape Irrigation Sprinkler and Emitter Standard	414.6, 414.11.3
ASHRAE 90.1-2013 (I-P)*	Energy Standard for Buildings Except Low-Rise Residential Buildings	703.3.2, Table 703.4.2
ASHRAE 146-2011*	Method of Testing Pool Heaters	Table 703.4.2
ASME A112.18.1/CSA B125.1-2012*	Plumbing Supply Fittings	402.5.1, 402.5.2.1, 402.6.1
ASME A112.19.2/CSA B45.1-2013*	Ceramic Plumbing Fixtures	402.2.1, 402.2.2, 402.3
ASME A112.19.3/CSA B45.4-2008*	Stainless Steel Plumbing Fixtures	402.3.1
ASME A112.19.14-2013*	Six-Liter Water Closets Equipped With a Dual Flushing Device	402.2.1
ASME A112.19.19-2006*	Vitreous China Nonwater Urinals	402.3.1
ASSE 1016/ASME A112.1016/ CSA B125.16-2011*	Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations	402.6.4
ASTM F2831-2012*	Standard Practice for Internal Non Structural Epoxy Barrier Coating Material Used in Rehabilitation of Metallic Pressurized Piping Systems	303.2
CFR 10, 430, Subpart B	Energy Conservation Program for Consumer Products — Test Procedures	Table 703.4.2
CFR 40, 178.274	Specifications for UN Portable Tanks	403.8.4.1.3, 403.9.11.4
CSA B45.5/IAPMO Z124-2011*	Plastic Plumbing Fixtures	402.3, 402.3.1
CSA B651-2012	Accessible Design for the Built Environment	402.6.2
CSA Z21.10.3-2014*	Gas Water Heaters, Volume III, Storage Water Heaters With Input Ratings Above 75 000 BTU per Hour, circulating and Instantaneous (same as CSA 4.3)	Table 703.4.2
EPA/625/R-04/108-2004	Guidelines for Water Reuse	501.7, A 101.7
EPA/625/R-92/013-2003	Control of Pathogens and Vector Attraction in Sewage Sludge	403.8.5.2
EPA WaterSense-2007	High-Efficiency Lavatory Faucet Specification, Version 1.0	402.5.1

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REFERENCED STANDARDS

STANDARD NUMBER-YEAR	STANDARD TITLE	REFERENCED SECTION
EPA WaterSense-2009	Flushing Urinal Specification	402.3
EPA WaterSense-2010	Showerheads Specification	402.6.1
EPA WaterSense-2011	Weather-Based Irrigation Controllers Specification	414.5.3
EPA WaterSense-2013	Commercial Pre-Rinse Spray Valve Specification	402.7
EPA WaterSense-2014	Tank-Type High-Efficiency Toilet Specification, Version 1.2	402.2.1
IAPMO IGC 115-2013	Automatic Water Leak Detection and Control Devices	408.1
IAPMO IGC 207-2009a/CSA B128-2006	Reclaimed Water Conservation System for Flushing Toilets	504.7
IAPMO IGC 250-2007	Diverter Valve for Rainwater Tank	302.1, A 101.4.2
IAPMO PS 59-2013	Wastewater Diverter Valves and Diversion Systems	502.2.3
IAPMO PS 76-2012a	Trap Primers for Fill Valves and Flushometer Valves	415.1
IAPMO PS 92-2013	Heat Exchangers and Indirect Water Heaters	705.0
IAPMO UMC 2015*	Uniform Mechanical Code	101.6.3
IAPMO UPC 2015*	Uniform Plumbing Code	103.6.4
IAPMO USEC 2015*	Uniform Solar Energy Code	101.6.5
IAPMO USPSHTC-2015*	Uniform Swimming Pool, Spa, and Hot Tub Code	101.6.6
ICC A117.1-2009*	Accessible and Usable Buildings and Facilities	402.6.2
NSF 41-2011*	Non-Liquid Saturated Treatment Systems	403.2.1
NSF 44-2014*	Residential Cation Exchange Water Softeners	406.1
NSF 53-2014*	Drinking Water Treatment Units – Health Effects	A 104.3.1
NSF 58-2013*	Reverse Osmosis Drinking Water Treatment Systems	406.3
NSF 61-2012*	Drinking Water Systems Components - Health Effects	A 104.5.1
NSF 350-2014*	Onsite Residential and Commercial Reuse Treatment Systems	504.7
NSF P151-1995	Health Effects from Rainwater Catchment System Components	A 103.1
WQA/ASPE S-803-2014*	Sustainable Drinking Water Treatment Systems	406.4

* ANSI Approved

Abbreviations and Standards Development Organizations in Chapter 9	
AHRI	Air-Conditioning, Heating, and Refrigeration Institute, 2111 Wilson Blvd., Suite 500, Arlington, VA 22201.
ANSI	American National Standards Institute, Inc., 25 W. 43rd Street, 4th Floor, New York, NY 10036.
ARCSA	American Rainwater Catchment Systems Association, 7650 S. McClintock Drive, Suite 103, Tempe, AZ 85284.
APSP	The Association of Pool & Spa Professionals, 2111 Eisenhower Ave., Alexandria, VA 22314.
ASHRAE	The American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1791 Tullie Circle, NE, Atlanta, GA 30329-2305.
ASME	The American Society of Mechanical Engineering, Two Park Avenue, New York, NY 10016.
ASPE	American Society of Plumbing Engineers, 6400 Shafer Court Suite 350, Rosemont, IL 60018.
ASSE International	American Society of Sanitary Engineering, 18927 Hickory Creek Drive, Suite 220, Mokena, IL 60448.
ASTM International	American Society of Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.
CSA Group	Canadian Standards Association, 178 Rexdale Blvd., Toronto, Ontario, M9W 1R3, Canada.
DOE	US Department of Energy, 1000 Independence Avenue, SW, Washington, DC 20585.
EPA	US Environmental Protection Agency, Municipal Support Division, Office of Wastewater Management, Office of Water, Washington DC
EPA	US Environmental Protection Agency, Office of Research and Development, National Risk Management Research Laboratory, Center for Environmental Research Information, Cincinnati, OH 45268.
EPA WaterSense	US Environmental Protection Agency, Office of Wastewater Management (4204M), 1200 Pennsylvania Avenue, NW, Washington DC 20460.
IAPMO	International Association of Plumbing and Mechanical Officials, 4755 E. Philadelphia Street, Ontario, CA 91761.
ICC	International Code Council, 500 New Jersey Ave, NW, 6th Floor, Washington DC 20001.
NSF	National Sanitation Foundation International, 789 Dixboro Road, Ann Arbor, MI 48113-0140.
WQA	Water Quality Association, 4151 Naperville Road, Lisle, IL 60532-3696.

DRAFT

APPENDIX A
POTABLE RAINWATER CATCHMENT SYSTEMS

A 101.0 General.

A 101.1 Scope. The provisions of this appendix shall apply to the installation, construction, alteration, and repair of potable rainwater catchment systems.

A 101.2 System Design. Potable rainwater catchment systems complying with this appendix shall be designed by a person registered, licensed, or deemed competent by the Authority Having Jurisdiction to perform potable rainwater catchment system design work.

A 101.3 Permit. It shall be unlawful for any person to construct, install, or alter, or cause to be constructed, installed, or altered any potable rainwater catchment systems in a building or on a premise without first obtaining a permit to do such work from the Authority Having Jurisdiction.

A 101.3.1 Plumbing Plan Submission. No permit for any rainwater catchment system requiring a permit shall be issued until complete plumbing plans, with appropriate data satisfactory to the Authority Having Jurisdiction, have been submitted and approved. No changes or connections shall be made to either the rainfall catchment or the potable water system within any site containing a rainwater catchment water system without approval by the Authority Having Jurisdiction.

A 101.3.2 System Changes. No changes or connections shall be made to either the rainwater catchment system or the potable water system within any site containing a rainwater catchment system requiring a permit without approval by the Authority Having Jurisdiction.

A 101.4 Product and Material Approval.

A 101.4.1 Component Identification. System components shall be properly identified as to the manufacturer.

A 101.4.2 Plumbing Materials and Systems. Pipe, pipe fittings, traps, fixtures, material, and devices used in a potable rainwater system shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) and shall comply with the approved applicable recognized standards referenced in this standard and the plumbing code, and shall be free from defects. Unless otherwise provided for in this standard, all materials, fixtures, or devices used or entering into the construction of plumbing systems, or parts thereof, shall be submitted to the Authority Having Jurisdiction for approval. [UPC 301.2]

A 101.5 Maintenance and Inspection. Potable rainwater catchment systems and components shall be inspected and maintained in accordance with Section A 101.5.1 through Section A 101.5.3.

A 101.5.1 Frequency. Potable rainwater catchment systems and components shall be inspected and maintained in accordance with Table A 101.5.1 unless more frequent inspection and maintenance is required by the manufacturer.

A 101.5.2 Maintenance Log. A maintenance log for potable rainwater catchment systems shall be maintained by the property owner and be available for inspection. The property owner or designated appointee shall ensure

TABLE A 101.5.1
MINIMUM POTABLE RAINWATER CATCHMENT SYSTEM TESTING, INSPECTION AND MAINTENANCE FREQUENCY

DESCRIPTION	MINIMUM FREQUENCY
Inspect and clean filters and screens, and replace (if necessary)	Every 3 months
Inspect and verify that disinfection, filters and water quality treatment devices and systems are operational. Perform any water quality tests as required by the Authority Having Jurisdiction.	In accordance with the manufacturer's instructions, and the Authority Having Jurisdiction.
Perform applicable water quality tests to verify compliance with Section A104.2.	Every 3-months
Perform a water quality test for E. Coli, Total Coliform, and Heterotrophic bacteria. For a system where 25 different people consume water from the system over a 60 day period, a water quality test for cryptosporidium shall also be performed.	After initial installation and every 12 months thereafter, or as directed by the Authority Having Jurisdiction.
Inspect and clear debris from rainwater gutters, downspouts, and roof washers.	Every 6 months
Inspect and clear debris from roof or other aboveground rainwater collection surface.	Every 6 months
Remove tree branches and vegetation overhanging roof or other aboveground rainwater collection surface.	As needed
Inspect pumps and verify operation.	After initial installation and every 12 months thereafter.
Inspect valves and verify operation.	After initial installation and every 12 months thereafter.
Inspect pressure tanks and verify operation.	After initial installation and every 12 months thereafter.
Clear debris and inspect storage tanks, locking devices, and verify operation.	After initial installation and every 12 months thereafter.
Inspect caution labels and marking.	After initial installation and every 12 months thereafter.

that a record of testing, inspection and maintenance as required by Table A 101.5.1 is maintained in the log. The log will indicate the frequency of inspection, and maintenance for each system. A record of the required water quality tests shall be retained for not less than 2 years.

A 101.5.3 Maintenance Responsibility. The required maintenance and inspection of potable rainwater catchment systems shall be the responsibility of the property owner, unless otherwise required by the Authority Having Jurisdiction.

A 101.6 Operation and Maintenance Manual. An operation and maintenance manual for potable rainwater catchment systems shall be supplied to the building owner by the system designer. The operating and maintenance manual shall include the following:

(1) Detailed diagram of the entire system and the location of all system components.

(2) Instructions on operating and maintaining the system.

(3) Details on maintaining the required water quality as determined by the Authority Having Jurisdiction.

(4) Details on deactivating the system for maintenance, repair, or other purposes.

(5) Applicable testing, inspection and maintenance frequencies as required by Table A 101.5.1.

(6) A method of contacting the manufacturer(s).

A 101.7 Minimum Water Quality Requirements. The minimum water quality for all potable rainwater catchment systems shall meet the applicable water quality requirements as determined by the Authority Having Jurisdiction. In the absence of water quality requirements, the guidelines EPA/625/R-04/108 contains recommended water reuse guidelines to assist regulatory agencies develop, revise, or expand alternate water source water quality standards.

A 101.8 Material Compatibility. In addition to the requirements of this appendix, potable rainwater catchment systems shall be constructed of materials that are compatible with the type of pipe and fitting materials and water conditions in the system.

A 101.9 System Controls. Controls for pumps, valves, and other devices that contain mercury that come in contact with the water supply are prohibited.

A 102.0 Connection.

A 102.1 General. No water piping supplied by a potable rainwater catchment system shall be connected to any other source of supply without the approval of the Authority Having Jurisdiction, Health Department or other department having jurisdiction. [UPC:602.4]

A 102.2 Connections to Public or Private Potable Water Systems. Potable rainwater catchment systems shall have no direct connection to any public or private potable water supply or alternate water source system. Potable water from a public or private potable water system shall be permitted to be used as makeup water to the rainwater storage tank provided the public or private potable water supply connection is protected by an airgap or reduced-pressure principle backflow preventer in accordance with the plumbing code.

A 102.3 Backflow Prevention. The potable rainwater catchment system shall be protected against backflow in accordance with the plumbing code.

A 103.0 Potable Rainfall Catchment System Materials.

A 103.1 Collections Surfaces. The collection surface for potable applications shall be constructed of a hard, impervious material and shall be approved for potable water use. Roof coatings, paints, and liners shall comply with NSF Protocol P151.

A 103.1.1 Prohibited. Roof paints and coatings with lead, chromium, or zinc are prohibited. Wood roofing material and lead flashing are prohibited.

A 103.2 Rainwater Catchment System Drainage Materials. Gutters and downspouts used in rainwater catchment drainage systems shall comply with NSF Protocol P151, and leaders and conductors shall be listed to NSF 61.

A 103.3 Storage Tanks. Rainwater storage shall be in accordance with Section A 104.5.

A 103.4 Water Supply and Distribution Materials. Potable rainwater supply and distribution materials shall be in accordance with the requirements of the plumbing code for potable water supply and distribution systems.

A 104.0 Design and Installation.

A 104.1 Collection Surfaces. Rainwater shall be collected from roof or other cleanable aboveground surfaces specifically designed for rainwater catchment. Rainwater catchment system shall not collect rainwater from:

(1) Vehicular parking surfaces.

(2) Surface water runoff.

(3) Bodies of standing water.

A 104.1.1 Prohibited Discharges. Overflows, condensate, and bleed-off pipes from roof-mounted equipment and appliances shall not discharge onto roof surfaces that are intended to collect rainwater.

A 104.2 Minimum Water Quality. Upon initial system startup, the quality of the water for the intended applications shall be verified at the point(s) of use, as determined by the Authority Having Jurisdiction in accordance with Section A 104.2.1 and Section A 104.2.2. Water quality maintenance shall be according to Section A 104.2.3.

A 104.2.1 Private Potable Water System. In the absence of water quality requirements determined by the Authority Having Jurisdiction, the minimum water quality for a private potable water system at the point of use shall comply with Table A104.2.1.

A 104.2.2 Public Use Occupancies. The minimum water quality for a potable water system for public use occupancies at the point of use and testing procedures shall comply with the Environmental Protection Agency

(EPA) Safe Drinking Water Act for a public water system.

A 104.2.3 Maintenance. Normal system maintenance shall require system testing every 3 months in accordance with Table A 104.2.3. Upon failure of the fecal coliform test, system shall be re-commissioned involving cleaning, and retesting in accordance with section A104.2.

TABLE A 104.2.1
MINIMUM WATER QUALITY

Escherichia coli (fecal coliform):	Non-detectable
Protozoan Cysts:	Non-detectable
Viruses:	Non-detectable
Turbidity:	<0.3 NTU

TABLE A 104.2.3
MINIMUM SYSTEM MAINTENANCE REQUIREMENTS

Escherichia coli (fecal coliform):	Non-detectable
Turbidity:	<0.3 NTU

A 104.3 Water Quality Devices and Equipment. Devices and equipment used to treat rainwater to maintain the minimum water quality requirements determined by the Authority Having Jurisdiction shall be listed or labeled (third-party certified) by a listing agency (accredited conformity assessment body) and approved for the intended application.

A 104.3.1 Filtration Devices. Potable water filters shall comply with NSF 53 and shall be installed in accordance with manufacturer's instructions.

A 104.3.2 Disinfection Devices. Chlorination, ozone, and ultraviolet or other disinfection methods shall be approved by an Authority Having Jurisdiction, or the product shall be listed according to a microbiological reduction performance standard for drinking water used to treat harvested rainwater to meet the required water quality permitted. The disinfection devices and systems shall be installed in accordance with the manufacturer's installation instructions and the conditions of listing. Disinfection devices and systems shall be located downstream of the water storage tank.

A 104.3.3 Filtration and Disinfection Systems. Filtration and disinfection systems shall be located after the water storage tank. Where a chlorination system is installed, it shall be installed upstream of filtration systems. Where ultraviolet disinfection system is installed, a filter not greater than 5 microns (5 μm) shall be installed upstream of the disinfection system.

A 104.4 Overhanging Tree Branches and Vegetation. Tree branches and vegetation shall not be located over the roof or other aboveground rainwater collection surface. Where existing tree branch and vegetation growth extends over the rainwater collection surface, it shall be removed as required in Section A 101.5.

A 104.5 Rainwater Storage Tanks. Rainwater storage tanks shall be installed in accordance with Section A 104.5.1 through Section A 104.5.7.

A 104.5.1 Construction. Rainwater storage tanks shall be constructed of solid, durable materials not subject to excessive corrosion or decay and shall be watertight. Storage tanks or storage tank liners and coatings shall be listed to NSF 61 and approved by the Autority Having Jurisdiction for potable water applications, provided such tanks comply with approved applicable standards.

A 104.5.2 Location. Rainwater storage tanks shall be installed above or below grade.

A 104.5.2.1 Above Grade. Above grade storage tanks shall be of an opaque material, approved for aboveground use in direct sunlight, or shall be shielded from direct sunlight. Tanks shall be installed in an accessible location to allow for inspection and cleaning. The tank shall be installed on a foundation or platform that is constructed to accommodate all loads in accordance with the building code.

A 104.5.2.2 Below Grade. Rainwater storage tanks installed below grade shall be structurally designed to withstand all anticipated earth or other loads. Holding tank covers shall be capable of supporting an earth load of not less than 300 pounds per square foot (lb/ft^2) (1465 kg/m^2) when the tank is designed for underground installation. Below grade rainwater tanks installed underground shall be provided with manholes. The manhole opening shall be a minimum diameter of 20 inches (508 mm) and located not less than 4 inches (102 mm) above the surrounding grade. The surrounding grade shall be sloped away from the manhole. Underground tanks shall be ballasted, anchored, or otherwise secured, to prevent the tank from floating out of the ground when empty. The combined weight of the tank and hold down system should meet or exceed the buoyancy force of the tank.

A 104.5.3 Drainage and Overflow. Rainwater storage tanks shall be provided with a means of draining and cleaning. The overflow drain shall not be equipped with a shutoff valve. The overflow outlet shall discharge as required by the plumbing code for storm drainage systems. Where discharging to the storm drainage system, the overflow drain shall be protected from backflow of the storm drainage system by a backwater valve or other approved method.

A 104.5.3.1 Overflow Outlet Size. The overflow outlet shall be sized to accommodate the flow of the rainwater entering the tank and not less than the aggregate cross-sectional area of the inflow pipes.

A 104.5.4 Opening and Access Protection.

A 104.5.4.1 Animals and Insects. Rainwater tank openings to the atmosphere shall be protected to prevent the entrance of insects, birds, or rodents into the tank.

A 104.5.4.2 Human Access. Rainwater tank

access openings exceeding 12 inches (305 mm) in diameter shall be secured to prevent tampering and unintended entry by either a lockable device or other approved method.

A 104.5.4.3 Exposure to Sunlight. Rainwater tank openings shall not be exposed to direct sunlight.

A 104.5.5 Inlets. A device or arrangement of fittings shall be installed at the inlet of the tank to prevent rainwater from disturbing sediment as it enters the tank.

A 104.5.6 Primary Tank Outlets. The primary tank outlet shall be located not less than 4 inches (102 mm) above the bottom of the tank, or shall be provided with floating inlet to draw water from the cistern just below the water surface.

A 104.5.7 Storage Tank Venting. Where venting by means of drainage or overflow piping is not provided or is considered insufficient, a vent shall be installed on each tank. The vent shall extend from the top of the tank and terminate a minimum of 6 inches (152 mm) above grade and shall be a minimum of 1 ½" (38 mm) in diameter. The vent terminal shall be directed downward and covered with a 3/32 inch (2.4 mm) mesh screen to prevent the entry of vermin and insects.

A 104.6 Pumps. Pumps serving rainwater catchment systems shall be listed for potable water use. Pumps supplying water to water closets, urinals, and trap primers shall be capable of delivering not less than 15 pounds-force per square inch (psi) (103 kPa) residual pressure at the highest and most remote outlet served. Where the water pressure in the rainwater supply system within the building exceeds 80 psi (552 kPa), a pressure reducing valve reducing the pressure to 80 psi (552 kPa) or less to water outlets in the building shall be installed in accordance with the plumbing code.

A 104.7 Roof Drains. Primary and secondary roof drains, conductors, leaders, overflows, and gutters shall be designed and installed as required by the plumbing code.

A 104.8 Freeze Protection. Tanks and piping installed in locations subject to freezing shall be provided with an adequate means of freeze protection.

A 104.9 Roof Washer or Pre-Filtration System. Collected rainwater shall pass through a roof washer or pre-filtration system before the water enters the rainwater storage tank. Roof washer systems shall comply with Section A 104.9.1 through Section A 104.9.4.

A 104.9.1 Size. The roof washer shall be sized to direct a sufficient volume of rainwater containing debris that has accumulated on the collection surface away from the storage tank. The ARCSA/ASPE 63 Standard contains additional guidance on acceptable methods of sizing roof washers.

A 104.9.2 Debris Screen. The inlet to the roof washer shall be provided with a debris screen or other approved means that protects the roof washer from the intrusion of debris and vermin. Where the debris screen is installed, the debris screen shall be corrosion resistant and shall have openings no larger than ½ of an inch (12.7 mm).

A 104.9.3 Drain Discharge. Water drained from the roof washer or pre-filter shall be diverted away from the storage tank and discharged to a disposal area that does not cause property damage or erosion. Roof washer drainage shall not drain over a public way.

A 104.9.4 Automatic Drain. Roof washing systems shall be provided with an automatic means of self draining between rain events.

A 104.10 Roof Gutters. Gutters shall maintain a minimum slope and be sized in accordance with the plumbing code.

A 104.11 Drains, Conductors, and Leaders. The design and size of rainwater drains, conductors, and leaders shall be in accordance with the plumbing code.

A 104.12 Size of Potable Water Piping. Potable rainwater system distribution piping shall be sized in accordance with the plumbing code for sizing potable water piping.

A 105.0 Cleaning.

A 105.1 General. The interior surfaces of tanks and equipment shall be clean before they are put into service.

A 106.0 Supply System Inspection and Test. Rainwater catchment systems shall be inspected and tested in accordance with the applicable provisions of the plumbing code for testing of potable water and storm drainage systems. Storage tanks shall be filled with water to the overflow opening for a period of 24 hours and during inspection or by other means as approved by the Authority Having Jurisdiction. All seams and joints shall be exposed during inspection and checked for water tightness.

APPENDIX B
VACUUM DRAINAGE SYSTEMS

B 101.0 Vacuum Drainage Systems.

B 101.1 General. This section regulates the design and installation provisions for vacuum waste drainage systems. Plans for vacuum waste drainage systems shall be submitted to the Authority Having Jurisdiction for approval and shall be considered an engineered designed system. Such plans shall be prepared by a registered or licensed person to perform plumbing design work. Details are necessary to ensure compliance with the requirements of this section, together with a full description of the complete installation including quality, grade of materials, equipment, construction, and methods of assembly and installation. Components, materials, and equipment shall comply with Section 302.1 or approved by the Authority Having Jurisdiction and other national consensus standards applicable to plumbing systems and materials. Where such standards and specifications are not available, alternate materials and equipment shall be approved in accordance with Section 102.0. [UPC C 7.1]

B 101.2 System Design. Vacuum waste drainage systems shall be designed and installed in accordance with the manufacturer's installation instructions. A vacuum waste drainage system shall include a vacuum generating system, waste collection center, piping network, vacuum valve, and control components used to isolate the vacuum piping network from atmospheric pressure and to collect waste at its point of origin. Where a vacuum system provides the only means of sanitation, duplicate vacuum generating equipment set to operate automatically shall be installed to allow the system to continue in operation during periods of maintenance. [UPC C 7.2]

B 101.2.1 Vacuum Generating System. The vacuum generating station shall include vacuum pumps to create a constant vacuum pressure within the piping network and storage tanks. The discharge from the tank shall be through an air gap in accordance with the plumbing code. Operation of pumps, collection tanks, and alarms shall be automated by controls. The vacuum pumps shall be activated on demand and accessible for repair or replacement. The vent from the vacuum pump shall be provided for vacuum pump air exhaust, and shall be of a size capable of handling the total air volume of the vacuum pump. [UPC C 7.2.1]

B 101.2.2 Waste Collection Center or Storage Tanks. Vacuum collection center or storage tanks shall be of such capacity as to provide storage of waste to prevent fouling of the system. Such collection or storage tank shall be capable of withstanding 150 percent of the rated vacuum (negative pressure) created by the vacuum source without leakage or collapse. Waste collection center or storage tanks shall be accessible for adjustment, repair, or replacement. [UPC C 7.2.2]

B 101.2.3 Piping Network. The piping network shall be under a continuous vacuum and shall be designed to withstand 150 percent of the vacuum (negative pressure) created by the vacuum source within the system without leakage or collapse. Sizing the piping network shall be in accordance with the manufacturer's instructions. The water closet outlet fitting shall connect with a piping network having not less than a 1½ inch (40 mm) nominal inside diameter. [UPC C 7.2.3]

B 101.2.4 Vacuum Interface Valve. A closed vacuum interface valve shall be installed to separate the piping network vacuum from atmospheric pressure. A control device shall open the vacuum interface valve where a signal is generated to remove waste from the plumbing fixture. [UPC C 7.2.4]

B 101.2.5 Control Components. Where a pneumatic signal is generated at the controller, a vacuum from the system to open the extraction valve shall be designed to operate where vacuum pressure exists to remove the accumulated waste. Each tank shall incorporate a level indicator switch that automatically controls the discharge pump and warns of malfunction or blockage as follows:

(1) Start discharge.

(2) Stop discharge.

(3) Activate an audible alarm where the level of effluent is usually high.

(4) Warning of system shutdown where tank is full. [UPC C 7.2.5]

B 101.3 Fixtures. Fixtures utilized in a vacuum waste drainage system shall comply with Section 302.1. Components shall be of corrosion resistant materials. The water closet outlet shall be able to pass a 1 inch (25 mm) diameter ball and shall have a smooth, impervious surface. The waste outlet and passages shall be free of obstructions, recesses, or chambers that are capable of permitting fouling. The mechanical valve and its seat shall be of such materials and design to provide a leak-free connection where at atmospheric pressure or under vacuum. The flushing mechanism shall be so designed as to ensure proper cleansing of the interior surfaces during the flushing cycle at a minimum operating flow rate. Mechanical seal mechanisms shall withdraw completely from the path of the waste discharge during flushing operation. Each mechanical seal vacuum water closet shall be equipped with a listed vacuum breaker. The vacuum breaker shall be mounted with the critical level or marking not less than 1 inch (25.4 mm) above the flood-level rim of the fixture. Vacuum breakers shall be installed on the discharge side of the last control valve in the potable water supply line and shall be located so as to be protected from physical damage and contamination. [UPC C 7.3]

B 101.4 Drainage Fixture Units. Drainage fixture units shall be determined by the manufacturer's instructions. The pump discharge load from the collector tanks shall be in accordance with this appendix. [UPC C 7.4]

B 101.5 Water Supply Fixture Units. Water supply fixture units shall be determined by the manufacturer's instructions. [UPC C 7.5]

B 101.6 Materials. Materials used for water distribution pipe and fittings shall be in accordance with the plumbing code. Materials used for aboveground drainage shall be in accordance with the plumbing code and shall have a smooth bore, and be constructed of non-porous material. [UPC C 7.6]

B 101.7 Traps and Cleanouts. Traps and cleanouts shall be installed in accordance with the plumbing code. [UPC C 7.7]

B 101.8 Testing. The entire vacuum waste system shall be subjected to a vacuum test of 29 inches of mercury (98 kPa) or not less than the working pressure of the system for 30 minutes. The system shall be gastight and watertight at all points. Verification of test results shall be submitted to the Authority Having Jurisdiction. [UPC C 7.8]

B 101.9 Manufacturer's Instructions. Manufacturer's instructions shall be provided for the purpose of providing information regarding safe and proper operating instructions whether or not as part of the condition of listing in order to determine compliance. Such instructions shall be submitted and approved by the Authority Having Jurisdiction. [UPC C 7.9]

DRAFT

From: Webb, David
Sent: Tuesday, November 20, 2018 10:57 AM
To: Christianson, Ernest
Cc: Gilbert, Jennifer; Burke, Jim; Spaulding, Frank
Subject: Additional Comment- Proposed WW Rules

Follow Up Flag: Follow up
Flag Status: Flagged

Ernie,

Jen and I put together the following additional questions/comments on the proposed Rule:

- Page 36: 1-311 (b)(1):
  Can a minimum standard for accuracy of the GPS coordinates be established? If one is not provided then there will be varying degrees of accuracy. Applications such as ANR Atlas could be used which could be beneficial for many, but would need some sort of baseline. Will there only need to be one GPS location in the center of the finished leachfield?
- Page 151: 1-1002 (i):
  This is then saying that septic tank effluent sanitary lines will not need lateral cleanouts? Even in cases of >45 deg. turns or long runs >100 ft?
- Regarding Campsite flows (Table 8-2):
  What is the technical justification for removing the 7 mo/yr +/- (i.e. seasonal) basis? Has there been evidence that there is no significant difference between seasonal and full year operation in regards to flow, resting periods and long term effectiveness of treatment? Reiterating the comments provided at the public hearing, the significant change in campsite flows for the seasonal state park campgrounds, which currently operate with public facilities open for no more than 6 months/yr, will have profound affect on the economics and viability of future campgrounds, expansions to existing campgrounds, or redesigns of failed systems. Unless there is recent technical data that supports overturning previous determinations that allowed lower flow criteria for seasonal campgrounds, what is the justification? Finally, with modernized fixtures with lower flow capacities, and state park programs to change out fixtures whenever there are replacements needed or renovations (waterless urinals as a state park standard upon replacement; high flow flush valves to low flow flush tanks for toilets, aerators to control flow at sinks, coin op showers), flows in the state parks are being systematically reduced. Relying on older flow studies likely does not capture this trend.
- Page 101: 1-911(c)(2)-
  Would there be any exceptions to requirement that perc tests resulting in use of higher application rate are not allowed (i.e. deference to table/soil classification). Number of tests corroborating (ie. Within certain %)? Witnessing of perc test methods used by Regional staff?

Thank you,
Dave

VERMONT
David H. Webb, P.E.
Environmental Engineer
(802) 595-9896
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VT Agency of Natural Resources
Facilities Engineering Division – Agency Facilities
1 National Life Drive, Main 1
Montpelier, VT 05620-3510

From: Alex Weinhagen <hinesburgplanning@gmavt.net>
Sent: Thursday, November 15, 2018 4:27 PM
To: Christianson, Ernest
Cc: Erik Bailey; 'Wayne Elliott'
Subject: Comments on proposed wastewater/water rules - Weinhagen

Follow Up Flag: Follow up
Flag Status: Flagged

Ernie,
Please see below for comments on the proposed amendments to the State Wastewater System and Potable Water Supply Rules.

Design flows for residential dwellings on municipal water/wastewater systems (section 1-803)
In our email correspondence, you indicated that a residential dwelling unit will continue to be assessed at 210 gallons per day (gpd) for wastewater flows when the wastewater treatment plant is designed to treat at least 50,000 gpd. You also indicated that the design flow for potable water will be 360 gpd when the residence connects to a public water supply. In Hinesburg, we've done some assessment of actual water usage versus design flow allocation for several developments. We found that actual water usage was substantially lower than the original allocation based on the State design flows. Based on six quarters of meter data, the average actual water usage for two of our more recent developments was 98 gpd per dwelling unit. These two developments are comprised of three and four bedroom homes, principally detached single family homes with a small number of duplex homes - Farmall Drive neighborhood, 37 dwelling units, completed in 2005; Thistle Hill Drive neighborhood, 55 dwelling units, completed in 2016.

The consultant we are working with to design an upgrade to our municipal wastewater treatment facility concurs that the design flows in the existing and proposed rules are well in excess of actual usage. Our consultant has done a lot of work for other municipal systems, and he indicated that this mis-match between the State design flow and actual usage is widely understood. Established demographic trends also support this point, given that household size has been dropping for many years. The assumption that two people will occupy each bedroom in a dwelling unit is outdated. A two-bedroom dwelling is unlikely to house four people, and a three-bedroom dwelling is even less likely to house six people, given that Vermont's median household size of 2.34 persons (per 2010 Census data).

Therefore, I recommend that the water and wastewater design flows for residential dwellings connected to municipal systems of 50,000 gpd or more be reduced to 150 gpd per dwelling, with an allowance for further reduction for one bedroom dwelling units (e.g., 100 gpd).

Design flow differential – wastewater vs. water supply
In our email correspondence, you indicated that the higher water supply design flow (e.g., 360 gpd for water vs. 210 gpd for wastewater per dwelling unit) is due in part to consideration of water not discharged into the sewer system, such as water for irrigation and vehicle washing. As noted above, our water meter data indicates that the higher water design flow is far in excess of actual usage. Furthermore, irrigation and car washing are not a factor in Vermont for eight months of the year (Oct-May). As such, any increase in the water supply design flow should be small – i.e., smaller than the proposed 71% increase above the wastewater design flow.

Therefore, I recommend that the water design flows for residential dwellings connected to municipal systems of 50,000 gpd or more not be inflated as much as has been proposed over the wastewater design flow. Perhaps a 10% or 20% increase above the wastewater design flow would be appropriate – i.e., wastewater flow of 150 gpd per dwelling, and water design flow of 165 gpd to 180 gpd.

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From: Jay Buermann <jay@belvt.com>
Sent: Friday, November 23, 2018 9:49 AM
To: Christianson, Ernest
Subject: Re: Comment Meetings and Comments

Ernie,

Thanks for the opportunity to provide comments on the proposed rule changes. Overall, I really like the proposal - a vast improvement over the current version! After hearing your explanation at the recent hearing and seminar, and continuing my review the draft, I offer the following:

1. I remain concerned about the lack of a "grace period" to use "old" test pit data. I'm certain I'm not the only designer with data gathered this last summer, that I consider still valid as basis for a design, despite the lack of formal Munsell colors. Similarly I occasionally have the opportunity to modify a design or permit from several years ago. Having to repeat test pits solely to gather Munsell color codes will add significant expense for my clients, with no real value gained. I therefore ask that you reconsider the possibility of a grace period (to allow continuation of currently active designs), and/or a design alternative to allow the continued use of older data (which, at least on my part, includes "plain English" colors, structure, consistency, etc.).

2. I've recently started work on a couple different lakeshore projects, each of which has an existing lake water supply, and each of which wants a single-lot subdivision. Reviewing the draft rules' impact it appears to me that each new lot, to use lake water, will need to install a new service from the lake to comply with the "on its own system" requirement. I think I understand the intent - that each homeowner is individually responsible for the maintenance (or lack thereof) for their own household only. It makes sense to me in these cases though, to share an intake pipe: there is less impact to the environment (digging in only one pipe, or using one already existing) and therefore less initial expense, and there is little that can go wrong with the pipe once construction is complete... essentially no maintenance. Any treatment systems, and even the pumping and pressurization systems could still be individual house-specific, but I don't see any significant benefit to requiring a separate intake pipe for each house. Please consider clarifying this requirement.

Please let me know if you have any questions or need clarification (or maybe I need to be clarified?), and thanks again for your consideration.

Respectfully,
Jay Buermann, PE
Buermann Engineering, LLC
(802) 893-1308

> On October 25, 2018 at 10:43 AM "Christianson, Ernest" <Ernest.Christianson@vermont.gov> wrote:
>
> Good morning. I sent you an email in September advising of the upcoming public comment meetings. I understand there may be confusion with my statement “Please note, the meetings above are only for people to provide us with comments on the Rules. We will hold meetings with designers following adoption of the Rules, most likely in January if the Rules are adopted, to discuss the Rules changes.” I heard some designers took that as meaning not to attend the public meetings.
>
> I was hoping to convey that the 7 public meetings are only for us to listen and receive comments on the proposed Rules changes. Once the Rules are adopted, we will hold a series of meetings with designers to answer questions, explain how the Rules will be implemented, provide training for describing soil, and discuss the information necessary for an application.
>
> Please understand, we are interested in your comments and hope you will attend one of the public meetings to present your comments or you will provide me your written comments by November 23, 2018 if you prefer or cannot attend a public meeting.

Please let me know if you have questions.

Thanks Ernie

Ernest Christianson, *Program Manager*

[phone] 802-585-4884 &bbsp; [fax] 802-828-1541

[email] ernest.christianson@vermont.gov

[website] http://dec.vermont.gov/water/ww-systems (program information)

[website] http://dec.vermont.gov/water/forms/ww-systems-permits (permit document search)

Agency of Natural Resources

Department of Environmental Conservation

Drinking Water & Groundwater Protection Division

One National Life Drive, Main 2

Montpelier, VT 05620-3521

Note: Written communications to and from state officials regarding state business are considered public records and, therefore, may be subject to public scrutiny.

From: Krueger <krueger.art@gmail.com>
Sent: Tuesday, October 16, 2018 1:05 PM
To: Christianson, Ernest
Cc: Heindel, Craig; Doug Henson; Hewitt, Doug, P.E.; Hindinger, Dave; Hirshberg, Charles PE; Hitchcock, Robert PE; Hoak, Andrew; Holmes, Justin, P.E.; Howells, Nathan, PE; Huizenga, Alan; Jewkes, Ian, P.E.; Johnson, Keith; Johnson, Naomi R PE; Kershner, Jeff; Kesselring, Nicole PE; Kiernan, John; Krebs, Bob, P.E.; Kynor, Ann PE; Larocque, Shannon, PE; Lawes, Dave; Lazorchak, Peter; Leach, Gary; Lefavour, Dexter, P.E.; Mapes, Scott PE; Marchessault, Karl, P.E.; Marquise, Michael PE; Marsh, Don; Marshall, Dave; McCusker, Kristin F PE
Subject: Re: Proposed Amended Wastewater System and Potable Water Supply Rules

Follow Up Flag: Follow up
Flag Status: Flagged

Dear Colleague:

Below find my written comments on the proposed septic rules. Please review them, and if you agree with them support them in your own comments.

I support the adoption of the proposed rules, but they need some changes. Especially note S1-919(b), which requires the replacement of in situ sand with mound sand on really good alluvial sites. This will add considerable expanse to otherwise cheap inground systems and I see no value here.

For my fellow P.E.s, especially note S1-903 and S1-927. These essentially say that only hydrogeologists have the necessary background in elementary algebra to apply D'Arcy's Law to determine the induced water table. It implies that we are so deficient in math skills that we must use the simplified method. This its a disservice to our clients since using D'Arcy's Law directly can result in some savings of mound sand. I hope you will join me in rejecting this insult to our profession.

Art Krueger, P.E.

Ernie -

I support the changes in the rules. As the engineer who wrote the first Vermont septic rules back in 1972, I have a long history with this subject. I have appreciated the progress the state has made in the past 46 years in improving the rules and incorporating scientific understanding as far as possible. Specifically I appreciate the fact that under the new rules we will be able to develop application rates dependent on soil texture rather than the percolation test. The perc test is expensive and gives problematic results. I regret not having gotten rid of it back in 1972.

The main challenge for me of the new rules has been the adoption of the Munsell color charts. It is very hard for us old dogs to adapt to new tricks, however after finally acquiring a Munsell color book and trying it on a few sites I have found that it is really no problem. I really appreciate the part of the chart that helps us estimate the soil texture.

I have the following specific comments on the rules.

S1-903(d): Ground slope requirements. Why are we limiting ground slope to 20% on new lots while allowing it to be 30% on old lots (June 14, 2002)?
If 30% works on old lots, why won't it work on new lots? We should not have unjustifiable restrictions on good septic sites.

S1-903(r) and S1-927: Why are professional engineers prevented from using D'Arcy's Law? D'Arcy was an engineer after all, and most if not all of us were introduced to this law in undergraduate soil courses. D'Arcy's Law simply requires us to apply elementary algebra to the same data used in the simplified method. Certainly P.E.s can handle

the math required. Would this be allowed under the note on page 146? Regardless of the method, could we use the full length of the mound footprint instead of the length of the bed? Obviously the flow spreads out in the mound sand before it hits the native soil. We should be able to take advantage of this to save mound sand and cut a little off the cost of these rather expensive systems.

1-903(f): Please define "special flood hazard areas." Do you mean the 100 year flood plain? We need some advice on how we are supposed to fulfill this requirement.

S1-914(d)(2)(A): This should be changed to Schedule 40 PVC pipe or equal.

S1-911(c)(1)(A) Table 9-3: Why aren't gravels shown on this table? They should definitely be included.

S1-919(b): Sites with perc rates of less than 1 min/inch are quite rare. I may have found 1 or 2 in the almost 50 years that I've been designing systems.
I believe that they are limited to gravels just consisting of small clean stone with no sand. Most gravels have considerable sand mixed in . Sand generally do not have a perc rate of less than 1 min/inch. Indeed, I've often found gravels with perc rates of over 4 min/inch. This requirement in most cases will result in replacing sand with sand, and will not increase the treatment capability of the system. This will place an additional financial burden on the home/land owner. In some places the existing sand will actually meet the specifications of S1-921(g) Table 9-8, as we do find deposits in situ.
In this case the requirement is absurd as well as expensive. This section should certainly be revisited and revised.

Arthur G. Krueger, P.E.
Krueger Engineering, Inc.
780 Button Hill Rd.
Shrewsbury, VT 05738
802-492-3653
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www.KruegerEngineeringVT.com

From: Ken White <kwhite.vaw@gmail.com>
Sent: Friday, November 23, 2018 3:16 PM
To: Christianson, Ernest
Subject: WSPWSR Comments
Attachments: VGWA-VT Potable Water Supply Rules 2018.docx

Hi Ernie,
Attached please find formal comments on the Wastewater System and Potable Water Supply Rules.
Ken White

--

Ken White CWD-PI
VALLEY ARTESIAN WELL CO., INC.
802 738 8400

VGWA Vermont Ground Water Association

November 23, 2018

Ernest Christianson
Agency of Natural Resources
1 National Life Building, Main 2
Montpelier, Vermont 05620-3521

Hi Ernie,

Thank you once again for allowing us, as Vermont Water Well Drillers, the opportunity to be a part of the rulemaking process. We are a very small group of construction and service providers who serve the water needs of many residents throughout Vermont and neighboring states. Our industry meets the needs of Vermonters by drilling, installing and servicing water wells, pump systems and water filtration systems offering access to clean and plentiful drinking water. We provide a conscientious stewardship and protection of the water aquifers that protect Vermont's drinking water and the very source of our livelihood. As independent Vermonter's, many of us often feel a natural disdain for regulation and being told how to do things. As businessmen and leaders of our industry, we understand and appreciate that the Water Supply Rules provide for protection of the natural resource and construction standards that will provide a healthy future for our industry and a high quality drinking water resource for future generations of Vermonters to come.

On behalf of the Vermont Ground Water Association, I would like to offer the following formal comments on the current Wastewater System and Potable Water Supply Rules:

1. **In regard to Permit Exemptions and Variances** - Our industry asserts that it is essential that the Permit Exemption 1-304(15) that allows for the construction of a replacement well also includes a provision for a variance 1-802(e). Our understanding of the Department's position is that the permit exemption is provided rather than a permit and therefore the need for a variance from the permit technical standards does not apply. Currently, the Exemption Form allows for the licensed well driller and the land owner to certify that a variance is required by the physical limitations of the site and that additional construction methods have been implemented to offset any reductions in isolation distances. To safeguard and make this policy clear for future members of our industry and the Department, we feel it would be helpful to include the current Exemption Form for a Replacement Water Supply in the Appendix (?) For clarification we would also like to offer the following language to be considered to 1-304(15)(D); "*a permit exemption form, which includes a variance from the technical standards in accordance with 1-802(e), provided by the Secretary that corresponds to the type of replacement supply is recorded and indexed in the land records of the municipality where the single family residence is located, and, if different, where the replacement supply will be located; and*"

2. In regard to Permit Exemptions for Replacement Water Supplies – In many instances a replacement well for a single family home is sought due to insufficient yield provided by the original source. There are also occasions when the replacement well also offers less than a desired yield and it is reasonable and advantageous to utilize both sources to provide for the needs of the home. There are also examples of people desiring to use their original well as geothermal borehole after a successful well is drilled. While 1-304(15) does not appear to preclude a property from installing and maintaining two sources to meet the needs of the property, the current Exemption Form on Page 1, at the end of the first paragraph, includes; "*This exemption does not apply if the proposed well will be used in conjunction with an existing well.*" We feel it would be helpful to replace this language with: *"When a replacement well is to be used in conjunction with the existing well, allowing for more than one source to meet the demands of a residence, this exemption applies only of the replacement source meets the requirements of 1-1102(b)(2), otherwise a permit may be necessary to demonstrate the need for multiple sources to meet the demands of the residence."* This or similar language, in our opinion, would provide the opportunity for more than one well to provide for a residence while not allowing a loophole for spite wells.

3. In regard to Isolation Distances and Table 11-1 - While many Vermonters may understand the theoretical concept of "first in" for isolation standards, I believe there is less than tepid support for "overshadowing". The horizontal isolation distances in Table 11-1 seem to apply only to the isolation distances between a water source and sources of contamination with no regard to property ownership. It is hard for me to believe that the generators of these sources of contamination do not have to own the property required for the isolation of their applied contaminates. The isolation distances for the growing number of storm water infiltration galleries and the increased isolation distance to agricultural cropland are of specific concern. My understanding, is that storm water catch basins can be constructed with the edge of the berm located at the edge of the property line. Therefore the isolation distance may overshadow and extend primarily onto the adjacent property owner's property. I am not sure that I can fully appreciate the difference between the isolation standard of 25' for a traveled roadway with its' volume of vehicular traffic, commensurate application of vehicle leakage and salt applications and isolation standard of 100' to a catch basin for a parking lot. On the Agricultural Cropland Isolation Standard, it is common sense and appropriate to not "cuss the farmer with your mouth full" and I certainly appreciate the hard work and dedication of farmers, however, Table 11-1 seems to require that every planted acre and cornfield in Vermont will require a 100' buffer, again to be potentially wholly located on neighboring properties. There are a lot of cornfields in Vermont, and the application of this isolation standard will deny permits and prevent the building of homes on acreage previously purchased and believed to be developable by adjacent owners. It appears that a permit applicant may request a reduction in the required isolation distance in 1-1104(k) and this would seem appropriate. As stated in 1-1104(k)(1) *"The Secretary shall authorize the use of a reduced isolation distance or isolation zone between a potable water source and a particular source of contamination when the Secretary determines that the isolation distance specified in Table 11-1 or the isolation zone identified pursuant to Subsection (f) I unnecessary to protect human health because the specific site conditions, or the construction techniques and pipe materials for the potable water supply or wastewater system will prevent the performance of the potable water supply from being impacted by the potential source of contamination."* For clarity we believe that a statement referencing 1-

1104(k) be included in 1-802(a) and not be necessarily precluded by 1-802(b) which states that "*Variances are not available in circumstances other than those identified in Subsection(a)".* If there is no conflict can the Department offer clarity to the statement in 1-802(b)? I am not sure that I understand how 1-802(b) can be applied if 1-1104(k) is available for use.

5. **In regard to Table 11-2** – I believe the intent of the Department is to have Confined Surficial Aquifers appear in the table with bedrock wells rather than with Unconfined Surficial Aquifers.

6. **In regard to Closure of Potable Water Sources** – There have been many instances of unqualified contractors attempting to close water wells and often doing so improperly. To provide clarity we suggest moving 1-1115(d) to become 1-1115(c). It would seem to offer better guidance for the Department to define who can perform the closure of a source and then present the appropriate steps for completing the closure.

7. **In regard to Water Source Design and Construction** – Perhaps I have missed this or perhaps this is covered in another section of Rules, but, shouldn't the Rules include somewhere near 1-1102 or near 1-1205(a) include "*the construction of a groundwater potable water source that is equal to or greater than 20 feet deep shall be performed by a Vermont Licensed Well Driller".* We mention that closure must be performed by a Vermont Licensed Well Driller in 1-1115(d). We reference the grouting of annular space in 1-1106 with references to drilling. Additionally we have no reference to Hydro-fracturing of water wells. Again, perhaps in Subchapter 11, we should include language to the effect that; *"the hydro-fracturing of bedrock water wells shall be performed by a Vermont Licensed Well Driller." "Packers shall be set at a minimum of 40' below the bottom of the well casing"* For both Well Drilling and Hydro-fracturing it would be advisable to include; *"Process water for Well Drilling and Injection water for hydro-fracturing of water wells shall be potable or if unavailable in sufficient quantity, obtained from a clear surface water source and disinfected with an initial dosage of at least 100 mg/L of Chlorine"*

I hope these comments are helpful, it may be that in my efforts to help I have been far too specific, hopefully you will understand the issues and concerns that I have commented on. After all of the Technical Advisory Committee Meetings, it appears there is a finish line in sight. I look forward to working with the new set of rules upon adoption. Thank you again for all of your hard work and effort in making these rules work for regulators, permit specialists, engineers, well drillers, installers and for especially for all of the people who that live and work and call Vermont their home.

Sincerely,

Ken White
President
Vermont Ground Water Association

Valley Artesian Well Co,, Inc.
PO Box 203
Ascutney, Vermont 05030

From: LaRose Surveys, PC <larosesurveys@gmail.com>
Sent: Friday, November 2, 2018 9:43 AM
To: Christianson, Ernest
Subject: Proposed Rules comments

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Ernie-

Thanks for sharing the Rules yesterday at VTC.

I'd like to offer a couple of comments:

1. In our changing demographic, I see many requests to convert a 3 to a 2+1 or a 4 to a 3+1 in order to help a family member moving in such as a parent. This task can be extremely difficult due to the potential of flows increase (70 gpd). It would be great to see a "waiver" granted for something like this where having the required space for the additional 70 gpd as this here in Addison County can prove to be very expensive. Also along these lines, if we have to go from 4 to 3, what happens to the 70 gpd leftover? Perhaps some clarity here?

2. I read that all wells will need to be tested as part of the permit. Will this be a requirement of the Certification Letter?

Thanks

--
Ronald L. LaRose, LS
Kevin R. LaRose, LS
LaRose Surveys, PC
P.O. Box 388 - 25 West Street
Bristol, Vermont 05443
www.larosesurveys.com
p 802.453.3818
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party recipients of the CAD files from the CAD file recipient.

From: Liz Royer <lroyer@vtruralwater.org>
Sent: Wednesday, November 21, 2018 10:12 AM
To: Christianson, Ernest
Subject: Proposed Rule Comments
Attachments: VRWA_WWPWSRcomments.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Ernie,
Please see the attached PDF for comments from VRWA on the proposed Wastewater System and Potable Water Supply Rules. Let me know if you have any questions.

Thanks,
Liz

Liz Royer
Source Protection Specialist
Vermont Rural Water Association
(802) 660-4988 x336
lroyer@vtruralwater.org

Rural Water…supporting water and wastewater systems in Vermont since 1982.

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802-660-4988 phone
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vrwa@vtruralwater.org
www.vtruralwater.org

November 21, 2018

Thank you for giving us the opportunity to provide comments on the proposed Wastewater System and Potable Water Supply Rules (8/27/18 version). On behalf of the Vermont Rural Water Association, we would like to submit the following request for clarification:

Page 82 § 1-903 General Requirements for Soil-Based Wastewater Systems

(g) No portion of a wastewater system shall be located in a Zone 1 of a Public Community Water System Source Protection Area, except a replacement system that replaces an existing wastewater system located in the same Zone 1.

- *Consider adding a reference in the statement above to Table 9-6 - Distances, in Feet, Used to Create Isolation Zones Around Drinking Water Sources (page 110)*
- *Table 9-6 includes setback distances for Public water sources for community water systems, non-community non-transient water systems, and transient non-community water systems*
- *The distances given in the Table 9-6 vary by aquifer type, design rate and design flow (from 50 feet to 1000 feet)*
- *In addition, please clarify in Table 9-6 that for Public Community Water Systems, the setback distances cannot be closer than Zone 1 of a Source Protection Area (generally 200 feet)*

Please contact me with any questions regarding these comments.

Thank you,

Liz Royer, Source Protection Specialist
Vermont Rural Water Association
lroyer@vtruralwater.org
802-660-4988 x336

From: Liza Sargent <lsargent@sveassoc.com>
Sent: Thursday, October 11, 2018 2:49 PM
To: Christianson, Ernest
Subject: RE: Proposed Amended Wastewater System and Potable Water Supply Rules

Follow Up Flag: Follow up
Flag Status: Flagged

Ernest,
Having only read through the proposed Wastewater System and Potable Water Supply Rules once, the following are my questions/comments/observations:

- In the WWPWS rules, I see the definition for "family child care home", "child care facility", and "home occupation". How do you address a day care that isn't licensed with the state of VT?
- I would suggest that the design values on Table 8-1 be to the nearest 5 gpd. Table 8-1 is easy to read but 8-2 and 8-3 are cumbersome. Is there some other way to create a table that fits on one or two pages? On Table 8-3, one of the design flows is to the ½ gallon per day, why?
- For the section on Water Meter Data (1-804), why are daily meter readings for a year necessary? Why not some other representative sample for some required period of time. 365 readings seems excessive. And to require a *daily* record of the number of users seems like an unattainable request.
- Section 1-912(f) is open ended and leaves a lot of risk on the designer not knowing how large a isolation distance may be.
- I don't understand what section 1-913(a) is trying to say. What about wells with a rate of more than 2 gpm? And we have to have isolation zones shown on the plan for wastewater tanks?
- Under section 1-920 regarding at-grade systems, requiring quantifying of boulders and tree stumps is cumbersome. And "approximate" equal percentage? Under (g) construction the first item is construct the swale. Item 16 is also construct the swale.
- Instead of saying under the section for each type of system, "a licensed designer is required to inspect the installation"-just have that listed only once somewhere in the rules. Same with the "construction shall not occur if a sample of soil obtained… moisture content is too high…".
- I think there is a typo under section 1-1007(a)(2)(B)(ii). It says "…sewer service line shall be water works grade 50 psi…", I think it should say "150" psi. This is also found in (b)(1)(B)(i) and (b)(2)(A).
- The new rules seem to specifically target the agricultural sector and not any other industry (i.e. isolation distances).
- Is there an exemption for single family residences for the requirement of including the supporting data and narratives in Appendix A(d)(4)?
- Because there were such extensive changes to the proposed rules, is the state considering multiple trainings/meetings for designers to alleviate the "learning curve" on expectations for permit applications?

Respectfully,
Liza Sargent

Please find attached the proposed unannotated version of the Wastewater System and Potable Water Supply Rules, an annotated and unannotated version of the Water Supply Rule, and the annotated and unannotated version of the Indirect Discharge Rules. A copy of the annotated Wastewater System and Potable Water Supply Rules is not included because the entire set of Rules is crossed out. The Water Supply Rule and Indirect Discharge Rules have minor changes for clarity due to changes to the WW Rules.

We also filed all copies of the Rules, including the annotated Wastewater System and Potable Water Supply Rules, at http://dec.vermont.gov/water/ww-systems

We are planning public comment meetings as follows:
Oct. 31 at 1 pm at the Springfield Regional Office
Nov. 1 at 2 pm at the Rutland Regional Office
Nov. 1 at 6 pm at the Rutland Town Office
Nov. 7 at 1 pm at the Essex Regional Office, Act 250 Conference Room
Nov. 8 at 1 pm at the St. Johnsbury Regional Office, UVM Extension Service Room
Nov. 14 at 2 pm and at 6 pm at the Annex Building in Montpelier

Please note, the meetings above are only for people to provide us with comments on the Rules. We will hold meetings with designers following adoption of the Rules, most likely in January if the Rules are adopted, to discuss the Rules changes.

Please let me know if you have questions or comments about the process or Rules.

Ernie

VERMONT

Ernest Christianson, *Program Manager*
[phone] 802-585-4884 [fax] 802-828-1541
[email] ernest.christianson@vermont.gov
[website] http://dec.vermont.gov/water/ww-systems (program information)
[website] http://dec.vermont.gov/water/forms/ww-systems-permits (permit document search)

Agency of Natural Resources
Department of Environmental Conservation
Drinking Water & Groundwater Protection Division
One National Life Drive, Main 2
Montpelier, VT 05620-3521

Note: Written communications to and from state officials regarding state business are considered public records and, therefore, may be subject to public scrutiny.

From: Lisa Truchon <ltruchon@clivusne.com>
Sent: Tuesday, November 20, 2018 2:04 PM
To: Christianson, Ernest
Cc: Joe Ducharme; Savannah Kelleher
Subject: Re: Written testimony for the Proposed Amended Wastewater System and Potable Water Rules
Attachments: VT Testimony_Clivus_Final Written 112318.docx

Hello Ernie,
I've attached the word document with Joe's comments. Please let me know if you need anything else.

Very kind regards,
Lisa Truchon

Clivus New England, Inc.
PO Box 127
North Andover, MA 01845
tel: 978-794-9400
fax: 978-794-9444
ltruchon@clivusne.com

On Nov 20, 2018, at 1:36 PM, Christianson, Ernest <Ernest.Christianson@vermont.gov> wrote:

Hi Joe, can you do me a favor and send just your comments in word. This way I can copy and past into my documents.

Thanks Ernie

Ernest Christianson, *Program Manager*
[phone] 802-585-4884 [fax] 802-828-1541
[email] ernest.christianson@vermont.gov
[website] http://dec.vermont.gov/water/ww-systems (program information)
[website] http://dec.vermont.gov/water/forms/ww-systems-permits (permit document search)

Agency of Natural Resources
Department of Environmental Conservation
Drinking Water & Groundwater Protection Division
One National Life Drive, Main 2
Montpelier, VT 05620-3521

Note: Written communications to and from state officials regarding state business are considered public records and, therefore, may be subject to public scrutiny.

From: Joseph Ducharme <jducharme@clivusne.com>
Sent: Tuesday, November 20, 2018 8:54 AM
To: Christianson, Ernest <Ernest.Christianson@vermont.gov>

Cc: Savannah Kelleher <kelleher@tremontstrategies.com>; Lisa Truchon <ltruchon@clivusne.com>
Subject: Written testimony for the Proposed Amended Wastewater System and Potable Water Rules

Ernie,

Attached please find Clivus' comments on the Proposed Amended Wastewater System and Potable Water Rules. We look forward to working with the Department as you finalize these rules.

Thank you,

Joseph Ducharme
President

<image001.jpg>

PO Box 127
No. Andover, MA 01845
tel: 978-794-9400
fax: 978-794-9444
JDucharme@clivusne.com

Clivus New England, Inc.
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E-mail: 123CNE@clivusne.com

November 23, 2018

Ernest Christianson
Agency of Natural Resources
1 National Life Drive, Main 2
Montpelier, Vermont 05620-3521

Re: Comments on Proposed Amendments to Wastewater System and Potable Water Supply Rules

To Whom It May Concern:

I am submitting this testimony on behalf of Clivus New England (Clivus) with industry recommendations to the Department's proposed amendments to the Wastewater System and Potable Water Supply Rules.

Clivus has been the industry leader in composting waste treatment and greywater technologies since 1973. Clivus' composting and greywater systems have solved problems and provided sustainable solutions for many ecologically and environmentally difficult sites that require human waste treatment before discharge into local waterways. Facilities using Clivus systems include parks and recreation facilities, nature centers, 'green buildings', and more recently, commercial operations. Today, Clivus systems are used in 53 locations in Vermont and thousands of locations across the country.

The Department's proposed amended rules govern the use and safety of installed wastewater systems and aim to protect the water quality of potable water sources. Due to the nature of Clivus' environmentally focused systems, Clivus is uniquely positioned to provide industry recommendations on innovative uses for wastewater systems that align with environmental standards and solve unique facility limitations.

Clivus is generally in agreement with the rules as proposed. However, Clivus has the below recommendations to provide site specific flexibility and align the rules with successful regulations in neighboring states:

Section 1-201: Definition
Clivus requests that the Department add a definition for Composting Waste Treatment System that would require a maintenance contract. Ongoing maintenance of composting systems is crucial to ensure that public health and safety standards continue to be met, that routine upkeep is performed, that contact records are provided as required to the Department, and that the system remains in compliance with National Sanitation Foundation (NSF) Standards.

Section 1-201 (19) **Composting Waste Treatment Systems** – means a unit that includes a composting toilet and meets the following descriptions:

(A) a unit that complies with the requirements of the NSF Standard 41 "Non-Liquid Saturated Treatment Systems";

(B) a unit that is designed to store compostable and composted solids for at least two years, unless otherwise approved by the Secretary;

(C) a unit for which the owner holds a valid maintenance contract at all times with an entity or individual that is certified by the composting toilet vendor to provide maintenance of the composting toilet. The minimum maintenance contract term shall be two (2) years;

a. Two (2) years after the issuance of the Certificate of Conformance, and every two (2) years thereafter, the owner shall submit a report prepared by a system inspector documenting the condition of all aspects of the system, including, but not limited to, certification that the permitted system has not been modified and the design remains as permitted.

Section 1-803: Design Flows

Clivus requests that the Department increase the standard for residential system design flow reduction. This would allow for a higher quality of effluent being produced using less land and bring Vermont rules in alignment with other New England states including Maine, Massachusetts, Rhode Island and Connecticut.

Section 1-803 (g)(2): If not more than four living units will be served by a component and each living unit contains only composting or incinerating toilets, the design flow for the component may be reduced by ~~25 percent~~ 50 percent.

Section 1-929: Disposal of Contents of Composting or Incinerating Toilets

- Clivus requests that the Department clarify section 1-929 (a). The rules as drafted do not make it clear that if the liquid by-product is removed from the site, compost solids can be disposed/reused per section 1-929(c).

- Clivus requests that the Department include a provision to allow the Secretary to approve alternative methods of compost disposal. This change would allow for flexibility in the land application of compost and liquid by-product in Department-approved locations after consideration of public health and safety requirements. For example, this would allow State Parks to collect compost from their systems and use that material at an approved on-site location.

Add: Section 1-929 (c)(3) Other use as approved by the Secretary.

Clivus thanks you for your consideration of our comments on the proposed rule. We look forward to working with the Department to ensure the safety, wellbeing and environmental security of wastewater systems and the potable water supply.

Sincerely,

Joseph Ducharme
President
Clivus New England, Inc.

From: Sicard, Nathan - Ruggles Engineering <nate.res@myfairpoint.net>
Sent: Wednesday, November 21, 2018 11:54 AM
To: Christianson, Ernest
Cc: Redmond, Bryan
Subject: Comments to proposed Rules
Attachments: WWPWS Rule Update - Comments - Submit.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Ernie,

I have attached comments for the proposed Wastewater Rules from Ruggles Engineering Services, Inc.

Sincerely,
Nate

Nathan P. Sicard, P.E., CPESC
Civil Engineer
Ruggles Engineering Services, Inc.
4580 Memorial Drive
St. Johnsbury, VT 05819
(802) 748-5898
www.rugglesengineeringservices.com

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ST. JOHNSBURY, VT 05819
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RES@MYFAIRPOINT.NET

RUGGLES ENGINEERING SERVICES INC.

DRAFT EPR Ch1 Wastewater System and Potable Water Supply Rules 2018 08 27

Comments: November 21, 2018

Definitions (7)(8)(35). Why are you referencing the River Corridor Rule. The RCR just references the language that you are removing from this definition. The language is not from RCR it is from FEMA. The RCR rule is for specific projects such as land exempt from municipal regulation. You're not referencing the definition of a stream or wetland to another ANR rule? Put back definitions or just reference FEMA.

1-803 Design Flow
Design flow for 7 month or less campgrounds proposed to be increased to only a year round campground. Shouldn't year round campground be removed as they don't seem to exist in VT.? We are not aware of any issues with the current design flow for 7 months. The result of this rule change will increase the size of leach fields and costs which is not necessary. Waste stream flows are not increasing and remain much lower flow than current design flows. If anything waste stream flows are historically low which result in higher effluent concentrations. Increasing the bed size does not improve the treatment, especially with gravity fields.

Need definition of food service and meal.

Tasting Rooms – How about outdoor beer gardens with food trucks? This has been a growing industry in NEK. Tasting rooms are required to have snacks, reason for defining meals or food service.

1-1001 Flexible Specific Technical Standards

Technical Standards should remain "guidelines" for the Engineer or Municipality to make the final decision. Engineers have licenses for a reason.

Minimum bury depth for sanitary sewer services, 48-inch needs to be removed. Depths may range as little as 12-inches of cover. Insulation varies based on judgement. Sanitary sewer thermal conditions vary significantly depending on the site.

We have worked on many sites in existing communities where existing services have been reconnected that do not meet the "technical standards", such as minimum slope or bury depth and no problems exist. Judgement is used to determine if reconnects will continue to work based on acceptable practice and experience or if another design is required which would conform to the technical standards that are used when we have the ability.

Rules are being changed for a problem that does not exist.

1-1007 Separation

Why are we continuing to use old standards that were used for VC (3' lay length with no gasketed joints or AC pipe or even cast that breaks easy when exposed to trench crossings? The more we apply this 18-inch standard, the more we compromise the constructability of modern pipe.

(a)(1)(A).C900 pressure classes are 165, 235 and 305. Water mains are usually constructed with DR18 (235). What about C909? C909 is more resistant to rupture when working around it. Test to 150#'s? Clarify to say "with water", some will tell contractors to use air…Mechanical joints and joint restraints within 10' of water pipes? Push on couldn't be tested without thrust blocks. Temporary megalug caps? 150psi in 8-inch pipe will produce 7500 lbs of thrust. Final connections would then require solid sleeves. Solid sleeves result in a total of 4 additional joints for the connection that will not be able to be pressure tested and will have ID transition issues. This creates more of a potential risk.

(a)(2)(A). Define sleeve materials if pressure pipe is defined in "(a)(1)(A)". How do you propose to seal the pipe water tight?

(b)(1)(B)
Same comments as horizontal separation. Consistency with pipe materials AWWA C-600? C-900?

Separation needs to remain guidelines. ANR needs to work with industry to develop a consistent approach for improving technical standards that doesn't create more compromising joints, disconnect of inner diameter continuity and transitioning from standards that were developed for brittle, poorly sealed pipe system from the mid 20th century.

Sincerely,
Ruggles Engineering Services, Inc.

Nathan P. Sicard, P.E., CPESC
Civil Engineer, VT Class 1Licensed Designer

From: patrick@larsengeology.com
Sent: Tuesday, October 30, 2018 8:37 AM
To: Christianson, Ernest
Subject: RE: Significant Changes to the Rules

Follow Up Flag: Follow up
Flag Status: Flagged

VERY minor grammatical comment caught while reading through rules. Not worthy of bringing up at meeting so I'll mention it here.

1-802(e)(2)(A)(i)

missing the word "of" after the word "development"?

Patrick L. Larsen
Larsen Applied Earth Science, LLC
www.larsengeology.com
802-793-6236

-----Original Message-----
From: "Christianson, Ernest" <Ernest.Christianson@vermont.gov>
Sent: Monday, October 29, 2018 4:41pm
To:
Subject: Significant Changes to the Rules

I was asked by several designers if I could provide a summary of the significant changes to the Rules. I was reluctant because I am concerned sending you my list because what I consider significant may not be significant in your opinion. Additionally, I'm concerned you may focus on my list and miss a change that you may otherwise feel is significant.

With those concerns expressed, please find attached a list I consider to be the major significant changes to the Rules.

Please note, this list does not represent the opinion of the Technical Advisory Committee nor did any Committee member offer suggestions on what they may consider to be a significant change to the Rules during my drafting of the list.

Thanks Ernie

VERMONT

Ernest Christianson, *Program Manager*
[phone] 802-585-4884 [fax] 802-828-1541
[email] ernest.christianson@vermont.gov
[website] http://dec.vermont.gov/water/ww-systems (program information)
[website] http://dec.vermont.gov/water/forms/ww-systems-permits (permit document search)

Agency of Natural Resources
Department of Environmental Conservation
Drinking Water & Groundwater Protection Division
One National Life Drive, Main 2
Montpelier, VT 05620-3521

Note: Written communications to and from state officials regarding state business are considered public records and, therefore, may be subject to public scrutiny.

From: RJ Thompson <rj@vermonthuts.org>
Sent: Thursday, November 15, 2018 10:14 PM
To: Bradley, Grahame
Cc: Christianson, Ernest
Subject: Re: Wastewater and Cabins

Hi Grahame,

Thank you for the thorough reply. May I ask what the new rules are? At any rate, yes, I'd like to provide a more comprehensive comment once I learn a bit more, but for now, please consider the comment below as my preliminary submission at the very least. It will undoubtedly need some refining. I will check back in on Monday to hopefully gain more detail (I will be in the field working on our Chittenden Brook Hut Friday through Sunday with no cell service).

Comment:
Structures used for overnight or day-use recreational purposes on a year-round or temporary basis shall not be required to have a grey water/leachfield septic system when there is no running water. This should apply to structures located on both public and private land. In such situations, composting privies, vaulted privies, pit latrines, or similar outhouse may be utilized for human waste.

Please do send any information you have regarding the review process and timelines. I will attempt to check in with Ernie on Monday when I'm back in service.

Thanks again, and safe travels.

-RJ

RJ Thompson
Executive Director
Vermont Huts Association

PO Box 745
Stowe, VT 05672
o. 802-798-3003 x1
c. 802-881-3284
www.vermonthuts.org

Facebook | **Instagram**

Did you know? We're currently fundraising for our first hut! You can support the project by **becoming a member** or **donating to our hut fund**.

On Thu, Nov 15, 2018 at 4:54 PM Bradley, Grahame <Grahame.Bradley@vermont.gov> wrote:

> Hi RJ,
>
> I'm writing from the car on the way to Boston airport. I discussed the issues you raised with two senior colleagues yesterday. There are currently at least situations:
>
> 1) cabins used all year with pit latrine/compost toilet but no running water (campers carry in water from stream of further) have been permitted without gray water leachfield.
>
> 2) cabins with pit latrine/ compost toilet and a single sink used for less than 3 consecutive weeks and less than 60 days per year

are considered primitive camps and no permit required

3) cabins as described in 2 or with more internal plumbing must have means of disposing of gray water (ie leachfield) and need a permit.

Your inquiry brought to our attention that we may need to take another look at category 1 and ensure something like this is available within the new rules. These are currently in public consultation. I recommend that you email an official comment to Ernie Christianson, Program Manager (copied in) before Thanksgiving (Friday if possible).

If you go to the Wastewater System and Potable Water Supply web page there is a link to the draft rules. These will be difficult to familiarize yourself within a short space of time. Therefore I recommend you write to Ernie describing the situation you think should be covered by the new rules. This way we will have to reply to your comment and potentially address it in the new rules. Time really is if the essence to receive your comment.

As a keen hiker and camper, I do want to ensure we have thought through these issues.

Best regards

Graham

Get Outlook for iOS

From: RJ Thompson <rj@vermonthuts.org>
Sent: Wednesday, November 14, 2018 3:53 PM
To: Bradley, Grahame
Subject: Re: Wastewater and Cabins

Hi Grahame,

I have a few questions about the "3 consecutive weeks, and no more than 60 days a year" section, particularly how it applies to backcountry facilities. For example, Bryant Camp and Bolton Lodge (both of which are used for recreational purposes and are rented throughout the year by the Green Mountain Club) are backcountry structures that have permitted composting privies.

My questions are:

1) Do you know what classification was used for those facilities so they could achieve the desired wastewater permit?

2) Is there a separate permitting process for structures being located on state land vs. private? To clarify, are private landowners held to a different standard when it comes to wastewater treatment - particularly as it relates to composting privies?

We have been contacted by a few private landowners who are interested in constructing a hut/yurt type of primitive camp that could potentially also be used as a hut. However, given the 60-day threshold and 3 consecutive week language, there appear to some limitations we'd need to navigate.

Thanks for your help. Perhaps we can hop on a call sometime Monday?

All the best,

-RJ

RJ Thompson
Executive Director

Vermont Huts Association

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Stowe, VT 05672
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c. 802-881-3284
www.vermonthuts.org

Facebook | **Instagram**

Did you know? We're currently fundraising for our first hut! You can support the project by **becoming a member** or **donating to our hut fund**.

On Fri, Oct 26, 2018 at 8:06 AM RJ Thompson <rj@vermonthuts.org> wrote:

> Hi Grahame,
>
> My apologies for the delayed reply. Thanks a bunch for looking into this - I appreciate the clarification and additional information. Should we have additional questions, I'll be sure to reach out to you.
>
> Have a great weekend!
>
> -RJ
>
> **RJ Thompson**
> **Executive Director**
> Vermont Huts Association
>
> PO Box 745
> Stowe, VT 05672
> **o.** 802-798-3003 x1
> **c.** 802-881-3284
> **www.vermonthuts.org**
>
> **Facebook** | **Instagram**
>
> Did you know? We're currently fundraising for our first hut! You can support the project by **becoming a member** or **donating to our hut fund**.
>
> On Thu, Oct 18, 2018 at 10:52 AM, Bradley, Grahame <Grahame.Bradley@vermont.gov> wrote:
>
> > Hi RJ,
> >
> > I'll quickly try and clarify some of your questions with reference to the Wastewater System and Potable Water Supply Rule (WW Rules). I've attached the current Rules and the draft amended WW Rules which are currently released for public consultation. The sections copied below are taken from the draft amended WW Rules. The intention of the old and new Rules are the same, but the language is clearer in the new Rules.
> >
> > With regard to the private cabin you mentioned. A new or modified 'building or structure' is required to have a permit for a wastewater system. A 'cabin' is included in the definition of a 'building or structure'. A living unit is considered a primitive camp if it is used for no more than 3 consecutive weeks, and no more than 60 days a year, and contains no more than a single sink. A primitive camp may have a compost toilet, if the compost is disposed of in an approved manner. A 'building

or structure' may have a compost toilet, in which case the 'design flow' and therefore the leachfield can be reduced in size by 25%.

You can see how Green Mountain Club operated huts are permitted by typing 'Green Mountain Club' in the Landowner/Applicant Name box here:

https://anrweb.vt.gov/DEC/WWDocs/Default.aspx

I just did it and saw that those with permits use either compost toilets or holding tanks. Holding tanks are only allowed if they have been in use since before 2007 and there is no alternative. I'm not sure how pit latrines are managed. You might want to talk to someone in Forest, Parks, and Recreation about that.

Regards

Graham

Graham Bradley, PhD, *Hydrogeologist & Soil Geologist*
Wastewater Designer Program & Innovative Alternative System Approvals
Department of Environmental Conservation
Drinking Water & Groundwater Protection Division
802-622-4129 grahame.bradley@vermont.gov

Note: Written communications to and from state officials regarding state business are considered public records and, therefore, may be subject to public scrutiny.

From: Seth Jensen <seth@lcpcvt.org>
Sent: Tuesday, November 20, 2018 4:13 PM
To: Christianson, Ernest
Cc: Claudon, Lynnette; Clark, Mary; Tasha Wallis; pps.caleb@gmail.com
Subject: Proposed Amended Wastewater System and Potable Water Supply Rules -- Comments from Lamoille County Planning Commission
Attachments: LCPC Comments -- Final -- Signed.pdf

Dear Mr. Christianson,

Attached to this email, please find comments on the Proposed Amendments to the Wastewater System and Potable Water Supply Rules from the Lamoille County Planning Commission.

Thank you for your time and consideration. Please feel free to contact either me or LCPC Executive Director Tasha Wallis if you have any questions. We can be reached via email at seth@lcpcvt.org or tasha@lcpcvt.org, respectively, or via telephone at 888-4548.

Seth

Seth Jensen, Principal Planner
Lamoille County Planning Commission
P.O. Box 1637
52 Portland Street, 2nd Floor
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seth@lcpcvt.org

(phone) 802.888.4548
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(fax) 802.888.6938

Lamoille County Planning Commission

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November 23, 2018

Mr. Ernest Christianson
Agency of Natural Resources
1 National Life Drive, Main 2
Montpelier, Vermont 05620-3521

Re: Comments on Proposed Amendments to Wastewater System and Potable Water Supply Rules

Dear Mr. Christianson,

Thank you for this opportunity to comment on the proposed Amendments to Vermont's Wastewater System and Potable Water Supply Rules (Rules). The Executive Committee of the Lamoille County Planning Commission (LCPC) has reviewed the proposed Amendments to the Rules with specific attention to potential impacts to Village Centers in our rural communities, and rural communities in other regions of Vermont. The Lamoille County Regional Plan identifies thirteen distinct Center Areas that are not served by public wastewater infrastructure. While these areas may lack public infrastructure, they remain commercial and civic centers that are vital to the economic vitality and social health of Lamoille County, and Vermont as a whole.

The Rules will play a part in determining whether or not redevelopment and revitalization of these Centers is possible. Revitalization of these Centers is critical to each of the Governor's three key priorities of growing the economy, making Vermont more affordable, and protecting the most vulnerable. Many of the Vermont's Villages without public wastewater infrastructure are in communities that have been passed over by the relative affluence found in more urban areas of Vermont. The structure of the Rules may enable or inhibit reinvestment in these communities -- from small increases in flow to major redevelopment such as welcoming a new employer or constructing new affordable housing. To this end, it is critical that the Rules enable and encourage methods and technologies that allow the most efficient use of limited on-site wastewater capacity, such as Time Dosing and Flow Equalization, composting and other waterless systems, and Innovative/Alternative Systems. We would encourage you to carefully consider comments from system users and designers regarding ways in which the Rules could encourage these and similar technologies.

Similarly, given the important role of rural Villages served primarily by individual onsite wastewater capacity, ***we strongly encourage the Agency to consider several hypothetical test cases of the Rules for development that is likely to occur within an un-sewered, rural Village***, such as adding a bedroom to an existing home; expanding use of a Town Office, Library, or Place of Worship; or adding a deli counter to a general store. These test cases should include constraints similar to those found in actual Villages, such as small lot size, proximity to surface water, and competing/overlapping well shields and other isolation distances.

In addition to this general comment, LCPC also seeks clarity on the meaning and intent of the proposed amendment to the definition of "Floodway" as found in the Rules. The current and proposed definitions are contained below.

> ***Current Definition:***
> Floodway - means the channel of a river or other water course and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. Where available, the floodway is designated on either the Flood Insurance Rate maps or Flood Boundary and Floodway maps prepared for a municipality by the Federal Emergency Management Agency, National Flood Insurance Program.
>
> ***Proposed Amendment Definition:***
> Floodway – means floodway as defined in the Vermont Flood Hazard Area and River Corridor Rule.

The definition of Floodway is important as it impacts what, if any, wastewater system components may be constructed. Section 1-903 General Requirements for Soil-Based Wastewater Systems (page 82) states:

> *"(e) – nothing except sanitary sewer service lines or sanitary collection lines can be located in a floodway"*
> *"(f) – A wastewater system shall be located, designed, and constructed in a manner that avoids impairment to the system and contamination from the system during flooding if the site is located in a mapped special flood hazard area."*

We request that ANR clarify in writing whether, as a result of the proposed amendment, ANR depicted "River Corridors" will be used to delineate the floodway as it relates to the Rules, or will in any other way restrict or dictate the location or design of a wastewater system or drinking water supply.

We also request clarification in writing as to whether ANR's current practice of utilizing the River Corridor as the "Act250 Floodway" for projects subject to Act250 Jurisdiction -- as articulated in the "Department of Environmental Conservation Flood Hazard Area and River Corridor Protection Procedure (September 7, 2017)" -- will place any additional limitations on the location of wastewater system or potable water supply components serving development subject to Act250 Jurisdiction, beyond those articulated in the Amended Wastewater Rules.

In general, the River Corridor is wider and more expansive than the FEMA Floodway. While we recognize the importance of protecting wastewater system components from erosion damage, as currently mapped the ANR River Corridors are so broad as to exclude unreasonably large portions of many communities. For example, the River Corridor encompasses nearly 60% of Johnson Village, most of North Main Street in Cambridge Village, School Street in Wolcott Village, and most of Wolcott Village south of Route 15, while the FEMA mapped floodway is more limited in scope. We would also note that such a rule change would not only impact expansion or replacement of existing individual onsite systems, but could also impede development of community scale decentralized wastewater systems, as STEP and STEG tanks do not appear to be allowed within the floodway under Section 1-903 (e).

If the floodway is expanded to include River Corridors, the proposed Rules will create significant new barriers to redevelopment and revitalization of many existing Village Centers. This is not only counter to State Planning and Economic Development goals, but also inhibits long term flood resiliency efforts. Absent outside funds, flood proofing and building elevation most often occurs in conjunction with other improvements. Prohibiting even minor increases in design flow, such as adding a bedroom, will greatly reduce the likelihood and incentive to undertake expensive flood mitigation measures. Finally, this is counter to water quality goals, as it will create barriers to replacement and upgrades of existing, antiquated onsite wastewater systems.

On behalf of the Lamoille County Planning Commission, we offer the following recommendations:

> ***Recommendation I: In order to prevent potential future confusion, maintain the FEMA based definition of floodway in the Wastewater Rules, rather than referencing the Vermont Flood Hazard Area and River Corridor Rule.***
>
> ***Recommendation II: In order to ensure alignment of Agency policies and reduce the potential for conflicting and contradictory standards, eliminate references to wastewater and potable water supply systems in the Department of Environmental Conservation Flood Hazard Area and River Corridor Protection Procedure (September 7, 2017), specifically those found in the definition of Below Ground Improvements.*** This recommendation is consistent with long standing State level policy that the location of wastewater system and potable water supply systems should be governed solely by the Wastewater Rules.

Thank you for your time and consideration. Please feel free to contact LCPC Principal Planner Seth Jensen or Executive Director Tasha Wallis if you have any questions. They can be reached via email at seth@lcpcvt.org or tasha@lcpcvt.org, respectively, or via telephone at 888-4548.

Sincerely,

Caleb Magoon
Chair, LCPC Board of Directors.

From: Tom - <tommosakowski@gmail.com>
Sent: Monday, November 19, 2018 10:42 PM
To: Christianson, Ernest
Subject: Comments prompted by the proposed amended WSPWS Rules
Attachments: screenshot NH DES alternate systems.png; screenshot Maine DEH primitive and limited disposal systems.png

Hello Mr. Christianson and the Agency of Natural Resources,

I thank you and the Agency for accepting comments from the public about the proposed changes to the Wastewater System and Potable Water Supply Rules. I have had concerns with the existing Rules, and this public comment period for the proposed Rules seems to me a good time to share them.

While I have spent a considerable amount of time reading and reflecting upon the Rules and supporting documents, I've found elusive a confident understanding of the whole 227 pages in terms of what is relevant to certain circumstances. (Perhaps a guidance document can me made that shows, specific for various types of buildings and uses, what is required.) With that in mind, please forgive any minor inaccuracies/misunderstandings I write in my comments below, and seek to understand the points I'm making.

1 - As I understand the proposed Rules, all new buildings and structures require a permit and an associated fee except for the following: a cabin on a campsite in a campground, a primitive camp under certain conditions, buildings/structures used for no more than 28 days of events per year and other conditions, buildings/structures built and used for seasonal outdoor activities under certain conditions, and a few other exemptions that don't apply to private residential or farm situations. Considering the above, I sincerely request for the following exemptions to permitting to be added:
-farm buildings such as chicken coops, pig pens, storage buildings, hoophouses and greenhouses, etc
-accessory buildings such as sheds, detached non-plumbed garages, carports, etc
-bonafide primitive or wilderness campgrounds

2 - As I understand the proposed Rules, they place the same requirements upon mainstream residences as upon low-impact or low-water-capacity or "primitive" residences (which are legal in VT as non-public buildings in terms of the Fire & Safety Building Code). Considering this, I sincerely request that permitted options be added that are degree- and kind-appropriate to the following:
-"primitive" year-round residences such as yurts, cabins, traditional-Amish-style houses, indigenous wigwam residences, and other structures whereby water is supplied by hand-carried or -pumped or rain-collected or similar means; there are no plumbed appliances like washing machines; human waste is managed via any of various "alternative" toilets; and as a result, wastewater produced and public health risk are minimal.

3 - More specifically, as I understand the proposed Rules, they don't allow for the following that I sincerely request be added as primary, independent, permitted options for residences:
-hand-carried, hand-pumped, and roof-rainwater-collected water supplies
-compost and moldering toilets, vermicomposting toilets, pit privies (with proper distance from water table, etc),
-no interior plumbing
-leachfield-only greywater systems without septic tanks

4 - For your convenience, below I have included website addresses and quotes in the form of cropped screenshots of the governments of the neighboring states of NH and Maine that, though not ideal in my opinion, are examples of allowances for non-mainstream and low-impact residences, which the VT WSPWS Rules do not seem to allow.
-NH's Dept. of Environmental Services has in its Rules shown here, https://www.des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1000.pdf , the allowances shown in this email's attachment titled "screenshot NH DES alternate systems". Please see the full document for complete information.
-Maine's Division of Environmental Health has in its Rules shown here, https://www.maine.gov/sos/cec/rules/10/144/144c241.docx , the allowances shown in this email's attachment titled "screenshot Maine DEH primitive and limited disposal systems". Please see the full document for complete information.

Thank you for considering my comments. I should add that, although I am representing myself by submitting these comments, I

know that there are many other people in Vermont who want these Wastewater and Potable Water Supply Rules altered to have allowances that are appropriate in kind and degree to low-water-use / "primitive" / low-risk living situations. As the Rules stand now, many people cannot legally live as eco-sustainably as they would like to.

Sincerely,
Tom Mosakowski
resident in Brattleboro, VT

I. PRIMITIVE & LIMITED DISPOSAL SYSTEMS

1. Scope: This Section governs the design and installation of primitive systems and limited systems.

2. Definitions: The following definitions apply to primitive and limited systems:

   (a) A primitive disposal system consists of a grey water disposal field designed to handle hand-carried or hand-pumped water only and an alternative toilet. Temporary portable toilets are not alternative toilets and shall not be used as permanent alternative toilets.

   (b) A limited system consists of a grey water disposal field to handle water supplied from elevated storage tanks or cisterns, of no more than 1,000 gallons capacity, and portable pumps, among other non-conventional pressurized water supplies, and an alternative toilet. Temporary portable toilets are not alternative toilets and shall not be used as permanent alternative toilets.

3. Use of alternative toilets: An alternative toilet must be used if a primitive or limited disposal field is used. An alternative toilet may also be used with a conventional disposal system.

4. Sizing primitive and limited disposal fields: A primitive or limited disposal field must be sized pursuant to Table 4D and Sections 4(J)(2) and 4(K)(3). They must be installed in compliance with the requirements Section 11.

5. Building sewer: The building sewer must have a maximum diameter of 2 inches, and a minimum pitch of ¼ inch per foot (2 percent).

6. Backup system reserve area required: The site evaluator must delineate on the application (HHE-200 Form) a reserve area where a full-size subsurface wastewater disposal area can be installed in compliance with first-time system criteria. The owner may not take or allow any action which would prevent the use of the reserve area for a disposal area installation.

J. PRIMITIVE DISPOSAL SYSTEM REQUIREMENTS

1. Requirement: A primitive system may be used where the primitive system will serve a structure for which the water supplied to not more than three grey wastewater fixtures is hand carried or hand pumped. Allowable fixtures are limited to lavatory, shower/tub or sink. No other plumbing fixtures may be connected to the primitive disposal field. A septic tank is not required.

2. Design flows: The design flow for a primitive system is 25 gallons of grey wastewater per day.

3. Upgrades for primitive systems: Upgrading a primitive subsurface wastewater disposal to a full size, conventional system and a pressurized water supply requires compliance with the first-time system criteria.

K. LIMITED SYSTEM REQUIREMENTS

1. Scope: This Section governs the design and installation of limited systems, which are defined herein as a system which consists of a grey wastewater disposal for a dwelling unit with a finite pressurized water supply. Water is typically supplied to such dwelling units from elevated storage tanks or cisterns, of no more than 1,000 gallons capacity, and portable pumps, among other non-conventional pressurized water supplies.

2. Use of alternative toilets: An alternative toilet must be used if a limited disposal field is used.

3. Design flows: The design flow for a limited system is 100 gallons of grey wastewater per day supplied to not more than 3 grey wastewater fixtures.

4. System upgrades: Upgrading a limited system to a full size, conventional system must meet first-time system criteria.

Source. (See Revision Notes #1 and #2 at chapter heading) #11184, eff 10-1-16

PART Env-Wq 1022 ALTERNATE SYSTEMS

Env-Wq 1022.01 Privies.

(a) No privy shall be located within 75 feet of drinking water wells, surface waters, or foundations on abutting lots.

(b) Subject to (c), below, the bottom of the privy pit shall be at least 4 feet above seasonal high water table and impermeable substratum or ledge.

(c) If the bottom of the privy pit is less than 4 feet above the seasonal high water table or impermeable substratum or ledge, the pit shall be sealed.

Source. (See Revision Notes #1 and #2 at chapter heading) #11184, eff 10-1-16

Env-Wq 1022.02 Mini-Dry Wells for Gray Water.

(a) For purposes of this section, "gray water" means residential wastewater other than from a urinal or a toilet.

(b) A mini-dry well shall be used for the disposal of gray water only if there will be:

(1) No running water to or within the structure to be served; and

(2) No other wastewater discharge from the structure to be served.

(c) No mini-dry well for gray water shall be within 75 feet of drinking water wells or surface waters.

(d) A mini-dry well for gray water shall be a hole up to 18 inches in diameter and up to 12 inches deep, filled with stone or gravel.

Source. (See Revision Notes #1 and #2 at chapter heading) #11184, eff 10-1-16

From: Wayne Elliott <welliott@aeengineers.com>
Sent: Wednesday, November 21, 2018 2:41 PM
To: Christianson, Ernest
Subject: EPR - Chapter 1 Comments

Ernie,

1. 1-103 Statewide Technical Standards (a) – This section notes that the technical standards of these rules supersede existing municipal ordinances and bylaws. It is understood that the technical standards need to apply to those soil base wastewater systems but it is not likely the intent that these standards should supersede Municipal PW Standards, ordinances, etc. Many municipalities have PW standards which apply to new construction of municipal wastewater systems and if these standards meet and/or exceed the technical standards in these Rules, they should not be superseded. Also, many communities define allowable pipe materials, pump station types, etc. as part of their technical standards and they should have the flexibility to customize their preferences as long as the meet the intent of these Rules.
2. 1-803 – The wastewater design flows as specified for connection to municipal wastewater systems are still a concern as being too conservative. There is usage data (billing based on metered water) from many communities that a single family residential unit does not average 210 gpd. In most cases, these flows average 150 to 165 gpd and are less than this for residential units with only 2 or 3 bedrooms. If the 210 gpd is used, it is not representative of actual flows once the units are connected. This higher flows can also cause oversizing of new sewer infrastructure once the peaking factors are applied to the design flows. Residential water usage at 380 gpd is also conservative for a typical residential unit, especially for new construction where appliances, fixtures, etc. use much less water and the household sizes have continued to decrease. It would be much simpler if the allocation for both water and sewer flows for residential units were the same for simplicity but understand that the water demands can be slightly higher in summer with water uses that aren't discharged to the sewer.

Thanks for the opportunity to comment.

Wayne

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Responsiveness Summary for Wastewater System and Potable Water Supply Rules
January 28, 2019

Comments Received and ANR Responses:

1. I would suggest that the design values on Table 8-1 be to the nearest 5 gpd.

   Response:
   Table 8-1 is the same as Table 8-1 in the 2007 Wastewater System and Potable Water Supply Rules (Rules). Table 8-3, although not mentioned in this comment, was developed by subtracting either the 10 percent or 20 percent reductions allowed by the 2007 Rules from the flow identified in the 2007 Rules. A change was not needed.

2. Table 8-1 is easy to read but 8-2 and 8-3 are cumbersome. Is there some other way to create a table that fits on one or two pages? On Table 8-3, one of the design flows is to the ½ gallon per day, why?

   Response:
   Table 8-2 needs to identify different types of campgrounds, amenities required for each campground, and types of structures or recreational vehicles that will occupy campsites for sizing wastewater systems that may not serve the entire campground. It is necessary to break out different flow categories for all the possible types of campgrounds and amenities. Table 8-3 was expanded because of the multitude of facilities which will connect to a wastewater system or potable water supply. The Table, albeit long, is intended to clarify flow figures for many different facilities for designers to base a design without needing to justify a flow number. The design flow for a brewery is 4.5 (the only ½ gallon in the tables) based on the industry's range in flow and represents an average of the industry range. A change was not needed.

3. For the section on Water Meter Data (1-804), why are daily meter readings for a year necessary? Why not some other representative sample for some required period of time. 365 readings seem excessive. And to require a daily record of the number of users seems like an unattainable request.

   Response:
   The Rules allow for those facilities that operate for a shorter period than 12 months to monitor during the actual use. Schools will fall in that category. § 1-804(d) was amended, based on the comment, to allow less than 1 year of readings. The Subsection will read:
   (1) A minimum of daily water meter readings for a year, unless:
      (A) the wastewater system and potable water supply will be operated for less than 180 days of days, in which case, daily water meter readings shall be taken for each day in operation; or
      (B) the wastewater system and potable water supply will be operated for 180 days or more and the Secretary concludes that 1 year of daily water meter readings is not necessary to demonstrate the wastewater strength and quantity of water necessary for the proposed use and the Secretary

provides approval, prior to the collection of water meter readings, for daily water meter readings to be taken for 180 consecutive days. An applicant seeking such approval shall submit the following information:

(i) the nature the existing use of the building or structure, including equipment that may be part of the use and any manufacturing process, that will be in use when meter readings will not be taken;

(ii) seasonal variations in occupancy or water usage of the building or structure demonstrating that all variations will be recorded during the 180 days;

(iii) wastewater strength and characteristics, including BOD and TSS, that may be required to adjust the sizing of the leachfield according to § 1-904 and as further described in Subsection (e), for the days when meter readings will not be taken; and

(iv) other information the Secretary deems necessary based on the specific proposed use and request.

Additionally, "by the Secretary" and "and based in information submitted by the applicant" was inserted into (2).

4. Section 1-912(f) is open ended and leaves a lot of risk on the designer not knowing how large an isolation distance may be.

Response:
The Secretary must be able to state why, within the context of the technical standards identified in the Rules, a greater isolation distance is necessary to protect a feature or object from a wastewater system or that may impact the performance of the wastewater system. The Secretary needs to make this decision based on a scientific analysis of many types of site conditions. A change was not needed.

5. I don't understand what section 1-913(a) is trying to say. What about wells with a rate of more than 2 gpm?

Response:
10 V.S.A. § 1973(j) requires that an applicant seeking a permit notify adjacent landowners when the isolation distances for the applicant's proposed wastewater system or potable water supply extends onto the adjacent lot. The Rules establish different required isolation requirements between a potable water supply and a wastewater system depending on the size and type of potable water source and wastewater system. With many permit applications, the adjacent lot is undeveloped. Thus, the Agency needs to determine what isolation requirements apply when the adjacent lot lacks a source or supply to base the isolation upon. As indicated in § 1-913, when an application seeks a permit for a wastewater system the Agency bases the isolation requirement for notification purposes upon the ability of an adjacent landowner to install a potable water source of 2 gallons per minute or less drilled into bedrock or a confined surficial aquifer, which represents the required flow rate for a potable water supply with the smallest isolation zone. This is called the Wastewater System Presumptive Isolation Zone. Also,

as stated in § 1-1105, when an application seeks a permit for a potable water supply, the Agency bases the isolation requirement for notification purposes upon the ability of an adjacent landowner to install a wastewater system of less than 2000 gallons per day, which represents the design flow for a soil-based wastewater system with the smallest isolation zone. This is called the Potable Water Supply Presumptive Isolation Zone. A change was not needed.

6. And we have to have isolation zones shown on the plan for wastewater tanks?

Response:
Question 6 was an additional thought to the question 5 so is understood to be asking about drawing a presumptive isolation distance around a tank for notification purposes. Under ANR's current guidance, to meet the purposes of 10 V.S.A. § 1973(j), isolation zones are required around leachfields, tanks, and sewer pipes and, when these zones extend onto adjacent lots, adjacent landowners need notification. Moving forward for notification purposes, the Rules require these isolation zones (the wastewater system presumptive isolation zone) to be designated around proposed leachfields, replacement areas, and wastewater tanks. Note, questions 5 and 6 concern notification. Isolation distances need to be shown for all components of a wastewater system when necessary to demonstrate the component will not be located too close to a water source, water service line, or public water system. A change was not needed.

7. Under section 1-920 regarding at-grade systems, requiring quantifying of boulders and tree stumps is cumbersome. And "approximate" equal percentage?

Response:
The current Rules require boulders and tree stumps to remain and to plow around them prior to placing the stone. Depending on the site characteristics, large boulders or many large trees can greatly reduce the infiltrative area that is required for the long-term viability of the at-grade. Designers, in their professional judgement, must decide how the operation of the at-grade will be affected by the decrease in infiltrative area and determine if additional area is needed to off-set the loss of area to boulders or stumps. A change was not needed.

8. Under (g) construction the first item is construct the swale. Item 16 is also to construct the swale.

Response:
Yes, thank you. The Rules were changed to delete construction of the swale in (16). Wording for § 1-920(g)(16) is now "The area surrounding the at-grade leachfield shall be graded, to divert stormwater away from the at-grade leachfield."

9. Instead of saying under the section for each type of system, "a licensed designer is required to inspect the installation", just have that listed only once somewhere in the rules.

Response:

This was a conscious decision for clarity. The Rules include 4 types of designers authorized to design different wastewater systems and leachfields. § 1-311(b) also allows installers to provide the installation certification for certain type potable water supplies and wastewater systems. This ties the design to the type of designer authorized to provide the installation certification and eliminates the installer as a certifying official. A change was not needed.

10. Same with the "construction shall not occur if a sample of soil obtained…moisture content is too high…".

Response:
Because different types of leachfields have slightly different construction standards, it was decided each construction standard be as complete as possible without searching through the Rules for other construction requirements. A change was not needed.

11. I think there is a typo under section 1-1007(a)(2)(B)(ii). It says "…sewer service line shall be water works grade 50 psi…". I think it should say "150" psi. This is also found in (b)(1)(B)(i) and (b)(2)(A).

Response:
Yes, thank you. The Rules was changed to say "150 psi".

12. The new rules seem to specifically target the agricultural sector and not any other industry (i.e. isolation distances).

Response:
The Agency of Agriculture has specific isolation distances in their Required Agricultural Practices Rule. The Wastewater System and Potable Water Supply Rules incorporated their distances to eliminate confusion and potential violations created by two sets of Rules with two different isolation distances. A change was not needed..

13. Is there an exemption for single family residences for the requirement of including the supporting data and narratives in Appendix A(d)(4)?

Response:
There is not an exemption for the supporting data and narratives for a single-family residence. Typically, one single-family residence served by one water source does not require more than the location of the water source and the water service pipe so there is no other component. Within the Rules are expectations for a potable water supply with exceptions carved out for one supply serving one single-family residence. There is also the exemption that allows for the replacement of a potable water supply that serves one single family residence. A change was not needed.

14. Because there were such extensive changes to the proposed rules, is the state considering multiple trainings/meetings for designers to alleviate the "learning curve" on expectations for permit applications?

Response:
Yes, the Agency will hold training/meetings for designers. A change was not needed.

15. In the WWPWS rules, I see the definition for "family child care home", "child care facility", and "home occupation". How do you address a day care that isn't licensed with the state of VT?

Response:
A "child care facility" is defined in the Rules to be consistent with the Agency of Human Services definition, as is the definition of "family child care home." Child care facilities require approval by the Agency of Human Services and the type of approval depends on the number of children, among other factors. No type of child care facilities is considered to be a home occupation for the purposes of these Rules. A change was not needed.

16. S1-903(d): Ground slope requirements. Why are we limiting ground slope to 20% on new lots while allowing it to be 30% on old lots (June 14, 2002)? If 30% works on old lots, why won't it work on new lots? We should not have unjustifiable restrictions on good septic sites.

Response:
This is a requirement established in statute. 10 V.S.A. § 1978(d) provides that "The Secretary shall not adopt rules under this chapter that allow wastewater systems that serve lots created after June 13, 2002 to be constructed on ground with a maximum slope in excess of 20 percent." A change was not needed.

17. § 1-903(r) and § 1-927: Why are professional engineers prevented from using D'Arcy's Law? D'Arcy was an engineer after all, and most if not all of us were introduced to this law in undergraduate soil courses. D'Arcy's Law simply requires us to apply elementary algebra to the same data used in the simplified method. Certainly P.E.s can handle the math required. Would this be allowed under the note on page 146?

Response:
The requirement to have an analysis performed by a qualified hydrogeologist was in the September 10, 1982 Rules and carried forward through the September 29, 2007 Rules. The only change is to remove "qualified". The Division will follow past procedure, if a designer demonstrates he or she has the qualifications that comply with the definition, the designer may perform a hydrogeological analysis. The Agency found that some designers do not understand the principals of Darcy or wrongly apply the principals of Darcy. When this happens, the definition allows the Agency to advise the designer they do not meet the qualifications of a hydrogeologist. A change was not needed.

18. Regardless of the method, could we use the full length of the mound footprint instead of the length of the bed? Obviously, the flow spreads out in the mound sand before it hits

the native soil. We should be able to take advantage of this to save mound sand and cut a little off the cost of these rather expensive systems.

Response:
The fill material outside the basal area may, in some situations, be considered when conducting a hydrogeological analysis for sizing a leachfield in the mound. The hydrogeological analysis, based on slope, soil type, flow, and type of leachfield, must demonstrate the induced water table is 6 inches below the ground surface at the limit of the fill material. For mounds where a hydrogeological analysis is not performed, the full length of the mound footprint is a safety margin to allow effluent to enter the naturally occurring soil and maintain the 6-inch unsaturated soil at the limits of the fill material. A change was not needed.

19. 1-903(f): Please define "special flood hazard areas." Do you mean the 100-year flood plain? We need some advice on how we are supposed to fulfill this requirement.

Response:
Agreed. The Vermont Flood Hazard Area and River Corridor Rule defines ***"Flood hazard area"*** means the land in the floodplain within a community subject to a one percent or greater chance of flooding in any given year. The term has the same meaning as "area of special flood hazard" under 44 C.F.R. § 59.1. The Rules were changed to delete the definition of "Special Flood Hazard Area" and define "Flood Hazard Area – means flood hazard area as defined in the Vermont Flood Hazard Area and River Corridor Rule." The following subsections were correspondingly changed to remove "special": § 1-903(f), § 1-1103(b), § 1-1205(d), § 1-1205(e), and § 1-1205(f).

20. S1-914(d)(2)(A): This should be changed to Schedule 40 PVC pipe or equal.

Response:
The Agency has not found that designers are specifying pipes that are not suitable for pressure distribution. The Subsection remains unchanged leaving to designers to select the proper rigid pipe material within the leachfield. A change was not needed.

21. S1-911(c)(1)(A) Table 9-3: Why aren't gravels shown on this table? They should definitely be included.

Response:
The USDA-NRCS Field Book for Describing and Sampling Soils is the adopted standard for soil description. "Soil texture is the numerical proportion of the sand, silt, and clay separates in the fine-earth fraction (< 2mm)." The matrix (fine-earth fraction) dominates the infiltration and treatment capacity. The infiltration rate in matrix-free gravel is too high to enable effective treatment. The use of texture modifiers including gravelly (15 to 35%), very gravelly (35 to 60%), and extremely gravelly (60 to 90%) may be used and are encouraged. A change was not needed.

22. § 1-919(b): Sites with perc rates of less than 1 min/inch are quite rare. I may have found 1 or 2 in the almost 50 years that I've been designing systems. I believe that they are limited to gravels just consisting of small clean stone with no sand. Most gravels have considerable sand mixed in. Sand generally do not have a perc rate of less than 1 min/inch. Indeed, I've often found gravels with perc rates of over 4 min/inch. This requirement in most cases will result in replacing sand with sand, and will not increase the treatment capability of the system. This will place an additional financial burden on the home/land owner. In some places the existing sand will actually meet the specifications of § 1-921(g) Table 9-8, as we do find deposits in situ. In this case the requirement is absurd as well as expensive. This section should certainly be revisited and revised.

Response:
Table 9-3 is revised to breakout Very Coarse Sand from Coarse Sand and Sand so the table will read:

Soil Characteristics		**Application Rates (gallons per square foot per day)**			
Texture	**Structure Type[1]**	**In-Ground Trench**	**In-ground Bed**	**At-Grade Leachfield**	**Leachfield in a Bottomless Sand Filter**
Very Coarse Sand or Coarser	SG	See § 1-919(b)	See § 1-919 (b)	1.00	1.00
Coarse Sand, Sand	SG	1.50	1.20	1.00	1.00

Additionally, § 1-919(b) is revised to read: "For sites where the soil that will be directly beneath the proposed infiltrative surface of an in-ground leachfield has a percolation rate faster than 1 minute per inch or a soil texture of very coarse sand or coarser and there is no soil with a thickness of 1 foot or greater with a percolation rate 1 minute per inch or slower or a soil texture of coarse sand or finer between the bottom of the proposed infiltrative surface of an in-ground leachfield and the seasonal high groundwater table or bedrock."

Correspondingly, § 1-920(c)(2) is revised to read: "At-grade leachfields shall not be constructed on soil with a percolation rate of faster than 1 minute per inch or a soil texture of very coarse sand or coarser, unless there is a soil with a thickness of 1 foot or greater with a percolation rate 1 minute per inch or slower or a soil texture of coarse sand or finer between the bottom of the proposed infiltrative surface of the leachfield and the seasonal high groundwater table or bedrock."

23. Is 1-802(e)(2)(A)(i) missing the word "of" after the word "development"?

Response:
Yes, thank you. The section now states "development of."

24. In our changing demographic, I see many requests to convert a 3 to a 2+1 or a 4 to a 3+1 in order to help a family member moving in such as a parent. This task can be extremely difficult due to the potential of flows increase (70 gpd). It would be great to see a "waiver" granted for something like this where having the required space for the additional 70 gpd as this here in Addison County can prove to be very expensive.

Response:
The Agency had an exemption to allow an in-family residential unit determined that, when the unit no longer was occupied by the family member, the unit was rented to a non-family member without applying for a permit for the additional non-family residential unit. The decision was to eliminate the exemption and work within the Rules so the residence has the proper wastewater system and potable water supply for a second living unit. A change was not needed.

25. Also, along these lines, if we have to go from 4 to 3 (bedrooms), what happens to the 70 gpd leftover? Perhaps some clarity here?

Response:
The 70 gallons may be reserved in a permit condition if requested by the landowner, and the Program agrees, to apply to future modifications to the residence. A change was not needed.

26. I read that all wells will need to be tested as part of the permit. Will this be a requirement of the Certification Letter?

Response:
The permit will condition the contaminants for testing and where to file the sample results, with the Health Department or, with the Health Department and the Drinking Water and Groundwater Protection Division. An installation certification will not be required to include the results of the water testing. A change was not needed.

27. Design flows for residential dwellings on municipal water/wastewater systems (section 1-803). Therefore, I recommend that the water and wastewater design flows for residential dwellings connected to municipal systems of 50,000 gpd or more be reduced to 150 gpd per dwelling, with an allowance for further reduction for one-bedroom dwelling units (e.g., 100 gpd).

Response:
When considering a reduction for wastewater flows from 210, to 150, the design flow needs to represent a number that may be seen at the treatment facility each day, that has a factor of safety for changing demographics, and represents a number that applies to each municipality, not just an average for the year one municipality may find. The 210 gpd per residential unit represents a number each municipality can use with confidence the wastewater treatment plant will not see a hydraulic failure. When a municipality reserves the 210 gpd per residential unit, and the residential unit is built and occupied, the flows seen at the treatment plant will convert to actual flows and any difference between the

210 gpd and the actual flows seen at the plant will convert the difference to reserve capacity for the treatment plant. A change was not needed.

28. Page 36: 1-311 (b)(1): Can a minimum standard for accuracy of the GPS coordinates be established? If one is not provided, then there will be varying degrees of accuracy. Applications such as ANR Atlas could be used which could be beneficial for many, but would need some sort of baseline. Will there only need to be one GPS location in the center of the finished leachfield?

Response:
The Rules were changed to remove the need to provide the coordinates of the leachfield and well at the time of submitting the installation certification. In place of this requirement, an application that involves one lot, or the subdivision of a lot into multiple lots, shall include the coordinates for the center of each lot that is included in the application. The requirements shall mirror the requirement in the 2007 Rules, "When the application includes one or more existing or proposed lots, the latitude and longitude for the center of each existing or proposed lot identified in the application shall be reported on the application form using a global positioning system receiver using the NAD 83 coordinate system or a NAD 83 base map. The coordinates shall be reported in decimal degrees to five decimal places with an accuracy of +/- 50 feet. Because many lots are irregularly shaped, the center location can be approximate."

29. Page 151: 1-1002 (i): This is then saying that septic tank effluent sanitary lines will not need lateral cleanouts? Even in cases of >45 deg. turns or long runs >100 ft?

Response:
Correct. The Rules establish the minimum design standards. The designer may propose cleanouts based on the characteristics of flow, the length of pipe, and concern of possible clogging/blockage. This will be at the designer's discretion when the pipe carries only liquids. A change was not needed.

30. Regarding Campsite flows (Table 8-2): What is the technical justification for removing the 7 month/year +/- (i.e. seasonal) basis? Has there been evidence that there is no significant difference between seasonal and full year operation in-regards to flow, resting periods and long-term effectiveness of treatment? Reiterating the comments provided at the public hearing, the significant change in campsite flows for the seasonal state park campgrounds, which currently operate with public facilities open for no more than 6 months/year, will have profound effect on the economics and viability of future campgrounds, expansions to existing campgrounds, or redesigns of failed systems. Unless there is recent technical data that supports overturning previous determinations that, allowed lower flow criteria for seasonal campgrounds, what is the justification? Finally, with modernized fixtures with lower flow capacities, and state park programs to change out fixtures whenever there are replacements needed or renovations (waterless urinals as a state park standard upon replacement; high flow flush valves to low flow flush tanks for toilets, aerators to control flow at sinks, coin op showers), flows in the

state parks are being systematically reduced. Relying on older flow studies likely does not capture this trend.

Response:
The Agency agrees and modified Table 8-2 as follows:

Design Flows for Campsites

Use of Campsite		
Type or description of campsite use	**Units**	**Gallons Per Day Per Unit**
Campsites for Tents and Other Camping Units with No Interior Plumbing		
central toilets with showers	site	75
central toilets no showers	site	50
Campsites for Camping Units with Interior Plumbing but No Sewer Hook-Up		
central toilets facilities	site	50
dumping station	site	25
Campsites for Camping Units with Sewer Hook-Up		
with or without central toilet facilities serving the units	site	75
Cabins with Plumbing; Park Model Recreation Vehicles		
with or without kitchen but w/o laundry	sleeping space*	50
with or without kitchen but with laundry facilities	sleeping space*	70

* Design flow shall be calculated based on a minimum of four sleeping spaces.

31. Page 101: 1-911(c)(2) - Would there be any exceptions to requirement that perc tests resulting in use of higher application rate are not allowed (i.e. deference to table/soil classification). Number of tests corroborating (ie. Within certain %)? Witnessing of perc test methods used by Regional staff?

Response:
No. The expectation is to properly classify the soil and use an application rate appropriate for the soil texture and structure. A change was not needed.

32. Change to design flows for campgrounds, Table 8-1, eliminated flexibility for design flows for year-round versus open 7 months. My paraphrase, an application filed after adoption involving an existing campground permitted under a different set of Rules, and there is a change increasing campsites, will we apply the new design flows when evaluating any increase in design flow.

Response:
See response to #30. Some design flows in Table 8-2 were modified.

33. Designer, seems easier to list what a design can do rather than two lists stating what a design may and may not do. Have one list.

Response:
Having two lists, albeit making the document longer, is to provide clarity. Even though there is a list of what a designer may do, there would remain a number of inquiries for what is not identified in the can-do list. Therefore, the list of what a designer may not do. A change was not needed.

34. Is Water Supply and us in agreement on the design flows?

Response:
The Wastewater System and Potable Water Supply program and the Public Water Supply program discussed design flows prior to this rulemaking and the Public Water Supply progarm intends to revisit their design flows in a future rulemaking. A change was not needed.

35. Mandatory water testing, when a potable water, unintended consequence for treating, potables do not require the treatment system have an operator similar to Public supplies. Should we have Public review all treatment systems who has the compliance wing to be sure testing occurs. How will we ensure treatment systems are operating properly?

Response:
In reviewing a proposed water treatment system for a potable water supply, the Wastewater System and Potable Water Supply program may seek the assistance of Public Water Supply staff, including seeking their recommendations for what conditions to include in the permit to ensure compliance. A change was not needed.

36. There is no safety factor when metering design flow, no formula. Give thought to how a designer determines a safety factor.

Response:
This was a conscious decision. Metering is unique to each facility, and the designer needs to look at different consideration during the metering period to decide the peaking factor for a wastewater system. The Rules identify the considerations without creating a set peaking factor that may not apply to many projects. Water, for potable supplies, will be the peak reading which the designer will need to decide if this number is appropriate or wishes to use a peaking factor for additional safety. A change was not needed.

37. Be certain guidance documents were incorporated in the proposed Rules.

Response:
Yes, this was done and § 1-304(28) was added to codify an exemption that is currently in guidance and is similar to other exemptions:
The periodic and temporary creation of a campground provided:

(A) The campground is not connected to a water service line, water service pipe, or sanitary sewer service line;
(B) there are no more than 10 nights of camping per year; and
(C) there is no discharge of wastewater to the ground surface.

38. There is a discrepancy for 150 gpd/bedroom for Public and 140 under potables and hopes this was resolved.

Response:
There will be the same number upon re-writing the Water Supply Rule. A change was not needed.

39. Why are we involved in subdivisions?
10 V.S.A. § 1973 requires a Wastewater System and Potable Water Supply permit to subdivide land. Both the statute and Rules include exemptions for some scenarios involving the act of subdividing land. A change was not needed..

40. § 304(7) design flows of less than 560, should that be less than or equal to.

Response:
The wording in the Rules is correct and states "for the uses is 560 gallons per day or less". A change was not needed.

41. § 304(18) & (20) added statute exemption. Identify the statute number.

Response:
The Rules contain many provisions that originate in statute. Adding statutory references throughout the Rules will add length to the Rules without adding clarity and is not a common practice among agencies. A change was not needed.

42. § 304(a)(12) exemption for connecting to public water at the time of construction. Choose different words for connecting to municipal water at the time of construction because often connections are made 3 months later.

Response:
To fall within this exemption from needing a permit, the installation of the water service line must be accomplished at the time of initial construction and operation of the water main. If the water service line is not constructed when the water main is constructed, or prior to operation of the water main, a permit is needed for the water service line when it is to be constructed. A change was not needed.

43. 1-501(b) says a reconsideration decision by the Director represents the final decision by the Secretary. Clarification is in order that the Director's decision may be made to the Environmental Court.

Response:
The ability to seek an administrative reconsideration of a Regional Office decision within the Agency in certain circumstances is in addition to the statutory ability to appeal a decision to the Environmental Division of the Vermont Superior Court. The Rules discuss appeals in § 1-502 and indicate when the appeal period starts should administrative reconsideration be sought pursuant to § 1-501. In response to this comment, the heading of Subchapter 5 has been clarified to add the term administrative reconsideration and be titled "Administrative Reconsiderations; Appeals; Enforcement."

44. Are we eliminating lists of designers now that designers licensed by Secretary of State? We have indicated we will not maintain a list of P.E.s.

Response:
The Agency does have a list of P.E.s on the Regional Office website. The Agency will continue to maintain an unofficial list of Class 1 and Class A, B, and BW designers. The Agency will seek assistance from the P.E. Board (as it did in the past) and the Office of Professional Regulation (OPR) to make the lists accurate. The OPR will maintain the official list. A change was not needed.

45. 804(d) requiring 1 year of meter data, which may be punitive for some people such as schools. Places that have high usage such as ski areas only need specific dates to cover high flows. This may create problems for many people.

Response:
See response to comment #5.

46. Construction in a Class A, will more than one lot be allowed, such as a 3-lot subdivision, provided the design flow for each lot is less than 1000 gpd?

Response:

Yes. A change was not needed.

47. Diagrams, when placed on the web, will we be able to make changes or are the diagrams frozen in time.

Response:
Diagrams will be placed in the Appendix of the Rules.

48. Metering needs to include attendance. Has thought been given how a multi-use building/resort can keep attendance records?

Response:
Yes, although this will be facility dependent. It may require multiple water meters and multiple sampling ports for wastewater strength to fully assess flows to strength. It is anticipated, when there are multiple uses, to consider the wastewater strength from the combined uses at the final point of treatment. Working together will be important to determine how to meter based on the purpose of the metering in multi-use buildings based on which use the owner wants to increase. A change was not needed.

49. Design flows, are they fully coordinated between Wastewater Section and Public Water Supply Sections of the Division?

Response:
See response to comment #34. A change was not needed.

50. Are the potable standards vetted with WS such as water storage tank, how much of a tank needs to be above or below grade and how this corresponds to the WS Rules.

Response:
The Water Supply Program worked with us in developing the standards. Subchapter 12, which contains many of the design requirements, are flexible. Additionally, a designer needs to discuss with the owner whether the owner may wish to change the water supply from a potable to a public and the differences in the design standards. This will allow the owner to decide which standard the designer will use. A change was not needed.

51. Any discussion on application fees such as municipal connections for reviews of a 3000 gal. connection is not the same as a review for a 3000 gpd soil-based.

Response:
The Wastewater System and Potable Water Supply Rules do not dictate fees. Fees are established in 10 V.S.A. § 2822. A change was not needed.

52. Change in use of a building with increase in flow has less review than new construction.

Response:

A change in use of an existing building or structure or campground that results in a decrease flow does not require a permit unless there is some other modification of operation that will require a permit. A change was not needed.

53. § 1-305(i) an applicant, should change description from "may not" to "shall not" and change so not so wordy and descriptive.

Response:
The wording and content of this provision was developed by the Agency in consultation with the Technical Advisory Committee and is intended to advise landowners of the inherent risk in using surface water as a potable water source as well as the need for upkeep of the water treatment system. The use of "may not" in the first sentence is accurate and an intentional choice. A change was not needed.

54. § 309(a) add "within reason".

Response:
The phrase "within reason" is subjective and would not add clarity to the Rules. It was not added to the provision. A change was not needed.

55. § 311(f) for GPS coordinates need to include accuracy and parameters, is this at the corners or where the reading will be taken for a well or wastewater system.

Response:
See response to comment #28.

56. Installation certification needs changing because a designer cannot observe all installation.

Response:
The installation certification language is in statute at 10 V.S.A. § 1973(e). A change was not needed.

57. 312(b) should have 14 days rather than 30 days for review of failed wastewater systems.

Response:
The Program has a policy to review a failed water supply or a failed wastewater system prior to other applications to abate a health hazard. Most applications can reasonably be reviewed less than 30 days. There are applications that are more difficult, particularly those with a PEP standard of 60 days, that require consideration of variances or a hydrogeological analysis. The average number of days to review and permit all applications is less than 14 days. The average number of days to review a failed system is generally less than 14 days. The Program will continue to make failed systems a priority. The Agency concluded it is a reasonable timeframe. A change was not needed.

58. Sub. 5 § 501(a)(2), the program manager to call other individuals outside the department and change make a decision within 30 days rather than 60 days may be better because 60 days is the construction season.

Response:
§ 1-501(a)(2) is a provision addressing requests for reconsideration that includes the potential the Programs Manager may call on individuals within or outside the Department. Because the 60-day period includes weekends, it will be approximately 44 business days, possibly less if there are intervening holidays. 60 days was selected to allow time to perform a complete review of the file and reconsideration request, correspond with the requester if necessary, and identify the applicable requirements. The Agency concluded it is a reasonable timeframe. A change was not needed.

59. § 803(c) design flows for individual components must be based on 2 bedrooms, how this works for holding tanks using a 1-bedrsoom unit using best fix for calculating holding storage.

Response:
By "best fix" the Agency assumes you are referring to applications filed that seek a variance pursuant to § 1-802 Variances. In the circumstances identified in § 1-802, the Agency has the authority to issue permits for designs that do not comply with specific technical standards, including the possibility of a design for a holding tank to serve a one-bedroom living unit, provided the requirements in § 1-802 are met. A change was not needed.

60. § 903(a)(2) eliminates cesspool, dry wells, seepage pits. Hopes there is an exemption to allow dry wells and gravel systems for water treatment backwash.

Response:
Water treatment backwash from a potable water supply, that is intended to be discharged to a dedicated soil-based wastewater system solely for the backwash, is subject to the UIC Rules. A change was not needed.

61. Page 120, soil testing 9" for testing soil, working in Addison county only considering the 8" of soil, so moot point what's happening at 9".

Response:
Each section of the Rules referencing 9 inches will be changes to state: "Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire."

62. Hydrogeologist definition needs clarification. Some people may not be covered and no classification on State or Federal level for a hydrogeologist.

Response:

The definition for a "Hydrogeologist" has not changed since the September 10, 1982 Rules except for eliminating the word "Qualified". The Program will not change how a hydrogeologist is viewed for the past 36 years. A change was not needed.

63. Can designers do desk top analysis?

Response:
Yes. A change was not needed.

64. Page 23, subdivision of an improved lot requires plan drawn by designer or land surveyor and recorded and indexed, VT statute title 26, chapter 45 section 2503 no exemption for a definer for a designer to perform land surveying. Title 26 chapter 45 2502 section 4 does not allow designer to do surveying.

Response:
The Rules do not require the plan be a survey, only a plan drawn to scale. The Rules do not require a surveyor to complete the plan, and it is standard practice for designers to do so. A change was not needed.

65. Professional engineer is defined. Land surveyor is not defined.

Response:
The term "land surveyor" was added to the definitions.

66. Sewer collection pipe, with 2 or less connections, a designer's license will allow for up to 3 connections. Class b license should allow for what license allows.

Response:
The proposed Rules allow for more than 2 connections provided the length of the sanitary sewer collection line and all sanitary sewer service lines are is less than 300 feet. The total length is necessary because, when designing any other sanitary sewer collection line, a manhole is installed at the end of the collection line and every 300 feet thereafter for maintenance, cleaning, and inspection. A change was not needed.

67. Manholes no longer allowed to be designed by a designer. A septic tank and manhole are similar for design and testing. A designer B should be able to design manholes.

Response:
The development of the designer program always included the installation of a septic tank. If the Rules change in the future to allow a designer other than a P.E. to design a sewer collection line with a manhole, the program will consider including design and testing of manholes in the Class B exam. A change was not needed.

68. Certification language in the Rules the same certification language in the application?

Response:

The certification language in the application form will need to be modified prior to the adoption date of the proposed Rules to remove referencing the Vermont Water Supply Rules.

69. GPS coordinates, fails to describe the accuracy.

Response:
See response to comment #28.

70. Page 55 § 704(a)(9)(C) limiting manholes for designers may make systems less maintenance friendly. Maintenance will be compromised.

Response:
The decision was made during drafting of the Rules that manholes is engineering for a P.E. The Agency does not agree maintenance will be compromised by allowing a sanitary sewer collection line without a manhole pursuant to § 1-1002(k). A change was not needed.

71. § 706(a)(b)(c) a designer has never been tested minimum testing standards for manholes for licensing a designer B or BW. Should test to allow design of manholes.

Response:
If a designer is allowed in the future to design a manhole, consideration will be given to require the designer to demonstrate proficiency in design, construction, and testing a manhole. A change was not needed.

72. Table 11-1 unconfined water systems, understanding well driller's rule requires wells to be drilled 20 feet into competent bedrock.

Response:
This is correct when wells are drilled into bedrock, but not all wells are drilled into bedrock. There are many wells that draw water from an unconfined aquifer or a confined aquifer. A change was not needed.

73. Add definition for composting toilets to include testing standards NSF 41 or equivalent.

Response: See response to comment #87 below. A change was not needed.

74. Add in definition storage requirement of 2 years for eradication of pathogens.

Response:
The Rules anticipate the compost will contain pathogens and needs to be bagged and taken to a landfill or buried in a manner that complies with the Rules and is approved by the Secretary. A change was not needed.

75. Add composting toilet maintenance requirements.

Response:
When appropriate, maintenance requirements for composting toilets will be included as a permit condition. A change was not needed.

76. § 803(g)(2) to increase design flow reduction from 25% to 50% for residential use similar to other states.

Response:
The comment does not provide sufficient data to support making this change in the Rules. A change was not needed.

77. § 929 clarification to allow composting solids separate from liquids can be buried when in compliance for protecting public health and the environment.

Response:
The Rules allows composting solids to be buried when the burial complies with § 1-929(c). A change was not needed.

78. Give the Secretary the ability to permit other uses of the solids or liquids from composting toilets when comply with public health and safety.

Response:
The Agency has the authority to allow recycling wastewater from composting toilets pursuant to an approved innovative/alternative system design. § 1-929 allows on-site disposal of wastes pursuant to the Vermont Solid Waste Management Rules. A change was not needed.

79. Table 8-2 design flows will result in significant viability for existing design flows. Systems not failing due to hydraulic overload, more to poor maintenance practices. What is the basis for using the higher design flow. Design flows should be decreasing with use of low flow fixtures.

Response:
See response to comment # 30.

80. Section 1-201: Definition, Clivus requests that the Department add a definition for Composting Waste Treatment System that would require a maintenance contract. Ongoing maintenance of composting systems is crucial to ensure that public health and safety standards continue to be met, that routine upkeep is performed, that contact records are provided as required to the Department, and that the system remains in compliance with National Sanitation Foundation (NSF) Standards.
Section 1-201 (19) Composting Waste Treatment Systems – means a unit that includes a composting toilet and meets the following descriptions:

- a unit that complies with the requirements of the NSF Standard 41 "Non-Liquid Saturated Treatment Systems";

- a unit that is designed to store compostable and composted solids for at least two years, unless otherwise approved by the Secretary;
- a unit for which the owner holds a valid maintenance contract at all times with an entity or individual that is certified by the composting toilet vendor to provide maintenance of the composting toilet. The minimum maintenance contract term shall be two (2) years;
- Two (2) years after the issuance of the Certificate of Conformance, and every two (2) years thereafter, the owner shall submit a report prepared by a system inspector documenting the condition of all aspects of the system, including, but not limited to, certification that the permitted system has not been modified and the design remains as permitted.

Response:
The Rules does not specify a unit needs to comply with a national standard, the designer needs to propose a make and model of a unit based on the manufacturer's specifications and the intended use of the composting unit. This allows the designer to propose an alternative design such as a watertight concrete vault. The retention time in a composting unit is to be determined by the designer. A maintenance schedule for a composting will be a condition of a permit when determined appropriate by the Program. The Agency feels that establishing a set report by a designer, there is no other person recognized in the Rules to perform such inspection, would be costly for landowners. The inspection shall be a permit condition when warranted. A change was not needed.

81. Section 1-803: Design Flows. Clivus requests that the Department increase the standard for residential system design flow reduction. This would allow for a higher quality of effluent being produced using less land and bring Vermont rules in alignment with other New England states including Maine, Massachusetts, Rhode Island and Connecticut. Section 1-803 (g)(2): If not more than four living units will be served by a component and each living unit contains only composting or incinerating toilets, the design flow for the component may be reduced by 50 percent.

Response:
The comment does not provide sufficient data to support making this change in the Rules. A change was not needed.

82. Section 1-929: Disposal of Contents of Composting or Incinerating Toilets. Clivus requests that the Department clarify section 1-929 (a). The rules as drafted do not make it clear that if the liquid by-product is removed from the site, compost solids can be disposed/reused per section 1-929(c).

Response:
The Rules remain basically unchanged for the disposal of the compost. The Rules are clear on the options for disposal of the solids from a composting unit. A change was not needed.

83. Clivus requests that the Department include a provision to allow the Secretary to approve alternative methods of compost disposal. This change would allow for flexibility in the land application of compost and liquid by-product in Department-approved locations after consideration of public health and safety requirements. For example, this would allow State Parks to collect compost from their systems and use that material at an approved on-site location.

Response:
The Rules are based on three basic methods for wastewater treatment, a soil-based wastewater system of less than 6500, disposal to an indirect discharge system, and disposal to a wastewater treatment facility. Also, see response to comment #78. A change was not needed.

84. Add: Section 1-929 (c)(3) Other use as approved by the Secretary.

Response:
See response to comment #90.

85. Regarding Campsite flows (Table 8-2): What is the technical justification for removing the 7 month/year +/- (i.e. seasonal) basis? Has there been evidence that there is no significant difference between seasonal and full year operation in-regards to flow, resting periods and long-term effectiveness of treatment? Reiterating the comments provided at the public hearing, the significant change in campsite flows for the seasonal state park campgrounds, which currently operate with public facilities open for no more than 6 months/year, will have profound effect on the economics and viability of future campgrounds, expansions to existing campgrounds, or redesigns of failed systems. Unless there is recent technical data that supports overturning previous determinations that allowed lower flow criteria for seasonal campgrounds, what is the justification? Finally, with modernized fixtures with lower flow capacities, and state park programs to change out fixtures whenever there are replacements needed or renovations (waterless urinals as a state park standard upon replacement; high flow flush valves to low flow flush tanks for toilets, aerators to control flow at sinks, coin op showers), flows in the state parks are being systematically reduced. Relying on older flow studies likely does not capture this trend.

Response:
See response to comment #30.

86. Recommendation I: In order to prevent potential future confusion, maintain the FEMA based definition of floodway in the Wastewater Rules, rather than referencing the Vermont Flood Hazard Area and River Corridor Rule.

Response:
See response to comment #19.

87. Recommendation II: In order to ensure alignment of Agency policies and reduce the potential for conflicting and contradictory standards, eliminate references to wastewater and potable water supply systems in the Department of Environmental Conservation Flood Hazard Area and River Corridor Protection Procedure (September 7, 2017), specifically those found in the definition of Below Ground Improvements. This recommendation is consistent with long standing State level policy that the location of wastewater system and potable water supply systems should be governed solely by the Wastewater Rules.

Response:
The Department of Environmental Conservation Flood Hazard Area and River Corridor Protection Procedure (September 7, 2017) establishes standards restricting activities, which include a potable water supply or wastewater system, allowed within a river corridor. There are other State regulations that restricts activities, which include a potable water supply or wastewater system, i.e., the Vermont Wetland Rules Effective August 15, 2018. The Procedure does not establish design and construction standards so is consistent with other regulations that prohibits certain activities. A change was not needed.

88. We request that ANR clarify in writing whether, as a result of the proposed amendment, ANR depicted "River Corridors" will be used to delineate the floodway as it relates to the Rules, or will in any other way restrict or dictate the location or design of a wastewater system or drinking water supply.

Response:
The term "river corridor" is not a defined term in the Wastewater System and Potable Water Supply Rules. This comment appears to speak to the interpretation of the Vermont Flood Hazard Area and River Corridor Rule, which is outside the scope of this rulemaking. A change was not needed.

89. We also request clarification in writing as to whether ANR's current practice of utilizing the River Corridor as the "Act250 Floodway" for projects subject to Act250 Jurisdiction - as articulated in the "Department of Environmental Conservation Flood Hazard Area and River Corridor Protection Procedure (September 7, 2017)" -- will place any additional limitations on the location of wastewater system or potable water supply components serving development subject to Act250 Jurisdiction, beyond those articulated in the Amended Wastewater Rules.

Response:
The interpretation of Act 250 is not within the scope of this rulemaking. A change was not needed.

90. § 1-903(g) "No portion of a wastewater system shall be located in a Zone 1 of a Public Community Water System Source Protection Area, except a replacement system that replaces an existing wastewater system located in the same Zone 1."

- Consider adding a reference in the statement above to Table 9-6 - Distances, in Feet, Used to Create Isolation Zones Around Drinking Water Sources (page 110)
- Table 9-6 includes setback distances for Public water sources for community water systems, non-community non-transient water systems, and transient non-community water systems
- The distances given in the Table 9-6 vary by aquifer type, design rate and design flow (from 50 feet to 1000 feet)
- In addition, please clarify in Table 9-6 that for Public Community Water Systems, the setback distances cannot be closer than Zone 1 of a Source Protection Area (generally 200 feet)

Response:
The following was added below Table 9-6: "Note: See § 1-903(g) for additional restrictions concerning the location of a wastewater system components in proximity of a Public Community Water System."

101. Definitions (7), (8), and (35). Why are you referencing the River Corridor Rule. The RCR just references the language that you are removing from this definition. The language is not from RCR it is from FEMA. The RCR rule is for specific projects such as land exempt from municipal regulation. You're not referencing the definition of a stream or wetland to another ANR rule? Put back definitions or just reference FEMA.

Response:
See response to comment #19.

102. 1-803 Design Flow Design flow for 7 month or less campgrounds proposed to be increased to only a year-round campground. Shouldn't year-round campground be removed as they don't seem to exist in VT.? We are not aware of any issues with the current design flow for 7 months. The result of this rule change will increase the size of leach fields and costs which is not necessary. Waste stream flows are not increasing and remain much lower flow than current design flows. If anything, waste stream flows are historically low which result in higher effluent concentrations. Increasing the bed size does not improve the treatment, especially with gravity fields.

Response:
See response to comment #30.

103. Need definition of food service and meal.

Response:
The term meal is used in § 1-803 and defined in Subsection (b). The Agency does not agree food service need to be a defined term. A change was not needed.

104. Tasting Rooms – How about outdoor beer gardens with food trucks? This has been a growing industry in NEK. Tasting rooms are required to have snacks, reason for defining meals or food service.

Response:

Food trucks, or mobile units requiring licensing by the Vermont Department of Health as a Temporary Food Stand or motorized or push cart type mobile units, are generally not buildings or structures. A food truck that doubles as structure used for other purposes may be a building or structure under the definition in § 1-201(13), depending on its use, particularly if it is connected to a potable water supply or wastewater system. A change was not needed.

105. 1-1001 Flexible Specific Technical Standards Technical Standards should remain "guidelines" for the Engineer or Municipality to make the final decision. Engineers have licenses for a reason.

Response:
The flexible technical standards contained in Subchapters 10 and 12 allow a designer to propose a design based on accepted engineering principles that differ from the technical standards in Subchapters 10 and 12. The Agency believes they provide sufficient options for designers. A change was not needed.

106. Minimum bury depth for sanitary sewer services, 48-inch needs to be removed. Depths may range as little as 12-inches of cover. Insulation varies based on judgement. Sanitary sewer thermal conditions vary significantly depending on the site.

Response:
The 48-inch depth needs to remain as the technical standard. The 48-inch requirement is in Subchapter 10, a subchapter with flexible technical standards, which means the Rules establish a proven technical standard with the flexibility for a designer to propose an alternative design based on accepted engineering principles. A designer can propose a different depth pursuant to § 1-1001(a) provided the sewer will function without collapsing due to loads and without freezing. A change was not needed.

107. We have worked on many sites in existing communities where existing services have been reconnected that do not meet the "technical standards", such as minimum slope or bury depth and no problems exist. Judgement is used to determine if reconnects will continue to work based on acceptable practice and experience or if another design is required which would conform to the technical standards that are used when we have the ability.

Response:
A proposal to replace a potable water supply or a wastewater system, including water service lines and sanitary sewer service lines, may be able to seek approval pursuant to § 1-802 Variances, provided the requirements in § 1-802 are met. A change was not needed.

108. Rules are being changed for a problem that does not exist.

Response:
The Rules were last updated in 2007. This revision is necessary to incorporate legislative changes to 10 V.S.A., Chapter 64 adopted subsequent to the last rule update, including but not limited to requirements that permit applicants notify other landowners of pending applications, that groundwater potable water sources be tested for water quality prior to use, and that surface water can be used as a source for potable water supplies serving single-family residences. The revision also consolidates the standards for potable water supplies into one rule. It also establishes new water quality sampling requirements; expands the options for the design of wastewater systems to include technologies and practices that have been proven effective in the field; and creates additional permitting exemptions to reduce administrative burdens on the public. The revision comprehensively reorganizes and revises the rule to increase clarity and promote understanding. A change was not needed.

109. 1-1007 Separation Why are we continuing to use old standards that were used for VC (3' lay length with no gasketed joints or AC pipe or even cast that breaks easy when exposed to trench crossings? The more we apply this 18-inch standard, the more we compromise the constructability of modern pipe.

Response:
The section mentioned is in Subchapter 10, a subchapter with flexible technical standards, which means the Rules establish a proven technical standard with the flexibility for a designer to propose an alternative design based on accepted engineering principles. A change was not needed.

110. (a)(1)(A).C900 pressure classes are 165, 235 and 305. Water mains are usually constructed with DR18 (235). What about C909? C909 is more resistant to rupture when working around it. Test to 150#'s? Clarify to say "with water", some will tell contractors to use air…Mechanical joints and joint restraints within 10' of water pipes? Push on couldn't be tested without thrust blocks. Temporary megalug caps? 150psi in 8-inch pipe will produce 7500 lbs. of thrust. Final connections would then require solid sleeves. Solid sleeves result in a total of 4 additional joints for the connection that will not be able to be pressure tested and will have ID transition issues. This creates more of a potential risk.

Response:
This design criteria was developed with the Public Water Supply program and the TAC. This subsection is in Subchapter 10, a subchapter with flexible technical standards, which means the Rules establish a proven technical standard with the flexibility for a designer to propose an alternative design based on accepted engineering principles. A change was not needed.

111. (a)(2)(A). Define sleeve materials if pressure pipe is defined in "(a)(1)(A)". How do you propose to seal the pipe water tight?

Response:

This design criteria was developed with the Public Water Supply program and the TAC. Water tight is only to prevent water from entering the sleeve. This subsection is in Subchapter 10, a subchapter with flexible technical standards, which means the Rules establish a proven technical standard with the flexibility for a designer to propose an alternative design based on accepted engineering principles. A change was not needed.

112. (b)(1)(B) Same comments as horizontal separation. Consistency with pipe materials AWWA C-600? C-900?

Response:
This design criteria was developed with the Public Water Supply program and the TAC. This subsection is in Subchapter 10, a subchapter with flexible technical standards, which means the Rules establish a proven technical standard with the flexibility for a designer to propose an alternative design based on accepted engineering principles. A change was not needed.

113. Separation needs to remain guidelines. ANR needs to work with industry to develop a consistent approach for improving technical standards that doesn't create more compromising joints, disconnect of inner diameter continuity and transitioning from standards that were developed for brittle, poorly sealed pipe system from the mid-20th century.

Response:
The requirements identified in the comment are in Subchapter 10 and Subchapter 12, subchapters with flexible technical standards, which means the Rules establish a proven technical standard with the flexibility for a designer to propose an alternative design based on accepted engineering principles. A change was not needed.

114. Concerned about the lack of a "grace period" to use "old" test pit data. I'm certain I'm not the only designer with data gathered this last summer, that I consider still valid as basis for a design, despite the lack of formal Munsell colors. Similarly, I occasionally have the opportunity to modify a design or permit from several years ago. Having to repeat test pits solely to gather Munsell color codes will add significant expense for my clients, with no real value gained. I therefore ask that you reconsider the possibility of a grace period (to allow continuation of currently active designs), and/or a design alternative to allow the continued use of older data (which, at least on my part, includes "plain English" colors, structure, consistency, etc.).

Response:
The following language will be inserted in § 1-910 of the Rules:

(f) Notwithstanding Subsection (e), soil descriptions and recordings completed on or after January 1, 2007 and prior to the effective date of these Rules may be accepted by the Secretary, when the descriptions and recordings identify:

(1) the soil texture corresponding to the name or acronym in Subsection (e)(3); and

(2) soil structure corresponding to the structure types identified on Table 9-3, or, in the absence of identifying structure, the soil evaluation shall be based on the most limiting soil structure identified in Table 9-3 for the reported soil texture.

115. I've recently started work on a couple different lakeshore projects, each of which has an existing lake water supply, and each of which wants a single-lot subdivision. Reviewing the draft rules' impact, it appears to me that each new lot, to use lake water, will need to install a new service from the lake to comply with the "on its own system" requirement. I think I understand the intent - that each homeowner is individually responsible for the maintenance (or lack thereof) for their own household only. It makes sense to me in these cases though, to share an intake pipe: there is less impact to the environment (digging in only one pipe, or using one already existing) and therefore less initial expense, and there is little that can go wrong with the pipe once construction is complete... essentially no maintenance. Any treatment systems, and even the pumping and pressurization systems could still be individual house-specific, but I don't see any significant benefit to requiring a separate intake pipe for each house. Please consider clarifying this requirement.

Response:
10 V.S.A. § 1981(2) limits the buildings or structures that can be served by a potable water supply utilizing a surface water source. It states that "only one single-family residence shall be served by a potable water supply using a surface water as a source." A potable water supply includes all of the infrastructure from the surface water source to the residence. This leaves total responsibility for any monitoring, operation, and maintenance of the potable water supply serving the residence to the owner of the residence. A change was not needed.

116. § 1-805 Wastewater Strength (c)(3) literature review of BOD5, TSS, and Fats, Oil, & Grease from buildings or structures, or campgrounds with similar uses, using the highest strength value identified for the particular uses. I believe that using the "highest strength value" can be overly conservative based upon a large sample size with the higher possibility of extreme outliers. In conjunction with the fact that the design flows represent values well above the literature search averages, it is my recommendation that the following alternate language be entertained. (c)(3) literature review of BOD5, TSS, and Fats, Oil, & Grease from buildings or structures, or campgrounds with similar uses, using: (i) the average value with flows derived from Table 8-3 or (ii) the average value plus one standard deviation when using meter derived values identified for the particular uses. Even the use of the average value (when the outliers are included) as opposed to the median value raises the relative factor of safety in this situation.

Response:
§ 1-805 Wastewater Strength (c)(3) is not intended to apply using the design flows in Table 8-3 but intended for use when there is no design flow in Table 8-3, other than for breweries, or when an existing facility undergoes water metering. The highest recorded value, although conservative, allows for fluctuations in operation of a facility without

stressing the wastewater system. Introducing the concept of one standard deviation would conflict with the Rules establishing the 90th percentile for water meter data in § 1-804(c). A change was not needed.

117. I understand that graphics will be available on the Divisions web page. Human nature being what it is, I believe that the success of the interpretation and application of the Rules scan be greatly increased by finding a way to include the supporting graphics in the main body of the rules so that a secondary search is not required.

Response:
Diagrams will be placed in the Appendix of the Rules.

118. The next is a general observation that has progressed over time as it relates to intent of minimizing the potential for partially treated effluent from being introduced to surface waters. The requirements for the setback from a downgradient foundation drains is 75 feet. Interestingly, the requirement for separation from a system to a downgradient surface waters is only 50 feet. And for performance-based system, effluent can surface anywhere after 25 feet (requirement to maintain mounded effluent no closer than 6" to the surface and to maintain an area of no disturbance). With all of the work we have done is bringing along certain engineers with the Performance Based approach, it would appear prudent to perhaps modify these distances in a manner where the distances more closely reflect the character of the soil in which the effluent is passing through and being renovated by. An example being: Flow with a hydraulic gradient of 5% through sand (K value of 50) to travel 75' feet to perforated drain, the travel time is 3.4 days. For a Performance based system where the slope is 10% in a fine sandy loam (K = 20 FT/Day), the travel time over 25 feet is 1.4 days. At 5%, the time of travel is 2.8 days. My general recommendation is to revise the setback distances to require the greater of 25 feet or 3 days of travel time.

Response:
The 50 feet is established as a distance to accommodate many soil types and is anticipating introduction into the groundwater beneath the length of a leachfield thereby diluting the effluent. The effluent will be further diluted upon reaching the surface water. Introduction of effluent to a curtain drain will result in collecting the effluent across the contour downslope of a leachfield and discharging the concentrated water to the ground surface. Further, the Rules do not imply it is acceptable for wastewater to surface 25 feet from a leachfield. The Rules establish the minimum distance a designer needs to demonstrate the effluent will remain 6 inches below ground surface. It is expected the isolation distances to other items that will result in surface discharges will be met. A change was not needed.

119. Add to § 1-928 "The Secretary shall approve the use of holding and pump out tanks as a supplementary system, whether or not the building or structure is publicly owned, when: (1) The use of the tank is for storing a source-separated waste fraction (.e.g. urine), and (2) The remaining wastewater from the building, structure, or campground is delivered to an approved wastewater system (e.g. a soil-based wastewater

system or sanitary sewer service line that conveys wastewater to a wastewater treatment facility or indirect discharge system)".

Response:
Response: A urine diversion design for a wastewater system or wastewater system component, for example a method for installing a holding tank, transporting the urine, treatment of the urine, and point of dispersion to the soil, can be proposed pursuant to Subchapter 4, Innovative/Alternative Systems and Components. A change was not needed.

120. § 1-928(f) Any building or structure or campground served by a holding and pump out tank, other than a marine holding and pump out tank [or urine holding and pump out tank], shall have a water meter, or meters, installed that measures all water that will be discharged as wastewater from the building or structure or campground.
(g) A permit issued for the use of a holding and pump out tank shall require a designer to periodically inspect the tank, visible piping, and alarms and meet the following requirements:
(4) Unless permitting a marine holding and pump out tank [or a supplemental holding and pump out tank pursuant to Section (xx proposed above)], the designer shall also inspect the water meter or meters and verify that they are installed, calibrated, and measuring all water that is discharged as wastewater.
(5) Unless permitting a marine holding and pump out tank [or a supplemental holding and pump out tank pursuant to Section (xx proposed above), the designer shall read the meters and compare the metered flow to the pumping records.

Response:
See response to comment #119. The decision for installing water meters shall be made as a condition of an approval if a proposal is approved. A change was not needed.

121. Could a design flow be added to Table 8-3 for the expected flow for handwashing only, using a high-efficiency sink faucet, applicable to structures with a composting or incinerating toilet?

Response:
The design flow for handwashing only, if such a wastewater system is submitted for review, will be determined case-by-case basis using Table 8-3, and § 1-803(g). A change was not needed.

122. In regard to Permit Exemptions and Variances, our industry asserts that it is essential that the Permit Exemption 1-304(15) that allows for the construction of a replacement well also includes a provision for a variance 1-802(e). Our understanding of the Department's position is that the permit exemption is provided rather than a permit and therefore the need for a variance from the permit technical standards does not apply. Currently, the Exemption Form allows for the licensed well driller and the land owner to certify that a variance is required by the physical limitations of the site and that additional construction methods have been implemented to offset any reductions in isolation

distances. To safeguard and make this policy clear for future members of our industry and the Department, we feel it would be helpful to include the current Exemption Form for a Replacement Water Supply in the Appendix (?). For clarification we would also like to offer the following language to be considered to 1-304(15)(D); "a permit exemption form, which includes a variance from the technical standards in accordance with 1-802(e), provided by the Secretary that corresponds to the type of replacement supply is recorded and indexed in the land records of the municipality where the single family residence is located, and, if different, where the replacement supply will be located; and".

Response:
Response: The exemption anticipates the location of a replacement water supply may not comply with all isolation distances since the landowner nor well driller is required to research permits to identify permitted but not constructed wastewater systems. The exemption relies on the professional judgement of the well driller when drilling a well and for the well driller to identify, as part of the exemption form, construction technics to protect a water source when an isolation distance cannot be met. If § 1-802, Variances, is referenced in the exemption form, the request needs to be prepared by a designer. A change was not needed.. A change was not needed.

123. In regard to Permit Exemptions for Replacement Water Supplies, in many instances a replacement well for a single-family home is sought due to insufficient yield provided by the original source. There are also occasions when the replacement well also offers less than a desired yield and it is reasonable and advantageous to utilize both sources to provide for the needs of the home. There are also examples of people desiring to use their original well as geothermal borehole after a successful well is drilled. While 1-304(15) does not appear to preclude a property from installing and maintaining two sources to meet the needs of the property, the current Exemption Form on Page 1, at the end of the first paragraph, includes; "This exemption does not apply if the proposed well will be used in conjunction with an existing well." We feel it would be helpful to replace this language with: "When a replacement well is to be used in conjunction with the existing well, allowing for more than one source to meet the demands of a residence, this exemption applies only of the replacement source meets the requirements of 1-1102(b)(2), otherwise a permit may be necessary to demonstrate the need for multiple sources to meet the demands of the residence." This or similar language, in our opinion, would provide the opportunity for more than one well to provide for a residence while not allowing a loophole for spite wells.

Response:
§ 1-1102(b) indicates when a building or structure can be served by more than one well. To the extent current forms do not conform with the amended Rules, they will be updated when the Rules are adopted. Additionally, § 1-304(16) was added that states:
The development of a potable water source to supplement an existing potable water source serving only one single-family residence on a lot with no other buildings or structures and with no campground, provided:

(A) the supplemental potable water source will not be located in an area classified by the Secretary as a Class IV groundwater area;
(B) the supplemental potable water source is not a surface water source;
(C) there is not a change in use of the single-family residence to also be a child care facility;
(D) the potable water supply presumptive isolation zone for the supplemental potable water source does not extend onto land owned by a person different than the owner of the single-family residence;
(E) a plan, with contours, drawn to scale, prepared by a designer, showing the location of the existing and supplemental potable water sources, the location of the potable water supply presumptive isolation zone for the supplemental potable water source, and the boundary lines for the lot on which the single-family residence is located, and, if different, the lot with the existing potable water source and the lot the supplemental potable water source will be located;
(F) a form provided by the Secretary, which includes the plan, is recorded and indexed in the land records of the municipality where the single-family residence is located, and, if different, the existing and supplemental potable water sources will be located; and
(G) water sampling that complies with § 1-1113(b) and (c) is conducted prior to any consumptive use of the water from the additional potable water supply.

124. In regard to Isolation Distances and Table 11-1 - While many Vermonters may understand the theoretical concept of "first in" for isolation standards, I believe there is less than tepid support for "overshadowing". The horizontal isolation distances in Table 11-1 seem to apply only to the isolation distances between a water source and sources of contamination with no regard to property ownership. It is hard for me to believe that the generators of these sources of contamination do not have to own the property required for the isolation of their applied contaminates. The isolation distances for the growing number of storm water infiltration galleries and the increased isolation distance to agricultural cropland are of specific concern. My understanding is that storm water catch basins can be constructed with the edge of the berm located at the edge of the property line. Therefore, the isolation distance may overshadow and extend primarily onto the adjacent property owner's property. I am not sure that I can fully appreciate the difference between the isolation standard of 25' for a traveled roadway with its volume of vehicular traffic, commensurate application of vehicle leakage and salt applications and isolation standard of 100' to a catch basin for a parking lot. On the Agricultural Cropland Isolation Standard, it is common sense and appropriate to not "cuss the farmer with your mouth full" and I certainly appreciate the hard work and dedication of farmers, however, Table 11-1 seems to require that every planted acre and cornfield in Vermont will require a 100' buffer, again to be potentially wholly located on neighboring properties. There are a lot of cornfields in Vermont, and the application of this isolation standard will deny permits and prevent the building of homes on acreage previously purchased and believed to be developable by adjacent owners. It appears that a permit applicant may request a reduction in the required isolation distance in 1-1104(k) and this

would seem appropriate. As stated in 1-1104(k)(1) "The Secretary shall authorize the use of a reduced isolation distance or isolation zone between a potable water source and a particular source of contamination when the Secretary determines that the isolation distance specified in Table 11-1 or the isolation zone identified pursuant to Subsection (f) I unnecessary to protect human health because the specific site conditions, or the construction techniques and pipe materials for the potable water supply or wastewater system will prevent the performance of the potable water supply from being impacted by the potential source of contamination." For clarity we believe that a statement referencing 1-1104(k) be included in 1-802(a) and not be necessarily precluded by 1-802(b) which states that "Variances are not available in circumstances other than those identified in Subsection(a)". If there is no conflict can the Department offer clarity to the statement in 1-802(b)? I am not sure that I understand how 1-802(b) can be applied if 1-1104(k) is available for use.

Response:
§ 1-1104(k) allows the Secretary to authorize a reduction of an isolation distance or zone otherwise required pursuant to § 1-1104 only after making the finding, based on information provided by the applicant or prospective applicant, that the isolation distance or zone "is unnecessary to protect human health because the specific site conditions, or construction or the construction techniques and pipe materials for the potable water supply or wastewater system will prevent the performance of the potable water supply from being impacted by the potential source of contamination." A reduction cannot be granted without this finding.

Pursuant to § 1-802, variances can be requested from one or more technical standards, including the provisions of § 1-1104. All of the requirements in § 1-802 must be met prior to the grant of a variance pursuant to § 1-802. A change was not needed.

125. In regard to Table 11-2 – I believe the intent of the Department is to have Confined Surficial Aquifers appear in the table with bedrock wells rather than with Unconfined Surficial Aquifers.

Response:
Yes, Table 11-2 is modified to state "Potable water sources in bedrock or confined surficial aquifer" and "or confined surficial aquifer" was removed from the unconfined section.

126. In regard to Closure of Potable Water Sources – There have been many instances of unqualified contractors attempting to close water wells and often doing so improperly. To provide clarity we suggest moving 1-1115(d) to become 1-1115(c). It would seem to offer better guidance for the Department to define who can perform the closure of a source and then present the appropriate steps for completing the closure.

Response:
The order is changed so who may close a well greater than 20 feet deep is now (c) and the steps for closing a well is now (d).

127. In regard to Water Source Design and Construction – Perhaps I have missed this or perhaps this is covered in another section of Rules, but, shouldn't the Rules include somewhere near 1-1102 or near 1-1205(a) include "the construction of a groundwater potable water source that is equal to or greater than 20 feet deep shall be performed by a Vermont Licensed Well Driller". We mention that closure must be performed by a Vermont Licensed Well Driller in 1-1115(d). We reference the grouting of annular space in 1-1106 with references to drilling.

Response:
A condition added to § 1-1102(e) stating: "The construction, installation, or hydrofracturing, of a groundwater potable water source, except the construction or installation of a potable water supply using surface water, that is equal to or greater than 20 feet deep shall be performed by a well driller."

128. Additionally, we have no reference to Hydro-fracturing of water wells. Again, perhaps in Subchapter 11, we should include language to the effect that; "the hydro-fracturing of bedrock water wells shall be performed by a Vermont Licensed Well Driller." "Packers shall be set at a minimum of 40' below the bottom of the well casing" For both Well Drilling and Hydro-fracturing it would be advisable to include; "Process water for Well Drilling and Injection water for hydro-fracturing of water wells shall be potable or if unavailable in sufficient quantity, obtained from a clear surface water source and disinfected with an initial dosage of at least 100 mg/L of Chlorine".

Response:
Response: § 1-1205(a)(4) was added to state "ensure process water for drilling a source, or injection water for hydrofracturing a water source, is obtained from a potable water source or public water source; however, if such water is unavailable in sufficient quantity, ensure clear, non-potable water that is obtained from a surface water body and is disinfected with an initial dosage of at least 100 mg/L of chlorine prior to using it as the process water."

129. The rules related to filtrate effluent do not appear to be geared for systems which passively distribute, treat and disperse filtrate effluent in the same footprint. We feel now would be the time to address these differences in technologies rather than needing to ask for exemptions in a brand-new rule set. When an advanced treatment system undergoes testing protocols to meet NSF/ANSI standards and the system tested does not utilize pressure or dosing applications, the state approvals for these systems should exempt their use as well, unless they are specified by the manufacturer of a proprietary product.

Response:
Pursuant to Subchapter 4, data to support a different I/A technology that the Rules does not include and the basis for considering the different I/A technology must be included with each application. One piece of information for accepting a different technology is third party testing. There are additional information and design considerations to be

resolved prior to the Agency making the decision to accept different technology or systems. A change was not needed.

130. Also, sampling ports are designed to sample from single-point discharge systems and many innovative/alternative systems are not designed for single-point discharge. Therefore, requiring sampling ports in these systems could potentially cause the system to function in a way that they were not designed, or could provide inaccurate sampling results. Thus, we are requesting consideration for systems that have undergone third party testing and have proven results to the required level of treatment, be given an exemption from the sampling port requirements set forth in these regulations.

Response:
The decision for sampling ports, locations, and number, will be made by the Division during the review process for an innovative/alternative wastewater system. The I/A system typically allows a reduction in size of the wastewater leachfield or a decrease in vertical separation to the seasonal high groundwater table or other limiting soil condition. Because I/A systems are proposed for varying types of discharges, relying solely on third party testing may not provide similar test results for a different use. A change was not needed.

131. 1-103 Statewide Technical Standards (a) – This section notes that the technical standards of these rules supersede existing municipal ordinances and bylaws. It is understood that the technical standards need to apply to those soil base wastewater systems but it is not likely the intent that these standards should supersede Municipal PW Standards, ordinances, etc. Many municipalities have PW standards which apply to new construction of municipal wastewater systems and if these standards meet and/or exceed the technical standards in these Rules, they should not be superseded. Also, many communities define allowable pipe materials, pump station types, etc. as part of their technical standards and they should have the flexibility to customize their preferences as long as the meet the intent of these Rules.

Response:
The Agency is not the author of the legal provision referenced in the comment. § 1-103 corresponds with language in 10 V.S.A. § 1976(b) which refers to governmental authority that the legislature, rather than the Agency, defines for municipalities. As indicated in the Rules, the superseded provisions of municipal ordinances and zoning bylaws are those that pertain to "technical standards for the design, construction, operation, and maintenance of potable water supplies and wastewater systems," in other words, the extent of the Rules adopted by the Secretary pursuant to 10 V.S.A. § 1978. The comment received by the Agency on this topic is general and does not distinguish between infrastructure that is permitted by the Rules and infrastructure which is not. It also does not distinguish between business practices of individual facilities and municipality-wide governmental regulations. These are other factors relevant to a determination of whether a specific provision sought to be implemented by a municipality is superseded under 10 V.S.A. § 1976(b). A change was not needed.

132. 1-803 – The wastewater design flows as specified for connection to municipal wastewater systems are still a concern as being too conservative. There is usage data (billing based on metered water) from many communities that a single-family residential unit does not average 210 gpd. In most cases, these flows average 150 to 165 gpd and are less than this for residential units with only 2 or 3 bedrooms. If the 210 gpd is used, it is not representative of actual flows once the units are connected. This higher flow can also cause oversizing of new sewer infrastructure once the peaking factors are applied to the design flows. Residential water usage at 380 gpd is also conservative for a typical residential unit, especially for new construction where appliances, fixtures, etc. use much less water and the household sizes have continued to decrease. It would be much simpler if the allocation for both water and sewer flows for residential units were the same for simplicity but understand that the water demands can be slightly higher in summer with water uses that aren't discharged to the sewer.

Response:
See response to comment #27. The water allotment was a decision by the Public Water Supply program to ensure adequate water during all peak usage. A change was not needed.

133. As I understand the proposed Rules, all new buildings and structures require a permit and an associated fee except for the following: a cabin on a campsite in a campground, a primitive camp under certain conditions, buildings/structures used for no more than 28 days of events per year and other conditions, buildings/structures built and used for seasonal outdoor activities under certain conditions, and a few other exemptions that don't apply to private residential or farm situations. Considering the above, I sincerely request for the following exemptions to permitting to be added:
-farm buildings such as chicken coops, pig pens, storage buildings, hoophouses, and greenhouses, etc.
-accessory buildings such as sheds, detached non-plumbed garages, carports, etc.
-bonafide primitive or wilderness campgrounds.

Response:
In response to the request for additional exemptions to cover a multitude of objects which might generally be considered structure or buildings, an exemption is not necessary. Pursuant to § 1-301(a), the action of constructing a "building or structure" requires a permit for the construction and operation of a wastewater system and potable water supply. However, not all objects that one might characterize as a "structure" fall within the definition of "building or structure" in § 1-201(13), and neither do all objects that one might characterize as "buildings," because not all generic "structures" or "buildings" have a use or useful occupancy that requires a potable water supply or wastewater system. For instance, the construction and common use of a garden shed, carport, or hoop house do not require a potable water supply or wastewater system. The definition of building or structure in § 1-201(13) identifies common examples that do fall within the definition.

In response to the request for an exemption for some types of camping or campgrounds, an exemption is not needed to cover primitive camping. Areas used for primitive camping are excluded from the definition of "campsite" in § 1-201(15) and do not constitute a campground. Areas used for non-primitive camping fall within the definition of campsites, and the creation of campgrounds with these campsites does require a permit for the construction and operation of a wastewater system and potable water supply. A change was not needed.

134. As I understand the proposed Rules, they place the same requirements upon mainstream residences as upon low-impact or low-water-capacity or "primitive" residences (which are legal in VT as non-public buildings in terms of the Fire & Safety Building Code). Considering this, I sincerely request that permitted options be added that are degree- and kind-appropriate to the following:
-"primitive" year-round residences such as yurts, cabins, traditional-Amish-style houses, indigenous wigwam residences, and other structures whereby water is supplied by hand-carried or -pumped or rain-collected or similar means; there are no plumbed appliances like washing machines; human waste is managed via any of various "alternative" toilets; and as a result, wastewater produced and public health risk are minimal.

Response:
The Rules have a permit exemption for primitive camps. All other buildings or structures with residential uses need a potable water supply and wastewater system because people need a sink and some form of bathing that is available year-round; and the ability to dispose of the wash water. The wash water contains pathogens, so the wastewater system needs to comply with the technical standards and capable of functioning year-round so wastewater does not surface on the ground. Rain water or similar water is not considered a potable water source under the proposed Rules. A change was not needed.

135. More specifically, as I understand the proposed Rules, they don't allow for the following that I sincerely request be added as primary, independent, permitted options for residences:
-hand-carried, hand-pumped, and roof-rainwater-collected water supplies
-compost and moldering toilets, vermicomposting toilets, pit privies (with proper distance from water table, etc),
-no interior plumbing
-leachfield-only greywater systems without septic tanks.

Response:
Rainwater from a roof is not an allowed source for a potable water supply in the Rules. Water coming off roofs will contain pathogens derived from birds, animals, and insects, as well as pollutants potentially derived from roofing material, transmitted through the air, or contained in precipitation. Composting toilets are allowed by the Rules. Other type of composting of human wastes, such as moldering toilets, are under the jurisdiction of another program within the Agency and therefore have not been included in these Rules. Septic tanks are important for all wastewater systems to remove floatables, scum, etc.,

even with the absence of solids from a toilet, and to begin the treatment process prior to discharging to a leachfield. A change was not needed.

136. For your convenience, below I have included website addresses and quotes in the form of cropped screenshots of the governments of the neighboring states of NH and Maine that, though not ideal in my opinion, are examples of allowances for non-mainstream and low-impact residences, which the VT WSPWS Rules do not seem to allow.
-NH's Dept. of Environmental Services has in its Rules shown here, https://www.des.nh.gov/organization/commissioner/legal/rules/documents/env-wq1000.pdf , the allowances shown in this email's attachment titled "screenshot NH DES alternate systems". Please see the full document for complete information.
-Maine's Division of Environmental Health has in its Rules shown here, https://www.maine.gov/sos/cec/rules/10/144/144c241.docx , the allowances shown in this email's attachment titled "screenshot Maine DEH primitive and limited disposal systems". Please see the full document for complete information.

Response:
The Rules address similar type of facilities, such as primitive camps, only with variations for performance expectations. These Rules are based on the life of the structure and expectations that sanitary facilities are necessary for human health. A change was not needed.

137. Structures used for overnight or day-use recreational purposes on a year-round or temporary basis shall not be required to have a grey water/leachfield septic system when there is no running water. This should apply to structures located on both public and private land. In such situations, composting privies, vaulted privies, pit latrines, or similar outhouse may be utilized for human waste.

Response:
The following was added to § 1-201(13)(C): "For the purposes of these Rules, a remote hut used by outdoor recreationists with no connection to a water source, no connection to a wastewater system (other than a composting or incinerating toilet that does not yield a liquid, provided its contents are disposed of in compliance with § 1-929), and accessible only by foot or water, is not a building or structure."

List of Changes to Wastewater System and Potable Water Supply Rules

The following changes were made to the proposed Wastewater System and Potable Water Supply Rules in response to comments received.

- § 1-201(13)(A)(ii) was changed by removing "only used for less than 180 days in any calendar year" for consistency with the definition of campgrounds.
  (Comment 30)

- § 1-201(13)(C) was changed to include "For the purposes of these Rules, a remote hut used by outdoor recreationists with no connection to a water source, no connection to a wastewater system (other than a composting or incinerating toilet that does not yield a liquid, provided its contents are disposed of in compliance with § 1-929), and accessible only by foot or water, is not a building or structure."
  (Comment 137)

- § 1-201(53) was added to define "land surveyor" to mean a land surveyor licensed by the Board of Land Surveyors under 26 V.S.A., Chapter 45.
  (Comment 65)

- § 1-201(93) defining the term "Special Flood Hazard Area" was deleted and replaced with (36) defining the term "Flood Hazard Area." The following subsections in the Rules were correspondingly changed to remove "special": § 1-903(f), § 1-1103(b), § 1-1205(d), § 1-1205(e), and § 1-1205(f).
  (Comment 19)

- § 1-304(15) was changed to add as (D) "if the replacement supply is a water service line and a booster pump will be installed in the single-family residence, the technical standards for the booster pump design in § 1-1111(d) are met (Secretary approval for the installation of the booster pump is not required)."
  (Comment 2 in the Responsive Summary – Water Supply Rule)

- § 1-304(16) was added:

  The development of a potable water source to supplement an existing potable water source serving only one single-family residence on a lot with no other buildings or structures and with no campground, provided:

  (A) the supplemental potable water source will not be located in an area classified by the Secretary as a Class IV groundwater area;
  (B) the supplemental potable water source is not a surface water source;
  (C) there is not a change in use of the single-family residence to also be a child care facility;
  (D) the potable water supply presumptive isolation zone for the supplemental potable water source does not extend onto land owned by a person different than the owner of the single-family residence;
  (E) a plan, with contours, drawn to scale prepared by a designer, showing the location of the existing and supplemental potable water sources, the

location of the potable water supply presumptive isolation zone for the supplemental potable water source, and the boundary lines for the lot on which the single-family residence is located, and, if different, the lot with the existing potable water source and the lot the supplemental potable water source will be located;

(F) a form provided by the Secretary, which includes the plan, is recorded and indexed in the land records of the municipality where the single-family residence is located, and, if different, the existing and supplemental potable water sources will be located; and

(G) water sampling that complies with § 1-1113(b) and (c) is conducted prior to any consumptive use of the water from the additional potable water supply.

(Comment 123)

- § 1-304(28) was added to codify an exemption that is currently in guidance and is similar to other exemptions:

  The periodic and temporary creation of a campground provided:

  (A) The campground is not connected to a water service line, water service pipe, or sanitary sewer service line;

  (B) there are no more than 10 nights of camping per year; and

  (C) there is no discharge of wastewater to the ground surface.

  (Comment 37)

- § 1-311(b) was modified to remove "(1) The GPS coordinates for the potable water source and the leachfield, mound, at-grade, or bottomless sand filter system." (Comment 28)

- Subchapter 5 was retitled to "Administrative Reconsiderations; Appeals; Enforcement" (Comment 43)

- § 1-802(e)(2)(A)(i) was edited to add "of" after development. (Comment 23)

- Table 8-2 was replaced with the following:

Use of Campsite		
Type or description of campsite use	**Units**	**Gallons Per Day Per Unit**
Campsites for Tents and Other Camping Units with No Interior Plumbing		
central toilets with showers	site	75
central toilets without showers	site	50

Use of Campsite		
Type or description of campsite use	**Units**	**Gallons Per Day Per Unit**
Campsites for Camping Units with Interior Plumbing but No Sewer Hook-Up		
central toilets facilities	site	50
dumping station	site	25
Campsites for Camping Units with Sewer Hook-Up		
with or without central toilet facilities serving the units	site	75
Cabins with Plumbing; Park Model Recreational Vehicles		
with or without kitchen but without laundry facilities	sleeping space*	50
with or without kitchen but with laundry facilities	sleeping space*	70

(Comment 30)

- § 1-804(d) was updated to replace "a minimum of daily water meter readings for a year, unless the wastewater system and potable water supply will not be operated every day of the year, in which case daily water meter readings shall be taken for each day in operation" with:
  - (1) A minimum of daily water meter readings for a year, unless:
    - (A) the wastewater system and potable water supply will be operated for less than 180 days of days, in which case, daily water meter readings shall be taken for each day in operation; or
    - (B) the wastewater system and potable water supply will be operated for 180 days or more and the Secretary concludes that 1 year of daily water meter readings is not necessary to demonstrate the wastewater strength and quantity of water necessary for the proposed use and the Secretary provides approval, prior to the collection of water meter readings, for daily water meter readings to be taken for 180 consecutive days. An applicant seeking such approval shall submit the following information:
      - (i) the nature the existing use of the building or structure, including equipment that may be part of the use and any manufacturing process, that will be in use when meter readings will not be taken;
      - (ii) seasonal variations in occupancy or water usage of the building or structure demonstrating that all variations will be recorded during the 180 days;

(iii) wastewater strength and characteristics, including BOD and TSS, that may be required to adjust the sizing of the leachfield according to § 1-904 and as further described in Subsection (e), for the days when meter readings will not be taken; and

(iv) other information the Secretary deems necessary based on the specific proposed use and request.

Additionally, "by the Secretary" and "and based in information submitted by the applicant" was inserted into (2).
(Comment 3)

- § 1-910(e) was edited to add "according to the structure types identified on Table 9-3" after "structure" and § 1-910(f) was added:

  (f) Notwithstanding Subsection (e), soil descriptions and recordings completed on or after January 1, 2007 and completed prior to the effective date of these Rules may be accepted by the Secretary when the descriptions and recordings identify:

  (1) the soil texture corresponding to the name or acronym in Subsection (e)(3); and

  (2) soil structure corresponding to the structure types identified on Table 9-3, or, in the absence of identifying structure, the soil evaluation shall be based on the most limiting soil structure identified in Table 9-3 for the reported soil texture.

  (Comment 114)

- Table 9-3 was revised to separate "Very Coarse Sand or Coarser" from "Coarse Sand, Sand"

Soil Characteristics		**Application Rates (gallons per square foot per day)**			
Texture	**Structure Type[1]**	**In-Ground Trench**	**In-ground Bed**	**At-Grade Leachfield**	**Leachfield in a Bottomless Sand Filter**
Very Coarse Sand or Coarser	SG	See § 1-919(b)	See § 1-919(b)	1.00	1.00
Coarse Sand, Sand	SG	1.50	1.20	1.00	1.00

(Comment 22)

- The following note was added after Table 9-6:
  "Note: See § 1-903(g) for additional restrictions concerning the location of a wastewater system components in proximity of a Public Community Water System."
  (Comment 90)

- § 1-917(d)(1), § 1-918(d)(1), § 1-920(g)(1), § 1-921(k)(2), and § 1-922(i) were modified to each read "Construction shall not occur if a sample of soil obtained from approximately 8 inches below the surface can be easily rolled into a wire. This indicates the soil moisture content is too high for construction purposes."
  (Comment 61)

- § 1-919(b) was revised to replace "texture of coarse sand or sand" with "texture of very coarse sand or coarser" and the following was added "and there is no soil with a thickness of 1 foot or greater with a percolation rate 1 minute per inch or slower or a soil texture of coarse sand or finer between the bottom of the proposed infiltrative surface of an in-ground leachfield and the seasonal high groundwater table or bedrock"
  (Comment 22)

- § 1-920(c) was revised to replace "or has a soil texture of coarse sand or sand" with "or a soil texture of very coarse sand or coarser, unless there is a soil with a thickness of 1 foot or greater with a percolation rate 1 minute per inch or slower or a soil texture of coarse sand or finer between the bottom of the proposed infiltrative surface of the leachfield and the seasonal high groundwater table or bedrock."
  (Comment 22)

- § 1-920(g)(16) was edited to remove "Install the swale, or."
  (Comment 8)

- § 1-1007(a)(2)(B)(ii) was changed to state "150 pounds" rather than "50 pounds."
  (Comment 11)

- § 1-1102(e) was added: "The construction, installation, or hydrofracturing of a groundwater potable water source, except the construction of a potable water supply using surface water, that is equal to or greater than 20 feet deep shall be performed by a well driller." The term licensed well driller was replaced with "well driller" throughout the Rules.
  (Comment 127)

- Table 11-2 was modified to move "or confined surficial aquifer" to follow "bedrock" in the first column.
  (Comment 125)

- § 1-1115(e) was moved to § 1-1115(c).
  (Comment 126)

- § 1-1205(a)(4) was added: "ensure process water for drilling a source, or injection water for hydrofracturing a water source, is obtained from a potable water source or public water source; however, if such water is unavailable in sufficient quantity, ensure clear, non-potable water that is obtained from a surface water body and is disinfected with an initial dosage of at least 100 mg/L of chlorine prior to using it as the process water."
  (Comment 128)

- Appendix A was updated to add Subsection (b): "When the application includes one or more existing or proposed lots, the latitude and longitude for the center of each existing or proposed lot identified in the application shall be reported on the application form using a global positioning system receiver using the NAD 83 coordinate system or a NAD 83 base map. The coordinates shall be reported in decimal degrees to five decimal

places with an accuracy of +/- 50 feet. Because many lots are irregularly shaped, the center location can be approximate."
(Comment 28)

- The following examples were placed in the Rules as Appendix C and associated notes were added to the Rules:
  Figure C-1 Example of 50-foot Calculation for Reconstruction
  Figure C-2 Detail of Typical Groundwater Monitoring Well
  Figure C-3 Detail of Typical Site that was Re-Graded
  Figure C-4 Example for Drawing Isolation Zone Around a Drinking Water Source
  Figure C-5 Detail of Typical Time Dosing Pump Station
  Figure C-6 Detail of Typical Shallow Trench Wastewater System
  Figure C-7 Detail of Typical Trench Wastewater System With 24 Inches of Limiting Soil
  Figure C-8 Detail of Typical Trench Wastewater System With 24 Inches to 5 Feet of Limiting Soil
  Figure C-9 Detail of Typical At-Grade Leachfield with One Infiltration Area (0-3 % Site Slope)
  Figure C-10 Detail of Typical At-Grade Leachfield with Two Infiltration Areas (> 3 % Site Slope)
  Figure C-11 Detail of Typical At-Grade Leachfield with Interfingering Infiltration Areas (> 3 % Site Slope)
  Figure C-12 Detail of Typical Bed in a Mound
  Figure C-13 Detail of Typical Leachfield in a Bottomless Sand Filter
  Figure C-14 Detail of Typical Leachfield using Subsurface Drip Distribution
  Figure C-15 Example for Drawing Isolation Zone Around a Leachfield
  Figure C-16 Detail of Typical Drilled Bedrock Well
  Figure C-17 Detail of Typical Driven Well
  Figure C-18 Detail of a Typical Shallow Well
  (Comment 117)

The following administrative changes were made to the proposed Wastewater System and Potable Water Supply Rules to increase clarity.

- § 1-201(14) and (15), defining the terms "campground" and "campsite," were modified to use consistent terminology between the terms. The words "occupied or made" were added to Subsection (14) and the definition of campground in Subsection (15) was modified to state "means an area that is occupied or made available to be occupied for vacation or rental purposes by a camping unit, such as a tent, yurt, teepee, lean-to, cabin, or recreational vehicle. For the purposes of this definition "primitive camping" means camping that involves temporary overnight occupancy in a natural environmental setting without a potable water supply, a wastewater system, picnic tables, or other developed structures or facilities and that is left in its original condition upon vacancy such that there is no, or minimal, evidence of human visitation. A campsite may rely on water faucets, central toilet facilities, or a dumping station or may have individual water service lines and sanitary sewer service lines."

- § 1-201(36), now (37), defining the term "flowing artesian well," was modified by adding "bedrock aquifer or" to be technically correct, a flowing artesian well can be in either a bedrock or confined aquifer.

- § 1-201(46), now (47), defining the term "indirect discharge system," was changed by removing "pursuant to 10 V.S.A. § 1263 or § 1265 or is otherwise permitted" to promote readability and ensure accuracy.

- § 1-201(48), now (49), defining the term "injection well," was changed by removing "pursuant to 10 V.S.A. § 1263 or § 1265 or" to promote readability and ensure accuracy.

- § 1-201(50), now (51), defining the term "instantaneous peak demand," was modified by adding "or determined by these Rules" because the instantaneous demand of a residential living unit of 5 gallons per minute is only determined in the proposed Rules, not in the Vermont Plumbing Rules.

- § 1-201(56), now (57), defining the term "linear loading rate," was modified by removing "or as determined by a hydrogeologist" because "linear loading rate" is a number for determining the length of a leachfield, regardless of who determines the number.

- § 1-201(64), now (65), was modified to include two additional examples of the defined term "modifies operational requirements," to remove language in one, and add language to another that improve clarity. "Change in use of a single-family residence from seasonal to year-round" and "Change in the use of a building or structure that produces a waste or wastewater identified in § 1-301(e) which will be treated and disposed of via a wastewater system serving the building or structure" were added as examples (G) and (I). The unnecessary language "that is connected to a soil-based wastewater system or a sanitary sewer service line that conveys wastewater to a wastewater treatment facility or an indirect discharge system," was removed from what is now example (H).

- § 1-201(69), now (70), defining the term "perched water table," was modified to more clearly define what is a perched water table.

- § 1-201(72), now (73), defining the term "potable water supply presumptive isolation zone" was modified to add "It takes the size and shape identified in § 1-1105(a)" to ensure consistency in interpretation of the term.

- § 1-201(74), now (75), defining the term "potable water supply presumptive isolation zone" was modified to add "It takes the size and shape identified in § 1-1005(a)" to ensure consistency in interpretation of the term.

- § 1-201(82) and (83), now (84) and (85), defining the terms "sanitary sewer collection line" and "sanitary sewer service line," were modified to replace "point of treatment at" with "leachfield of" for accuracy.

- § 1-201(102), now (103), defining the term "wastewater system presumptive isolation zone" was modified to add "It takes the size and shape identified in § 1-913(a)" to ensure consistency in interpretation of the term.

- § 1-301(e) was changed to add "any of" in the introductory statement and in (4) to add "which will not receive pretreatment prior to discharge to the septic tank or leachfield to prevent adverse effects" to clarify that the type of wastewater and waste identified in (4) may be able to permitted for treatment and disposal via a leachfield if it is pretreated. The term "wastewater or" was also added to the last sentence in (4) for clarity.

- § 1-304(11) was changed to add "the sanitary sewer service lines comply with the technical standards in Subchapters 8, 9, and 10" as (B) to create consistency across like permitting exemptions and make the requirement express. The term "wastewater system" was replaced with the term "sanitary sewer service lines" in what is now (D) for clarity and a correction was made to remove "sanitary sewer collection lines" from what is now (C).

- § 1-304(12) was changed to add "the water service lines comply with the technical standards in Subchapters 8, 9, and 10" as (B) to create consistency across like permitting exemptions and make the requirement express.

- § 1-304(19)(C) was changed to remove radon and radium and § 1-304(19)(D) was changed to add radon and radium because both contaminants can affect human health through drinking, bathing, preparation of food, and laundering.

- § 1-304(25)(D) became (26)(D) and was changed to remove the term "special" before "events" to comport with the use of the term "event" in the remainder of the provision.

- § 1-304(26)(G) became (27)(G) and was changed to remove the term "special" before "events" to comport with the use of the term "event" in the remainder of the provision. (27)(G) was also changed to add "and alternative hand washing supplies" to comport with (E) of the same section.

- Table 8-1 was edited to correct a math error. The calculation for the water supply serving 19 living units was changed from 7200 to 6840.

- Table 8-3 was modified to replace "Caterer" with "Catering or Take-Out Facility" and the following rows were added because "caterer" implies the facility is licensed by the Vermont Department of Health and would not apply to facilities serving ice cream. Identifying each provides clarity.

ice cream shop	N/A	100
ice cream shop	employee	13
bakery	N/A	100

bakery	employee	13
deli	N/A	100
deli	employee	13

- Table 8-3 was clarified by adding the following footnote in reference to design flows associated with seafood licenses:
  "** Design flow does not include disposal of ice used for storing and displaying seafood. If the ice is disposed of by spraying with water to melt the ice, the design flow needs to include the quantity of water needed to melt the ice."

- § 1-903(i)(2)(C) was modified to replace 18, an error, with 14.

- § 1-903(i)(4) was edited for clarification to read "For at-grade leachfields, the minimum soil depths of naturally occurring soil shall be met for a distance of:
  (A) 25 feet beyond the limits of the fill material in the downslope direction; and
  (B) 10 feet beyond the limits of the fill material on all other sides."

- § 1-903(j)(2) was edited for clarification to read "The minimum depths of naturally occurring soil shall be met:
  (A) for a distance of 25 feet beyond the limits of the fill material of the mound in the downslope direction;
  (B) for a distance of 10 feet beyond the limits of the fill material at each end of the mound; and
  (C) at the limits of the fill material of the mound in the upslope direction."

- § 1-903(k)(3) was edited for clarification to read: "The minimum depths of naturally occurring soil shall be met:
  (A) for a distance of 25 feet beyond the limits of the fill material of the mound in the downslope direction; and
  (B) for a distance of 10 feet beyond the limits of the fill material of the mound at each end of the mound; and
  (C) at the limits of the fill material of the mound in the upslope direction."

- § 1-903(l)(4) was modified for clarification to read "The minimum depths of naturally occurring soil shall be met:
  (A) for a distance of 25 feet beyond the limits of the fill material of the mound in the downslope direction;
  (B) for a distance of 10 feet beyond the limits of the fill material of the mound at each end of the mound: and
  (C) at the limits of the fill material of the mound in the upslope direction."

- § 1-903(m)(3), was modified for clarification to read "The minimum depths of naturally occurring soil shall be met for a distance of:
  (A) 25 feet from the edge of the enclosure for the bottomless sand filter in the downslope direction; and

(B) 10 feet from the edge of the enclosure for the bottomless sand filter on all other sides."

- § 1-904 was modified to insert as a new (a) "Wastewater systems designed to dispose of filtrate effluent shall:
  (2) be designed using pressure distribution pursuant to § 1-914; and
  (3) comply with all other technical standards in this Subchapter, except that a wastewater system designed to dispose of filtrate effluent may use up to twice the application rate of soil for sizing the leachfield required by § 1-911."
  This provision replaced the following two provisions: "(a) Except as provided in Subsection (c), wastewater systems designed to dispose of filtrate effluent shall comply with all technical standards in this Subchapter" and "(c) When a wastewater system designed to dispose of filtrate effluent is designed using pressure distribution pursuant to § 1-914, the wastewater systems may use up to twice the application rate of soil for sizing the leachfield required by§ 1-911." This change was made to reflect the need for systems designed using filtrate effluent to use pressure distribution and to reflect the real-world design of systems using filtrate effluent.

- § 1-906(a)(1)(B)(iv)(I) was edited to remove "high" in front of "permeable" because "high," when used in this Subsection, is subjective and the Subsection identifies the allowed soil textures.

- § 1-908(e), establishing the following express language, was added in order to ensure consistency and compliance with requirements located elsewhere:
  (e) The excavation for installing a septic tank shall not be located within:
    (1) 10 feet of the edge of the leachfield stone or other infiltrative surface for an in-ground trench or in-ground bed;
    (2) 25 feet of the limits of the fill material in the downslope direction, and 10 feet of the limits of the fill material in all other directions, for an at-grade leachfield;
    (3) 25 feet of the limits of the fill material in the downslope direction, and 10 feet of the limits of the fill material in all other directions for a mound; and
    (4) 25 feet of the edge of the enclosure in the downslope direction, and 10 feet from the edge of the enclosure in all other directions for a bottomless sand filter.

- § 1-909(a) was modified to add "only" between "serving" and "plumbing fixtures' to ensure clarity.

- § 1-911(c)(1)(a) and (b), and § 1-920(2)(a)(i) and (ii) were modified to correct the reference to "0 to 4 feet" with "0 to 3 feet" and to comport with § 1-903(i) for the minimum depths of naturally occurring soil below the infiltrative area of an in-ground or at-grade leachfield to the seasonal high groundwater table.

- Table 9-3 was modified to replace the reference to § 1-919(b) in the application rate for at-grade leachfields located in "coarse sand, sand" with 1.00 to avoid confusion.

- Table 9-5 was modified to replace “Normal high-water elevation of surface water” with “Surface water, normal high water” for ease of location.

- § 1-917(c)(5) was deleted as it was redundant with (c)(11) and therefore unnecessary.

- § 1-920(e)(2)(A)(i) and (ii) was changed to correct “4 feet” to “3 feet.”

- § 1-922(i)(6)(C) was modified to add “¼ inch mesh” to be consistent with (i)(6)(D).

- § 1-1001(a)(4) was corrected to replace the reference to “potable water supply” with “wastewater system.”

- § 1-1004(a) was corrected to remove “sanitary sewer service lines and” because § 1-1002 identifies the general requirements for a sanitary sewer service line.

- § 1-1106(a) was edited to add “grouting using the methods identified in § 1-1205(j)” and Subsection (d) the moved to Subchapter 12, Flexible Standards and became § 1-1205(j) because Subchapter identifies when grouting is required while Subchapter 12 identifies construction standards which includes how grouting shall be placed around a well casing.

- § 1-1007(a)(2) was edited to remove “where site conditions prevent obtaining the 10-foot horizontal separation and” and add “when” before “one of the following requirements is met” to be consistent with § 1-1204(a).

- § 1-1007(b)(2) was corrected to add a missing “is” and was edited to remove “where site conditions prevent obtaining the 18-inch separation and” and add “when” before “one of the following requirements is met” to be consistent with § 1-1204(b).

- § 1-1009(a) was edited from “shall not be less than 4 inches” to read “shall be 4 inches” because the Subsection begins with “the minimum force main diameter” meaning the force main “shall not be less than” so is redundant.

- Table 11-1 was modified to replace “Normal high-water elevation of surface water” with “Surface water, normal high water” for ease of location. The following footnote was also added for consistency with Table 9-5: “The horizontal location to surface water shall allow for possible future widening of the surface water due to bank erosion.”

- Table 11-1 was modified to include “Property lines” which had been erroneously excluded and is consistent with current rule.

- § 1-1109(e) was edited to remove “licensed” in front of well driller for consistency in the use of the term well driller.

- § 1-1110(b)(2)(A)(ii) and (C)(i)(II) and (ii)(II) were modified to replace “measured below top of casing or, if major water bearing fractures exist above the PCL, measured

below top of casing to the water bearing fractures" with "pump cut-off level measured below top of casing" to simplify the method to calculate casing storage.

- § 1-1113(c)(2) was modified to add the following for when to take a lead sample: "Water samples taken for lead shall be first draw."

- § 1-1202(g) was modified to replace "watertight" with "has a discharge pipe that terminates at least 18 inches above ground surface, shall passively drain water from the enclosure, and shall remain visible" to be consistent with § 1-1112(d).

- § 1-1205(b)(4)(i) was edited to add "for 7-inch casing" after "thickness" for clarification.

- § 1-1207(b)(3) was modified to add the following for clarification: "at an elevation below the calculated drawdown level."

- § 1-1210(d) was simplified to read "Disinfection of water storage tanks shall be completed pursuant to AWWA Standard C652" to comport with the Vermont Water Supply Rule. (d) originally read: "Disinfection of water storage tanks shall be completed pursuant to the following method:
  (1) fill 5 percent of the total volume of the water storage structure with a water/chlorine solution of 100 mg/L;
  (2) allow the chlorinated water to rest in the water storage tank for a minimum of 6 hours; and
  (3) then add water to fill the water storage tank with a combination of the original chlorinated water and additional water to the overflow pipe and allow the diluted chlorinated water to rest in the water storage tank for a minimum of 24 hours before disposing of the chlorinated water."

- Appendix A, Subsection (b), now (c), (4)(B) was edited to add "limits of the infiltrate area for an in-ground leachfield" which was missing from the list.

- Appendix A, Subsection (b), now (c), (8) was clarified to include "except when the component of the potable water supply is a water service line or a water service pipe, and except when the component of the wastewater system is a sanitary sewer service line connecting to a sanitary sewer collection line."

- Appendix A, Subsection (c), now (d), (1)(C) was modified to replace "plus a boundary that is 50 feet or less from the proposed leachfield" with "that ends 50 feet or less from the proposed leachfield" for greater clarity and consistency with other subsections.

- Appendix A, Subsection (c), now (d), (1)(G) and (H) was edited to limit identifying test pits and percolation tests to only those "conducted within 50 feet of a leachfield."

- Appendix A, Subsection (c), now (d), (1)(I) and (J) was clarified to include "within 75 feet of the proposed leachfield."

- Appendix A, Subsection (d), now (e), (1)(C) was modified to replace “with a boundary that is 50 feet or less from the proposed potable water source” with “that ends 50 feet or less from the proposed potable water source” for greater clarity and consistency with other subsections.

- Appendix A, Subsection (d)(3)(A) and Subsection (e)(3)(A) were added to require inclusion of the “Preparer’s signature, plan title, date, and revision date(s) on all plans.”

- Appendix B, Example 1 Table, was updated to include correct calculations for the examples.

- Formatting and typographical errors were also corrected where identified.