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

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Environmental Protection Rules

Chapter 14

Indirect Discharge Rules

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Chapter 14

INDIRECT DISCHARGE RULES

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Subchapter 1 - Scope, Authority, and Purpose

§14-101 Scope

(a) These rules apply to all indirect discharges of wastes,

- except for on site sewage or non-sewage disposal systems with less than 6,500 gpd capacity that are covered by the Wastewater System and Potable Water Supply Rules, or
- are exempt from those rules, or
- are existing indirect discharges of non-sewage waste.

(b) New indirect discharges require a permit under these rules prior to the commencement of construction of the system or any facility that would be served by the system. Indirect discharges from sewage disposal systems that have a design capacity of 6,500 gallons per day or more and that were in existence as of May 17, 1986 were required to obtain a discharge permit under these rules by July 1, 1991.

§14-102 Authority

(a) These rules are adopted by the Secretary of the Vermont Agency of Natural Resources under the authority granted by 10 V.S.A. §§905b, 1250, 1251a, 1259, 1263, 1390-1394, and Chapter 25 of Title 3 (Administrative Procedures Act).

§14-103 Purpose

(a) These rules establish standards and procedures that the Secretary uses in reviewing permit applications for indirect discharges and in the issuance and administration of indirect discharge permits under the authority referenced in §14-101 above. These rules further implement the policies established in the Water Pollution Control Act (10 V.S.A. Chapter 47) and in the Groundwater Protection Act (10 V.S.A., Chapter 48). It is the purpose of these rules to insure that:

(1) Indirect discharges comply with the provisions of the Vermont Water Quality Standards.

(2) Indirect discharges and associated treatment and disposal systems are designed and constructed in a manner that will provide reliable protection of the public health, groundwater, and surface water during operation and maintenance.

(3) New indirect discharges of sewage from systems with a design capacity of 6,500 gpd or more:

(A) will not significantly alter the aquatic biota in the receiving waters,

(B) will not pose more than a negligible risk to the public health, and

(C) will be consistent with existing and potential beneficial uses of the waters.

Subchapter 2 - Permits, Liability, Circumvention

§14-201 Permit Duration, Conditions, Modification, Suspension, or Revocation

(a) An indirect discharge permit shall be valid for the period specified in the permit despite any intervening changes in Vermont Water Quality Standards, effluent or treatment standards, or classification of the receiving stream. The maximum period for which a permit can be issued is five years and the Secretary may issue permits for periods of less than five years. An indirect discharge permit renewal application is subject to rules, regulations, and standards, in effect at the time the renewal application is received.

(b) The indirect discharge permit shall include conditions necessary for monitoring operational reliability of the collection, treatment, and disposal system, and the effluent quality, discharge volumes, in-ground effluent quality, quality of ground and surface water, and biological monitoring of the receiving waters.

(c) After notice and opportunity for public hearing, the Secretary may modify any indirect discharge permit upon the Secretary's motion or upon a written request for modification that contains facts or reasons supporting the request. If the Secretary determines that modification is appropriate, only the conditions subject to modification are reopened. Causes for modification of an indirect discharge permit are:

(1) material and substantial additions or alterations to the facility or the facility's activities that occurred after permit issuance that justify the application of permit conditions which are different or absent in the existing permit; or

(2) the receipt of information concerning the facility which was not available when the permit was issued and that would have justified the application of different requirements at the time of issuance; or

(3) the Secretary determines good cause exists for modification of a compliance schedule, such as an act of God, strike, flood, materials shortage, or other events over which the facility has little or no control and for which there is no reasonably available remedy.

(d) After notice and opportunity for public hearing, the Secretary may suspend or revoke any indirect discharge permit upon the Secretary's motion or upon a written request that contains facts or reasons supporting the request. Causes for suspension or revocation of an indirect discharge permit are:

(1) non-compliance by the facility with the requirements of 10 V.S.A. Chapter 47, these rules, any order issued under 10 V.S.A. §1272, or any permit condition; or

(2) failure by the facility to disclose all relevant facts during the permitting process which were known at that time; or

(3) misrepresentation of any relevant fact at any time; or

(4) a determination by the Secretary that the facility's activities endanger human health or the environment and can only be regulated to acceptable levels by suspension or revocation of the permit.

§14-202 Liability

(a) The issuance of an indirect discharge permit for an indirect discharge under these rules does not relieve the permittee from the responsibility of proper operation of the system and does not limit liability under other statutes pertaining to ground and surface water protection or rights.

§14-203 Circumvention

(a) The design and installation of two or more systems of less than 6,500 gallons per day each that results in a combined indirect discharge of more than 6,500 gallons per day for the purpose of circumventing the requirement to obtain an indirect discharge permit is prohibited. In evaluating any proposal with two or more systems of less than 6,500 gallons per day, the Secretary will consider the proximity of each system to the other, normal engineering practice in the design of wastewater collection, treatment and disposal systems, and the applicant's reasons for the design of two or more systems to determine if the design is to circumvent the Rules. If the design is considered to circumvent the Rules, an application for a *New Indirect Discharge of Sewage* must be submitted and an indirect discharge permit must be obtained.

Subchapter 3 - Definitions

§14-300 Definitions

(a) The following definitions and abbreviations shall apply in the interpretation and enforcement of these rules. As used in these rules, all terms not defined herein shall have the meaning given them in 10 V.S.A. Chapter 47 and the Vermont Water Quality Standards adopted pursuant to 10 V.S.A. Chapter 47 §1252(e).

(1) **Agency** means the Agency of Natural Resources.

(2) **Aquatic Biota** consists of three distinct communities: the periphyton, the aquatic macroinvertebrates and the fish.

(3) **Board** means the Vermont Water Resources Board.

(4) **Commissioner** means the Commissioner of the Department Environmental Conservation or his or her duly authorized representative.

(5) **Complete Application** means an application that contains all the information required for filing an application for the type of approval requested, including but not limited to all required hydrogeologic studies, engineering plans, specifications, calculations, and evidence of ownership of the disposal site.

(6) **Department** means the Department of Environmental Conservation.

(7) **Design Capacity** means the maximum volume of effluent in gallons per day that is discharged to groundwater from the disposal system in any 24-hour period.

(8) **Design Flow** means the highest anticipated volume of sewage to be generated in a day, including infiltration, as established using the Wastewater System and Potable Water Supply Rules, '1-804, or other means of calculation approved by the Secretary.

(9) **Director** means the Director of the Drinking Water and Groundwater Protection Division ~~Wastewater Management Division~~ or duly authorized representative.

(10) **Division** means the Drinking Water and Groundwater Protection Division ~~Wastewater Management Division~~ of the Department of Environmental Conservation.

(11) **Existing In-Stream Water Quality** means in-stream water quality conditions in the receiving water for a proposed indirect discharge which exist or are projected to result from all existing and approved sewage disposal facilities upstream and may include other permitted development or activity which can affect the quality of the receiving waters.

(12) **Existing Indirect Discharge of Non-Sewage Waste** means an indirect discharge of a Non-Sewage Waste that existed on or before May 17, 1986.

(13) **Existing Indirect Discharge of Sewage** means an indirect discharge of sewage with a design flow of 6,500 gallons per day or more that existed on or before May 17, 1986.

(14) **Failed System** - means

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

(i) that allows wastewater to be exposed to the open air, pool on the surface of the ground, discharge directly to surface water, or 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;

(ii) that results in a potable water supply being contaminated and rendered not potable; or

(iii) that presents a threat to human health.

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

(i) these effects can be and are remedied solely by minor repairs; 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.

(15) **Five Percent Exceedence Limit** means a value which will not be exceeded by more than 5 percent of the samples when evaluating the entire population.

(16) **Hydrogeologist** means an individual who has specialized training and experience in bedrock geology, glacial geology, geomorphology and groundwater hydrology, including well hydraulics and contaminant hydrogeology.

(17) **Indirect Discharge** means any discharge to groundwater, whether subsurface, land based or otherwise.

(18) **Indirect Discharge Permit** means an indirect discharge permit issued pursuant to these rules.

(19) **Lake or Pond** means, for the purpose of determining the point of compliance and the permitting limits for an indirect discharge of sewage or non-sewage, any natural or man-made standing body of water with a drainage area to surface area ratio of less than 500:1.

(20) **Low Median Monthly Flow (LMMF)** means the median flow for that month having the lowest median flow during the seasonal release period.

(21) **Macroinvertebrates** means the aquatic macroinvertebrates, which are animals without backbones, that are large enough to be seen by the unaided eye and can be retained by a U.S. Standard #30 mesh sieve (28 meshes per inch, 0.595 mm openings) and live at least part of their life cycles within or upon available substrates in a body of water.

(22) **Median Monthly Flow** means, for a given calendar month, the mean daily flow that is equaled or exceeded 50 percent of the time, for the period of record for the gage.

(23) **New Indirect Discharge of Non-Sewage Waste** means an indirect discharge of a Non-Sewage Waste which came into existence after May 17, 1986. Existing Indirect Discharges of Non-Sewage Waste that have increased design flows or changed the nature of the waste discharged after May 17, 1986 are New Indirect Discharges of Non-Sewage Waste.

(24) **New Indirect Discharge of Sewage** means an indirect discharge of sewage which came into existence after May 17, 1986. Existing Indirect Discharges of Sewage that have increased design flows after May 17, 1986 are New Indirect Discharges of Sewage.

(25) **Ninety-five Percent Confidence Value** means a value which has a 95 percent chance of being greater than the population mean.

(26) **Non-Pathogenic Waste** means any waste that, prior to treatment, does not contain organisms pathogenic to human beings.

(27) **Non-Sewage Waste** means any waste other than sewage which may contain organisms pathogenic to human beings but does not mean stormwater runoff.

(28) **Periphyton** means all those aquatic organisms that are firmly attached to, but do not penetrate into, the substratum. The periphyton consists of three basic components: 1) the producers, i.e. the algal or photosynthetic component, 2) the reducers or bacterial/fungal component, and 3) the consumer or animal component including protozoans, rotifers, and other microinvertebrates.

(29) **Person** means an individual, partnership, public or private corporation, entity, municipality, institution or agency of the state or federal government and includes any officer or governing or managing body of a partnership, association, firm or corporation.

(30) **Secretary** means the Secretary of the Agency of Natural Resources or his or her duly authorized representative.

(31) **Seven Day Low Flow, Ten Year Return Period (7Q10)** means a drought flow equal to the lowest mean flow for seven consecutive days, adjusted to nullify any effects of artificial flow regulation, that has a 10% chance of occurring in any given year.

(32) **Sewage** means waste containing human fecal coliform and other potential pathogenic organisms from sanitary waste and used water from any building, including but not limited to carriage water, shower and wash water, but does not include stormwater.

(33) **Significant Alteration of Aquatic Biota (SAAB)** means a change in the numbers or diversity of aquatic biota that exceeds the range of natural variation and where such change results in a measurable alteration of the essential biological characteristics of the receiving waters.

(34) **System** means a collection, treatment, storage, or disposal facility that results in one or more indirect discharges.

(35) **Upland Waters** means those waters which have not passed through a Waste Management Zone established in accordance with the Water Pollution Control Act.

Subchapter 4 - Application Requirements

§14-401 Application Categories

(a) The Secretary has established several different categories of applications for approval under these rules, based on the nature of the activity proposed and the level of approval being requested. These categories range in scope from a full approval of a *New Indirect Discharge of Sewage* or *Existing Indirect Discharge of Sewage*, to a limited approval to begin testing to provide information for an application. The categories are intended to provide flexibility for applicants in proceeding with their projects while retaining sufficient control by the Secretary to insure compliance with statute. Should a particular project not clearly fall into one of these categories, the Secretary will select a category consistent with the intent of these rules.

§14-402 Permit and Capacity Applications for *New Indirect Discharge of Sewage*

(a) A permit application for a *New Indirect Discharge of Sewage* shall include all information on application form WR-82 and form Schedule I, complete with all data, hydrogeologic study report(s), final engineering plans and specifications, documentation that the applicant is the land owner or has a legal permanent lease, list of landowners adjacent to the disposal site and the point(s) of compliance, all information required for completing the Notice of Application [see §14-504(a)] and the correct application fee.

(b) An applicant may submit a partial application, referred to as a capacity application, for review by the Secretary and subsequent determination by the Secretary of the design capacity of the site for a *New Indirect Discharge of Sewage*. A capacity application shall include all of the same components as for a permit application for a *New Indirect Discharge of Sewage* with the exception that only preliminary engineering plans and specifications are required for the wastewater treatment and disposal system showing compliance with all applicable isolation requirements. Upon completion of the review of the capacity application the Secretary shall provide the applicant with a Capacity Determination giving the approved design capacity for the site subject to submission and approval of all necessary final engineering plans and specifications for construction. The Capacity Determination is not a draft indirect discharge permit. The Capacity Determination is valid for 365 days, within which time period the applicant must submit all necessary final engineering plans and specifications for construction. If the Capacity Determination expires, in order to obtain a permit for a *New Indirect Discharge of Sewage*, the applicant must then re-submit the permit application including the appropriate application fee.

§14-403 Permit Application for *Existing Indirect Discharge of Sewage*

(a) The Secretary will issue an indirect discharge permit for an *Existing Indirect Discharge of Sewage* unless the Secretary finds that the discharge is causing a violation of the Vermont Water Quality Standards. An application for a system involving an *Existing Indirect Discharge of Sewage* shall include the following information:

(1) completed WR-82 form properly signed;

(2) a copy of a previous permit issued for the disposal system, if any, and a copy of any engineering plans available for the system;

(3) a detailed description of use of the system including the total sewage design flow in accordance with the Secretary's rules in effect at the time the plans and specifications were approved by the Secretary, or, if constructed prior to any required approval, based on information on the plans or basis of design. This includes a complete list of all buildings, number of bedrooms, and owners of all properties connected to the system. Note: When a home owners association or other legal entity represents a group of owners, the representing entity, not the individual owners, should be listed;

(4) the location of the system identified on a copy of a United States Geological Survey topographical map;

(5) written authorization for the Secretary to investigate the condition of the system and adjacent surface waters, with prior notice to the system owner or a duly authorized representative, for the purpose of determining compliance with applicable standards; and

(6) the correct application fee.

§14-404 General Permit Application for *Existing Indirect Discharge of Sewage*

(a) For inclusion under the General Permit for *Existing Indirect Discharge of Sewage* all the following criteria must be met:

(1) the applicant must hold a valid indirect discharge permit unless this requirement has been waived by the Secretary;

(2) the discharge from the system must have a design capacity of 15,000 gallons per day or less;

(3) the indirect discharge must be an *Existing Indirect Discharge of Sewage* as defined in these Rules;

(4) the indirect discharging system must be currently operating in a manner that:

(A) does not permit the discharge of sewage onto the surface of the ground;

(B) does not result in the surfacing of sewage;

(C) does not result in the direct discharge of sewage into the waters of the State; and

(D) does not cause a violation of the Vermont Water Quality Standards in the receiving waters.

(5) A certified operator is not required to operate the system;

(6) The applicant is in compliance with all terms and conditions of the current indirect discharge permit at the time application is made for inclusion under the General Permit (unless the requirement for a current indirect discharge permit has been waived by the Secretary); and

(7) A complete application is submitted consisting of the following:

(A) completed and signed application form supplied by the Secretary; and

(B) the correct application fee; and

(C) a copy of an Annual Inspection Report by a Vermont Registered Professional Engineer completed within the past 365 days (unless this requirement is waived by the Secretary).

§14-405 Permit Application for *New Indirect Discharge of Non-Sewage Waste*

(a) Indirect discharge permits are required for the land application of *Non-Sewage Wastes* such as food processing wastes and other wastes, such as quarry discharges, that are applied to the surface of the land [except on-farm activities covered under §1259(f)]. Permits are also required for disposal of such wastes in manure pits. The wastes must have a beneficial impact on the land, equivalent to fertilizer amendments or equivalent to farmland irrigation. Due to the potential variation in the wastes which may be land applied, a complete application for an indirect discharge permit for a *New Indirect Discharge of Non-Sewage Waste* shall consist of the following:

(1) a completed and signed application form WR-82;

(2) a complete chemical description of the waste to be land applied, based on waste sampling and analysis in accordance with guidance provided by the Secretary, and Material Safety Data Sheets for all chemicals which could reasonably be expected to be in the discharge;

(3) hydrogeologic study reports and/or other site investigation reports for the disposal site (if deemed applicable by the Secretary);

(4) documentation of ownership of the disposal site and copies of agreements between the applicant and the owner for use of the site (a manure pit agreement only is required for disposal utilizing manure pits);

(5) information on the receiving stream for the indirect discharge resulting from the direct land application (based on guidance from the Secretary);

(6) a complete listing of all landowners adjacent to the disposal site (unless this requirement is waived by the Secretary); and

(7) the correct application fee.

§14-406 Indirect Discharge Permit Renewal Application

(a) All indirect discharge permits must be renewed every five years unless a shorter renewal time period is specified in the permit. Applications for renewal must be filed in accordance with the date specified in the permit. Permittees holding General Permits for an *Existing Indirect Discharge of Sewage* are required to re-file for coverage under the General Permit in accordance with conditions contained in the General Permit.

(b) Each application for renewal of an indirect discharge permit for a *New Indirect Discharge of Sewage* must contain the following:

(1) a completed WR-82 application form; Note that the Schedule I application form is also required when changes are proposed to the indirect discharge system that result in a change of the indirect discharge;

(2) a consultant's report and evaluation of performance of the system under all terms and conditions of the current indirect discharge permit (annual inspection report);

(3) a consultant's evaluation of all monitoring data available for the treatment facility effluent, groundwater, and the receiving stream for the previous five year period, unless a different time period is established by the Secretary. The data analysis shall include the calculation of the 95% confidence value about the mean for surface water data and the 5% exceedence value for groundwater data. However, use of the mean (or average) value for either or both data sets will be allowed if there are at least 30 data points in the data set;

(4) a consultant's evidence of compliance with all permit limitations and compliance with the Aquatic Biota Criteria;

(5) a condition-by-condition review of the permit establishing compliance with all permit conditions; and

(6) the correct application fee.

(c) Each application for renewal of an indirect discharge permit for an *Existing Indirect Discharge of Sewage* must contain the following:

(1) a completed WR-82 application form;

(2) a consultant's report and evaluation of performance of the system under all terms and conditions of the current indirect discharge permit (annual inspection report);

(3) a condition-by-condition review of the permit establishing compliance with all permit conditions; and

(4) the correct application fee.

(d) Each application for renewal of an indirect discharge permit for a *New Indirect Discharge of Non-Sewage Waste* must contain the following:

(1) completed WR-82 application form;

(2) a water quality evaluation report if required by the permit;

(3) a condition-by-condition review of the permit establishing compliance with all permit conditions; and

(4) the correct application fee.

(d) All indirect discharge renewal applications shall be subject to regulations and standards in effect at the time the renewal application is received.

(e) The Secretary will review all performance data, permit violations if any, water quality data, and aquatic biota data, in making a determination on the renewal of the indirect discharge permit. Non-compliance with conditions of the current permit may be grounds for halting the processing of an application for renewal until the Secretary decides that the permittee has adequately addressed the non-compliance.

(f) If the Secretary determines that there is any question concerning the ability of the previously permitted indirect discharge to meet the conditions of the permit, the Secretary may require the permittee to adopt and comply with a contingency plan in accordance with §14-703(a)(4). The Secretary may also renew the permit with additional monitoring conditions and for less than a five year period and with more restrictive discharge limitations.

§14-407 Amendments of Indirect Discharge Permits

(a) Major revisions to existing permits shall be processed as permit amendments by the Secretary. Examples of when a permit amendment is required include an increase in discharge volume or substantive change in the quality of the wastewater discharged, a substantial change in the treatment system for the indirect discharge or other changes which, in the opinion of the Secretary, change the nature, capacity or potential impact of the system. The Secretary will advise the applicant of the information that must be submitted for a complete application for permit amendment.

(b) Minor revisions to existing permits or approvals may be processed as administrative amendments by the Secretary. Examples of administrative amendments include: a change in the name of the permittee due to a transfer in ownership; minor revisions to an approved system which, in the opinion of the Secretary, do not change the nature, capacity, or potential impact of the system; and the addition of land application sites or manure pits for disposal of *Non-Sewage Waste*.

(c) In no instance shall an amendment extend the term of the original permit.

(d) Prior to submitting an application for an amendment, the applicant must review the proposal with the Secretary and receive oral or written approval for filing under this section. The Secretary will advise the applicant of the information that must be submitted for a complete application.

(e) The Secretary will notify the municipality, the municipal planning commission, the regional planning commission, and all parties to the original application (or last amendment) before issuing an administrative amendment of a discharge permit under this section and allow at least ten (10) days for filing comments or requests for a hearing on the proposed approval. In the case of indirect discharge permits for land application of food processing wastes, only those municipalities and planning commissions where new land application sites and/or manure pits are located will be so notified.

§14-408 Application Requirements for Correction Of Failed Systems

(a) The procedures and process to be used for correction of failed systems, as well as the standards to be applied, are contained in §14-604 and §14-605.

§14-409 Application Requirements for Alternative Demonstration Testing

(a) The procedures and process to be used for an alternative demonstration are contained in §14-914.

§14-410 Application Fee

(a) Each application shall be accompanied by fees determined in accordance with 3 V.S.A §2822.

(b) The application fee must be based on the proposed maximum design capacity in gallons per day to be discharged indirectly for all disposal systems at any time.

Subchapter 5 - Application Review Process

§14-501 Agency Review and Determination

(a) The Secretary will review each application for compliance with all applicable permitting criteria. The Department of Environmental Conservation Permit Application Review Procedure, adopted May 22, 1996, shall be used in the application review process. When the Secretary has reached a determination to issue or deny an application, the Secretary will prepare a tentative determination of compliance with all Permitting Criteria and appropriate standards. Compliance with all applicable standards and criteria is necessary for a tentative determination to issue a permit. Failure to comply with all requirements will result in a tentative determination to deny a permit.

(1) A tentative determination to issue a permit will be in the form of a draft indirect discharge permit.

(2) A tentative determination to deny a permit will be in the form of a written notification to the applicant and will provide the basis for the denial.

(b) After the applicant and the Secretary have satisfied the requirements of §14-504, Public Participation Procedure, the Secretary shall make a final determination to issue or deny a permit.

§14-502 Agency Response to Comments Received on Draft Permit

(a) When the final determination is made to issue or deny, the Secretary shall also issue, in writing, a response to comments for that permit. The response to comments shall contain:

(1) A specific indication of which provisions of the draft indirect discharge permit have been changed in the final permit;

(2) The reasons for the change;

(3) A brief description of comments received and the Secretary's response to all significant comments on the draft permit raised during the public comment period.

§14-503 Appeals

(a) Any person or party in interest may appeal an act or decision of the Secretary to the Water Resources Board pursuant to 10 V.S.A. §1269 within thirty (30) days of the act or determination. An appeal filed pursuant to this section shall not stay the effectiveness of any act or decision of the Secretary pending a determination by the Board.

(b) Appeals of decisions by the Secretary of various requirements of these rules may be dependent upon the authority for promulgating the requirement in question. Prior to filing an appeal with the Board, the appellant may file a request with the Secretary for a determination of the statutory basis for the requirement(s) at issue and advice on the appropriate route of appeal. The filing of such requests must occur within thirty (30) days of the decision to be appealed, and the period for appeal will begin on the day the Secretary responds to the request. The Board may remand an appeal to the Secretary for determination of the statutory basis for a requirement at issue in an appeal.

§14-504 Public Participation Procedure

(a) **Notice of Application** - The Secretary and applicant will provide the public with notice of an application for an indirect discharge permit for a *New Indirect Discharge of Sewage* by the following process.

(1) The applicant will provide the following information for the Notice of Application as part of a complete application for a *New Indirect Discharge of Sewage*:

(A) a statement, written in a clear and coherent manner using words with common and everyday meanings, which describes the proposed project; and

(B) the location of the project described in a manner which will allow identification by individuals who are reasonably familiar with the area; and

(C) a description of the project which includes the basic elements of the project and its purpose. When the application is for one or more elements of a larger project, a brief description of the larger project shall be included; and

(D) the name, address and phone number of the applicant.

(2) The Secretary, after determining that the application is complete, will prepare the Notice of Application (NOA) and send it to the applicant and/or the applicant's consultant for review, allowing 10 days from the date of mailing for the review.

(3) Following the 10 day applicant review period, the Secretary shall send the Notice of Application (NOA) to the town clerk for posting and to the town and regional planning commissions. The NOA shall include an invitation to the public to submit comments regarding the application to the Secretary. The Secretary shall require that the applicant publish the NOA in a local newspaper generally circulating in the area where the land is located a minimum of one day each for two consecutive weeks. Whenever possible the newspaper selected shall be the one used for publishing Act 250 notices. The applicant shall submit to the Secretary a copy of the published NOA, the name of the paper, and the dates the notice was published.

(b) **Public Informational Meetings** - The Secretary may, at his/her own discretion, hold public informational meetings concerning an indirect discharge application any time during the review process. The purpose is to inform the public of an indirect discharge application and to receive public comment. The informational hearing shall be informal and not subject to the contested case provision of 10 V.S.A. Chapter 25.

(c) **Public Notice of Draft Permit** - The Secretary and applicant will provide the public with notice of a draft permit for an *Existing Indirect Discharge of Sewage* or *New Indirect Discharge of Sewage* by the following process.

(1) The Public Notice of a draft Indirect Discharge Permit shall include:

(A) the application number, name of the project and the town where the project is located; and

(B) the name and address of each applicant; and

(C) a brief description of each applicant's activities or operations that result in the indirect discharge described in the application; and

(D) the name of the receiving water for each indirect discharge and a short description of the location of each discharge on the receiving water indicating whether such indirect discharge is an *Existing Indirect Discharge of Sewage* or a *New Indirect Discharge of Sewage;* and

(E) a brief description of the procedures for the formulation of final determinations and any other means by which interested persons may influence or comment upon those determinations, including a statement of the right of parties to request a public hearing; and

(F) the address and phone number of the Agency and/or other premises at which interested persons may obtain further information, request a copy of the draft indirect discharge permit, request a copy of the fact sheet (if any), and inspect and copy files and related documents pertinent to the application.

(2) Circulation

(A) The public notice shall be circulated within the geographical area of the proposed indirect discharge and may include posting in post offices, municipal offices, and public places near where the *Existing Indirect Discharge of Sewage* or *New Indirect Discharge of Sewage* is located. At a minimum, the public notice will be sent to the town clerk for posting and to the town selectboard, town planning commission, and regional planning commission. It may also be published in local newspapers and periodicals and/or a daily newspaper of general circulation.

(B) For an original permit for a *New Indirect Discharge of Sewage*, a notice shall be mailed to all adjoining landowners of the applicant's land used for the indirect discharge and landowners adjacent to the point of compliance.

(C) A notice shall be mailed to any person or group upon request to the Secretary.

(D) Interested Party Mailing List -The Secretary shall maintain and use a mailing list of interested parties for those persons or groups interested in receiving certain or all public notices for draft indirect discharge permits.

(i) For an interested party to be included on such a mailing list, the party shall submit a written request specifying which notices they wish to receive.

(ii) From time to time the Secretary will revise the interested party mailing list. All parties on the list will be contacted to see if they wish to remain on the mailing list. Failure to respond will result in removal from the list.

(E) Time Period - The Secretary shall provide a period of not less than thirty (30) days following the date of the public notice during which time interested persons may submit their written comments on the draft indirect discharge permit. All written comments submitted during the thirty (30) day comment period shall be retained by the Secretary and considered in the formulation of the Secretary's final determination on the application. The comment period for receiving written comments may be extended at the discretion of the Secretary.

(d) **Public Hearings on Draft Permit** - The Secretary shall provide an opportunity for the applicant, any affected municipality, any affected Agency of the State of Vermont, or any interested group or persons to request a public hearing with respect to a draft indirect discharge permit.

(1) Any request or petition for public hearing must be received by the Secretary within the thirty (30) day public comment period prescribed above and shall indicate the interest of the party filing such request and cite specific reasons why a hearing is warranted.

(2) The Secretary shall hold a hearing upon finding, on the basis of requests, that there is a significant public interest in the draft indirect discharge permit and sufficient cause to hold a hearing. Instances of doubt shall be resolved in favor of holding a hearing. The Secretary may also hold a hearing on his/her own motion.

(3) Any hearing held pursuant to this subsection shall be held in the geographical area of the proposed indirect discharge or other appropriate area, at the discretion of the Secretary, and may, as appropriate, consider related groups of indirect discharge permit applications.

(4) The official notice of a public hearing pursuant to this section shall be circulated a minimum of thirty (30) days prior to the hearing. Subsequent abbreviated notices may be made less than thirty (30) days prior to the hearing to remind the general public of the approaching hearing.

(5) Hearings held pursuant to this section shall be conducted by a duly authorized representative of the Secretary. Any person may submit oral or written statements and data at the hearing concerning the draft permit. The Secretary shall have discretion to limit the time allowed for oral statements and may require the submission of statements in writing. All statements, comments and data presented at the hearing shall be retained and considered in the formulation of the final determination on the draft permit. The submission of written testimony at the hearing is encouraged.

(6) When a hearing is held the Secretary shall allow a minimum of ten days following the close of the hearing for filing written comments and may extend the original public comment period.

(7) The public hearing shall be informal and not subject to the contested case provisions of 10 V.S.A. Chapter 25.

(e) **Public Participation Process for General Permit** - The Secretary shall follow the following process for public involvement in the formulation of a General Permit for *Existing Indirect Discharge of Sewage*:

(1) A copy of the Public Notice for the draft general permit shall be sent to every town clerk in the State of Vermont. A copy of the Public Notice will be sent to every permittee holding a valid Indirect Discharge Permit potentially eligible for inclusion in the class of discharges covered under the General Permit. The Public Notice shall include the following information:

(A) name, address and phone number of the duly authorized representative of the Secretary to whom comments on the General Permit may be submitted;

(B) a brief description of the General Permit and the types of systems it covers;

(C) the period of time during which comments will be accepted on the General Permit; and

(D) a brief description of the procedures for the formulation of the final determination on the issuance of the General Permit and means by which interested persons may comment on that determination, including the right to request a public hearing.

(2) A copy of the draft General Permit will be sent to every town clerk in the State of Vermont and to permittees with discharges which would be eligible for inclusion in the class of discharges covered under the General Permit. However, failure to notify a town clerk or a permittee, following a good faith effort by the Secretary, does not invalidate the public notification process.

(3) The Secretary shall review the comments received on the draft General Permit and make a determination as to whether or not to issue the General Permit. The Secretary may also modify the General Permit based on the comments received.

(4) If issued, the General Permit will be valid for a period not to exceed five (5) years and will be subject to public comment prior to its renewal by following steps (1), (2) and (3) above.

Subchapter 6 - Permitting Standards

§14-601 Burden of Proof

(a) It is the applicant's burden to prove that a proposed indirect discharge will meet the established criteria before the Secretary may issue a permit for the discharge. The only exception to this requirement is provided by the Water Pollution Control Act for *Existing Indirect Discharge of Sewage*. For these discharges, the Secretary must issue a permit unless he or she finds that the discharge is violating the Water Quality Standards.

(b) The applicant shall meet the burden of proof by complying with the permit procedures or by submitting such other biological and technical evidence as the Secretary determines will provide both functional equivalency to the permit procedures and similar reliability.

(c) For a *New Indirect Discharge of Sewage*, the applicant must show by clear and convincing evidence that the discharge will meet the statutory requirements for obtaining an indirect discharge permit. The standards and requirements of these rules, when met, provide the evidence necessary to meet this statutory requirement.

§14-602 General Permitting Criteria

(a) All indirect discharges subject to the provisions of these rules must comply with the requirements of the current version of the Vermont Water Quality Standards adopted by the Water Resources Board. Indirect discharges which have been permitted must comply with the current Water Quality Standards in effect at the time of permit renewal, including any revisions which have occurred since the permit was issued.

§14-603 Specific Permitting Criteria for Indirect Discharges of Sewage

(a) Applicants with *Existing Indirect Discharges of Sewage* were required to obtain an indirect discharge permit by July 1, 1991.

(b) The Secretary shall grant an indirect discharge permit for an *Existing Indirect Discharge of Sewage* to the waters of the state unless the Secretary finds that the discharge violates the Vermont Water Quality Standards.

(c) Applicants with proposed *New Indirect Discharges of Sewage* which will discharge to a valid Waste Management Zone shall obtain an indirect discharge permit before any construction of the system. The Secretary shall not issue an indirect discharge permit unless the applicant demonstrates compliance with the Vermont Water Quality Standards. Site specific methods may be required for the applicant to demonstrate compliance with the Vermont Water Quality Standards. These indirect discharges shall demonstrate compliance with the Reliability Permitting Criteria and the Public Health Protection Criteria before a draft permit can be distributed for public comment.

(d) Applicants with proposed *New Indirect Discharges of Sewage* that will discharge to Class B Waters shall obtain an indirect discharge permit before any construction of the system. The Secretary shall not issue an indirect discharge permit unless the applicant demonstrates by clear and convincing evidence, and the Secretary finds, that the discharge:

(1) will not significantly alter the aquatic biota of the receiving waters,

(2) will not pose more than a negligible risk to public health,

(3) will be consistent with existing and potential beneficial uses of the waters, and

(4) will not cause a violation of Water Quality Standards.

Applicants with proposed *New Indirect Discharges of Sewage* that will discharge to Class B Waters must also document compliance with the applicable criteria of these rules before a draft permit can be distributed for public comment.

§14-604 Correction of System Failures Involving *Existing Indirect Discharges of Sewage*

(a) Upon learning of the failure of the system, the permittee (or owner) must notify the Secretary, by the end of the next working day. Written notification shall follow, within five (5) working days. That notification shall include:

(1) a description of the failure; and

(2) if the failure involves surfacing of sewage, the measures taken to isolate the area and the measures taken to prevent the discharge of sewage to waters of the state.

(b) Upon notification of the failure, the Secretary may arrange a site review with the permittee (or owner) and/or their consulting engineer. At the site, the Secretary may require immediate corrective action to safeguard the public health or the environment without prior public notification or comment. This action may include, but is not limited to, the installation of a "temporary" disposal field, pumping and trucking of sewage or such actions necessary in the opinion of the Secretary to decrease or eliminate surfacing sewage.

(c) Following the site assessment and subsequent investigations which may be required, the owner shall have a Vermont registered professional engineer prepare a report of the failure. The report, at a minimum, shall include the following:

(1) description of the failure and probable cause(s);

(2) a schedule of all further site work and engineering design work which needs to be accomplished as part of correction of the failure; and

(3) a listing of options available to the owner for permanent correction of the failure in compliance with these Rules.

(d) The Secretary, following notification of the failure, shall determine when the above referenced report shall be submitted. The report shall be subject to the review and approval of the Secretary and shall be revised as necessary in accordance with comments received from the Secretary. The report shall be used by the Secretary in permit issuance to reflect changes to the system necessary to correct the failure.

(e) The repair or replacement of a failed system which involves an *Existing Indirect Discharge of Sewage* shall be accomplished in accordance with the following:

(1) The Secretary must find that the discharge from the repaired or replacement system will not cause a violation of the Vermont Water Quality Standards. The standard of no significant alteration of aquatic biota shall not apply, regardless of the location of the system.

(2) The repaired or replacement system shall not be allowed to discharge to a Class A water.

(3) The design of the repaired or replacement system shall meet the Reliability Permitting Criteria (Technical Design Standards, Subchapter 10) unless a variance is approved by the Secretary. At the discretion of the Secretary, designs that are at variance with the Reliability Permitting Criteria may be approved provided that the permittee has clearly demonstrated that alternatives have been examined and the proposed design is the best reasonable design. In considering whether or not to grant a variance from the Reliability Permitting Criteria, the Secretary shall consider the following:

(A) Site conditions exist which render strict compliance with the technical requirements of these rules impossible;

(B) There are no other reasonable and feasible means of legally treating and disposing of the sewage;

(C) A system can be constructed that will function in a satisfactory manner so as not to create a health hazard, public nuisance, or source of pollution; and

(D) The proposed wastewater treatment and disposal system is necessary to eliminate an existing health hazard, public nuisance, or source of pollution.

(E) The Secretary shall not grant a variance which decreases the required depth of unsaturated sand and/or soil beneath the disposal field unless the Secretary finds that the overall design of the system provides a degree of treatment which protects the public health and the environment. In addition, the Secretary shall not grant a variance that allows a system to be located where the likelihood of contaminating a water supply is increased above that which characterizes the previous (failed) condition. In reviewing the location of these proposed systems, the requirements of the Vermont Water Supply Rules will be followed to the extent reasonably possible.

(f) The Secretary shall use the following process for permitting the correction of the failed system:

(1) If the *Existing Indirect Discharge of Sewage* from the failed system is already authorized under an indirect discharge permit, the application for repair or replacement of that system will be processed as a permit amendment. The permittee shall submit an application including engineering plans, specifications and the required application fee.

(2) If the *Existing Indirect Discharge of Sewage* from the failed system is not authorized by an indirect discharge permit, the application for repair or replacement of the system shall be processed as an application for an initial indirect discharge permit. The owner shall submit a complete application in accordance with §14-403 of these rules.

(3) The Public Participation Procedure listed in §14-504 will be followed with the following exceptions:

(A) If, in the opinion of the Secretary, it is necessary to safeguard public health or the environment the Secretary may authorize construction of a replacement system, or repair of the failed system prior to any public notice or participation as specified in subsection (b) above.

(B) If the *Existing Indirect Discharge of Sewage* from the failed system is not authorized by an indirect discharge permit, the owner will be required to publish a Notice of Application prepared by the Secretary in a newspaper specified by the Secretary and in accordance with §14-504(a).

§14-605 Correction of System Failures Involving *New Indirect Discharges of Sewage*

(a) Upon learning of the failure of the system, the permittee (or owner) must notify the Secretary, by the end of the next working day. Written notification shall follow, within five (5) working days. That notification shall include:

(1) a description of the failure; and

(2) if the failure involves surfacing of sewage, the measures taken to isolate the area and the measures taken to prevent the discharge of sewage to waters of the state.

(b) Upon notification of the failure, the Secretary may arrange a site review with the permittee (or owner) and/or their consulting engineer. At the site, the Secretary may require immediate corrective action to safeguard the public health or the environment without prior public notification or comment. This action may include, but is not limited to, the installation of a "temporary" disposal field, pumping and trucking of sewage or such actions necessary in the opinion of the Secretary to decrease or eliminate surfacing sewage.

(c) Following the site assessment and subsequent investigations which may be required, the owner shall have a Vermont registered professional engineer prepare a report of the failure. The report, at a minimum, shall include the following:

(1) description of the failure and probable cause(s);

(2) a schedule of all further site work and engineering design work that needs to be accomplished as part of correction of the failure; and

(3) a list of options available to the owner for permanent correction of the failure in compliance with these rules.

(d) The Secretary, following notification of the failure, shall determine when the above referenced report shall be submitted. The report shall be subject to the review and approval of the Secretary and shall be revised as necessary in accordance with comments received from the Secretary. The report shall be used by the Secretary in permit issuance to reflect changes to the system necessary to correct the failure.

(e) The repair or replacement of a failed system which involves a *New Indirect Discharge of Sewage* shall be accomplished in accordance with the following:

(1) The permittee shall use the alternative disposal fields which are available while the failed system is repaired or replaced.

(2) The repaired or replacement system shall not be allowed to discharge to a Class A water.

(3) If the correction results in an indirect discharge to a new receiving water, or to the same receiving water but upstream of the previous location, the permittee shall comply with the requirements of Subchapter 9, Methods for Demonstration of Compliance With Aquatic Permitting Criteria.

(4) Notwithstanding (3) above, if the correction results in an indirect discharge to the same receiving water but, in the opinion of the Secretary, the discharge zone is not significantly changed from the previous condition, no new demonstration of compliance with the Aquatic Permitting Criteria will be required prior to the repair or construction.

(5) The design of the repaired or replacement system shall meet the Reliability Permitting Criteria (§14-702, Technical Design Standards, Subchapter 10) unless a variance is approved by the Secretary. At the discretion of the Secretary, designs which are at variance with the Reliability Permitting Criteria may be approved provided that the permittee has clearly demonstrated that alternatives have been examined and the proposed design is the best reasonable design. In considering whether or not to grant a variance from the Reliability Permitting Criteria, the Secretary shall consider the following:

(A) site conditions exist which render strict compliance with the technical requirements of these rules impossible;

(B) there are no other reasonable and feasible means of legally treating and disposing of the sewage;

(C) a system can be constructed that will function in a satisfactory manner so as not to create a health hazard, public nuisance, or source of pollution; and

(D) the proposed wastewater treatment and disposal system is necessary to eliminate an existing health hazard, public nuisance, or source of pollution.

(6) The Secretary shall not grant a variance which decreases the required depth of unsaturated sand and/or soil beneath the disposal field unless the Secretary finds that the overall design of the system provides a degree of treatment that protects the public health and the environment. In addition, the Secretary will not grant a variance that allows a system to be located where the likelihood of contaminating a water supply is increased above that which characterizes the previous (failed) condition. In reviewing the location of these proposed systems, the requirements of the Vermont Water Supply Rules will be followed to the extent reasonably possible.

(f) The Secretary shall use the following process for permitting the correction of the failed system:

(1) Applications for repair or replacement of failed systems involving a *New Indirect Discharge of Sewage* will be processed as permit amendments. The permittee shall submit an application including engineering plans, specifications and the correct application fee as required by 3 V.S.A. Chapter 51, §2822.

(2) If the discharge is relocated to a new receiving stream that, in the judgement of the Secretary, will require a level of review similar to that for a new application, the Secretary may require the owner to submit a complete application in accordance with §14-402 of these rules.

(3) The Public Participation Procedure listed in §14-504 will be followed with the following exceptions:

(A) If, in the opinion of the Secretary, it is necessary to safeguard public health or the environment the Secretary may authorize construction of a replacement system, or repair of the failed system prior to any public notice or participation as specified in subsection (b) above.

(B) If the *New Indirect Discharge of Sewage* from the failed system is relocated to a new receiving stream, the owner will be required to publish a Notice of Application prepared by the Secretary in a newspaper specified by the Secretary and in accordance with §14-504(a).

§14-606 Criteria for Revocation of Authorization to Discharge under the General Permit For *Existing Indirect Discharges of Sewage*

(a) A permittee whose disposal system is covered under the General Permit for *Existing Indirect Discharge of Sewage* may be subject to revocation of authorization to discharge under that permit for any one of the following reasons:

(1) Failure to comply with the terms and conditions of the General Permit for *Existing Indirect Discharge of Sewage*;

(2) Failure of the indirect discharging system as defined in these rules.

(3) Failure on the part of the permittee to submit operating fees determined in accordance with 3 V.S.A Chapter 51, §2822.

(4) Evidence that the applicant submitted false or misleading information as part of the application for inclusion under the General Permit for *Existing Indirect Discharges of Sewage.*

(5) The Secretary finds that the indirect discharge is causing a violation of the Vermont Water Quality Standards in the receiving waters.

(b) Upon determination by the Secretary that a permittee should be subject to the revocation of authorization to discharge under the General Permit for *Existing Indirect Discharge of Sewage*, the Secretary shall follow the following procedure:

(1) The Secretary shall notify the permittee, in writing and by Certified Mail, that the Secretary intends, after notice and opportunity for public hearing under 3 V.S.A. §814, to revoke the permittee's authorization to discharge under the General Permit for*Existing Indirect Discharge of Sewage*. The written notice shall clearly state the reason(s) for the proposed removal from coverage as listed in (a) above.

(2) The written notice shall allow a period of time for the permittee to respond to the proposed revocation to discharge. The period of time for a response to this notice shall not exceed 60 days.

(3) The Secretary shall review any response from the permittee to the written notice in making a final determination as to whether or not to proceed with the revocation under 3 V.S.A. §814.

(4) In lieu of initiating revocation proceedings, the Secretary may require the permittee to take actions as deemed necessary by the Secretary to allow the discharge to continue under the General Permit for *Existing Indirect Discharge of Sewage.* The Secretary may establish a schedule for compliance in this regard.

(5) If the Secretary determines that the revocation of authorization is necessary, the Secretary shall provide notice of revocation and opportunity for a public hearing under 3 V.S.A. §814. The notice sent to the permittee shall include the following, at a minimum:

(A) the reason(s) for proposed revocation of authorization to discharge under the General Permit for *Existing Indirect Discharge of Sewage*;

(B) a description of the revocation process;

(C) the application process and requirements that the permittee must follow for coverage under an individual indirect discharge permit.

(D) a statement that the Secretary's decision to revoke the permittee's authorization to discharge under the General Permit for *Existing Indirect Discharge of Sewage*, after notice and opportunity for public hearing under 3 V.S.A. §814 may be appealed to the Water Resources Board.

§14-607 Specific Permitting Criteria for Indirect Discharges of Non-Sewage Wastes

(a) *Existing Indirect Discharges of Non-Sewage Waste* do not require a permit under these rules. Should violation(s) of the Water Quality Standards result from such discharges, the violation(s) must be corrected.

(b) All *New Indirect Discharges of Non-Sewage Waste* shall obtain an indirect discharge permit or an underground injection control (UIC) permit before construction. For the purposes of these rules, expansion is judged against the volume of the discharge and its constituents as of May 17, 1986. The following requirements apply:

(1) Any proposed discharger of *Non-Sewage Waste* shall submit all information, as required by the Secretary, for the Secretary to determine if an indirect discharge permit or an underground injection control (UIC) permit is required.

(2) Any proposed land application of food processing wastes must use the Vermont Guidelines for the Land Application of Dairy Processing Wastes (as amended) in the formulation of the application for an indirect discharge permit.

(3) *New Indirect Discharges of Non-Sewage Waste* may also be subject to the jurisdiction of the Secretary under other regulatory programs (e.g. landfills, hazardous waste sites, etc.). In such cases of concurrent jurisdiction, the Secretary's rules specific to the regulated activity will be the design standard, and approval under those standards will be a prerequisite for an indirect discharge permit or an underground injection control (UIC) permit. All applications for *New Indirect Discharges of Non-Sewage Waste* must demonstrate compliance with the Vermont Groundwater Rule and Strategy. However, for those discharges for which the Secretary has sufficient information on the impact of the discharge on groundwater quality, such as the land application of dairy processing wastes, additional information in this regard will not be required. Any additional information required to demonstrate compliance with the Vermont Water Quality Standards is at the discretion of the Secretary. The type and amount of information required to demonstrate compliance with the Vermont Water Quality Standards includes, but is not limited to,:

(A) the pollutants, concentrations and discharge rate,

(B) disposal location and receiving water body,

(C) disposal practice, frequency, and method of application,

(D) degree of control by applicant, and

(E) potential threat to public health.

(4) The Secretary may request that the applicant provide such testing, investigation and engineering plans that the Secretary finds necessary to evaluate an indirect discharge application.

(5) The applicant shall also demonstrate compliance with the Reliability Permitting and Additional Public Health Criteria (as applicable) before a draft permit will be distributed for public comment.

(6) An indirect discharge permit is not required for storm water discharges.

Subchapter 7 - Permitting Criteria

§14-701 Aquatic Permitting Criteria - Applicability

(a) The applicant must demonstrate compliance with the Aquatic Permitting Criteria before a draft permit will be distributed for public comment. The Aquatic Permitting Criteria are numerical permitting limits, which are allowable in-stream concentrations for nutrient parameters and other parameters. These numerical limits apply to *New Indirect Discharges of Sewage* only. If compliance is demonstrated in the stream at the designated stream flow, or in the groundwater, depending on the designated point of compliance, the discharge is presumed to not significantly alter the aquatic biota in the receiving waters.

(b) Aquatic Permitting Criteria nutrient parameters include Total Dissolved Phosphorus and Nitrate nitrogen which, when added to a stream, can cause increased algal growth and changes in the aquatic biota.

(1) Using procedures approved by the Secretary the applicant must demonstrate that the indirect discharge will not increase the in-stream concentration of Total Dissolved Phosphorus at the point of compliance at the designated stream flow by more than 0.001 mg/L above existing background concentration. The applicant shall also demonstrate the indirect discharge will not increase the in-stream Total Phosphorus above any limit established in the Water Quality Standards. These limitations are applicable to upland waters.

(2) For all other streams with a point of compliance in a Waste Management Zone (WMZ) or downstream of a WMZ, the applicant must demonstrate that the indirect discharge will not cause more than a 0.002 mg/L increase in the Total Dissolved Phosphorus concentration above existing background concentration at the designated stream flow. The applicant shall also demonstrate the indirect discharge will not increase the in-stream Total Phosphorus above any limit established in the Water Quality Standards.

(3) For indirect discharges to a lake or pond the applicant must demonstrate that the indirect discharge will not cause more than a 0.001 mg/L increase in the concentration of Total Dissolved Phosphorus in the groundwater downgradient of the system at monitoring locations specified in these Rules.

(4) Using procedures approved by the Secretary the applicant must demonstrate that indirect discharge will not raise the in-stream concentration of Nitrate nitrogen at the point of compliance at the designated stream flow above 2.0 mg/L. The 2.0 mg/L limitation must include the background concentration of nitrate nitrogen and is applicable to all upland waters.

(5) For all other streams with a point of compliance in a Waste Management Zone (WMZ) or downstream of a WMZ, the applicant must demonstrate that the indirect discharge will not raise the in-stream concentration of Nitrate nitrogen at the point of compliance at the designated stream flow above the concentration established in the Vermont Water Quality Standards.

(6) For indirect discharges to a lake or pond the applicant must demonstrate that the indirect discharge will not raise the concentration of Nitrate nitrogen above 2.0 mg/L in the groundwater downgradient of the system at monitoring locations specified in these Rules. The 2.0 mg/L limitation must include the background concentration of Nitrate nitrogen in the groundwater.

(c) The Aquatic Permitting Criteria also include Non-Nutrient parameters. The applicant shall also demonstrate compliance for the following parameters:

(1) The indirect discharge shall not cause an in-stream pH whose mean value is outside the background range for the stream. There are no pH criteria applicable to groundwater for indirect discharges.

(2) The maximum allowable concentration for any other contaminant at its point of compliance, shall be determined by the Secretary on an individual basis after review of available data of its effects on water quality and aquatic biota.

(d) The Aquatic Permitting Criteria shall be applied at the designated stream flow in accordance with the following:

(1) The Nutrient parameters of Total Dissolved Phosphorus and Nitrate nitrogen, and the parameter pH shall comply with the Aquatic Permitting Criteria at the low median monthly stream flow at all points of compliance or at the low median monthly flow for the type of storage and release period proposed.

(2) All other parameters shall demonstrate compliance with maximum allowable concentration as established by the Secretary at the designated stream flow established by the Secretary.

(3) In determining stream flows, applicants may use comparisons with other gages with proper adjustment or may provide actual stream flow measurements to establish a statistical relationship with a U.S.G.S. gage. Any field gaging and statistical analysis proposed should be approved by the Secretary before data collection is initiated. All estimates of stream flow are subject to review and approval by the Secretary.

(4) Altering the location of a stream or the stream flow is unacceptable as a method to obtain compliance with the Aquatic Permitting Criteria for an indirect discharge.

(5) An applicant may design an indirect discharging system to comply with permitting limits utilizing the storage of treated, disinfected wastewater in aerated holding facilities and controlling the release of it in compliance with one of the following two methods to achieve compliance with the Aquatic Permitting Criteria:

(A) The annual release system must be used to demonstrate compliance for those indirect discharges which do not include sufficient operating storage. These indirect discharges must demonstrate compliance with the Aquatic Permitting Criteria using the low median monthly stream flow for the year.

(B) The applicant may use storage and variable release systems (seasonal release) to design an indirect discharging system to comply with the Aquatic Permitting Criteria:

(i) A seasonal release system discharges the treated effluent to the land-based disposal system at differing rates depending upon the season. The use of the seasonal release system requires both summer and winter <u>in situ</u> effluent soil tests to determine the degree of renovation of the effluent applied. If a tertiary treatment system with nitrogen and phosphorus removal is proposed, the requirement for winter <u>in situ</u> effluent soil testing is waived.

(ii) The applicant must conduct water quality sampling during the summer and winter periods to determine background in-stream receiving water quality in order to use the seasonal release system. This is applicable for all effluent treatment levels.

(I) Summer period - the months of June, July, August, September, and October.

(II) Winter period - the months of November, December, January, February, and March.

(III) Spring period - the months of April and May.

(iii) When storage and seasonal release is used to comply with the Aquatic Permitting Criteria, the applicant may calculate the low median monthly flow separately for the Summer, Winter and Spring periods and use the applicable flow in each period to determine the allowable release rate for each period.

(e) All applicants for indirect disposal systems required to demonstrate compliance with the Aquatic Permitting Criteria shall use one of five methods (dilution, treatment index, modified site specific, site specific, or alternative demonstration) described in Subchapter 9.

(f) The point of compliance is the location or locations at which the indirect discharge must comply with the Aquatic Permitting Criteria. Multiple factors must be considered in determining the point of compliance for each indirect discharge. The Secretary will select the most environmentally protective point(s) of compliance.

(1) When the indirect discharge is to groundwater that enters a lake, pond or standing water wetland without entering a stream, the applicant must demonstrate compliance with the Aquatic Permitting Criteria in the groundwater at a minimum of 100 feet from the edge of the surface water.

(2) When the indirect discharge is to a stream, the applicant must demonstrate compliance with the Aquatic Permitting Criteria at all points in the stream or streams where the Vermont Water Quality Standards apply.

§14-702 Reliability Permitting Criteria - Applicability

(a) The Reliability Permitting Criteria are those engineering standards for the design, construction and operation of an indirect discharge collection, treatment, and disposal system necessary to comply with the statutory requirement of posing not more than a negligible risk to public health. The specific technical design standards for reliability permitting criteria are contained in Subchapter 10.

The applicant shall submit final detailed engineering plans and specifications and all other required data and information to provide evidence that these criteria have been met in order to obtain an indirect discharge permit.

§14-703 Additional Public Health Permitting Criteria

(a) An indirect discharge which complies with the Aquatic Permitting Criteria and Reliability Permitting Criteria, and with the Vermont Water Supply Rules for the criteria for protection of water supplies and groundwater, is generally considered to be a negligible risk to public health. The following administration, design and operation standards shall be followed in the design and operation of an indirect discharging system to ensure negligible risk to public health.

(1) Guarantee of Continued Operation

As part of an application for an indirect discharge permit, an applicant may be required to demonstrate that a guarantee of continued operation of the system has been adequately provided. This guarantee may include trust indentures, contracts with a municipality, or other evidence which the Secretary determines to be sufficient to guarantee continued operation and maintenance of the system.

(2) Sludge Disposal Certification

A sewerage system which uses a treatment system other than septic tanks is required to have a sludge management plan approved by the Agency. A Certificate for a Solid Waste Management Facility may also be required.

(3) Dam Permit

Any lagoons or storage vessels that require approval in accordance with 10 V.S.A. Chapter 43 must obtain that approval before an indirect discharge permit may be issued.

(4) Contingency Plan

If, during the review of a renewal application, the Secretary determines that in-stream Nitrate nitrogen or Total Dissolved Phosphorus confidence values exceed the aquatic permitting criteria, or if biomonitoring results indicate a Significant Alteration of the Aquatic Biota in the receiving waters and these chemical or biomonitoring results are linked to the permitted indirect discharge, a contingency plan will be required. The contingency plan shall encompass the entire approved design capacity of the indirect discharge in the event the indirect discharge causes a significant alteration of the aquatic biota. The contingency plan shall comply with the following:

(A) The contingency plan shall provide assurance that system modifications can be made to eliminate the significant alterations of the aquatic biota. For example, when the capacity of the land disposal system to remove pollutants is exhausted, or if the application submittals failed to accurately predict the impact of the indirect discharge on the receiving stream, the contingency plan must indicate what viable options are available to prevent significant alteration of the aquatic biota. Considerations would include, but not be limited to, providing 100% alternative disposal area or demonstrating that with additional advanced treatment the aquatic permitting limits can be met without renovation by soils.

(B) An acceptable contingency plan must include the following:

(i) demonstration that the plan is reasonable and can be implemented; and

(ii) evidence that the applicant has the ability in terms of financial and technical resources to implement the plan when needed.

(C) The level of sophistication and detail of the plan is dependent upon the level of pre-treatment provided and the quality of effluent applied to the land. The greater the degree of pre-treatment provided, the lower the dependency upon the contingency plan in terms of available land disposal area.

(D) In addition to its other responsibilities under Vermont laws and regulations, a municipality shall be responsible for the compliance with all requirements established under Vermont law by all new or increased discharges of domestic wastewater originating within its jurisdiction from community type wastewater treatment and disposal facilities (10 V.S.A. Chapter 47, §1277). Prior to issuing a permit for any such indirect discharge of such wastewater originating within a particular municipality, the Secretary may require the applicant to have made arrangements, by contract or otherwise, for the proper operation and maintenance of any facilities to treat such discharge, which may include arrangements for the municipality to operate and maintain such facilities.

Subchapter 8 - Compliance Monitoring

§14-801 Monitoring Requirements

(a) Compliance monitoring requirements in indirect discharge permits for *New Indirect Discharge*s *of Sewage* will generally require sampling and analysis of the effluent, groundwater, and receiving stream with regular reporting to the Secretary. Monitoring for aquatic biota in the receiving stream may also be required. As the design capacity of the indirect discharge increases there will be an increasing number of sampling points and increased frequency of sampling due to a perceived increase in the potential risk of significant alteration of aquatic biota as determined by the Secretary. Monitoring of parameters in addition to those contained under the Aquatic Permitting Criteria may be required (e.g. chloride as an indicator of renovated sewage effluent).

(b) By permit condition, the Secretary may require that the permittee collect and submit for analysis duplicate effluent, groundwater, and/or receiving stream samples for the purpose of establishing the precision of the data collected. The indirect discharge permit may also contain provisions for an increase in the frequency of sampling and analysis in the event that effluent limitations or other criteria prescribed in the permit are exceeded.

§14-802 Sampling and Analysis Procedures

(a) All sampling and analysis shall be conducted in accordance with a Quality Control/Quality Assurance Plan submitted by the permittee and approved by the Secretary. All sampling and analysis procedures for testing and monitoring shall be in accordance with the Vermont Water Quality Standards and conducted by a competent laboratory. A competent laboratory is one that has demonstrated successful performance in the analysis of U.S. EPA check samples for all parameters and/or any check samples provided by the Secretary. Permittees may conduct their own analysis or may use independent laboratories. Permittees electing to do their own analysis will be required to demonstrate the competence of their analysis by annually analyzing samples of known concentrations. On failure of the permittee's laboratory to correctly determine the known concentrations, the permittee will be required to have further analyses done by an independent laboratory.

§14-803 Monitoring of Aquatic Biota

(a) The Secretary may require a permittee to monitor the aquatic biota of the receiving water to determine if a significant alteration of aquatic biota has occurred.

(b) Aquatic biota monitoring shall be conducted in accordance with procedures in the Secretary's Biological Compliance Monitoring Methods Manual, and in accordance with §§14-2201, 14-2202 to determine if a significant alteration of the aquatic biota has occurred. These procedures are for use in determination of the effect of indirect discharges on the aquatic biota in Class B rivers and streams. The procedures are specifically for high quality running waters and are not applicable to lakes, ponds, standing water wetlands, reservoirs, or large low gradient rivers. Other procedures may be developed on a site specific basis to monitor these other aquatic environments. Monitoring of the following components of the aquatic biota may be required:

(1) **periphyton** - nutrient additions to receiving waters may result in increases in primary productivity. Such increases, detectable through monitoring of periphytic chlorophyll accumulation, may represent a significant alteration of the aquatic biota. Paired station analysis using spatial control and impact stations will be used to evaluate the significance of such increases induced by the indirect discharge;

(2) **macroinvertebrates** - characteristics of the aquatic macroinvertebrate community at spatial control and impact areas will be used to evaluate changes to the biological integrity of the aquatic biota affected by the indirect discharge. Temporal controls will generally not be used.

(3) **fish** - as conditions warrant, the Secretary may require assessments of fish community structure at control and impact areas for the purpose of determining whether or not an indirect discharge has had any effect on that community. Any project plans for fishery assessments must also be submitted to the Department of Fish and Wildlife for review and approval. In order to conduct such studies, the permittee's consultant must obtain a Collection Permit or equivalent from the Department of Fish and Wildlife.

(c) Pre-Discharge Control Area

Under some conditions a permittee may be required to conduct a pre-discharge assessment by sampling the aquatic biota at the proposed control and impact areas before initiation of any site development activities to determine the relative difference between the two areas before any discharge has occurred. This will provide assurance that the post-discharge data will be useful for determining if a significant alteration of the aquatic biota has occurred.

(d) Alternative Monitoring Methods

The Secretary recognizes that situations may arise in which the primary sampling strategy of paired station comparison cannot be directly applied. The most probable situation would be the lack of appropriate reference or control areas. Alternative procedures for determining compliance with the aquatic biota criteria will be determined on a site specific basis.

(e) Qualified Personnel

Aquatic biota compliance monitoring shall be conducted by a qualified aquatic biologist or by qualified personnel under the direct supervision of a qualified aquatic biologist. In determining whether an aquatic biologist is qualified, the Secretary will consider the following education and experience criteria:

(1) education - BS in biology or a related field with specialized course work in aquatic macroinvertebrate ecology/entomology.

(2) experience - A minimum of one year experience with routine lotic aquatic macroinvertebrate sampling and taxonomic procedures.

(3) allowable substitution for education - Three years of professional experience in the fields of aquatic macroinvertebrate ecology, including sampling methods and taxonomy, may be substituted for academic requirements. A graduate degree based on a project involving sampling and analysis of lotic macroinvertebrates may be substituted for experience requirements.

§14-804 Compliance

(a) An indirect discharge system must be operated and maintained at all times in a manner satisfactory to the Secretary and in compliance with the conditions of the indirect discharge permit, the Vermont Water Quality Standards and the Groundwater Protection Rule and Strategy.

(b) Criteria

The wastewater collection, treatment, storage, and disposal system shall be operated and maintained at all times in a manner satisfactory to the Secretary and shall not cause:

(1) violations of the Vermont Water Quality Standards in the receiving waters;

(2) a health hazard;

(3) nuisance conditions or objectionable odors; and

(4) undue groundwater pollution (that is, significantly greater contamination than that expected and which may have an adverse impact on the receiving waters).

(c) Significant Alteration of Aquatic Biota

A *New Indirect Discharge of Sewage* shall not cause a significant alteration of the aquatic biota in the receiving waters.

§14-805 Enforcement Actions

(a) Information that the wastewater collection, treatment or disposal system is a potential threat to human health or the environment; or that the permittee is in violation of any term or condition of the indirect discharge permit, the Vermont Water Quality Standards or has failed to comply with the required corrective action of an Order or Assurance, may serve as grounds for an enforcement action by the Secretary, including, but not limited to:

(1) issuance of an Order to immediately cease and desist any operation or practice and assessing penalties under 10 V.S.A. Chapter 210;

(2) issuance of an Order to correct or prevent environmental damage likely to result from any deficiency in operation or practice and assessing penalties under 10 V.S.A. Chapter 210;

(3) issuance of an Order suspending or revoking the indirect discharge permit and requiring temporary or permanent cessation of the operation of such facility and assessing penalties under 10 V.S.A. Chapter 210;

(4) a request that the Attorney General or appropriate State's Attorney commence an action for injunctive relief, the imposition of penalties and fines provided in 10 V.S.A. Chapter 211, or other relief as may be appropriate;

(5) issuance of a warning letter or a Notice of Alleged Violation;

(6) convening an enforcement conference with the alleged violator to determine the nature and extent of the violation and the appropriate enforcement action.

Subchapter 9 - Methods for Demonstration of Compliance With Aquatic Permitting Criteria

§14-901 Applicability of Methods

(a) All applicants proposing *New Indirect Discharges of Sewage* are required to demonstrate compliance with the Aquatic Permitting Criteria of §14-701, and shall use one of the five methods (dilution, treatment index, modified site specific, site specific, or alternative demonstration) listed in Table #1 and described below.

TABLE #1: METHODS FOR DETERMINING COMPLIANCE WITH THE AQUATIC PERMITTING CRITERIA

Compliance Method	Applicability (Maximum Design Capacity)	Stream Sampling Required ?	Renovated Effluent Sampling Required?	Section of Indirect Discharge Rules
Dilution	20,000 gpd	No	No	14-902
Treatment Index	20,000 gpd	No	No	14-903
Modified Site Specific	30,000 gpd	Yes	No	14-908
Site Specific (1)	No Limit	Yes	Yes	14-904
Alternative Demonstration	No Limit	Yes	Yes	14-914
(1) Site Specific includes In-Situ In-Ground Testing, Soil Extraction and Laboratory Testing, and Alternative In-Situ Testing				

§14-902 Dilution Method

(a) Applicability

The dilution method can be used for subsurface systems preceded by septic tanks that have a design capacity of 20,000 gallons per day or less and that indirectly discharge to streams. It is a presumptive method of demonstration that a proposed subsurface disposal system can comply with the Aquatic Permitting Criteria and the Vermont Water Quality Standards based on the ratio of the proposed indirect discharge of sewage to the low median monthly flow of the receiving stream.

(b) Criterion

A subsurface disposal system shall be presumed to meet the Aquatic Permitting Criteria and the Vermont Water Quality Standards if the ratio of the low median monthly flow of the receiving stream to the design capacity is 120:1 or greater. For a 6,500 gpd discharge, the low median monthly stream flow must be at least 780,000 gpd. For a 20,000 gpd discharge, the low median monthly stream flow must be at least 2,400,000 gpd.

§14-903 Treatment Index Method

(a) Applicability

(1) The Treatment Index Method can be used for subsurface systems preceded by septic tank(s) that have a design capacity of 20,000 gpd or less, and that indirectly discharge to streams. The Treatment Index Method is a presumptive method of demonstration that a proposed subsurface disposal system that complies with the required treatment index is presumed to comply with the Aquatic Permitting Criteria and the Vermont Water Quality Standards. This method considers the combined environmental factors of the soil and groundwater conditions which improve the quality of renovated effluent that reaches the stream. The treatment index is based on two general principles: (1) the longer the effluent is in contact with the soil, the greater the amount of renovation that will occur, and (2) greater flow in the receiving stream will provide additional dilution. Values are assigned to general characteristics of the disposal site and the receiving water and described in (c) below. The sum of these values is the Treatment Index.

(2) Any subsurface disposal system with a design sewage flow of greater than 15,000 gallons per day must have a low median monthly stream flow to design sewage flow ratio of at least 60:1 for consideration under the Treatment Index Method.

(b) Criterion

A subsurface disposal system which has a treatment index of at least 150 points shall be presumed to meet the Aquatic Permitting Criteria and the Vermont Water Quality Standards.

(c) Components

There are four individual components to the treatment index for subsurface disposal systems. The sum of these components yields the total treatment index for the system. The four components are: vertical treatment, loading rate, horizontal treatment and dilution.

(1) Vertical Treatment Component

The vertical treatment component is attributed to only the unsaturated soils that may occur below the infiltrative surface of the disposal system. It represents the extent to which the effluent is treated by passage through these soil layers. It is based on the expectation that the longer the effluent remains in contact with the soil, the greater the potential for biological and chemical changes that provide renovation. The vertical treatment component is the sum of incremental calculations for each foot of unsaturated soil below the system to the seasonal high water table as determined in §14-1101(c). The vertical treatment component can be determined in two ways:

(A) Using Percolation Tests

The vertical treatment component is based on the median percolation rate. A vertical factor is determined from Figure #1, Vertical Factor Vs. Percolation Rate, based on a minimum of two percolation tests in each leachfield (minimum of four for primary and alternate fields), in accordance with procedures in §14-1101(b), or at other suitable locations in the soil profile approved by the Secretary. All percolation tests conducted for the entire disposal site must be considered to determine the median percolation rate. The vertical factor is adjusted for each vertical foot of unsaturated soil below the disposal system in accordance with Table #2, Vertical Treatment Component Multipliers. The vertical treatment component is the sum of the adjusted vertical factors for each foot of unsaturated soil used for effluent renovation.

(B) Soils Evaluation Method

When a designer uses the soils evaluation method to design a system, Table #3 shall be used in determining the applicable percolation rate to use in conjunction with Figure #1.

Note: Adjustment for Mound Sand

For mound disposal systems, a vertical factor of 10 shall be used for mound fill. The vertical component for each foot of mound fill shall be determined using 70 percent of (0.70 multiplied by) the vertical factor so each foot of mound fill provides seven (7) points towards the treatment index total. This is in addition to the vertical component points associated with the minimum two feet of unsaturated soil beneath the mound fill.

(2) Loading Rate Component

Leachfield designs that use loading rates less than those allowed in §14-1302 and §14-1303 receive additional points towards the Treatment Index. The rationale for the loading rate component is that the sewage effluent is distributed over a greater land area than that required by these rules therefore providing an increased time of contact between the sewage effluent and unsaturated soils. The loading rate component is equivalent to 10 percent of the vertical treatment component point total, determined in subsection(1) above, for each 0.1 gallon per day per square foot that the design loading rate is less than the allowable loading rate, to a maximum of 50 percent of the vertical treatment component point total.

(3) Horizontal Treatment Component

The horizontal treatment component is based on the shortest horizontal distance from any portion of the disposal field to the nearest point of natural groundwater discharge, whether it is a seepage zone or stream. The rationale for the horizontal component is that the greater the distance the sewage effluent must travel to the receiving stream, the more renovation the sewage effluent will receive. The horizontal component is calculated as follows:

(A) The horizontal component is ten percent of (0.1 multiplied by) the vertical treatment component point total calculated for the first three feet of soil immediately below the bottom of the disposal field for each 200 feet of horizontal distance from the disposal area to the nearest point of natural groundwater discharge.

(B) Disposal systems that are greater than 1000 feet to the nearest point of natural groundwater discharge receive an additional 30 points towards the calculation of the Treatment Index.

(C) For those disposal sites characterized by a hydraulic conductivity (rate of groundwater movement) of 15 feet per day or less from the proposed leachfield to the receiving stream, the number of treatment index points from the horizontal treatment component shall be doubled.

(4) Dilution Component

The dilution component is the ratio of low median monthly stream flow to design flow at the point of compliance for the system. The rationale is that the larger the ratio of stream flow to design flow, the less the potential for the indirect discharge to significantly affect the stream chemistry and ultimately the aquatic biota. The dilution component is calculated by dividing the low median monthly stream flow at the point of compliance by the maximum design flow.

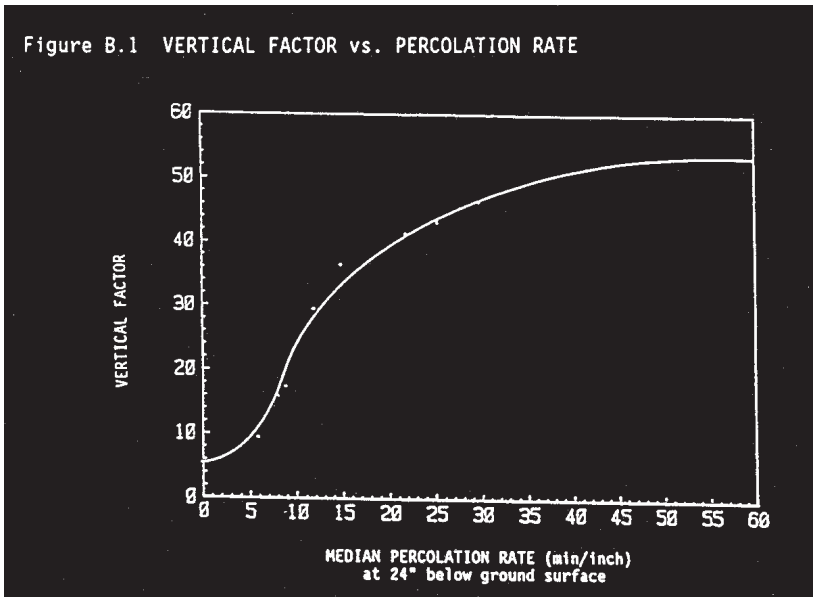


Figure #1 VERTICAL FACTOR vs. PERCOLATION RATE

TABLE #2: VERTICAL TREATMENT COMPONENT MULTIPLIERS

DEPTH OF UNSATURATED SOIL BELOW GROUND SURFACE USED FOR EFFLUENT RENOVATION	**VERTICAL COMPONENT MULTIPLIER TO BE USED WITH VERTICAL FACTOR FROM FIGURE #1**
0 - 12 inches[1]	2.0 x
12 - 24 inches[1]	1.3 x
24 - 36 inches	1.0 x
36 - 48 inches	0.8 x
48 - 60 inches	0.7 x
> 60 inches	0.7 x
[1]Can only be used for mound systems.	

TABLE #3: VERTICAL FACTORS FOR CALCULATING THE VERTICAL TREATMENT COMPONENT BASED ON SOILS EVALUATION METHOD

SOIL CLASS	SOIL TEXTURE (CONSISTENCE)	APPLICABLE VERTICAL FACTOR
1	Coarse Sand	5
2	Medium or Loamy Sand	6
3 a.	Fine Sand or Loamy Fine Sand	9
3 b.	Sandy Loam (loose; very friable)	9
4	Sandy Loam, Fine Sandy Loam, Loam, or Silt Loam (friable)	48
5 a.	Sandy Loam, Fine Sandy Loam, Loam, or Silt Loam (firm)	52
5 b.	Silt	52
6	Sandy Clay Loam, Silty Clay Loam, Clay Loam	52 (requires mound system)

§14-904 Site Specific Methods - General

(a) All site specific compliance methods involve two distinct testing programs:

(1) determining the in-ground effluent quality by testing the ability of the soil, at the proposed disposal site, to treat and renovate the applied wastewater effluent. The methods for determining in-ground effluent quality are detailed in §§14-905, 14-906, 14-907, and 14-908.

(2) determining the existing water quality of the receiving water. The methods for determining the existing water quality of the receiving water are detailed in §14-910.

(b) The results of the two testing programs will be considered in conjunction with the prescribed stream flow conditions for each parameter to determine compliance with the Aquatic Permitting Criteria at the point of compliance. This determination is usually accomplished using a mass balance equation. The exception to this is when the indirect discharge is to a lake, pond or standing water wetland. In such cases only the in-ground effluent quality is compared against the applicable Aquatic Permitting Criteria.

(c) A quality assurance/quality control (QA/QC) plan shall be submitted to and approved by the Secretary before any sampling or testing for the site specific method. The QA/QC plan shall include, but not be limited to, a statement of which site specific method will be used, the exact location at which the tests and sampling will occur, testing methodology to be used, the number and type of samples to be taken, and how the samples will be analyzed. If the applicant wishes, changes to the approved QA/QC plan can be made as amendments to the plan, provided the Secretary approves such proposed amendments.

(d) Pre-Application Testing Proposals

On-site testing with sewage can cause pollution or health hazards if not conducted properly. Therefore, before an applicant or consultant may conduct on site testing with sewage, a pre-application testing authorization must be obtained from the Secretary by submitting a proposal for on-site testing with sewage. The proposal shall be submitted at least one month prior to the proposed testing period and include, at a minimum, the following:

(1) all necessary soils and hydrogeological information as outlined in §14-1101 for Subsurface Disposal Systems or §14-1601 for Spray Disposal Systems;

(2) contour maps proving documentation of compliance with all isolation requirements to streams, ponds, lakes, water supplies and lines, property lines, houses, roads, and all other features in accordance with the isolation requirements in Table #21, Isolation Distances (pp. 131-132);

(3) the location and design of any temporary effluent storage ponds or tanks. All effluent used for spray testing shall be chlorinated before spraying. Warning signs shall be conspicuously placed at 50 foot intervals 200 feet from the test area perimeter around the testing site warning the public not to enter the area;

(4) a regional contour map at a scale of 1" equals 400', identifying the owner and address of the property to be tested, and the owners' names and addresses for the adjacent lands; and

(5) the time period of the test.

(e) Pre-Application Testing Approval Posting

(1) The Secretary shall arrange to have a copy of the pre-application test authorization approval posted at the Town Clerk's office in the town where the test site is located at least 5 days before the start of any sewage application.

§14-905 In Situ In-Ground Effluent Testing

(a) An applicant may perform in-situ effluent and soil testing at the proposed disposal site to demonstrate effluent renovation achieved by soil treatment. Wastewater may be applied to the soil at hydraulic loading rates and frequencies equal to the design loading rate of the proposed system. The wastewater used in the effluent testing shall have the minimum concentrations for the type of pre-treatment system proposed as listed in Table #4, Effluent Concentrations for In-Situ Testing by Treatment Level. Sampling and analysis of the effluent will be necessary to determine these concentrations.

(b) The test system shall be designed to apply effluent in a manner similar to the proposed disposal system and at a loading rate equal to or greater than the proposed loading rate.

(c) The test system shall be operated for a period of time sufficient to establish steady state conditions in the groundwater based on the chloride concentrations.

TABLE #4: EFFLUENT CONCENTRATIONS FOR IN-SITU TESTING BY TREATMENT LEVEL

	Effluent Concentrations (in mg/L) by Treatment Level (1)			
Parameter	**Septic Tank**	**Secondary**	**Secondary + (2)**	**Tertiary**
Biochemical Oxygen Demand (5-Day)	175 (3)	30 (3)	15 (3)	10 (3)
Total Suspended Solids	60 (3)	30 (3)	15 (3)	10 (3)
Total Dissolved Phosphorus	8	5	5	0.5
Total Kjeldahl Nitrogen	50	N/A	N/A	5
Ammonia (as N)	N/A	N/A	N/A	1
Nitrate nitrogen	N/A	N/A	N/A	5
Total Nitrogen (as N)	N/A	15 / 25 (4)	15 / 25 (4)	N/A

(1) For in-situ effluent renovation testing, these should be considered minimum concentrations.
(2) Secondary 'plus' treatment level expected from recirculating filters.
(3) When used for in-situ renovation testing, this minimum concentration is a recommendation only.
(4) 15 mg/L for small aerated lagoon systems; 25 mg/L for larger aerated lagoon systems and activated sludge systems.

(d) All groundwater concentrations shall be evaluated by sampling groundwater monitoring wells sited in accordance with (e) below to determine the degree of dilution of the renovated effluent that has occurred due to groundwater and determine the renovated effluent concentrations prior to such dilution.

(e) The downgradient groundwater sampling wells may be as close to the test disposal field as desired; however, these wells shall not be more than 50 feet from the test disposal field unless prior written approval of the Secretary to use wells at a greater distance is obtained.

(f) Applicants proposing to expand an existing land disposal system may complete in-situ effluent testing by the following methods:

(1) by showing that contiguous land on which the expanded disposal field will be built has similar characteristics of soil type, soil depth, depth of groundwater, slope, vegetative cover, etc. as the currently used disposal field, and

(2) by measuring the resulting groundwater quality down gradient of the currently operated disposal field while that field or a part of that field is loaded at design hydraulic loading rates or above.

§14-906 Alternative In-Situ Testing

(a) The Secretary will consider alternative methods of in situ effluent testing that applicant may wish to propose. The applicant shall obtain approval from the Secretary of the test procedure prior to initiating any alternative test procedures.

§14-907 Soil Extraction and Laboratory Testing

(a) An applicant may seek approval from the Secretary for a method of laboratory analysis of soil columns constructed from soil samples extracted from the disposal site. The purpose of the analysis is to measure the soils ability to remove Nitrate nitrogen and Total Dissolved Phosphorus. The results of the laboratory analysis are projected to full scale operation of the disposal field to estimate effluent renovation during actual system operation. Applicants wishing to demonstrate compliance with the in-stream water quality criteria shall obtain approval from the Secretary of the methods to be used for all sampling and analysis before starting field work on this testing method. The following requirements apply to the laboratory test:

(1) This test shall be performed using a loading rate equal to or greater than the design loading rate of the disposal system.

(2) Effluent applied to the soil columns shall be at a temperature of 40^{o} to 45^{o} F.

(3) All soil columns shall be a minimum of 8" in diameter or of equivalent area (50 square inches).

(4) The testing for each indirect discharge disposal site shall use a minimum of three separate soil columns from approved locations in the proposed disposal site, with at least one soil column per 10,000 gpd of proposed discharge. The Secretary may require more soil columns for larger sites.

(5) There shall be a minimum of three effluent samples from each soil column taken at a minimum of 24 hours apart when each column reached a steady state, as evidenced by chloride concentration in the soil column effluent. Samples shall be analyzed for all parameters listed under §14-701 Aquatic Permitting Criteria.

(6) The top three feet of each soil column may be perforated to allow for aeration of the soil.

§14-908 Modified Site Specific Compliance Method

(a) Applicability

The Modified Site Specific Compliance Method may be used to demonstrate compliance with the Aquatic Permitting Criteria for septic tank/leachfield systems with capacities of 30,000 gpd or less that discharge to streams using default values for concentrations of in-ground effluent parameters.

(b) The default concentrations for each parameter of the in-ground effluent quality listed in Table #5, Default Concentrations to Be Used in the Determination of Compliance With the Aquatic Permitting Criteria Using the Modified Site Specific Method, shall be used for this method (pH is presumed to be in compliance).

TABLE #5: DEFAULT CONCENTRATIONS TO BE USED IN THE DETERMINATION OF COMPLIANCE WITH THE AQUATIC PERMITTING CRITERIA USING THE MODIFIED SITE SPECIFIC METHOD

Parameter	**Default In-Ground Effluent Concentration (mg/L)**
Nitrate Nitrogen	60
Total Dissolved Phosphorus (TDP)	0.14

Note: Use these default in-ground concentrations in the mass balance equation (§14-912) to determine if the Aquatic Permitting Criteria have been met.

§14-909 Evaluation of Soil Renovated Effluent Data

(a) All data from site-specific testing as required in §§14-905, 14-906 or 14-907 shall be evaluated statistically to calculate the 5% exceedence value for each parameter. At the applicant's option, the highest and lowest TDP and Nitrate nitrogen concentrations may be eliminated from the calculation; this process of eliminating data shall be used only if without these two values there still are the minimum required number of data points for the calculation. Calculation of the 5% exceedence value shall be performed as follows:

(1) the data for each parameter shall be analyzed using accepted statistical methods to determine if the data are normally distributed;

(2) the data shall be subject to transformation if not normally distributed. At a minimum, the natural log and square root transformations shall be applied to the data in order to achieve a normal distribution. If repeated transformations fail to yield a normal distribution, the transformed data that appear to most closely approach a normal distribution, on the basis of skewness and kurtosis, shall be used. If the distributions are equivalent in this regard, the un-transformed data shall be used;

(3) The mean and standard deviation of the resulting data set shall be calculated and used to determine the 5% exceedence limit (5% exc) using the equation listed below:

5% Exceedence Calculation:

$$5\%\ exc = \bar{X} + (t) \times (s)$$

where:
- $\bar{X}$ = mean of the data
- n = number of data points
- t = t-value from the one-tailed student's t-distribution table for n-1 at p = 0.95 [see Table #7, page 56]
- s = standard deviation of the data

TABLE #6 PHOSPHORUS REDUCTION FACTORS

Residence Time (days)	Factor
0 to 5	1.0
6 to 10	0.90
11 to 15	0.80
16 to 20	0.75
21 or greater	0.70

(4) For disposal systems that indirectly discharge to streams, a phosphorus reduction factor based on residence time may be used, if the applicant wishes, in calculating the phosphorus exceedence value. The smallest residence time between the disposal system and the receiving stream must be determined as follows:

$$T = [(l) \times (n)] / [(K) \times (i)]$$

where: T = residence time (days)
l = shortest distance from system to stream (feet)
n = porosity
K = hydraulic conductivity (feet/day)
i = slope (feet/feet)

The appropriate factor from Table #6, Phosphorus Reduction Factors, is selected based on the calculated residence time. The phosphorus 5% exceedence value is multiplied by this factor and used in the mass balance equation listed in §14-912.

(5) The 5% exceedence value for each parameter is used with the existing in-stream receiving water quality to determine the design capacity for compliance with the permitting limits. For Total Dissolved Phosphorus, the 5% exceedence value multiplied by the phosphorus reduction factor (from Table #6 above) may be used to determine compliance with the Aquatic Permitting Criterion for Total Dissolved Phosphorus.

TABLE #7: STUDENT'S t DISTRIBUTION

for n, the number of degrees of freedom, equal to 1, 2, ..., 30, 40, 60, 120; and for F(t)=0.60, 0.75, 0.80, 0.90, and 0.95. The t-distribution is symmetrical, so that F(-t) = 1-F(t)

n F	.60	.75	.80	.90	.95
1	.325	1.000	1.376	3.078	6.314
2	.289	.816	1.061	1.886	2.920
3	.277	.765	0.978	1.638	2.353
4	.271	.741	0.941	1.533	2.132
5	.267	.727	0.920	1.476	2.015
6	.265	.718	0.906	1.440	1.943
7	.263	.711	0.896	1.415	1.895
8	.262	.706	0.889	1.397	1.860
9	.261	.703	0.883	1.383	1.833
10	.260	.700	0.879	1.372	1.812
11	.260	.697	0.876	1.363	1.796
12	.259	.695	0.873	1.356	1.782
13	.259	.694	0.870	1.350	1.771
14	.258	.692	0.868	1.345	1.761
15	.258	.691	0.866	1.341	1.753
16	.258	.690	0.865	1.337	1.746
17	.257	.689	0.863	1.333	1.740
18	.257	.688	0.862	1.330	1.734
19	.257	.688	0.861	1.328	1.729
20	.257	.687	0.860	1.325	1.725
21	.257	.686	0.859	1.323	1.721
22	.256	.686	0.858	1.321	1.717
23	.256	.685	0.858	1.319	1.714
24	.256	.685	0.857	1.318	1.711
25	.256	.684	0.856	1.316	1.708
26	.256	.684	0.856	1.315	1.706
27	.256	.684	0.855	1.314	1.703
28	.256	.683	0.855	1.313	1.701
29	.256	.683	0.854	1.311	1.699
30	.256	.683	0.854	1.310	1.697
40	.255	.681	0.851	1.303	1.684
60	.254	.679	0.848	1.296	1.671
120	.254	.677	0.845	1.289	1.658
infinity	.253	.674	0.8416	1.282	1.645

§14-910 Determining Existing In-Stream Receiving Water Quality

(a) In order to determine if a particular indirect discharge of sewage is in compliance with the Aquatic Permitting Criteria, it is necessary to establish the existing in-stream receiving water quality at the point of compliance. A statistical procedure is required so that a limited number of data points can be used to characterize the variability of water quality for determining compliance with the Aquatic Permitting Criteria. The process of determining existing in-stream receiving water quality is as follows:

(1) Quality Assurance/Quality Control (QA/QC) Plan

The in-stream receiving water quality shall be determined in accordance with a Quality Assurance/Quality Control (QA/QC) Plan submitted to and approved by the Secretary before the start of sampling. This QA/QC plan shall include, but is not limited to, the exact locations where the sampling will occur, the number and frequency of samples, the method of stream gaging, and the methods used for sample analysis.

(2) Chemical Water Quality Sampling

There are two types of release systems for indirect discharging systems recognized in these rules. In an annual release system, the amount of effluent discharged per day is not regulated by the permittee based on the time of year. In a seasonal release system, the amount of effluent discharged is regulated by the permittee based on the season (winter or summer). Such systems necessitate the ability to store effluent. For the purposes of these rules, almost all systems are considered annual release systems.

(A) Annual Release

An applicant for an indirect discharge permit using the annual release system shall collect and analyze a minimum of ten (10) in-stream receiving water samples at each point of compliance for a proposed indirect discharge in accordance with one of the two following procedures:

(i) a minimum of two (2) samples per month for the months of June, July, August, September and October. These samples may be taken during non-consecutive months (for example, October in Year 1 and June - September in Year 2); or

(ii) a minimum of eight samples taken during the months of August and September and at stream flows that are less than twice the median monthly flow, with at least two additional samples collected in any of the other three Summer months, i.e. June, July and October.

(B) Seasonal Release

In addition to the 10 samples collected for the annual release system, an applicant for an indirect discharge permit using the seasonal release system must collect and analyze an additional eight (8) in-stream receiving water samples at each point of compliance during the months of January and February and at stream flows that are less than twice the median monthly flow, with at least two (2) additional samples collected in any of the other three Winter months of November, December and March.

(C) Sampling Interval

Unless a shorter interval between consecutive samples at a particular compliance point is approved by the Secretary, there shall be a minimum of 4 days between samples. All stream samples shall be analyzed for all parameters listed under §14-701 Aquatic Permitting Criteria.

(3) Effect of Other Indirect Discharges

For indirect discharges that overlap the point of compliance of another permitted discharge that is not operating at full permitted design capacity, the applicant may be required to evaluate the impact on water quality from the their proposed indirect discharge assuming the permitted discharge was operating at full design capacity.

(4) Development Impact on In-Stream Water Quality

For indirect discharges greater than 20,000 gpd of design capacity, the Secretary may request the applicant to evaluate the impact of the proposed development served by the proposed indirect discharge on the in-stream receiving water quality. This evaluation may be required when the in-stream receiving water quality will be affected by both the development and the indirect discharge or when construction of the development will affect the ability to conduct biological sampling to demonstrate compliance with
§14-2201.

(5) Nutrient Impact Study

When the proposed location for an indirect discharge is in a reach of stream that is also affected by other direct discharges, indirect discharges, and non-point discharges, the Secretary may withhold a determination on compliance with the Aquatic Permitting Criteria permitting limits for the indirect discharge application until a nutrient impact study is conducted. When this concern is evident from the location and data, the Secretary may require the applicant to conduct a nutrient impact study and evaluate the cumulative impact of all discharges on the in-stream receiving water quality.

(9) Additional Samples

All parameters shall be evaluated with the same number of samples, as practically possible. If additional sampling is conducted in-stream after the ten (10) initial samples, the data set for all parameters must be re-evaluated using the additional sampling data along with the initial sampling data. Any additional in-stream water quality samples must be analyzed for all required in-stream parameters listed under §14-701 Aquatic Permitting Criteria..

§14-911 Evaluation of Existing In-Stream Receiving Water Quality Data

(a) The analytical data from all in-stream samples shall be used to determine the 95% confidence values about the mean for each existing in-stream receiving water quality parameter. At the applicant's option, the highest and lowest Total Dissolved Phosphorus and Nitrate nitrogen concentrations may be eliminated from the calculation; this process of eliminating data shall be used only if without these two values there still are the minimum required number of data points for the calculation. Calculation of the 95% confidence value shall be performed as follows:

(1) the data for each parameter shall be analyzed using accepted statistical methods to determine if the data are normally distributed;

(2) The data shall be subject to transformation if not normally distributed. At a minimum, the natural log and square root transformations shall be applied to the data in order to achieve a normal distribution. If repeated transformations fail to yield a normal distribution, the transformed data that appear to most closely approach a normal distribution, on the basis of skewness and kurtosis, shall be used. If the distributions are equivalent in this regard, the un-transformed data shall be used for the purposes of this section.

(3) The mean and standard deviation of the resulting data set shall be calculated and used to determine the 95 % confidence value using the equation listed below:

$$95\%\ cv = \bar{X} + [(t) \times (s) / \sqrt{n}\ ]$$

Where
$\bar{X}$ = the mean of the data
n = number of data points
t = the t-value from the one-tailed student's t-distribution table for n-1 at p = 0.95 [see Table #7, page 56]
s = the standard deviation of the data

§14-912 Determining Compliance With Aquatic Permitting Criteria

(a) To determine compliance with the Aquatic Permitting Criteria, a mass balance equation shall be used. The resulting in-stream concentration calculated with the mass balance equation must be less than or equal to the Aquatic Permitting Criterion for each parameter to demonstrate compliance. The following mass balance equation shall be used for calculating the resulting in-stream concentration:

$$\frac{[(E_c) \times (E_q) + (D_c) \times (D_q)]}{(E_q + D_q)} = \text{Resulting in-stream concentration}$$

Where: E_c = Existing in-stream receiving water concentration
E_q = Appropriate stream flow at point of compliance and for annual or seasonal release rate.
D_c = In-ground effluent concentration (5% exc), based on site specific testing.
D_q = Proposed discharge flow (i.e. maximum design capacity) .

and:

(A) the low median monthly stream flow (E_q) shall be determined for the seasonal periods of discharge;

(B) the in-ground effluent concentration (D_c) shall be determined in accordance with §14-908 or §14-909;

(C) the existing in-stream receiving water quality shall be determined in accordance with §14-911;

(D) the proposed discharge flow (gpd) for subsurface disposal systems is the maximum design capacity per day for each period of release. For a spray disposal system the design capacity is the weekly volume (in gallons) divided by seven (7) for each release period.

(b) The resulting in-stream concentration must be less than or equal to the Aquatic Permitting Criterion (APC) for demonstration of compliance for each parameter during each release period. The Secretary may establish different levels of statistical significance for each parameter, recognizing that there are different levels of confidence for various testing methods (i.e., detection limits, numbers of samples analyzed). If the resulting calculated in-stream concentrations using these other levels of statistical significance are less than or equal to the APC then compliance with that Criterion has been demonstrated.

(c) If the existing in-stream receiving stream quality, as determined in accordance with §14-911, is higher in concentration than the Aquatic Permitting Criterion, the resulting in-stream concentration as calculated above must be less than or equal to the in-stream receiving stream quality to demonstrate compliance.

§14-913 Pre-Discharge Biological Water Quality Sampling

(a) An applicant for a *New Indirect Discharge of Sewage* with a design capacity greater than 20,000 gallons per day shall conduct an aquatic biota sampling program at an approved location upstream and at all points of compliance during the months of August and/or September using methods established by the Secretary. The results of the sampling program shall be submitted as part of an application for a *New Indirect Discharge of Sewage*. The Secretary may waive this pre-discharge requirement if the Secretary finds that the ratio of the proposed indirect discharge to the low median monthly flow of the receiving stream is so small as to render the probability of the indirect discharge affecting the stream chemistry unlikely.

(b) If a Significant Alteration of the Aquatic Biota is detected during this pre-discharge testing, the Secretary may require the applicant to perform additional stream testing.

§14-914 Alternative Demonstration

(a) Using the following procedures, an applicant may attempt to demonstrate that the receiving stream for an indirect discharge can assimilate a nutrient mass loading higher than would otherwise be authorized by presumptive criteria of these Rules without violating the Water Quality Criteria of the Water Quality Standards and the requirements of 10 V.S.A. Chapter 47 §1259(e).

(b) The following pre-conditions must be met:

(1) Before an applicant may submit an application for Alternative Demonstration they must have successfully completed a capacity application as per §14-402, and must have received a Capacity Determination letter from the Secretary.

(2) In support of an application for Alternative Demonstration the applicant must submit all information for review and approval to demonstrate that the proposed indirect discharge is limited by the Aquatic Permitting Criteria set forth in these Rules.

(3) The applicant must also demonstrate that there is sufficient hydrogeologic capacity for the design capacity proposed in the application for an Alternative Demonstration and that the proposed indirect discharge disposal system can comply with all requirements of the Reliability Permitting Criteria and the Additional Public Health Permitting Criteria (§§14-702 and 14-703).

(4) Applicants are encouraged to propose an Alternative Demonstrations based on an annual or a seasonal release method. Before approval the Secretary must determine that the Alternative Demonstration shall cause the least possible adverse impact to the condition of the waters necessary to achieve the purposes of the study.

(c) Application For Alternative Demonstration

There are three components of the application for an Alternative Demonstration:

(1) joint site visit(s) with representatives of the Secretary to establish site eligibility:

(A) The receiving stream must have the characteristics of a lower order stream where a riffle/pool sequence dominates. The stream must allow for a paired station analysis whereby station locations are independent of other external influences (e.g. non-point source runoff, shading differences, other discharges, etc.).

(B) Site eligibility shall be determined by joint site visit(s) with representatives of the Secretary and the applicant or his/her representatives. The Secretary's decision on site eligibility shall be final. Any site determined to be ineligible for the paired station (spatial) analysis may be reviewed under a temporal analysis proposal if the Secretary approves.

(2) Quality Assurance/Quality Control (QA/QC) plan for pre-Alternative Demonstration surveys:

(A) Upon determination of site eligibility for a paired station analysis, a QA/QC plan for the physical, chemical, and biological surveys of the receiving stream shall be submitted by the applicant and approved by the Secretary prior to the commencement of any survey work. The QA/QC plan shall include, but not be limited to, the following:

(i) physical survey and description of the receiving stream extending from the location of proposed control stations to downstream reaches. The physical survey will involve a hydrologic study of the trunk stream and tributaries. This study will determine the areas of the stream at risk to significant alteration during the Alternative Demonstration. The survey will extend to the point where sufficient natural stream flow dilution occurs such that any added nutrients are reduced to concentrations that would be equivalent to those of the presumptive criteria. This point will be considered the boundary of the reach of the stream at risk.

(ii) detailed contour map showing significant land uses, natural areas, and receiving stream riparian ownership downstream to the boundary of the reach of the stream at risk. No Alternative Demonstrations will be authorized that would adversely impact designated outstanding resource waters. The Vermont Department of Forest and Parks Heritage Program will also be given the opportunity to provide pertinent information to the applicant regarding special habitats and species in and around the receiving stream.

(iii) chemical survey of the stream for all nutrient and parameters including, but not limited to, Total and Dissolved Phosphorus, nitrate, calcium, sulfur, sulfides, silicates, alkalinity, pH, sodium, potassium, magnesium, manganese, iron, aluminum, boron, zinc, copper, cobalt, molybdenum, vanadium, proteins, carbohydrates, fats, oils, greases, surfactants, total and dissolved organic carbon, and any other constituents that may be important to the growth of algae. Frequency of sampling for the parameters listed above shall be determined on a case by case basis.

(iv) a one year, seasonal survey that shall include an in-stream habitat evaluation, documentation of substrate types, stream bank vegetation/canopy, and a biological assessment of the stream using methods approved by the Secretary to determine seasonal macroinvertebrate community assemblages and document the frequency of occurrence of algal species in the receiving stream. A photographic survey of stream bottom conditions must be conducted with the biological sampling. A fisheries assessment using protocols established by the Secretary must also be conducted during the summer/fall months.

(3) Quality Assurance/Quality Control Plan for the Alternative Demonstration Using Paired Station Analysis must contain the following components:

(A) The Alternative Demonstration period shall extend for a minimum period of 18 months that must include two summer periods (June - October). Additional testing may be required if it is determined that the Alternative Demonstration was conducted during years of excessive stream flow (wet years) and/or that stream flows during the critical months of August and September were not within specified tolerances. The criteria for determining what constitutes a wet year and the tolerances for median August and September stream flows will be established by the Secretary prior to the initiation of the Alternative Demonstration using existing stream gage station data applicable to the geographic area where the Alternative Demonstration will be conducted. During the AlternativeDemonstration period, the applicant shall simulate nutrient loading to the stream at rates equivalent to loading of the proposed disposal system at design flows.

(B) The type and efficacy of the synthetic effluent solution to be discharged during the Alternative Demonstration must be documented by a literature review. The solution must contain all micronutrients necessary for algal growth that are present in sewage effluent. Sewage effluent cannot be used as a nutrient source. The ratios of nutrients in renovated effluent, as determined during the site capacity analysis, must be maintained in the synthetic solution and adjusted seasonally.

(C) The Alternative Demonstration shall use mass loading of nutrient to the stream at rates equivalent to the mass loading of the proposed sewage treatment and disposal system at design flows. No nutrient mass loading rates will be allowed in a Alternative Demonstration that would result in exceedences of the associated toxic parameters beyond the permitting limits at the appropriate 7Q10 stream flow.

(D) An annual or seasonal release method may be used during an Alternative Demonstration. Regardless of the release method, the synthetic effluent solution must be discharged to the stream at a uniform rate throughout the course of the Alternative Demonstration and the discharge rate must be specified in advance.

(E) The number and locations of sampling stations will be determined on a case-by-case basis (in conjunction with representatives of the Secretary).

(F) During the pre-Alternative Demonstration period, the applicant shall install weirs, gages, or other U.S. Geological Survey approved flow measurement devices on the receiving stream at locations approved by the Secretary. The applicant shall develop rating tables from stage-discharge relation curves (water stage recorders) or recognized flow measurement equations (weirs). The flow measurement device must be operational year-round and available for inspection by representatives of the Secretary.

(G) The synthetic effluent shall be sampled and analyzed for the chemical parameters listed in (c)(2)(A)(iii) whenever a new batch of synthetic effluent is made.

(H) Parameters that are considered to be critical to the Alternative Demonstration shall be monitored in-stream on a weekly basis. These shall include Total Dissolved Phosphorus, nitrates, total iron, total manganese, dissolved and total organic carbon. Other parameters including, but not limited to, essential micronutrients shall be monitored on a bi-weekly basis.

(I) Biological monitoring using methods approved by the Secretary to determine the macroinvertebrate community assemblages, and increases in periphytic chlorophyll accumulation must be conducted throughout the Alternative Demonstration period. For annual and seasonal release systems, four (4) macroinvertebrate assessments per year will be required (for a total of 8 assessments for the Alternative Demonstration period). Each assessment period will be of six weeks duration. The assessment of periphytic chlorophyll accumulation shall be conducted using methods established by the Secretary.

(J) The following biological measurements shall be established during each assessment period:

(i) Periphytic Chlorophyll Accumulation
(ii) The Pinkham-Pearson Coefficient of Similarity
(iii) The Biotic Index
(iv) The Ephemeroptera-Plecoptera-Trichoptera Taxa Richness
(v) Relative Abundance (Density)

(K) If climatological or other factors result in the failure on the applicant's part to obtain biological data for any assessment period, the Alternative Demonstration period may be prolonged such that eight (8) complete biological assessments are obtained.

(L) The applicant shall submit monthly reports during the course of the Alternative Demonstration period. All chemical results must be submitted within two months of sample collection; all biological monitoring results shall be submitted within four months of macroinvertebrate basket retrieval.

(M) A complete listing of personnel responsible for conducting the Alternative Demonstration shall be included. All biological monitoring must be conducted by a qualified aquatic biologist or under the direct supervision of a qualified aquatic biologist.

(N) A list of all equipment and methods to be employed to insure that the mass nutrient loading of the stream is maintained throughout the Alternative Demonstration period must be provided.

(d) Approval, Review, and Permitting Process

(A) Following technical approval of the Alternative Demonstration QA/QC plan but before allowing the Alternative Demonstration to proceed, the Secretary shall hold a public informational meeting to inform the public of the proposed Alternative Demonstration and to receive public comment of the proposal. The Secretary will address all comments received in making a final determination on the Alternative Demonstration proposal.

(B) Decision on Application

Following submittal of the complete application, and the public information meeting, the Secretary either approves, modifies, or denies the proposed Alternative Demonstration. The Alternative Demonstration shall be approved unless, in the opinion of the Secretary, it will cause an undue adverse effect on any beneficial value or use of the receiving stream, as defined by Water Quality Standards, or cause irreversible damage to the receiving stream. If the Secretary determines that the proposed mass nutrient loading may cause irreversible damage to the receiving stream, the Secretary may authorize the Alternative Demonstration at a lower loading rate than that requested by the applicant.

(C) Authorization for Alternative Demonstration

Authorization for the Alternative Demonstration shall be in the form of a written authorization from the Secretary that outlines the terms and conditions of the Alternative Demonstration. A copy of the written authorization shall be posted in the office of the town clerk in the town where the Alternative Demonstration is to take place.

(D) Interpretation of Results

(1) The applicant must be prepared to demonstrate that the experimental basis for the Alternative Demonstration has been maintained throughout the Alternative Demonstration period. Failure to maintain mass nutrient loading at the proposed levels, or failure to adequately monitor and report on the progress of the Alternative Demonstration, shall be considered grounds for technical failure of the Alternative Demonstration. Depending upon the severity of the technical failure, the Secretary may either require that the Alternative Demonstration be terminated, or require that the Alternative Demonstration period be extended to provide the required monitoring data.

(2) For the purpose of determining whether or not the mass loading of nutrients is being maintained at the proper levels, the Secretary may use in-stream concentrations of nutrient parameters, the available stream gage data, and the discharge rate of the synthetic effluent solution to calculate mass loading. Mass loading within 20% of design loading will be considered acceptable. Failure to maintain acceptable mass loadings on any five (5) occasions will constitute failure of the technical criteria.

(3) The results of the assessment of the aquatic biota shall be evaluated in accordance with §§14-2201, 14-2202. If, during any one Periphytic Chlorophyll Assessment or Macroinvertebrate Assessment, the Secretary makes the finding that a Significant Alteration of Aquatic Biota (SAAB) has occurred, the Alternative Demonstration will be judged a failure and no increase in in-stream nutrient loading above presumptive rates will be granted. However, the applicant may re-apply to conduct an Alternative Demonstration at a reduced nutrient loading after the stream has recovered.

(E) The draft indirect discharge permit circulated for public comment following a successful Alternative Demonstration shall be based on either the annual or seasonal release method used during the Alternative Demonstration. The design capacity will be determined using the mass nutrient loading rate used during the Alternative Demonstration.

(f) Alternative Demonstration Based on Temporal Analytical Process

Upon the Secretary's determination that the paired station analysis is not applicable to a particular stream location, the applicant may request that he/she be allowed to conduct an Alternative Demonstration utilizing a temporal analytical process, i.e. looking at one location over time. While the outline of study would be similar to that proposed for the paired station approach, four (4) years of background chemical and biological monitoring would be required, at a minimum, for an estimation of temporal variation at a specific stream location. Biological data collected during the course of the 18 month Alternative Demonstration would be judged against the background data for determination of Significant Alteration of Aquatic Biota. All such proposed Alternative Demonstrations must be developed by the applicant in conjunction with the Secretary.

(g) Alternative Demonstrations For Discharges To Lentic Environments

The Secretary will not approve Alternative Demonstrations conducted on lakes, ponds or wetlands or to tributaries of lakes, ponds or wetlands within one mile of these water bodies unless the applicant can produce clear and convincing evidence during pre-Alternative Demonstration survey work that the nutrients discharged will exert their impact on the tributary in question and not the lentic environment.

Subchapter 10 - Technical Design Standards

§14-1001 Guidelines

(a) The following are guidelines for use in the design of systems subject to the Indirect Discharge Rules. Professional Engineers are encouraged to use equally or more effective technologies or practices in the design of systems under these guidelines. When proposing an alternative design, the engineer shall state the basis of design and provide evidence to substantiate its reliability. The engineer may also propose materials other than those specified here for acceptance by the Secretary.

§14-1002 Building Sewers

(a) Definition

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 sewer collection systems.

(b) 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 polyvinyl chloride (PVC) gravity sewer pipe, solvent-weld-jointed acrylonitrile-butadiene-styrene (ABS) solid wall sewer service pipe, or cast iron (CI) sewer service pipe. Other materials may be proposed to the Secretary for approval.

(c) Sizing and Slope

Building sewers shall be sized based on procedures outlined under §14-1003(c). Minimum building sewer size is 4 inches and minimum slope is 1/4 inch per foot.

(d) Connection With Manholes

Building sewers discharging to a collection sewer shall be connected through a manhole constructed in accordance with §14-1003(k) or with a wye fitting to direct flow and minimize in-line turbulence. The junction of more than two individual building sewers shall be made with a manhole.

(e) 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.

(f) Leakage Testing

Building sewers shall meet the leakage standards prescribed in §14-1003(j).

(g) Sewage Pumps

Sewage pumps shall not be located inside buildings other than wastewater treatment facilities or buildings constructed as pump stations.

§14-1003 Sewage Collection Systems

(a) Definition

A sewer collection system is that system of sewers that transport wastewater from building sewers to the wastewater treatment/disposal system.

(b) Restrictions

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) Sizing

Building and collection sewers carrying raw sewage 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 daily flows for the facilities connected times the following factors:

(A) for design flows less than 10,000 gpd, a factor of 5;

(B) For design flows over 10,000 gpd, a factor derived from the Table #8, Peaking Factors, listed below:

TABLE # 8 PEAKING FACTORS

Design Flow (gpd)	Peaking Factor
10,000	4.2
100,000	3.8
500,000	3.2
1,000,000	3.0

(3) 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 formula and friction coefficients appropriate for the pipe materials proposed, considering surface deterioration over the expected useful life of the pipe.

Kutter's Formula

$$V = \frac{\frac{1.81}{n} + 41.67 + \frac{0.0028}{S_e}}{1 + n/R + 41.67 + \frac{0.0028}{S_e}} \quad (R \times S_e)$$

V is the mean velocity of flow
R is the hydraulic radius
S_e is the slope of energy grade line
n is the coefficient of roughness

(d) Burial 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. Where the designer cannot maintain these burial depths without significant expense, the engineer may propose a lesser depth of cover to the Secretary for approval with mitigating measures to protect the sewer.

(e) Slope Velocity

All sewers shall be designed and constructed to provide a minimum velocity, 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 not less than the slopes shown in Table #9, Minimum Slopes for Sewers. The following criteria shall also apply:

(1) Sewers shall be laid with uniform slope and straight alignment between manholes.

(2) Where velocities greater than 15 feet per second are attained, special provisions shall be made to protect against displacement by erosion and shock.

(3) Sewers on 20 percent slopes or greater shall be anchored securely with concrete anchors or equal, spaced as follows:

(A) not over 36 feet center to center on grades 20 percent and up to 35 percent;

(B) not over 24 feet center to center on grades 35 percent and up to 50 percent; and

(C) not over 16 feet center to center on grades 50 percent and over.

TABLE #9 MINIMUM SLOPES FOR SEWERS

Pipe Size (inches)	Slope Required (feet/100feet)
6	0.60
8	0.40
10	0.28
12	0.22
15	0.15

(f) Changes in Pipe Size

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. Extensions of the sewer collection system should be designed for projected flows even when the diameter of the receipt sewer is less than the diameter of the proposed extension. The Secretary may require a schedule for future downstream sewer relief.

(g) Materials

Generally, rubber-ring-jointed PVC, or ductile iron (DI) gravity sewer pipe of the proper class is acceptable. Other materials may be approved by the Secretary. The following criteria also apply:

(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 that consider the width and depth of trench. Where necessary, to withstand extraordinary superimposed loading, special bedding, concrete cradle or special construction may be used.

(h) 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).

(i) Bedding

(1) Bedding classes A, B, or C, as described in American Society for Testing and Materials (ASTM) C12-02 shall be used for all rigid pipe provided the proper strength pipe is used with the specific bedding to support the anticipated load.

(2) Bedding classes I, II, or III, as described in ASTM D2321-00 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.

(j) Leakage Testing

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: The following procedure takes into account the leakage from one manhole in the test section:

(A) Plug or cap all service laterals, stubs, and fittings. Place adequate bracing to withstand thrust forces.

(B) Insert a tapped plumber's plug 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, when connected to the sewer, must be two feet higher than any point in the sewer or two feet higher than the highest known groundwater table, whichever is higher. A manhole may be used as a stand pipe, providing the top of the manhole is more than 2 feet above the surrounding groundwater level. Otherwise the groundwater level shall be lowered.

(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 or to the top of the manhole cone section.

(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 referenced 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 - If the sections of gravity sewerline are tested for leakage using a low pressure air test, the manholes will need to be individually tested for leakage. The following procedure is used:

(A) Determine the test time for the section of line to be tested using Table #10, Minimum Test Times for Various Pipe Sizes, or the formulas listed under Formulas and Allowable Air Loss Standards.

(B) Plug all openings in the test section.

(C) Add air until the internal pressure of the line is raised to approximately 4.0 pounds/square inch (psi) greater that the average pressure of any groundwater above the pipe. 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.

(D) When the pressure has stabilized and is at or above the starting test pressure of 3.5 psi greater than the average pressure of groundwater 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.

(E) Test Time Determination

(i) Table #10, Minimum Test Times for Various Pipe Sizes, 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 #10 has been established using the formulas listed under Formulas and Allowable Air Loss Standards.

(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 #10 MINIMUM TEST TIMES FOR VARIOUS PIPE SIZES

Nominal Pipe Size (inches)	Time (minutes/ 100 feet)	Nominal Pipe Size (inches)	Time (minutes/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

FORMULAS AND ALLOWABLE AIR LOSS STANDARDS

Calculate the required test time at a given allowable air loss as follows:

$$T = K \times \frac{D^2L}{Q}$$

Calculate air loss with a timed pressure drop as follows:

$$Q = K \times \frac{D^2L}{T}$$

Symbols:
D = nominal size , inches
K = 0.371×10^{-3} for inch-pound units
K = 0.534×10^{-6} for S.I. units
L = Length of line of one pipe size, feet
Q = air loss, ft^3/minute
T = time (in minutes) for pressure to drop 1.0 psi

An appropriate allowable air loss, Q, in cubic feet per minute, has been established for each nominal pipe size. Based on field experience, the Qs that have been selected will enable detection of any significant leak. Table #11 lists the Allowable Air Loss (Q) established for each pipe size.

TABLE #11 ALLOWABLE AIR LOSS (Q) FOR VARIOUS PIPE SIZES

Nominal Pipe Size (inches)	Q (cubic feet/min)	Nominal Pipe Size (inches)	Q (cubic feet/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 Standard C828-01.			

(k) 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.

(2) Drop Type

(A) 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.

(B) 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 30 inches shall be provided to allow for the equipment required for confined space access.

(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) Materials

Manholes shall be of the pre-cast concrete or poured-in-place concrete type. Manholes shall be waterproofed on the exterior. Rungs or steps shall be provided on the interior of each manhole to enable the structure to be easily and safely accessed.

(6) Connections

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) Covers

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 locations where vandalism may be a problem.

(8) Leakage Testing

All manholes shall be tested for leakage. Leakage testing of gravity sewers utilizing the water testing procedure takes into account the leakage from one manhole in the section. Otherwise, manholes shall be tested for leakage in accordance with one of the following procedures:

(A) Hydrostatic Test Procedure

(i) After the manhole has been assembled in place, all lifting holes and exterior joints shall be filled and pointed with an approved non-shrinking mortar. All pipes and other openings into the manhole shall be suitably plugged and the plugs placed to prevent blowout. The top of the manhole shall be more than 2 feet above the surrounding groundwater level or the groundwater level shall be lowered.

(ii) Each manhole shall be checked for infiltration 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.

(B) Vacuum Test Procedure

This method of testing manholes for leakage involves the use of a device for sealing the top of the manhole cone section and pumping the air out of the manhole, creating a vacuum and holding this vacuum for a prescribed period of time. The procedure for this test is as follows:

(i) All lifting holes 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.

(ii) All pipes and other openings into the manhole shall be suitably plugged in a manner to prevent displacement.

(iii) 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 pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

(iv) 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 air shall then be stopped and the test time begun.

(v) The vacuum must not drop to below 9 inches of mercury within a 2 minute test period. If more than 1 inch drop in vacuum occurs within the 2 minute test period, the manhole has failed the test and shall be repaired or reconstructed, and retested.

(vi) Following satisfactory test results, the manhole may be backfilled.

(l) Location of Sewers at Stream Crossings

(1) Subsurface crossings shall be constructed such that the top of all sewers entering or crossing streams are 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:

(A) One foot of cover is required where the sewer is located in rock;

(B) Three feet of cover is required in other material. In major streams, more than three feet of cover may be required; and

(C) In paved stream channels, the top of the sewer line should be placed below the bottom of the channel pavement.

(D) Sewers 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) 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 crushed stone, coarse aggregate, washed gravel, or other materials that will not cause siltation

(2) Sewers located alongside 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.

(A) 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.

(3) Aerial Crossings

(A) Support shall be provided for all joints in pipes used for aerial crossings. The supports shall be designed to prevent frost heave, overturning and settlement.

(B) Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above-ground and below-ground sewers.

(C) For aerial stream crossings, the impact of flood waters and debris shall be considered. The bottom of the pipe should be placed no lower than the elevation of the fifty (50) year flood.

(m) Water Line Separation

(1) 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 impractical, 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.

(2) Vertical Separation at 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 or impractical to maintain the 18" vertical separation or where the sewer must be laid above the water main, the following criteria apply:

(A) 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;

(B) 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;

(C) 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;

(D) Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to prevent damage to the water main.

§14-1004 Sewage Lift Stations

(a) Location

All sewage lift stations shall be located outside of buildings, except at wastewater treatment facilities and buildings constructed as pump stations.

(b) 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.

(c) Equipment Removal

Provision shall be made to facilitate removal of pumps, motors, and other mechanical and electrical equipment.

(d) Pump Removal Without De-watering

Submersible pumps shall be readily removable and replacement easily possible without de-watering the wet well or disconnecting any piping in the wet well.

(e) Construction

Submersible pumps shall be designed specifically for raw sewage use, including totally submerged operation during a portion of each pumping cycle.

(f) Number of 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 or shall contain other pumping arrangements considered sufficient by the Secretary to provide reliability.

(g) Pump Operations

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 satisfactory to handle the particular wastewater to be pumped. Potable water pumps are generally not acceptable for pumping wastewater, except for highly treated effluent.

(h) Pump Priming

Generally, the pump shall be so placed that under normal operating conditions, it will operate under a positive suction head.

(i) Electrical Equipment

Electrical systems and components (e.g., motors, lights, cables, conduits, switch boxes, 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 [R], 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 a 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 Manufacturer’s 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." The address for NEMA is listed in §14-2301(g) at the end of these rules.

(j) Pump Intake

(1) Each pump should have an individual intake. Wet well design should avoid turbulence near the intake. Intake piping should be as straight and short as possible.

(2) Where turned-down bell mouth inlets or submersible pumps are used, the bottom of the inlets should be placed a sufficient distance above the wet well floor to assure inlet velocities sufficient to prevent solids deposition.

(k) 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 minimum pumping rate shall be 5 times the average design flow.

(3) For average design flows greater than 10,000 gallons per day, the minimum pumping rate shall be determined by multiplying the average design flow by the appropriate peaking factor from Table #8, Peaking Factors, page 71.

(l) Pump Controls

(1) Location

The pump control system shall be located away from the turbulence of incoming flow and pump suction.

(2) Settings

The '2nd pump-on' level and 'alarm-on' level shall be at the same elevation.

(m) 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 valves 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 of Valves

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 soil or the wet well. If the pit is drained to the wet well, an effective method of preventing sewage from entering the pit during surcharged wet well conditions shall be provided. If the pit is drained to the soil, three feet of vertical separation shall be provided between the bottom elevation of the receiving device and the seasonal high groundwater level.

(n) Wet Wells

(1) Sizing

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 design flow. For raw sewage lift stations receiving less than 20,000 gallons per day, the retention time in the wet well should not be more than 30 minutes at average design flow. These requirements do not apply for lift stations handling only settled wastewater.

(2) Emergency Storage or Power

(A) 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 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.

(B) 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.

(C) Emergency storage will be a minimum of one day for all lift stations with a single pump.

(3) 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.

(4) 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.

(5) Leakage Testing

Upon completion of installation all tankage, including wet wells and storage tanks, shall be tested with clean water to demonstrate that the structures are watertight. The testing shall be conducted before the tankage and structures are backfilled. The test shall be conducted by completely filling the tankage to the top of the structures and providing a hydrostatic head of at least two feet above the surrounding groundwater level at the time of testing. The test shall be at least 24 hours, with no leakage resulting. If any leakage occurs during the test period the tanks shall be repaired and retested. At the Secretary's discretion, leakage testing may be required for a period longer than 24 hours.

(o) 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.

§14-1005 Force Mains

(a) Minimum Hydraulic Velocity

The force main shall be sized to maintain a minimum hydraulic velocity of 2 feet per second under normal operating conditions. The minimum force main size shall be 1 1/2 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. In situations where the force main terminates at an elevation lower than the pumping station, a combination air release/vacuum release valve shall be installed at high points to protect the pumps and to prevent the remaining contents in the wet well from being siphoned out at the end of the pump cycle.

(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 (below) 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:

$$v = 1.32 \times C \times R^{0.63} \times S^{0.54}$$

where: 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.

(g) Pressure Testing

Upon completion of construction of a force main, the line shall be pressure and leakage tested in accordance with the following procedure:

After the pipe has been laid, 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.

(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 (two) hour duration;

(D) not vary by more than $\pm$ 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.

(A) 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 the elevation of the test gauge, shall be applied by means of a pump connected to the pipe.

(B) Before the specified test pressure is applied, air shall be expelled completely from the pipe valves.

(C) 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 during or following the pressure test shall be repaired or replaced with sound material and the test shall be repeated.

(h) Leakage Testing

A leakage test shall be conducted concurrently with the pressure test as follows:

(1) 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 with water.

(2) No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{N \times D \times (P^{0.5})}{7400}$$

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 gage.

§14-1006 Gravity Effluent Sewer Lines

(a) All gravity effluent sewer lines shall meet the following minimum requirements:

(1) have a minimum pipe size of 4 inches;

(2) have the same grade as raw sewage lines, one-quarter inch per one foot;

(3) have manholes provided at all changes in horizontal and vertical direction and at all intersections; and

(4) distances between manholes may be increased to 600 feet, providing cleanouts are provided at distances not greater than 300 feet.

§14-1007 Sewage Treatment Facilities - Design Standards

(a) All indirect discharges of sewage which involve treatment prior to disposal by means other than septic tanks shall be designed in accordance with Great Lakes-Upper Mississippi Board of State Public Health and Environmental Managers Recommended Standards for Wastewater Facilities (1997 edition) and the New England Interstate Water Pollution Control Commission Guides for Design of Wastewater Treatment Works TR-16, 1998 Edition, or additional design criteria established by the Secretary and listed below. When there are differing standards the more conservative standards shall apply. Table #12 lists the minimum sewage treatment requirement based on design capacity and disposal method. Table #13 lists the effluent limitations to be included in permits for each treatment level.

TABLE #12: MINIMUM SEWAGE TREATMENT REQUIREMENTS BASED ON DESIGN CAPACITY AND DISPOSAL METHOD

Design Capacity (gallons per day)	Disposal Method	Minimum Treatment Level Required
6,500 - 30,000	Leachfield	Primary (Septic tank)
30,001 - 50,000	Leachfield	Secondary + [(1)]
50,001 and greater	Leachfield	Tertiary
6,500 and greater	Sprayfield	Secondary

[(1)] Secondary 'plus' treatment level from recirculating sand / textile filters. See Table #13.

TABLE #13: EFFLUENT LIMITATIONS FOR EACH TREATMENT LEVEL

	Effluent Limitation (in mg/L) by Treatment Level			
Parameter	**Septic Tank**	**Secondary**	**Secondary + [(1)]**	**Tertiary**
Biochemical Oxygen Demand (5-Day)	**N/A**	**30 [(2)]**	**15 [(3)]**	**10 [(4)]**
Total Suspended Solids	**N/A**	**30 [(2)]**	**15 [(3)]**	**10 [(4)]**
Total Dissolved Phosphorus	**N/A**	**N/A**	**N/A**	**0.5 [(5)]**
Total Kjeldahl Nitrogen	**N/A**	**N/A**	**N/A**	**5 [(6)]**
Ammonia (as N)	**N/A**	**N/A**	**N/A**	**1 [(7)]**
Nitrate nitrogen	**N/A**	**N/A**	**N/A**	**5 [(8)]**
Total Nitrogen (as N)	**N/A**	**N/A**	**N/A**	**N/A**

(1) Secondary 'plus' treatment level from recirculating sand/textile filters.
(2) Daily maximum.
(3) Monthly average.
(4) Monthly average; daily maximum is 18 mg/L
(5) Monthly average; daily maximum is 1.0 mg/L
(6) Monthly average; daily maximum is 10 mg/L
(7) Monthly average; daily maximum is 2.0 mg/L
(8) Monthly average; daily maximum is 10 mg/L

§14-1008 Septic Tanks

(a) Materials

Septic tanks shall be watertight, structurally sound, and constructed of materials not subject to extensive corrosion or decay. Reinforced concrete and fiberglass are considered the normal construction materials. 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 which relates to structural testing of the tank.

(b) Sizing

Septic tanks shall be sized based on Table #14.

TABLE #14: SEPTIC TANK SIZING BASED ON DESIGN FLOW

Design Flow (gallons per day)	Required Septic Tank Capacity (gallons)
Less than 750	1000
750 - 6,500	1.5 times the design flow
Greater than 6500	0.75 times the design flow + 1,125
Where garbage grinders or disposals are proposed, the septic tank capacity shall be increased by a factor of 25 percent to provide additional storage for the expected increase in solids.	

(c) Additional Specifications

(1) Multiple Tanks

When more than one septic tank is used in series the first tank shall be a minimum of 66% of the required septic tank capacity. The installation of septic tanks in parallel on a single building sewer or as part of a community sewage treatment and disposal system is not acceptable. Properly sized septic tanks installed on parallel building sewers are acceptable.

(2) Pumping to Septic Tanks

Pumping of sewage to septic tanks without provisions for energy dissipation is not acceptable because this will reduce the size of the solids being received at the tanks and will cause surging through the tanks, both of which reduce the effectiveness of the tanks.

(3) Dimensions

(A) Adequate tank capacity is required above the liquid tank level to provide for that portion of the scum which 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 above the liquid line is required to permit free passage of gas back to the inlet and house vent pipe.

(B) 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.

(4) Siting

Septic tanks shall be located to meet the minimum isolation distances listed in Table #21, Isolation Distances. Septic tanks shall also be located to facilitate removal of sludge and scum by scavenger vehicles.

(5) 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 of at least 16 inches in diameter. Each tank shall have one manhole access to grade. Covers should be tight fitting and exposed covers should be designed to prevent entry by children.

(6) 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.

(7) 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 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.

(8) Effluent Filter

The most downstream community septic tank in series shall be equipped with a properly sized septic tank effluent filter.

(d) Installation and Leakage Testing

Upon completion of installation all tankage shall be tested with clean water to demonstrate that the structures are watertight. The testing shall be conducted, before the tankage and structures are backfilled, by completely filling the tankage to the top of the structures and providing a hydrostatic head of at least two feet above the level of the surrounding groundwater at the time of testing. The test shall be at least 24 hours, with no leakage resulting. If any leakage occurs during the test period the tanks shall be repaired and retested. At the Secretary's discretion, a leakage test may be required for a period longer than 24 hours.

§14-1009 Grease Interceptors

(a) When Required

An approved grease interceptor shall be installed in the waste line from sinks, drains, and other fixtures or equipment in restaurants, cafeterias, bars and clubs, hotel, factory or school kitchens, or other establishments where grease introduced into the drainage system would be of particular concern.

(b) Location

Each grease interceptor shall be located outside buildings and connected to the wastewater system at a location prior to the septic tank. Each grease interceptor shall be so installed and connected that it is, at all times, easily accessible for inspection, cleaning and removal of the intercepted grease.

(c) Sizing

For the purpose of the section, the term fixture shall include each plumbing fixture, appliance, apparatus or other equipment required to be connected to a grease interceptor.

TABLE #15: GREASE INTERCEPTOR CAPACITY BASED ON NUMBER OF CONNECTED FIXTURES AND REQUIRED FLOW RATES

Total Number of Fixtures Connected	Maximum Capacity of Fixtures Connected (gallons)	Required Flow Rate (gallons per minute)	Grease Retention Capacity (pounds)
1	50	20	40
2	65	25	50
3	90	35	70
4	125	50	100

Each grease interceptor shall have a minimum capacity of 125 gallons plus 2.5 gallons of capacity for each seat in a restaurant, dining hall, or cafeteria or a minimum capacity as calculated by the above table, whichever is greater.

(d) Construction

Each grease interceptor shall be constructed of durable materials and shall have a full size gas-tight cover which can be easily and readily removed. Each grease interceptor shall be vented and each fixture discharging into a grease interceptor shall be individually trapped and vented in an approved manner.

§14-1010 Sand Filters: Intermittent and Recirculating

(a) General Requirements

Sand filters are intended for use following septic tanks. For a reduction in the disposal area required, an intermittent sand filter effluent quality must meet secondary effluent standards, with no more than 30 mg/L biochemical oxygen demand (BOD5) and no more than 30 mg/L total suspended solids (TSS). For recirculating sand filters, the effluent standards are no more than 15 mg/L biochemical oxygen demand (BOD5) and no more than 15 mg/L total suspended solids (TSS) for a reduction in the disposal area required.

(b) Container Design & Construction

(1) The filter container shall be watertight to prevent groundwater from infiltrating into the filter and to prevent effluent exfiltration from the filter.

(2) Reinforced concrete shall be used, unless other materials having equivalent function, workmanship, water-tightness and at least a twenty (20) year service life can be documented. Flexible membrane liner materials may be used provided they comply with the following requirements:

(A) Flexible membrane liner materials must have properties that are at least equivalent to thirty (30) mil un-reinforced polyvinyl chloride. To be approved for installation, flexible membrane liner materials must:

(i) have field repair instructions and material that are provided to the purchaser with the liner;

(ii) 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

(iii) be compatible with the wastewater being treated.

(B) All tanks associated with a sand filter system, 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 30 inches in diameter, unless another design is approved by the Secretary.

(C) Leakage testing of the container components including septic tanks, pump chambers, recirculation tanks and filter containers is required. Leakage testing of all container components shall be conducted as required by §14-1012(h).

(c) Siting Requirements

(1) Filter Location

(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 must maintain the isolation distances for septic tanks listed in Table #21, Isolation Distances, (pp. 131-132).

(d) Filtrate Disposal Systems

(1) Filtrate disposal systems shall be designed to hydraulically transmit the filtrate away from the filtrate disposal system. Except for criteria specifically addressed below, the criteria described within these rules for each specific disposal system type must be followed.

(2) Design

(A) All types of disposal systems listed in Subchapter 14, Design and Construction of Conventional Leachfields, and Subchapter 15, Design and Construction of Mound Disposal Fields, are acceptable as filtrate disposal systems for sand filter effluent.

(B) The following requirements apply to all sand filtrate disposal systems:

(i) There shall be a minimum of three (3) feet of naturally occurring soils between the bottom elevation of the filtrate disposal system and the highest elevation of the limiting soil conditions (two (2) feet for mound filtrate disposal systems).

(ii) A linear loading rate of no more than 4.5 gallons per linear foot of filtrate disposal system is to be used unless the site specific hydrogeologic analysis performed indicates that a higher linear loading rate may be used.

(iii) Loading rates are limited to no more than two times the allowable rate as determined under §14-1302 for intermittent sand filters and three times the allowable rate for recirculating sand filters. However, if the intermittent sand filter can achieve effluent standards of no more than 15 mg/L biochemical oxygen demand (BOD5) and no more than 15 mg/L total suspended solids (TSS) the disposal field can be loaded at three times the allowable rate.

(C) If hydrogeologic analysis is conducted it shall demonstrate that:

(i) An unsaturated soil zone of at least 36 inches is maintained beneath the filtrate disposal system; and

(ii) The mounded watertable is at least one (1) foot below grade at the downhill toe of the filtrate disposal system.

Note: Filtrate disposal areas located more than twenty five (25) feet apart may be considered hydraulically isolated from each other for the purpose of this subsection.

(e) Underdrain System

(1) The base of the filter container shall be level or constructed at a grade of one (1) percent or less towards the underdrain piping.

(2) 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.

(3) The underdrain piping and filter container bottom shall be covered with a minimum of six (6) inches of washed clean : ¾" – 1 ½" stone aggregate.

(4) Other underdrain systems may be proposed by a professional engineer and submitted for approval by the Secretary.

(f) Monitoring

(1) The sand filter system shall be designed to allow for sample collection of the influent to and effluent from the sand filter to evaluate effluent quality and determine percent removals.

(2) All sand filter systems shall have the capability of measuring and recording the wastewater flow to the filter and the flow to the filtrate disposal system.

(g) Operation & Maintenance Manuals:

(1) A user's manual for the sand filter system shall be developed and submitted to the Secretary by the system designer at the time that the system installation "as-built" drawing is completed. These materials shall contain the following as a minimum:

(A) diagrams of the system components and their location;

(B) an explanation of general system function, performance expectations, owner operational responsibility and other information as appropriate;

(C) specifications for all electrical and mechanical components installed (occasionally components other than those specified on the plans are used);

(D) names and telephone numbers of the system designer, local health authority, 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 sewage system: septic tank, dosing and recirculating/mixing tanks, sand filter unit, pumps, switches, alarms, disposal unit and other information as appropriate;

(F) information on trouble-shooting common operational problems that might occur. This information should be detailed and as 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; and

(G) for proprietary sand filter devices, 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.

(h) Additional Requirements for Intermittent Sand Filters

In addition to the applicable requirements of (a) - (f) above, the following system specific criteria apply to design of intermittent sand filters:

(1) Filter Media

(A) A minimum of twenty-four (24) inches of approved sand filter media shall be placed over the underdrain system.

(B) The sand filter media shall be sand texture complying with the specifications listed below in Table #16, Filter Media Specifications For Intermittent Sand Filter.

(C) A professional engineer may propose other filter media along with technical justification for the substitution. The Secretary will review the proposal and may approve of the use of other filter media.

(D) The area of the sand filter shall be based on a maximum loading rate of 1.25 gallons per day per square foot.

TABLE #16: FILTER MEDIA SPECIFICATIONS FOR INTERMITTENT SAND FILTER

SIEVE NUMBER	OPENING (mm)	PERCENT PASSING (by weight)
3/8	9.50	100
4	4.75	95-100
8	2.38	80-100
16	1.19	45-85
30	0.59	15-60
50	0.297	3-15
100	0.149	0-4

(2) Distribution System

(A) Above the filter media and below the distribution piping there shall be a minimum of three (3) inches of washed, clean : ¾" to 1 ½" stone aggregate, and there shall be sufficient stone above the laterals equal to or covering the orifice shields to provide a smooth even cover.

(B) Within the zone described above a pressurized distribution system shall be constructed in accordance with the following requirements:

(i) 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;

(ii) 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 effluent may be discharged to the septic tank or into the sand filter.

(iii) The diameters of the distribution manifold and laterals shall not be less than one half (2) inch diameter and shall be constructed of schedule 40 or 80 (or equivalent) piping.

(iv) The orifices shall not be less than 1/8" in diameter. All orifices shall be covered by a removable, protective, durable, non-corroding shield.

(3) 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 calculations shall include maximum static lift, pipe friction and a residual head of five (5) feet at the distal 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.

(4) Internal Pump Option: 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 absorption facility, the design and construction of the filter may include provisions for an internal pump station, providing the following conditions are met:

(A) The location, design, and construction of the pump station does not conflict with rules for design, construction and operation of a sand filter system;

(B) The pump and related apparatus shall be housed in a corrosion resistant vault designed to withstand the stresses placed upon it and 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 a watertight access to finished grade with a diameter large enough to remove, replace, or service any equipment in the vault. The vault shall be designed to receive treated effluent from an elevation equal to that of a gravity discharging sand filter;

(C) 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;

(D) The internal sand filter pump shall be electronically linked to the sand filter dosing apparatus in such a manner as to prevent effluent from entering the sand filter in the event the internal sand filter pump fails.

(i) Additional Requirements for Recirculating Filters

In addition to the applicable requirements of (a) - (f) above, the following system specific criteria apply to design of recirculating filters:

(1) Filter Media

(A) A minimum of thirty-six (36) inches of approved filter media shall be placed above the underdrain system.

(B) The filter media shall be of sand texture complying with the sieve analysis listed in Table #17, Filter Media Specifications for Recirculating Sand Filter.

(C) A professional engineer may propose other filter media along with technical justification for the substitution. The Secretary will review the proposal and may approve of the use of other filter media.

TABLE #17: FILTER MEDIA SPECIFICATIONS FOR RECIRCULATING SAND FILTER

SIEVE NUMBER	OPENING (mm)	PERCENT PASSING (by weight)
3/8	9.50	100
4	4.75	60-100
8	2.38	7-75
16	1.19	0-5
30	0.59	0-3
50	0.297	0-2

(D) The area 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 either:

(i) the maximum hydraulic loading rate, 5 gallons per day per square foot; or

(ii) the maximum loading rate based on waste strength, (expressed as gallons per day per square foot), determined using the formula $LR = 1150/BOD_5$ where LR equals the loading rate (gallons per day per square foot) and BOD_5 equals the wastewater strength of the septic tank effluent in mg/L, whichever is less.

(2) Distribution System

(A) Above the filter media and below the distribution piping there shall be a minimum of three (3) inches of washed, clean : ¾" to 1 ½" stone aggregate, and there shall be sufficient stone above the laterals equal to or covering the orifice shields to provide a smooth even cover.

(B) Within the zone described above a pressurized distribution system shall be constructed in accord with the following requirements:

(i) Distribution laterals shall be spaced on maximum twenty-four (24) inch centers. Orifices shall be placed such that there is one orifice for each four (4) square feet of media surface area;

(ii) 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 effluent may be discharged to the septic tank or into the sand filter.

(iii) The diameters of the distribution manifold and laterals shall not be less than one half (2) inch diameter, and shall be constructed of schedule 40 or 80 (or equivalent) piping.

(iv) The orifices shall not be less than 1/8" in diameter. All orifices shall be covered by a removable, protective, durable, non-corroding shield.

(3) Recirculation/Dilution Tank and Dosing:

The recirculation tank receives septic tank effluent and the discharge from the filter. The recirculation tank and dosing system shall comply with the following requirements:

(A) The tank shall have sufficient capacity to provide one (1) day of emergency storage above a high water alarm level.

(B) 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 daily design flow.

(C) The filter should be dosed 48 times a day and not more than once in a thirty (30) minute period. The minimum period between doses shall be twenty (20) minutes.

(D) The system should be designed to meet the following criteria:

(i) The minimum liquid volume in the recirculation tank should be at least eighty (80) percent of the daily design flow;

(ii) 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 daily 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 when the liquid level of the recirculation tank is less than fifty (50) percent of the daily design flow;

(iii) Head calculations shall include maximum static lift, pipe friction and a residual head of five (5) feet at the distal orifice;

(iv) There shall be no more than a ten (10) percent flow variation between any two orifices; and

(v) The pumping system shall be protected from solids by a filter apparatus that will not allow the passage of solids larger than the diameter of the orifices.

§14-1011 Aerated Lagoons

(a) Independent Cells

Each system shall have a minimum of three (3) treatment cells contained in a minimum of two separate and independent treatment lagoons. A floating baffle or other separation device may be installed in the second treatment lagoon. Each lagoon shall be capable of being de-watered separately, while maintaining treatment in the other lagoon.

(b) Minimum Freeboard

To prevent any accidental discharge of waste to waters of the State, all waste lagoons including treatment and effluent storage lagoons, shall have a minimum freeboard of three (3) feet at all times from the lowest portion of the top of embankment to the design water level. If the lagoon is also permitted under 10 V.S.A. Chapter 43 and a freeboard of more than three feet is necessary to provide for structural safety of impoundment then the greater freeboard shall limit the high water level. Tank storage structures are required to have a minimum of two (2) feet of freeboard.

(c) Underdrains and Gas Vents

All lagoons shall be designed with underdrains and gas relief vents beneath the required impermeable liner.

(d) Leakage

All waste treatment and storage lagoons shall be lined with a man-made impermeable material approved by the Secretary. The liner shall be adequately protected from chemical and physical damage and deterioration with a proper base and cover. The minimum thickness of the liner shall be 30 mil. Exposed liners may be permitted if the applicant makes adequate demonstration of the long-term protection of the liner from deterioration. Once the liner is installed, it shall be tested for leakage in accordance with the manufacturer's specifications. If the lagoon is also permitted under 10 V.S.A. Chapter 43 and a lesser leakage rate is necessary to provide for structural safety then the lesser leakage rate shall control the design.

(e) Required Aeration

(1) The aeration shall be designed so that the aeration capacity of the first treatment cell is provided in the remaining cells to enable the treatment capability to be maintained should the first cell be taken out of service.

(2) All systems with a single aeration unit shall be provided with a backup unit of the same capacity connected to the system. When the system is designed for normal operation using multiple units there shall be a backup unit equal to the largest of any units connected to the system.

(f) Spare Aeration Tubing or Diffusers

Each system will have sufficient aeration tubing or diffusers on the site to replace the entire aeration system in the largest treatment cell.

(g) Purging Aeration Lines (tubing systems only)

Each system shall have the ability to expel water from the aeration lines without dewatering the lagoons or forcing the water to exit above the lagoon water surface. A separate drain is required for each header or header set in a multi-header system.

(h) Gas Cleaning (tubing systems only)

The system shall include a provision for gas cleaning of aeration lines, including sub-headers.

(i) Tubing Flexing (tubing systems only)

Each system shall have equipment on site capable of flexing aeration tubing for cleaning.

(j) Separate Treatment and Storage

All required effluent storage volume shall be separate and independent from any treatment lagoon.

(k) K_e (Reaction Coefficient) Rate

Aerated lagoon systems shall be designed with a K_e rate of not greater than 0.11, unless the Secretary approves the use of another value as proposed by a professional engineer. This K_e rate reflects an appropriate decay rate and an allowance for short-circuiting across the system. (See also TR-16, Guides for the Design of Wastewater Treatment Works).

(l) Volume for Ice and Sludge

Overall lagoon size and volume is determined by adding 15% for ice and sludge whose accumulation would decrease the detention time in the lagoon.

(m) Rip Rap Side Slopes

If the liner sides are covered, then the entire treatment or storage lagoon side slopes shall be lined with riprap.

(n) Required Oxygen

The aeration system should be designed with capacity to provide FOUR (4) pounds of oxygen per pound of BOD applied. The field oxygen transfer rate (FOTR) for mechanical systems and the field oxygen transfer efficiency for diffuser systems shall be calculated using an appropriate "aeration adjustment equation" and an alpha factor which is characteristic of the system being proposed. The standard oxygen transfer rate (SOTR) or standard oxygen transfer efficiency of the proposed system shall be based on the results of laboratory testing of the proposed equipment and the liquid depth of the proposed lagoons.

(o) Liquid Level Indicators

Liquid level indicators shall be installed in each storage and treatment lagoon.

(p) Wastewater Flow

All wastewater lagoon systems shall have the capability of measuring and recording the totalized influent wastewater flow and the totalized effluent flow discharged.

§14-1012 Mechanical Treatment Facilities

(a) Equalization

All mechanical treatment facilities, except those smaller units (< 50,000 gpd) preceded by septic tanks, will provide flow and organic load equalization tanks ahead of, or incorporated into, the first biological treatment unit , and shall also provide an aeration system sufficient to maintain complete mix with no settling and to prevent the wastewater from becoming septic. Air mixing equipment should provide 10 - 30 Standard Cubic Feet Per Minute (scfm) per 1000 cubic feet of storage volume. The sizing of the equalization tank(s) must be large enough to assure that flows reaching downstream treatment units do not exceed 200% of the design average flow rate. Equalization tanks shall have a minimum of two (2) feet of freeboard.

(b) Effluent Diversion

All mechanical treatment plants preceded by a lagoon shall be constructed with the capability to divert substandard effluent from the mechanical treatment processes back to the initial lagoon instead of the effluent storage pond.

(c) Unit Reliability

All unit operation and processes shall have a minimum of two independent units, each with a minimum of 75% of design capacity and capable of independent operation. If the process is designed for normal operation utilizing more than two units, then a backup unit with a capacity equal to the capacity of the largest unit and capable of replacing any of the individual units shall be provided. All unit processes must be provided with a reliable means of properly proportioning the sewage flow to each unit.

(d) Filtration

(1) Effluent filtration, when used, shall be designed with a minimum of two filter units each with capability of treating 50% of the design flow at a filter rate not exceeding 2 gpm/square foot, with a backup unit of equal capacity. Filters shall be equipped to automatically initiate a backwash cycle based on each of the following signals:

(A) timer control

(B) filter head loss; and

(C) excess turbidity breakthrough.

(2) Manual overrides shall be provided. The filter rate shall be calculated on the total available filter area with one unit out of service.

(e) Back-up Power

Mechanical secondary and tertiary plants shall be provided with one of the following reliability features:

(1) an alternative power source;

(2) retention ponds or tanks with volume sufficient to hold the design sewage flow for 48 hours, reserved only for influent retention during a power outage.

(f) Sludge Storage

Each facility shall provide a minimum capability for 30 days of aerobic sludge digestion and additional capacity to store six (6) months volume of treated sludge. The requirement for six months storage capability shall be waived if the facility has a sludge disposal contract approved by the Secretary.

(g) Sludge Disposal

All sludge removed from the sewage treatment facility shall be disposed of at locations approved by the Residuals Management Section of the Department of Environmental Conservation. The permittee(s) shall comply with the reporting procedures specified in the Certification from the Residuals Management Section or approved Sludge Management Plan.

(h) Leakage Testing

Upon completion of installation all tankage shall be tested with clean water to demonstrate that the structures are watertight. The testing shall be conducted before the tankage and structures are backfilled. The test shall be conducted by completely filling the tankage to the top of the structures and providing a hydrostatic head of at least two feet above the surrounding groundwater level at the time of testing. The test shall be at least 24 hours, with no leakage resulting. If any leakage occurs during the test period the tanks shall be repaired and retested. At the Secretary's discretion, a leakage test may be required for a period longer than 24 hours.

§14-1013 Reclaimed Water Use - Treatment Requirements

(a) Any proposal to reuse effluent (reclaimed water) shall be subject to the review and approval of the Secretary. For effluent reuse within buildings (eg. flushing water for urinals and toilets) the effluent shall meet the tertiary limitations listed in Table #4, Effluent Concentrations for In-Situ Testing by Treatment Level, and the limits in Table #18, Treatment Requirements For Reclaimed Water Use.

TABLE #18: TREATMENT REQUIREMENTS FOR RECLAIMED WATER USE

PARAMETER (units)	LIMITS
E. Coli Bacteria (per 100ml)	2.2 (a) 25 (b)
Turbidity (NTU)	2.0 (c) 5.0 (d)
Residual Chlorine (mg/L)	1.0 (e)
BOD_5 (mg/L)	10.0 (c)
TSS (mg/L)	5.0 (c)

Footnotes:
(a) Geometric mean of 5 samples at point of use
(b) Single sample cannot exceed this level at point of use
(c) Monthly average prior to disinfection
(d) Single sample cannot exceed this level
(e) Minimum concentration required

§14-1014 Disinfection Systems

(a) Chlorine Disinfection System Design Requirements

(1) Chlorine contact tanks shall be designated to provided a flow path having a minimum length to width ratio of 40:1. Internal baffling shall be arranged so that internal passes have a minimum length to width ratio of 10:1 and water depth is not more than twice the channel width. The design shall provide for the rapid mix of the chlorine solution with wastewater prior to entering the contact portion of the chamber. The chlorine contact chamber shall have the capability of being divided into two separately operable volumes, each providing a detention time of 20 minutes at design peak instantaneous flow rate.

(2) All systems shall provide dual 100% disinfection units.

(3) Chlorine contact time for spray disposal sites may use detention time in the transmission lines to the spray site and the requirement for two separately dual operable volumes would not apply.

(b) Ultraviolet Radiation Disinfection System Design Requirements

(1) The design of the UV Disinfection System shall conform as nearly as possible to guidelines for such designs supplied by the Secretary including the document entitled ”Draft Design Standards for Wastewater Ultraviolet Light Disinfection Systems.”

(2) Performance Guarantee

A written guarantee from the manufacturer stating that the unit will meet the prescribed effluent limitations for Escherichia coli as stated in the Vermont Water Quality Standards (surface water standard) may be required.

(c) Other Disinfection Systems

(1) Submittals

The consultant may propose other disinfection systems for review and approval by the Secretary. These systems will be evaluated based on the information supplied by the consultant which should include complete documentation of system by the manufacturer, evidence of reliable performance in systems installed in similar working environments including monitoring data and evidence that regulatory effluent limitations can be met, and establishing that the proposed system is as reliable as other disinfection systems allowed under these rules.

(2) Performance Guarantee

A written guarantee from the manufacturer stating that the unit will meet the prescribed effluent limitations for Escherichia coli as stated in the Vermont Water Quality Standards (surface water standard) may be required.

§14-1015 Sewage Treatment Facility Isolation

(a) Isolation Distances Treatment and Storage Units

Except for pump stations and sewerlines, all components of sewage treatment systems shall not be located closer than 300 feet to any property line, habitation, or area frequented by the public, unless a reduction in distance is approved in accordance with paragraph (b) below. The applicant must obtain legal easements restricting public access if any component is to be located within 300 feet of a property line, habitation, or area frequented by the public, unless a reduction in this distance is granted.

(b) Reduction of Isolation Distance

The minimum isolation distance may be reduced from 300 feet to 100 feet if the applicant demonstrates to the satisfaction of the Secretary that all components will be enclosed and have operating mechanical equipment as necessary to prevent odors and health hazards from aerosols escaping the facility. The applicant may be required to demonstrate successful performance of similar controls under severe climatic conditions.

(c) Chlorinated and Aerated Effluent Storage

Effluent storage lagoons or tanks may be located a minimum of 150 feet from a property line, habitation or area frequented by the public if designed and operated in accordance with the following conditions:

(1) Effluent shall be chlorinated with a minimum of 20 minutes contact time before entering the lagoon.

(2) The lagoons shall be aerated as necessary to assure uniform quality throughout and meet any oxygen demand of the wastewater being stored. A minimum of one (1) horsepower per 100,000 gallons of storage volume shall be provided along with the required backup aeration capability.

Subchapter 11 - Soil and Site Evaluation for Subsurface Disposal Systems

§14-1101 Evaluation Components

(a) There are three major components of a soil and site evaluation for subsurface disposal systems (including mound systems):

(1) Soil and Terrain Investigation: includes describing surface features, providing soil data, conducting soils evaluation or percolation testing for loading rate determination, and site/terrain mapping.

(2) Hydrogeologic Investigation: includes determination of seasonal high groundwater levels, determining groundwater contours and hydrogeologic capacity of the site, conducting water supply investigations, demonstrating direct bedrock recharge protection and evaluation of aquifer potential.

(3) Report: includes a comprehensive site evaluation, provides additional data as necessary for experimental systems, and the final submittals as necessary to provide evidence that the proposed subsurface system will meet the required criteria.

(b) Soil and Terrain Investigation

(1) The investigation of soil conditions and surface features, and the subsequent report on the investigation, must include, at a minimum, the following components:

(A) a description of the site and its surface features including current use and vegetation; existing building or building remnants; adjacent bodies of water including all streams, lakes and ponds; drainage courses; wetlands; ledge outcrops; all parking areas, roads or highways; the nature of all existing embankments; and the slope of the site. The site should be characterized in general conformance with ASTM D 5879-95 Standard Practice for Surface Site Characterization for On-Site Septic Systems, or Guidance Documents for Surface Site Characterization provided by the Secretary;

(B) the location of all existing wells, water supplies/sources and other water appurtenances such as pipelines, pump houses, reservoirs, within 1000 feet of the proposed disposal site and between the proposed disposal site and the receiving water body in the downgradient direction, both based on groundwater contours.

(C) the location of all existing wastewater treatment and disposal systems such as septic tanks, treatment units, sewer, pump stations, siphons, and disposal fields within 500 feet of the site.

(D) test pits and soil data from those excavations in general conformance with ASTM D 5921 - 96 Standard Practice for Subsurface Site Characterization of Test Pits for On-Site Septic Systems or Guidance Documents for Test Pit Excavations and Reporting provided by the Secretary.

(E) determining the probable depositional environment for the site and the soil texture (consistence) for the soils at the infiltrative surface of the proposed system needed to determine the effluent loading rate in accordance with Table #19, Leachfield Loading Rates (not required if percolation tests are conducted in accordance with Guidance Documents from the Secretary).

(F) percolation tests in accordance with Guidance Documents from the Secretary in order to determine effluent loading rate if the soils identification method in (E) above is not used.

(c) Hydrogeologic Investigation

(1) The hydrogeologic investigation must include, at a minimum, the following:

(A) determining the seasonal high groundwater table for the disposal site from either soil mottles observed in test pits, or groundwater level monitoring during the period March 1st - May 31st; or determining the minimum depth of unsaturated soils on a year round basis based on lack of soil mottles and the absence of groundwater encountered in test pits. All determinations shall be made in accordance with Guidance Documents for Determination of Seasonal High Groundwater provided by the Secretary.

(B) determining the direction of groundwater movement across the site through the installation of groundwater monitoring wells and measurement of groundwater levels over time (unless site characteristics, evidenced from test pits, borings, etc., in the opinion of the Secretary, provides sufficient evidence to indicate the direction of groundwater flow) .

(C) determining groundwater recharge and discharge points as they relate to the proposed indirect discharge, including the probable location of the surface water discharge point for the effluent/groundwater mix.

(D) determining what conditions exist at the site that provide direct bedrock recharge protection.

(E) calculating the site hydrogeologic capacity based on point permeability tests (or large-scale testing approved by the Secretary) and determining the degree of groundwater mounding which can be expected to occur when the proposed disposal system is put into use at the design capacity.

(F) investigating all water supplies within 1000 feet of the disposal site and downgradient to the receiving water body to provide information on: the owner of the water supply system, type of supply system (i.e., spring, dug well, drilled well, artesian or water table aquifer); type of aquifer formation and material; and well boring logs if available. The investigation must provide sufficient information to allow a professional evaluation of the disposal site in terms of its contamination or degradation potential to any/all water supplies.

(d) Report of the Site Evaluation

(1) The report of the site evaluation shall, at a minimum, include the following:

(A) a written discussion or tabulation of all components of the Soil and Terrain Investigation and the Hydrogeologic Investigation as outlined above.

(B) a site plan for the entire area to be developed at a scale of one inch equals 100 feet or less showing all key features identified in the Soil and Terrain Investigation.

(C) a disposal field specific plan drawn to a scale of one inch equals 50 feet or less with surface topography shown using contour intervals not to exceed five feet and the preliminary layout of the disposal system (both primary and alternate fields) shown and a magnetic North arrow and which shows the location of all test pits and lists the test pit logs;.

(D) a preliminary disposal field layout on a plan showing groundwater contours and/or contours of subsurface impeding layers.

TABLE #19: LEACHFIELD LOADING RATES - PART I: BASIC SIZING CRITERIA

SOIL CLASS	TYPICAL DEPOSITIONAL ENVIRONMENT	SOIL TEXTURE [a] (CONSISTENCE)	TYPICAL RANGE OF PERCOLATION RATES (min./inch)	MAXIMUM WASTEWATER LOADING RATE (gpd/ft^2)
1.	Glaciofluvial or Alluvial	Coarse Sand	0-3	0.9
2.	Glaciofluvial or Alluvial	Medium Sand or Loamy Sand	1-10	0.9
3a.	Alluvial	Fine Sand or Loamy Fine Sand	5-30	0.7
3b.	Glacial Till	Sandy Loam (Loose; Very Friable)	5-30	0.7
4.	Glacial Till	Sandy Loam, Fine Sandy Loam, Loam, or Silt Loam (Friable)	30-45	0.5
5a.	Glacial Till	Sandy Loam, Fine Sandy Loam, Loam, or Silt Loam (Firm)	45-60	0.35
5b.	Lacustrine or Alluvial	Silt	45-60	0.35
6.	Lacustrine or Marine	Sandy Clay Loam; Silty Clay Loam; or Clay Loam	60-120	0.24 [b]
7.	Lacustrine or Marine	Sandy Clay; Silty Clay; or Clay	120 +	Not Suitable

a Per USDA - Soil Conservation Service Soil Textural Classes (see Figure #2). Consistence is based on moist, in-situ conditions.

b Requires a mound disposal system.

TABLE #19: LEACHFIELD LOADING RATES - PART II: SIZING ADJUSTMENT

If any of the soil layers within the zone of interest have any of the following characteristics, then the maximum loading rates for those layers must be adjusted as indicated below. It is possible that a soil layer different than that identified as limiting before the adjustment is made will control the maximum loading rate, or the suitability of the site for sewage disposal.

1. (a) If the soil in Classes 1 or 2 has 35 to 50% rock fragments; or

   (b) If the soil in Classes 3, 4, 5, or 6 has 50 to 75% rock fragments; or

   (c) If the soil is in either class 5b or class 6 and has a firm consistence, in-place when moist;

   then the maximum loading rate for that soil layer is reduced by one soil class (increase of one soil class number).

2. (a) If a soil in any class has very firm, moist consistence; or

   (b) If a soil in any class has very hard or extremely hard dry consistence; or

   (c) If in soil classes 4 through 6 the soil has a strong platy structure;

   then that layer is an impeding layer and there must be three feet of suitable soil between the top of that layer and the bottom of the leachfield.

3. (a) If a soil layer in soil classes 1 and 2 has greater than 50% rock fragments by weight; or

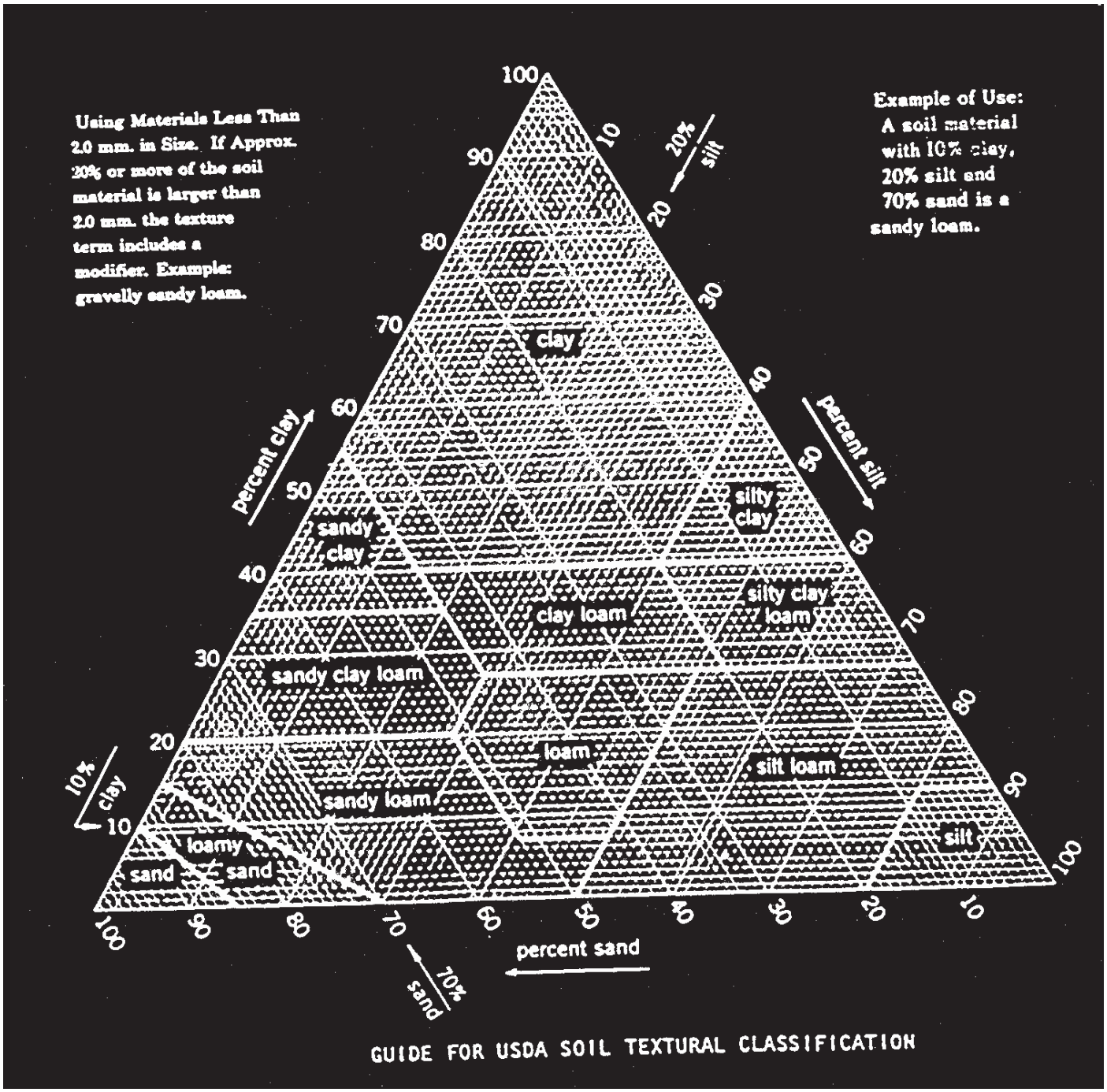
   (b) If a soil layer in classes 3, 4, 5 and 6 has greater than 75% rock fragments by weight;

   then due to insufficient treatment potential, that soil layer shall not normally be included when determining the vertical separations between the bottom of the system and seasonal high water table.

   However, if all other criteria for a mound or soil replacement system are met, then either 3(a) or 3(b) may be used to provide up to two feet of the required three feet of suitable soil above seasonal high water table, with mound specified sand providing the remaining foot of soil.

FIGURE #2: SOILS TRIANGLE

SOIL SEPARATE	PARTICLE SIZE RANGE
Clay	Less than 0.002 mm
Silt	0.002 mm - 0.05 mm
Sand	0.05 mm - 2.0 mm
Rock Fragments	Greater than 2.0 mm



Subchapter 12 - Site Modifications

§14-1201 Applicability

(a) Site modifications are those changes necessary to convert an unsuitable or marginally suitable site into one complying with the requirements for the type of disposal system proposed. These changes include lowering of water table using curtain or dewatering drains, regrading of the site, and use of fill material (e.g. in mound disposal system construction; see Subchapter 15).

(b) Cuts or fills of one foot or less shall not be considered site modifications for the purposes of this section.

§14-1202 Curtain or Dewatering Drains

(a) Curtain or dewatering drains may be used to lower permanent or perched seasonal high water tables, which prevent compliance with the required wastewater disposal system design requirements. Drains are highly dependent upon their design and construction and site conditions for continued adequate performance. Prior to designing a dewatering system, it is recommended that the applicant or consultant consult such references as Drainage of Agricultural Land by the U.S.D.A., Soil Conservation Service. Any proposal to convert an unsuitable or marginally suitable site to a complying site utilizing curtain or dewatering drains must incorporate the following:

(1) engineering design and specifications;

(A) The applicant shall have a Vermont registered professional engineer submit a plan to the Secretary which details the drain and the proposed location of the sewage disposal system. All design criteria must be detailed as to site 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.

(2) monitoring plan;

(A) 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 sewage disposal system. A plan outlining the instrumentation and monitoring of groundwater levels shall be submitted to and approved by the Secretary before testing commences. The requirement for spring testing may be waived if the Secretary concludes that the applicant or his/her consultant has provided sufficient evidence to show that the drain will work effectively and that spring testing is not necessary. The plan shall show the location of monitoring wells and a schedule of groundwater level measurements and shall be subject to approval by the Secretary.

(3) construction procedures;

(A) 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.

(B) If the drain is downslope of the disposal field, the disposal field shall not be closer than 150 feet to the drain. If the drain is upslope of the disposal field, it shall be at least 20 feet from the disposal field (but 150 feet downslope of any other disposal field). The upslope distances may be reduced if the engineering consultant provides adequate data and analysis to show that effluent from the disposal system will not enter the upslope drain.

(C) The outlet of all drains shall be constructed to prevent erosion and clogging.

(4) and a report on the effectiveness of the curtain/dewatering drainage system

(A) All drains must be constructed and their effectiveness measured for at least one spring, or the period of high groundwater anticipated, if other than spring, before a permit will be issued for a disposal system that depends on the effectiveness of the drain. Following the testing period, the engineer shall submit a report on the effectiveness of the drain and

submit all groundwater monitoring data. As part of the report, the engineer shall offer his/her opinion on the effectiveness of the drain and submit supporting documentation. If, in the opinion of the Secretary, the drain does not lower the groundwater on the site to provide compliance with these rules for the proposed sewage system, the drain will be considered a failure and the proposed sewage system dependent on that drain will not be permitted.

§14-1203 Excessive Slope

(a) In some cases, sites with slopes exceeding 20% may be regraded and reshaped to provide adequate soil disposal area. Prior to regrading, soil excavations shall be performed to show that there will be sufficient soil over the seasonal high water table and ledge (bedrock) after the regrading.

(b) All site work must comply with the following requirements:

(1) Only sites with Soil Classes 1 through 3, or with percolation rates of 0 to 30 minutes per inch, are acceptable for consideration under this section.

(2) No portion of the sewage disposal system shall be installed in the fill area, although 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 altered areas.

(3) All slope areas shall be graded to direct surface water drainage away from the system areas. In some cases, this may require the use of grassed waterways or other means of diverting surface waters. All disturbed areas shall be seeded or sodded with grass and appropriate steps shall be taken to control erosion.

Subchapter 13 - Leachfield Sizing Procedures and Effluent Distribution

§14-1301 General Considerations

(a) The design sewage flow for individual connections to indirect discharging systems are determined by the issuance of Water Supply and Wastewater Disposal Permits, other state permits or otherwise determined by the Secretary.

(b) The sizing of the leachfield is dependent upon the design capacity, the organic concentration of the wastewater (measured by biochemical oxygen demand), the solids concentration of the wastewater (measured by the total suspended solids), the treatment capability of the soil, and the hydraulic permeability of the soil.

(c) Once design capacity is established, the soils must be examined to determine the loading rate of sewage measured in gallons per day per square foot of infiltrative surface. The soil column between the bottom of the proposed subsurface disposal system (also called the bottom of stone) and the limiting site factor, determined during the site evaluation, is the zone of interest. Limiting site factors include depth to seasonal high groundwater, ledge or bedrock, and relatively impermeable soils (Class 7, or percolation rate greater than 120 minutes per inch drop). The subsurface disposal system loading rate is determined by the most restrictive soil in the zone of interest. This may either be the soil with the lowest hydraulic permeability or the least treatment capability.

§14-1302 Methods for Establishing Loading Rates

(a) The system designer may choose one of two methods for establishing loading rates for the subsurface disposal system as explained below:

(1) Soil Evaluation Method

(A) Soil evaluations may be conducted by any qualified designer; that is, a professional agricultural, civil, sanitary, and/or civil/sanitary engineer, or a hydrogeologist, provided they have adequate training and experience in soil identification; or a trained and experienced soil scientist. It is also recommended that the Secretary be advised in advance of site inspections when the soil evaluation method is to be used for sizing the leachfield.

(B) The evaluator must properly log the soil layers on the site and accurately identify the soil texture of each layer. The evaluator is also required to assess each layer for rock fragment content, in-place consistence and structure. Based on these evaluations Table #19, Leachfield Loading Rates (pp. 117-118), is used to establish a wastewater loading rate for the leachfield. The typical geologic environments are included in Table #19 as examples only. The designer must apply the sizing adjustment included in that table for soil consistence, rock fragment content, and structure.

(2) Percolation Testing

(A) Subsurface disposal systems may be sized using percolation testing. The site evaluator must identify the limiting soil layers on the site by use of test pits. Percolation tests must then be conducted in each limiting soil layer. This includes the least permeable soil layer in the zone of interest as defined above. Generally, two percolation tests conducted in two different locations on each leachfield will be required. Allowances will be made for uniform soils across a disposal area. Larger systems with more variable soils will require testing at more locations. All percolation tests will be conducted using procedures provided by the Secretary in guidance documents. The percolation rate for the leachfield shall be the second slowest rate as determined during percolation testing.

§14-1303 Leachfield Sizing and Treatment Capability

(a) With the information collected in the soil evaluation, or from percolation testing, an adequate leachfield size can be determined which will provide assurance that sewage effluent will form a mature biological layer and permeate through the soil and will be adequately treated before reaching groundwater, ledge or bedrock, or an impermeable soil layer. For standard domestic strength sewage Table #19, Leachfield Loading Rates, (pp. 117-118) is used to determine wastewater loading rates. Table #19 consists of two sections: the first establishes base loading rates for uniform soils and the second provides corrected loading rates when the soils have characteristics that limit their permeability or treatment capability.

(b) The wastewater loading rates in Table #19, Leachfield Loading Rates, are be considered maximum loading rates and the system designer should take other factors into account such as effluent organic strength, seasonal loading patterns, and site limitations.

(c) Increases in loading rate can be obtained by providing effluent treatment. The loading rate following an intermittent sand filter is two times the rate allowed under Table #19, Leachfield Loading Rates, (pp. 117-118); the loading rate following a recirculating sand filter is three times the rate allowed under Table #19; and the loading rate following a tertiary treatment system is five times the rate allowed under Table #19. With the use of tertiary treatment, disinfection of the effluent is required prior to discharge to the leachfield.

§14-1304 Effluent Distribution for Leachfields and Mound Systems

(a) Basic Requirements

The effluent distribution system for all subsurface leachfields and for mound systems must meet the following requirements:

(1) All disposal systems shall have dosing and pressure distribution.

(2) Dosing may be accomplished by pumps, siphons, or other methods approved by the Secretary.

(3) The primary or alternate disposal field shall be dosed not more than four (4) times per day. However, for disposal systems constructed in Soil Class I more frequent doses are warranted to prevent saturated conditions. The frequency of dosing these systems shall be determined on a case-by-case basis.

(4) The size of the dosing pumps and siphons shall be selected to maintain a minimum pressure of one (1) psi (or 2.3 feet of head) at the end of each distribution line with a maximum of 15% discharge rate differential between any two orifices within the distribution system in each disposal field. The design shall provide uniform distribution throughout the field.

(5) There shall be a minimum of 1 orifice in the distribution piping per 25 square feet of disposal area.

(6) If pumps are used to dose pressure distribution systems, the design discharge rate of the pumps shall be equal to or greater than the design discharge rate of the distribution network(s). If dosing siphons are used, the average discharge rate of the siphon unit(s), as specified by the manufacturer, shall be equal to or greater than the design discharge rate of the distribution network(s).

(7) A ratio of at least 5:1 (dose volume to distribution network volume) shall be provided in the design of the system.

(8) All distribution systems shall be designed such that the flow is properly proportioned to each disposal field. The design of the flow proportioning shall be controlled by hydraulically balanced pressure distribution systems in the disposal fields.

Subchapter 14 - Design and Construction of Conventional Leachfields

§14-1401 Basic Requirements

(a) All disposal systems shall meet the following design and construction standards:

(1) Design

(A) All disposal systems must be designed by a qualified consultant and depicted on engineering plans stamped and signed by a Vermont registered professional engineer.

(B) All disposal systems shall be designed to provide for 100% dual alternating fields and effluent pressure distribution as per §14-1304.

(C) The isolation distances specified in Table #21, Isolation Distances, (pp. 131-132) shall be used in the design of the disposal system.

(D) Pretreatment of septic tank effluent, consisting of a recirculating sand filter or equivalent, as determined by the Secretary, is required for all leachfields with a design capacity of greater than 30,000 gpd but less than 50,000 gpd. A tertiary treatment system is required for all leachfields with a design capacity exceeding 50,000 gpd.

(E) Leachfields shall be laid out parallel to natural contour lines to provide optimum dispersal and maintenance of the unsaturated zone. Fields should be as long and narrow as possible. Conventional systems are permitted in undisturbed, native soils of classes 1 through 5, or of percolation rates of 1 to 60 minutes per inch drop, and with depths of unsaturated soils between the infiltration surface and seasonal high groundwater, including any wastewater effluent induced mounding, of at least three (3) feet. Sites which do not meet these criteria may qualify for site modification or consideration under the mound system design standards.

(F) The maximum slope for construction of any leachfield shall be 20%.

(G) Trenches are required and may be up to 48 inches in width. Individual trenches must be separated by at least 48 inches of undisturbed soil.

(H) The depth from the ground surface to the bottom of stone in the trench shall not exceed three (3) feet.

(I) A minimum 18 inches of sand meeting the sieve analysis requirements listed in Tables #22(A), or #22(B) or #22(C), Sand Specifications, shall be placed below disposal fields constructed in soils having a percolation rate faster than 1 minute per inch or coarse sand, or in medium or loamy sand soils with >35% rock fragments.

(J) Prefabricated chambers with a minimum H-10 structural load rating may be used in the trenches instead of stone.

(K) There is no construction limit on the size of any leachfield, subject to hydrogeologic limitations, (e.g. effluent mounding).

(L) When more than one disposal field is required, the flow to each individual field shall be distributed by adjustable weir plates or controlled by hydraulically balanced pressure distribution systems.

(M) For replacements of failed systems only, a reduction in the required trench bottom area may be allowed if additional crushed stone is placed beneath the distribution pipe invert in accordance with Table #20.

TABLE #20: REQUIRED DISPOSAL AREA WITH INCREASED DEPTH OF STONE

Depth of Stone	Percentage of Standard Disposal Area Required
18"	75%
24"	66%

(2) Construction Requirements and Materials

(A) Excavation of the trenches shall not result in compacted or smeared soils. When trenches have been excavated, the sides and bottom shall be raked to scarify any smeared soil surfaces.

(B) Construction equipment not needed to construct the system should be kept off the area to be used for the absorption trench system to prevent undesirable compaction of the soils. Construction shall not be initiated when the soil moisture content is high. (If a fragment of soil occurring approximately 9" below the surface can easily be rolled into a wire, the soil moisture content is too high for construction purposes).

(C) A minimum of 12 inches of crushed stone shall be placed below the distribution pipe invert. All crushed stone used shall be clean, washed, durable and sized between three-fourths (3/4) of an inch to one and one-half (1.5) inches in diameter.

(D) The distribution piping shall be carefully placed on the bedding at a uniform slope and must be placed along the center line of each trench. The ends of distribution lines (laterals) shall be capped or plugged but, when they are at equal elevations, they should be connected. Pipe used for distribution lines shall be rigid plastic pipe, schedule 40 or 80, one-inch diameter or greater, and meet the American Society for Testing and Materials (ASTM) standards or those of an equivalent testing laboratory. Fittings used in the disposal field shall be compatible with the materials used in the distribution lines.

(E) During construction, the pressure distribution pipe shall be placed in crushed stone with the holes facing upward to facilitate testing of the system for even distribution and adequate residual pressure. Upon completion of the installation of the distribution piping, the network shall be tested with clean water to assure that distribution is complete and equal and to demonstrate that the difference in discharge rate between any two orifices within the mound is less than 15%. There shall be a minimum residual pressure of one p.s.i. at each orifice in the distribution network.

(F) Following successful distribution testing the laterals shall be rotated with the holes facing downward and the piping glued in that position. The ends of all distribution pipes shall be capped and the distribution piping covered with at least two (2) inches of crushed stone.

(G) Observation wells shall be installed in the trenches to monitor the depth of ponding in the leachfield. The wells shall extend from ground surface (or above) to the bottom of stone. The number and location of the observations wells shall be subject to approval by the Secretary.

(H) After the placement of crushed stone and the distribution piping, the field must be topped with filter fabric to prevent soil from migrating into the stone, but permitting free aeration. Six (6) to twelve (12) inches of soil shall be placed on top of the filter fabric. The top several inches shall be top soil and the field(s) must be seeded with grass to stabilize the field, prevent erosion and maximize aeration.

TABLE #21: ISOLATION DISTANCES

The following isolation distances apply regardless of property line location and ownership. These distances may be reduced when it is evident that the distance is unnecessary to provide protection and may be increased if greater distance is necessary to provide adequate protection.

	Minimum Horizontal Isolation Distance (feet)			
ITEM	**SEWER**	**SEPTIC TANK**	**DISPOSAL FIELD**	**SPRAY FIELD**
Drinking Water Supply Source			see (a)	see (a)
Drilled Well		50	200 [see (b)]	200 [see (b)]
Gravel Pack Well, Shallow Well or Spring	75	75	200 [see (b)]	200 [see (b)]
Standing Water (Lake or Pond)	25	25	200	100
Streams and Rivers (includes groundwater seeps)	10	25	150	100
Drainage Swales / Roadway Ditches	C	C	25	100
Main or Municipal Water Lines	see (c)	50	50	200
Service Water Lines	see (c)	25	25	200
Roads, Driveways, Parking Lots	see (d)	5	10	200
Top of Bank or to Slope Greater than 30%	C	10	50	see (e)
Property Line	10	10	25 [see (f)]	200
Trees	10	10	10	---
Other Disposal Field	C	C	10	200
Foundations, Footing Drains or Curtain Drains	C	10	35 [see (g)]	200
Public Community Water System	see (h)	see (h)	see (h)	see (h)
Suction Water Line	50	50	100	200

TABLE #21: ISOLATION DISTANCES (continued)	
(a)	Separation between drinking water sources and leachfields or sprayfields shall be determined by the methods in the Vermont Water Supply Rule and guidance from the Secretary.
(b)	Presumes that geological conditions exist that would prevent the movement of contaminants from the indirect discharge to the water supply. If a hydrogeologic connection exists between the indirect discharge and a water supply, see §14-2102 of these rules for further requirements.
(c)	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 comply with the requirements of the Vermont Water Supply Rule. Separation of pressure water lines considered to be "service connections" and sewer lines shall comply with the Vermont Plumbing Code.
(d)	Sewer lines under roads, driveways or parking lots may require protective conduits or sleeves.
(e)	Thirty percent (30%) is the maximum slope for the wetted area of a spray field.
(f)	For mound disposal systems, the limit of mound fill must be 50 feet from any downgradient property line and 10 feet from any property lines on the side or uphill.
(g)	If the foundation or curtain drain is downgradient of the disposal field, there must be a minimum of 150 feet between the drain and the disposal field, assuming that the effluent discharged will not enter the drain. Upgradient of the disposal field the distance shall be a minimum of 20 feet and preferably 35 feet if possible. These distance may be reduced if the applicant provides adequate data and analysis to show that the effluent from the disposal field will not enter the drain. The distances may be increased if there is potential for effluent to enter the drain.
(h)	Contact the DEC Water Supply Division, 103 South Main Street, The Old Pantry Building, Waterbury, Vermont 05671-0403 Phone: (802) 241-3400

Subchapter 15 - Design and Construction of Mound Disposal Fields

§14-1501 Basic Requirements

(a) All mound disposal fields shall meet the following design, siting and construction standards:

(1) Design and Siting Requirements

(A) All mound disposal systems shall be designed to provide for 100% dual alternating fields and effluent pressure distribution as per §14-1304.

(B) The isolation distances specified in Table #21, Isolation Distances (pp. 131-132) shall be used in the design of the mound disposal system.

(C) All mound wastewater disposal systems must be designed by a qualified consultant and depicted on engineering plans stamped and signed by a Vermont registered professional engineer.

(D) The consultant shall prepare a one (1) foot interval contour plan(s) with a scale of not greater than twenty feet per inch. All details of the mound system, including but not limited to toe of slope, surface drains, curtain drains, existing and proposed contours, and trench cross-sections shall be shown on the plan(s).

(E) The plans shall show the location of primary and alternate mound disposal fields. The toe of each mound shall not be closer than ten (10) feet to the alternating mound on the sides or if used simultaneously not closer than 50 feet on the uphill or downhill side.

(F) A permanent benchmark shall be established and shown on the plans.

(G) A mound disposal system may only be considered on sites that have at least 24 inches of undisturbed, unsaturated native soil of Class 1 through 6, or percolation rate of less than 120 minutes per inch of drop, in accordance with Table #19, Leachfield Loading Rates (pp. 117-118). Mound disposal systems may be placed on natural ground slopes not exceeding 15 percent.

(H) The site shall meet the minimum conditions in subsection (G) above and must be of sufficient size to permit the construction of a primary and replacement mound each with side slopes of 1 on 4, with at least 10 feet between the toes of slopes, 10 feet on all sides, and 25 feet in the direction(s) of the effluent plume. Mounds may not be placed in floodways. The crest site is preferred; no mound shall be located in a depression which could act as a natural surface or groundwater collection area.

(I) Twelve inches of unsaturated native soil must be maintained at all points under and 25 feet downgradient of a mound at all times, taking into account groundwater mounding induced by wastewater effluent.

(J) There must be at least three (3) feet of unsaturated material, including both native soil and mound fill, between the wastewater infiltration surface in the mound and the seasonal high groundwater table, including any mounding induced by effluent, or soil layer of Class 7, or percolation rate greater than 120 minutes per inch drop, whichever is higher in the native soil profile.

(K) There must be at least four (4) feet of material, including both native soil and mound fill, between the wastewater infiltration surface in the mound and fractured ledge or bedrock.

(L) The mound basal area, defined as the area directly under the mound application field and the area formed by the projection of the application field area downgradient toward the toe of the mound, must be sized so that in soils of Classes 1 through 5, or percolation rates less than 60 minutes per inch drop, as defined in Table #19, Leachfield Loading Rates (pp. 117-118), the infiltration rate at design flow of the basal area does not exceed 0.74 gallons per day per square foot. For soils of Class 6, or percolation rates between 60 and 120 minutes per inch drop, the maximum infiltration rate at design flow of the basal area will not exceed 0.24 gallons per day per square foot.

(M) The mound must be oriented with its length parallel to slope contour lines and use maximum slopes of 1 on 3 when placed on soils of Class 1 through 5, or percolation rates less than 60 minutes per inch, as defined in Table #19, provided the fill extends beyond the basal area required above, and the fill can be extended to at least a 1 on 4 slope at a later date. The mound shall use a 1 on 4 slope when placed on soils of Class 6, or percolation rates between 60 and 120 minutes per inch. The perimeter of the top of the mound must extend at least one (1) foot beyond the disposal area in the mound in all directions in all cases.

(2) Construction Requirements and Materials

(A) The construction of the mound system shall be conducted under the inspection of a Vermont registered professional engineer or authorized representative.

(B) Above-ground vegetation shall be closely cut and removed from the ground surface throughout the area to be used for the placement of the fill material. 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).

(C) 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 should be cut flush with the surface of the ground and roots should not be pulled. Once plowing of the mound area is completed, the area shall be fenced to prevent vehicles and equipment from entering the plowed area. 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.

(D) Sand Fill

The fill material used shall meet one of the following three specifications listed in Tables #22(A), #22(B) & #22(C). Interpolation of analyses is not permitted. Fill material Type B is ASTM Specification C-33.

TABLES #22(A) (B) & (C): SAND SPECIFICATIONS

TABLE #22(A): Type A Sand Specifications		
Sieve Number	Opening (mm)	Percent Passing (by Weight)
10	2.000	85 - 100
40	0.420	25 - 75
60	0.240	0 - 30
100	0.149	0 - 10
200	0.074	0 -5

TABLE #22(B): Type B Sand Specifications		
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

TABLE #22(C): Type C Sand Specifications		
Sieve Number	Opening (mm)	Percent Passing (by Weight)
10	2.000	85 - 100
40	0.420	30 - 50
200	0.074	0 - 10

(E) To prevent compaction, construction equipment shall not be moved across the plowed surface or the effluent dispersal area. 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.

(F) The area surrounding the mound shall be graded to provide diversion of surface run-off waters.

(G) Construction should be initiated immediately after preparation of the soil interface by placing all of the sand fill needed for the mound to a minimum depth of twenty-one (21) inches above the plowed surface. This depth will permit excavation of trenches to accommodate the crushed stone (9 inches minimum) necessary for the distribution piping. After hand leveling of the absorption area, the stone shall be placed into the trench, hand leveled and the distribution pipe installed.

(H) The distribution piping shall be carefully placed on the bedding at a uniform slope and must be placed along the center line of each trench.

(I) During construction, the pressure distribution pipe shall be placed in crushed stone with the holes facing upward to facilitate testing of the system for even distribution and adequate residual pressure. Upon completion of the installation of the distribution piping, the network shall be tested with clean water to assure that distribution is complete and equal and to demonstrate that the difference in discharge rate between any two orifices within the mound is less than 15%. There shall be a minimum residual pressure of one p.s.i. at each orifice in the distribution network.

(J) Following successful distribution testing the laterals shall be rotated with the holes facing downward and the piping glued in that position. The ends of all distribution pipes shall be capped and the distribution piping covered with at least two (2) inches of crushed stone.

(K) The entire mound is to be covered with filter fabric and then top soil native to the site, or of similar characteristics, to support vegetation found in the area. Crown the entire mound with cover of soil less permeable that the mound fill, covering with 12 inches on the side slopes, and a minimum of eighteen (18) inches over the center of the mound. Native soil from the site is normally suitable for cover material, though the top 2" to 4" of this cover should be top soil. The entire mound shall be seeded, sodded, or otherwise provided with vegetative cover, to assure stability of the installation.

Subchapter 16 - Soil and Site Evaluation For Spray Disposal Systems

§14-1601 Components of Soil and Site Evaluation

(a) There are three major components of a soil and site evaluation for a spray disposal system:

(1) a soil and terrain investigation which includes a description of surface features, submitting soil data, determining site characteristics which protect regional aquifers, and site/terrain mapping;

(2) a hydrogeologic investigation which includes determination of groundwater contours and hydrogeologic capacity of the site, conducting water supply investigations, demonstrating direct bedrock recharge protection and evaluation of aquifer potential; and

(3) a report of the investigations which shall include a comprehensive site evaluation and all submittals necessary to provide evidence that the proposed spray disposal system will meet the required criteria.

(b) Soil and Terrain Investigation

The investigation of soil conditions and surface features must include, at a minimum, the following components:

(1) generating a description of the site and its surface features including current use and vegetation; existing building or building remnants; adjacent bodies of water including all streams, lakes and ponds; drainage courses; wetlands; ledge outcrops; all parking areas, roads or highways; the nature of all existing embankments; and the slope of the site. The site should be characterized in general conformance with Guidance Documents for Surface Spray Site Characterization as provided by the Secretary. Note that only forested sites can be used for Winter spray disposal;

(2) identifying and mapping the location of all existing wells, water supplies/sources and other water appurtenances such as pipelines, pump houses, reservoirs, within a radius of 1000 feet of the spray disposal site, including those beyond the receiving waters, with the investigation area extending downgradient to the receiving water body if it is further that 1000 feet.

(3) excavating test pits and collecting soil data from those excavations in general conformance with Guidance Documents for Test Pit Excavations and Reporting as provided by the Secretary;

(c) Hydrogeologic Investigation

The hydrogeologic investigation must include, at a minimum, the following components:

(1) determining the direction of groundwater movement across the site through the installation of groundwater monitoring wells and measurement of groundwater levels over time (unless site characteristics, evidenced from test pits, borings, etc., in the opinion of the Secretary, provides sufficient evidence to indicate the direction of groundwater flow);

(2) determining groundwater recharge and discharge points as they relate to the proposed indirect discharge, including the probable location of the surface water discharge point for the spray disposal field;

(3) determining the hydraulic conductivity and hydrogeologic capacity of the site. The hydrogeologic capacity of the spray disposal site 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 design capacity shall be made using recognized subsurface flow equations;

(4) determining what conditions exist at the site that provide direct bedrock recharge protection. One of the following conditions must be present:

(A) an impeding layer (silt or clay) at a depth greater than the minimum required one foot below the infiltration surface. An impeding soil layer is defined as a soil horizon with a percolation rate or vertical permeability at least ten (10) times slower than that soil layer above it, or

(B) a minimum of eight (8) feet of unsaturated soil (which includes the minimum requirement of 1 foot) at all times below the infiltrative surface including any groundwater mounding due to effluent, or

(C) a soil with a saturated water thickness at all times of a minimum of two (2) feet not including any effluent mounding, at a depth greater than the minimum required one foot below the infiltration surface.

(5) identifying and mapping the location of all surface waters, water supplies/sources, within a radius of 1000 feet of the spray disposal site, including those beyond the receiving waters, with the investigation area extending downgradient to the receiving water body if it is further that 1000 feet. locating all surface waters and water supplies within 1000 feet of the proposed spray disposal site on a contour map. This distance may be extended by the Secretary as necessary to protect water supplies from contamination by the proposed discharge. All public water supplies within one mile radius of the proposed spray disposal site shall also be identified on a map. For all water supplies, the following information shall be obtained by house to house survey, well drilling records, observations, or whatever means are necessary:

(A) owner of the supply, whether in use or not, and use as to potable, industrial or agricultural;

(B) type of supply: drilled or dug well, artesian or not, spring or stream;

(C) well boring logs when available, depth of casing, depth to aquifer, and aquifer material - i.e., gravel, bedrock, and if available, the predominant bedrock material.

(6) evaluating possible effects of the spray disposal system on quality or quantity of any local or regional aquifers, and water supplies. Hydrogeologic relationships between the 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. If, within the area examined for water supplies, the owner of an identified or potential water supply does not cooperate in providing the applicant with required information, then the Secretary may consider this and determine if all practical means of obtaining the information have been attempted. The Secretary may determine that the applicant has fulfilled this requirement if the owner of the identified or potential water supply prevents the applicant from obtaining the required information.

Subchapter 17 - Sprayfield Design and Sizing Procedures

§14-1701 Loading Rates for Treated Sewage Effluent

(a) The weekly loading rates applicable to disposal of treated sewage effluent in all sprayfields are listed in Table #23, Allowable Spray Application Rates Based on Effluent Treatment.

TABLE #23: ALLOWABLE SPRAY APPLICATION RATES BASED ON EFFLUENT TREATMENT

Treatment Level: BOD5 / TSS	**Application Rate (inches per week)**	**Equivalent gallons per day (per acre of wetted area)**
30 mg/L (1) 30 mg/L(1)	2	7,758
15 mg/L (2) 15 mg/L (2)	3	11,637
10 mg/L (3) 10 mg/L (3)	4	15,516

(1) Daily Maximum.
(2) Required treatment level from recirculating sand / textile filter - see Table #13 (p.92)
(3) Tertiary Treatment required - see Table #13 (p. 92)

§14-1702 Design

(a) Each spray disposal field shall be designed with two or more separate spray zones that can be operated independently. The minimum capacity for each zone should provide for latitude in the operation of the sprayfield should the zones be operated on alternating days.

(b) The maximum acceptable slope for the wetted area of a spray disposal site is thirty (30) percent.

(c) There must be a minimum of 5 feet between the wetted area of laterals of sprinklers in the direction of surface water run-off.

(d) The spray pumping system shall be sized to deliver the total approved wastewater volume for a seven day period to the spray field in not more than four (4) eight (8) hour periods.

(e) The difference in discharge rate between any two nozzles along a lateral shall not be greater than 10%.

(f) A minimum of one foot unsaturated soil between the average ground surface and the resulting water table shall be maintained during all spray disposal episodes. In making such determinations, consideration shall be given to locations of monitor wells for water quality sampling which may be located in microtopographic low points.

(g) A drain back system shall be provided for all laterals to ensure that the laterals are emptied between spray episodes. Whenever possible, the drain back system should use spray nozzles and all laterals shall be drained in a manner that does not result in erosion or runoff.

(h) The isolation distances specified in Table #21, Isolation Distances (pp. 131-132) shall be used in designing the sprayfield.

§14-1703 Equipment and Construction

(a) All spray fields designed with a single spray pump shall have a second alternating pump installed, both capable of full operation of the sprayfield. If two or more pumps are provided for full operation of the spray fields, then a back up pump with a capacity equal to the largest pump shall be installed.

(b) The spray disposal area shall be restricted from 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 spray effluent. Modifications to the fencing/warning system to allow for the free migration of wildlife through the spray disposal area shall be made on a case-by-case basis when requested by state wildlife biologists.

(c) The installation of the spray laterals shall be accomplished in a manner which minimizes the damage to existing vegetation and the soil structure of the wetted area.

(d) Upon completion of construction of the spray disposal system, the engineer shall verify that the difference in discharge rate between any two nozzles along a lateral is not greater than 10%, that all spray zones constructed are operational and that all drain back structures are functioning properly.

§14-1704 Spray Effluent Storage

(a) Spray disposal systems shall have effluent storage capacity capable of storing a minimum 30 days of permitted design flow. Due to spring runoff conditions a spray disposal system shall be designed to store effluent for up to 30 days during the period March 15th - May 15th. This effluent storage shall be in addition to any storage capacity required for controlled storage and release. All storage ponds or tanks shall have a minimum of two (2) separate independent cells.

(b) The two independent cells may be constructed in phases with the first pond or tank having a minimum volume equivalent to 20 days of permitted design flow and the second pond or tank having a minimum volume equivalent to 10 days of permitted design flow. The phased construction of the second pond or tank shall be required if both of the following two conditions are met:

(1) The 30-day peak flow volume (as defined in (c) below) for the period April 1st - May 15th exceeds 80% of the total storage volume available (not including required pond freeboard); and

(2) During the period March 15th - May 15th the volume of total effluent stored at any time exceeds 90% of the total storage capacity available.

(c) For those spray disposal systems currently in use as of the date of the adoption of these rules, and subject to phased construction of effluent storage, the additional storage capacity to be built is calculated as follows:

Capacity = 30-day Peak Flow - [0.80 (TSV)]

Where: 30-day Peak Flow is the maximum metered influent flow, in gallons, for the system for any 30 consecutive days during the period April 1st - May 15th.
TSV is the total storage volume (gallons)

(d) The permittee is required to have fully approved plans and specifications on file with the Secretary for the construction of the additional storage at the time the determination is made that more storage is required. This will enable construction of the additional storage to proceed in a timely manner.

(e) All effluent storage lagoons shall be separate from treatment lagoons. Treatment lagoons are not allowed to be used concurrently for effluent storage capacity. All expansion of spray disposal systems with combined treatment and storage lagoons shall provide completely separate effluent storage facilities from treatment facilities for all treated wastewater.

(f) Seasonal spray disposal system facilities for systems which only generate sewage in summer months only shall have sufficient storage capacity in separate lagoons to allow for effective operation. The minimum acceptable storage capacity is equivalent to 30 days of permitted design flow.

§14-1705 Disinfection Requirements for Spray Disposal Systems

(a) Options for Disinfection

There are two options for providing effluent disinfection for spray disposal systems:

(1) Disinfection Prior to Spraying

(A) The applicant can provide disinfection with a 20 minute chlorine contact time at the design peak instantaneous flow rate immediately prior to spraying. The applicant shall utilize a free chlorine or total chlorine residual in the spray effluent as necessary to achieve an E coli bacteria count of 77 colonies/100 ml or less as measured in samples taken at the spray nozzle. The level of free chlorine or total chlorine residual necessary to meet this limitation shall be verified through monitoring with samples taken at the beginning and end of the spray period.

(2) Disinfection Prior to Effluent Storage

(A) The applicant can provide disinfection with 20 minute chlorine contact time at the design peak instantaneous flow rate immediately prior to spray effluent storage, with exceptions as noted below. The applicant shall utilize a free chlorine or total chlorine residual as necessary to achieve an E coli bacteria count of 77 colonies/100 ml or less in the effluent discharged to the effluent storage pond.

(B) Other disinfection systems such as ultraviolet radiation may be proposed for review and approval by the Secretary.

(C) If the system operation indicates that there is minimal re-colonization by E coli bacteria (77 colonies/100 ml or less), the effluent does not have to be chlorinated prior to spraying. A month long test period with weekly sampling would be required during the winter (November - March) and summer (June - October) periods. During these test periods, the spray effluent would be tested weekly for E. coli. If the spray effluent meets the required effluent limitation for E. coli, no chlorination of the spray effluent would be required. If the limitation is not met, the spray effluent must be chlorinated prior to spraying regardless of the disinfection system used prior to the storage lagoon.

(D) The winter and summer test periods are considered important in ascertaining whether or not a particular treatment system can reliably achieve the necessary disinfection and not create a health hazard.

Subchapter 18 - Experimental Systems

§14-1801 Applicability

(a) Applicants and/or their consultants may submit designs for treatment and/or disposal systems which are not contained in the rules but which meet the intent of the rules. These shall be considered experimental systems.

§14-1802 Experimental Treatment Systems

(a) Experimental treatment systems which are proposed and which the Secretary finds are analogous to treatment systems authorized by these rules shall meet all the minimum requirements for the latter as determined by the Secretary.

(b) Experimental treatment systems which are proposed and which the Secretary finds are not analogous to treatment systems authorized by these rules must be based on established engineering principles and designed in accordance with TR-16 - Guides For the Design of Wastewater Treatment Works, 1998 Edition. The Secretary may also impose other requirements as necessary to ensure the reliability of the experimental treatment system.

(c) Prior to submitting a formal application containing the engineering plans for an experimental treatment system, the applicant shall have a Vermont registered professional engineer prepare a thorough Basis of Design for the treatment system for review and approval by the Secretary. In preparing the Basis of Design the engineer shall follow guidance documents as provided by the Secretary including “Submittal Guidelines for Division Review and Approval of Proposed Wastewater Treatment Facilities.”

(d) The Secretary will make a determination to approve or reject the Basis of Design for the experimental treatment system in writing and will state the reasons for the determination. If approved, the applicant shall have a Vermont registered professional engineer prepare detailed engineering plans and specifications for the experimental treatment system to be submitted with an application for an indirect discharge permit. The plans and specifications shall also be subject to the review and approval of the Secretary.

§14-1803 Experimental Disposal Systems

(a) Requests for approval of experimental disposal systems must be filed in advance of any application for an indirect discharge permit. All applicable site investigations and reports, as described under §14-1101 or §14-1601 shall be completed and submitted to the Secretary. The request for approval must include a complete description of the proposed disposal system, how the design varies from disposal systems authorized under these rules, and how the proposed system meets the following criteria:

(1) The proposed design is based on established engineering principles and can be expected to perform with the same level of reliability and environmental protection as the conventional disposal systems described in these rules; and

(2) The public and persons associated with the system are protected from health hazards during the operation of the experimental disposal system.

(b) The applicant must demonstrate that a disposal system fully complying with these rules can be constructed if the experimental disposal system fails.

(c) The Secretary will make a determination to approve or reject the design for the experimental disposal system in writing and will state the reasons for the determination. If the design is approved, the applicant shall have a Vermont registered professional engineer prepare detailed engineering plans and specifications for the experimental disposal system to be submitted with an application for an indirect discharge permit. The plans and specifications are subject to the review and approval of the Secretary.

(d) Disinfection using ultraviolet radiation or other system approved by the Secretary shall be required for all experimental disposal systems that include effluent application rates above those allowed for recirculating sand filter effluent.

§14-1804 Testing Period and Criteria for Success/Failure

(a) Any indirect discharge permit authorizing an experimental system shall specify a test period for determining whether or not the experimental treatment system and/or experimental disposal system has achieved the performance objectives (e.g. effluent limitations, application rate, etc.). The performance objectives for the system shall be listed in the indirect discharge permit. Criteria for success and failure shall also be listed as appropriate.

§14-1805 Corrective Action

(a) If an experimental treatment system fails to meet its performance objectives, the Secretary reserves the right to require the permittee to install additional treatment units or replace with other approved treatment processes as necessary to achieve a specified effluent quality objective.

(b) If an experimental disposal system fails to meet its performance objectives, the Secretary reserves the right to require the permittee to correct the situation, if possible. Otherwise the permittee will be required to install the previously specified fully complying disposal system.

Subchapter 19 - Non-Sewage Wastewater

§14-1901 Determination of Jurisdiction

(a) For projects involving the disposal of non-sewage wastewater it is recommended that the applicant and system designer consult with representatives of the Secretary at an early stage of project development to ascertain legal jurisdiction, planning and design requirements (See §14-607, p. 31).

§14-1902 Design Considerations

(a) Loadings

When designing wastewater treatment and disposal systems for projects generating non-sewage wastewater the designer will establish hydraulic flows, solids loadings, and organic loadings. Flow and loading variations, both cyclical and chronological, will be considered in all specialized designs. Whenever applicable, normal domestic sewage strength will be the standard of comparison for all non-sewage wastewater. Normal domestic sewage strength after septic tank treatment is typically characterized by a biochemical oxygen demand (5-day) concentration of < 400 mg/L and a total suspended solids concentration of < 150 mg/L.

(b) Characterization of Wastewater

When the non-sewage wastewater contains non-conventional pollutants (anything other that those found in domestic sewage) and/or conventional pollutants in concentrations substantially greater than in domestic sewage the designer will report each pollutant and its concentration and loading, in the permit application. The designer will also render his/her professional opinion as to the fate of these pollutants after passage through the proposed wastewater treatment system and their impact on the quality of ground and surface waters. If any of the pollutants are considered hazardous or toxic waste the application will be reviewed by hazardous and toxic waste experts in the Department. They may recommend that jurisdiction of the system remain under these rules or claim jurisdiction over the project based on Vermont hazardous and toxic waste laws.

(c) Food Processing Wastes

The Secretary may consider non-sewage wastewater from food processing facilities discharged to agricultural lands as fertilizer amendments. The Secretary may issue permits for these non-sewage discharges with adequate conditions and monitoring considered necessary to prevent a violation of the Water Quality Standards. The Secretary may establish guidelines and procedures for the design and operation of different types of non-sewage waste treatment facilities.

(d) Reliability

In the design of all non-sewage wastewater treatment systems the Secretary will require a level of design, construction and operation reliability to ensure that the proposed system can function as intended without violation of permit conditions or Vermont Water Quality Standards.

Subchapter 20 - Operational Reliability, Multiple Use and Unidentified Risk

§14-2001 Operational Reliability

(a) General Requirements

(1) Monitoring

Monitoring of the treatment systems for indirect discharges shall be conducted at the frequencies specified in the permit. Monitoring requirements shall be commensurate with the nature of the indirect discharge, the size of the system and the potential for alteration of the chemistry and aquatic biota of the receiving waters.

(2) Quality Assurance/Quality Control Plan (QA/QC Plan)

All operational testing, effluent monitoring and ground and surface water monitoring shall be conducted following procedures for sampling and analysis in accordance with a Quality Control/Quality Assurance Plan submitted to and approved by the Secretary.

(3) Inspection

Annually, during the month of April (unless otherwise specified by the Secretary), a professional engineer shall thoroughly inspect the complete sewage collection, treatment and disposal system for any evidence of failure and report all necessary repairs and maintenance required for the proper operation of the system. The engineer's inspection report shall be submitted to the Secretary by June 1st for review and approval unless otherwise specified by the Secretary.

(b) Septic Tank Effluent System Operational Reliability

(1) Pumping

During the system's annual inspection the depth of sludge and scum shall be measured in all septic tanks. The septic tanks shall be pumped if: 1) the sludge is closer than twelve (12) inches to the outlet baffle or; 2) the scum layer is closer than three (3) inches to the septic tank outlet baffle or; 3) if otherwise recommended by the inspecting engineer. Before pumping the tanks, the permittee shall notify the Secretary in writing of the name and address of the pumper and the municipal sewage treatment facility, or other facility approved by the Secretary, where the septage is to be disposed.

(c) Advanced Treatment Systems Operational Reliability

(1) Certified Operators

(A) All treatment facilities other than septic tanks shall be operated by a chief and assistant chief Wastewater Treatment Facility Operator both having a current wastewater treatment plant operator's certificate for the correct grade based on the system. The operator's certification grade shall be established using the Vermont Water Pollution Abatement Facility "Operator Certification Regulations" effective October 21, 1985. At the discretion of the Secretary, an assistant chief operator may not be required for those treatment systems requiring infrequent oversight.

(B) All wastewater treatment facilities operating in accordance with an indirect discharge permit issued under these rules and with a design flow of 50,000 gallons per day or less may have an assistant chief operator with a provisional certificate.

§14-2002 Multiple Use and Effluent Re-Use

(a) Any planned multiple use of the disposal area or re-use of the effluent will be evaluated on its own merits, and approvals granted at the discretion of the Secretary (in consultation with the Department of Health as necessary), 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 or effluent re-use (e.g., agricultural use of disposal field area, golf course irrigation), the applicant must show that the environmental or health concerns have been adequately addressed in the design.

§14-2003 Unidentified Risk

(a) If, during the review process, facts arise which raise questions as to the adequacy of a proposed system to pose only a negligible risk to public health, the Secretary may refer the matter to the Department of Health to determine if there is a substantive public health issue for which adequate protection may not be provided in the design.

(b) If a finding of negligible risk to public health cannot be made, the applicant will be notified and given the opportunity to revise the system design to pose no more than a negligible risk to public health to the satisfaction of the Department of Health.

Subchapter 21 - Water Supply Isolation and Protection

§14-2101 Isolation Distances

(a) Any downgradient water supply wells must be located outside the two-year time of travel path for the effluent plume.

(b) The design of the system must be in compliance with the isolation distances listed in Table #21, Isolation Distances (pp. 131-132).

(c) The Secretary may increase the minimum isolation distances in this section, or prescribe any additional safeguards it deems necessary when the depth to the aquifer or the nature of the overburden material is not sufficient to protect groundwater.

§14-2102 Water Supply Protection

(a) Hydrogeologic Connection

If hydrogeologic connections are deemed to exist between a water supply and an indirect discharge as proposed, the Secretary shall apply the following criteria which, if met, will allow approval of the discharge:

(1) A minimum residence time, in saturated materials, of two years to reasonably insure that pathogenic microorganisms will be eliminated. Calculation of residence time must take into account the following:

(A) horizontal hydraulic conductivities in the materials with the largest hydraulic conductivity; and

(B) the cone of influence of production wells being considered.

(2) The indirect discharge, combination of indirect discharges, or background groundwater conditions should not increase the level of contamination of any drinking water supply to more than one-half (2) the Enforcement Standard for the Primary Groundwater Quality Standards of the Groundwater Protection Rule and Strategy (Environmental Protection Rules, Chapter 12, effective January 20, 2000, as amended). Nitrate nitrogen (measured as N) shall be used as an indicator when dealing with sewage wastes. Other parameters may be used for non-sewage wastes after consultation with and approval by the Secretary. For sewage discharges, calculations should take into account the following:

(A) assuming that the concentration of Nitrate nitrogen at the infiltrative surface of the leachfield or in the soil immediately downgradient of the sprayfield is 40 mg/L;

(B) assuming that no denitrification takes place in the subsoil;

(C) dilution with precipitation and groundwater flow;

(D) dispersion;

(E) background groundwater concentrations of Nitrate nitrogen; and

(F) other existing sources of Nitrate nitrogen in the subsurface drainage basin including fertilizers.

(3) The above criteria presume that the treatment of wastewater will be in accordance with the design standards for sewage treatment and disposal as listed in these rules, and that there will be a minimum of three (3) feet of unsaturated soil between the base of the subsurface disposal field and the seasonal high water table or one foot of unsaturated soils during the operation of any sprayfield.

(4) Methods of calculating these values should be designed to closely approximate actual conditions and should be determined in consultation with the Secretary.

§14-2103 Groundwater Protection Rule and Strategy

(a) All indirect discharges shall comply with the requirements and conditions of the Vermont Groundwater Protection Rule and Strategy, effective January 20, 2000, as amended.

§14-2104 Public Water Source Protection Area

(a) Definition

The Public Water Source Protection Area (PWSPA) refers to the surface and subsurface area, designated by the Secretary, surrounding a water well or well field supplying a public water system through which contaminants are likely to move toward and reach such water well or well field.

(b) Construction Standards for Public Water Source Protection Areas

All sewage collection facilities constructed within a PWSPA shall comply with the standards listed below. However, Professional Engineers are encouraged to use equally or more effective technologies or practices in the design of systems under these guidelines. When proposing an alternative design, the engineer shall state the basis of design and provide evidence to substantiate its reliability. The engineer may also propose materials other than those specified here for acceptance by the Secretary.

(1) Sewerlines must be constructed to either (A) or (B) below:

(A) bell and spigot pipe with Neoprene boot and stainless steel band straps and stainless steel adjustment screw for the following pipe:

(i) PVC-SDR-35 (ASTM 3034), or

(ii) Ductile iron - Schedule 50, 51, or 52

(B) Mechanical joint construction using ductile iron pipe, Schedule 50, 51, or 52.

(2) Pump Stations

(A) All pump station inlet and outlet piping must be ductile or cast iron mechanical joint pipe. Connections to wet wells or manholes must be Neoprene boot with stainless steel band straps and stainless steel adjustment screw.

(3) Manholes and Wet Wells

(A) Pipe inlet and outlet connections must be flexible Neoprene boot with a stainless steel band strap and stainless steel adjustment screw.

(B) Joints between manhole sections (precast manholes) shall have a watertight gasket seal.

(C) The base section floor slab shall be fabricated monolithic with the manhole walls.

(4) Force Mains

(A) Force mains above frost line shall be constructed of ductile iron pipe with mechanical joint.

(B) Force mains below frost line shall be constructed of either (a) PVC pressure pipe with bell and spigot joints, or (b) ductile iron pipe with bell and spigot joints or mechanical joints.

(5) Testing Requirements

(A) All gravity sewer pipe shall be tested for exfiltration with a low pressure air test after backfilling between manholes. If a water table has been noted, the pressure shall be adjusted to compensate for the static water level over the invert elevation of the pipe. See §14-1003(j) for testing requirements.

(B) All force mains shall be pressure tested to the pressure rating of the pipe. At a minimum the pressure rating of the pipe shall be twice the expected operating pressure of the system. See §14-1005(g) for testing requirements.

(C) All manholes shall be tested with a hydrostatic test (24 hours with no exfiltration) after backfilling or vacuum tested prior to backfilling. See §14-1003(k) for testing requirements.

(D) All wet wells and pump stations tankage shall be hydrostatically tested for leakage. See §14-1004(n)(5) for testing requirements.

(E) All components shall comply with allowable leakage rates listed in these rules.

Subchapter 22 - Aquatic Biota Criteria

§14-2201 Assessment of Significant Alteration of Aquatic Biota

(a) Following sampling, identification, and enumeration of the macroinvertebrate community, in accordance with guidelines provided by the Secretary, and sampling for periphytic chlorophyll accumulation as outlined in §14-2202(a), the applicant, permittee or his/her consultant shall conduct comparative analyses to test for significant alteration of the aquatic biota. In order to provide clear and convincing evidence that a *New Indirect Discharge of Sewage* has not caused a significant alteration of the aquatic biota, the data on the macroinvertebrate community and the periphytic community must be assessed as outlined below:

(1) Periphytic Community Assessment

In order to demonstrate compliance with the criterion of no significant alteration of the aquatic biota, the assessment of periphytic chlorophyll accumulation must indicate no significant differences between or among stations at the 99.9% probability level ($P \leq 0.001$ two-tailed test).

(A) Periphytic Chlorophyll Accumulation

The sampling and testing procedure for determining the periphytic chlorophyll accumulation is outlined in §14-2202(a). The Mann-Whitney U test, a non-parametric equivalent of the Student's T-test, shall be used to determine if there are significant differences between control and impact stations. Significant differences at $P \leq 0.001$ (two-tailed test) shall indicate a significant alteration of the aquatic biota (SAAB).

(2) Macroinvertebrate Community Assessment

The following four metrics are used to assess the macroinvertebrate community relative to the criterion of no significant alteration of the aquatic biota:

(A) Pinkham-Pearson Coefficient of Similarity

The procedure for determining the Pinkham-Pearson Coefficient of Similarity (PPCS) metric is outlined in §14-2202(b).

(i) If the PPCS is equal to or greater than 0.75 a determination of no significant alteration of the aquatic biota (NSAAB) is indicated and no further analyses under §14-2201(a)(2) are required.

(ii) If the PPCS is less than or equal to 0.25, a determination of significant alteration of the aquatic biota (SAAB) is indicated and no further analyses under §14-2201(a)(2) are required.

(iii) If the PPCS is between 0.25 and 0.75, no significant determination (NSD) can be made. The assessment must continue with the Biotic Index metric.

(B) Biotic Index

The procedure for determining the Biotic Index (BI) metric is outlined in §14-2202(c).

(i) If the change in BI is less than 0.5, a determination of no significant alteration of the aquatic biota (NSAAB) is indicated. The assessment shall continue with the Ephemeroptera - Plecoptera - Trichoptera Taxa Richness metric.

(ii) If the change in BI is equal or greater than 0.5, and that change is statistically significant ($P \leq 0.05$, Mann-Whitney U Test), a determination of significant alteration of the aquatic biota (SAAB) is indicated. No further analyses under §14-2201(a)(2) are required.

(iii) If the change in BI is equal to or greater the 0.5 and that change is not statistically significant ($P > 0.5$, Mann-Whitney U Test), excessive data variability is indicated and no significant determination (NSD) can be made using the BI. The assessment shall continue with the Ephemeroptera - Plecoptera - Trichoptera Taxa Richness metric.

(C) Ephemeroptera-Plecoptera-Trichoptera Taxa Richness

The procedure for determining the Ephemeroptera - Plecoptera - Trichoptera Taxa Richness (EPT) metric is outlined in §14-2202(d).

(i) If the mean EPT richness change is less than 20%, a determination of no significant alteration of the aquatic biota (NSAAB) is indicated. The assessment shall continue with the Relative Abundance metric.

(ii) If the mean EPT richness change is equal to or greater than 20% and that change is statistically significant ($P \leq 0.05$, Mann-Whitney U Test), a determination of significant alteration of the aquatic biota (SAAB) is indicated. No further analyses under §14-2201(a)(2) are required.

(iii) If the mean EPT richness change is equal to or greater than 20% and that change is not statistically significant ($P > 0.05$, Mann-Whitney U Test), excessive data variability is indicated and no significant determination (NSD) can be made using the EPT index. The assessment shall continue with the Relative Abundance metric.

(D) Relative Abundance

The procedure for determining the Relative Abundance metric is outlined in §14-2202(e).

(i) If the change in relative abundance is not statistically significant ($P > 0.05$, Mann-Whitney U Test) and both the Biotic Index and Ephemeroptera - Plecoptera - Trichoptera Taxa Richness metrics have indicated no significant alteration of the aquatic biota (NSAAB), a final determination of NSAAB is indicated.

(ii) If the change in relative abundance is statistically significant ($P \leq 0.05$, Mann-Whitney U Test), a determination of significant alteration of the aquatic biota SAAB is indicated.

(iii) If the change in relative abundance is not statistically significant ($P > 0.05$, Mann-Whitney U Test) and either the Biotic Index or the Ephemeroptera - Plecoptera - Trichoptera Taxa Richness metric has resulted in finding of no significant determination (NSD), excessive data variability is indicated and no significant determination can be made.

(b) Evaluation of Results

The Secretary will review all pertinent stream data and factors affecting the monitoring locations prior to making a finding that a significant alteration of aquatic biota has occurred due to the indirect discharge.

(c) No Significant Determinations

If the macroinvertebrate assessment results in no significant determination due to excessive data variability the following process shall be followed:

(1) The data set will be examined to determine the source of the excessive variability. If scientific justification can be found for reducing that variability of the existing data, the data will be adjusted and re-evaluated as above.

(2) If the data variability cannot be justifiably reduced, the Secretary, using best professional judgement, will make a compliance ruling and/or require additional biological monitoring at the sampling locations bracketing the indirect discharge. Additional monitoring would include a complete review of sampling locations, collection methods, analytical methods and techniques.

§14-2202 Methods

(a) Periphytic Chlorophyll Accumulation

(1) Testing Periods

Three testing periods shall be used in determining whether or not significant differences in chlorophyll accumulation between stations is in evidence: Spring (May 15 - June 30), Summer (July 15 - August 31) and Fall (September 15 - October 31). Testing is normally required only during the Summer period but the Secretary reserves the right to require testing during the Spring and Fall periods.

(2) Sampling

Three samplers shall be deployed at each station at locations approved by the Secretary. Each sampler shall include four rectangular granitic blocks (1/4" x 1" x 3") for a total of 12 station replicates (n = 12). Samplers shall be left in-stream for a period of three to four weeks during each sampling period.

(3) Sample Processing

Each block shall be scraped and analyzed for chlorophyll a using Standard Method 1002G or an equivalent approved by the Secretary. Results for each block shall be reported in terms of mg/m^2.

(4) Data Analysis

Data shall be analyzed for significant differences between stations using the Mann-Whitney U test procedure. For comparing 3 or more stations, the Kruskal-Wallis test procedure shall be used. Both tests shall use $P \leq 0.001$ (two-tailed).

(b) Pinkham - Pearson Coefficient of Similarity

(1) Description

The Pinkham-Pearson Coefficient of Similarity (PPCS) as described by Carlos F. A. Pinkham and J. G. Pearson (1976) shall be used to make an immediate compliance determination when alteration/no alteration of the aquatic biota is extreme. Information is also generated by this index relative to the magnitude of intermediate effects. The PPCS involves a stepwise comparison of both abundance and structural factors, providing a numerical indicator of the changes in the biological integrity (standing crop and taxonomic structure) of the macroinvertebrate community from the control to impact area. Values range from 0 (total dissimilarity) to 1 (total similarity).

(2) Calculation

The PPCS is calculated as follows:

$$\mathbf{PPCS} = 1/k \sum_{i=1}^{k} \frac{\mathbf{minimum(xia,xib)}}{\mathbf{maximum\ (xia,xib)}}$$

Where:

k = the number of comparisons between stations
xi = the number of individuals in taxon i
a,b = site a, site b

(3) Data Requirements

(A) a valid estimate of the relative abundance of aquatic macroinvertebrates from the control and impact areas. For the purposes of this evaluation, five (5) quantitative replicate samples from each area will be considered to be a valid data base for estimating relative abundance. A sample collected by means of an appropriate artificial substrate sampling device will be considered to be a quantitative sample. Other sampling devices may be approved by the Secretary on a case-by-case basis.

(B) identification and enumeration of individual organisms at the generic taxonomic level, unless otherwise specified by the Secretary.

(C) mean abundance and percent composition for each generic level taxonomic component of the sampled macroinvertebrate community at each site.

(D) determination of the major taxonomic components (generic level) of each site sample (5 replicates). A major taxonomic component is defined as all taxa (genus) whose mean abundance makes up 3.5% or more of the mean total abundance at either of the two sampling sites. The PPCS calculation will involve only the major taxonomic components in order to eliminate disproportional representation in the index from rare or minor taxa.

(4) Interpretation Guidance

Examination of data on file at the Department of Environmental Conservation as well as from the general scientific literature suggest the following conclusions:

(A) PPCS values greater than 0.75 calculated from data as previously described can and do occur due to natural spatial variability in macroinvertebrate distribution as well as to sampling error.

(B) PPCS values in the range of 0.25 to 0.75 indicate a possibility that significant alterations in the biological integrity of the aquatic macroinvertebrate community have occurred. A wide range of effects can be exhibited within this range of similarity and further evaluation of the data must be made in order to establish the significance of observed changes.

(C) PPCS values of less than 0.25 indicate a categorically significant alteration to the biological integrity of the aquatic macroinvertebrate community. A change of this magnitude indicates a large change in abundance and/or a major restructuring of the macroinvertebrate community and may include the reduction or total elimination of major taxonomic orders (i.e. mayflies, stoneflies, caddisflies, etc.) or the reduction or elimination of major functional processes within the macroinvertebrate community. Alterations of this magnitude may indicate profound effects on the entire aquatic ecosystem.

(c) Biotic Index

(1) Description

The biotic index to be used in this analysis is the Hilsenhoff Biotic Index (BI) (Hilsenhoff, 1982) with specific modifications made by the Secretary for the aquatic macroinvertebrate fauna of Vermont. The BI uses the concept of indicator organisms.

Each taxon is assigned a tolerance value based primarily on that specific organism's response to nutrient/organic enrichment. As with the PPCS, the BI is an integrating index which uses information concerning both the relative abundance and organic pollution tolerance of individual taxa. The evaluation involves the stepwise analysis of each taxa, relating its pollution tolerance to its relative abundance in the community. Data on file at the Agency as well as the literature indicate that the BI is a highly sensitive and reliable index of nutrient/organic enrichment.

(2) Calculation

The following formula is used to calculate the BI:

$$\mathbf{BI} = \sum \frac{(ni \times ti)}{N}$$

Where:

N = the total number of individuals in the sample
ni = the number of individuals in taxa i
ti = the tolerance value assigned taxa i

(3) Data Requirements

Data requirements for calculating the Biotic Index are the same as for PPCS calculations, with the following exceptions:

(A) Organism identification must be made to the lowest possible taxonomic level, ideally species, due to intra-generic differences in tolerance.

(B) Calculations include all organisms found in the site sample that have been assigned a BI value by the Secretary. Analysis is not limited to the major taxonomic components, as is the case for the PPCS.

(4) Interpretation Guidance

(A) Tolerance values for individual organisms range from 0 to 5 where (0 = very intolerant, 5 = very tolerant). Likewise, the BI also ranges from 0 to 5 (pristine to extremely degraded). In reality, a BI value of 0 or 5 is very unlikely to occur; most values falling in the range of 1 - 4. The major factor driving the BI in its low to mid-range appears to be related to changes in the macroinvertebrate vegetative food base, consisting primarily of periphyton and particulate organic material. The upper end of the BI scale appears to be driven by factors associated with extreme organic degradation.

(B) The following is a generalized water quality rating for the BI:

BI Value	Water Quality Rating
BI < 1.5	Excellent, undisturbed
1.5 - 2.	Very good, minor change
2.0 - 2.75	Good, moderate change
2.75 - 3.5	Fair, major change
BI $\geq$ 3.5	Poor, highly degraded

(C) Based on analysis of data on file with the Secretary as well as data in the literature, the following conclusions appear to be true:

(i) A Biotic Index value of greater than 3.5 indicates a level of enrichment not normally occurring in an undisturbed system. At this level of enrichment it is highly probable that beneficial uses and values of Class B waters are degraded.

(ii) The mean detectable change in BI is 0.3 units.

(iii) A statistically significant ($P \leq 0.05$ Mann-Whitney U Test) change in BI equal to or greater than 0.5 units indicates a significant alteration of the aquatic biota.

(iv) An increase in BI indicates an enrichment impact while a decrease in BI indicates an impact resulting from some factor having a depressive influence on productivity in the receiving water.

(d) Ephemeroptera-Plecoptera-Trichoptera Taxa Richness (EPT)

(1) Description

Mayflies, stoneflies, and caddisflies make up a major proportion of the macroinvertebrate communities in Vermont's natural, undisturbed streams and these three orders of insects are relatively more sensitive to pollution and therefore respond to pollution in a relatively predictable manner. Changes measured in the taxa richness provide a reliable indication of changes to the taxonomic integrity of the aquatic biota. EPT taxa richness is defined here as the mean number of taxa from the orders Ephemeroptera, Plecoptera, and Trichoptera present at a site.

(2) Calculation

The EPT is calculated as follows:

$$\mathbf{EPT} = \frac{\sum_{i=1}^{N} \mathbf{EPT_i}}{N}$$

Where: EPT_i = the number of EPT taxa from replicate i
N = number of replicates

(3) Data Requirements

Data requirements are the same as for the PPCS.

(4) Interpretation Guidance

Based on analysis of data on file with the Secretary as well as data in the literature, the following conclusions appear to be true:

(A) When a change of 30% in the EPT taxa occurs a moderate level of impairment of the macroinvertebrate community is indicated. A change of greater than 50% indicates a severe impact on the aquatic biota.

(B) The mean detectable change in EPT is 10%.

(C) A statistically significant change in the EPT index of > 20% indicates a significant alteration of the aquatic biota.

(D) An increase in EPT taxa can indicate enrichment of the macroinvertebrate community while a decrease in EPT taxa indicates suppression of the macroinvertebrate community probably from habitat degradation or toxic pollutants.

(e) Relative Abundance

(1) Description

Calculation of changes in the relative abundance of aquatic macroinvertebrates provides a means of evaluating changes in gross primary and secondary biologic production.

(2) Calculation

Relative abundance is defined here as the mean number of organisms per replicate from a sampling area and is calculated as follows:

$$RA = \frac{\sum_{i=1}^{N} T_i}{N}$$

Where: RA = Relative Abundance
N = number of replicates
T_i = number of individuals in replicate i

(3) Data Requirements

Data requirements are the same as for the PPCS.

(4) Interpretation Guidance

(A) Estimates of relative abundance are fairly imprecise, often with variability of 20 - 40% of the mean. Because of this imprecision, a statistically significant change in relative abundance from control to impact area constitutes a significant alteration of the aquatic biota.

(B) An increase in abundance indicates an increase in productivity from enrichment. A decrease in density of organisms is often caused by habitat degradation or toxic pollutants.

(C) The Mann-Whitney U Test will be applied to control/impact data to determine statistical significance of observed changes. The 95% probability level ($P \leq 0.05$) will be used to determine significance.

§14-2203 Non-Parametric Statistical Procedures

(a) Analysis of biological data by parametric statistical procedures is usually inappropriate because assumption of normal data distribution and homogeneity of variance required for parametric analysis are almost never met by biological data. Data may be transformed by various procedures in order to meet parametric assumptions, however, a replication level of less than ten is generally considered too small to effectively test the data for compliance with distributional and variance homogeneity assumptions. Therefore, for testing statistical significance between paired stations (i.e. control and impact), a non-parametric equivalent of the parametric T-test or Analysis of Variance will be used. Non-parametric tests require no assumptions of the data and can be applied to raw biological data. For the purposes of this evaluation, the Mann-Whitney U Test (paired stations) or Kruskal-Wallis test (for three or more stations) will be applied to determine the statistical significance of measured changes in Biotic Index, Ephemeroptera-Plecoptera-Trichoptera Taxa Richness, and Relative Abundance.

(b) Mann-Whitney U Test and Kruskal-Wallis Test calculations and tables can be found in Sokal and Rohlf (1969), Elliot (1971), Zar (1974) and other statistical texts. When determining critical values for the U statistic or H statistic, probability values for a two-tailed test should be applied.

§14-2204 Taxonomic References

(a) A listing of the current references used in the taxonomic identification of aquatic macroinvertebrate fauna is available from the Secretary upon request.

Subchapter 23 Addresses for Organizations Which Publish the Codes and Material Standards Incorporated by Reference in These Rules

§14-2301 Address List

(a) ASTM American Society for Testing and Materials
100 Barr Harbor Drive
West Conshohocken, Pennsylvania 19428-2959
Telephone: 610-832-9585
www.astm.org

(b) NEIWPCC New England Interstate Water Pollution Control Commission
Boott Mills South
100 Foot of Johns Street
Lowell, Massachusetts 01852
www.neiwpcc.org

For copies of:
Guides For The Design Of Wastewater Treatment Works, 1998 Ed.
New England Interstate Environmental Training Center
2 Fort Road
South Portland, Maine 04106
Telephone: 207-767-2539

(c) National Fire Protection Association, Inc.
1 Batterymarch Park
Quincy, Massachusetts 02269-9101
Telephone: 800-344-3555
617-770-3000
www.nfpa.org

*The National Electrical Code is a Registered Trademark of the National Fire Protection Association, Inc. of Quincy Mass.

(d) NEMA National Electrical Manufacturers Association
1300 North 17th Street
Suite 1847
Rosslyn, Virginia 22209
Telephone: 703-841-3200
www.nema.org

Publications available through Global Engineering Documents
Telephone: 800-854-7179
www.global.ihs.org

(e) 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, 1997 Edition