

Onsite Wastewater Systems & Title 5 Rules: Basic Concepts

Presented to the Massachusetts Environmental Health Association

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SUBJECTS

- Wastewater and how is it regulated
- What are the concerns about wastewater?
- What is an Onsite Wastewater System and how does it function?
- What are the Title 5 Rules?
- How are Title 5 Rules Implemented by Boards of Health?
- Resources

Introduction

- Disclaimer

This presentation is prepared by Dan Ottenheimer and not by the good people at the Massachusetts DEP

Introduction

- Terminology

Septic tank & septic system – poor terminology

Onsite sewage treatment and disposal systems – Title 5 term

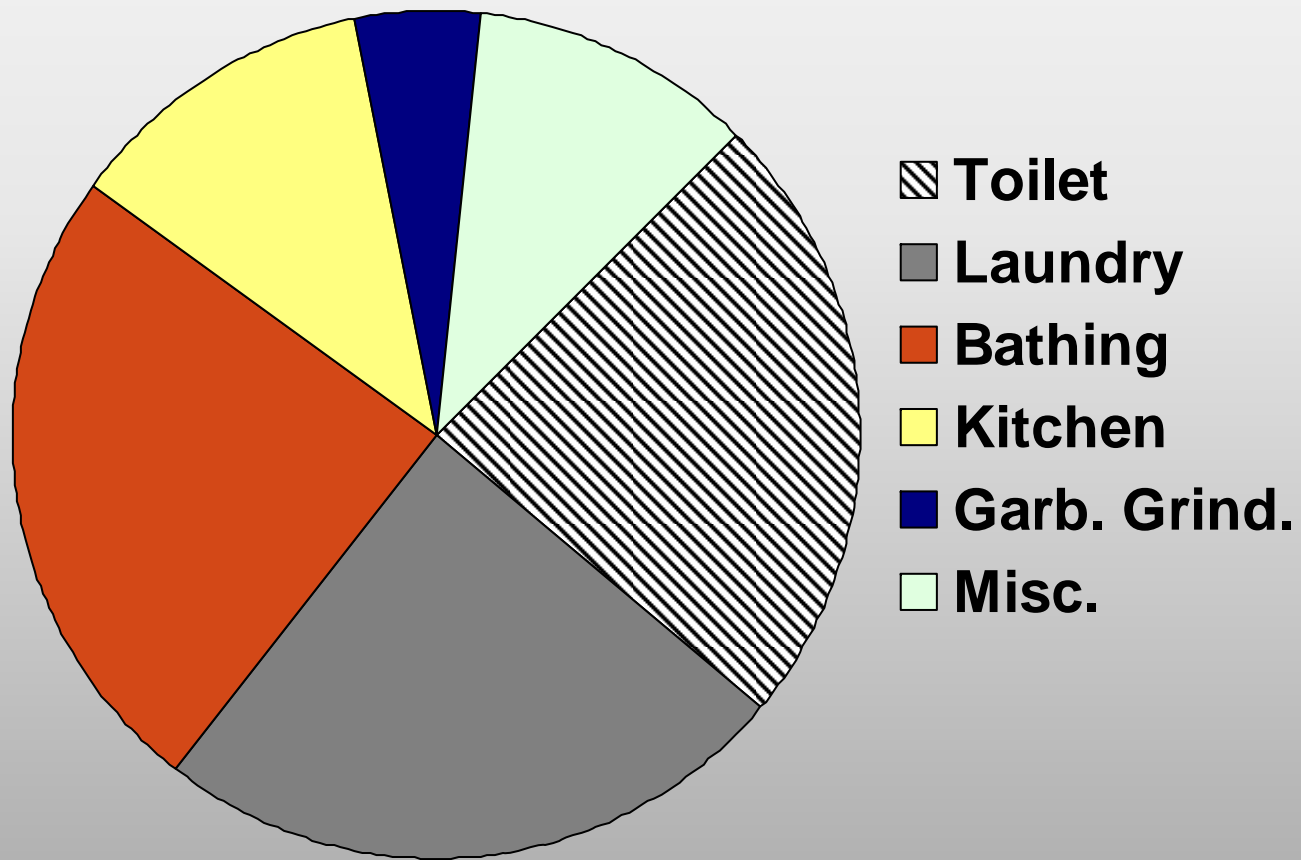
Onsite wastewater treatment and dispersal system – perfect descriptor but too wordy

Onsite wastewater system – should become the commonly used term

What is wastewater?

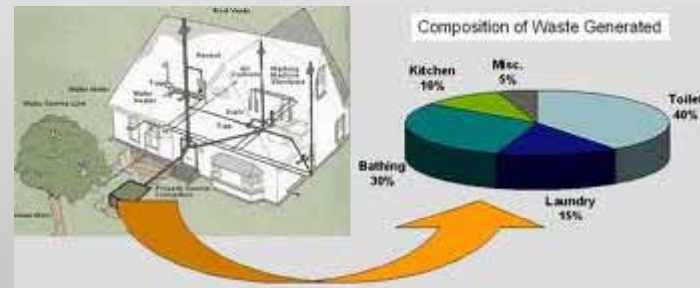
- The liquid by-products of domestic, commercial and industrial processes
- Industrial and commercial wastewater is regulated by DEP and EPA
- Sanitary wastewater from domestic sources is subject today

Composition of Domestic Wastewater



Wastewater Concerns

- Why Are We Concerned About Proper Sewage Disposal?
 - Disease transmission
 - Environmental contaminants
 - Nuisance Conditions



Wastewater Concerns

- Diseases
 - Bacteria, protozoa, viruses and others
 - Historically sewage was huge factor in disease transmission
 - John Snow completed first modern epidemiological assessment of sewage and disease transmission

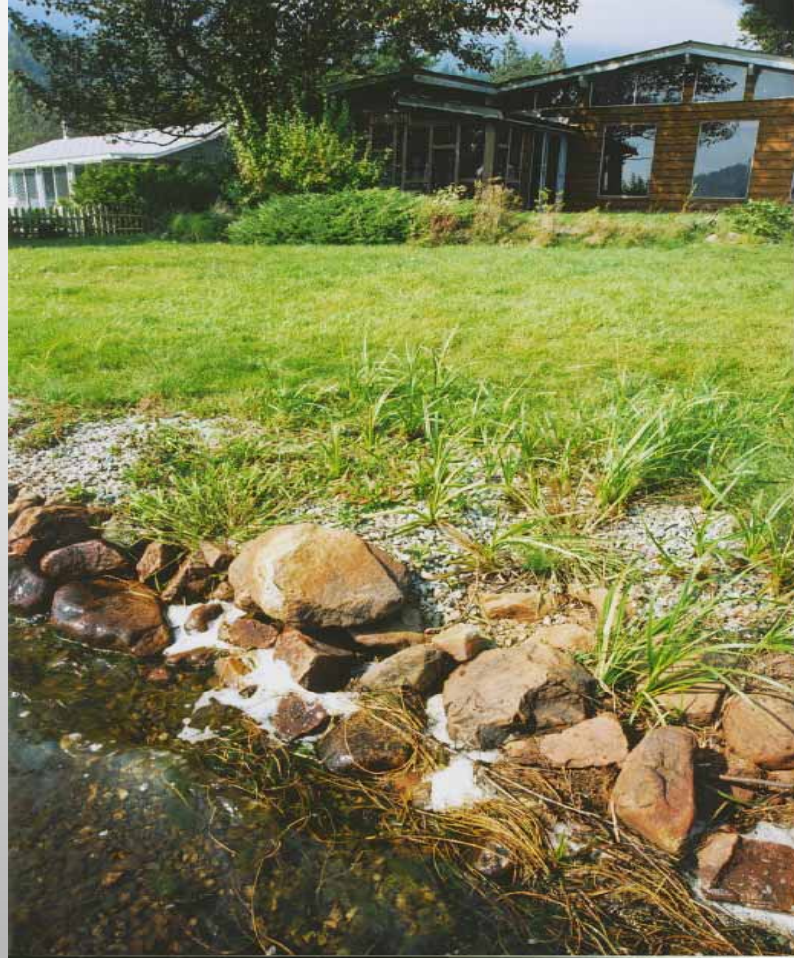
Wastewater Concerns



Wastewater Concerns

- Environmental Contaminants
 - Components of human waste that when concentrated become problematic
 - Can lead to fish kills, algae blooms, polluted ground water wells

Wastewater Concerns



Wastewater Concerns

Table 4-3. Percent of Limited or Restricted Classified Shellfish Waters Affected by Types of Pollution (Leonard et al., 1991)

	Septic Systems	Urban Runoff	Ag. Runoff	POTWs	Boats	Industry
North Atlantic	26	23	3	67	17	7
Mid-Atlantic	11	58	12	57	31	20
South Atlantic	34	34	28	44	17	21
Gulf	48	35	8	27	14	14
Pacific	19	36	13	25	15	42
Nationwide	37	38	11	37	18	17

Wastewater Concerns

- Nuisance conditions
 - Odors
 - Sewage ponding

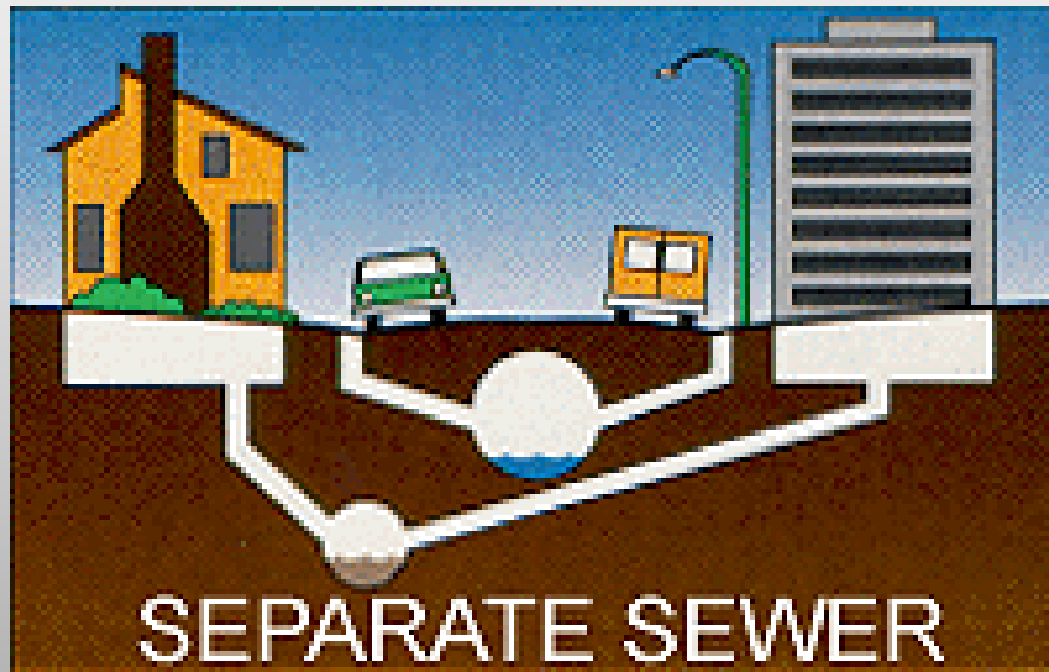
Wastewater Concerns

- Sound engineering, correct construction and proper treatment needed to avoid these problems

Treatment & Disposal Locations

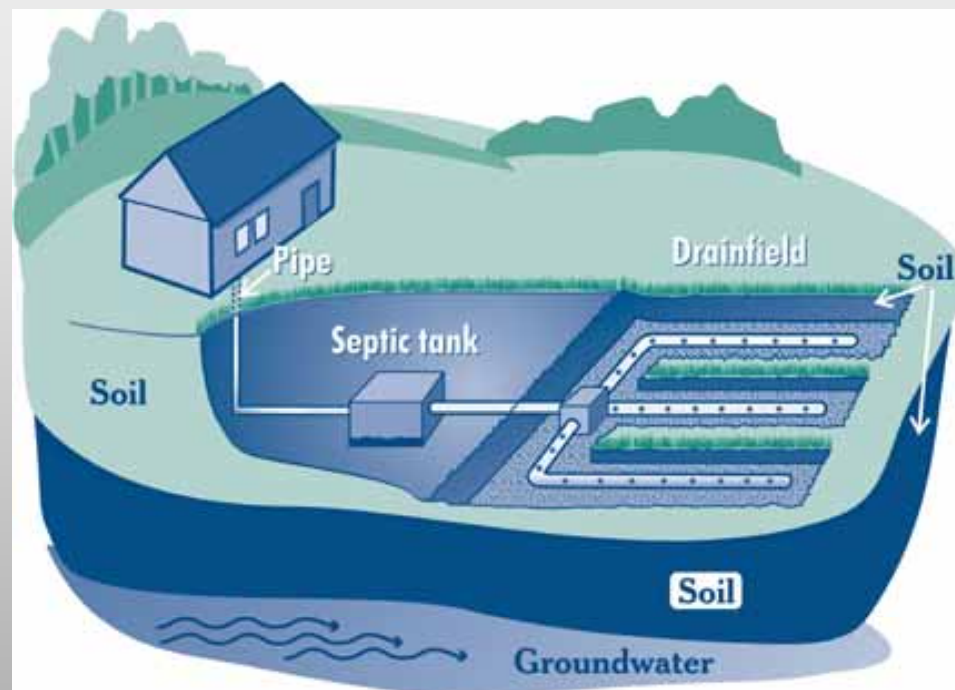
- Where Does Sewage Go?
 - Publicly owned sewer systems which collect, treat and discharge sewage to surface water (about 2/3 of Massachusetts residents)
 - Publicly or privately owned small neighborhood systems where sewage is collected, treated and discharged to surface water or ground water (less than 1% of Massachusetts residents)
 - Privately owned Onsite Wastewater systems which collect, treat and discharge to ground water (about 1/3 of Massachusetts residents)

Centralized Sewer Systems



Onsite Wastewater System

What is a Typical On-Site Wastewater Treatment and Dispersal System?



Background

What is an On-Site Wastewater System?

A Means to Collect, Treat, and Disperse Sanitary Wastewater Before Introduction to the Natural Environment

Background

Why do we regulate and care about an on-site wastewater system?

To Assure That the Means to Collect, Treat, and Disperse Sanitary Wastewater Before Introduction to the Natural Environment is Intended to Occur Properly

Historical Images of Wastewater Disposal



Regulating Onsite Wastewater

What Complications are There?

- Science is Evolving
- Regulations Not Easy to Read
- Folklore
- Processes Happen Out of Sight
- Multiple Audiences
- Regional Variation
- Emotional Subject
- Expensive Property Enhancement that is Often not Desired

Onsite Wastewater Governance

State and Local jurisdiction:

- Historically was only locally regulated
- DPH Article 11 provided basic standards
- 1970s Massachusetts Department of Environmental Protection (DEP) created
- DEP given authority to regulate large and small flows, rules written in Massachusetts Environmental Code
- Title 5 of Massachusetts Environmental Code governs onsite wastewater systems with flows up to 10,000 gallons per day

Onsite Wastewater Governance

- Initially adopted as Title 5 in 1978
- 1978 regulations were primarily engineering standards for new construction

Onsite Wastewater Governance

What is Title 5?:

- Rules designed to provide structure to the design, construction, operation, maintenance, inspection and enforcement of standards for onsite wastewater systems
- Also governs the transport of septage

Onsite Wastewater Governance

State and Local jurisdiction:

- Title 5 written by DEP
- Title 5 mostly implemented by Boards of Health
- Review of certain types of waivers must be approved by DEP
- Certain functions performed by state or local licensed individuals
- Home Rule allows local regulations to be developed in addition to Title 5

Onsite Wastewater Governance

What is Title 5?

- 155+/- pages long
- Dense reading, and not organized for beginners
- Strong in some areas (design standards, enforcement procedures), weak in other areas (construction, maintenance)

310 CMR: DEPARTMENT OF ENVIRONMENTAL PROTECTION 310 CMR 15.000: THE
STATE ENVIRONMENTAL CODE, TITLE 5: STANDARD
REQUIREMENTS FOR THE SITING, CONSTRUCTION, INSPECTION, UPGRADE AND
EXPANSION OF ON-SITE SEWAGE TREATMENT AND DISPOSAL SYSTEMS AND FOR
THE TRANSPORT AND DISPOSAL OF SEPTAGE

SUBPART A: GENERAL PROVISIONS AND ENFORCEMENT

15.001: Purpose, Authority and Related Provisions

15.002: Definitions

15.003: Coordination with Local Approving Authorities

15.004: Applicability

15.006: Facilities Where the Total Design Flow Generated on the Facility Equals 10,000 gpd
or Greater but Less than 15,000 gpd

15.007: Campgrounds

15.010: Division and Aggregation of Facilities

15.011: Criteria to Assess Whether Facilities are in Separate Ownership or Control

15.017: Approval of Soil Evaluators

15.018: Function of Soil Evaluators

15.019: Disposal System Installer's Permit

15.020: Disposal System Construction Permits

15.021: Certificates of Compliance

15.022: Duty of Compliance

15.023: Approving Authority Access

15.024: Violations of 310 CMR 15.000

15.025: Enforcement by Approving Authorities

Onsite Wastewater Governance

What is Title 5?:

- Available on DEP's website www.mass.gov/dep
- Trying to achieve many goals in one document. Not easy to write and not easy to meet everyone's expectations
- Much appreciation to primary authors of most current version John Higgins and David Ferris.

State Rules – Title 5

- Major re-write in 1995
- 1996 - Required inspections upon property sales (not required previously)
- 1996 – Allowed “Innovative and Alternative” technologies to be used (not allowed previously)
- 1996 – Allowed many variances to be approved by local officials (previously all by DEP)
- 1996 – Required more scientific assessment of ground water table (often incorrect previously)
- 1996 - Provided clear procedure for upgrading substandard systems

State Rules – Title 5

Selected 1996 Innovations & Their Benefits:

- Composting Toilets (Clivus) – graywater recycling
- Pre-treatment Systems (Waterloo Biofilter, Jet)
– allows smaller or lower leach fields
- Drip Dispersal (Perc-Rite) – allows less invasive construction, preserves vegetation

State Rules – Title 5

- 2004 - New percolation rate acceptable
(maximum was 30 minutes per inch, now 60)
- 2005 - Shallow soils more acceptable
(only C soil layer was acceptable, now B soil layer is)

System Inspections



Owner information is required for every page.

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Commonwealth of Massachusetts

Title 5 Official Inspection Form

Subsurface Sewage Disposal System Form - Not for Voluntary Assessments

Property Address _____

Owner's Name _____

City/Town _____ State _____ Zip Code _____ Date of Inspection _____

Inspection results must be submitted on this form. Inspection forms may not be altered in any way. Please see completeness checklist at the end of the form.

A. General Information

1. Inspector:

Name of Inspector _____

Company Name _____

Company Address _____

City/Town _____ State _____ Zip Code _____

Telephone Number _____ License Number _____

B. Certification

I certify that I have personally inspected the sewage disposal system at this address and that the information reported below is true, accurate and complete as of the time of the inspection. The inspection was performed based on my training and experience in the proper function and maintenance of on site sewage disposal systems. I am a DEP approved system inspector pursuant to Section 15.340 of Title 5 (310 CMR 15.000). The system:

- Passes Conditionally Passes Fails
 Needs Further Evaluation by the Local Approving Authority

Inspector's Signature _____

Date _____

The system inspector shall submit a copy of this inspection report to the Approving Authority (Board of Health or DEP) within 30 days of completing this inspection. If the system is a shared system or has a design flow of 10,000 gpd or greater, the inspector and the system owner shall submit the report to the appropriate regional office of the DEP. The original should be sent to the system owner and copies sent to the buyer, if applicable, and the approving authority.

****This report only describes conditions at the time of inspection and under the conditions of use at that time. This inspection does not address how the system will perform in the future under the same or different conditions of use.

What is in Title 5?

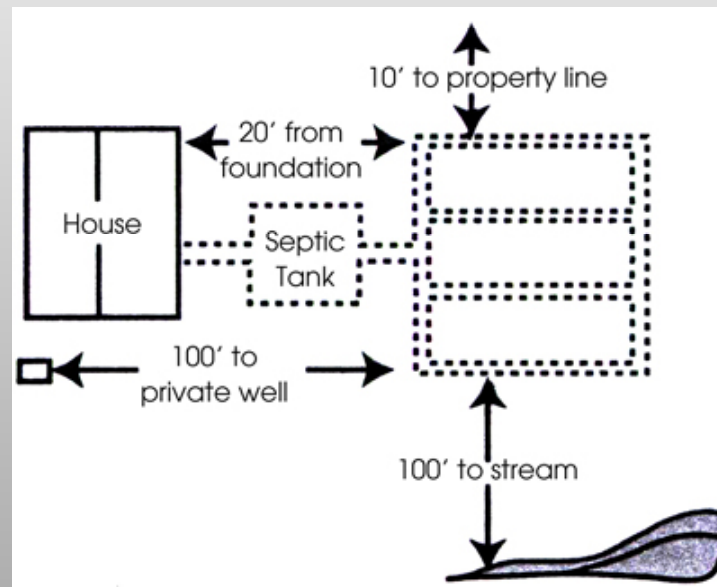
Subparts A-F Which Govern:

- Design Procedures and Standards
- Construction Procedures and Standards
- Inspection Procedures and Standards
- Maintenance
- Septage Transport
- Implementation Procedures

Onsite Wastewater Governance

What is Title 5?

- Prescriptive code (if all standards are met, assumed to protect public health and environment)



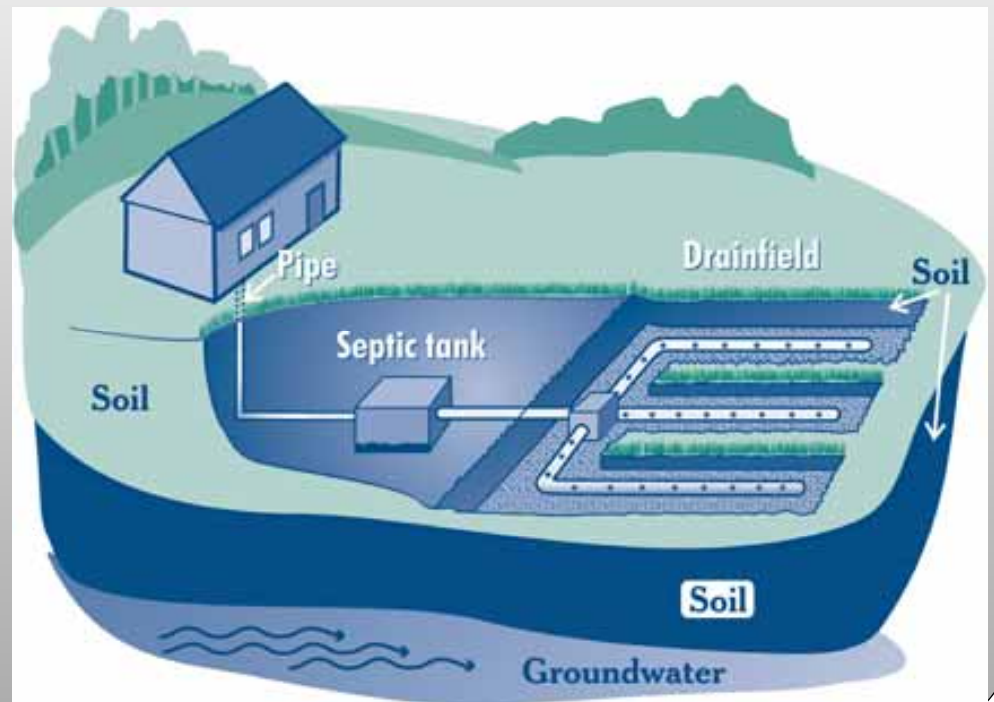
How Do We Achieve Proper Standards?

State Regulation:

15.003 (1) In general, full compliance with the provisions of 310 CMR 15.000 is presumed by the Department to be protective of the public health, safety, welfare and the environment. Specific site or design conditions, however, may require that additional criteria be met in order to achieve the purpose and/or intent of 310 CMR 15.000.

Trying to Achieve Proper

- Collection
- Treatment
- Dispersal
- Receipt by Environment



How Should I Study Title 5?

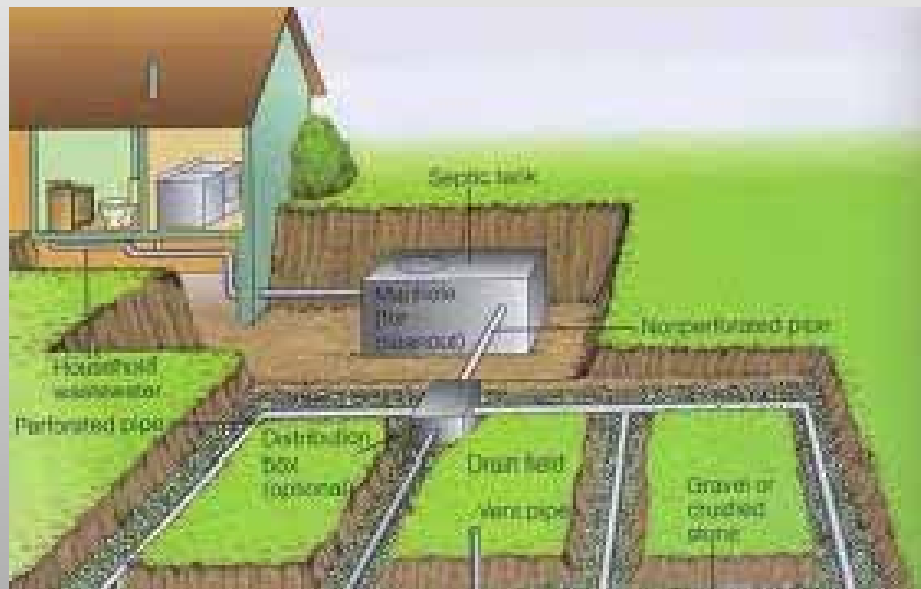
Create Labeling System by Paragraph with Sections Labeled for:

- Design Standards
- Construction Standards
- Maintenance Standards
- Enforcement & Implementation Procedures

Onsite Wastewater Systems

Onsite Wastewater System

A number of specifically engineered components brought together to assure the proper collection, treatment and dispersal of treated effluent into the ground surface for final treatment and disposal



Onsite Wastewater System

Goals of operation:

- Prevent back up of sewage into building
- Collect wastewater into a treatment system
- Provide proper treatment in various components
- Provide proper treatment in soil
- Provide hydraulic disposal of volume of water
- Prevent disease transmission, environmental harm, or nuisance conditions



How Can We Provide Proper On-Site Sewage Treatment and Dispersal?

Three Components Result in Public Health & Environmental Protection

- Proper Design
- Proper Construction
- Proper Maintenance

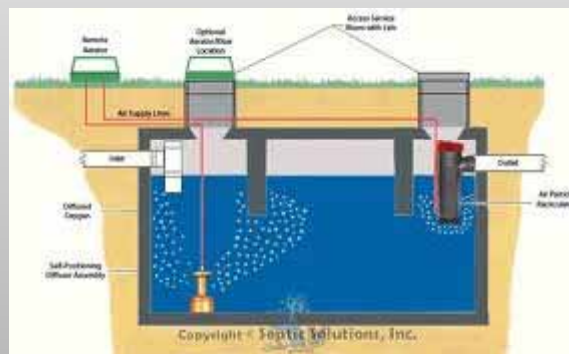
Basics of On-Site Wastewater Treatment & Dispersal

Each of the Three Aspects Requires Involvement of the Property Owner, Designer, Installer, Maintainer and Regulator to Succeed

Onsite Wastewater System

Major Components:

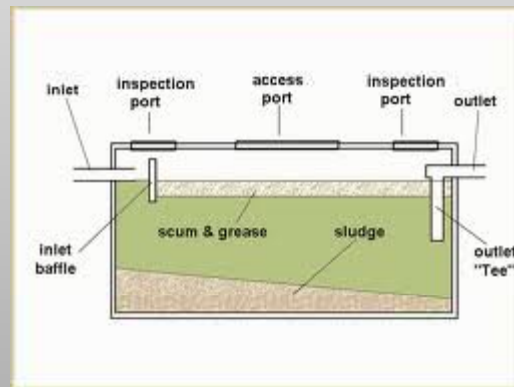
- Primary (septic) tank
- Secondary pre-treatment system (optional)
- Soil Absorption System



Onsite Wastewater System

Primary (Septic) Tank:

- Always full
- Oil and grease floats to top
- Solid material settles to bottom
- Needs routine maintenance (pumping) depending on size and usage and how much material builds up in tank



Onsite Wastewater System

Soil Absorption System:

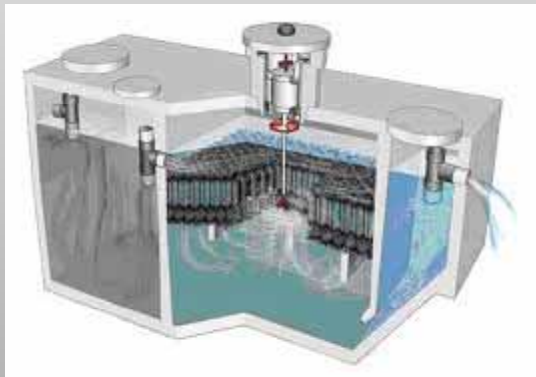
- Sized to accommodate amount of flow and soil type
- Provides ability for water to soak into ground
- Provides for final treatment of sewage in soil
- Most critical component to design and build



Onsite Wastewater System

Pre-Treatment System:

- Provides clean-up of sewage prior to it entering into the soil
- “mini sewage treatment plant” so needs to be maintained on regular basis
- Can be effective in overcoming health or environmental protection concerns



Onsite Wastewater System

Expected to be a permanent fixture at the site so needs to be designed, built and maintained accordingly.

There might be aspects or components that need care or attention in the future, but the onsite wastewater system should be conceived as a long-term part of the property infrastructure

Routine maintenance will help prevent long-term operational problems

Key Aspects of Title 5

Key Areas of Title 5 Related to Health & Environmental Protection

- Design standards, setbacks
- Soils
- Alternative treatment and dispersal systems
- Variances and Local Upgrade Approvals
- Construction
- Operation & Maintenance
- Inspections of Existing Systems

Design and Soils

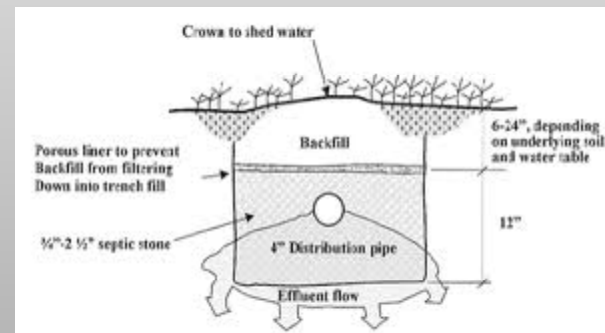
Engineering Standards:

- Complex Aspect of Regulations
- Sections deal with each component and aspect – tanks, soil absorption systems, how much flow to predict, etc.
- Regulations strict for new projects, room for reasonable accommodations when making a repair (upgrade)

Design and Soils

Engineering Standards:

- Most critical part from public health and environmental protection standpoint are requirements for design of soil absorption system
 - Site specific
 - Based on soil type and ground water on property, plus volume of sewage proposed



Design and Soils

Engineering Standards:

- Procedures and licensing to assure proper soil classification through Soil Evaluator program





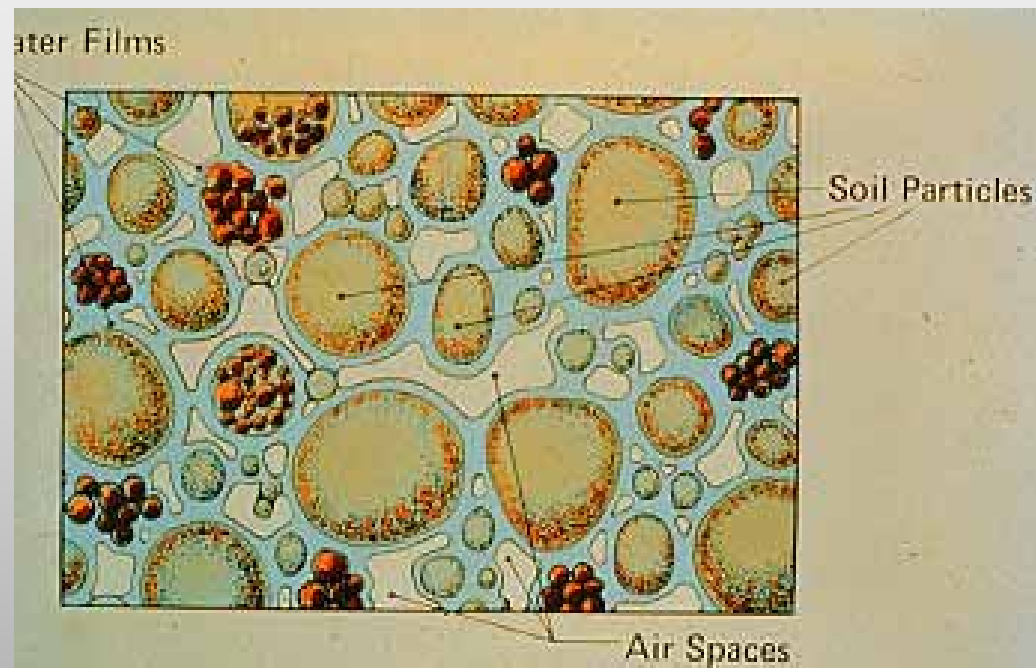
Design and Soils

- At Interface of Dispersal System and Native Soil or Sand
- Effective Pollutant Removal Tool



Design and Soils

- Aerobic Conditions Needed
- Unsaturated Flow Conditions Needed



Design and Soils

FIGURE 3-26



Strong thin platy structure.

Design and Soils

Enhance Treatment Through Better Use of Soil Treatment:

- Small Doses
- High in Soil Profile

Design and Soils

Pressure Distribution: Good distribution of sewage into the soil



Design and Soils

Drip Dispersal: Little-to-no disturbance during installation, lower profile, no walls

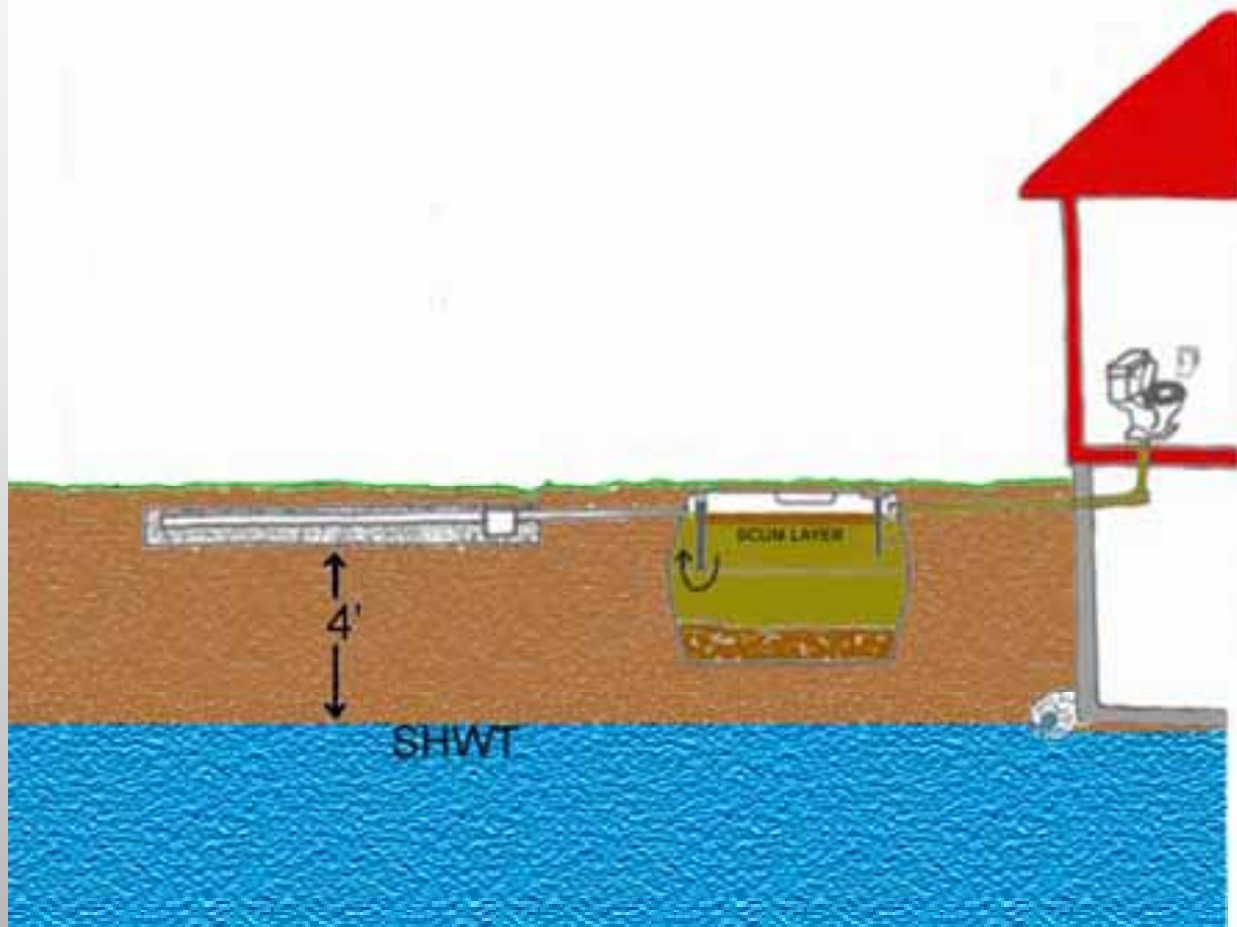


Design and Soils

Engineering Standards:

- Determine soil type as a method of approximating volume of water the soil can accept and what treatment might occur
- Determine water table depth so bottom of soil absorption system can have an adequate amount of soil or sand beneath it for treatment to occur
- Determine percolation rate as a method of approximating volume of water the soil can accept
- Determine soil layers as a method of assessing glacial versus organic layers and which should be used for placement of soil absorption system

Design and Soils



Design and Soils

Engineering Standards:

- Nitrogen loading standards
- Setback distances
- Volumes of wastewater predicted to be generated
- Requirements for presenting information on a design plan
- Standards for various traditional and non-traditional components

Design and Soils

Engineering Standards:



Design and Soils

Engineering Standards:

- Flexibility in engineering standards when non-traditional components are used (some in regulations, some in product-specific approvals issued by DEP)
- Classified in Title 5 as “Alternative Systems” and “Humus/Composting Toilets”



Design and Soils

Engineering Standards:

- Procedures to seek approval when standards in Title 5 cannot be met
- Called “Local Upgrade Approvals”, “Maximum Feasible Compliance” and “Variances in Title 5”

Design and Soils

Non-traditional methods of treatment and dispersal:

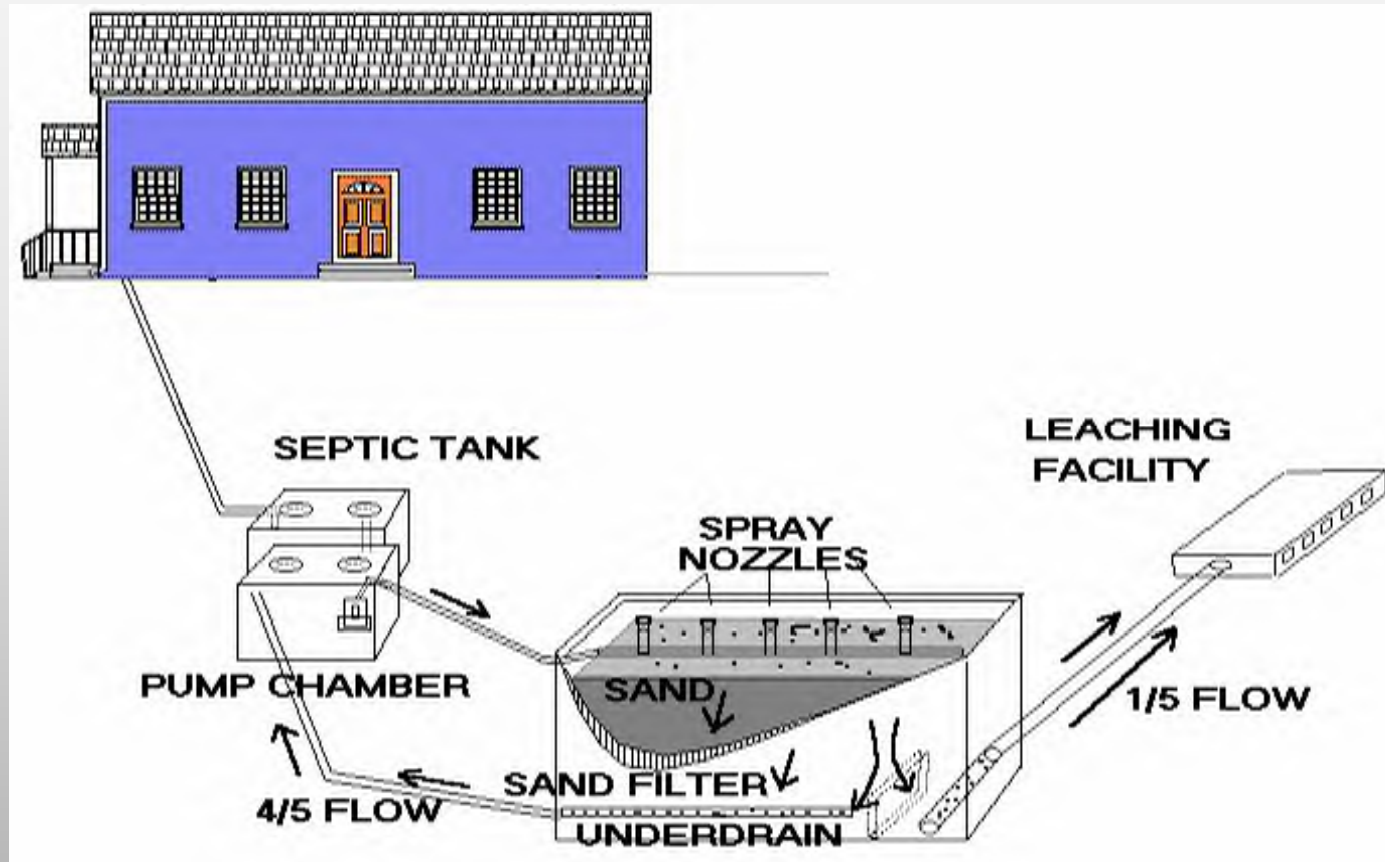
- Composting toilets allowed if comply with standards in Title 5
- Other technologies which treat, disperse, remediate or perform other functions are individually reviewed and approved by an “approval letter” specific to that technology

Design and Soils

Non-traditional methods of treatment and dispersal:

- Technologies are typically approved for Remedial Use or General Use
- Remedial Use – upgrade with no increase in design flow and technology often provides flexibility such as allowing reduced distance from bottom of soil absorption system to groundwater table
- General Use – typically new construction sites where technology offers more flexibility or better treatment, but cannot use technology to make site approvable if cannot do so with a regular onsite system

Design and Soils



Design and Soils



Varying From Title 5 Standards

Most often, waivers from design standards are heard before the Board of Health:

- Standards and procedures vary for:
 - New construction (typically a variance from Title 5)
 - An upgrade (typically “Maximum Feasible Compliance” as indicated in Title 5)
- Procedures and standards generally found in Section 400 of Title 5

Varying From Title 5 Standards

Variances:

- Requesting permission to “vary” from one of the fundamental standards in the code
- Burden is on applicant to demonstrate:
 - An equal degree of environmental protection has been provided as if the standard in Title 5 has been met
 - Denying the variances would be manifestly unjust
 - For new construction, that all beneficial use is not being deprived of the land

Varying From Title 5 Standards

Variances:

- Often in a formal hearing setting – evidence, minutes, motions, abutter notification, etc.
- Typically also needs approval from DEP if granted by local officials
- One standard cannot be varied (less than 4' of naturally occurring soil)
- If granted, variances can have conditions placed on them

Varying From Title 5 Standards

Maximum Feasible Compliance:

- Only applies to upgrades (“repairs”), not new construction or an increase in flow
- Goal is always full compliance
- Procedure called “Local Upgrade Approval”
- Standards require applicant to first try to use least risky approach first, then try more risky approach

Varying From Title 5 Standards

Maximum Feasible Compliance should not be granted if:

- A fully compliant system can be built
- A connection to public sewer is available
- An “Innovative/Alternative” system can be used to achieve full compliance

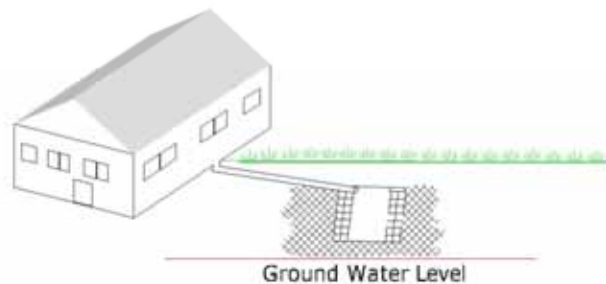
Existing System Inspection

Existing System Inspection:

- Prior to sale of property, existing onsite systems to be inspected
- Standards in regulations determine which are properly functioning and able to remain in use
- Substandard existing systems have time schedule when need to be upgraded
- DEP licenses people who can perform these inspections

Dispersal System Types

Old technology, never built today, can remain if meets certain criteria



Cesspool

Operation & Maintenance

Operation & Maintenance Standards:

- Recommends pump frequency for primary (septic) tanks
- Requires routine maintenance for non-traditional components

Engineering Standards

Engineering Standards:

- Complex Aspect of Regulations
- Sections deal with each component and aspect – tanks, soil absorption systems, how much flow to predict, etc.
- Regulations strict for new projects, room for reasonable accommodations when making a repair (upgrade)

Construction Standards

Construction Standards:

- Local license
- Preserve soil absorption system area

Less Critical Aspects of Title 5

Less Critical Aspects

Tanks

Distribution boxes

Enforcement mechanisms

Nitrogen

Septage hauling

Bedrooms

Tanks - Primary and Pump

Tanks – primary or pump

Often concrete, sometimes plastic

Watertightness is typically only concern

Tanks - Primary and Pump

Conventional:

- cheaper
- hard to move onto site



Tanks - Primary and Pump

Recently approved:

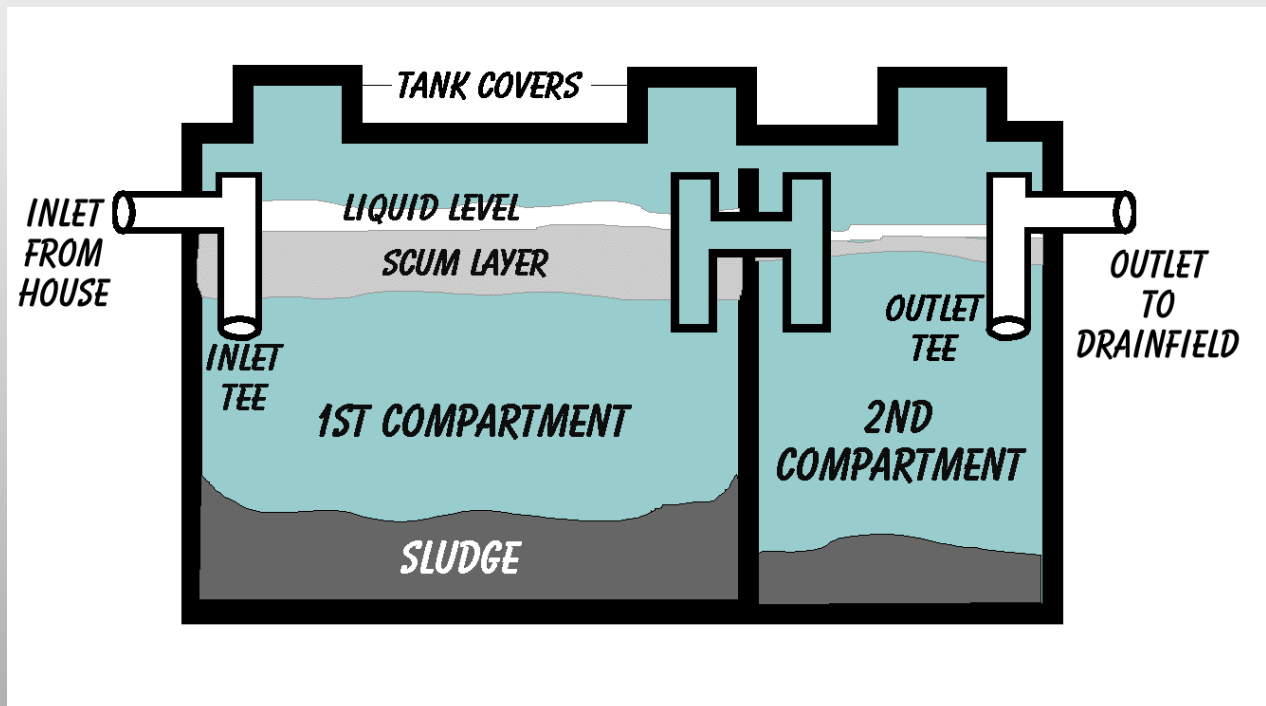
- lighter weight
- easy to move onto site



Tanks - Primary and Pump

1500-gallon capacity is minimum for new installations; existing smaller ones can remain

Pumpout is needed when scum or sludge layers get too thick



Distribution Box

Distribution Boxes

Often concrete, sometimes plastic

Constructing so level flow output is important, but typically doesn't stay that way through backfill process, settling and frost

Easy access and leveling devices can help assure better distribution

Distribution Box

Common solution for gravity flow septic systems



Enforcement

Enforcement:

- Can act to eliminate public health problem, environmental health problem or nuisance condition
- Notices of non-compliance, investigatory hearings, court complaints and other mechanisms are available
- Licenses issued by Boards of Health (installer, pumper) or DEP (inspector, soil evaluator) can be subject to disciplinary action. Designers licensed by other state agency

Nitrogen

Nitrogen

- Standards indicated in Title 5
- Some technologies approved with different loading rates

Hauling of Septage

Septage Hauling

- Often little risk with transport
- Disposal locations highly regulated
- Pumping records are an indicator of onsite wastewater system maintenance and should be available

Number of Bedrooms

- Used to approximate flow
- Each community handles differently
- If design plan on file stating number of bedrooms of system in the ground, *that* is the number of bedrooms allowed in the dwelling
- If no design plan on file, typically assessor office or walk-through determines number

Number of Bedrooms

- Regulation definition is complex to interpret
- *Not* based on closets
- Must be > 70 sq. ft, electric service, ventilation, at least one window
- Living/dining/bath rooms, kitchens, halls, unfinished cellars & unheated storage areas over garage are not considered bedrooms

Number of Bedrooms

For homes with greater than 8 rooms,
use the following formula:

Total number of rooms minus bathrooms, hallways, unfinished cellars, and unheated storage spaces, then divide by two, then round down to the next lowest whole number

Common Issues Not in Title 5

Final Appearance

Aesthetics:

- Not part of Title 5
- Function of creativity of designer, not a reason for waiver of design standards



Consumer Protection

- Like any profession, there are good and bad people
- Should not be wary of new technology if approved by DEP

Conclusion

Title 5 and Boards of Health

Conclusion:

- Rules are complex
- Audience is complex
- Seek guidance from professional societies, regional DEP office, or consultants
- Act in best interest of public health and environmental protection

The “Big Picture”

Remember the Goal:

Section 003(1) states “In general, full compliance with the provisions of 310 CMR 15.000 is presumed by the Department to be protective of the public health, safety, welfare and the environment.”

This Does Not Require That You Are Responsible for Making the Designer or Owner Pleased With the Results of Your Review

Title 5 and Boards of Health

References:

- Massachusetts Environmental Health Association
- Massachusetts Association of Health Boards
- Massachusetts Department of Environmental Protection
- Massachusetts Health Officers Association
- Yankee Onsite Wastewater Association

- NOWRA Conference, April 2-5, Providence.
NOWRA.ORG

Onsite Wastewater and Title 5 Questions?

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