



McIntyre Engineering & Septic Services, Inc.

Title 5 Inspections and Failure Factors

Title 5 Inspections ...

Why are Septic System Inspections required?

The goal of system inspection is to provide sufficient information to make a determination as to whether or not the system is adequate to protect public health and the environment. [15.300 (1)]



Title 5 Inspections ...

What is Protection of the Public Health and Environment?

According to Title 5 15.303(1)(a):

1. Backup of sewage into the facility
2. Discharge of effluent to the ground surface or surface waters
3. Static liquid level in distribution box above outlet pipe inverts
4. Liquid depth in cesspool is less than 6 inches below inlet pipe or available volume less than $\frac{1}{2}$ of one day's design flow
5. Pumping septic tank or cesspool more than 4 times a year
6. Septic tank or tight tank is metal or structurally unsound
7. Cesspool privy or soil absorption system below seasonal high groundwater

Failure Criteria ...

	Yes	No	
"Yes" results in failure with one exception	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Static liquid level in the distribution box above outlet invert due to an overloaded or clogged SAS or cesspool
	N/A <input type="checkbox"/>	<input checked="" type="checkbox"/>	Liquid depth in cesspool is less than 6" below invert or available volume is less than ½ day flow
	N/A <input type="checkbox"/>	<input checked="" type="checkbox"/>	Required pumping more than 4 times in the last year NOT due to clogged or obstructed pipe(s). Number of times pumped: _____.
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Any portion of the SAS, cesspool or privy is below high ground water elevation.
	N/A <input type="checkbox"/>	<input checked="" type="checkbox"/>	Any portion of cesspool or privy is within 100 feet of a surface water supply or tributary to a surface water supply.
	N/A <input type="checkbox"/>	<input checked="" type="checkbox"/>	Any portion of a cesspool or privy is within a Zone 1 of a public water supply well.
	N/A <input type="checkbox"/>	<input checked="" type="checkbox"/>	Any portion of a cesspool or privy is within 50 feet of a private water supply well.
	N/A <input type="checkbox"/>	<input checked="" type="checkbox"/>	Any portion of a cesspool or privy is less than 100 feet but greater than 50 feet from a private water supply well with no acceptable water quality analysis. [This system passes if the well water analysis, performed at a DEP certified laboratory, for fecal coliform bacteria indicates absent and the presence of ammonia nitrogen and nitrate nitrogen is equal to or less than 5 ppm, provided that no other failure criteria are triggered. A copy of the analysis and chain of custody must be attached to this form.]
N/A <input type="checkbox"/>	<input checked="" type="checkbox"/>	The system is a cesspool serving a facility with a design flow of 2000 gpd-10,000 gpd.	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	The system fails. I have determined that one or more of the above failure criteria exist as described in 310 CMR 15.303, therefore the system fails. The system owner should contact the Board of Health to determine what will be necessary to correct the failure.	

Conditional Pass ...

Component Replacement

2) System Conditionally Passes:

- ☐ One or more system components as described in the "Conditional Pass" section need to be replaced or repaired. The system, upon completion of the replacement or repair, as approved by the Board of Health, will pass.

Check the box for "yes", "no" or "not determined" (Y, N, ND) for the following statements. If "not determined," please explain.

The septic tank is metal and over 20 years old* or the septic tank (whether metal or not) is structurally unsound, exhibits substantial infiltration or exfiltration or tank failure is imminent. System will pass inspection if the existing tank is replaced with a complying septic tank as approved by the Board of Health.

* A metal septic tank will pass inspection if it is structurally sound, not leaking and if a Certificate of Compliance indicating that the tank is less than 20 years old is available.

☐ Y ☐ N ☐ ND (Explain below):

- ☐ Pump Chamber pumps/alarms not operational. System will pass with Board of Health approval if pumps/alarms are repaired.

D-box surcharged but can be remedied with minor repair

- ☐ Observation of sewage backup or break out or high static water level in the distribution box due to broken or obstructed pipe(s) or due to a broken, settled or uneven distribution box. System will pass inspection if (with approval of Board of Health):

☐ broken pipe(s) are replaced ☐ Y ☐ N ☐ ND (Explain below):

☐ obstruction is removed ☐ Y ☐ N ☐ ND (Explain below):

☐ distribution box is leveled or replaced ☐ Y ☐ N ☐ ND (Explain below):

Pumping more than 4 times per year

- ☐ The system required pumping more than 4 times a year due to broken or obstructed pipe(s). The system will pass inspection if (with approval of the Board of Health):

☐ broken pipe(s) are replaced ☐ Y ☐ N ☐ ND (Explain below):

☐ obstruction is removed ☐ Y ☐ N ☐ ND (Explain below):

Further Evaluation is Required ...

Cesspools near sensitive
environmental resources

3) Further Evaluation is Required by the Board of Health:

- ☐ Conditions exist which require further evaluation by the Board of Health in order to determine if the system is failing to protect public health, safety or the environment.
- a. System will pass unless Board of Health determines in accordance with 310 CMR 15.303(1)(b) that the system is not functioning in a manner which will protect public health, safety and the environment:**

☐ Cesspool or privy is within 50 feet of a surface water

☐ Cesspool or privy is within 50 feet of a bordering vegetated wetland or a salt marsh

b. System will fail unless the Board of Health (and Public Water Supplier, if any) determines that the system is functioning in a manner that protects the public health, safety and environment:

☐ The system has a septic tank and soil absorption system (SAS) and the SAS is within 100 feet of a surface water supply or tributary to a surface water supply.

☐ The system has a septic tank and SAS and the SAS is within a Zone 1 of a public water supply.

☐ The system has a septic tank and SAS and the SAS is within 50 feet of a private water supply well.

☐ The system has a septic tank and SAS and the SAS is less than 100 feet but 50 feet or more from a private water supply well**.

Method used to determine distance: _____

** This system passes if the well water analysis, performed at a DEP certified laboratory, for fecal coliform bacteria indicates absent and the presence of ammonia nitrogen and nitrate nitrogen is equal to or less than 5 ppm, provided that no other failure criteria are triggered. A copy of the analysis must be attached to this form.

c. Other: _____

S.A.S. near
water supplies

S.A.S > 50' & < 100'
Well must be tested

Title 5 Inspections ...

**Systems with any of the observed failure criteria
will require some remedial action**

- | | |
|--------------------------------|------------|
| ✓ Unclogging a pipe | \$ |
| ✓ Replacing a crushed pipe | \$ |
| ✓ Replacing a distribution box | \$\$ |
| ✓ Replacing a septic tank | \$\$\$ |
| ✓ Complete system replacement | \$\$\$\$\$ |



Minimum Inspection Requirements ...

Minimum Requirements

1. General inspection of property for signs of failure
 - Backup into facility
 - Ponding to ground surface
 - Breakout
2. Locate and inspect all system components
3. Determine high groundwater



<https://www.mass.gov/guides/guidance-for-the-inspection-of-on-site-sewage-disposal-systems>

However DEP qualifies its inspection guidance

Meeting minimum requirements may not always be considered as an acceptable inspection

Title 5 Inspection Guidance Document ...

However meeting minimum requirements may not be acceptable:

The following are the minimum requirements necessary to complete an inspection. Meeting these minimum criteria, however, should not be construed as completion of an acceptable inspection if through **reasonable effort**, a complete inspection of all components of the system is feasible. Furthermore, if a complete inspection cannot be performed, the inspector must provide adequate documentation of the specific conditions that prevented a complete inspection and should indicate on the inspection form what was done to try to locate components, determine high ground water, etc.

1. The inspector must note the general conditions of the property to identify any obvious signs of failure. These would include but not be limited to backup of sewage to the facility, effluent ponding, breakout to the surface of the ground or to surface waters, **and other occurrences which professional judgment would deem indications of failure.**
1. All components prior to the leaching facility must be located and inspected. In a conventional component system, this would generally require inspection of the septic tank and distribution box. If a cesspool system, all cesspools in the system must be exposed for inspection.
1. Determine high ground water elevation at the site.

“Professional Judgment”

“Reasonable Efforts”

Title 5 Inspections ...

What a Title 5 inspection is NOT.

It is not a guarantee?

Inspection is not intended to demonstrate that the system will adequately serve the use placed on it by the new owner [15.302 (1)]

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.



Will these statements protect the Inspector?

Maybe

Must be able to demonstrate that your inspection was conducted in conformance with Title 5 and DEP guidelines

Pre-Inspection Research - Homeowner Interview ...

1. System components pumped out in the previous two weeks?
2. When was the system last pumped? Ever have a sewage backup?
3. Has the system received normal flows in the previous two week period?
4. Number of bedrooms?
5. Does residence have a garbage grinder?
6. Is laundry on a separate sewage system?
7. Age of the house? Original system?
8. Is there a well? Where is it located?
9. When did you buy the property? Did it have a Title 5?
10. Number of people currently residing in the home?
11. Ever have water in the basement? Is there a sump pump?

I have a garbage grinder.... but I never use it!



Pre-Inspection Research – File Reviews ...

Interviewing Homeowner won't provide all information needed for your report ...

As-Built Plan & Design Plan

- Location of system components
- Well locations
- Design flow
- Groundwater information



Pumping Records

Previous Inspection Reports

Other Interesting Information

- Complaints
- Variances or Upgrade Waivers
- Deed Restrictions

Setback Issues

- Review maps for nearby wetlands, streams, public wells and water supplies

[illegible]

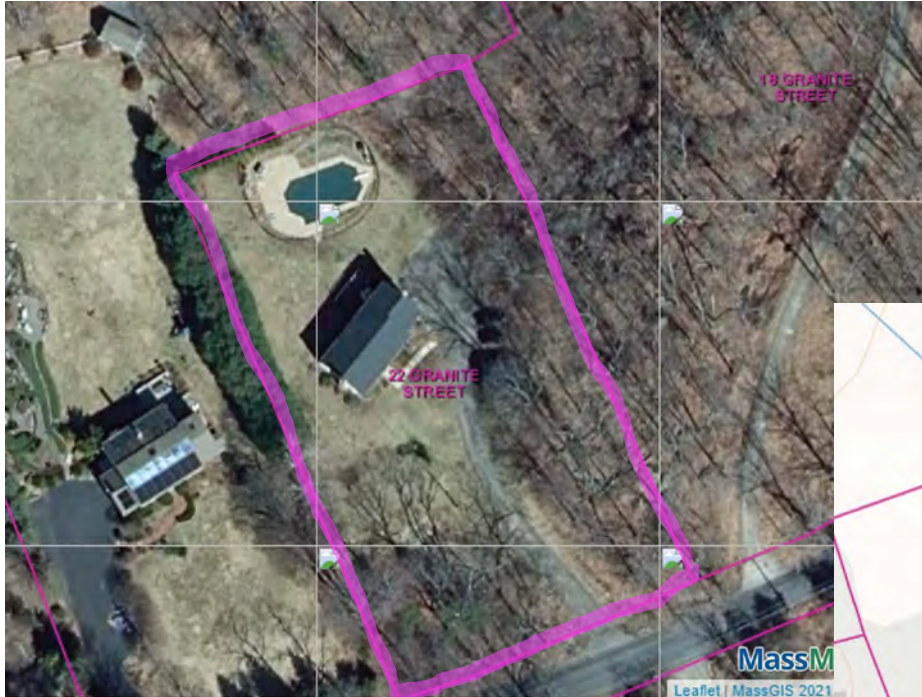
- Check Assessor's Card (bedroom check)



- Obtain water records if on a municipal water system

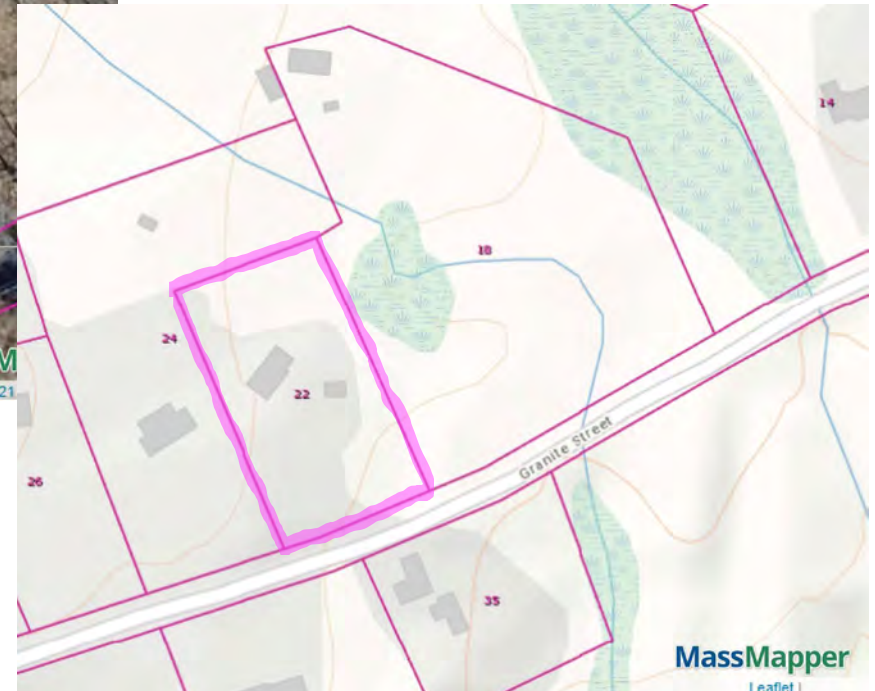
Pre-Inspection Research - On Line Tools ...

<https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html>

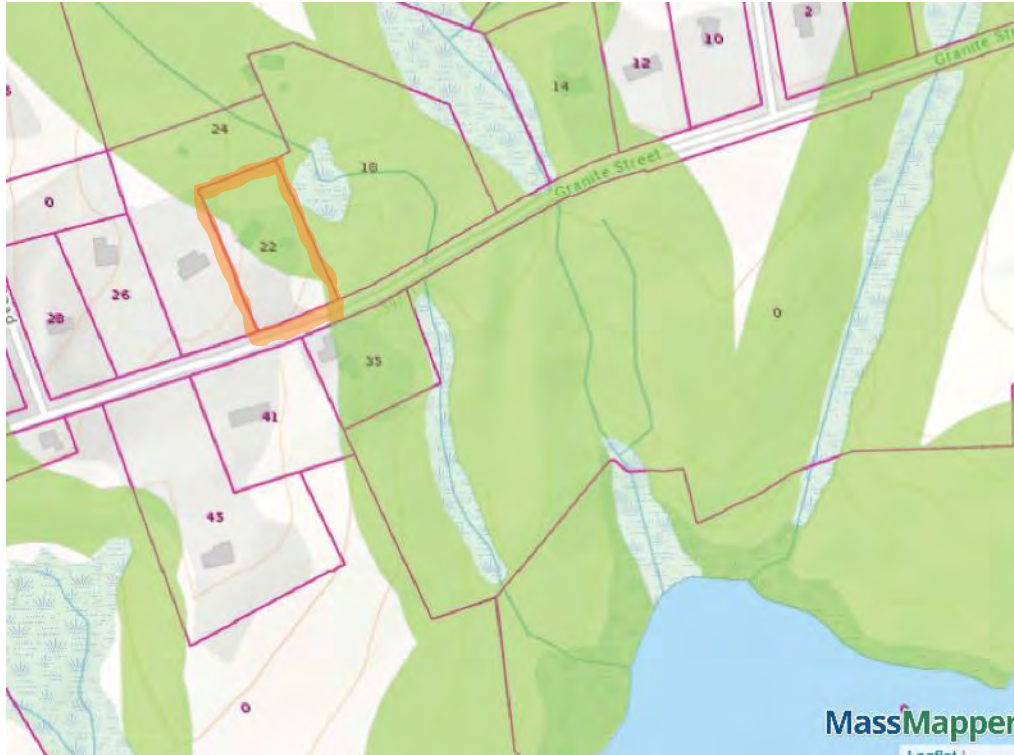


GIS Layers

✓ Title 5 Setbacks Layer



Pre-Inspection Research - On Line Tools ...



Setbacks could trigger:

- ✓ Failure criteria
- ✓ Further Review by BOH

Knowing this before field inspection will assist in field checking setbacks

- ✓ Inspection time of year may affect ability to observe wetlands
- ✓ Avoids telling homeowner system passes and then find out you have a setback issue

On-line mapping not a complete substitute for field checking

Pre-Inspection Research - Documentation ...

Interview Owner

TELEPHONE INTERVIEW		
Reason for Inspection	<input type="checkbox"/> Sale?	On Market <input type="checkbox"/> yes <input type="checkbox"/> no
	<input type="checkbox"/> Problems?	Closing Date: _____
		Describe: _____
Age of House: _____ years	Original System?	<input type="checkbox"/> yes <input type="checkbox"/> no
Type of System:	<input type="checkbox"/> Tank/Leachfield	<input type="checkbox"/> Cesspool <input type="checkbox"/> Unknown
	Pump? <input type="checkbox"/> yes <input type="checkbox"/> no	Separate Laundry? <input type="checkbox"/> yes <input type="checkbox"/> no
Town Water <input type="checkbox"/> , or Private Well <input type="checkbox"/> ,	Water Softener System?	<input type="checkbox"/> yes <input type="checkbox"/> no
System Plans Available: <input type="checkbox"/> yes <input type="checkbox"/> no	Property Plans Available:	<input type="checkbox"/> yes <input type="checkbox"/> no
When was tank last pumped? _____	By Whom? _____	
Number of Bedrooms: _____	Garbage Disposal: <input type="checkbox"/> yes <input type="checkbox"/> no	Sump Pump in Basement: <input type="checkbox"/> yes <input type="checkbox"/> no
Price Quoted \$ _____	NOTE: Cesspools must be pumped; Add Town Fees)	

Town Offices

ASSESSORS		
Obtain Assessors Card:	<input type="checkbox"/> yes	<input type="checkbox"/> no <input type="checkbox"/> not available

BOARD OF HEALTH		
As-Built Plan	<input type="checkbox"/> not available	<input type="checkbox"/> If available obtain copy
Design Plan	<input type="checkbox"/> not available	<input type="checkbox"/> If available obtain copy of system area, design criteria and soil logs
Pumping Records	<input type="checkbox"/> yes, date last pumped _____	<input type="checkbox"/> not available

WATER DEPARTMENT		
If Town water, obtain water records for last 2 years	<input type="checkbox"/> yes	<input type="checkbox"/> no <input type="checkbox"/> not available

Dig Safe

DIG SAFE	
PHONE 1-888-344-7233	M.E.S.S. ACCOUNT NO.

Date Called: _____ Dig Safe # _____ Start Date: _____

Pre-Inspection Research ...

Even with research you may come across the un-expected



Exterior Walk Around ...

- ✓ Is there an odor?
- ✓ Break out visible?
- ✓ Lush green grass in certain spots?
- ✓ Trees and roots near system



Interior inspection ...

- ✓ Garbage grinder?
- ✓ Number of bedrooms
- ✓ Sewer pipe leaving house
- ✓ Water line entering house
- ✓ Is there a water softener connected to septic system?
- ✓ Is there a sump pump? (high groundwater indicator)
- ✓ Separate laundry?



Septic Tank ...

What to look for

- ✓ Liquid level below outlet invert
Possible leaky tank
- ✓ Liquid level above outlet invert
Possible pipe blockage
- ✓ Constant inflow from house
Possible leaking plumbing fixture
- ✓ Measure scum and sludge depths
- ✓ Evidence of past backups
Waste/debris above tees, in risers
- ✓ Tees and baffles
- ✓ Are lids secure?



Unsafe Conditions Observed ...

Family whose son died in Taunton septic tank in 2006 awarded \$21M settlement

“This is a widespread problem, not just in Taunton, but in various rural areas of Massachusetts and the rest of the country, that there are unsecured septic systems. Fifty children a year die from falling into unsecured septic systems.”

Source: Taunton Daily Gazette

The plaintiffs sued the manufacturer of the cover, the companies responsible for the installation, inspection and pumping of the septic system and the home inspection company

Notify owner of the problem.

Repair before leaving site?

Secure and Conditional Pass to repair?

Pass with recommendation to repair?



Septic Tank ...

Missing tees or baffles?

- ✓ Replace tee at time of inspection and Pass?
- ✓ Pass with recommendation to install tees?
- ✓ Conditional pass with tee recommendation?



Surcharged Tank

- ✓ Blocked pipe or clogged filter
- ✓ Inspector must determine cause



Caution - Know where you are working
Local BOH may have an opinion or require permit when
repairing a tank component

Septic Tank ...

Does tank need to be pumped during inspection?

- ✓ Liquid level below outlet invert
 - Pump to attempt to verify tank integrity
 - Look for liquid draining back in tank
- ✓ If scum and sludge depths dictate pumping
 - Normal maintenance pumping
- ✓ Check local Board of Health Regulations
 - May have specific inspection requirements



Distribution Box ...

Must be opened to observe

What to look for

- ✓ Structural condition
 - Eventual collapse
 - Possibly leaking
- ✓ Liquid level above outlet invert
 - Pipe blockage?
 - Surcharged soil absorption system?
- ✓ Solids carryover
 - Indication mis-use or no maintenance
- ✓ Evidence of past backups
 - Black stain line above inverts
 - Waste/debris on pipes



Distribution Box ...

Liquid level above inverts – Automatic Failure?

Per DEP Inspection Guidance Document

If the liquid level is above the outlet and there is no outflow, either the outlet pipes are clogged or the leaching area is surcharged and in failure. **The inspector must determine the cause.** The system may qualify for a conditional pass.

Possible causes

- Settled D-Box or header pipes
- Plugged lines
- Clogged stone/ Biomat buildup

Without determining cause, run risk of.....

- Failing a conditional pass
- Conditional passing of a failure



Determination of cause ...

Why would a D-Box settle?



Determination of cause ...

Investigation techniques

- Snake the lines for evidence of surcharging
- Probe or auger into leaching trenches
- Camera the lines
- Excavate test pit into system



OR



Dry S.A.S. with Perforated Pipe
Conditional Pass
Replace and level D-box

Surcharged S.A.S.
Fail

Determination of cause ...

Clogged Leach Lines

Clean stone
around pipe

Orangeburg




Clay Pipe

Joint clogged with
sludge

Systems cannot be made to pass by cleaning out leach lines!

Determination of cause ...



Why men who know Building
...use and recommend
ORANGEBURG ROOT-PROOF
PIPE

ORANGEBURG

PLUMBER

ARCHITECT

ENGINEER

BUILDER

ORANGEBURG
Root-Proof **PIPE**
SAVES YOU MONEY

EASY TO INSTALL

ORANGEBURG MANUFACTURING CO. INC. ORANGEBURG, N.Y. NEWARK, CALIF.

The advertisement features a central illustration of five professionals—Plumber, Architect, Engineer, Builder, and a man carrying a large pipe—gathered around a trench where Orangeburg Root-Proof Pipe is being installed. The pipe is shown in a close-up at the bottom, with the brand name 'ORANGEBURG' repeated along its length. The overall design uses a color palette of reds, oranges, and greys, with bold typography for the product name and key benefits.

Determination of cause ...

Newer pipe systems can be come clogged as well



Leaching Pits ...

May or may not have a D-Box

Do they need to be exposed?

Considered a Soil Absorption System
so it does not have to be investigated
by invasive means



But ...

It may be very helpful in evaluating the
System; Particularly high groundwater



Pump Chambers ...

Pump

- ✓ Operate pump (by floats)
- ✓ Operate alarm float
- ✓ Is there a riser to grade?
- ✓ Observe discharge to distribution box



Control Panel

- ✓ Hard wired to electrical panel
- ✓ Separate circuits for pump and alarm
- ✓ Audible and visual alarm



Cesspools ...

Targets for Environmental Protection - **Many Failure Criteria**

Single Cesspool

- ✓ Scum and sludge buildup
- ✓ Measure distance between inlet pipe and liquid level
- ✓ Must be pumped
- ✓ Estimate size (diameter and depth)
- ✓ Material of construction



Overflow Cesspools

- ✓ First cesspool acts as tank
- ✓ Terminal cesspool is SAS
- ✓ Setback distances apply to both



Can be dangerous during inspection!

Unoccupied Homes ...



What's the right thing to do?

1. Conditional Pass. Effluent level not above inverts. Tank and D-Box not watertight. Replace these components?
2. Fail. If evidence of past surcharging?
3. Recommend to Owner that inspection should be expanded to use more invasive procedures (hydraulic load test?).
4. Refuse inspection. Recommend re-inspection after house is occupied again and receiving normal flows.

Professional Judgement ...

Professional Judgement

“ other occurrences which professional judgement would deem indications of failure.”

Judgement should consider age, maintenance history, current and former occupancy



Staining

Is this evidence of backup?



Can I change this to a voluntary inspection ...

Sorry, your system won't pass inspection!



Document what was done and your findings of that day to the homeowner rather than just a verbal

Do not use or modify the official Title 5 form for a voluntary

Alternative Designs ...

Drip Irrigation



Treatment Systems



Pressure Distribution



Groundwater Determination ...

High ground water as defined by DEP:

Inland - The elevation above which in eight out of ten consecutive years the ground water table does not rise. This elevation is commonly but not invariably reached during the months of December through April.

Coastal - For ground water influenced by tidal action, the average of the monthly spring high tide ground water level as recorded over the most recent consecutive 19 year period.

DEP's Inspection Guidance Document states

"Most reliable method is a deep hole test by a soil evaluator."

"This is probably beyond routine inspection and should be used in only rare cases ..."

Title 5 Regulations state

"A deep hole observation test is not required to determine high groundwater elevation during an inspection."

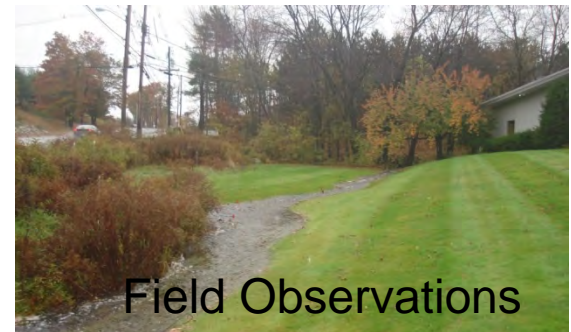
*"High groundwater elevation shall be **estimated** by the inspector, using best professional judgment, based on the methods described in 310 CMR 15.302(4) (a) through (c)."*

Groundwater Determination 310 CMR 15.302(4)

(a) The inspector shall review local maps and records of groundwater elevation (previous deep hole observation tests or groundwater monitoring results) on the site and nearby properties, if available.



(b) If the system includes a cesspool, the cesspool shall be pumped during the inspection and then examined to determine whether groundwater flows into the cesspool, indicating that the cesspool is below high groundwater elevation.



(c) If the system includes a septic tank and distribution box, the condition of these components and the surrounding soil shall be observed for indications that groundwater has infiltrated the system. Care should be taken not to destabilize the distribution box or the piping to or from the box.



Reviewing Design Plan Soil Logs ...

Be careful on date of testing

**Post 1995 Plans
Design Groundwater
Reliable**

**Pre-1995 Plans
Design Groundwater
Trust but verify**



Estimation from Field Conditions ...

Topography of Lot & Abutting Lots

- Yard raised as compared to surroundings
- House style (raised ranch, split level)
- Mounded system in neighborhood
- Streams, Wetlands



Observe On-Site Components

- Infiltration into septic tank
- Infiltration into cesspool, leaching pits



Inspect the basement

- Weeps, water stains
- Sump pumps



Determination from Field Conditions ...

Validity of field observations may be dependent on time of year the inspection is conducted!

Dear Mr. [REDACTED],

The [REDACTED] Board of Health (BOH) has reviewed a Title 5 Inspection Report submitted 9/26/2016 for your property located at [REDACTED]. In the review of the report the BOH note that Inspector, [REDACTED], states that the high groundwater was established by a hole dug to three feet.

Based upon the drought conditions and the fact that abutting properties are known to have extensively mounded subsurface sewage disposal systems due to high groundwater, it is required that a further review of the "high ground water" be completed as detailed in the Department of Environmental Protection's guidance document. A shallow test hole in an extremely dry period of the year is not a valid determination of the high groundwater.

Please consider a review of the abutting properties files and visible mounded systems. In addition, a "soil evaluation" performed by a licensed Soil Evaluator should be considered. A revised Title 5 Inspection report will be required. Please be aware the current form is a 2016 revision.

If you are estimating groundwater without an accurate design plan, its always good to confirm your estimate by more than one means

Local Regulations ...

Reports for vacant properties shall be considered as Requiring Further Evaluation by the Board and may require additional inspections.

The Board has determined that groundwater levels shall be determined by a Soils Evaluator, as part of the Inspection, if the septic system was installed prior to 1996.

All seepage pits must be inspected. Pits will fail an inspection when the liquid depth in a seepage pit is less than six inches from the inlet pipe invert or the remaining volume above the liquid depth is less than ½ of one day's design flow.

All cesspool systems shall constitute an automatic failure.

If the leaching area has less than 4' vertical separation to observed groundwater, system fails

If the bedroom count inside the building does not match the basis for the approved design flow

Have Questions?

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