



**Department
of Health**

Water Quality Protection in the Champlain Basin

**Individual Wells and On-Site Wastewater
Treatment Systems**

Objectives – Individual Water Supply

1. Learn the basics of individual wells and how they work
2. Essential elements of DOH standards, regulations, and policy
 - a) Separation Distances
 - b) Testing
3. Roles of DOH, DEC, CEOs, Realtors, etc.
4. Residential Code and its relationship to individual wells and onsite wastewater systems



Objectives – Onsite Wastewater Treatment Systems

1. Goals of OWTS management
2. Learn the basics of OWTSs and how they work
3. Essential Elements of DOH standards, regulations, and policy
 - a) Separation Distances
 - b) Soil Investigations
4. Identifying Failures
5. Roles and responsibilities of DOH, DEC, CEOs, Realtors, etc.



Handouts

- Fact Sheet #5 – Susceptible Water Sources
- Fact Sheet #7 – Testing, Operation, and Maintenance
- Concerns about Surface Water as a Drinking Water Source
- Septic System Operation & Maintenance Manual
- PE Fact Sheet

ACRONYMS

- IWS – Individual Water Supply (Residential)
- OWTS – Onsite Wastewater Treatment System (aka: septic system)
- LHD – Local Health Department
 - a) 37 County Health Departments
 - b) 9 District Offices
 - c) NYC
- 5-B – Appendix 5-B: Standards for Water Wells
- 75-A – Appendix 75-A: Wastewater Treatment Standards – Residential Onsite Systems





**Department
of Health**

Residential (Individual) Water Supply

Residential (Individual) Water Supply

- By “individual” we really mean “household” or “residential”: “RWS” or “IWS”
- Non-residential/non-public water supply wells also considered IWS (e.g. dentist office with a well, out in the country and not on public water)
- Appendix 5-B, “Standards for Water Wells”, released 11/23/05
- Public water supplies (PWS) are preferred over individual water supplies

Objectives

- Attendees should be able to:
- Categorize types of IWS
- Describe a properly constructed IWS
- Describe DOH policy
- Describe disinfection, treatment & other protective measures
- Describe roles of local CEO, DEC, DOH, Local Health Departments

Goals of Properly Constructed IWS

- Quality: Assures acceptable water quality for short and long term use
“Quality” refers to safe and aesthetic properties (taste and appearance)
- Protect: Protect against contamination
- Quantity: Assures acceptable quantity for short and long term use
- Maintenance and Treatment: Relatively low maintenance or treatment is needed



IWS “Facts and Factoids”

- About 1.1 million homes in NYS have wells...
- About 4 million home residents in NYS (and millions of visitors) depend on residential water wells
- About 43 million USA home residents (14% of population) depend on residential water wells
- About 10,000 new (10%), or replacement (90%), residential wells installed every year in NYS
- NYS is a “water rich” state; however, our groundwater resources are not inexhaustible



Types of IWS

- Expect to come across these types:
- Dug wells
- Driven well “points”
- Springs
- Cisterns
- Surface water/shore wells
- SEE FACT SHEET 5
- Drilled wells



Types of IWS

Driven “points”

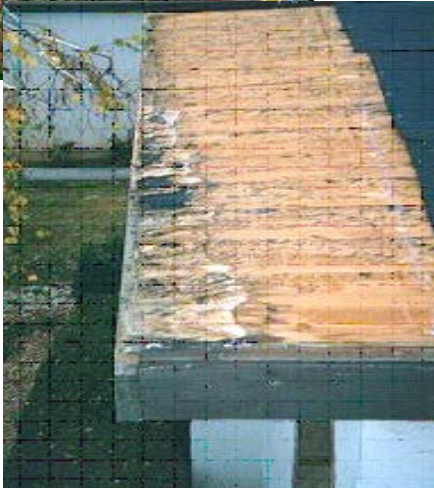
- Usually refers to a shallow, single pipe *under vacuum* (pump in basement)
- Also not recommended...
- Shallow, easily contaminated, subject to drought
- Very popular - cheap and easy to install



Types of IWS

Cisterns

- Collects rainwater that drains from roof (bird droppings, leaves, shingles, etc.)
- Not recommended/should not be allowed:
- Easily contaminated, subject to drought



Types of IWS

Surface water:

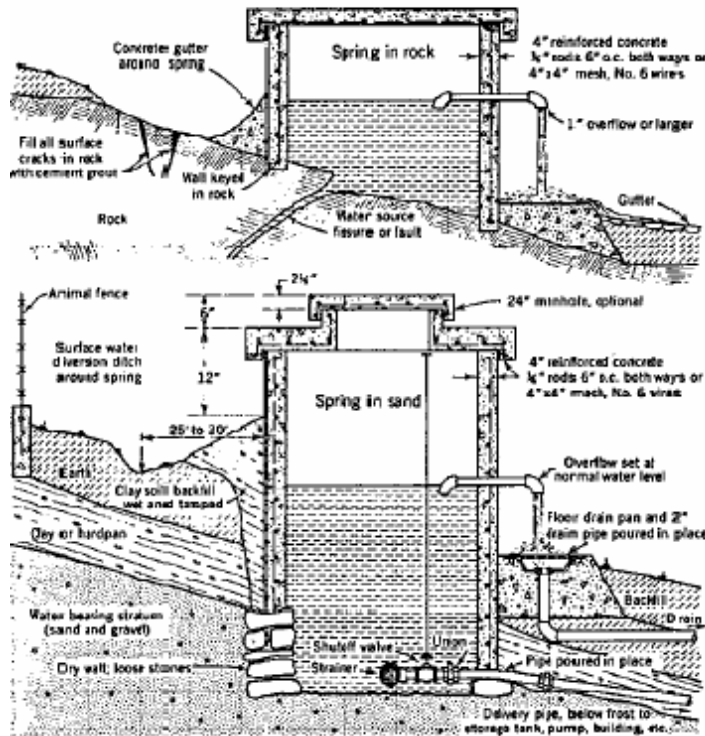
- Not recommended/should not be allowed;
- High degree of treatment and maintenance for micro-organisms and other contaminants



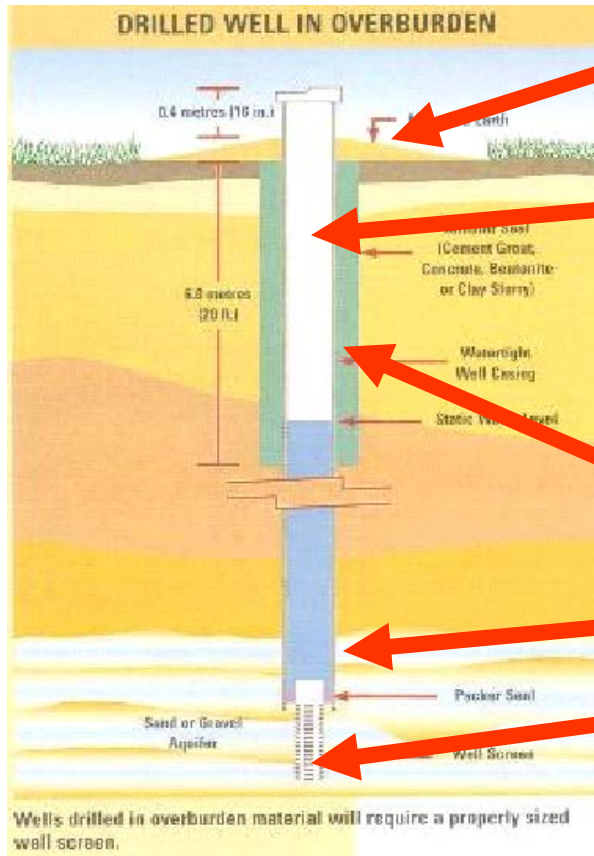
Types of IWS

Springs

- Not recommended...
- Easily contaminated
- Subject to drought
- Water comes from where?

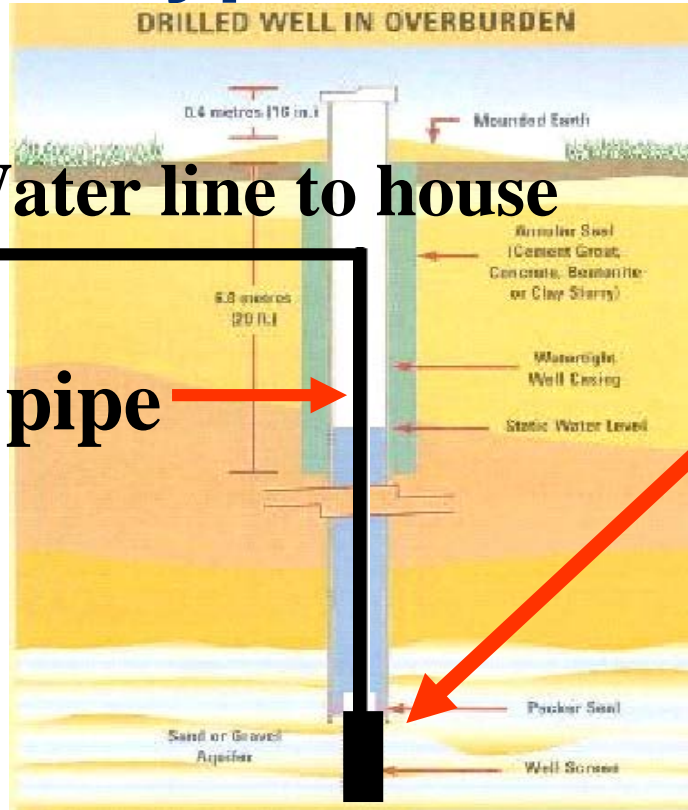


Types of IWS: Drilled wells



- Earth mounded around top of casing
- Casing (steel or PVC, 6" diameter pipe) - Extends at least 20 feet below ground, 1 foot above grade
- Grout seal around casing
- Casing seated into bedrock
- Screen – if necessary

Types of IWS: Drilled wells



Drop pipe

Submersible pump

- Permanent casing surrounds drop pipe (drop pipe is a small pipe within the casing)
- Drop pipe connects to the submersible well pump...
- Drop pipe connects to water line to house plumbing

Well Caps

Screen Vent

Good well cap:

- Sealed
- Watertight
- Vermin-proof
- Screen vented



Seal

“Split”
well caps NOT
allowed



Department
of Health

Well Caps

Another Bad Well Cap:

- Not watertight
- Not vermin-proof
- Not vented

This was a public water supply well and tested positive for e-coli. Much work was needed to remediate this.



Typical Drilled Well Construction

SUBMERSIBLE PUMP

- Long life – 20+ years
 - The life of the well is dependent on the life of the pump.
- Easy to maintain
- Water lubricating
- Fits inside well casing



Typical Drilled Well Construction

Well Pits

- A pit was where the drop pipe and the well casing connection used to be located
- Pits were open:
 - to the elements
 - to vermin and contamination
- Safety concerns

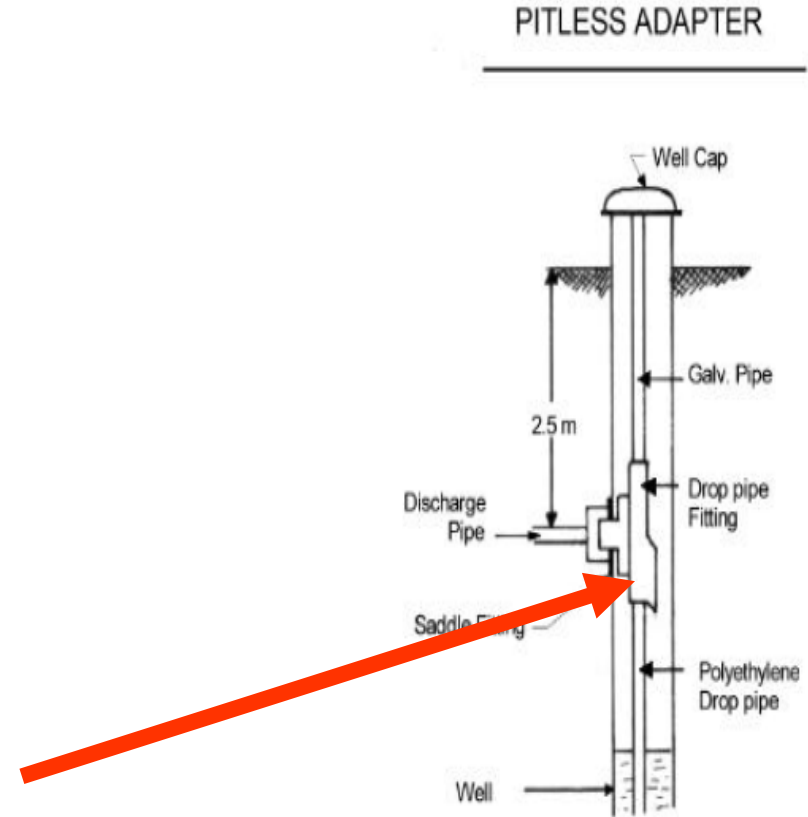
PITLESS adapters
are much better



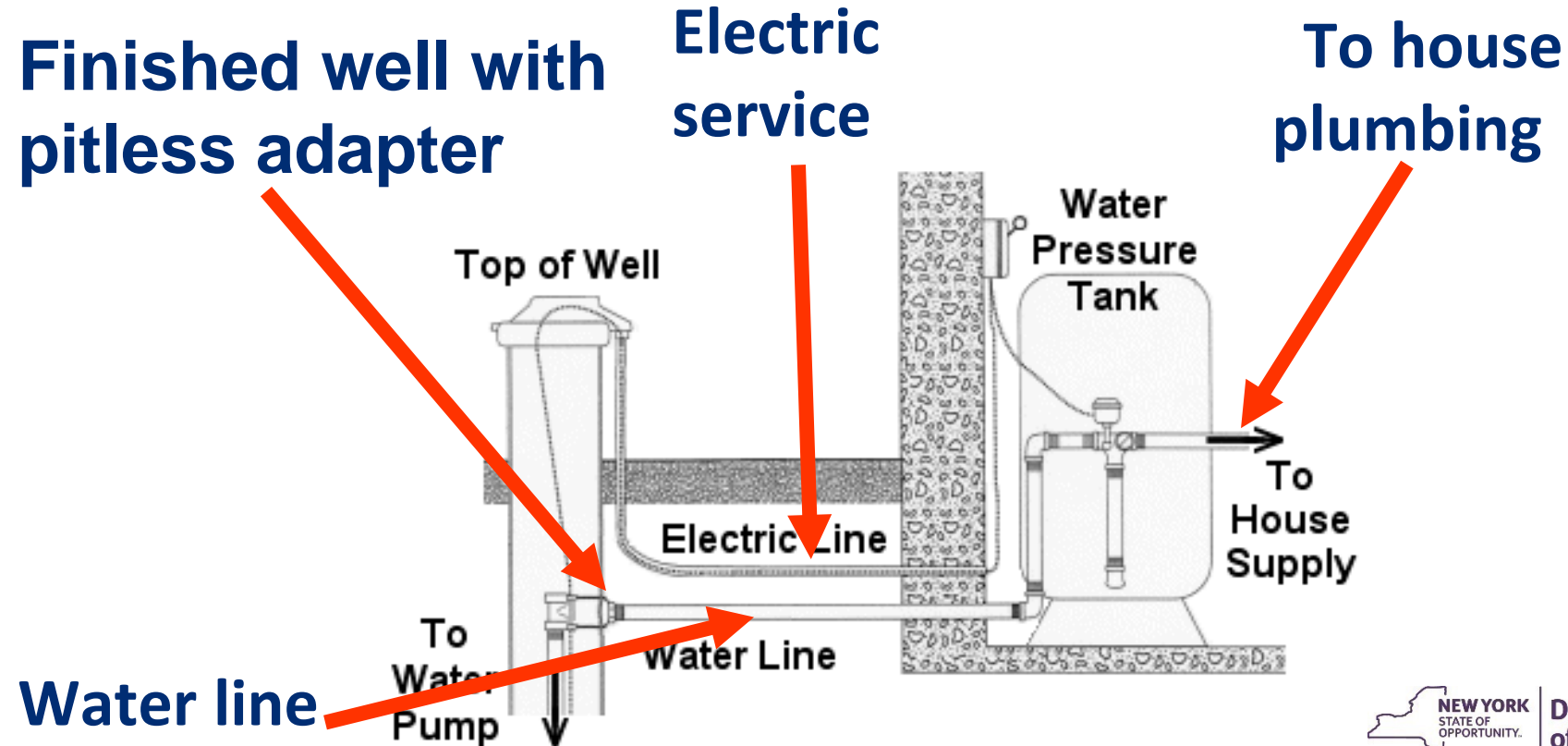
Typical Drilled Well Construction

Pitless Adapter

- Buried underground
- Sanitary (sealed and not open to contamination, including drainage)
- Frost-proof
- Convenient to service



Typical Drilled Well Construction



Yield Testing

- Average water usage for 3 bedroom house: 330 gallons/day (GPD) – see Appendix 75-A
- 5 gallons per minute (GPM) minimum recommended
- No yield requirement unless home is part of a realty subdivision
- 1-5 GPM: extra storage is recommended for peak flows (e.g. water tank plus storage in well)
 - If well cannot provide water at high enough rate for peak times, draws water from storage
 - Recovery during low flow times

DOH and Other Policy

- 1999 Well Drillers Registration Law required:
 - Well regs (Appendix 5-B) written by DOH
 - Driller registration/certification by DEC(All drillers need to be registered with DEC)
- DEC “Well Completion Report” (well log) needs to be submitted to DEC and to the homeowner by the driller
- Some counties have their own well code and other IWS policy, such as water quality testing (Albany CHD does)
- Applies to new wells



Appendix 5-B

- **Covers: Well construction, pumps (installation and repair), yield tests, separation distances, well abandonment**
- **Developed with drilled, cased wells under positive pressure as the goal**
- **The Residential Building Code references Appendix 5-B; local code enforcement officers (CEOs) can enforce (unless a County has its own IWS program e.g., Dutchess)**

Appendix 5-B

Separation distances:

- Helps to reduce risk from sources of contamination, such as OWTS, barnyards, watercourses, etc.
- Applies to all new construction
- Minimum lot size: 20,000 square feet (~1/2 acre)
 - See 10 NYCRR 74.4(b)

Contaminant Source	Distance to Well (ft)
OWTS Absorption Field	100
Barnyard	100
Septic Tank	50
Stream, Lake	25

Appendix 5-B

Separation distances: distance from contaminant source increased by 50% if well less than 50 feet deep (50/50 Rule)

Contaminant Source	Normal Distance (ft)	50/50 Distance (ft)
Septic Tank	50	75
Absorption Field	100	150
Stream, Lake	25	37.5

Water Quality Testing

- There are currently no statewide well testing requirements
- Some counties do require testing – contact the Local Health Department in the county where home is located
- Possible future testing regulations may require testing:
 - For new wells
 - Upon property transfer
- FHA Loans:
 - No well testing requirements – defers to state/local requirements
 - NY does not have well testing requirements, only recommended standards (see Appendix 75-C)

Appendix 75 – C (Water Quality)

Test	MCL
Coliform bacteria	Any positive result is unsatisfactory
Lead	0.015 mg/L (15 µg/L)
Nitrates	10 mg/L as N
Nitrites	1 mg/L as N
Turbidity	5 NTU
Arsenic	0.010 mg/L
Iron	0.3 mg/L
Manganese	0.3 mg/L
Iron plus manganese	0.5 mg/L
Sodium	No designated limit.
pH	6.5 – 8.5
Hardness	150 mg/L as CaCO ₃
Alkalinity	100 mg/L as CaCO ₃



Treatment

- Naturally occurring hardness, iron, manganese and hydrogen sulfide (“sulfur”) are commonly treated and are not a health concern
- Home may have water softener, etc.
- An ultraviolet (UV) unit or chlorination unit may be present
- These units provide continuous disinfection in cases of a contaminated existing well

Home water softener

Cost of Drilling a Well

Cost of Well Construction (typical well, 50 feet deep):

Item	Quantity	Unit	Unit Cost	Cost
Well Drilling w/Casing	20	feet	\$18/foot	\$360
Grouting Top 20 ft.	20	feet	\$5/foot	\$100
Remaining Drilling	30	feet	\$10/foot	\$300
Drive shoe, well cap	1 each	As noted	\$30, \$75	\$105
Fuel Charge	50	feet	\$1/foot	\$50
			Total:	\$915

Note: cost estimates are from 2008



**Department
of Health**

Cost of Drilling a Well

Cost of Pump and Development (typical well, 50 feet deep):

Item	Quantity	Unit	Unit Cost	Cost
Pump	1	Pump	\$683	\$683
Pressure Tank, fittings, pitless adapter, pipe, disinfection	Item Specific	Item Specific	\$878	\$878
Pump Installation	1	Install	\$300	\$300
Yield Test	6	Hours		\$360
Generator Rental	5	Hours		\$50
Disinfectant	1	Bottle		\$3
Test Report	1	Report		\$50
			Total:	\$2,324



Cost of Drilling a Well

Item Category	Cost
Well Construction	\$915
Pump and Development	\$2,324
Grand Total	\$3,239

Note: All cost estimates are from 2008

- Sampling for all parameters in Appendix 75-C costs an additional \$150 (approximately)
 - This is an average cost
 - Generally more expensive downstate, less expensive upstate



Risks of Contamination

- Shallow and improperly constructed wells at risk for contamination
- Permeable soil allows surface contamination to reach the water entering the well
- Wells whose casing is seated in impermeable formations (bedrock) is protected from surface contamination
- Deeper wells in bedrock are also less likely to run dry
- All well owners should test their water quality regularly

Risks of Contamination

- **Identify contamination by testing:**
 - **Annually for coliform bacteria**
 - **Every 3-5 years for other contaminants in Appendix 75-C**
 - **Whenever there is a change in taste, odor, appearance of water**
 - **See Fact Sheet 7**

Risks of Contamination

- If contamination is found:
 - Identify source (septic system, road salt, etc.)
 - Remediation: move or repair septic system, ensure well is properly constructed, etc.
 - May need to install treatment such as UV

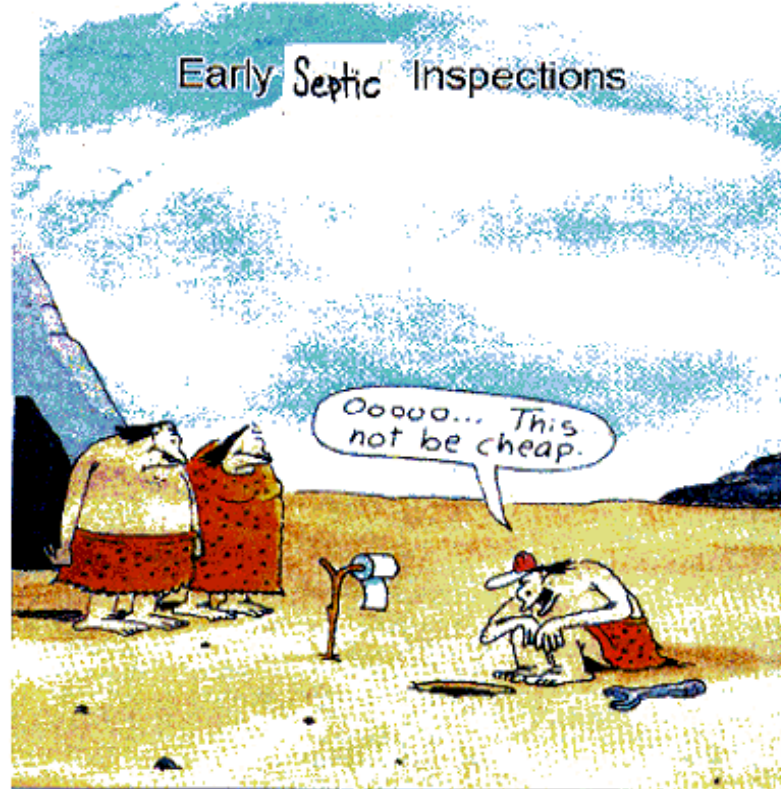
Resources

- IWS Fact Sheets:
http://www.health.ny.gov/environmental/water/drinking/regulations/fact_sheets/
- Appendix 5-B:
http://www.health.ny.gov/regulations/nycrr/title_10/part_5/appendix_5b.htm
- Local Health Department Contact Information:
http://www.health.ny.gov/environmental/water/drinking/doh_pub_contacts_map.htm
- Bureau of Water Supply Protection:
bpwsp@health.ny.gov, 518-402-7650

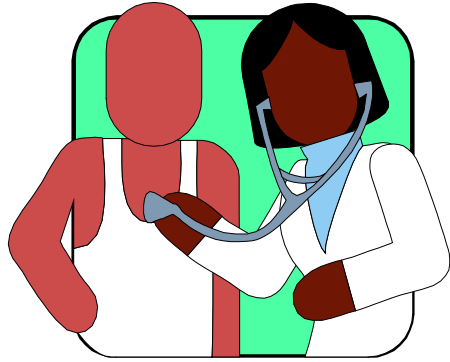


Onsite Wastewater Treatment Systems (OWTS)

Also known as....
Septic Systems

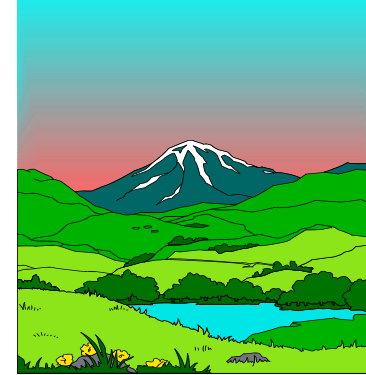


Goals of OWTS Design & Management



Protect Public Health

Protect the Environment



Protect Water Sources



Avoid Nuisance Conditions



**Department
of Health**

OWTS “Take Away” Points

- Systems must be designed by Design Professional (Professional Engineer or Registered Architect)
 - a) Perform site evaluation and prepare plans
 - b) Assure construction in accordance with plans (as-builts)
- Where available – Rely on LHDs for OWTS
- OWTS Fact Sheet (“Need for PE”)
 - a) New systems
 - b) Any increase in flow
 - c) Changes to the absorption field
- Contact your LHD with questions

http://www.health.ny.gov/environmental/water/drinking/doh_pub_contacts_map.htm



**Department
of Health**

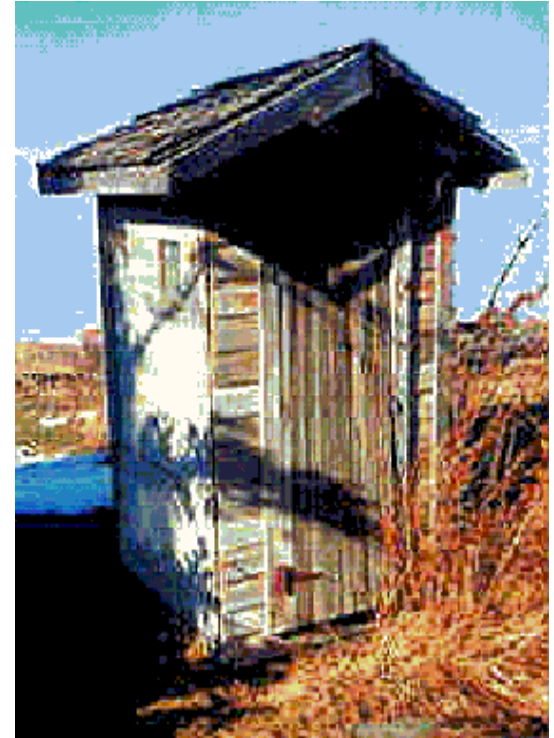
OWTS “Fun Facts”

- About 25% of existing USA houses use OWTSs
- About 33% of new houses in USA use OWTSs
- More than 1.5 million NYS houses use OWTSs
- About 350 million gallons of wastewater from OWTS discharged per day into ground in NYS from residences (for commercial sources estimate an additional 10%)



Brief History of OWTS

- Out House (Privy)
- Indoor Plumbing
- Cesspools
- Septic Tank
- Seepage Pits (Dry Well)
- Soil Absorption System
- Enhanced Treatment Systems (ETU)
 - treatment before soil absorption area

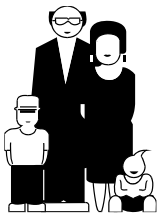


Disposal vs. Treatment

What's in Wastewater???

- Residential Wastewater Contains:
 - Organic matter (pathogens & viruses), solids, nutrients (nitrogen & phosphorus), grease, household chemicals, etc... (homeowner habits)
- Wastewater “strength” is typically measured as:
 - Amount of Biochemical Oxygen Demand (BOD)
 - Suspended particles (TSS)
 - Some non-biodegradable that can “block” the soil area
- Wastewater “strength” and characteristics vary:

Residential



Restaurant



Bar



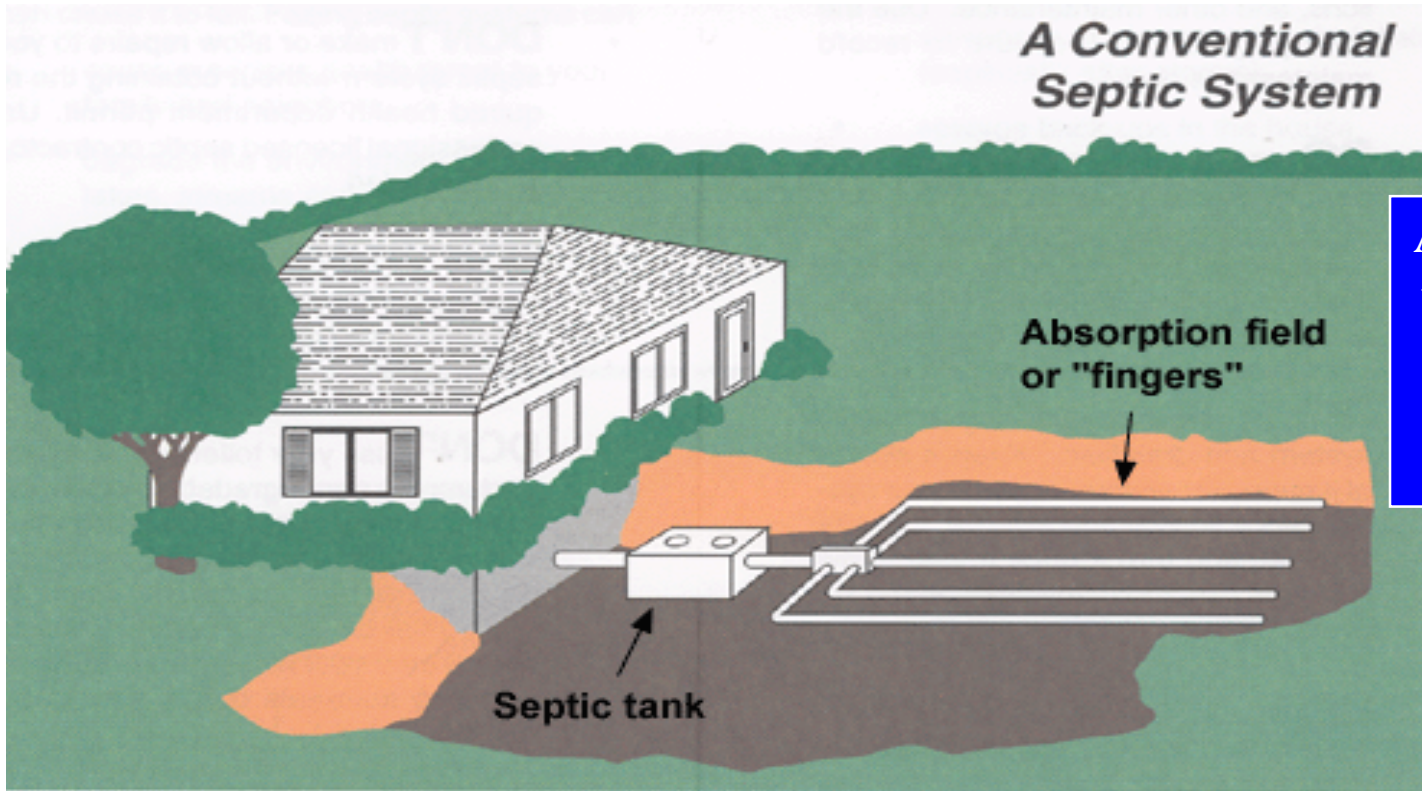
Factory



School



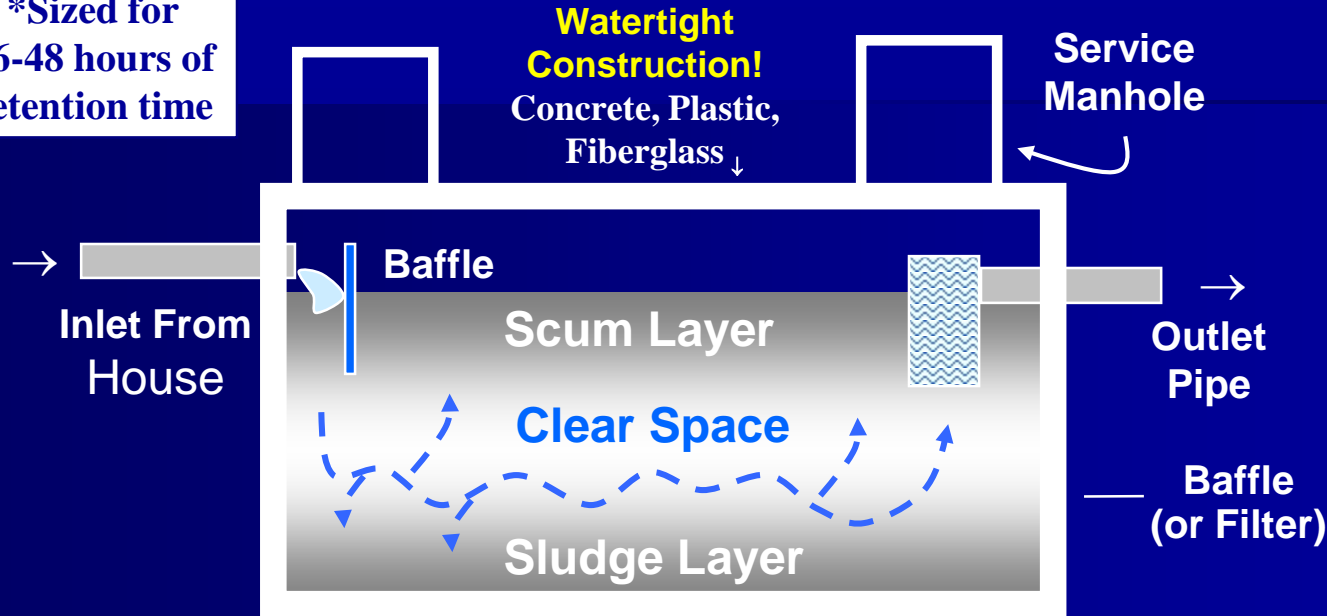
Basic OWTS Components



An OWTS is designed to collect and TREAT wastewater prior to dispersal back to the environment

Septic Tank

***Sized for
36-48 hours of
retention time**



- Allows for solids to settle (sludge) and floatable material to rise (scum)
- Reduces wastewater "strength" going to the soil absorption area
- Effluent filters are used to further reduce effluent "strength"
- Limited anaerobic biodegradation occurs in the septic tank

Septic Tanks and Filters

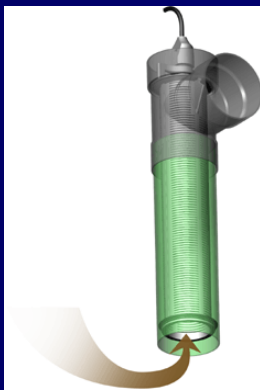
Residential Septic Sizing

<u># Bedrooms</u>	<u>Gallons</u>
1, 2, 3	1,000
4	1,250
5	1,500
6	1,750

Add 250-gallon for BR, garbage grinder or spa-tub



Effluent Filters



www.nsf.org
Standard 46

Plastic or Fiberglass

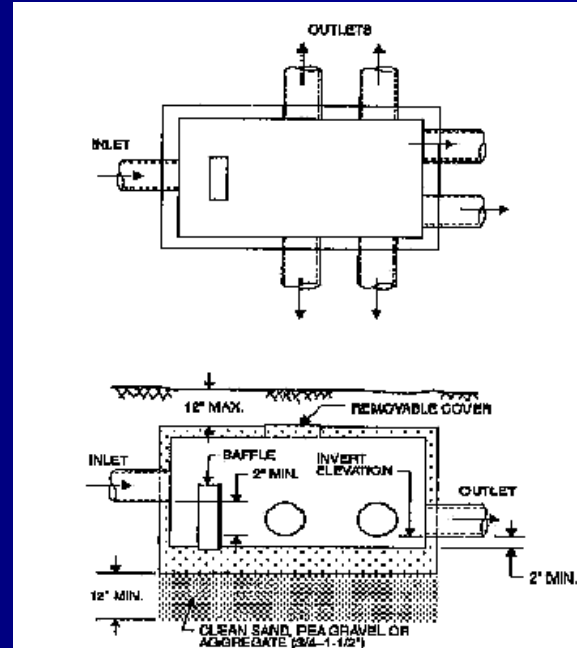


Distribution to the Soil Absorption Area

■ Gravity Distribution

– Distribution Box

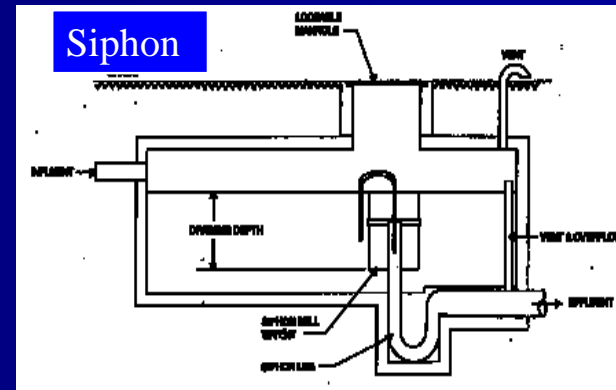
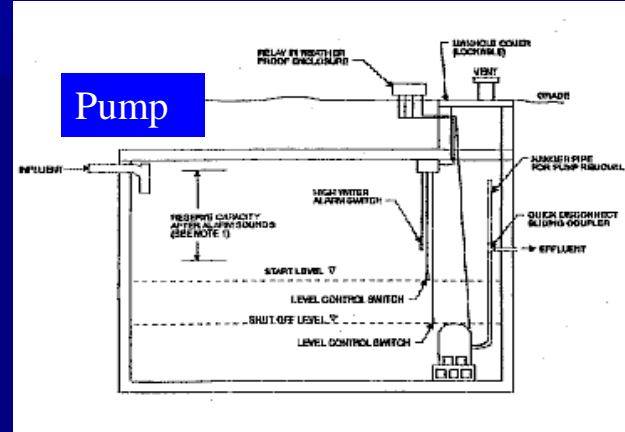
- Provides equal distribution
- Controls flow
- Use Speed Levelers



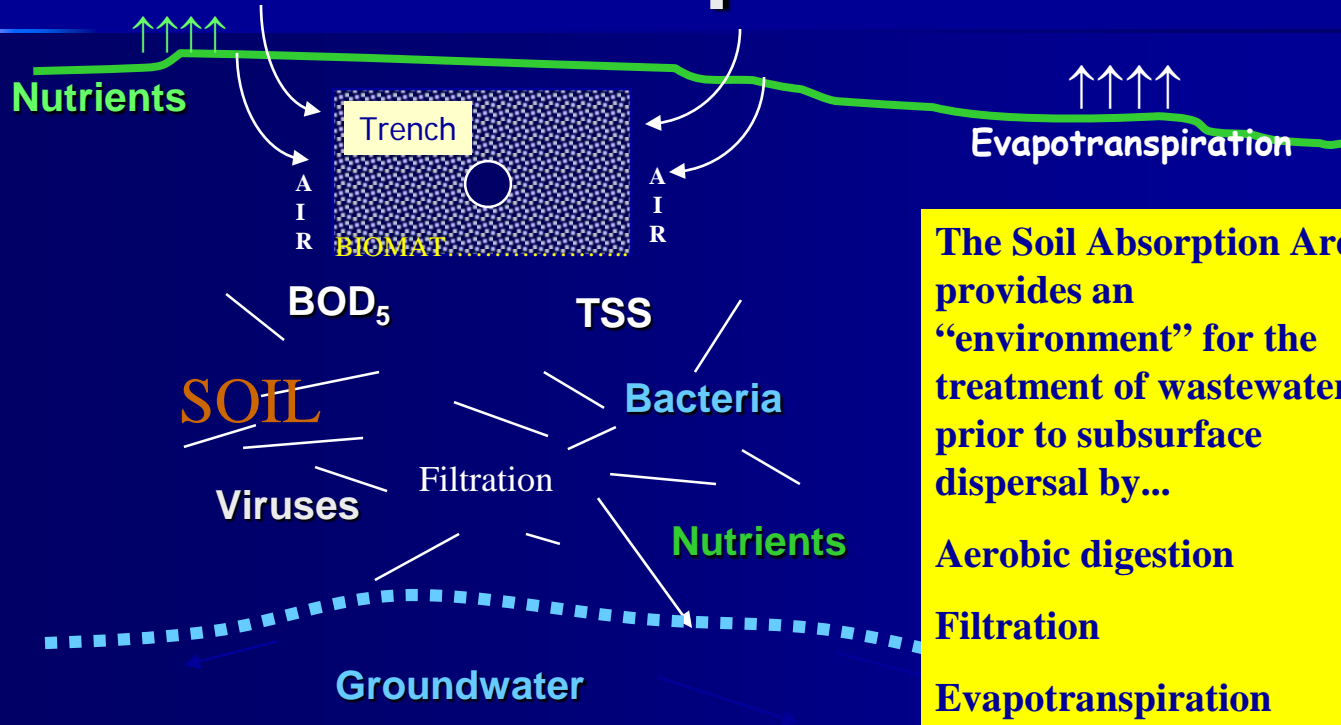
Pump or Siphon Distribution

Dosing

- May be required by design or to “lift” wastewater to the Absorption Area
- Delivers a calculated “dose” of wastewater to the Absorption Area (75-85% of pipe volume)
- “Dose” is typically delivered to a D-Box for gravity feed to the Absorption Area
- *Pressure distribution* is through smaller diameter piping (5-10 times the pipe volume dose). May be required by design



Wastewater Treatment in a Soil Absorption Area



The Soil Absorption Area provides an “environment” for the treatment of wastewater prior to subsurface dispersal by...

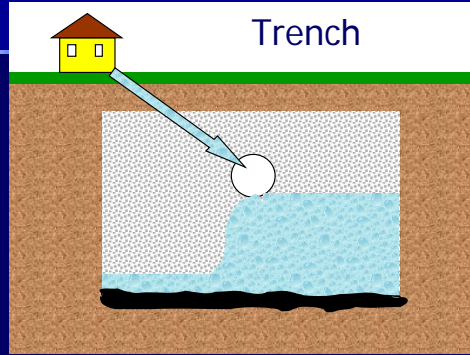
Aerobic digestion

Filtration

Evapotranspiration

Adsorption

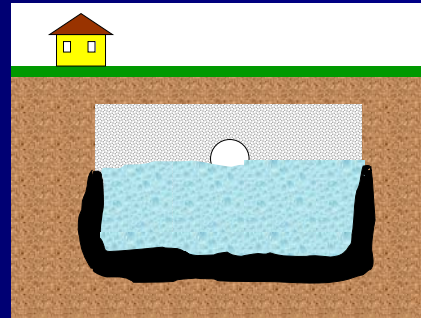
Biomat



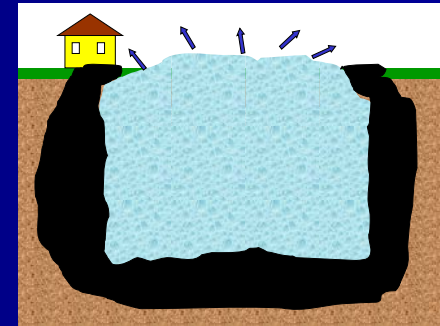
A Biomat is a “bed of bugs” which forms on the soil surface and “digests” organic matter, harmful bacteria and viruses as food. The “bed” also slows down infiltration and helps distribute wastewater

When a Biomat grows too thick wastewater will “surface”

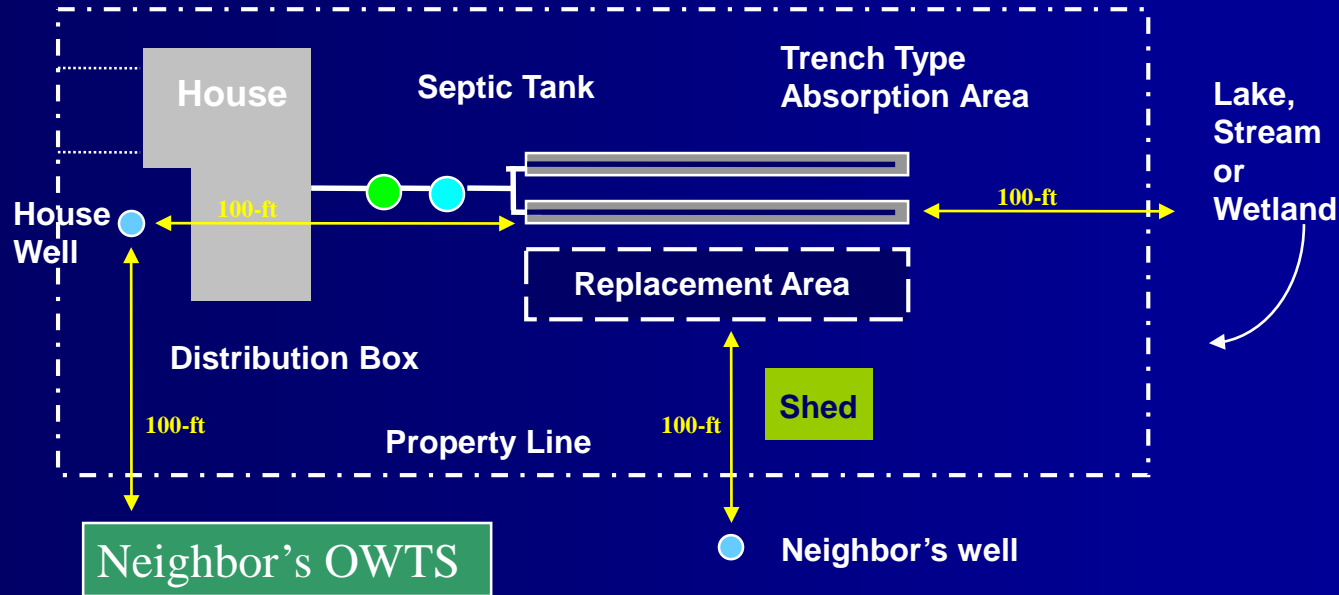
OWTS are designed for an expected life of about 20+ years



OWTSs can last for much longer with proper homeowner use, operation and maintenance

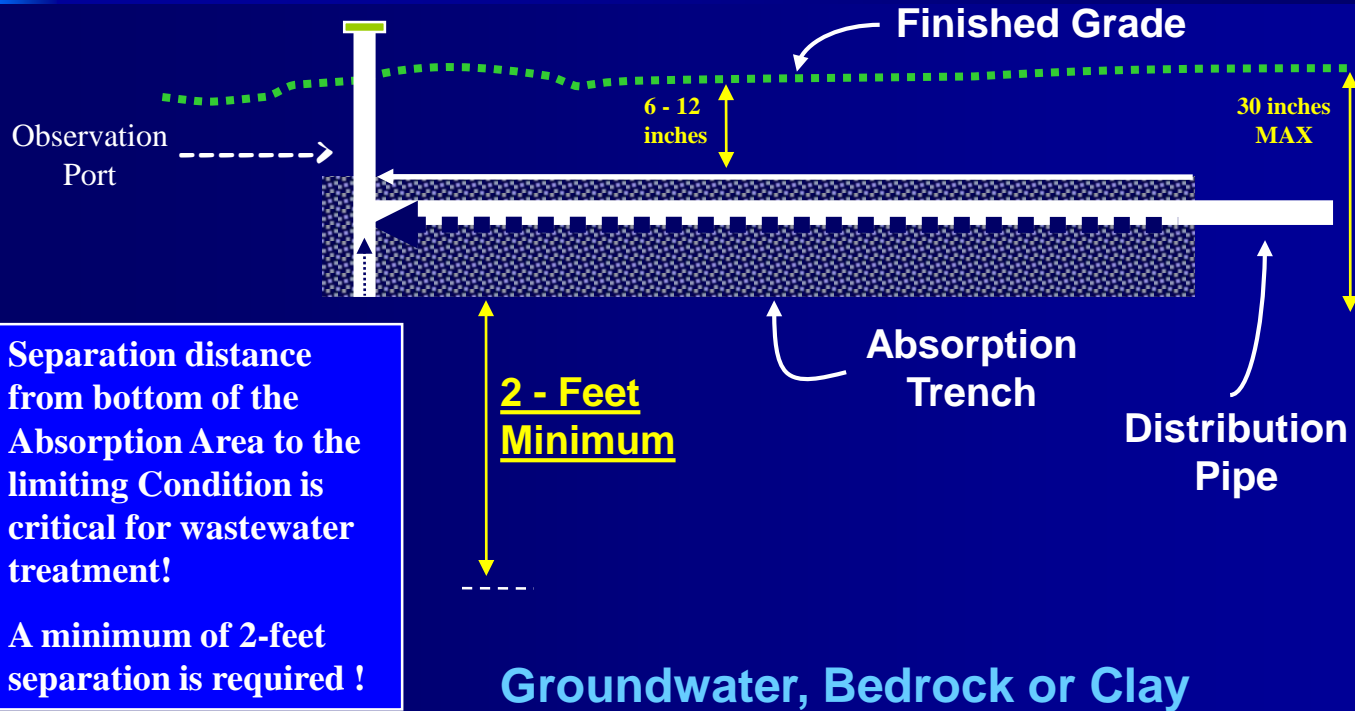


Separation Distances (Horizontal)



Separation distances are maintained to “minimize risks” to public health and the environment

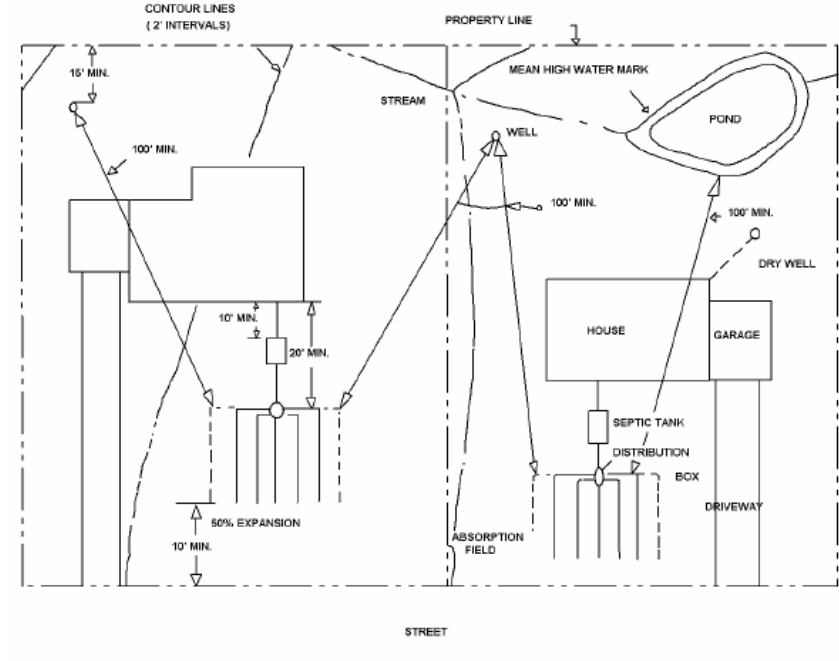
Separation Distances (Vertical)



Separation Distances

TABLE 2
SEPARATION DISTANCES FROM WASTEWATER SYSTEM COMPONENTS
(IN FEET)

System Components	Well or Suction Line (e)(g)	To Stream, Lake, watercourse (b), or Wetland	Dwelling	Property Line
House sewer (watertight joints)	25 if cast iron sewer pipe, 50 otherwise	25	3	10
Septic tank or watertight ETU	50	50	10	10
Effluent line to distribution box	50	50	10	10
Distribution box	100	100	20	10
Absorption field (c)(d)	100 (a)	100	20	10
Seepage pit(d)	150 (a)	100	20	10
Raised or Mound system (c)(d)	100 (a)	100	20	10
Intermittent Sand Filter (d)	100 (a)(f)	100 (f)	20	10
Non-Waterborne Systems with offsite residual disposal	50	50	20	10
Non-Waterborne Systems with onsite discharge	100	50	20	10



Soil Evaluation

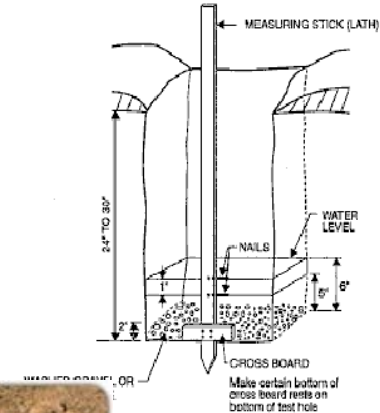
- Test Pits performed by design professional
- Identify soil type and “limiting conditions” (water, bedrock, clay)
- Used to determine the TYPE of absorption area appropriate for the site
- Typically 6 feet deep



Soil Evaluation

- Percolation Test performed by design professional
- Measure “How Fast” soil will absorb water, measured in minutes per inch (mpi)
- Used to determine the SIZE of the soil absorption area
- “Perc” between 1-60 mpi
- Too Slow: liquid will not disperse fast enough (untreated water may surface)
- Too Fast: liquid will disperse before treatment can occur (groundwater contamination)

- Dig a hole about 12" wide on all four (4) sides or 12" diameter - 24" to 30" deep, or to depth of absorption trench.
- Scrape sides and remove loose soil from bottom.
- Install measuring stick.
- Place 2" of washed gravel or crushed stone on bottom.
- Presoak and saturate soil.
- Observe and record the time in minutes required for the water to drop from 6" to 5".
- Repeat the test at least 3 times until the time for the water to drop from 6" to 5" for two successive tests is approximately equal.



Conventional vs. Alternative Absorption Areas

Conventional: “good” sites

Trenches (Stone & Pipe or Gravelless)

Shallow Absorption Trenches

Deep Absorption Trenches

Absorption Bed

Seepage Pit

Alternative: “difficult” sites

Raised System (soil fill)

Mound (sand fill)

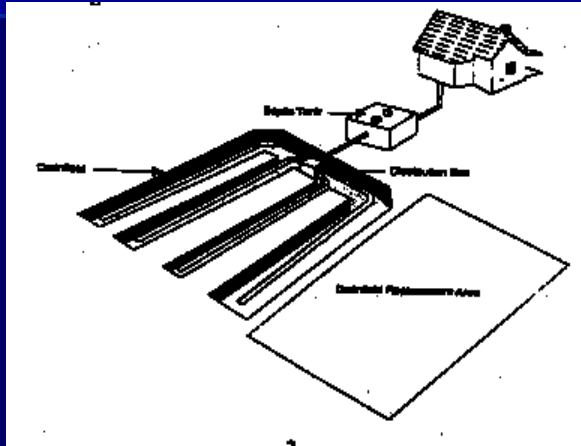
Sand Filter

Enhanced Treatment Units

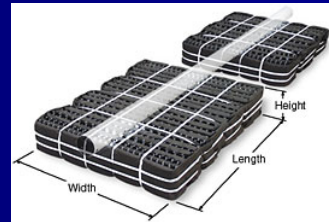
Others: Composter, “Waiver”,
Holding Tank (temporary only)

OWTS design decisions are based upon the *depth* of useable soil (1-60mpi), the *percolation rate* and the overall *site characteristics* (slopes, separation)

Conventional Absorption Trench System



Gravelless



Alternative Systems & ETUs

www.nsf.org
Standard 40



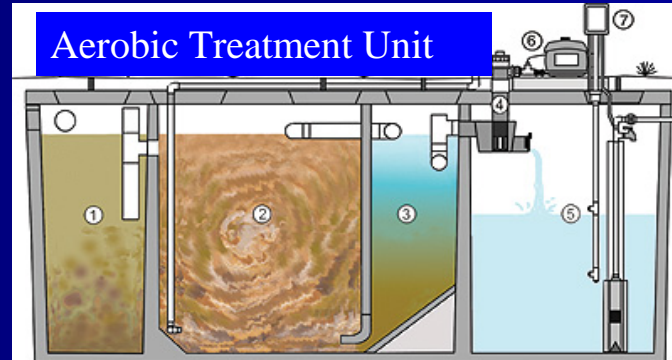
Raised System



Peat Filter



Sand Filter



OWTS Maintenance

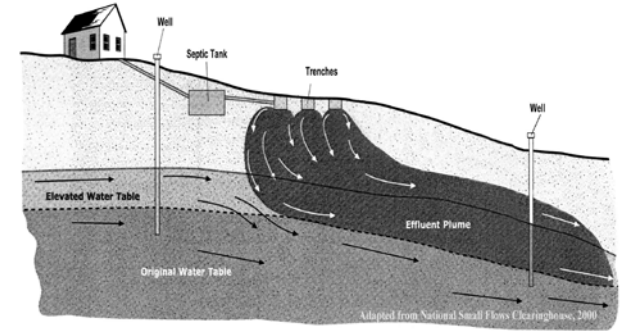
- **DON'T** drain or flush certain items: diapers, plastic, trash, etc. (“flushable wipes” are not flushable)
- Normal amounts of household products (bleach, detergents, drain cleaner, etc.) are **OK**
- **DON'T** flush household drugs; refer to local recycling coordinator or https://www.health.ny.gov/professionals/narcotic/medication_drop_boxes/
- Pump septic tank every 2-3 years
- Additives don't work and are not necessary

NYS General Business Law 396-s

- *On and after July first, nineteen hundred eighty-one every vendor shall, either in person or by certified mail, deliver to a vendee at the time of the transfer of title of the newly constructed home serviced by an individual sewage disposal system a copy of the health bulletin. If the political subdivision within which the home is located has published a waste treatment handbook or pamphlet on individual sewage disposal systems, the vendor shall supply a copy of such informational material to the vendee in the same manner as the health pamphlet.*

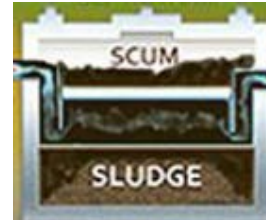
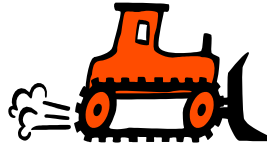
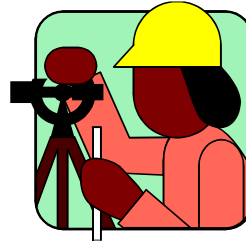
OWTS Failure

- Exposure to pathogens
- Contamination of drinking water wells
- Environmental contamination of surface water (e.g. eutrofication) and groundwater
- Public nuisance: odors, exposure, run-off (neighbors)



OWTS Failure - Causes

- Misuse (over use of water, grease, garbage grinder, etc.)
- Poor design and site evaluation
- Old, “legacy” systems
- Poor Installation
- System abuse or neglect (e.g. not pumped)





How to know if your system is failing?

- Sewage backup in drains and toilets
- Slow flushing toilets
- Surfacing of wastewater over absorption field
- Sewage odors in the house
- Lush green grass over the absorption field, even during extremely dry weather
- Dye test indicators



Regulations

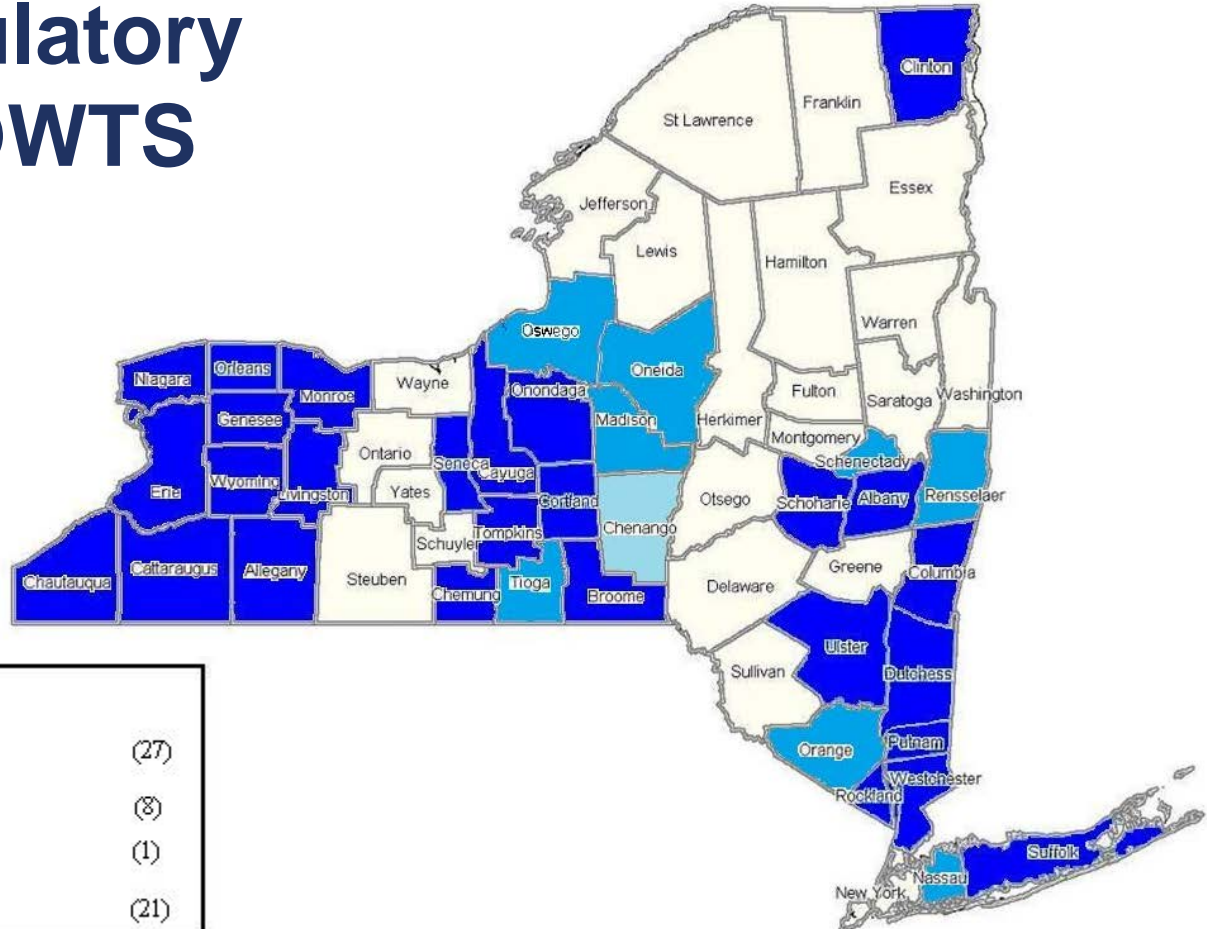
- **Residential Code** 
- 10 NYCRR Part 75
- **10 NYCRR Appendix 75-A** 
- Residential Onsite Wastewater Treatment Systems Design Handbook (best practice guide) - 2012
- Design Standards for Intermediate Sized Wastewater Treatment Systems – 2014 (DEC)

DOH Roles and Responsibilities (State/LHD)

- OWTS
 - Residential System <1,000 gpd*
 - Review/approval for LHDs where it is written into their sanitary code (see map)
 - DOH permitted facilities (restaurants, campgrounds, mobile home parks, etc.)
 - Issue waivers from Appendix 75-A
 - Nuisance Complaints
 - Technical Assistance



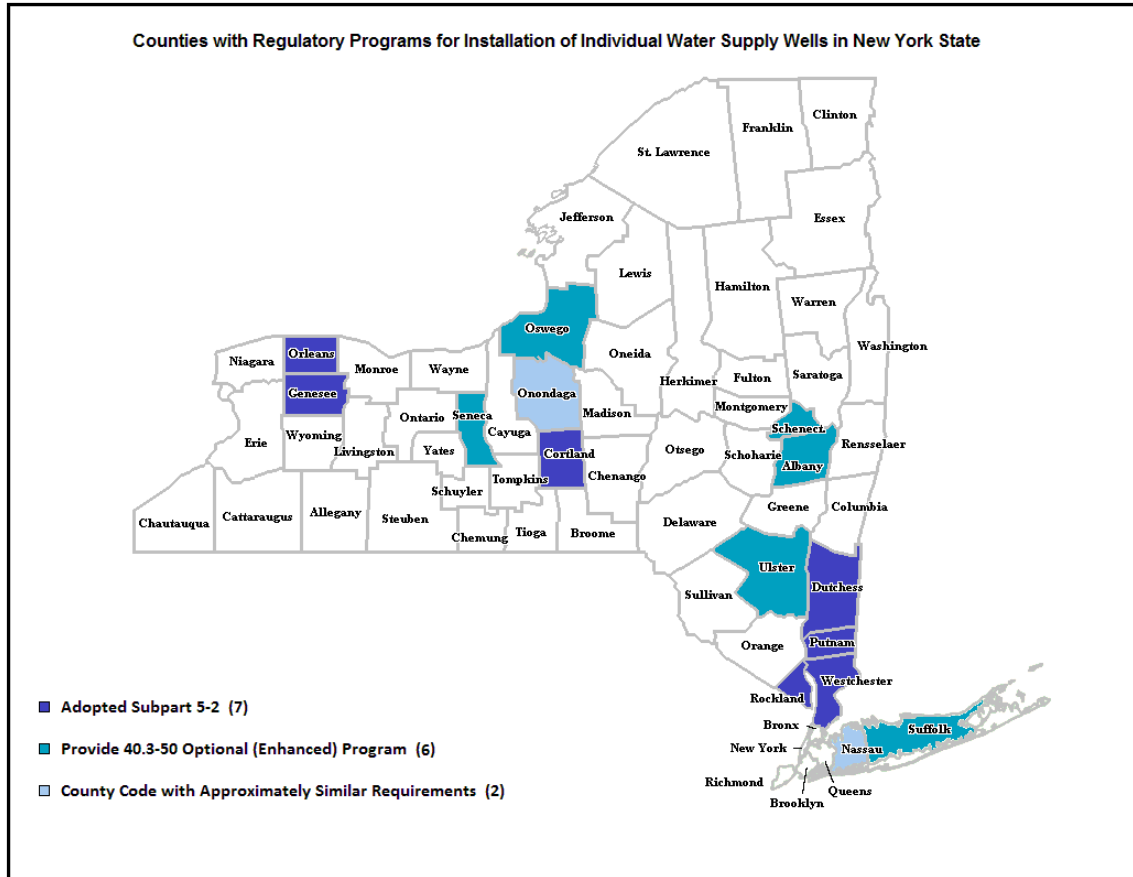
LHDs with regulatory programs for OWTS



DOH Roles and Responsibilities (State/LHD)

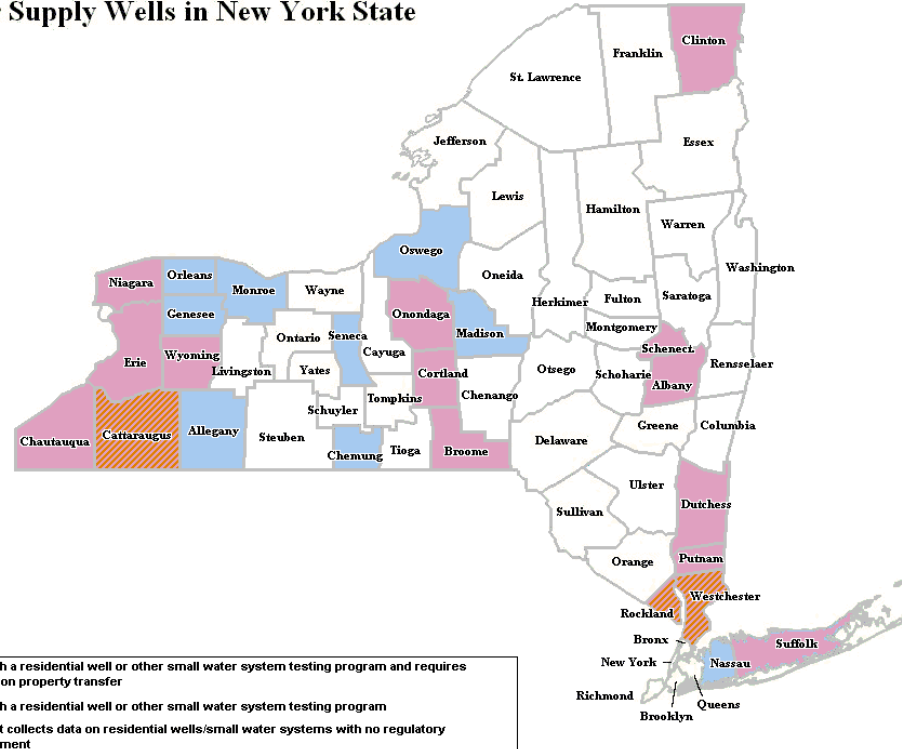
- IWS
 - Some LHDs have permitting programs/testing requirements
 - Issue waivers from Appendix 5-B
 - Technical Assistance

County Well Permitting Programs



County Well Testing Programs

Counties with Regulatory Programs for Installation of Individual Water Supply Wells in New York State



P:\Sections\Residential Sanitation\EHS-NET Well Project\LHD-IWS-2013 Updated Map 5 10 2013.bmp

DEC Roles and Responsibilities

- OWTS
 - Commercial systems >1,000 gpd (non permitted facilities)
 - Issuance of SPDES permits
 - All surface discharges
 - Subsurface discharges from all facilities >10,000 gpd
 - Septic Haulers – transport/disposal

DEC Roles and Responsibilities

- IWS
 - Regulate Well Drillers
 - Maintain well logs for all drilled wells – since 1999
 - Enforcement of well drillers

CEO Roles and Responsibilities - OWTS

- Building permits should not be issued until OWTS plans have been completed by design professional and reviewed/approved by LHD where applicable
- Review/approve conventional systems in counties covered by a State District Office
- Certificate of Occupancy should only be issued once design professional certifies as-built construction
- CEO **CANNOT** issue waivers from Appendix 75-A

CEO Roles and Responsibilities - IWS

- A copy of the well log should be given to CEO
- Certificate of Occupancy should only be issued once well log is obtained and the well meets Appendix 5-B
- CEO **CANNOT** issue waivers from Appendix 5-B

2015 International Residential Code

- Section P2602 Individual Water Supply and Sewage Disposal – 2602.1

“The water-distribution and drainage system of any building or premises where plumbing fixtures are installed shall be connected to a public water supply or sewer system, respectively, if available. Where either a public water-supply or sewer system, or both, are not available, or connection to them is not feasible, an individual water supply or individual (private) sewage-disposal system, or both, shall be provided.”



2016 Uniform Code Supplement

- P2602.1.1 Individual water supplies. Individual water supplies (private wells) shall be installed by a well driller registered with the Department of Environmental Conservation and be in compliance with the provisions of Appendix 5-B of the New York State Department of Health regulations (10NYCRR Appendix 5-B.)
- P2602.1.2 Individual sewage treatment system. Individual sewage treatment systems shall be constructed in conformance with the provisions of Appendix 75-A (Wastewater Treatment Standards-Individual Household Systems) of the New York State Department of Health, Sanitary Code (10 NYCRR).



Realtors Roles and Responsibilities

- Have a general understanding of the rules/regulations in your area – separation distances are key
- Understand differences between existing homes and new construction
- Provide septic system operation & maintenance pamphlet where appropriate
- Know who to contact with questions – DOH/CEO

Thank You - Questions

Diane Sheppard or Kevin Kenyon
New York State Department of Health
Bureau of Water Supply Protection
Empire State Plaza – Corning Tower Room 1119
Albany, NY 12237
(518) 402-7650; Fax: (518) 402-7599
diane.sheppard@health.ny.gov
kevin.kenyon@health.ny.gov

