



# BROOME COUNTY HEALTH DEPARTMENT

## SEPTIC SYSTEM INSTALLER CERTIFICATION COURSE

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# INTRODUCTION

## COURSE PURPOSE

This course is meant to familiarize contractors with the engineering specifications and design standards set forth by the New York State Department of Health & Broome County Health Department for residential septic systems.

The rules & regulations for residential onsite wastewater treatment systems (OWTS) are set forth in the following:

- Pursuant to the authority of the Commissioner of Health by section 201 (1)(l) of the Public Health Law, Appendix 75-A Wastewater Treatment Standards - Individual Household Systems, and Chapter 11 of Title 10 (Health) of the Official Compilation of Codes, Rules & Regulations of the State of New York
- Department of Health's Administrative Rules & Regulations Design Standard (10NYCRR Appendix 75-A)
- Residential Onsite Wastewater Treatment Systems Design Handbook (2012)

# INTRODUCTION

## GENERAL OVERVIEW

Properly designed, constructed and maintained residential OWTs provide for a safe, sanitary means of treating and dispersing wastewater. Many gastrointestinal illnesses can be transmitted by water, food, insects, pets, and toys contaminated by human waste. Properly designed, constructed, and maintained OWTs minimize the possibility of disease transmission

### **Diseases caused by pathogens in sewage**

- Cholera
- Hepatitis A
- Giardiasis
- Typhoid Fever
- Viral Diarrhea
- Poliomyelitis
- Amoebic Dysentery
- Fascioliasis
- Ascariasis

# SEPARATION DISTANCES

All septic system components must maintain a minimum separation distance from various items such as wells, water lines, surface waters, property boundaries, foundations, etc. A complete list of distances is provided in the following table and figure from the Residential Onsite Wastewater Treatment Systems Design Handbook (2012).

10NYCRR Appendix 75-A Table 2: Required Separation Distances from Wastewater Treatment System Components

10NYCRR Appendix 75-A Figure 1: Absorption System Separation Requirements

**TABLE 2  
REQUIRED SEPARATION DISTANCES FROM WASTEWATER TREATMENT SYSTEM COMPONENTS  
(FEET)**

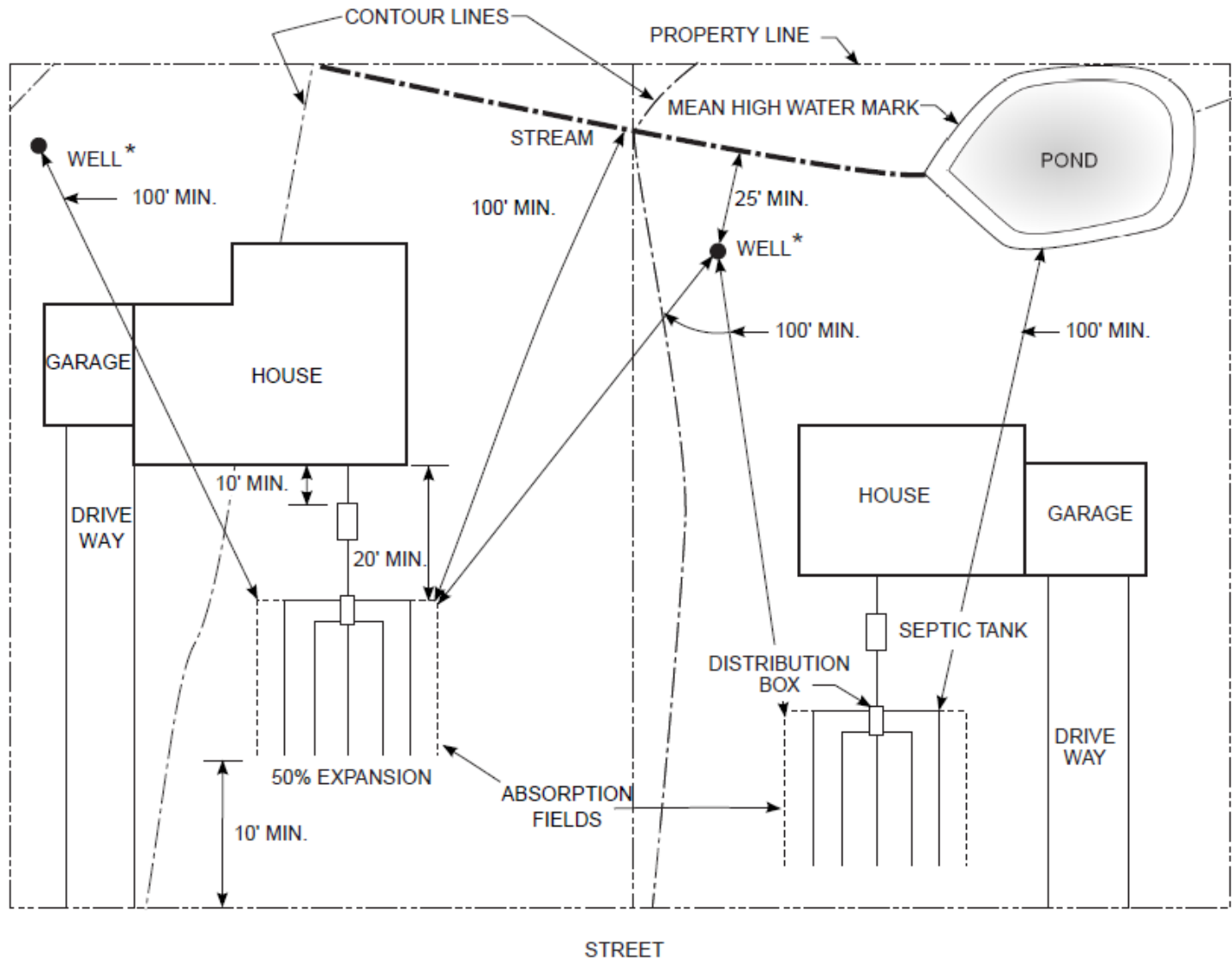
System Components	Well or Suction Line (e)(g)	Stream, Lake, Watercourse (b), or Wetland	Dwelling	Property Line	Drainage Ditch or Rain Gardens (h)
House Sewer Drain (watertight joints)	25 if cast iron, 50 otherwise	25	3	10	10
Septic Tank, Dosing Tank or watertight ETU	50	50	10	10	10
Effluent Line to Distribution Box/Drop Box	50	50	10	10	10
Distribution Box/Drop Box	100	100	20	10	20
Absorption Field (c)(d)	100 (a)	100	20	10	20
Seepage Pit(d)	150 (a)	100	20	10	20
Raised System or Mound (c)(d)	100 (a)	100	20	10	20
Intermittent Sand Filter (d)	100 (a)(f)	100 (f)	20	10	20
Non-Waterborne Systems with offsite residual disposal	50	50	20	10	10
Non-Waterborne Systems with onsite discharge	100	50	20	10	20

**Notes:**

- a) When wastewater treatment systems are located upgrade and in the direct path of surface water drainage to a well, the closest part of the treatment system shall be at least 200 feet away from the well.
- b) Mean high water mark. Wetland or watercourse determinations should be addressed with the LHD or other agency having jurisdiction and the applicable NYSDEC regional office.
- c) For all systems involving the placement of fill material, separation distances are measured from the toe of the slope of the fill, except for some shallow absorption trench systems as described in Section 9.12.2 of this Handbook.
- d) Separation distances shall also be measured from the edge of the designated additional useable area (i.e., reserve area), when available.
- e) The closest part of the wastewater treatment system shall be located at least ten (10) feet from any water service line (e.g., public water supply main, public water service line or residential well water service line).
- f) When intermittent sand filters are designed to be watertight and collect all effluent, the separation distance can be reduced to 50 feet.
- g) The listed water well separation distances from contaminant sources shall be increased by 50% whenever aquifer water enters the water well at less than 50-feet below grade. If a 50% increase cannot be achieved, then the greatest possible increase in separation distance shall be provided with such additional measures as needed to prevent contamination.
- h) Recommended; use site evaluation to avoid OWTS short-circuiting to the surface or groundwater and to minimize impacts on OWTS functionality.

**Embankment or very steep slope:** It is recommended that system components be located a minimum of 25 feet and the absorption field be located a minimum of 50 feet from an embankment or very steep slope. Maximize separation distances and use site evaluation to avoid short-circuiting to surface (breakout or seepage).

**Swimming pools (above or below ground):** It is recommended that system components be located a minimum of 20 feet and the absorption field be located a minimum of 35 feet from swimming pools. Maximize separation distances and use site evaluation to minimize impacts on OWTS accessibility and functionality.



\* The listed water well separation distances from contaminant sources shall be increased by 50% whenever aquifer water enters the water well at less than 50-feet below grade. If a 50% increase cannot be achieved, then the greatest possible increase in separation distance shall be provided with such additional measures as needed to prevent contamination

**FIGURE 1: ABSORPTION SYSTEM SEPARATION REQUIREMENTS**

# SYSTEM SIZING

Minimum daily design flows for residential systems are based upon the number of bedrooms in the dwelling and the age of water fixtures (i.e. toilets, faucets and showerheads).

Use of low flow fixtures can help reduce wastewater discharge volumes to the system; however, the biological load to the system will be about the same. Therefore, septic tank size and other certain system parameters are not affected when water saving fixtures are used.



# SYSTEM SIZING

**TABLE 1**

**DAILY DESIGN FLOWS**

Plumbing Fixtures (based on manufactured date)	Minimum Design Flow (gallons/day/bedroom)
Post-1994 Fixtures 1.6 gallons/flush toilets 2.5 gallons/minute faucets & showerheads	110
Pre-1994 Fixtures 3.5 gallons/flush toilets 3.0 gallons/minute faucets & showerheads	130
Pre-1980 Fixtures 3.5+ gallons/flush toilets 3.0+ gallons/minute faucets & showerheads	150
Waterless Toilets (e.g., composter) (greywater discharge only)	75

# CONSTRUCTION PROCESS

1. Submission of a completed “Application for Sewage Disposal Construction Permit” w/ applicable permit fee
2. Site Evaluation: Contractor to dig a 6ft deep soil cut with BCHD staff onsite. Perc test requirement dependent on soil cut results
3. BCHD designs new system and provides homeowner and contractor with copies
4. Contractor moves forward with installation. Contractor schedules inspection w/ BCHD inspector  $\geq 48$ hrs prior to completion
5. Inspection(s) by BCHD
6. Contractor completes construction
7. Approval issued by BCHD

# CONSTRUCTION PROCESS

## REINSPECTIONS

### **COMMON CONTRACTOR ERRORS REQUIRING A REINSPECTION**

- Separation distance requirements not met (unless a waiver by BCHD has been issued)
- Varying from the approved system design without prior approval from BCHD (alterations to the BCHD system design can only be made by BCHD staff)
- Enhanced Treatment Unit not supplied with a motor, power, filter and/or chlorine tablets
- Hay or geotextile fabric not readily available for covering system
- Insufficient stone or sand depth where specified
- Absorption field deeper or shallower than specified
- System components not meeting design specifications

# DIG SAFE NY

- If you plan to dig or do any type of excavation work, NYS law requires that you contact Dig Safe NY prior to doing so.

Phone: **811**

Website: <https://udignny.org/>

- Provide two full working days notice prior to starting your work, not counting the day of your call, weekends or holidays. This provides time for the utilities to locate your proposed dig site.
- Before digging on your stated commencement date, confirm that all utilities have responded to you indicating that they have marked your property or they have no facilities present.

# SITE EVALUATION

## SOIL CUT

- All Broome County Health Department approved septic system designs require a Site Evaluation and Soil Cut.
- The contractor will dig a 6ft deep soil cut in the proposed absorption area identified by BCHD using a backhoe or excavator.
- The soil cut is used to observe soil composition, depth to groundwater, bedrock or impermeable layer, and depth of useable soil.
- Based on results of the soil cut, a percolation test may be required. A “Perc Test” is used to observe the soil’s capacity to receive effluent and to determine the system type and size required.
- During the site evaluation, separation distance requirements will be checked, and waivers issued as needed.



# SITE EVALUATION

## SOIL CUT



Various soil types in vertical soil profile (left). Groundwater encountered at shallow depth (right).

# HOUSE SEWER DRAIN

- All “gray water” and “black water” plumbing must discharge through the same house sewer drain.
- House sewer drains shall be made of sound and durable material, have water-tight construction, have a minimum diameter of four (4) inches and be laid on a firm foundation at a minimum grade of one-quarter ( $\frac{1}{4}$ ) inch per foot.
- House sewer drains should be installed with as straight an alignment as possible.
- If bends are necessary, a maximum bend of 45 degrees shall be used and fitted with an appropriately installed clean out of the same size as the house sewer drainpipe.
- At least one (1) clean out with a properly fitted plug is required on the house drain within the building to provide access to the house sewer drain for maintenance.

# SEPTIC TANK SIZING

Number of Bedrooms	Minimum Tank Capacity (gals)	Minimum Liquid Surface Area (SF)
1, 2 or 3	1,000	27
4	1,250	34
5	1,500	40
6	1,750	47

NOTE: Tank size requirements for more than six bedrooms shall be calculated by adding 250 gallons and 7 square feet of surface area for each additional bedroom. A garbage grinder or hot tub/spa should be considered equivalent to an additional bedroom for determining tank size.

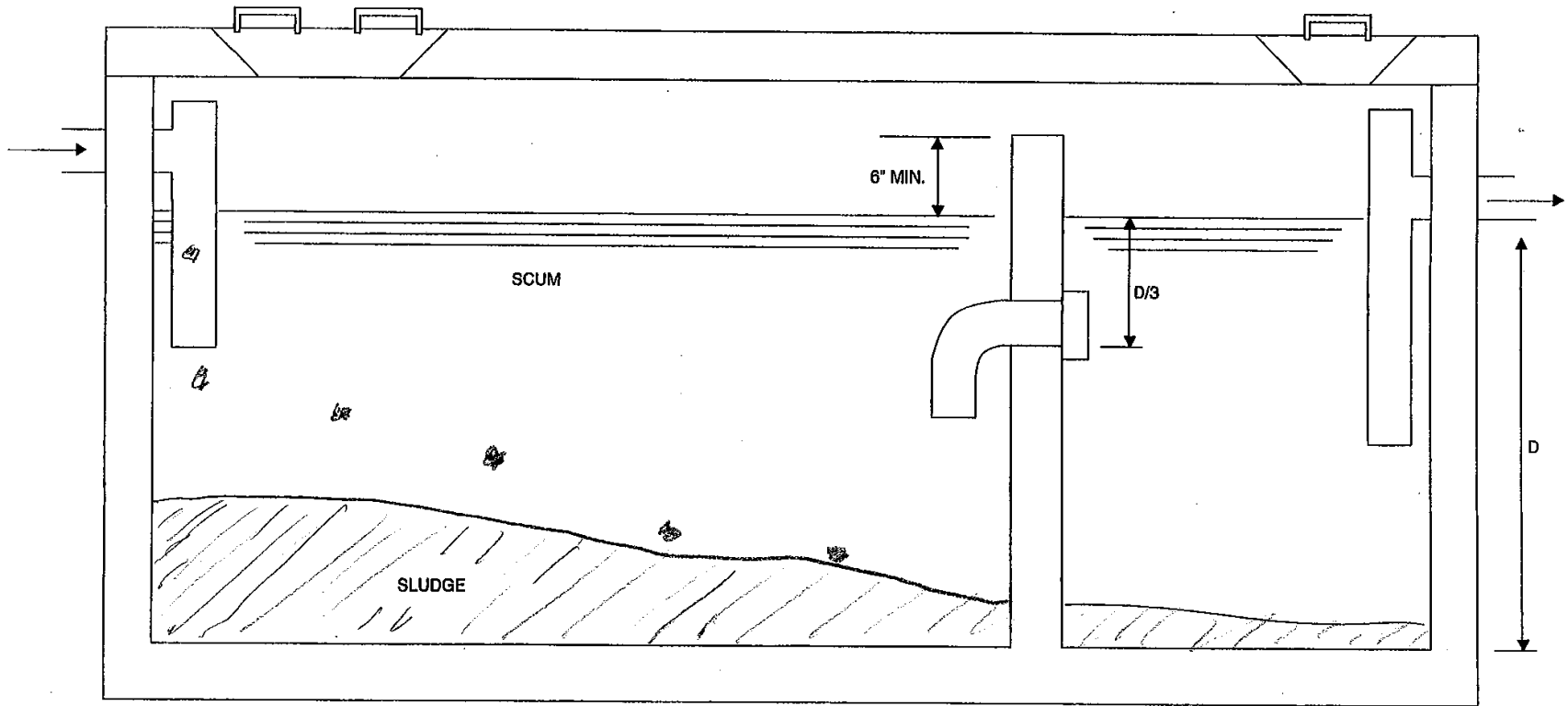


# SEPTIC TANK INSTALLATION

- Install septic tanks on 3” sand/pea gravel, or 5” #2 stone.
- Polyethylene (plastic) tanks require anchoring to prevent floating during cleanings.
- Tank access covers must be brought to the surface or within 12” of grade using risers if needed.
- Tanks must be watertight, constructed of durable materials and not subject to excessive corrosion, decay, frost damage or cracking
- Baffling or sanitary tees must be installed on inlet and outlet pipes. Filters may be required on outlet pipes, such as for all enhanced treatment units.
- Do not install under driveways or in areas receiving vehicular/heavy equipment traffic.

**NOTE:** Septic tank replacements do not require an Application for Sewage Disposal Construction Permit if only the tank is being replaced. A “Waiver Request” form must be completed and submitted to the Health Department before replacing the tank.

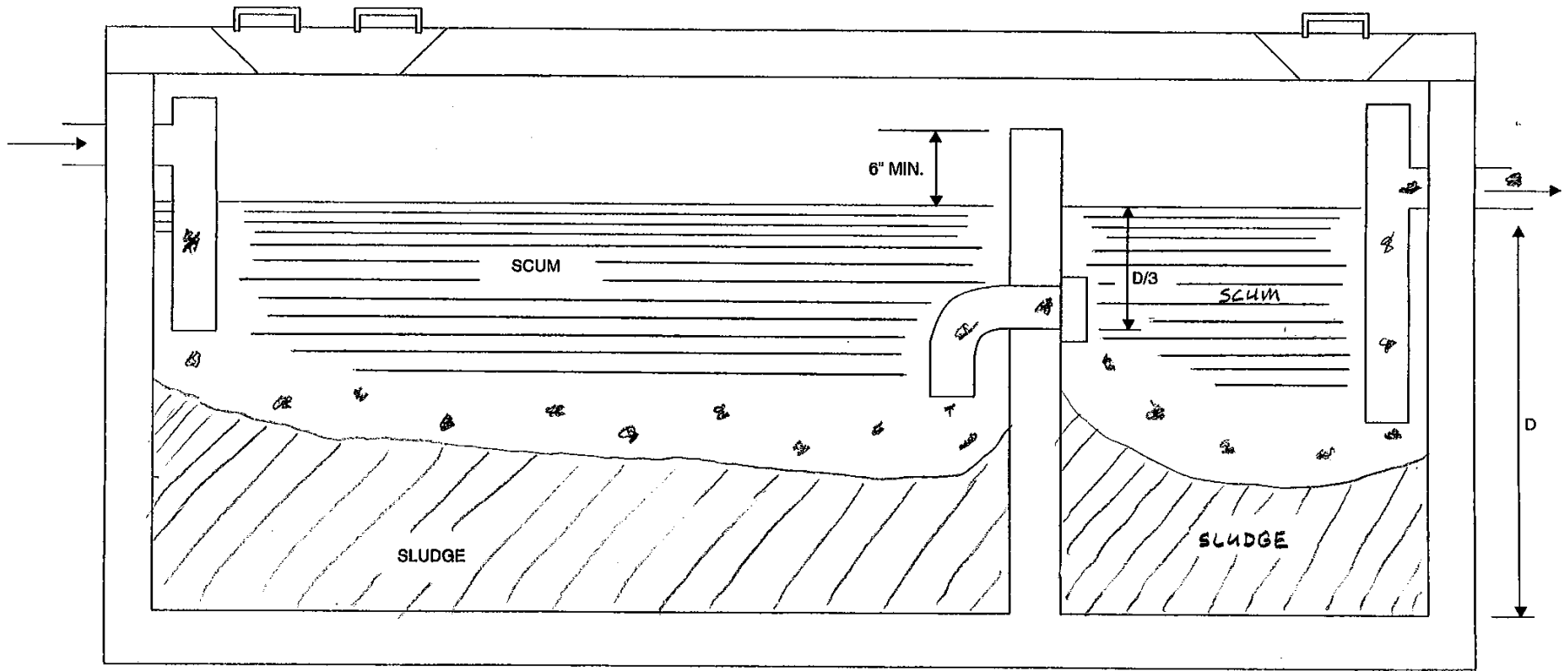
# Properly Operating Septic Tank



## NOTES:

1. COMPARTMENTS SHALL BE CONNECTED BY A FOUR INCH VERTICAL SLOT AT LEAST 18" IN WIDTH, A SIX INCH ELBOW, TWO 4-INCH ELBOWS, OR FOUR 4-INCH DIAMETER HOLES LOCATED AS SHOWN.

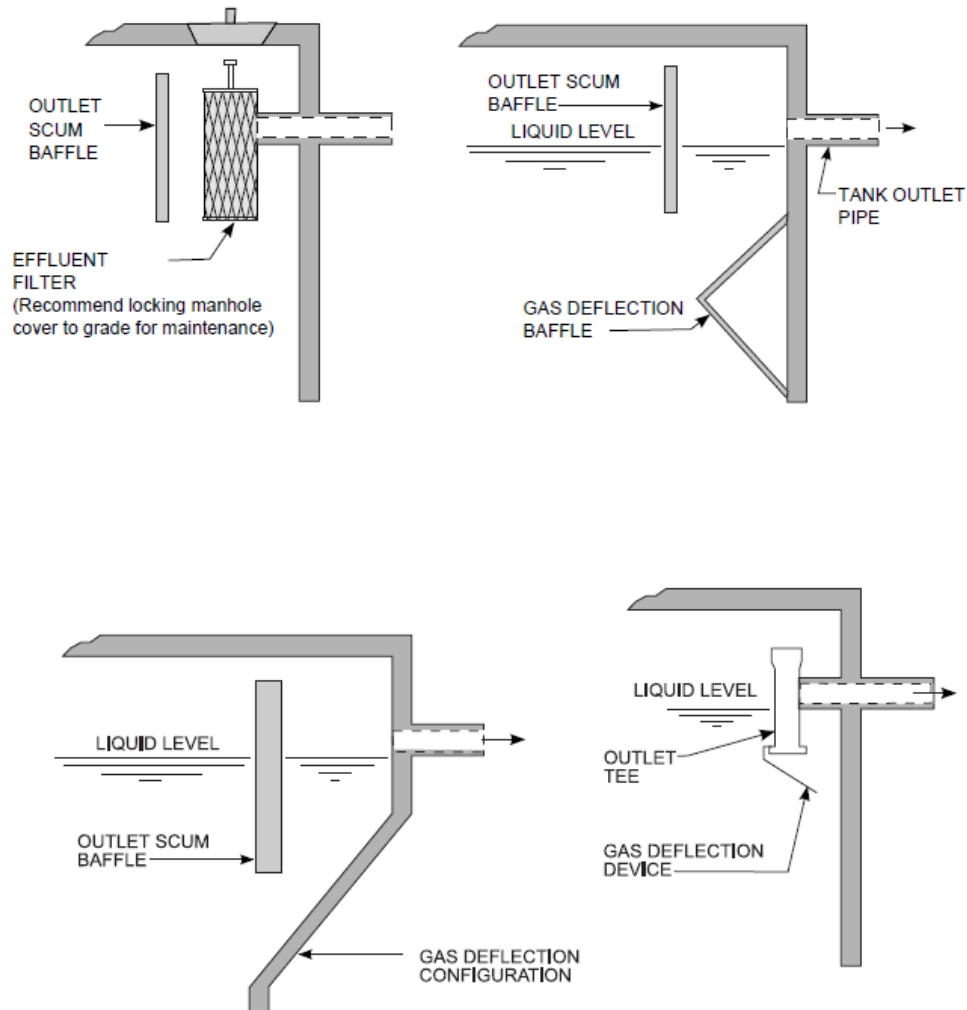
# Septic Tank Needs Pumping



## NOTES:

1. COMPARTMENTS SHALL BE CONNECTED BY A FOUR INCH VERTICAL SLOT AT LEAST 18" IN WIDTH, A SIX INCH ELBOW, TWO 4-INCH ELBOWS, OR FOUR 4-INCH DIAMETER HOLES LOCATED AS SHOWN.

# SEPTIC TANK OUTLET STRUCTURE



# PUMP CHAMBERS OVERVIEW

Septic systems will require a pump chamber when any of the following occurs:

- Effluent not able to reach the specified absorption system depth via gravity feed (i.e., system too deep)
- System dosing is required as part of the design
- Pressure distribution is required as part of the design

In certain situations, a pump chamber can be avoided by:

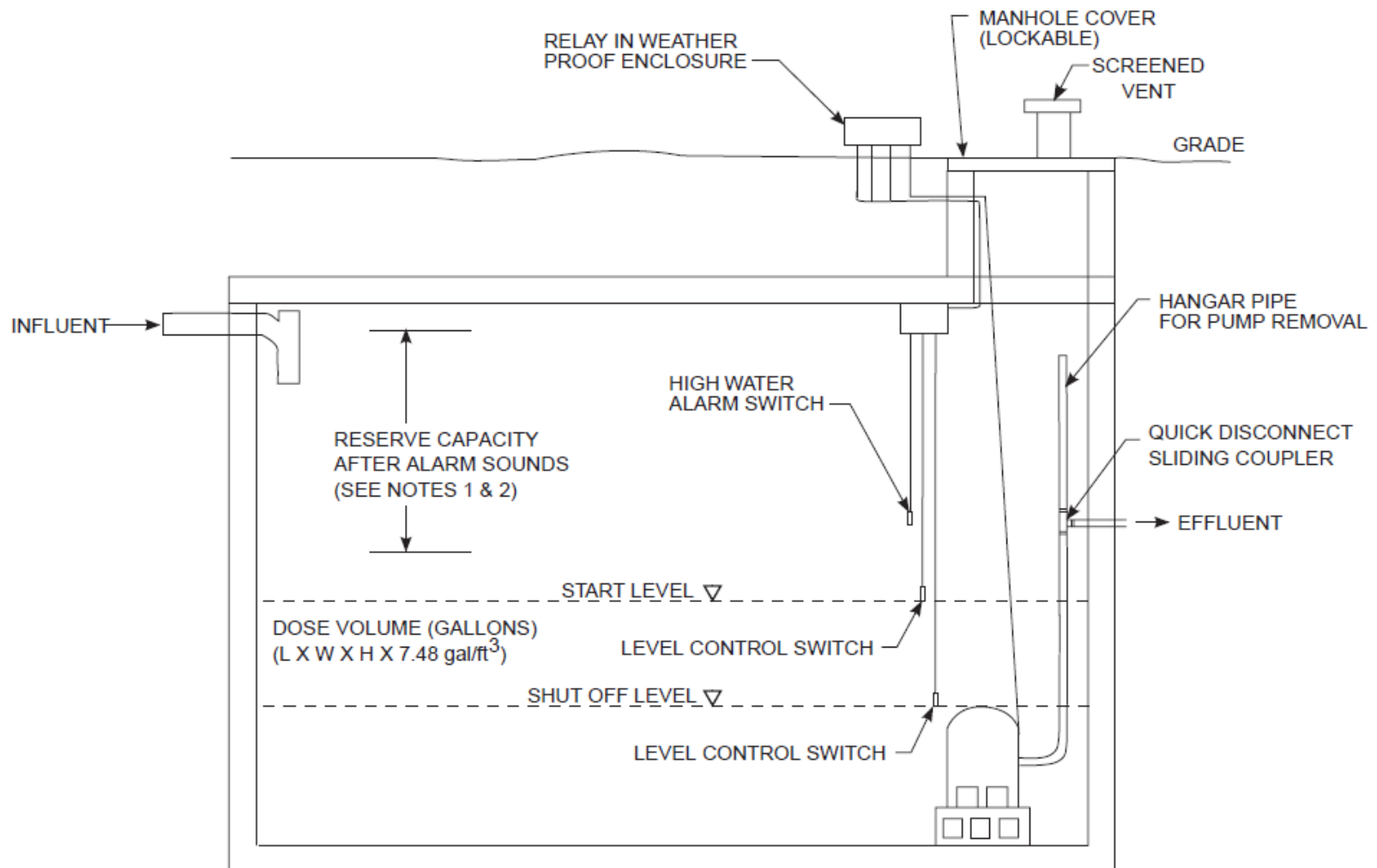
- Locating the absorption field further down slope
- Replumbing the house sewer drain to exit the home closer to grade

# PUMP CHAMBERS REQUIREMENTS

- Pump chambers shall be equipped with an audible and/or visual alarm
- Pump chambers shall be sized to provide a minimum reserve storage capacity of one day's daily design flow above the alarm level
- Where the discharge pipe is not buried below the frost line the pipe should be drained between doses or properly insulated
- The volume of wastewater pumped per dosing cycle should not exceed the daily design flow to prevent overdosing

System designs provided by the Health Department will include the required dosage volume as well as pump specifications. If a system cannot meet the absorption field depth requirements via gravity feed, and pump chamber specifications have not been provided, contact the Health Department for further guidance before continuing work.

# PUMP CHAMBERS DESIGN



# PUMP CHAMBER



Pump chamber installed to raise effluent exiting septic tank at 4ft depth to trench system installed in shallower useable soil on a flat parcel. See proper venting assembly and pump alarm installed near tank.



# ABSORPTION SYSTEM DESIGNS

- **Conventional Absorption Trench/Bed:** sandy soils, little to no clay, no shallow vertical restrictions
- **Modified Absorption Trench/Bed:** some useable soil, no shallow vertical restrictions
- **Shallow Absorption Trench/Bed:** minimal useable soil and/or shallow vertical restrictions
- **Raised Absorption Trench/Bed:** minimal useable soil and/or shallow vertical restrictions
- **Mound with Absorption Trench/Bed:** no useable soil and/or shallow vertical restrictions
- **Drywell:** Sandy soils, no vertical restrictions, small lots

For a full list of absorption systems with design specifications, see the [Residential Onsite Wastewater Treatment Systems Design Handbook \(2012\)](#)

# ABSORPTION SYSTEM DESIGNS

**SEWAGE, WHETHER TREATED OR UNTREATED, MAY NEVER BE DISCHARGED DIRECTLY TO A DITCH, CREEK OR WATERBODY. AN ABSORPTION SYSTEM MUST ALWAYS EXIST.**

# ABSORPTION SYSTEM DESIGNS

## SLOPED SITES

- 0-8% Slope: Absorption bed and absorption trenches acceptable
- 8-15% Slope: Absorption trenches acceptable
- >15% Slope: Unsuitable for absorption system

On sloped sites, absorption trenches or beds must run parallel to the site contours. It is not acceptable to install an absorption system perpendicular to the contours.

In order to maintain a specified absorption system depth requirement, it is often necessary to import permeable soil to level out the site before excavating to maintain trench depth requirements.

# ABSORPTION SYSTEM DESIGNS

## SLOPED SITES - FAILURE



Improperly installed absorption trenches. Trenches running perpendicular to site contours. Deeper at front of trench, shallow at distal end. Trench and bed lengths must run parallel with site contours.



# ABSORPTION SYSTEM DESIGNS

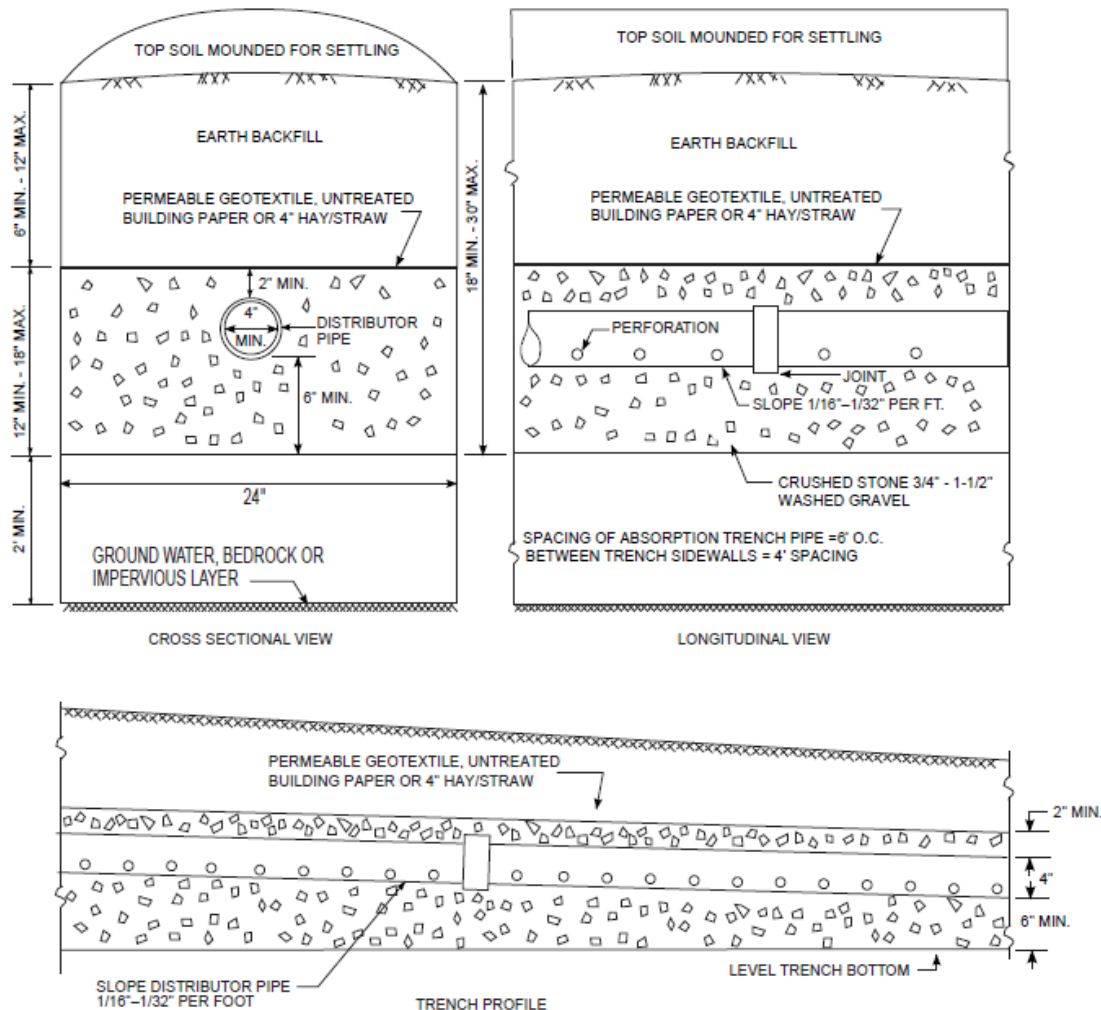
## SLOPED SITES - SUCCESS



A properly installed modified absorption bed on a slope. Length of bed parallels the site contours, bending to match the gradient. Same depth achieved across length of bed.

# ABSORPTION SYSTEM DESIGNS

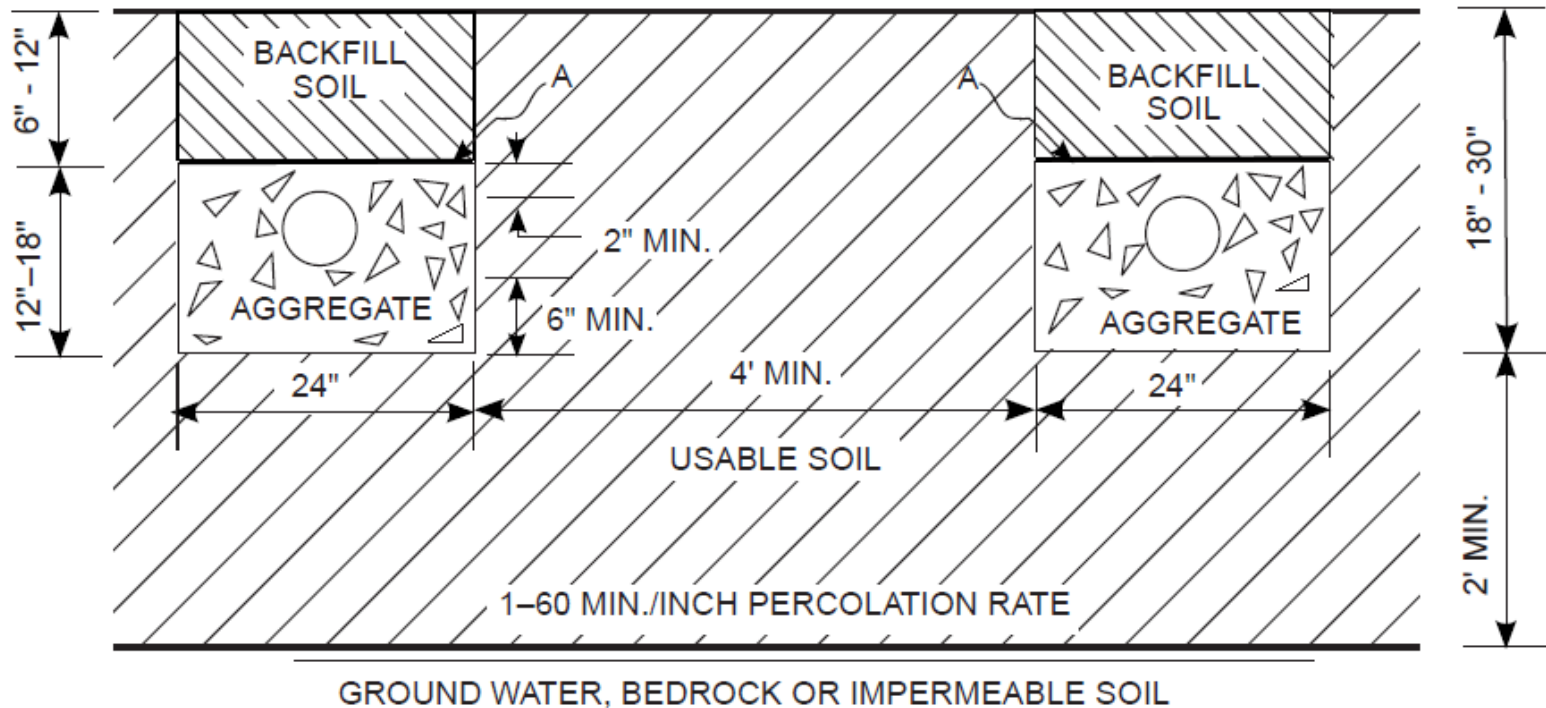
## LEACH LINES



# ABSORPTION SYSTEM DESIGNS

## CONVENTIONAL ABSORPTION TRENCHES

### CONVENTIONAL ABSORPTION TRENCH DESIGN



A = PERMEABLE GEOTEXTILE, UNTREATED BUILDING PAPER, OR 4" OF HAY OR STRAW.  
O = LATERAL

15% SLOPE MAX.



# ABSORPTION SYSTEM DESIGNS

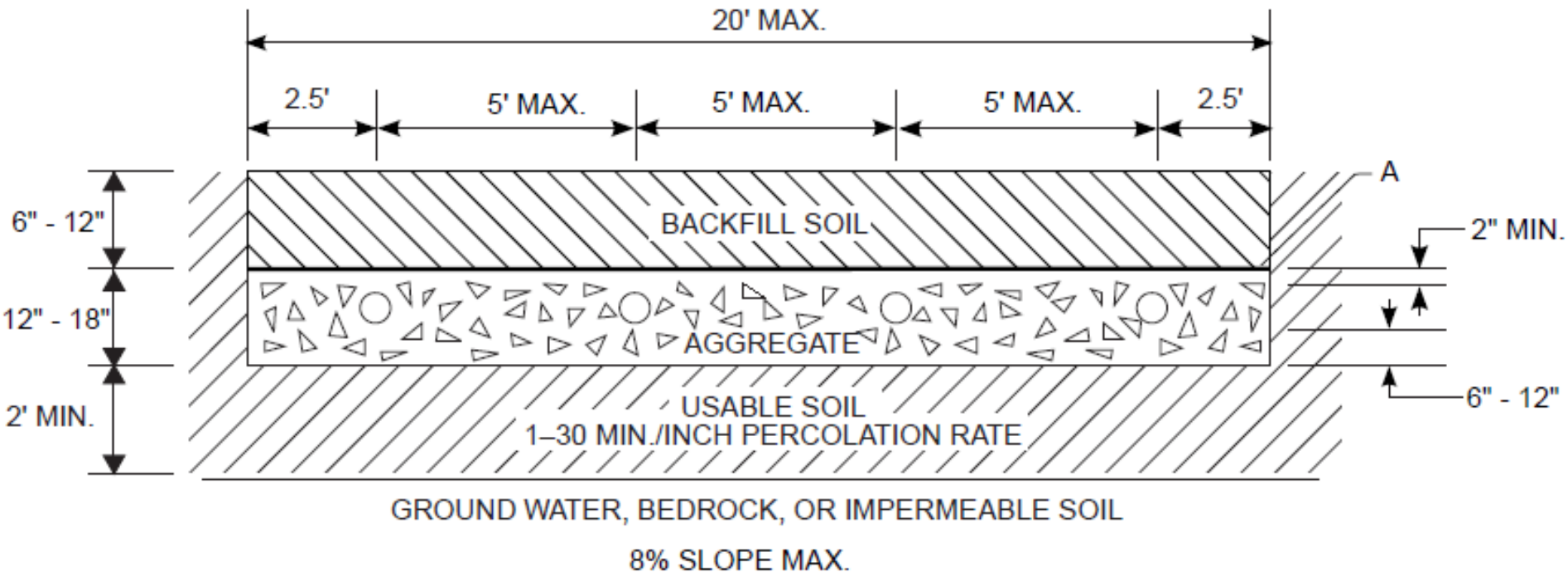
## CONVENTIONAL ABSORPTION TRENCHES





# ABSORPTION SYSTEM DESIGNS

## CONVENTIONAL ABSORPTION BED



# ABSORPTION SYSTEM DESIGNS

## CONVENTIONAL ABSORPTION BED



# ENHANCED TREATMENT SYSTEMS

**Septic systems require enhanced treatment of effluent when any of the following occurs:**

- Poor soil conditions present
- The required separation distance to a well cannot be achieved
- The required separation distance to surface water cannot be achieved
- System is undersized due to property restrictions
- Effluent likely to surface during regular or high system usage, or during precipitation events

# ENHANCED TREATMENT SYSTEMS

## SAND FILTER & ETU

### Sand Filters

VS

### Enhanced Treatment Units (ETU)

#### PROS

- No maintenance
- No power required (if gravity fed)
- Reduction in absorption system size vs ETU

#### CONS

- Larger footprint
- Labor, time & material intensive
- Extensive drainage may be required
- Still requires a dual compartment septic tank
- Typically, more expensive than ETU

#### PROS

- Smaller footprint
- No need for an additional septic tank
- Quicker install over Sand Filter
- Typically, cheaper than Sand Filter

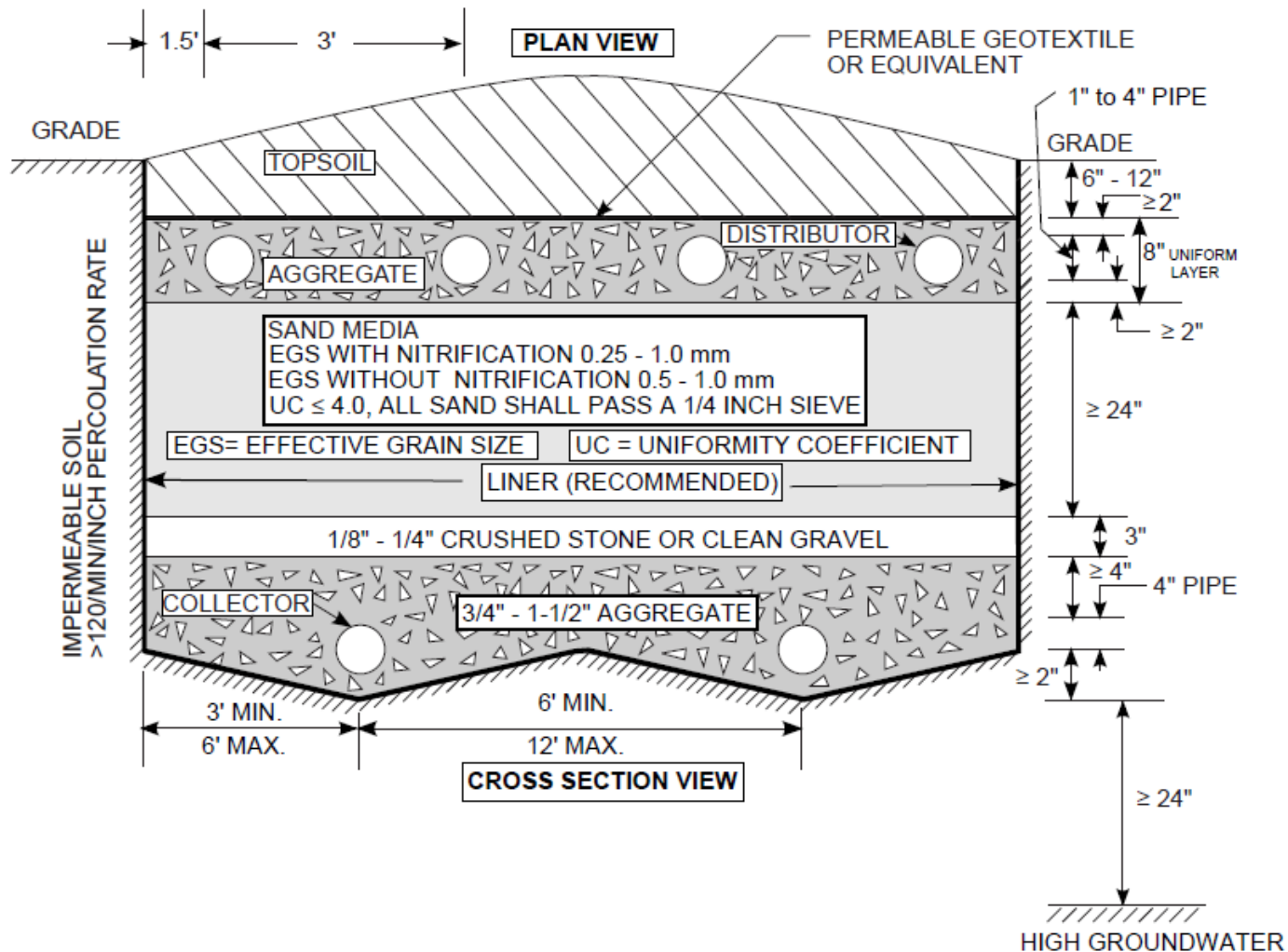
#### CONS

- Regular maintenance by a certified service provider required for life of unit
- Power required from a dedicated breaker in service panel
- Mechanical components fail over time
- Larger absorption system size vs Sand Filter



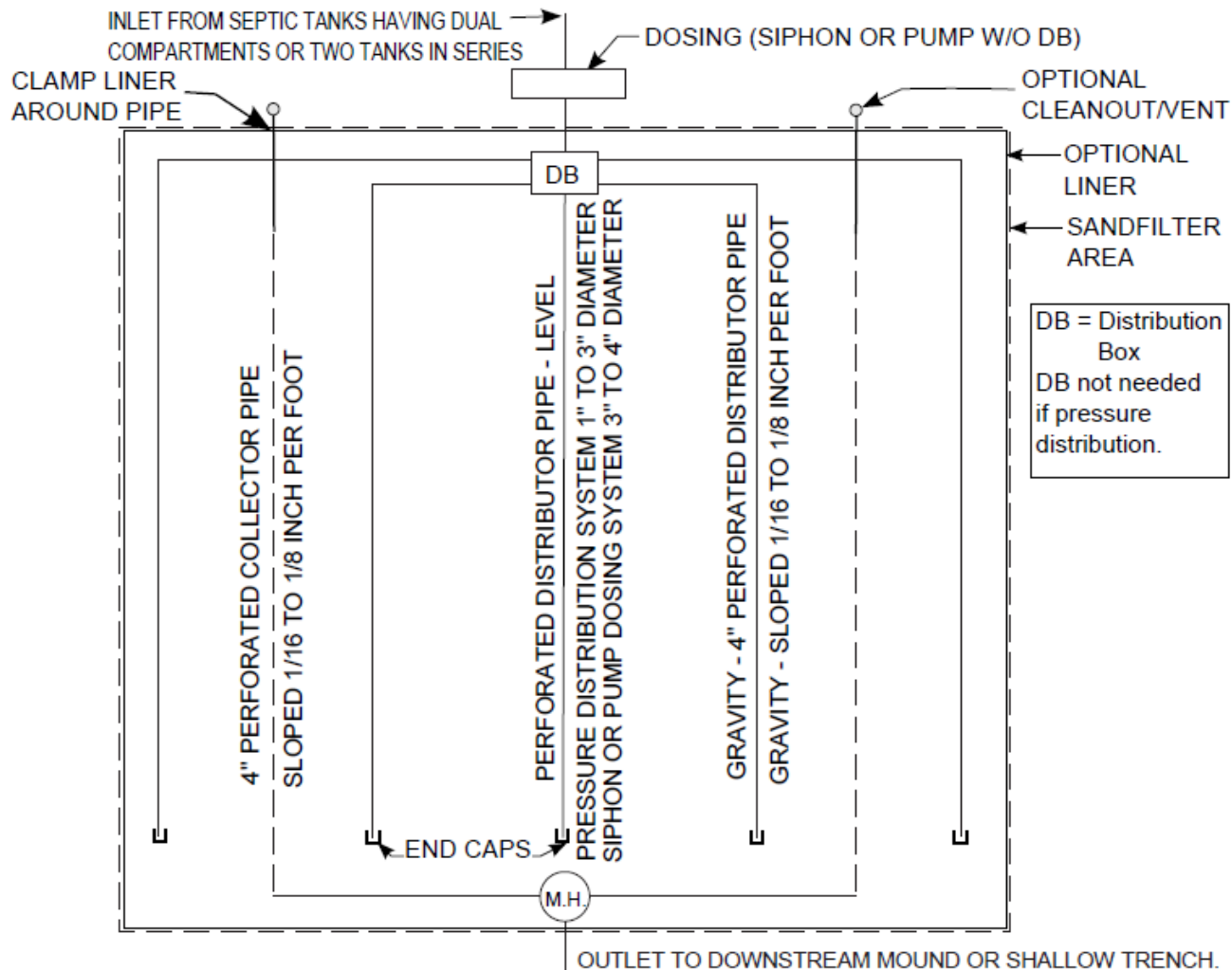
# ENHANCED TREATMENT SYSTEMS

## SAND FILTER - CROSS SECTION



# ENHANCED TREATMENT SYSTEMS

## SAND FILTER - PLAN VIEW



# ENHANCED TREATMENT SYSTEMS

## SAND FILTER – BOTTOM INSPECTION





# ENHANCED TREATMENT SYSTEMS

## SAND FILTER – TOP INSPECTION W/ INFILTRATORS





# ENHANCED TREATMENT SYSTEMS

## SAND FILTER - FAILURE



Sand Filter with ground water intrusion. Curtain drain required.

# ENHANCED TREATMENT SYSTEMS

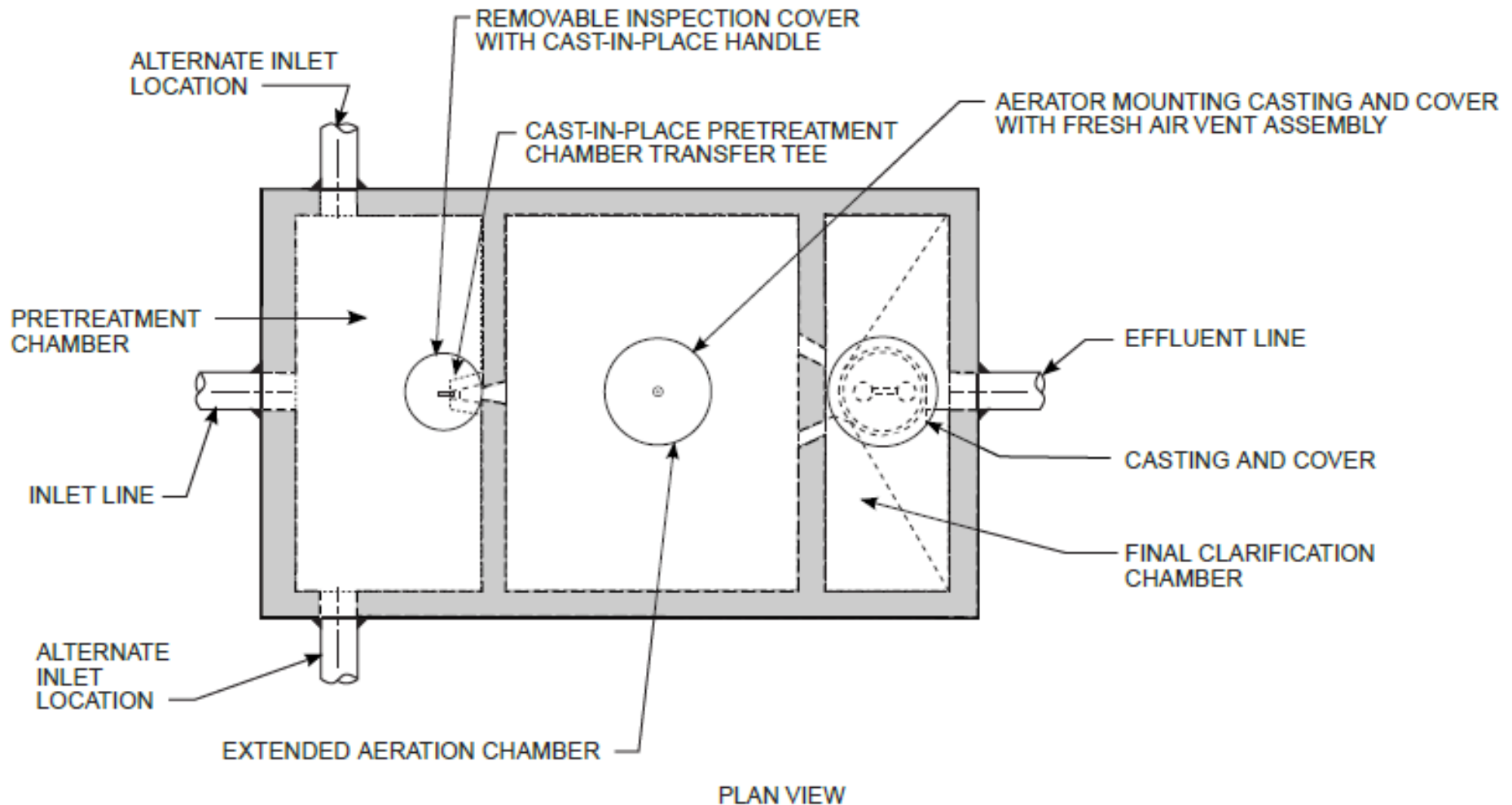
## ETU - DESIGN

### Enhanced Treatment Unit Components

1. **Tank** – Concrete or Polyethylene with baffles/tees
  1. Pretreatment Chamber – Separation of sludge and scum from effluent
  2. Aeration Chamber – Breakdown of particulates by aerobic bacteria
  3. Clarification Chamber – Pathogen removal
2. **Aerator** – Motor or Compressor injecting air into aeration chamber providing oxygen to aerobic bacteria on suspended media
3. **Filter** – Removal of remaining particulates at tank outlet
4. **Chlorinator** – Pathogen removal via chlorine tablet contact with effluent in clarification chamber, either integrated into same tank as aerator or installed separately

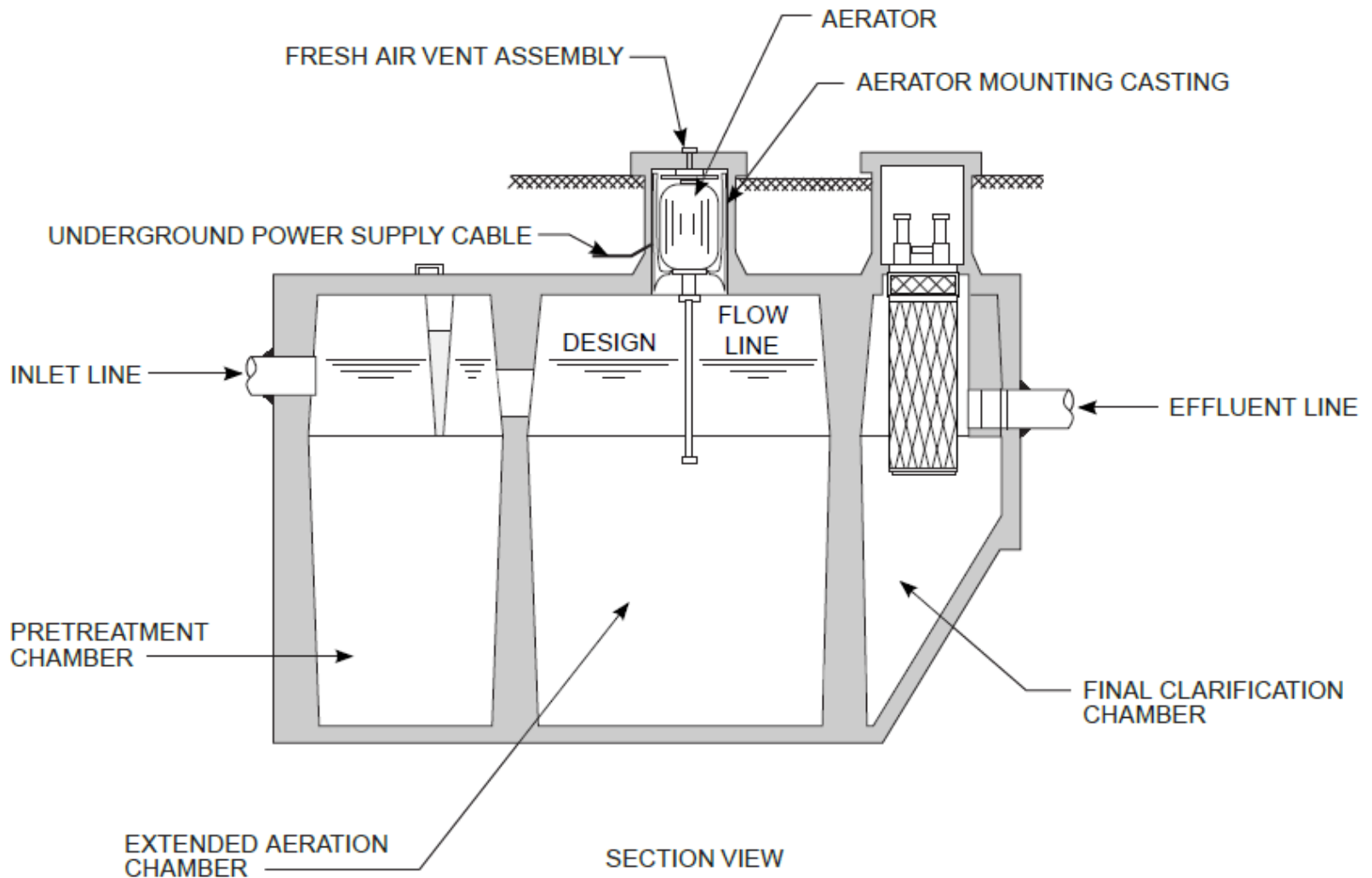
# ENHANCED TREATMENT SYSTEMS

## ETU - DESIGN



# ENHANCED TREATMENT SYSTEMS

## ETU - DESIGN



# ENHANCED TREATMENT SYSTEMS

## ETU - ACCEPTABILITY

Acceptable ETU's must meet the following qualification to meet 10NYCRR Appendix 75-A requirements:

**Class I Standard 40 or Standard 245 units with NSF International (NSF)**

Currently accepted ETU's:

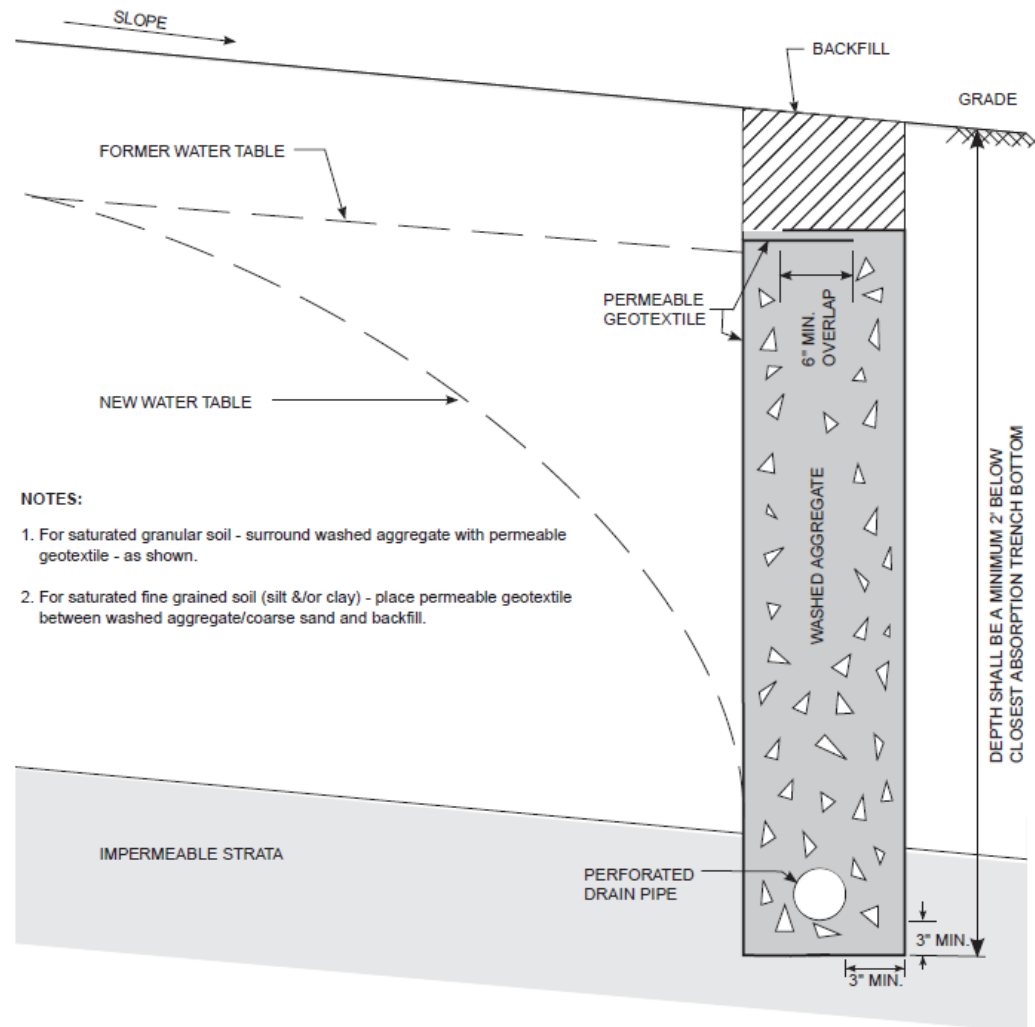
**Jet Home Plant**  
**Norweco Singulair**  
**Aeris Aerobics D-500**

# ADDITIONAL DRAINAGE GROUNDWATER & SURFACE WATER CONTROLS

- Subsurface drainage control facilities such as curtain drains, vertical drains or interceptor drains may be installed to control shallow lateral groundwater flow or perched water tables in the vicinity of existing or proposed subsurface treatment facilities.
- Curtain drains may be installed upslope of proposed absorption systems and sand filters on sloped sites to intercept and control high ground water. Non-perforated, watertight pipe installed on in-situ soil bedding at least ten (10) feet from the absorption facility should be constructed to convey the collected ground water to the ground surface.
- Subsurface drainage aggregate (washed number 2 stone or gravel) in granular soils should be surrounded by permeable non-woven geotextile to prevent siltation and plugging of the aggregate and drain pipes. In clay soils, drain pipes should be surrounded by coarse sand and gravel only as geotextile fabric is subject to clogging.
- Surface swales are to be installed upslope of absorption systems and sand filters when stormwater runoff along surface is a concern.



# ADDITIONAL DRAINAGE CURTAIN DRAIN DESIGN





For any questions concerning the course material or septic system installations, please contact the Health Department using the information below.



Broome County Health Department  
Division of Environmental Health  
Sewage Program

225 Front St  
Binghamton, NY 13905

**(607)778-2847**

To complete the BCHD Septic System Installer Certification Course, click the link below or scan the provided QR code to access the Septic System Installer Quiz. If you are unable to access the quiz, contact the Health Department for further instruction.

**After completing the quiz, notify Health Department staff.** Your quiz will then be graded. A passing score of 80% is required. A failure will require retaking the quiz.

<https://forms.office.com/g/i1rpsbYea0>

