Rhode Island

Design Manual
for
GeoMat™ 1200 & 3900
Leaching Systems

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For installation instruction please refer to Installation Manual

Introduction

The GeoMat Leaching System (GeoMat) is a low profile modular form of the shallow narrow drain field. GeoMat is comprised of a core of fused, entangled plastic filaments wrapped with a geotextile fabric. A Low Pressure Pipe (LPP) distribution line is incorporated into the product. GeoMat is installed in the shallow soil horizon for enhanced aeration, increased microbial activity, enhanced nutrient removal, enhanced plant uptake and increased evapotranspiration. In Rhode Island GeoMat shall be preceded by a treatment technology that must achieve a minimum treated effluent quality of TSS/BOD of 30/30 mg/L, or utilize a SoilAir™ System. The GeoMat 1200 is nominally 12 inches wide and 1 inch thick and the GeoMat 3900 is nominally 39 inches wide and 1 inch thick.

GeoMat is utilized in conjunction with time dosing for flow equalization and enhanced treatment. Through a combination of the high surface area to void space ratio and time dosing, microbial respiration byproducts such as carbon dioxide, methane and hydrogen sulfide can be displaced with the wastewater dose; once the dose infiltrates, air is subsequently drawn into the system. Due to the high surface area to void space ratio, this gas exchange has been shown to be significantly greater than in other leach field technologies. This increased oxygen transfer rate results in increased removal of pathogens, B.O.D. and nutrients such as nitrogen and phosphorus in a shallower soil profile.

The distal head pressure of the GeoMat can be fully adjustable through valving on the distribution manifold; this is often located in the pump station. Distal head is typically set between 24 and 48 inches of the water gauge. Distal heads on different laterals should be set as closely as possible with no more than a 10% differential. A cleanout/distal pressure monitoring port is installed on the terminal end of each of the lateral lines. The lateral lines can be readily brushed, flushed and jetted, should this be necessary; however, it is recommended to use a pressure filter in the pump tank to diminish this maintenance frequency.

Geomatrix products are the result of intensive research and development, including in house and third party testing. Test reports are available by contacting Geomatrix, LLC.

Designing a GeoMat System

GeoMat Leaching Systems shall be designed in accordance with the Rhode Island sand filter guidance document revised March 2010 (or most recent version). Table 1 should be used as a guide.

Designers should utilize GeoMat in conjunction with systems that will at a minimum always achieve the specified performance standards.

The designer is responsible for specifying the diameter of the distribution pipe used (either 1" or 1 1/2"), the spacing of the 1/8" orifice holes and the calculated head loss from pressurization. Distal head should be a **minimum** of 2 feet of residual head (static pressure) at the end of each drain field distribution lateral.

Systems should be time dosed.

Design software for pump, lateral line, transport pipe, manifold, and additional head losses is available by emailing request to info@geomatrixsystems.com.

	Rating – square foot per linear foot	Maximum dosing volume gallons per linear foot per dose
GeoMat 1200	1.00	0.25
GeoMat 3900	3.25	0.75

GeoMat Sizing

Sizing a GeoMat system is dependent on consistency and quality of treated effluent. This guide divides treatment systems into two categories as follows:

Category 1 systems are advanced treatment systems that incorporate time-dosing and that have been classified by the RIDEM as meeting treatment standards of less than or equal to 20 mg/L for both BOD and TSS and FOG of less than or equal to 5 mg/L. This timer provides de facto time-dosed application of treated effluent to the GeoMat

Category 2 system is any advanced treatment system that is **not** time dosed, and has been classified by the RIDEM as meeting treatment standards of 30 mg/L or less for both BOD and TSS and FOG of less than or equal to 5 mg/L. Routine hydraulic surge storage capacity in the tank from which the treated effluent is pumped to the GeoMat is required. The surge storage capacity shall be positioned between the elevation of the timer operating float switch and the high water alarm/timer override float switch

Table 1

Hydraulic Loading Rates for GeoMat

Soil Category	Soil Texture [*4]	Soil Structure	Soil Consistence In-hand Using Soil Clods	Typical Soil Class	Category 1 Systems[1] Geo-Mat Loading Rates[3] (gal/ft^2/day)	Category 2 Systems[2] Geo-Mat Loading Rates[3] (gal/ft^2/day)
1	cos, s, lcos, ls, cosl, fs	structureless-single grain subangular blocky	Loose friable	Outwash (class C), ice contact (class D) and course ablation till (class B) deposits	2.3[4]	1.5[4]
2	vfs, lvfs	structureless-single grain	loose	Outwash (class C), ice contact (class D) deposits	2.7	1.9
3	ls, sl, l	granular, subangular blocky	very friable to friable	Lodgement Till (Class A), Ablation Till (Class B), Outwash (Class C), or Ice Contact (Class D)	3.5	2.3
4	lfs, lvfs, fsl,vfs	granular, subangular blocky	very friable to friable	Lodgement Till (Class A), Ablation Till (Class B), Outwash (Class C), or Ice Contact (Class D)	3.1	2.0
5	sil, si, vfsl	subangular blocky	very friable to friable	Typically Eolian deposits (Class G)	2.7	1.9
6	lcos, cosl, lfs, ls, sl, l	structureless-massive	very friable to friable	Ablation till (Class B)	2.3	1.5
7	fsl, vfsl, sil, si, vfs	structureless-massive	very friable to friable	Ablation till (Class B)	2.1	1.5
8	All textures	structureless-massive	firm to very firm	Lodgement till (Class A)	1.9	1.3
9	All textures	platy, structureless-massive	firm to very firm	Lodgement till (Class A)	1.5	1.0
10	All textures	platy, structureless-massive	extremely firm	Lodgement till (Class A)	Not Allowed	Not Allowed

* Soil textures defined below.

[1] Category 1 Systems = Any advanced treatment system that is **time dosed** according to the specifications of the RIDEM Guidelines for the Design and Use of Sand Filters and Pressurized Shallow-Narrow Drain fields and has been classified as meeting treatment standards of less than or equal to 20 mg/L for both BOD and TSS and FOG of less than or equal to 5 mg/L.

[2] Category 2 Systems = Any advanced treatment system that is **not time dosed** according to the specifications of this guide and has been classified by the Department as meeting treatment standards of 30 mg/L or less for both BOD and TSS and FOG of less than or equal to 5 mg/L. Time dosing and an in-line screen filter or a screen pump vault must be used on the pump dosing the GeoMat.

[3]Drainfield loading rates shall be based upon texture, structure, and consistence of most restrictive horizon. The design loading rate shall be based upon the texture, structure and consistence (described in Table 1. Hydraulic Loading Rates for GeoMat) of the most restrictive soil horizon within 1.5 feet below the proposed base of the GeoMat.

[4]GeoMat placed in cos, vcos, gravelly or very gravelly soils shall have a leveled-off 6-inch ASTM C-33 sand layer.

Hydraulic load per linear foot of the GeoMat 1200 is 1.0 x Category 1 or 2 loading rate above

Hydraulic load per linear foot of the GeoMat 3900 is 3.25 x Category 1 or 2 loading rate above

Soil Texture:

The relative proportions of soil separates (sand, silt, and clay particles) in a particular soil. USDA soil texture abbreviations illustrated in the above table are defined as: cos = coarse sand; vcos = very coarse sand; fs = fine sand; lfs = loamy fine sand; ls = loamy sand; fsl = fine sandy loam; sl = sandy loam; l= loam; vfs = very fine sand; lvfs = loamy very fine sand; vfsl = very fine sandy loam; sil = silt loam; vfsl = very fine sandy loam; si = silt; sicl = silty clay loam.

Basic Design Parameters

Remember to follow these design parameters when designing and installing GeoMat:

Minimum invert perimeter shall be five-feet, provided a 3:1 slope is maintained beyond the five-feet to original grade; the invert of the distribution lateral and the bottom of the GEOMAT shall be held to be the same.

Preservation of the native soil between trenches and minimizing its disruption and compaction during construction is essential to maintaining soil structure and therefore water and gas movement in the soil around the trenches. For this reason construction is to be trench-by-trench (relief from this requirement may be granted by the RIDEM on a case-by-case basis when informed of unanticipated site conditions encountered during construction)

Keep the bottom of the GeoMat shallow (8-12 inches below existing and finish grades);

Separation to the seasonal high water table is two (2) feet statewide unless otherwise specified by permit;

Separation to impervious layer shall be four (4) feet statewide unless otherwise specified by permit;

Keep the bottoms of the individual GeoMat laterals level;

Do not over-dig the width or depth of the drain field trenches;

Provide for lateral pipe drainage and maintenance access;

Avoid working soils that are moist or wet because they can easily smear and compact.

Scarify the drain field base well before installing components.

When first reviewing a site and developing a design, it is best to position the GeoMat laterals parallel to ground surface contours. This will help make it easier to keep drain field base elevations uniform. Designing perpendicular to a surface contour will mean that the down gradient end of the drain field trench will be shallow-placed, whereas the up gradient end will be much deeper.

Within reason, small frequent doses of effluent to the GeoMat are preferred over fewer larger doses; however, rest/re-aeration intervals must be provided for. Pump chambers should be designed with float switches controlling high water alarm, pump on/off, and low water alarm/redundant off. An event counter and elapsed time run meter should also be used on the pump.

GeoMat Excavation Requirements

The soil between the dispersal trenches shall remain undisturbed. If the presence of boulders or other obstacles make trench construction impractical, the entire leach field area may be excavated as necessary, backfilled with ASTM C-33 sand to the design elevation of the bottom of trench and the GeoMat constructed and backfilled with native soil material.

Transport Lines

Generally the effluent transport pipe from the treatment unit to the GeoMat is 1 ½“ to 2” PVC pipe (Class 200 minimum). The actual pipe size will depend upon such factors as distance, pump head, scour velocity, frictional losses and desired pressure at the distal orifices. The transport pipe should be sloped either back to the pump basin or toward the GeoMat to clear the line after each dose. In some cases it may be better to slope the transport line in both directions. In all cases this is done to prevent freezing in cold weather. A anti-siphon device should be used where any chance of siphoning of the pump tank may occur.

Distribution Manifolds and Laterals

GeoMat distribution manifolds are typically 1 ½" to 2" schedule 40 PVC. Distribution laterals are typically 1" or 1 ½" schedule 40 PVC. Size will vary depending on design and site conditions. Flow equalization valves are optional when distribution lines will be at the same elevation and are mandatory if laterals are installed at different elevations. Flow equalization valves are often installed in the pump chamber for easy operation, protection from damage and prevention of freezing. Individual flow equalization valves are optional if laterals are all installed at the same elevation.
NOTE: Small lateral and orifice sizes are recommended to provide the highest possible scouring velocity in the laterals, to minimize orifice clogging, and to provide as even distribution of wastewater as possible. However this requires that the treatment system operate at the specified performance standard or orifice clogging can result.

The lateral piping will be predrilled and GeoGuard™ orifice shields attached and will be available with the GeoMat— The ⅛" diameter orifice holes will be drilled downward (six o'clock position) and spaced according to the design requirements of the system.

Designs should account for a **minimum** of two feet and a maximum of eight feet of head pressure at the distal end of each GeoMat distribution lateral.

Design software for pump, lateral line, transport pipe, manifold, and additional head losses is available by emailing request to info@geomatrixsystems.com.

Schedule 40 PVC or equivalent **sweep** elbows (also called turn ups) shall be attached to the distal end of each GeoMat distribution lateral to facilitate maintenance and inspection. A standard ninety elbow should not be used because it will interfere with maintenance activities. The open end (upward end) of the sweep needs to be closed off with either a ball valve or threaded plug or cap. The distal head ports are utilized for measuring and setting distal head on the GeoMat laterals. Distal head ports can also be used for cleaning the laterals with a bottle brush or jetter, should this be necessary.

Trench Spacing and Maximum Length

A minimum of:

PRODUCT	Center to Center	Edge to Edge
GeoMat 1200	2.5'	1.5'
GeoMat 3900	8.125'	4.875'

Maximum trench length should not exceed fifty feet. Actual lengths will vary between sites and will be influenced by site conditions and the need to maintain the required minimum two feet of distal head pressure on the GeoMat laterals.

Zoned Drain Fields and Trenches at Different Elevations

Smaller pumps can be used on larger drain fields and still maintain distal head pressure by utilizing automatic sequencing valves. These valves automatically direct flow to each respective zone or distribution lateral, in a prescribed order.

Site conditions may not facilitate installing drain field trenches at the same elevation. In these situations, distribution valves can be used to provide uniform wastewater distribution; valves also help facilitate flow equalization and cleaning of laterals. Access ports must be installed at the locations of gate valves. Valves can be located in the pump tank. Alternately, orifice plates may be used to help equalize flow to trenches that are not at the same elevation.

Drain Field Cover

Drain field cover shall be a minimum of 6". Uniform cover depth over the drain field results in consistent oxygen transfer to the entire system. The final grade over and around the drain field should direct storm water sheet flow away from drain field. When backfilling the system, construction staples can be utilized to hold down piping components and mat, but they should not penetrate the top fabric. Care should be exercised to keep a minimum of 6" of cover material over the system before operation of low ground pressure equipment. Excavation equipment should not exceed 10 psi. Turning excavation equipment on top of the GeoMat should be avoided.

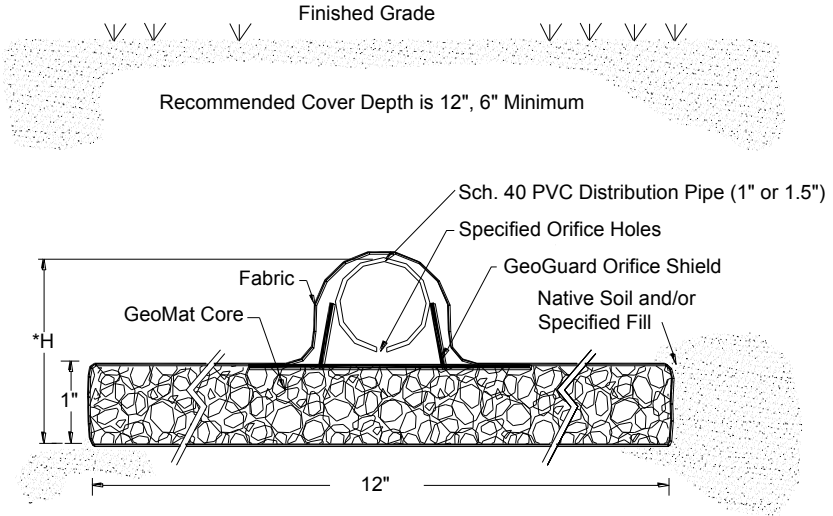
The area directly above and adjacent to any septic drain field should be protected from heavy vehicle traffic and excess weight loads before, during and post construction. This is especially important when using GeoMat. GeoMat systems are located close to the ground surface and therefore susceptible to damage after construction.

On all new construction, it is recommended that the proposed drain field location be staked and flagged/ fenced to prevent encroachment during home construction. If vehicle encroachment is expected to be a problem after construction, some structure, such as garden timbers, railroad ties, fences or walls should be used to protect the drain field area. The drain field area should be free of debris and planted with grass. Impermeable materials and structures should not be installed or stored over the drain field. Trees and shrubs should be kept a minimum distance of ten (10) feet from the drain field. Roots from nearby moisture loving trees such as willow, black locust and red maple may cause problems with roots clogging drain field lateral orifices. Greater setback distances are recommended for these tree species.

Maintenance Requirements

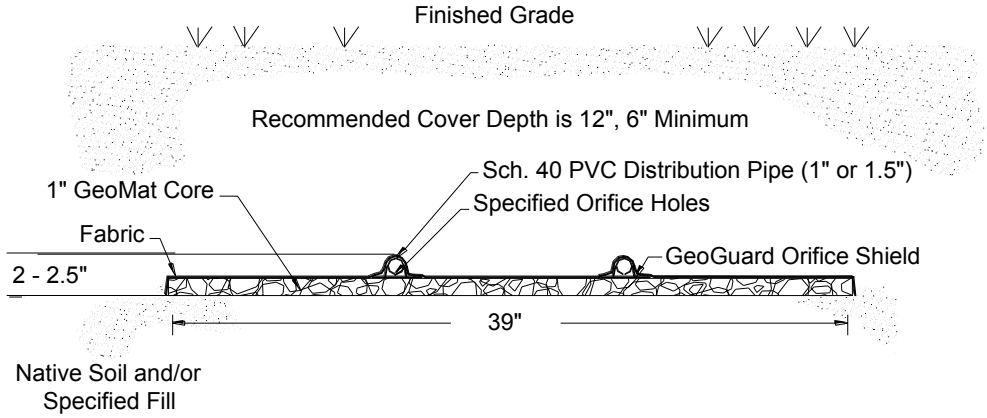
Sand filter and other RIDEM approved advanced treatment systems' effluent is low in BOD and TSS; however, overtime, accumulation of biosolids or slime can accumulate in GeoMat lateral pipes and orifices and create uneven wastewater distribution along the lateral. To unclog the orifices locate the distal port valve boxes and open the lateral sweep on end of each lateral line. Manually engage the pump to purge any loose solids. Once all noticeable solids are purged, shut off the pump. A bottle brush (of the same size of the lateral pipe) attached to a small plumbers snake is then pushed down each lateral line. With the bottle brush removed, manually engage the pump again to flush out any loose solids in the lateral line. To increase the flushing action and velocity, before and after bottle brushing, open only one equalization valve at a time. Alternatively a small jetter may be used to remove any accumulated solids. It is recommended that the lateral lines of the leach field be serviced annually. If being used in conjunction with a pressure filter it may be possible to extend this frequency. An indication of orifice clogging is distal head pressure increasing by more than 20% or pump run times increase by greater than 20% relative to number of doses.
The septic tank and treatment system should be pumped, maintained and operated according to the requirements of the manufacturer and applicable regulatory agency.

GeoMat Schematics—Not to Scale

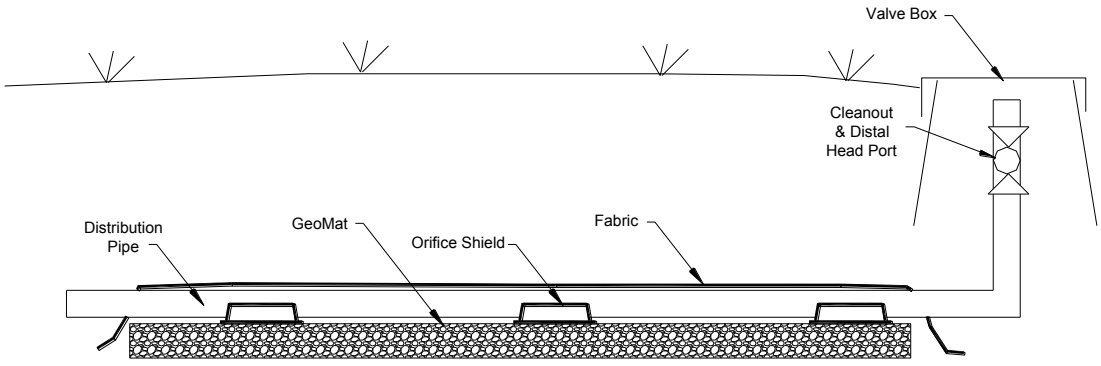


GEOMAT™ 1200 LEACHING SYSTEM
Cross Section
- Not to Scale -

*H = 2" -2.5"

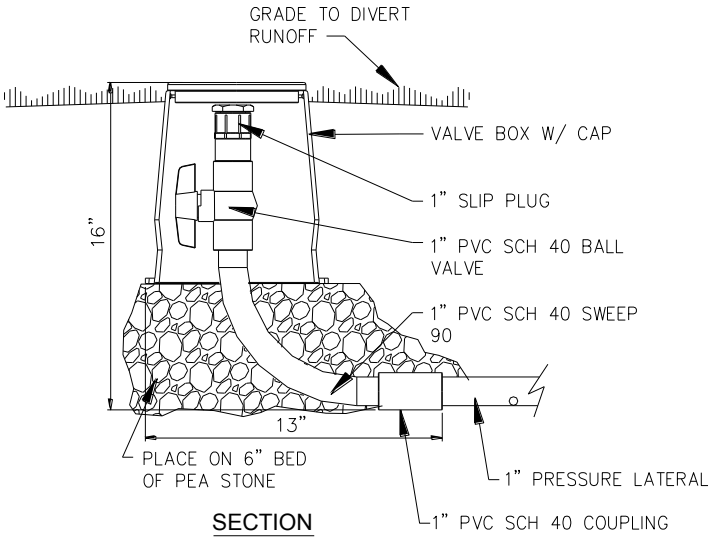


GEOMAT™ 3900 LEACHING SYSTEM
Cross Section
- Not to Scale -

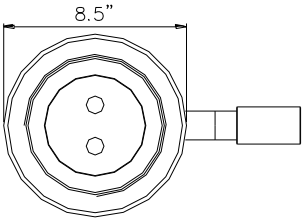


GEOMAT™ LEACHING SYSTEM
Longitudinal Cross Section

Distal Head Schematic—Not to Scale



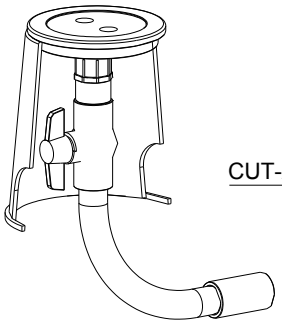
SECTION



PLAN

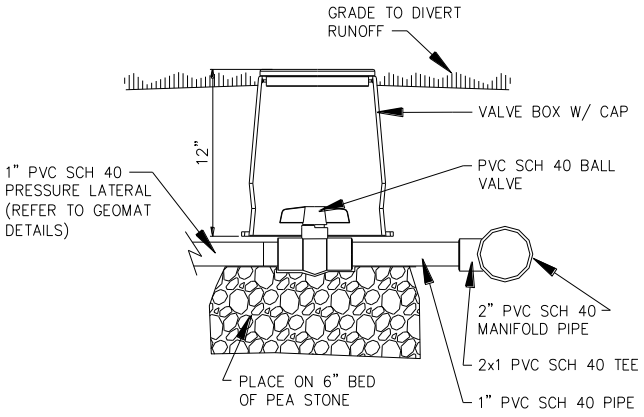
FLOW EQUALIZATION PROCEDURE:

1. INSTALL CLEAR PIPE INTO BALL VALVE.
2. OPEN ALL VALVES.
3. TURN ON PUMP AND NOTE ELEVATION OF WATER IN EACH PIPE.
4. EQUALIZE HEIGHT FOR EACH @ 48" HEAD WITH BALL VALVE AT START OF LATERAL.
5. AFTER EQUALIZATION, TURN OFF PUMP AND REMOVE PIPES. CLOSE VALVES AND REINSTALL PLUGS.



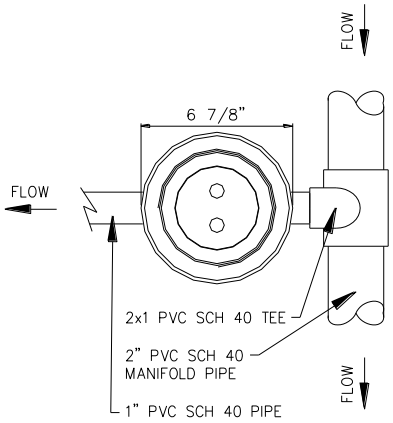
CUT-AWAY

Flow Equalization Valve Schematic—Not to Scale



SECTION

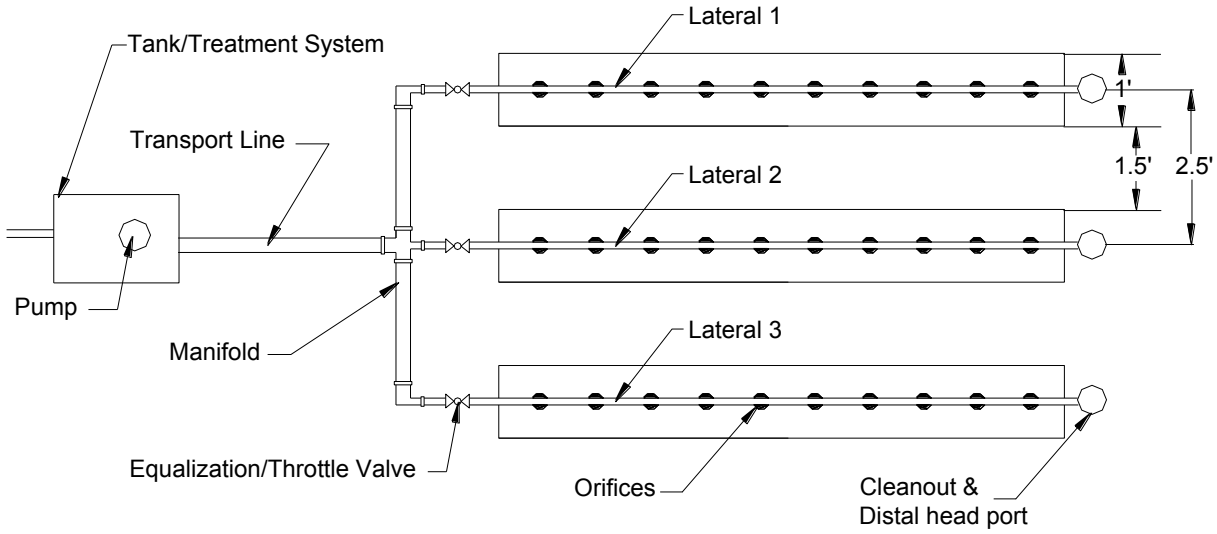
NOTE: The valve should be the high point, water should drain back to the pump tank and to GeoMat to prevent freezing.



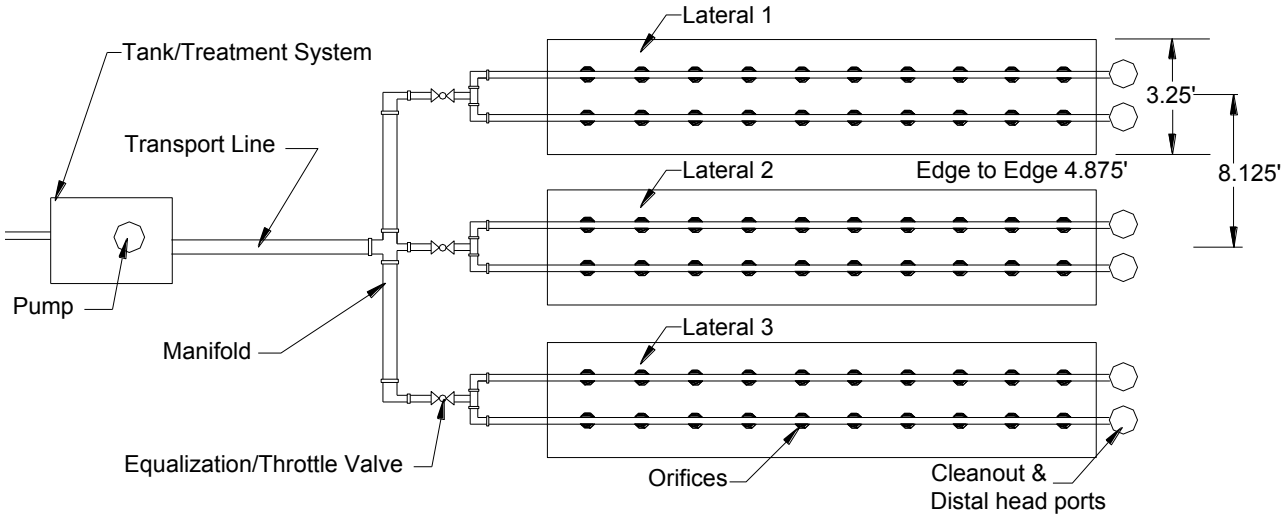
PLAN

Typical System Design Examples—Not to Scale

GeoMat™1200 Leaching System
One Zone Design Example

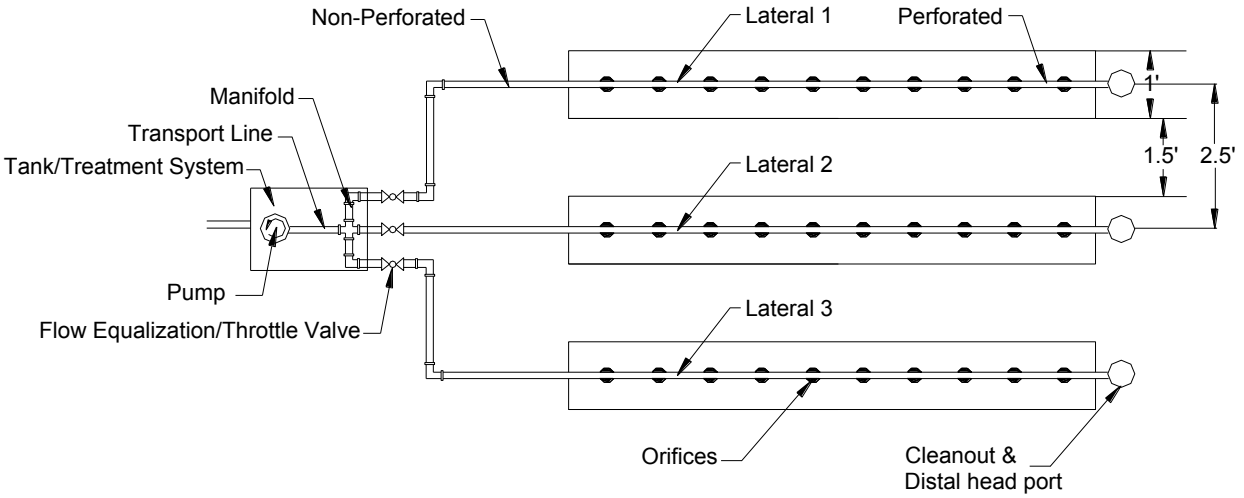


GeoMat™3900 Leaching System
One Zone Design Example

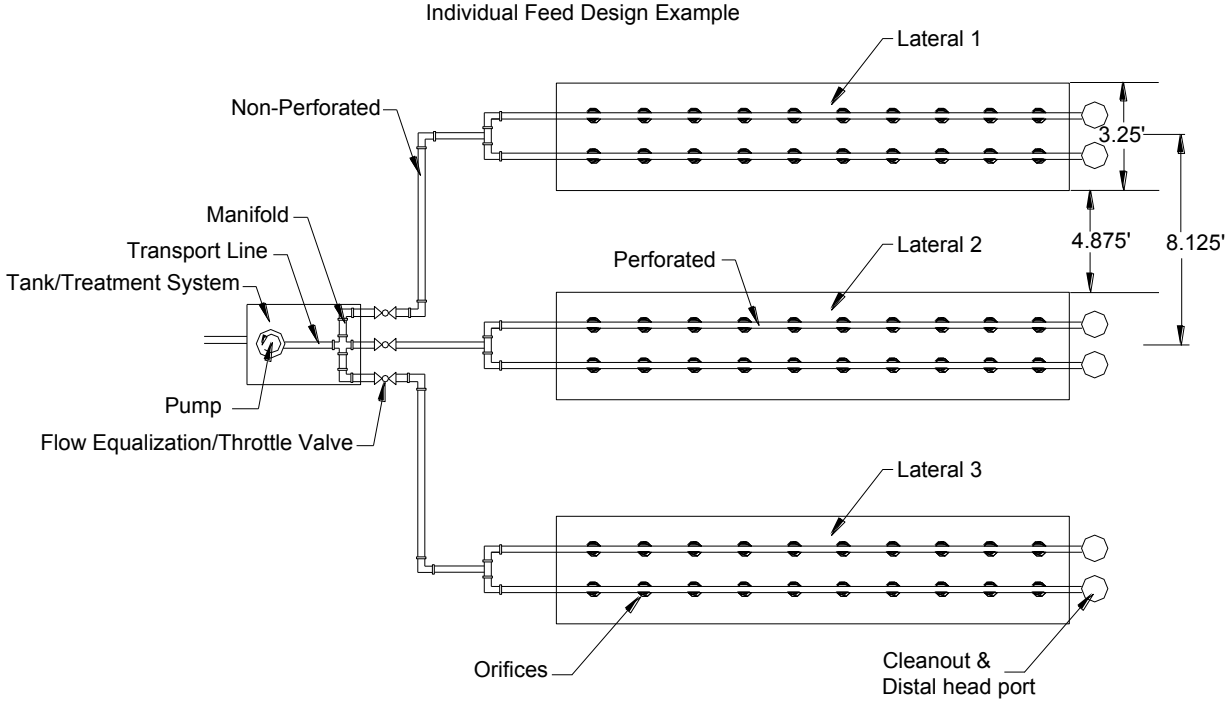


Typical System Design—Not to Scale

GeoMat™ 1200 Leaching System
Individual Feed Design Example

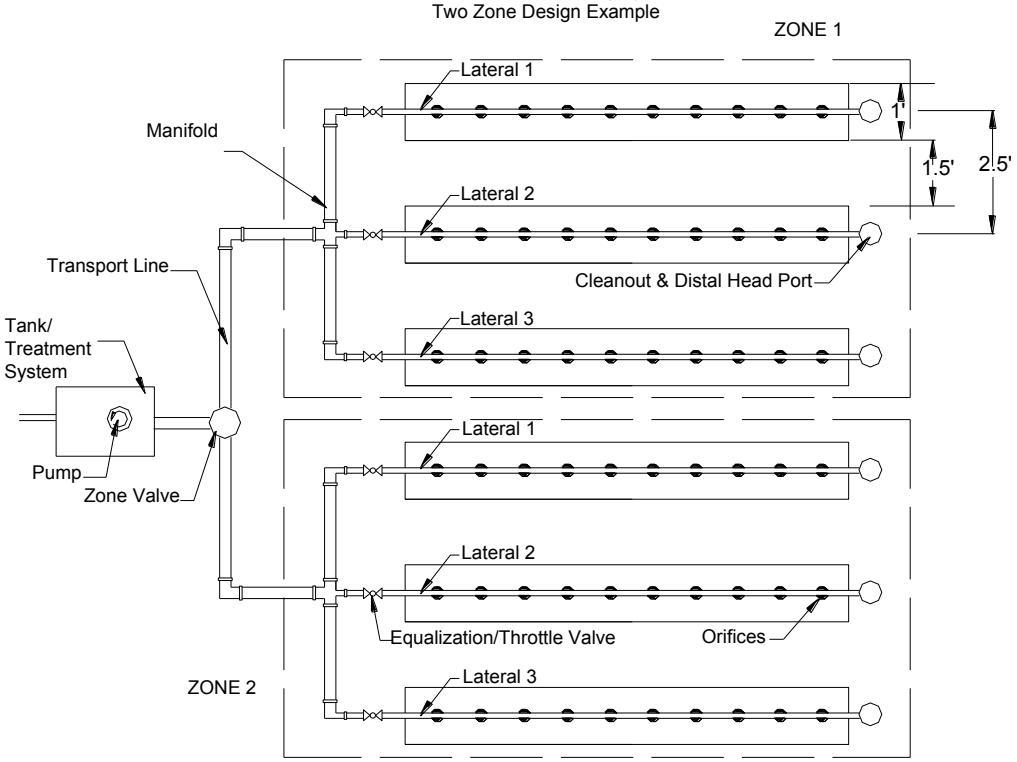


GeoMat™ 3900 Leaching System
Individual Feed Design Example

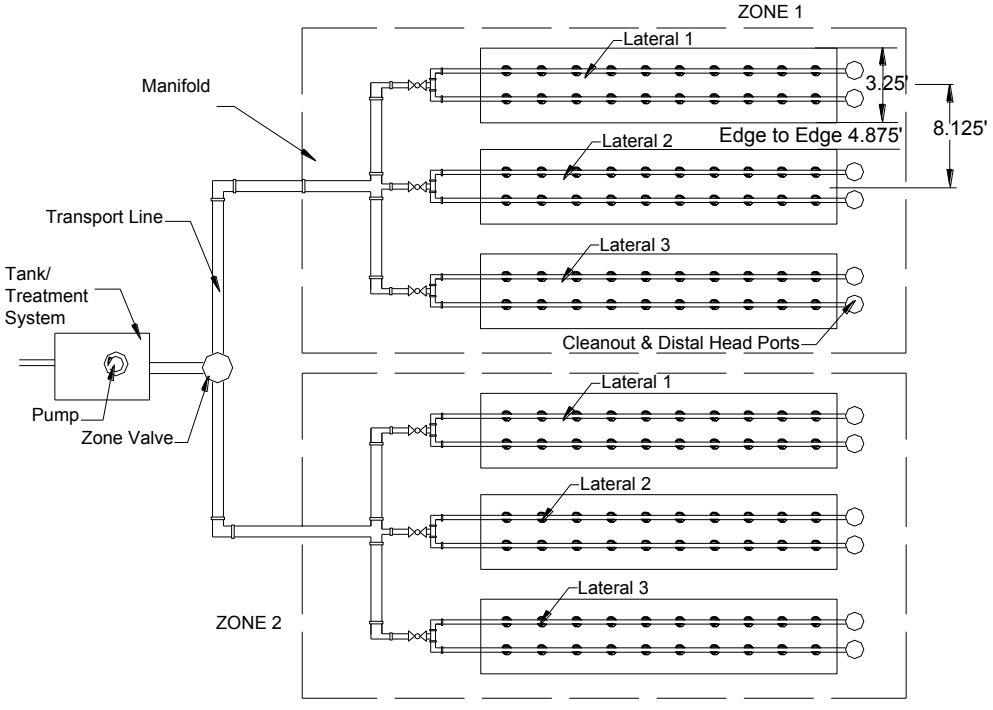


Typical System Design—Not to Scale

GeoMat™1200 Leaching System
Two Zone Design Example

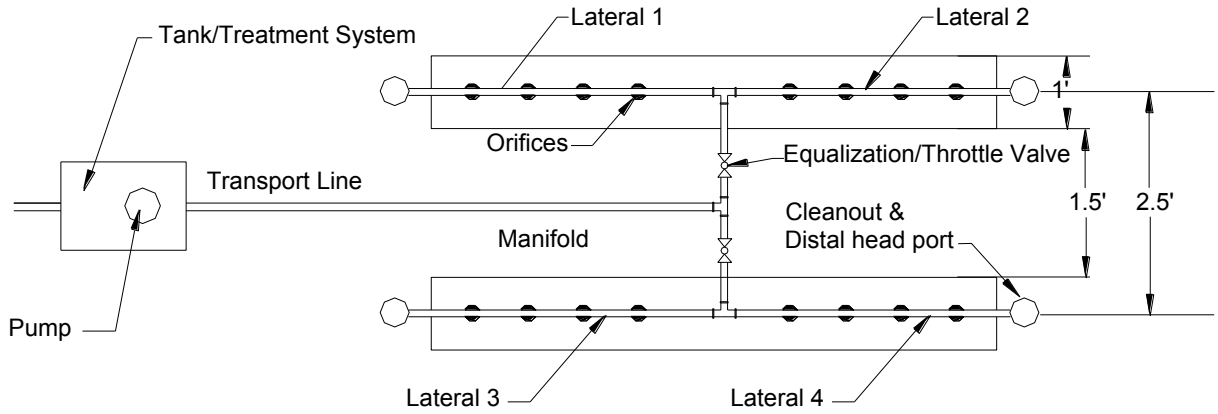


GeoMat™3900 Leaching System
Two Zone Design Example

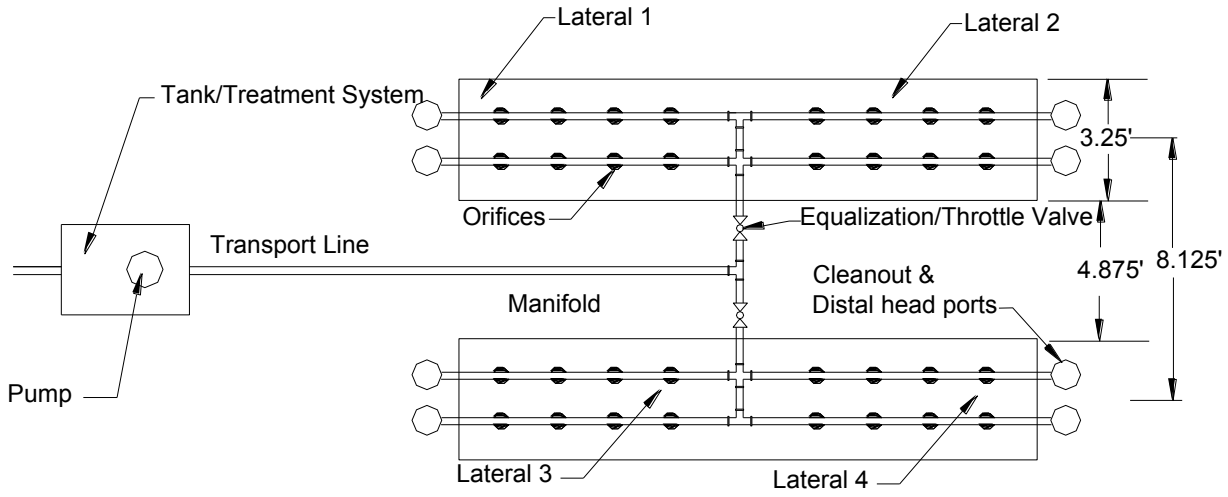


Typical System Design—Not to Scale

GeoMat™ 1200 Leaching System
Center Feed Design Example



GeoMat™ 3900 Leaching System
Center Feed Design Example



Contact Us

Contact us or your local distributor for any questions you may have Monday – Friday 8am – 4pm Eastern Standard Time.

888-764-5247—Toll Free
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860-510-0735—Fax

Distributed By:

Septic Do's and Don'ts

Do:

- Conserve water to reduce the amount of wastewater that must be treated and disposed.
- Repair any leaking faucets and toilets.
- Only discharge biodegradable wastes into system.
- Restrict garbage disposal use.
- Divert downspouts and other surface water away from your drain field & tanks.
- Keep your septic tank cover accessible for tank inspections and pumping.
- Have your septic tank pumped regularly and checked for leaks and cracks.
- Call a professional when you have problems.
- Compost your garbage or put it in the trash.

Don't:

- Flush sanitary napkins, tampons, condoms, cigarette butts, diapers, wipes and such products into your system.
- Dump solvents, oils, paints, paint thinner, disinfectants, pesticides or poisons down the drain.
- Dig in your drain field or build anything over it.
- Plant anything other than grass over your drain field.
- Drive over your drain field or compact it in any way.

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