GUIDELINES FOR SUBSURFACE DRIP DISPOSAL OF PRIMARY TREATED EFFLUENT FOR SYSTEMS < 2,000 GPD **February 2010**

This document is intended to be read in conjunction with Geoflow's Design, Installation and Maintenance Guidelines.

NOTE:
These are guidelines and all rules and regulations of the appropriate health and environmental authorities must be followed. Tables 1 and 2 are presented for guidance only. These tables are not consistent with one another. The designer must be aware of the many other factors that may influence the loading rate decision. These include, but are not limited by slope, runoff of rainfall, flooding, vegetation, soil layers below the A horizon, previous use of the land, water tables etc.

AN ISSUE OF PUBLIC HEALTH:
The use of subsurface drip irrigation for disposal of septic effluent in a private home is contentious and is not permitted in many states and counties. Please consult with your local regulators. This paper should not be read as being either supportive or opposed to the dispersal of septic effluent with subsurface drip.

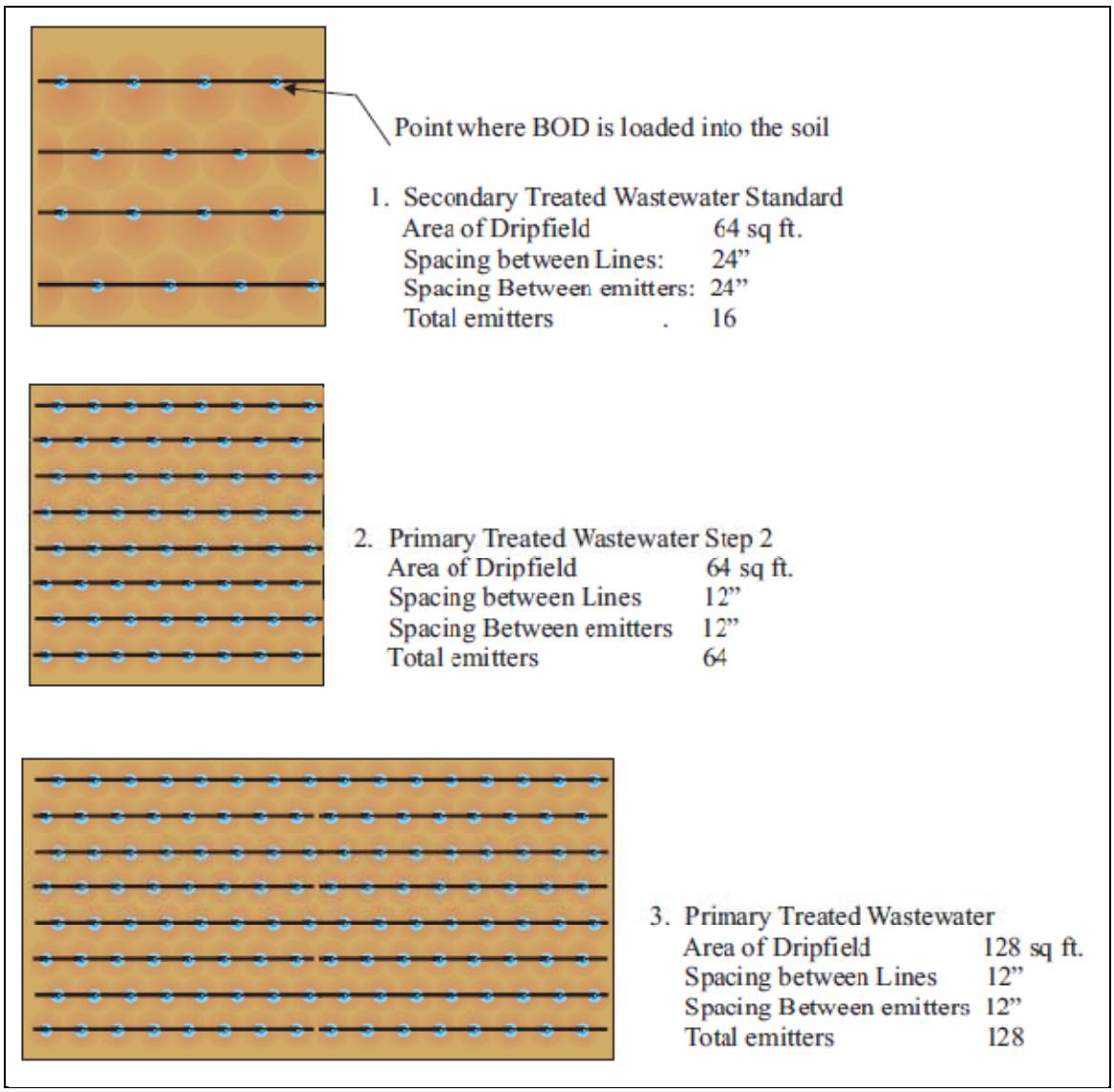
The use of WASTEFLOW™ for subsurface drip irrigation disposal of secondary treated effluent is well known and proven in both large and small systems.

Septic Tank requirements:

1. Ensure that the septic tank is adequate in size and design for the designed flow and effluent to be treated. A minimum of 2 days flow is required and 3 days flow is recommended. Placing two smaller tanks in series is an acceptable method to achieve the desired volume.
2. Use an in-tank effluent filter with grade level access to facilitate servicing.
3. All primary treated drip dispersal systems must be automated with timed dosing and automatic field and filter flush.
4. Use an appropriately sized filter in the automated headworks. Filters must be sized not only for the flow (gpm) but also for the anticipated BOD and TSS they will receive. As different type filters require different management, be sure you have a controller with the ability to manage your filter and adequate capacity within your pump.

Sizing and design of the drip disposal field:
Drip disposal is a point source application and failure can come about by overloading the dripper emission point with BOD and forming an anaerobic zone in the soil around the dripper. Although the water will move through the soil, the bacteria in the effluent has a tendency to stay put close to the emission point. (Bacteria will stay and thrive in the most suitable environment – if it is an anaerobic environment -- that is where the anaerobic bacteria will be and also so for the aerobic bacteria in an aerobic environment

– thus this is a organic material loading and not a bacterial loading – the bacteria will only multiplied as the environment we create allows it – aerobic or anaerobic.) Therefore we need to reduce the organic load per emitter down to the levels we have found by experience to be appropriate with secondary treated effluent. The standard spacing between dripline and drip emitters is 24" x 24" with secondary treated wastewater. If we use 12" x 12" spacing between drippers and driplines with primary effluent, we have immediately increased the number of drippers by four-fold. If we then increase the area by doubling it we are up to 8 times the number of drippers as compared with the number of emitters we use when applying secondary treated effluent. Increasing the total number of emitters reduces the amount of water at each



emission point, which increases the amount of air at each emission point, which in turn increases the ability of the soil to absorb the anaerobic effluent. This is a considerably

larger number of emitters than is recommended by others; however we are comfortable with the extra safety margin.
Table 1 below sets out these standards.
Table 2 is based upon using drippers spaced at 24" x 24", as is specified by some states.

Dripper selection: To give the aerobic soil bacteria maximum time to absorb the anaerobic bacteria in the effluent the slower the rate of application of the effluent the better. Under most circumstance we recommend the WASTEFLOW ½ gallon (0.53 gph) per hour pressure compensating emitter.
To summarize the above arguments for 12" spacing when using primary treated effluent, we recommend WFPC16-2-12.

Control and Monitoring:
The use of septic tank effluent obviously carries considerably higher risk to both health and environment than the use of secondary treated effluent. Geoflow offers a WASTEFLOW Manager which will control and continuously monitor the septic tank, the pump chamber, the filters and the subsurface drip disposal fields. The Manager will automatically dial to up to six 'phone numbers in the event of any failure. The Manager can be accessed and both operated and re-programmed over a telephone line. The Manager will hold one year's data in the data log. We strongly urge that larger systems using septic effluent should consider the technology of the WASTEFLOW Manager to ensure safe and effective operation.

Application Rates based upon percolation rate:

Table 1. Minimum surface area required to dispose of 100 gpd of filtered septic effluent with a BOD < 200 mg./l using WASTEFLOW dripline with 12" between drippers and 12" between lines.

Soil type	Soil absorption rates Est.Soil Perc. rate min/in	Hydraulic. Conductivity- in/hr	Design Hydraulic Loading rate gal / ft2/day	Total Area required ft2 / 100gal per day
Coarse- sand	<5	>2	0.700	143
Fine sand	5-10	1.5-2	0.600	166
Sandy loam	10-20	1.0-1.5	0.500	200
loam	20-30	0.75-1.0	0.350	286
Clay loam	30-45	0.5-0.75	0.300	333
Silt-clay loam	45-60	0.3-0.5	0.200	500
Clay non-swell	60-90	0.2-0.3	0.100	1000
Clay - swell	90-120	0.1-0.2	0.050	2000
Poor clay	>120	<0.1	0.037	2703

Table 2: Application rates based upon morphological soil evaluation:
This table is taken from the Wisconsin State regulations.
Note: The expectation is that the drippers will be spaced 24" x 24". When using 12' x 12" spacing in the case of soils more coarse that silt-clay loam, one may decide to increase these application rates.

Maximum Soil Application Rates
Based Upon Morphological Soil Evaluations

Soil Textures	Soil Structure	Maximum Monthly Average	
		BOD_5>30mg/L≤220mg/L TSS>30 mg/L≤150 mg/L (gallons / ft² / day)	BOD_5≤30mg/L TSS≤30 mg/L (gallons / ft² / day)
Course sand or coarser	N/A	0.4	1.6
Loamy coarse sand	N/A	0.3	1.4
Sand	N/A	0.3	1.2
Loamy sand	Weak to strong	0.3	1.2
Loamy sand	Massive	0.2	0.7
Fine sand	Moderate to strong	0.3	0.9
Fine sand	Massive or weak	0.2	0.6
Loamy fine sand	Moderate to strong	0.3	0.9
Loamy fine sand	Massive or weak	0.2	0.6
Very fine sand	N/A	0.2	0.6
Loamy very fine sand	N/A	0.2	0.6
Sandy loam	Moderate to strong	0.2	0.9
Sandy loam	Weak, weak platy	0.2	0.6
Sandy loam	Massive	0.1	0.5
Loam	Moderate to strong	0.2	0.8
Loam	Weak, weak platy	0.2	0.6
Loam	Massive	0.1	0.5
Silt loam	Moderate to strong	0.2	0.8
Silt loam	Weak, weak platy	0.1	0.3
Silt loam	Massive	0.0	0.2
Sandy clay loam	Moderate to strong	0.2	0.6
Sandy clay loam	Weak, weak platy	0.1	0.3
Sandy clay loam	Massive	0.0	0.0
Clay loam	Moderate to strong	0.2	0.6
Clay loam	Weak, weak platy	0.1	0.3
Clay loam	Massive	0.0	0.0
Silty clay loam	Moderate to strong	0.2	0.6
Silty clay loam	Weak, weak platy	0.1	0.3
Silty clay loam	Massive	0.0	0.0
Sandy clay	Moderate to strong	0.1	0.3
Sandy clay	Massive to weak	0.0	0.0
Clay	Moderate to strong	0.1	0.3
Clay	Massive to weak	0.0	0.0
Silty clay	Moderate to strong	0.1	0.3
Silty clay	Massive to weak	0.0	0.0