MEMORANDUM

TO: Class C Designers
Class D Soil Scientists
Class E System Contractors

FROM: Jack Hayes, ES, Ground Water Discharges Section
Hilary Valentine, EE, Ground Water Discharges Section
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American Manufacturing, Inc.
Geoflow, Inc.
Delta Environmental Products, Inc.

SUBJECT: Micro-Irrigation "Drip" Dispersal Design Criteria

ORIGINAL DATE: November 18, 2003

AMENDED DATE: January 6, 2010

This memo will serve as the new directive for micro-irrigation "drip" dispersal criteria and must be adhered to when siting, designing and constructing micro-irrigation "drip" dispersal systems in Delaware, effective September 15, 2009. The manufacturers (American Manufacturing Inc., Geoflow, Inc. and Delta Environmental Products, Inc.) presently supplying the "drip" products have agreed to the criteria outlined below.

** Some design considerations and the subsequent approval will be determined on a case by case basis and in those instances when performance based criteria is utilized.

Siting Criteria:

- Micro-irrigation "drip" dispersal systems are often sited addressing adsorption areas with shallow and/or multiple limitations. Scientists, designers and system contractors need to approach drip dispersal systems appropriate application with due care.

    - Loading rates are to be based on the most restrictive texture within 24" of the surface.
    - For **at-grade systems**, the tillage depths are to be 6-8", although slightly deeper depths may be necessary in the case of shallow thin plow pans or similar restrictive layers within 12" of the surface.

    - For **at-grade systems** on slopes > 5% no sandy fill should be utilized. Tubing should be installed directly onto the scarified surface with a 6" topsoil cap.

- All replacement **at-grade systems** on slopes > 5% and with a limiting zone < 12" will be addressed on a case by case basis.
- Landscape position is also a necessary consideration, do not site within a closed depression or where water tends to pond during heavy rainfall events.

New Construction:

Separation requirements;

- 18" from limiting zone
  - Full Depth installation = 24" limiting zone, 6" trench
  - Surface installation (at-grade systems) = 18-22" limiting zones require that 3" sandy fill be added, then place tubing 1" into sandy fill and add 6" topsoil cap (***See Design and Construction Notes for Site Preparation).***

    * ***No advanced treatment required ****

- 12 – 17" from limiting zone **requires advanced treatment**. A 12" separation distance must be maintained from the limiting zone. For limiting zones 12-16", 3" of suitable sandy fill must be added, then place tubing 1" into fill and add 6" topsoil cap.

Replacement System;

Separation requirements:

- 18" from limiting zone – Same installation parameters as above

- 12 – 17" limiting zone – Suitable sandy fill added to establish 19" separation, place tubing 1" into sandy fill and add 6" topsoil cap

  **** No advanced treatment required unless soil scientist determines otherwise****

- Less than 12" limiting zone **requires advanced treatment** – Suitable sandy fill added to establish 13" separation, place tubing 1" into sandy fill and add 6" topsoil cap.

Design and Construction Notes for At-Grade Systems

- Rope off proposed "drip" disposal area.

- Prepare disposal area when appropriate soil moisture conditions exist (field capacity).

- Remove vegetation, but do not pull out stumps; do not remove sod, topsoil or rock.

    - Grass, shrubs, and trees must be cut as close to the ground surface as possible and removed, preferably by hand.
    - For wooded lots, with excess litter, we recommend the litter be raked from site.

- Chisel plow disposal area 6-8”deep or as prescribed by soil scientist.
    - Preferred methods
        - Chisel teeth mounted on a backhoe bucket and pulled through surface
        - Chisel plow pulled behind a tractor

    ******* ROTOTILLERS SHALL NOT BE UTILIZED*******

- Add 3” of sandy fill and place tubing 1” into sandy fill.

- Add 6” topsoil cap.

- To maintain positive drainage additional cover on top may be necessary.

If in doubt, please call the GWDS at 739-9948, prior to beginning any construction procedures.

Delaware Residential “Drip” Design Criteria

Soil Type	Permeability Rate (mpi)	Hydraulic Loading Rate (gpd/ft²)	Drip – Line Spacing	Emitter Spacing
S	5	.303	Typically 24”	Typically 24”
LS	10	.278		
	15	.253		
SL	20	.228		
	25	.211		
SCL, L	30	.203		
	35	.196		
	40	.189		
	45	.180		
Si, SiL	50	.173		
	55	.162		
	60	.154		
	65	.146		
	70	.139		
CL, SiCL	75	.133		
	80	.127		
	85	.122		
	90	.117		
	95	.116		
	100	.105		
	105	.096		
	110	.088		
	115	.080		
SC, SiC, C	120	.073		

Notes:

1. All primary effluent systems require automation of filter and field flushing.
2. Spacing of drip-line and emitters may also be a function of soil textures and landscaping requirements. Please contact manufacturer for recommendations and limitations.
3. For commercial and/or large systems, please contact the GWDS and the manufacturers for additional siting criteria.