NORTH CAROLINA DEPARTMENT
OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL HEALTH
ON-SITE WASTEWATER SECTION

INNOVATIVE WASTEWATER SYSTEM APPROVAL

INNOVATIVE WASTEWATER SYSTEM NO: IWWS-2001-1

ISSUED TO: Delta Environmental Products, Inc.
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FOR: Delta's Subsurface Drip System

APPROVAL DATE: August 2, 2001

In accordance with 15A NCAC 18A .1969, an application by David Morgan, Delta Environmental Products, Inc., of Denham Springs, Louisiana, for approval of their subsurface wastewater drip system has been reviewed, and the system has been found to meet the standards of an innovative system when the following conditions for use, monitoring and operation are met:

I. System description:

a. Collection system: conventional gravity, pressure sewer fed by grinder pumps or individual septic tank effluent pumping units.

b. Pretreatment: Aerobic System: DEH-approved Delta Environmental Products, Inc. WHITEWATER Aerobic Treatment Unit.

c. Filtration: Automatic, self-cleaning screen filter(s) (appropriately sized Agriculture Products, Inc. Screen Filter[s], or approved equal) capable of screening particles larger than that recommended by the tube manufacturer, typically 100 microns.

d. Manifold: Common line (Schedule 40 PVC) to connect all the dripline in a single field at the start of the field and the distal ends of the dripline (flush end).

e. Air vent: Air Vacuum Breaker(s) installed at the high point(s) of each dripfield to keep soil from being sucked into the drip emitters due to back siphoning or backpressure.

f. Dripline: Geoflow's Wasteflow PC dripline with pressure-compensating emitters spaced uniformly in the tubing (24-inch centers). The tubing consists of three layers; the inside layer is a bactericide protector, the middle layer is black and the outside layer is purple-striped for easy identification. The emitters are impregnated with Treflan® to inhibit root intrusion.

NETAFIM BioLine for wastewater with pressure-compensating emitters spaced uniformly

in the tubing (24-inch centers). Manufactured in purple for non-potable sources. The BioLine emitter is impregnated with a bactericide protector.

g. Field flushing valve: An automatic valve used to enable accumulated debris and sediment to be flushed from the dripline back to the pretreatment unit.

h. System Controls: Control/software package controlling all functions, including filter flushing, system dosing and flushing, audible/visible alarms, and for larger systems (> 600 gpd), flow monitoring, self diagnostics, and telemetry capabilities.

II. Siting criteria:

a. The Delta Subsurface Drip System may be utilized on sites that meet the following criteria:

i. Sites classified suitable or provisionally suitable in accordance with Rules .1939-.1948;

ii. Sites reclassified to be provisionally suitable in accordance with Rules .1956(1), (2), (4), (5) or (6a);

iii. Sites meeting the criteria for low pressure pipe systems in accordance with Rule .1957(a)(2); or

iv. Sites meeting the criteria for new or existing fill, in accordance with Rule .1957(b). The system is considered a fill system when all or part of the drip tubing shall be installed in fill material. For existing fill systems, the minimum vertical separation distance between the drip tubing or installed trench bottom and any soil wetness condition or any soil horizon unsuitable as to soil structure, clay mineralogy, organic soil, rock or saprolite shall be 18 inches.

b. Required vertical separation requirements shall be measured from the bottom of the drip tubing, or the installed trench bottom, whichever is deeper. All reductions in vertical separation allowed in the Rules based on the use of low pressure pipe systems shall apply.

c. The minimum horizontal setback requirements as allowed for aerobic treatments units in accordance with Rule .1957(c)(5)(a) shall be met.

III. System sizing:

a. The following table shall be used in determining the long-term acceptance rate (LTAR) for the Delta Subsurface

Drip System. The LTAR shall be based on the most hydraulically limiting soil horizon within 18 inches of the naturally occurring ground surface or to a depth of one foot below drip tubing, whichever is deeper.

Soil Group	Soil Textural classes (USDA classification)	Soil Textural Classes (USDA Classification)	LTAR (area basis) (gpd/ft^2)
I.	Sands (with S or PS structure and clay mineralogy)	Sand Loamy Sand	1.0 - 0.6
II.	Coarse Loams (with S or PS structure and clay mineralogy)	Sandy loam Loam	0.6 - 0.4
III.	Fine Loams (with S or PS structure and clay mineralogy)	Sandy Clay Loam Loam Silt Loam Clay loam Silty Clay Loam Silt	0.4-0.15
IV.	Clays (with S or PS structure and clay mineralogy)	Sandy Clay Silty Clay Clay	0.15-0.05

b. The following table shall be used in determining the LTAR for Delta Subsurface Drip Systems installed in saprolite pursuant to Rule .1956(6). The LTAR shall be based on the most hydraulically limiting, naturally occurring saprolite to a depth of two feet below the drip tubing.

Saprolite group	Saprolite Textural Classes	Saprolite Textural Classes	LTAR (areal basis) (gpd/ft^2)
I.	Sands	Sand Loamy sand	0.6 - 0.4 0.5 - 0.3
II.	Loams	Sandy Loam Loam Silt Loam	0.4 - 0.25 0.3 - 0.2 0.20 - 0.07

c. In calculating the number of square feet for the drainfield, the design daily sewage flow rate shall be divided by the long-term acceptance rate determined from the appropriate table, above

d. In calculating the minimum length of drip tubing to be used, the total square footage of drainfield shall be divided by two feet.

IV. Design criteria:

a. Pretreatment:

The drip emitter system shall be preceded by a pretreatment process designed to reduce the wastewater biochemical oxygen demand (BOD) and total suspended solids (TSS) concentrations to a maximum of 30 milligrams per liter (mg/1), each. This level of pretreatment shall be achieved by properly designed Delta Environmental Products, Inc. WHITEWATER Aerobic Treatment Units (ATUs) approved in accordance with Rule .1957(c).

b. Dosing tank:

i. The dosing tank and dosing system shall meet the design and construction criteria of Rules .1952-.1954, except that the minimum liquid capacity shall not be less than the total liquid capacity of the septic tank that would be required for this system.

ii. Level control floats in the dosing tank shall be adjustable and replaceable from the ground surface without requiring entrance into the tank.

iii. The requirement for a separate high water alarm that is audible and visible by system users shall be met, in conjunction with any required self monitoring features of the Delta system.

c. Pumps:

Unit shall include high head submersible pump(s) or suction lift self-priming centrifugal pump(s), specified by Delta Environmental Products, Inc. in accordance with Rule .1952(c)(2). For a suction lift pump, the intake pipe shall contain a screen and foot valve as specified by Delta Environmental Products, Inc. Pump, controls, intake pipe and screen, as applicable, shall be easily accessible by the system operator for routine operation, maintenance, monitoring and servicing.

d. Filters:

Self-cleaning screen filter(s) capable of screening particles larger than or equal to that recommended by the tube manufacturer, typically 100 microns shall be used. Self-cleaning process shall be automatic. Agriculture Products, Inc. screen filters, or approved equal, shall be used. Filter flushing residuals shall be pumped into the upstream end of the pretreatment system with provisions made to minimize disturbance of any solids in the pretreatment tank or settling chamber (where applicable). Filter number and size shall be at least as necessary to have flow rate during both irrigation and flushing conditions to be within filter manufacturer-specified acceptable operating range.

e. Delta processing and control unit:

i. Controls shall provide for delivery of designer-specified preprogrammed volumes of effluent to each field zone (adjustable) at designer-specified time intervals (flow equalization); automatic flushing of integral unit filters (filter flushing), initiated by a timer (adjustable duration); automatic flushing (at least weekly) of the drip laterals (field flushing) with filtered effluent for designer-specified duration; and monitor pump cycles and run times (for each pump) and flow (with totalizing flow meter, or equal). For systems designed for over 600 gallons per day, controls shall also monitor alarm conditions (high water, power outage), flow volume to each zone and flow variance indication when flow is + or - 20% of design.

ii. Controls and float levels shall be synchronized to assure the minimum dose is available prior to initiating a dosing cycle to a zone. Minimum dose volume per zone shall be <u>five</u> times the liquid capacity of the drip laterals plus the liquid capacity of the supply and return manifold lines (only the portion which drain between doses). Minimum automatic field flushing volume per zone shall be <u>two</u> times the liquid capacity of the drip laterals plus the liquid capacity of supply and return and manifold lines that drain between doses.

iii. Duplex pump dosing system shall be provided whenever the total length of drip lines exceeds 10,000 feet.

iv. A telemetry system shall be provided for systems with a design flow greater than 600 gallons per day, whereby the operator shall be notified immediately of alarm conditions (high water and power outage) and flow variance (+ or - 20%). Telemetry system and alarm shall include automatically rechargeable battery backup power supply.

v. Floats, pump and control circuits, and the control panel shall meet the requirements of Rule .1952(c). Panel and control equipment shall include lightning protection, be protected from unauthorized access, and remain accessible at all times to the system operator.

f. Delta Subsurface Drip System Field Design (See Section VII for designer responsibilities):

i. The field network may utilize 1/2-inch (0.64 inch O.D., 0.55 inch I.D.) nominal size WASTEFLOW PC polyethylene dripline containing bactericide incorporated into the inner lining and Treflan® root intrusion inhibitor bound into the pressure-compensating emitters. Manufacturer guarantees roots shall be effectively inhibited by this product for a minimum of ten years. Pressure compensating emitters shall be spaced uniformly along the dripline on two foot centers and designed to deliver 0.53 or 1.02 gallons per hour per emitter (+ or - 5%) at internal tubing pressures of 7 to 60 pounds per square inch.

The field network may utilize Netafim Bioline dripperline for wastewater. Individual dripperlines shall be of extruded linear low density polyethylene with an in side diameter of 0.56-inch and an outside diameter of 0.66-inch. The entire polyethylene pipe is to be purple throughout to designate its use for wastewater. The tubing is to have fully pressure compensating drippers integral with the inner wall of the tubing. The drippers will be impregnated with an anti-microbial agent to prevent the attachment of microbial slime to the dripper. Each dripper will have an individual filter at the inlet to the dripper; this filter shall have a cross sectional area not less than five times larger than the minimum cross sectional area of the dripper flow path. The drippers are to have a nominal flow of 0.62 gallons per hour or 0.92 gallons per hour at pressure of 7 to 60 pounds per square inch. The flow from any individual dripper in a dripperline may not vary more than ± 10% of the nominal flow of the dripper.

ii. Individual drip lines shall be designed and installed level, following the naturally occurring ground contour (allow maximum variance of + or - two inches within any linear segment), on at least two foot centers. Solvent welded heavy duty nonperforated flexible PVC shall be used to connect the supply and return manifolds with the driplines, or to connect common driplines installed at varying depths or locations (e.g.: in stepdowns or to connect looped drip line segments). The connection lines shall be made to the driplines by solvent welded compression adapters, spinlock fittings, or approved equal. Connection lines shall be conveyed over earthen dams constructed at least 2-inches higher than the driplines served, to retain effluent in the lines at the end of each dose cycle.

iii. The field shall consist of two to six separately and automatically dosed and valved zones whenever the total length of dripline exceeds 2100 linear feet, the design flow exceeds 600 gallons per day, or as otherwise needed to meet irrigation and/or flushing requirements.

Separately dosed zones shall contain equivalent lengths of dripline (+ or – 5 percent).

iv. The hydraulic design shall be based on achieving the following conditions:

- No more than a 10 percent variation in flow between any individual emitters anywhere within a separately dosed zone, including any drain back.

- When the slope exceeds 10 percent, check valves shall be used in the supply and return manifolds, or other acceptable means identified to minimize disproportionate amount of drainage into the lowest area of the zone.

- Maintenance of scour velocity of at least 1.0 feet per second in the supply line from the dosing tank to the beginning of the drip field during normal dosing cycles.

- Maintenance of flushing velocities of at least 1.2 feet per second in each supply manifold segment during field flushing, and maximum flushing velocities less than 10 feet per second in each supply and return manifold segment.

- Minimum pressure in the drip line of 10 pounds per square inch and a maximum pressure of 60 pounds per square inch during normal dosing and flushing cycles.

- Maintenance of flushing velocities of at least two feet per second at the distal end of each dripline. Dripline flushing shall be automatic.

v. Field appurtenances include an air vent at the high point(s)/outlet of each zone; check valve at the high point/outlet of each zone (when there are more than one zone); K-Rain index valve (or approved equal) to split flow between two to six equal-sized field zones, as applicable; pressure regulator; cleanout at each end of the supply and return manifolds; a separate cleanout at the distal end of the supply line to each zone; and pressure monitoring fittings at the field inlet and outlet points and at both ends of the supply and return manifolds. The operator must be able to service all valves and air vents and check pressures without effluent discharging from the network in preparation for these maintenance/testing procedures. Valves and cleanouts shall be provided with protective vaults or boxes.

V. Installation and Testing Procedures:

a. Dosing tank shall be demonstrated to be watertight by a 24-hour leakage test (maximum of 1/2-inch rise or fall in 24 hours) or vacuum test. Test shall be run with risers/and inlet/outlet pipes in place.

b. Drainfield area shall be prepared in a manner that minimizes site disturbance. No equipment shall cross the field areas during rainfall events, or when the fields are above field capacity ("too wet to plow"). Lightweight equipment only shall be used to remove trees, roots, and rocks, with hand incorporation of select fill material used to eliminate weak spots where roots or boulders must be removed. Field shall be prepared as needed to enable a grass cover to be established and maintained prior to line installation.

c. Field laterals shall be staked out by use of an engineer's or laser level and tape to assure conformation with natural contours and design requirements for sizing, location and separations. Maximum drip line depth shall be in accordance with permit conditions.

d. When a trencher is used, trench bottoms shall be hand cleaned and drip tubing shall be secured to the center of the trench bottom prior to backfilling.

e. Fields shall be installed in accordance with manufacturer's recommendations for each site. A vibratory plow, static plow or trencher is most typically used and soil moisture must be dry enough so that soil compaction will not occur.

f. Minimum soil cover over drip tubing shall be six inches, to finished grade. Cover material shall be free of rocks or debris. Minimum depth of valves in protective vaults or boxes shall be at least 18 inches below grade.

g. Extreme care must be taken during system installation to assure no extraneous debris enters the tankage, supply lines, and drip line network. Supply lines and manifolds shall be flushed out prior to system startup.

h. Manufacturer's recommendations shall be followed for system startup. All leaks in pipe network or from emitters exhibiting excessive emission rates as evidenced by wet spots during dosing cycles comparable to normal operating

conditions shall be repaired. Normal dosing and flushing flow rates and flushing pressure at the ends of each zone supply and return manifold shall be measured and determined to be in accordance with design criteria.

i. Fields shall be finished graded to shed surface water and in a matter which facilitates easy maintenance with standard mowing equipment. Provisions shall be made to establish a vegetative so as to prevent erosion and to allow for effective system inspection and maintenance.

j. All mechanical components, pumps, pump cycling, filters, flushing, high water alarm and telemetry systems, as applicable, must be demonstrated to be fully operable in accordance with their design.

VI. Operation, Maintenance and Monitoring Requirements:

a. System management entity, inspection/maintenance and reporting frequency requirements shall be comparable to at least Type V(c) systems in Rule .1961(b), Table V(b), except that the maximum inspection interval shall be monthly for the first year of operation and quarterly thereafter (more frequently if required for the ATU).

b. The operator in responsible charge (ORC) shall provide monitoring reports to the health department which include a log of all malfunction incidences/notifications and maintenance activities. Minimum maintenance during each required inspection shall include visual observation of the dripfield(s), checking/cleaning filter screen(s), measured dosing flow rate to each zone, and recording of flow meter reading, pump run times and cycle counts. Flushing flow rates and pressure head measurements during flushing at the inlet and outlet of each field zone shall be taken at least once per year.

c. For systems with a design flow rate of over 600 gallons per day, the ORC shall be telemetrically notified of high water, power outage, flow variance (+ or – 20%) and catastrophic failure (+ or – 50%) conditions.

d. The ORC shall also conduct other additional observations, measurements, monitoring, and maintenance activities as specified in the Operation Permit and as recommended by Delta or as otherwise required for the ATU.

VII. Responsibilities and Permitting Procedures:

a. All systems shall be designed by individuals authorized in writing by Delta Environmental Products, Inc. or its authorized agent/agents. The system shall be designed by a professional engineer when the system design flow exceeds 600 gallons per day, a field zone contains 10,000 linear feet or more, or when duplex pumps are otherwise required to be used. In such cases, plans and specifications shall be prepared, reviewed and approved in accordance with Rules .1938(e) and (f).

b. The system shall be installed by a contractor authorized in writing by the manufacturer or its authorized agent/agents, who shall coordinate the installation with the designer and manufacturer's field. The manufacturer's field representative and designer shall provide written confirmation of their acceptance of the system installation prior to operation permit issuance.

c. Prior to issuance of an operation permit a contract for operation and maintenance shall be executed between the system owner and an ORC as required in accordance with Rule .1961(b), who is authorized in writing by the manufacturer to operate and maintain the system. A condition of the operation permit shall be that a contract for operation and maintenance with an ORC shall remain in effect for as long as the system is to remain in use.

VIII.Repair of System:

The provisions of 15A NCAC 18A .1961(c) shall govern the use of the Delta Subsurface Wastewater Drip System for repairs to existing malfunctioning wastewater systems.

Approved by:____________________________________Date:_____________________