NORTH CAROLINA DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH SECTION
ON-SITE WATER PROTECTION BRANCH

INNOVATIVE WASTEWATER SYSTEM APPROVAL

INNOVATIVE WASTEWATER SYSTEM NO: IWWS-1993-2-R16

Issued To: Infiltrator Water Technologies, LLC
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For: "Infiltrator" Standard, Standard SideWinder, Standard SC, Equalizer 36, High Capacity, Contour Wedge, Standard Contour Swivel, Quick4 Standard, Quick4 Standard-W, Quick4 Equalizer 36, Quick4 High Capacity and Quick4 Equalizer 24, Quick4 Standard MultiPort Endcap, Quick4 EQ 24 MultiPort Endcap, Quick4 EQ 36 MultiPort Endcap, Quick4 High Capacity MultiPort Endcap, and Quick4 Plus Standard All-in-One 12 Endcap, as well as "BioDiffuser" Standard Model 11" High Unit, Angle Chamber Section, Bio 3, Arc 36, Arc 36HC, and Arc 24 Models, Arc 36 Side Port Coupler (SPC) Unit, Arc 24 Side Port Coupler (SPC) Unit, Arc 36HC Side Port Coupler (SPC) Unit, Arc 36 SPC Endcap, and Arc 36HC SPC Endcap chambered sewage effluent subsurface disposal systems

Approval Dates:

August 25, 1994	"Infiltrator" Standard Chamber Approval
March 21, 1997	BioDiffuser 12-Inch Cover H-10 Load Design*
April 26, 1999	"Infiltrator" SC (Shallow or 6-inch cover) Load Design and High Capacity Chamber
August 10, 2000	BioDiffuser 6-Inch Cover (Shallow Placement) Design
January 17, 2001	Standard SideWinder and Contour Wedge
July 25, 2001	BioDiffuser Class IV Cover
October 4, 2001	Equalizer 36 and Standard SideWinder SC (Shallow or 6 inch cover) Load Design
October 5, 2001	BioDiffuser Angle Chamber Section
April 18, 2002	"Infiltrator" High Capacity SideWinder and Revised Equivalency Factors
November 4, 2002	BioDiffuser Warranty System with Revised Equivalency Factors
March 20, 2003	Equalizer 36 Swivel and Standard Contour Swivel
April 8, 2003	Revised (Warranty) Equivalency Factors
April 9, 2003	Bio 3
December 19, 2003	Quick4 Standard Chamber
April 7, 2004	Minor Revisions/Edits
September 29, 2004	Quick4 Standard-W Chamber

November 1, 2005	Quick4 Equalizer 36 Chamber
March 10 2006	Arc 36
December 21, 2006	Quick4 High Capacity Chamber and Quick4 Equalizer 24 Chamber and Deep Installation Approval
April 28, 2008	Arc 24 and Arc 36 Side Port Coupler (SPC)
July 18, 2008	Addition of Hancor, Inc.
February 25, 2010	Arc 36HC, Arc 24 Side Port Coupler (SPC), Arc 36HC Side Port Coupler (SPC), and Deep Installation Approval
March 1, 2011	Addition of Quick4 Plus Standard
November 30, 2012	Elimination of Warranty Equivalency Factors and Reductions Exceeding 25%
November 30, 2012	Change of BioDiffuser and Arc Ownership to Infiltrator Systems Inc.*
September 5, 2014	Addition of Area Sizing Credit for End Cap Parts
May 1, 2015	Merge IWWS-1997-2-R11 BioDiffuser model specifications into IWWS-1993-2-R15; retire IWWS-1997-2-R11
August 7, 2015	Update trench levelness requirements and change company name to Infiltrator Water Technologies, LLC**

*The March 21, 1997 innovative approval was issued to Advanced Drainage Systems, Inc. and transferred to Infiltrator Systems, Inc. on November 30, 2012.
**Prior approvals were issued to Infiltrator Systems, Inc. or predecessor companies.

In accordance with General Statute 130A-343 and 15A NCAC 18A.1969, an application by Infiltrator Water Technologies, LLC or its predecessor of Old Saybrook, CT for a revised approval of their chamber (gravel-less) nitrification trench system has been reviewed, and found to meet the requirements of an innovative system when all of the following conditions are met:

I. General

A. Scope of this Innovative Approval
   1. Use, design, and installation requirements for the Infiltrator chamber nitrification trench system, inclusive of Quick4, Arc, and BioDiffuser models as well as respective predecessor designs.

B. The following chamber system models have been found to meet the standards of an innovative system:
   - Infiltrator Standard and Standard SideWinder (polyethylene) with 12 inch cover
   - Infiltrator High Capacity (polyethylene) with 12 inch cover
   - Quick4 Plus Standard, Quick4 Standard, Quick4 Standard-W, Standard SC and Standard SideWinder SC (polypropylene) Models with 6 inch cover
   - Equalizer 36 with 6 inch cover
   - Quick4 Equalizer 36 with 6 inch cover
   - Quick4 High Capacity with 6 inch cover
   - Quick4 Equalizer 24 with 6 inch cover
   - High Capacity SideWinder (polypropylene) with 12 inch cover
   - Contour Wedge

- EQ36 Swivel
- Contour Swivel – Standard
- Quick4 Standard MultiPort Endcap with 6 inch cover
- Quick4 EQ 24 MultiPort Endcap with 6 inch cover
- Quick4 EQ 36 MultiPort Endcap with 6 inch cover
- Quick4 High Capacity MultiPort Endcap with 6 inch cover
- Quick4 Plus Standard All-in-One12 Endcap with 6 inch cover
- BioDiffuser Standard Model with 6 inch cover
- Angle Chamber section with 6 inch cover
- Bio 3 with 6 inch cover
- Arc 36 with 6 inch cover
- Arc 24 with 6 inch cover
- Arc 36HC with 6 inch cover
- Arc 24 Side Port Coupler (SPC) with 6 inch cover
- Arc 36 Side Port Coupler (SPC) with 6 inch cover
- Arc 36HC Side Port Coupler (SPC) with 6 inch cover
- Arc 36 SPC Endcap with 6 inch cover
- Arc 36HC SPC End Cap with 6 inch cover

II. System Description

A. Minimum pretreatment by septic tank as required in 15A NCAC 18A .1952.

B. The chambers must meet the following requirements as specified. Table I identifies chamber dimensions.
1. Infiltrator Standard and Standard SideWinder chamber units (including High Capacity Model) consist of a high density polyethylene arch-shaped injection molded chambers.
2. The Quick4 Plus Standard, Quick4 Standard, Standard SC and Standard SideWinder SC units consist of polypropylene arch-shaped injection molded chambers.
3. Sixteen Infiltrator Standard or High Capacity chambers are approximately equal to 100 linear feet.
4. Twenty-five Quick4 Plus Standard, Quick4 Standard, Quick4 Standard-W, Quick4 Equalizer 36, Quick4 High Capacity chambers, and Quick4 Equalizer 24 are approximately equal to 100 feet.
5. Twelve Equalizer 36 chambers are approximately equal to 100 linear feet.
6. BioDiffuser units consist of high-density polyethylene arch-shaped injection molded chambers.
7. Arc units consist of polypropylene or high-density polyethylene arch-shaped injection molded chambers.
8. Sixteen BioDiffuser Standard chamber units are approximately equal to 100 linear feet.
9. Fourteen BioDiffuser Bio 3 chamber units are approximately equal to 100 linear feet.
10. Twenty Arc 36, Arc 36HC, and Arc 24 units are each equal to 100 linear feet.
11. The chamber sidewall slope is approximately 20 degrees toward the chamber center or away from the trench sidewall.

C. Each chamber unit shall be properly and permanently marked in compliance with the appropriate standard, and conditions of this approval as follows:
- Standard or Standard SideWinder

- Quick4 Plus Standard, Quick4 Standard, Quick4 Standard-W, Standard SC or Standard SideWinder SC
- High Capacity, High Capacity SideWinder or Quick4 High Capacity
- Equalizer 36 or Quick4 Equalizer 36
- Contour Wedge
- Quick4 Equalizer 24
- EQ36 Swivel
- Contour Swivel – Standard
- Bio 3
- Arc 36
- Arc 24
- Arc 36HC

D. Each chamber unit is designed to mechanically interlock with the downstream chamber forming a complete nitrification trench that consists of an inlet plate with a splash plate located below the inlet on the trench bottom and a solid end plate to be located at the distal end of any chamber nitrification line.

E. The contour wedge, EQ 36 swivel, or standard swivel can be utilized as accessories to achieve turns as necessary in all applications including but not limited to shallow cover with 6 inches of soil, or the standard and high capacity units with 12 inches of soil.

F. The Angle Chamber Section may be utilized as an accessory for the BioDiffuser Standard and the Bio 3 models to achieve turns as necessary in all applications including but not limited to shallow cover with 6 inches of soil.

G. The Side Port Coupler (SPC) may be utilized as an accessory for the Arc 24, Arc 36, and Arc 36HC model chambers in series of no more than three (3) consecutive units to decrease the turning radius of a chamber line, as a drop-box in serial distribution, and for mid-line distribution pipe entry and exit in all applications where the Arc 24, Arc 36, and Arc 36HC model chambers may be utilized.

III. Siting Criteria

Chamber nitrification trench assemblies may be utilized on any site that one can use rock aggregate and pipe which meet the following criteria:

A. Sites which are classified as Suitable or Provisionally Suitable for a conventional nitrification field system in accordance with 15A NCAC 18A .1948(a) or (b).

B. Sites which have been reclassified as Provisionally Suitable in accordance with 15A NCAC 18A .1956(1), (2), (4), (5), (6), and (7).

C. Sites which meet the criteria for new or existing fill in accordance with 15A NCAC 18A .1957(b). The provisions of Rule .1957(b) are applicable whenever any portion of the chamber in a nitrification system extends into fill material. There shall be no reduction in trench length compared to a conventional gravel trench as computed per Rule .1955 (sizing for all models shall be based on minimum excavated trench width in Table III, Section IV.C of this Approval, without the application of an Equivalency Factor). This reference to "fill material" applies to the site fill

and not the backfill placed between the trench and the chamber sidewall.

Table I –Chamber Dimensions

Model	Height (in)	Invert[1] Height (in)
Standard and Standard SideWinder	12.3	6.9
Standard SC and Standard SideWinder SC	12.3	6.9
Quick4 Standard	12.5	8.0
Quick4 Plus Standard	12.0	5.3 or 8.0
Quick4 Standard-W	12.5	8.0
High Capacity and High Capacity SideWinder	15.9	10.2
Quick4 High Capacity	15.9	11.5
Equalizer 36	13.6	6.0 or 9.0
Quick4 Equalizer 36	12.5	1.25, 6.0, 9.0, or 10
Quick4 Equalizer 24	11.0	1.25, 6.0, 9.0, or10.0
Standard	11	6
Arc 36	13	6
Bio 3	12.38	6 or 11.75
Arc 24	12	6 or 12
Arc 36HC	16	10.5

[1]Invert Height is for a 4-inch diameter Schedule 40 PVC Pipe

D. The required vertical separation shall be measured from the bottom edge of the chamber.

E. Where required by soil or site conditions and approved by the local health department, chamber systems may be installed in lieu of conventional gravel trenches at depths deeper than 36 inches up to a maximum of 60-inches, as measured from the base of the trench. There shall be **no reduction in trench length** compared to a conventional gravel trench as computed per Rule .1955 for chamber systems installed greater than three feet deep (sizing for all models shall be based on minimum excavated trench width in Table III, Section IV.C of this Approval, without the application of an Equivalency Factor). **Furthermore, for trench depths between 48 and 60 inches, only "high capacity" models installed in a 36-inch wide trench shall be used, unless an advanced pretreatment system is used pursuant to Rule .1970.** Deep installation details shall be in accordance with Infiltrator's North Carolina Design and Installation Manual, including special provisions to assure compliance with federal and state safety procedures for underground excavations.

IV. System Sizing

A. The maximum long-term acceptance rate (LTAR) shall be as follows:

Table II – LTAR for Chambers

Textural Group		LTAR (gpd/sq ft)	
		Natural Soil	Saprolite
Soil/Group I (Sands)	Sands	0.8-1.0*	0.6-0.8
	Loamy Sand		0.5-0.7
Soil Group II (Coarse Loams)	Sandy Loam	0.6-0.8	0.4-0.6
	Loam		0.2-0.4
Soil Group III (Fine Loams)	Silt Loam	0.3-0.6	0.1-0.3
	Other Fine Loams		NA
Soil Group IV	Clays	0.1-0.4	NA

***** For sites where the LTAR exceeds 1.0 gpd/sq ft, use 1.0 gpd/sq ft.

B. The LTAR shall be based on the most hydraulically limiting naturally occurring soil horizon within three feet of the ground surface or to a depth of one foot below trench bottom, whichever is deeper.

C. To determine the total trench bottom area (ft^2) required, the design daily sewage flow shall be divided by the applicable LTAR shown in Table II above. The minimum linear footage for chamber systems shall be determined by dividing the total trench bottom area by the following equivalency factors:

Table III –Trench Width and Equivalency Factors

Product	Excavated Trench Width (inches)	Equivalency Factor*, ** (SF/LF)
Quick4 Standard	36	3.8
Quick4 Plus Standard	36	4.0
Quick4 Standard-W	36	4.00
Standard	36	4.00
Standard SC	36	4.00
Standard Sidewinder	36	4.00
Standard Sidewinder SC	36	4.00
High Capacity	36	4.00
High Capacity SideWinder	36	4.00
Quick4 High Capacity	36	4.00
Equalizer 36	24	3.00
Quick4 Equalizer 36	24	3.00
Quick4 Equalizer 24	18-24	2.00
Standard	36	4.00
Arc 36	36	4.00
Arc 36HC	36	4.00
Bio 3	24	3.00
Arc 24	24	3.00

* Reduction in nitrification trench length allowed by use of these Equivalency Factors, as compared to sizing requirements delineated in Rule .1955 for conventional systems, apply only to drainfields receiving effluent of domestic strength or better quality. Any proposed use of the system for facilities producing higher strength wastewater shall be sized in adherence with conditions set forth in Rule .1969(m).

** When advanced pretreatment pursuant to Rule .1970 is used to gain a trench length reduction or LTAR increase, system sizing shall be initially based on the minimum excavated trench width in this Table without use of an Equivalency Factor.

Example:

Three bedroom residence with a design daily sewage flow of 360 gallons on a sandy clay loam (Group III) soil

Total computed trench bottom area is:

360 gpd/0.5 LTAR = 720 ft^2

The required linear footage for Standard Infiltrator chamber system is:

720 ft^2/4.0 ft = 180 linear ft

Where 4.0 ft. is the equivalency factor for the Infiltrator Standard chamber system

D. The sizing for the chamber end cap and mid-line connection systems shall be determined by the equivalency factors in Table IV.

Table IV – Equivalency Factors for Endcap Systems and Mid-Line Connections

Product	Excavated Trench Width (inches)	Approved Chamber Equivalency Factor Linear Foot Basis[1] (sf/lf)	Linear Feet of Chamber Credit per Pair when Placed at Ends of Chamber Line (lf) [2]	Linear Feet of Chamber Credit per Unit when Placed as a Mid-Line Connection (lf)
Quick4 Standard MultiPort Endcap	36	4.0	1	NA
Quick4 Plus Standard All-in-One 12 Endcap	36	4.0	2	1[3]
Quick4 HC MultiPort Endcap	36	4.0	2	NA
Quick4 EQ 36 MultiPort Endcap	24	3.0	1	NA
Quick4 EQ 24 MultiPort Endcap	18-24	2.0	1	NA
Arc 36 SPC and SPC Endcap	36	4.0	2	1[4]
Arc 36HC SPC and SPC Endcap	36	4.0	2	1[4]

[1] Actual linear-foot equivalency rating of compatible chamber part.
[2] Must install two (2) end cap parts to get approved linear feet of chamber credit.
[3] Single end cap part installed within chamber line receives one (1) linear foot of chamber credit.
[4] Single Side Port Coupler installed within chamber line receives one (1) linear foot of chamber credit.

E. The minimum area (without reduction or equivalency factor) for a bed system shall be determined as required in 15A NCAC 18A .1955(d) except that the chambers shall be placed in rows next to each other.

F. The available space requirements of Rule .1945 shall be met, and this approved innovative system may be designated as the required replacement system.

V. Special Site Evaluation

A special site evaluation may be required based on the proposed ground absorption system. Refer to

Rule .1970(p).

VI. Design Criteria

Refer to Siting Criteria (Section III) and Installation (Section VII) for design details.

VII. Installation

A. The chamber system used in nitrification trenches shall be installed according to the minimum and maximum dimensions in Table V.

Table V –Installation Requirements

Model	Maximum Trench Width (in)	Minimum Trench Depth (in)	Minimum Trench Spacing (ft on center)	Minimum Soil Cover (in)
Standard	36	24	9	12
Standard SideWinder	36	24	9	12
Quick4 Plus Standard, Quick4 Standard, Quick4 Standard-W, and Standard SC	36	18	9	6
Standard SideWinder SC	36	18	9	6
High Capacity and High Capacity SideWinder	36	30	9	12
Quick4 High Capacity	36	22	9	6
Equalizer 36	24	19.5	7	6
Quick4 Equalizer 36	24	18.5	7	6
Quick4 Equalizer 24	24	17	6	6
Standard	36	17	9	6
Arc 36	36	19	9	6
Arc 36HC	36	22	9	6
Bio 3	24	18.4	7	6
Arc 24	24	18	7	6

B. The inlet to the chamber shall be in the uppermost portion of the specially molded inlet panel (“end cap”). For dosed systems receiving effluent from a pump or siphon, manufacturer’s installation procedures shall be followed, including provisions to dissipate inflow rate so as to minimize soil scouring and modifications that enable the presence and effectiveness of these provisions to be field-verified.

C. Backfill shall be placed between the trench and chamber sidewall to a minimum compacted (carefully walked in) height that is equal to the top of the chamber louvers. Chamber systems can be installed utilizing native soil backfill (Group I, II, III, or IV). Backfill shall be free of trash or debris. The area adjacent to louvers shall be free of large (8”or greater) clods that do not break apart during the walk in procedure. The latest version of the manufacturer’s installation procedure shall be followed. The Standard, Standard SideWinder, High Capacity, High Capacity SideWinder and Quick4 Equalizer 24 chamber models require additional soil backfill (Group I, II, III, or IV) to a minimum compacted cover of 12 inches is required above the chamber. The Quick4

Standard, Quick4 Plus Standard, Quick4 Standard-W, Standard SC, Standard SideWinder SC, Equalizer 36, Quick4 Equalizer 36, Quick4 High Capacity,Quick4 Equalizer 24, BioDiffuser Standard, Arc 36, Arc 36HC, Bio 3, and Arc 24 chamber models may be installed with a minimum compacted cover of 6 inches (shallow placement) when the following conditions are met:

1. Quick4 Standard, Quick4 Plus Standard, Quick4 Standard-W, Standard SC, Standard SideWinder SC, Quick4 High Capacity, Quick4 Equalizer 24, Equalizer 36, Quick4 Equalizer 36, BioDiffuser Standard, Arc 36, Arc 36HC, Bio 3, or Arc 24 chamber units are used;
2. The person installing or constructing the system is certified (documented) by Infiltrator Water Technologies, LLC or its authorized representative as specially trained and qualified to install chamber units;
3. The person installing the chamber system shall produce certification documentation upon the request by the State or local health department.
4. When installing the chambers in shallow placement (6 inches of soil cover) in Group I (sand) soils (including specially constructed Infiltrator Contour Wedge and Swivel units), the installer shall carefully follow the manufacturer's installation guideline for shallow placement.

Vehicular traffic or construction equipment may traverse the chamber system only when the load is bridged over the trench so as not to disturb the chambers. The load may be bridged with a minimum of six inches of compacted soil cover over shallow chamber models (Quick4 Standard, Quick4 Standard-W, Standard SC, Standard SideWinder SC, Quick4 High Capacity, Equalizer 36, Quick4 Equalizer 36, Quick4 Equalizer 24, BioDiffuser Standard, Arc 36, Arc 36HC, Bio 3, and Arc 24) and a minimum of 12 inches of compacted soil cover over other chamber models.

D. Infiltrator Swivel units (EQ36 Swivel and Standard Contour Swivel) shall be installed on undisturbed soil which is level with the adjacent drainfield trench bottoms. The installer shall be responsible for compacting the trench bottom beneath the Swivel units according to the manufacturer's guidelines when the units are installed in Group I (sand) soil. Backfill for the Swivel units shall be hand-compacted (carefully walked in) up to the top of the adjacent chamber units. Backfill shall be native soil (Group I, II, III, or IV). Backfill for the Swivel units shall be free of trash or debris and clods larger than 3" which do not break apart during the hand-compaction procedure.

E. Chamber trenches shall be constructed level in all directions with a plus or minus one-half-inch tolerance from side-to-side and maximum fall in a single trench bottom not exceeding one-fourth inch in 10 feet end-to-end for any continuous contoured segment. Trenches shall follow the contour of the ground surface elevation (uniform depth). Trenches shall be constructed with continuous interlocking chambers, including appurtenances, without any dams, stepdowns or other water stops.

F. Chamber systems installed on a sloping site may use distribution devices or stepdowns as described in 15A NCAC 18A .1955(j) and (l) when it is necessary to change level nitrification line segments from upper to lower elevations. The Multi-Port end cap of the Quick4 model chambers may be used as a stepdown by making the cross-over out of one of its upper pre-marked ports (8-inches above the bottom of the end cap) and conveying effluent through a solid pipe segment installed on a positive downhill grade down to the next lower trench in series. The pre-marked ports on the top of chambers may be used to receive effluent from an upper trench by a cross-over pipe. Stepdown installation details shall be in accordance with Infiltrator's North Carolina Design and Installation Manual.

G. After installation of chambers in trench or bed configuration, a filter fabric barrier shall be installed to cover the chambers (except Quick4 Chamber models) if chambers are installed in uncompacted, fine or very fine uniform sand and at least one of the following conditions are present.
    1. Installations are left uncovered and subject to a major rain event.
    2. Systems are subject to not being sodded (or stabilized) in a timely manner after final cover-up has occurred.
    3. The drainfield is not protected from surface drainage.

    The filter fabric shall be non-woven, weight 0.35 oz./s.y. to 1 oz./s.y., have apparent opening size (AOS) 20-30 U.S. Sieve (ASTM D-4571), or alternate with equal or better performance characteristics. An alternate fabric shall be approved in writing by the manufacturer on a case-by-case basis.

H. Manufacturer's installation instructions for the applicable chamber system used in septic tank systems shall be followed except as required herein or 15A NCAC 18A .1900 et.seq.

I. All chamber systems shall be installed by a contractor or installer appropriately certified in writing by the manufacturer or its authorized representative.

J. All chamber systems shall be installed with compatible end caps at the inlet and distal ends of each chamber row.

VIII. Operation, Maintenance, and Monitoring

Chamber systems shall have a minimum classification as a Type IIIg system (other non-conventional trench systems) in accordance with Table V(a) of 15A NCAC 18A .1961(b).

IX. Responsibilities and Permitting

Prior to the installation of the approved chamber nitrification trench system at a site, the owner or owner's agent shall fill out an application at the local health department for the proposed used of this system. The local health department shall issue an improvement permit or Construction Authorization or amend a previously issued Construction Authorization allowing the use of a chamber nitrification trench system. Use of the proposed innovative system and any conditions shall be described in the construction authorization or amended construction authorization, as applicable. Such information shall also be described on the operation permit to be issued upon the acceptable completion of the system installation.

X. Repair of Systems

The provisions of 15A NCAC 18A .1961(l) shall apply to the use of chamber systems for repairs to existing malfunctioning septic tank systems.

Approved by:_____Date:_____