

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

<b>CONTROLLED DEMONSTRATION SYSTEM APPROVAL</b>
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CONTROLLED DEMONSTRATION WASTEWATER SYSTEM NO: CDWS 2010-1-R2B

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For: Infiltrator Quick4 Plus Standard Low Profile (LP) Chamber Installations Located in the Piedmont Physiographic Region

Approval Dates:	May 24, 2010	
	July 7, 2014	Modified Controlled Demonstration criteria specific to Piedmont physiographic region
	October 31, 2014	Modified number of systems allowed

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

I. General

A. Scope of this Controlled Demonstration Approval

1. Use, design, and installation requirements for the Infiltrator Systems Inc. Quick4 Plus Standard LP chamber system in shallow soil profiles in the **Piedmont** physiographic region.
2. Monitoring proposal for evaluation of the Infiltrator Systems Inc. low profile chamber installations located in the **Piedmont** physiographic region.

B. This Controlled Demonstration is limited to 200 improvement permits issued with daily design flows up to 720 gallons per day. The field evaluation of the Quick4 Standard LP chamber systems in North Carolina shall be limited to evaluating the hydraulic performance and surge volume capability of the Quick4 Plus Standard LP chamber system.

C. Except for the criteria provided herein, the design, siting, permitting, operation and maintenance shall be governed by the provisions of the Infiltrator Systems Inc. Innovative Wastewater System

Approval No. IWWS-2010-1 or most recent version, and the applicable laws and regulations of the State of North Carolina.

II. System Description

- A. Minimum pretreatment by septic tank as required in 15A NCAC 18A .1952.
- B. The Quick4 Plus Standard LP unit consists of a polypropylene arch-shaped injection molded chamber. The connected overall length of a Quick4 Plus Standard LP chamber is 4 feet. The chamber sidewall slope is approximately 20 degrees toward the chamber center or away from the trench sidewall. Twenty-five Quick4 Plus Standard LP chambers are approximately equal to 100 feet.

Table I – Infiltrator Chamber Dimensions

Model	Length Overall (ft)	Height (in)	Bottom Width (in)	Average Open Bottom Width (in)	Slotted Sidewall Height (in)	Invert <sup>1</sup> Height (in)
Quick4 Plus Standard LP (polypropylene)	4	8.0	33.5	29.3	6.3	3.3 and 9.0

<sup>1</sup>Invert Height is for a 4-inch diameter Schedule 40 PVC Pipe

- C. Each chamber unit shall be permanently marked as follows: Quick4 Plus Standard LP.
- D. Each chamber unit is designed to mechanically interlock with the downstream chamber forming a complete nitrification trench that consists of an inlet plate or cap with a splash plate located below the inlet on the trench bottom and a solid end plate or cap to be located at the distal end of any chamber nitrification line.
- E. In addition to conventional use as an end cap, the Quick4 Plus All-in-One 8 Endcap and the Quick4 Plus Periscope pipe appurtenances can also be used as an accessory with the Quick4 Plus Standard LP chamber 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. The Quick4 Plus All-in-One 8 Endcap can be used in all applications where the Quick4 Plus Standard LP chamber may be utilized.

III. Siting Criteria

- A. The Quick4 Plus Standard LP nitrification trench assemblies may be utilized on any site which meets the following criteria in the **Piedmont counties** listed in Table II:
  1. Group II, III, or IV soils on any site where a **minimum of 20 inches and a maximum of 24 inches** of naturally occurring soil is present above saprolite, rock, parent material, expansive clay mineralogy, unsuitable soil structure, restrictive horizons, or soil wetness conditions and all other factors are provisionally suitable or suitable.
  2. Group I soils on any site where a **minimum of 26 inches and a maximum of 30 inches** of naturally occurring soil is present above saprolite, rock, or soil wetness and all other factors are provisionally suitable or suitable.

**Table II – Piedmont Counties**

Alamance	Durham	McDowell	Rowan
Alexander	Forsyth	Mecklenburg	Rutherford
Anson	Franklin	Montgomery	Stanly
Burke	Gaston	Moore	Stokes
Cabarrus	Granville	Nash	Surry
Caswell	Guilford	Northhampton	Union
Caldwell	Halifax	Orange	Vance
Catawba	Harnett	Person	Wake
Chatham	Iredell	Polk	Warren
Cleveland	Johnston	Randolph	Wilkes
Davidson	Lee	Richmond	Wilson
Davie	Lincoln	Rockingham	Yadkin

IV. System Sizing

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

**Table III**

Textural Group		LTAR (gpd/sq ft)	
		Natural Soil	Saprolite
Soil/Group I (Sands)	Sands	0.8 - 1.0 <sup>1</sup>	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

<sup>1</sup>For sites where the LTAR exceeds 1.0 gpd/ sq ft, use 1.0 gpd/sq ft.

B. To determine the total trench bottom area (ft<sup>2</sup>) required, the design daily sewage flow shall be divided by the applicable long-term acceptance rate. The minimum linear footage for the Quick4 Plus Standard LP chamber shall be determined by dividing the total trench bottom area by an equivalency factor of 3.0 square feet per linear foot (3.0 sf/lf).

**EXAMPLE:**

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

Then: Total computed trench bottom area is:

$$360 \text{ gpd}/0.5 \text{ LTAR} = 720 \text{ ft}^2$$

The required linear footage for Standard Infiltrator Systems is:

$$720 \text{ ft}^2/3.0 \text{ ft} = 240 \text{ linear ft.}$$

(Where 3.0 ft. is the equivalency factor for the chamber system)

- C. Reductions in total trench bottom area shall not be granted for low profile chambers.

#### 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 details.

#### VII. Installation

- A. The Quick4 Plus Standard LP chamber system used in nitrification trenches shall be installed with a maximum trench width of 36 inches, and with a minimum trench depth of 8 inches. The minimum on-center trench spacing shall be 9 feet, and the minimum soil cover shall be 6 inches.
- B. Each nitrification trench shall be installed with a minimum 2-inch-diameter inspection port located at the distal end of the trench. The observation port shall be extended directly to grade, without turns or elbows to facilitate access for periodic monitoring of ponding levels.
- C. This Controlled Demonstration study shall be for nitrification trenches only. Successful demonstrated performance of the Quick4 Plus Standard LP in trenches shall be adequate to justify innovative approval in other types of system configurations.
- D. The Quick4 Plus Standard LP chamber system shall be installed only with the Infiltrator Quick4 Plus All-in-One 8 Endcap or Quick4 Plus 8 Endcap options at the ends of each chamber row.

#### VIII. Operation, Maintenance and Monitoring Requirements

- A. The Infiltrator chamber system 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).
- B. Monitoring proposal for evaluation of the Infiltrator Systems Inc. low profile chamber installations located in the **Piedmont** physiographic region
  1. Systems may be installed and evaluated in the **Piedmont** physiographic region only, defined as located in any of the counties listed in Table II.
  2. The systems shall be for primary residences only, with a maximum daily design flow of 720 gallons per day.
  3. The county health department shall conduct a soil evaluation prior to each system installation site and shall complete a soil evaluation sheet.
  4. Systems shall be installed for at least two wet seasons, defined as the time period beginning December 1 through April 30. A maximum of 200 improvement permits may be issued in the

- Piedmont physiographic region. Sites shall be identified by street address, city, and zip code. Global positioning coordinates should be provided when available.
5. Water usage records shall be provided for all monitored sites for the wet season #1 monitoring event, unless determined to be unavailable by the independent third party. All monitored systems shall be designed and installed using parallel distribution. Successful demonstrated performance of the Quick4 Plus Standard LP in parallel distribution shall be adequate justification for innovative approval in both parallel and serial distribution configurations.
  6. For systems included in the field performance evaluation:
    - i. Pump systems shall be equipped with a pressure manifold and Aquaworx control panel to monitor effluent flow volume.
    - ii. Where water use records are not available, a water meter shall be installed on gravity systems to ascertain effluent flow volume.
  7. Each nitrification trench shall be installed with a minimum 2-inch-diameter inspection port located at the distal end of the trench. The observation port shall be extended directly to grade, without turns or elbows to facilitate access for periodic monitoring of ponding levels.
  8. This Controlled Demonstration study shall be for nitrification trenches only. Successful demonstrated performance of the Quick4 Plus Standard LP in trenches shall be adequate to justify innovative approval in other types of system configurations.
  9. Ponding measurements shall be recorded in each trench. All measurements shall be reported for each individual site at each visit.
  10. The ponding behavior monitoring protocol for the designated systems shall be as follows:
    - i. Three monitoring events will be conducted, two in the wet season (defined as December 1 through April 30) and one in the dry season.
    - ii. The monitoring events shall occur in the following calendar order: wet season #1, dry season, and wet season #2.
    - iii. A minimum of 21 sites will be monitored during each monitoring event.
    - iv. The manufacturer can forgo wet season #2 monitoring event if more than 21 sites are monitored during the wet season #1 monitoring event and during the dry season monitoring event (for example, visit at least double the number of sites during each of the two monitoring events for a minimum of 42 sites visited twice).
    - v. Pass/fail criteria is as follows:
      - a. Average ponding depth across all trenches at a site must be less than five inches, and
      - b. Equal to or greater than 95% of systems must pass during each monitoring event.
    - vi. For the dry season monitoring event, no water use data is required. Verification must be provided that the system has been in recent use prior to the monitoring event. However no data will be excluded from consideration based on hydraulic overload unless data collection performed under Section III.E of CDWS 2010-1-R1B demonstrates that such an exclusion is warranted.
    - vii. Monitoring shall begin no sooner than 12 months after issuance of the Operation Permit by the county health department.
    - viii. Monitoring shall begin after at least part of two wet seasons of operation, as determined from the time of Operation Permit issuance by the county health department.
  11. Monitoring events shall be conducted by an independent third party. Visual inspection for evidence of malfunction shall also be conducted at the ground surface, and the homeowner or occupant shall be interviewed about system operation at the time of the site evaluation. Homeowner or occupant information shall be gathered where available, recognizing that the homeowner or occupant may not be available or willing to answer questions. Criteria for evaluation of each system are provided in an example form in Appendix A.
  12. Should any of the evaluated systems reveal an average ponding height greater than 5 inches,

the following analysis shall be provided by the independent third-party:

- i. Evaluate siting, site soil characterization, installation method, and/or signs of misuse;
- ii. Acquire property water usage records;
- iii. Investigate plumbing fixtures for broken seals or running water;
- iv. Evaluate and report condition of septic tank and effluent filter; and/or
- v. Install continuous monitoring equipment to assess system use characteristics over an extended period.

Infiltrator Systems, Inc. may commission a North Carolina-licensed soil scientist to conduct an evaluation to determine if the observed effluent ponding resulted from the Quick4 Plus Standard LP chambers or other unrelated factors.

13. At the conclusion of the controlled demonstration period, it shall be determined whether the Quick4 Plus Standard LP chamber provides adequate hydraulic performance and surge capacity when installed in the soil profiles described herein. The performance standard is: a minimum of 20 of the 21 designated systems or at least 95% of the average ponding measurements if more than 21 sites are monitored shall meet the hydraulic performance criterion of not exceeding 5 inches, and without indications of a malfunction based on visual inspection of the drainfield.
14. Systems determined to have malfunctioned as a result of improper siting, installation, or usage will not be considered in determining performance. In the event that such a system is identified, an alternate site will be substituted in the evaluation.
15. A written report summarizing the results of the review shall be developed by an independent third party, approved by both the On-Site Water Protection Branch and Infiltrator Systems Inc., and submitted along with any recommendations for changes as identified during the demonstration period. Copies of all ponding height measurement reports and soil evaluation sheets for monitoring systems shall be submitted with the final report.
16. Successful passage of the above criteria and compliance with the requirements in 15A NCAC 18A.1969(g)(1) shall result in innovative approval of the Quick4 Plus Standard LP for sites having a minimum of 20 inches of Group II, III, or IV or a minimum of 26 inches of Group I suitable or provisionally suitable soil in the Piedmont Physiographic region identified in Table II.
17. Eligibility for innovative approval in the Mountain physiographic region requires that the Quick4 Plus Standard LP chamber is approved as innovative for both the Coastal Plain and Piedmont physiographic regions.

#### IX. Responsibilities and Permitting

- A. A pre-construction conference shall be required to be attended by the local health department (LHD) and Infiltrator Systems, Inc. or its authorized representative prior to beginning installation of the Quick4 Plus Standard LP chamber.
- B. Infiltrator Systems, Inc.'s participation in the pre-construction conference can be either in person or by teleconference.
- C. To ensure that each installation is eligible for monitoring, Infiltrator will provide written verification that the minimum number of monitoring ports are installed and that for the systems that are not connected to a water purveyor, a method of flow measurement has been installed (i.e., Aquaworx control panel or flow meter).
- D. LHD will verify that the system is installed in accordance with the provisions of this approval.

- E. LHD will inform applicant in writing on the Improvement Permit and Construction Authorization that the system is a controlled demonstration product with limited availability.
- F. LHD will attach a copy of the controlled demonstration approval to all Improvement Permits and Construction Authorizations.
- G. The LHD will notify the On-Site Water Protection Branch of all Improvement Permits, Construction Authorizations, and Operation Permits issued under this Controlled Demonstration approval, and the On-Site Water Protection Branch will correspondingly notify Infiltrator.
- H. Infiltrator shall maintain a list of installers authorized to install Infiltrator chambers, including the Quick4 Plus Standard LP chamber.

X. Repair of Systems

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

Approved by: \_\_\_\_\_ Date: \_\_\_\_\_