RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF WATER RESOURCES
235 Promenade Street, Providence, Rhode Island 02908

Alternative/Experimental OWTS Technology Program

Applicant Information:
Town of Charlestown, RI
Office of Environmental Scientist and
On-Site Wastewater Management
Charlestown Town Hall
4540 South County Trail
Charlestown, RI 02813
Phone: 401-364-5030

Contact:
Matthew J. Dowling
Phone: 401-364-5030
Email: mdowling@charlestownri.org

Non- Proprietary Technology Name
Nitrogen Reducing Layered Soil Treatment Area

Technology Approval Type:
Experimental
Total Nitrogen ≤ 19 mg/L
TSS ≤ 30 mg/L
BOD ≤ 30 mg/L
Oil & Grease ≤ 5 mg/L

Certification Dates:
Approved: April 8, 2021
No Expiration

CERTIFICATION

The Rhode Island Department of Environmental Management (RIDEM) has reviewed the Experimental Technology application for a non-proprietary leachfield system which based on applied theory and research has the potential to achieve the waste strength reduction and nitrogen removal targets listed in this certification. The experimental application was submitted and will be sponsored by the Town of Charlestown – Office of Environmental Scientist and On-Site Wastewater Management hereafter referred to as the "Town of Charlestown", for the Nitrogen Reducing Layered Soil Treatment Area (LSTA), hereafter referred to as the "System". This experimental application was submitted in partnership with the University of Rhode Island Laboratory of Soil Ecology and Microbiology and the New England On-Site Wastewater Training Program. Based upon information contained in the application the RIDEM hereby approves the System for listing on the RIDEM Alternative and Experimental (A/E) Technology List as an Experimental Technology for waste strength reduction and nitrogen removal.

The LSTA OWTS technology is a non-proprietary method of facilitating waste strength reduction as well as sequential nitrification and denitrification of residential strength septic tank effluent (STE) utilizing only the drainfield and no other additional treatment components. The treatment train consists of a two-compartment septic tank with a hanging pump vault in the second compartment and the LSTA. The waste strength reduction and nitrogen removal processes are passive, using only one pump to time-dose STE to the LSTA surface. Because the LSTA is a single pass media filter it does not require wastewater to be recirculated between multiple compartments or actively aerated. The LSTA configuration relies only on stratification of aerobic and anaerobic carbon-amended zones within the LSTA, leveraging the microbial communities to sequentially nitrify and denitrify the incoming nitrogen in the septic tank effluent within the two layers of the LSTA.

The LSTA is constructed in two layers: a top 18-inch-thick layer of ASTM C-33 sand (nitrification layer; where aerobic conditions promote autotrophic nitrification) above an 18-inch-thick layer of ASTM C-33 sand mixed with lignocellulosic material (sawdust/woodchips) denitrification layer, where anaerobic conditions exist and provide a carbon source as an electron donor supporting populations of heterotrophic microbes and facilitating denitrification.

A layer of pea stone at the interface with native soil helps retain moisture in the denitrification layer further

promoting anaerobic conditions. In this non-proprietary design, STE is time-dosed to the top of the sand layer where passive aerobic conditions allow ammonium (NH_4^+) to be oxidized to nitrate (NO_3^-). The nitrified effluent subsequently infiltrates into the underlying denitrification layer where the water content is higher, as the lignocellulos materials used to amend the sand have a higher water-holding capacity, slowing down the diffusion of oxygen (O_2). This denitrifying layer also has a higher concentration of dissolved organic carbon (C) from the lignocellulose wood products, which serves as a C source for heterotrophic denitrification, and helps keep O_2 levels low as a result of microbial oxidation of organic C.

The RIDEM recognizes the System as experimental as defined in OWTS Rule 6.41.F and based on demonstrated theory and applied research has the potential to achieve effluent concentrations of ≤ 19mg/L Total Nitrogen, ≤30 mg/L for TSS and BOD and ≤5 mg/L for Oil and Grease.

Design and installation of the System shall be in accordance with the following terms and conditions:

I. General Design Requirements

1. The System is granted an Experimental approval for the reduction of Total Nitrogen to ≤ 19 mg/L, TSS and BOD to ≤ 30 mg/L, and Oil and Grease to ≤ 5 mg/L.
2. The System is approved for use in the Town of Charlestown, RI only.
3. The System is recognized for treating residential strength wastewater only up to a maximum design flow of 460 GPD (i.e., 4-bedroom use).
4. A maximum of 10 installations is allowed.
5. The System shall only be used for OWTS Repair applications in dwelling units with full-time occupancy.
6. No reduction in leachfield size is allowed.
7. All designs must utilize a maximum and uniform hydraulic loading rate of 0.70 GPD/sq.ft.
8. Minimum required separation to the seasonal high water table is 2 feet and the minimum required separation to ledge is 4 feet for all installations.
9. Separation to the seasonal high water table or separation to ledge shall be measured from the bottom of the pea stone layer in the LSTA.
10. A minimum fill perimeter of 10 feet is required for all installations.
11. Site soil conditions shall be determined by a soil evaluation conducted by a RIDEM Class IV Licensed Soil Evaluator. A completed Site Evaluation form must be submitted to the RIDEM for review and approval for each installation.
12. All OWTS Repair applications must incorporate a 1,500-gallon two compartment septic tank with a hanging screened pump vault.
13. A surge storage volume of at least 75-gallons per bedroom must be factored into the design to provide surge flow protection to the LSTA.
14. Septic tank effluent shall be pressure dosed to the LSTA using a pressurized shallow narrow drainfield technology for wastewater distribution.
15. Design and installation shall be in strict conformance with the RIDEM-approved "Nitrogen Reducing Layered Soil Treatment Area Onsite Wastewater Treatment System Guidance Document" dated: **March 2, 2021.**
16. The control panel must incorporate an event counter, an elapsed-time meter and a visible and audible pump/power failure warning indicator in a NEMA approved cabinet installed exterior to the building.
17. System tanks, dosing chambers, pumping chambers, and riser assemblies shall be certified watertight by the manufacturer or field-tested and certified watertight using procedures set forth

in the OWTS Rules. Riser assemblies and access manholes shall be installed and maintained at grade.

18. Design and installation shall be in strict conformance with the RIDEM-approved "Nitrogen Reducing Layered Soil Treatment Area Onsite Wastewater Treatment System Guidance Document" dated: March 2, 2021 and shall only be performed by a Rhode Island licensed designer/installer who has received training and is authorized in writing by the Town of Charlestown to design/install the System.
19. Each OWTS Construction Permit application submitted to RIDEM utilizing the System shall include a signed statement detailing fiscal responsibility to repair, replace, or modify the System (LSTA) if it fails to performed as designed. The signed statement shall clearly state who is responsible for the cost of repairing, replacing, or modifying the OWTS. The specific funds held in reserve shall be identified as part of each signed statement.
20. Each System design shall meet all other applicable OWTS standards and receive prior approval by the RIDEM pursuant to the regulations in effect at the time of application.

II. Training

1. The Town of Charlestown shall make training available for designers, installers, and service providers.
2. The Town of Charlestown shall make available to the public, a means of verifying individuals, by name and category, who have received training and are authorized in writing by the Town of Charlestown to design, install, and maintain the System.

III. General Certification Requirements

1. The Town of Charlestown shall submit a guidance document detailing design, installation, operation and maintenance requirements for the System. When this certification and the associated design, installation and operation and maintenance guidance document are approved by RIDEM, training may be held.
2. The Town of Charlestown is responsible for providing any revisions to the design, installation, operation and maintenance guidance document to RIDEM for review and approval within thirty (30) days of RIDEM request. All manuals must be provided to the RIDEM in electronic portable document format (pdf).
3. The Town of Charlestown shall notify the RIDEM in writing of any changes to the System, including its discontinuation. Modifications deemed by the RIDEM to be substantial, may require re-application to the alternative/experimental program.

IV. Operation and Maintenance Requirements

1. Operation and maintenance of the System shall be performed in strict conformance with the RIDEM approved "Nitrogen Reducing Layered Soil Treatment Area Onsite Wastewater Treatment System Guidance Document" dated: March 2, 2021.
2. The RIDEM approved Nitrogen Reducing Layered Soil Treatment Area Onsite Wastewater Treatment System Guidance Document" dated: March 2, 2021 shall be provided to the Owner/Operator.

V. Monitoring Requirements

1. The Town of Charlestown is responsible for monitoring and reporting on the performance of each installation of the System over the first two years following each System installation as outlined in Section VIII of the RIDEM-approved "Nitrogen Reducing Layered Soil Treatment Area Onsite Wastewater Treatment System Guidance Document" dated: March 2, 2021.

    a. For each installation, the Town of Charlestown will comply with OWTS Rule

6.41.F.2.c.(2) of the RIDEM OWTS Rules. The Town of Charlestown will repair, replace, or take any other action required if the RIDEM determines that the LSTA technology at any installation location fails to meet the performance claims after two years or is found to be a failed OWTS as defined in the RIDEM OWTS Rules.

b. Regulatory applicability for meeting the performance standards shall be considered by achieving the required standards on a yearly average basis for each System installed. The applicable monitoring requirements and performance standards are outlined in Section VIII. of the RIDEM-approved "Nitrogen Reducing Layered Soil Treatment Area Onsite Wastewater Treatment System Guidance Document" dated: March 2, 2021.

c. Monitoring shall be conducted for each installed LSTA for a period of no less than two years from each System startup date.

d. Within six (6) months of the completion of the two-year LSTA sampling protocol for each LSTA installed under this experimental approval, efficacy data and operational summaries shall be submitted to the RIDEM in a report format to detail results, conclusions, and next steps including compliance with RIDEM OWTS Rule 6.41.F.2.c.(2).

e. Two years following the final System sampling protocol, a final monitoring report shall be submitted to the RIDEM from the Town of Charlestown to discuss results, conclusions, and next steps in regard to the overall viability of the LSTA technology.

2. The System owner is responsible for long term monitoring, reporting, and maintenance of the System after the initial two-year monitoring period is complete as outlined in Section VIII. of the RIDEM-approved "Nitrogen Reducing Layered Soil Treatment Area Onsite Wastewater Treatment System Guidance Document" dated: March 2, 2021.

a. Subsequent to the final monitoring report required by section V.1.d of this certification a series of four quarterly samples shall be collected and analyzed in accordance with the protocol outlined in Section VIII. of the RIDEM-approved "Nitrogen Reducing Layered Soil Treatment Area Onsite Wastewater Treatment System Guidance Document" dated: March 2, 2021. These four quarterly samples must be collected every fifth operating year for each LSTA installed under this experimental approval. Sampling results shall be submitted to the RIDEM for evaluation of performance standards following the collection of each round of four quarterly samples collected. Verifying long term treatment performance and ensuring that operation and maintenance is conducted as specified in the "Nitrogen Reducing Layered Soil Treatment Area Onsite Wastewater Treatment System Guidance Document" dated: March 2, 2021 is the system owner's responsibility.

VI. Rights of the RIDEM

1. The RIDEM may suspend, modify or revoke this approval for cause, including but not limited to: non-compliance with any of the provisions or conditions of this Certification, misrepresentation or failure to disclose fully all relevant data, or receipt of new information indicating that the use of the System is contrary to the public interest, public health or the environment.
2. The Nitrogen Reducing Layered Soil Treatment Area Onsite Wastewater Treatment System Guidance Document" dated: March 2, 2021 referenced herein is approved upon the date of approval of this Certification.
3. The RIDEM reserves the right to suspend or revoke this Certification if updated design,

installation, and O&M manuals are not provided to the RIDEM within thirty (30) days of RIDEM request or one hundred and eighty (180) days prior to the expiration date of this Certification. All revisions must be reviewed and approved by the RIDEM.

4. This approval does not represent an endorsement of the System by the RIDEM. This letter of approval may be reproduced only in its entirety.

Mohamed J. Freij

Mohamed J. Freij, PE, PLS
Supervising Sanitary Engineer, OWTS Program

4-8-2021
Issuance Date