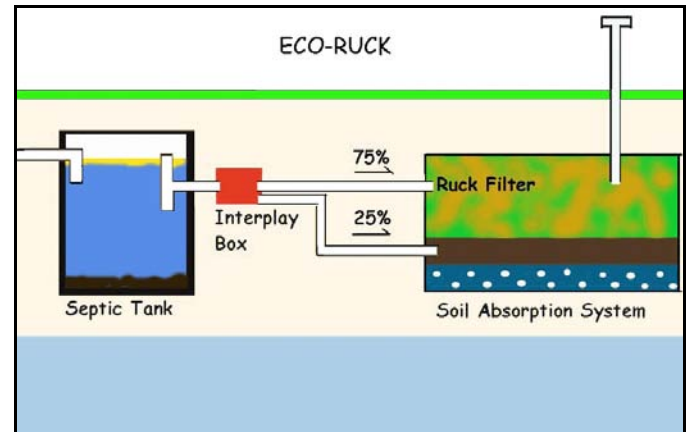


Massachusetts Alternative Septic System Test Center Technology Fact Sheet - *Interim Findings*

ECO-RUCK

The Massachusetts Alternative Septic System Test Center is a collaborative project of the Buzzards Bay Project National Estuary Program, the Massachusetts Office of Coastal Zone Management, Massachusetts Department of Environmental Protection, Barnstable County Department of Health and the Environment, and UMass Dartmouth School for Marine Science and Technology. The Test Center was established in recognition of the need in Massachusetts for cost-effective wastewater disposal systems suitable for sites with limited space, poor soils, high groundwater elevations, or where advanced pollutant removal is required. Its mission is twofold. First, to evaluate the performance and operation costs of new and innovative wastewater disposal technologies in a carefully controlled and unbiased manner, and provide this information to regulators and consumers. Second, to assist vendors in getting their technologies more quickly approved for use in Massachusetts, and at a lesser cost.

Technology Name: ECO-RUCK
Technology Type: In-ground passive treatment system using modifications to the soil absorption system.
Manufacturer: Innovative Ruck Systems, Inc.
200 Main Street
Falmouth, MA 02540
(508) 548-3564
Contact: Michael B. McGrath, President
Company Website: www.irucks.com
Performance & Permitting Info at MA DEP and BCHED Websites:
www.state.ma.us/dep/brp/www/t5pubs.htm#it
www.barnstablecountyhealth.org/AlternativeWebpage/
Testing Objectives: Demonstrate N removal for use in N-sensitive watersheds. Obtain approval for reductions in SAS size or high groundwater elevation separation distance.
Testing Period: Testing conducted 6/99 to 7/00, results shown for 10/99 to 7/00. Testing completed.
Test Loadings: System loading was 220 gpd, (in 15 doses AM/PM), SAS loading was 0.74 gallons per sq. ft per day.



Generalized design of ECO-RUCK System.



During installation, interplay box shown at right.

Siting Considerations and Installation Notes

No information is provided in this section because the technology was withdrawn from the program because of poor performance.

Actual & Manufacturer's Estimated Costs (3-bedroom home) and Labor

No information is provided in this section because the technology was withdrawn from the program because of poor performance.

Design Theory

The ECO-RUCK is a Soil Absorption System (SAS) treatment technology. Clarified effluent from a conventional septic tank enters the SAS, which was designed with upper and lower SAS separated by about three feet of medium sand. Seventy-five percent of the septic tank effluent was shunted to the upper SAS where treatment would be similar to that achieved in a conventional Title 5 SAS. The remaining 25 percent of septic tank effluent was shunted to the lower SAS identical in construction to the upper layer. When effluent was nitrified in the upper SAS, it would pass through the lower SAS zone, which was intended to remain anaerobic due to its distance from the surface. Denitrification was to occur as the nitrified liquid passed through a zone of anoxia, where additional carbon from the septic effluent would provide a source of food for bacterial denitrification.

Permitting and Use in Massachusetts (as of June 2001)

No permitting was obtained for the "ECO-RUCK," application withdrawn. (Note: The ECO-RUCK was an experimental design, different from the RUCK® system that has approval for use in Massachusetts. The standard RUCK® has both Certification for General Use and Remedial Use Approval in Massachusetts).



Final above ground view: aeration pipe and monitoring ports.

Operation and Maintenance Issues
Not Applicable.

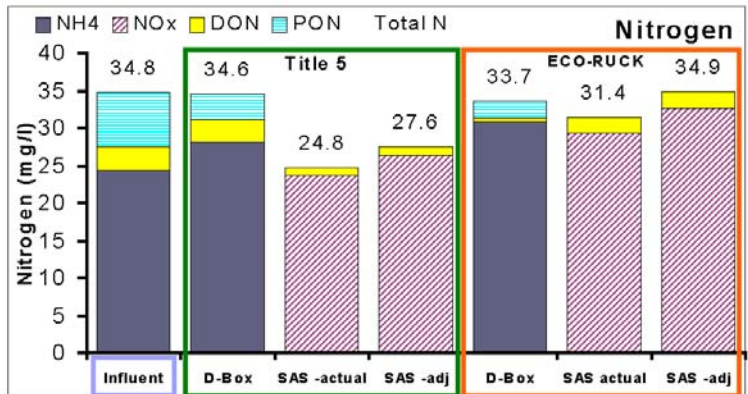
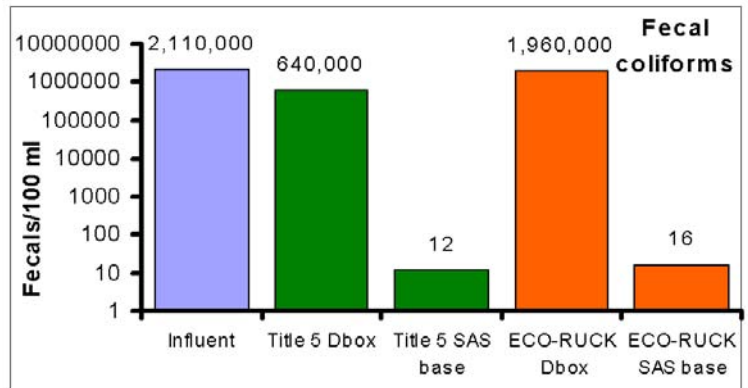
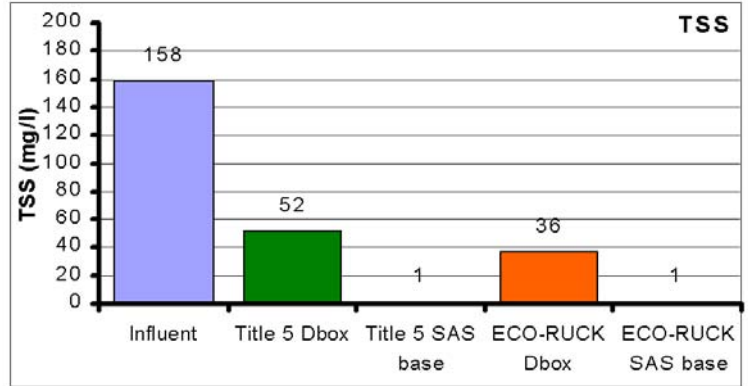
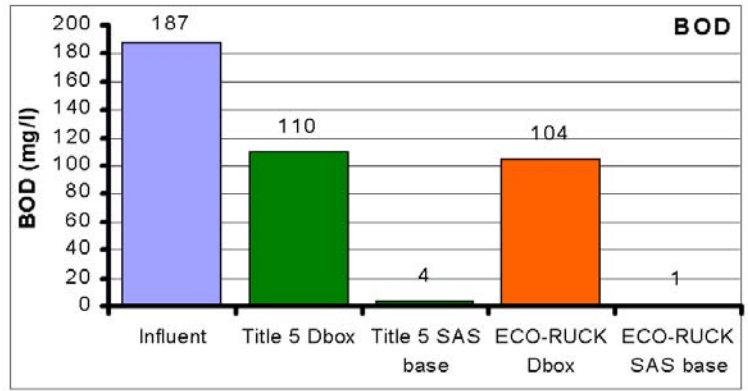
Explanation of the Graphs

The graphs to the right show the mean of three replicates for each parameter over the testing period, compared to Title 5 performance and influent measured in parallel samples during the same period. Fecal coliform results are expressed as geometric means. In the nitrogen graph, NH₄ represents ammonia, NO_x represents nitrate + nitrite, DON is dissolved organic nitrogen, and PON is particulate organic nitrogen. Total nitrogen is the sum of these four parameters.

Soil absorption system samples include wastewater disposal system effluent and precipitation. The recharge of precipitation to groundwater is estimated to be between 8 and 16 percent of effluent discharge based on local rainfall, estimated groundwater recharge rates, SAS size and dosage rates. For all technologies, an interim dilution rate of 10 percent was employed based on precipitation and theoretical and measured dosage rates at the Test Center. The results for nitrogen removal include this estimated dilution factor (note bars labeled "SAS adj.") Results shown for biological oxygen demand (BOD), total suspended solids (TSS), and fecal coliforms were not adjusted for dilution by precipitation, because the adjustment was negligible in evaluating overall performance. This interim approach, is being compared to specific conductivity, chlorides, and bromide tracer to better refine this estimate, and develop system specific dilution factors. **Thus, the "SAS adjusted" values reported here for nitrogen discharge to groundwater should be considered preliminary.**

Summary of Interim Findings

The ECO-RUCK, with the SAS does provide the equivalent of secondary treatment (i.e., TSS and BOD less than or equal to 30 mg per liter). However, it does allow for the reduced separation to groundwater, or reduced soil absorption system size because it incorporates the SAS in the design. This technology did not discharge below the regulatory standard of 19 mg/l TN to allow for use in nitrogen sensitive areas. This system was not tested at the Test Center for seasonal or intermittent use or for high hydraulic loading conditions. BOD and TSS concentrations at the base of the SAS for this technology and the Title 5 system are similar.



Funding for the Massachusetts Septic System Test Center was provided by the US EPA, through Cooperative Agreements x991657 and x981007, the Massachusetts Department of Environmental Protection (319-99-01, 319-00-02), Massachusetts Office of Coastal Zone Management, Massachusetts Environmental Trust, Barnstable County Department of Health and Environment, UMass Dartmouth SMAST, and other organizations. Other information on this initiative can be found at www.buzzardsbay.org. These fact sheets were reviewed by a multi-agency work group. The views or opinions expressed are not necessarily those of the Commonwealth of Massachusetts, the US EPA, or any of the funding organizations and agencies. The information presented here represents the technical findings of the Massachusetts Septic System Test Center after at least one year of system testing. Manufacturer claims of cost and longevity, warranties, or stated costs have not been verified. Modifications to system designs from those tested, or installation under other soil or climate conditions may result in different system performance. This fact sheet was prepared and printed by the Buzzards Bay Project.



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