#### **Progress Report** to the Massachusetts Environmental Trust

for the

# Buzzards Bay Project's Massachusetts Septic System Test Center

at Otis Air National Guard Base

August 1999

#### Background

In 1998, the Buzzards Bay Project National Estuary Program<sup>1</sup> (BBP) constructed the Massachusetts Septic System Test Center at the Massachusetts Military Reservations OTIS Air National Guard Base on Cape Cod. From its inception the Test Center has been a collaborative undertaking between the BBP, the Barnstable County Department of Health and the Environment, the UMass Center for Marine Science and Technology (CMAST), and the MA Department of Environmental Protection (MA DEP). The Test Center is operated the Buzzards Bay Project (BBP).

Funding for the construction of the Test Center was originally provided by the US EPA's Environmental Technologies Initiative. Additional funding for the construction and operation of the Test Center has been provided by MA Department of Environmental Protection, Massachusetts Environmental Trust, and ComElectric. In-kind assistance has been contributed by Endeco/YSI, F.E. Myers, Plasti-Drain Ltd., Tuf-Tite Inc., Wiggins Precast, Zabel Environmental and the vendors participating in verification. Most recently, in the Fall of 1998, the Buzzards Bay Project was awarded a \$50,000 grant from the Massachusetts Environmental Trust as match to a \$112,500 "section 319" grant from the MA Department of Environmental Protection. These funds were to meet the costs associated with testing the new, innovative septic system technologies at the Test Center. A contract from MET for this effort was executed for their award in May 1999.

#### **Facility Mission**

From their experience with coastal ecosystems, the original partners in the Test Center (BBP, BCDHE and CMAST) recognized that effluent from conventional septic systems was a major contributing factor to the decline of water quality in surface waters in general and in particular onsite-derived nitrogen as transported by groundwater was contributing to coastal eutrophication.

<sup>&</sup>lt;sup>1</sup>The BBP is a unit of Massachusetts Coastal Zone Management within the Executive Office of Environmental Affairs.

It was also clear that technologies existed which provided more advanced removals of contaminants, and which could be an important tool to improve both ground water and surface water quality. However, these technologies have been slow to find regulatory and commercial acceptance in the New England region partly because of the scanty and uneven quality of performance data and the time and cost required to generate data which is acceptable to regulators.

Threatened and eutrophic coastal ecosystems are currently being designated as Nitrogen Sensitive Embayments and local boards of health are under pressure to approve nitrogen removing technologies in order to manage the growth nutrient inputs from new Development. However, Boards of health sometimes have only manufacturers claims of nitrogen removal performance. Moreover, reliance on manufacturers claims of performance at system startup conditions may not be representative of long term septic system performance. Local approvals of systems that do not perform as advertised would be unfortunate because of local water quality goals would not be met, and public support for alternative septic system designs would be undermined.

In response to these concerns, the Test Center's goal is to provide state and local managers with reliable data base on alternative septic system performance, operation, and maintenance. For those systems that meet state performance criteria, speed their introduction and approval in Massachusetts. These efforts will in turn, provide a wider variety of innovative technologies and economical alternatives to the conventional septic system in Massachusetts.

To accomplish these goals, the Test Center is providing independent, rigorous testing programs to measure the performance of innovative onsite technologies, which are conducted under controlled conditions for a testing period of two years. This testing period will ensure that technologies which claim to remove nitrogen can do so consistently for an extended period of time.

The facility has the capacity to test six residential treatment technologies (in triplicate) in addition to three conventional septic systems which will serve as a benchmark for the other technologies for a total of 21 treatment units. Additional capacity at the facility is currently being used as a test bed for two nitrogen removal technologies and for research and development of new, unproven technologies. As the verified data is developed, the Test Center will be conducting an active outreach effort to convey this information to local boards of health, onsite professionals and consumers.

### **Community Benefits**

Beyond the benefits to onsite system vendors, the Test Center will benefit the public in several ways.

• First, by speeding approvals of new technologies, there should be an increase in the variety of systems available to the public, which should also lead to more price

competition.

- Second, technologies that are approved for Nitrogen credits based on their performance at the Test Center will provide meaningful benefits to the environment by performing consistently over the long-term.
- Third, as many as one-third of Massachusetts existing septic systems are substandard or are in failure and contaminate ground and surface waters. These systems often have severe siting limitations which only innovative and advanced treatment technologies can address. Assuring the performance of these repaired systems will protect and improve the water quality throughout Massachusetts.
- Fourth, the verified results of testing for each technology will be released as public documents which will be available to homeowners and Boards of Health and other regulators thereby increasing the availability of verified performance data on existing systems. Boards of health will then be able to make informed decisions for approvals of advanced technologies.
- Fifth, in cooperation with Barnstable County and other regional onsite wastewater groups, Test Center will disseminate onsite information, acting as a clearinghouse for information to the New England region.

## Participating Proprietary Technologies

The Test Center has approved the applications of five innovative technologies for the two-year verification testing. The remaining space will be filled in the Fall of 1999. Three conventional or Title 5 systems which serve as the benchmark for DEP approvals have been installed and monitored since April 1999. Three proprietary technologies have been installed to date and operating since May 1999:

- The BioMicrobics *Micro-FAST* uses aeration and an immersed fixed-film media to achieve removal of both organic and nitrogen contaminants. The FAST unit is currently being marketed in Massachusetts but does not have nitrogen removal credits. The technology uses an electric blower to provide for aeration.
- The Innovative RUCK Systems' *ECO/RUCK* technology removes organic and nitrogen contaminants in a passive two-level soil absorption system (leach field). The system does not require electricity. The system was designed for use in nitrogen sensitive embayments.
- The Waterloo Biofilter's *Biofilter* is a trickling filter using foam cube media for aeration (nitrification) and organic contaminant removal and recycles to the septic tank for nitrogen removal (denitrification). The system employs a pump and fan.

#### Technologies to be installed

- The Geoflow *PCWasteFlow* pressure drip irrigation technology. Used extensively in the southern and western U.S., this technology provides treatment in the shallow soil zone (6-10 " deep). Removal of organic and nitrogen contaminants is by soil microbes and plant biomass. The system uses a pump to pressurize the system.
- The F.R. Mahoney *Amphidrome* technology uses a sequential batch reactor to remove organic and nitrogen contaminants. The system uses pumps and a sophisticated microprocessor to achieve removals of both organic and nitrogen contaminants.

### **Non-Proprietary Technologies**

• The recirculating sand filter is currently only one of two technologies which MA DEP has awarded Nitrogen Removal credits. The Barnstable County Department of Health and the Environment with funding from MA DEP and U.S. EPA has installed two recirculating sand filters for long-term testing at the facility. The filters were built to the new DEP guidelines and incorporate the two major design variants and will provide both verified data and serve as demonstration units for the outreach program at the Test Center.

### **Research and Development Testing**

Two technologies have been accepted for single-unit testing under the R&D designation for one year periods. The costs of R&D testing, monitoring and facility overhead are entirely borne by the applicants, and no MET, DEP, or EPA funds are being used for this effort.

- The Zeoseptic Systems LLC *Zeoseptic System* uses ion exchange to achieve the removal of nitrogen from septic tank effluent. The system has been undergoing testing since May 1999.
- The UMass Dartmouth Engineering Department will be testing *tire chips* as an alternative to crushed stone as a material for leach trenches. Several leach trenches will be installed and monitored and the data provided to MA DEP for approval of this recycled material for general use.

In addition to the above testing programs the test center is providing testing for national nonprofit testing and certification laboratory, NSFI. At present, one technology is being tested for a six-month period. This testing is entirely self-sustaining and funded by the technology vendors..

### **MET Grant History Progress**

The MET grant is providing support for the first year of testing of the seven technologies in the two-year testing cycle. The funds are for FY 2000 and thus are just beginning to be drawn upon. We expect that all funds will be disbursed by February 2000.

#### **Technology Monitoring**

Monitoring of four of the seven systems which have been installed began in May 1999. Of the\$50,000 grant total, \$38,000 is being used for analytical monitoring of the seven technologies in the two year testing program, wherein technologies will be sampled at two and three week intervals. Monitoring includes the analyses of *BOD*, or biochemical oxygen demand, a measure of the strength of organic contaminants and *fecal coliform*, a measure of pathogen concentrations. This analysis is being conducted at the Barnstable County Health certified laboratory. Inorganic measures conducted at the CMAST Coastal System Laboratory include *dissolved and particulate nitrogen* and *phosphorous* species, *alkalinity, pH, total suspended solids and specific conductance*. Analytical costs for monitoring one technology with three replicate units is about \$18,500 annually. Additional funds to cover the costs of monitoring are being provided by MA DEP and US EPA through the FY2000 s319 grant.

### Materials and supplies

Sample processing occurs at the Test Center and includes field sampling, filtration of dissolved samples, measurement of pH, dissolved oxygen, and specific conductance. \$7,900 of the MET grant will provide materials and supplies to support the field monitoring program for the next seven months.

## **Outreach Publications**

\$4,000 of the MET grant will be used for outreach publications which will consist of published performance reports for each technology. Because of the normal lag in processing data the outreach funds will be expended last. The reports will be furnished to Boards of Health throughout Massachusetts. Currently, data and information about the Test Center is posted on the BBP website. As verified data is collected from the technologies, it will be posted on the BBP website and the Barnstable County website for greater exposure.

On the following pages is a pictorial sampling of technologies and features of the Test Center.