Infiltration chambers play increasing role in decentralized wastewater treatment

By Dennis Hallahan

The evolution of the decentralized wastewater treatment industry over the past 15 years has created a need for new approaches. Coupled with environmental demands that continue to challenge plant operators, engineers, regulators and product manufacturers, this evolution has benefited the industry with new ways of thinking about how decentralized wastewater treatment is accomplished and managed.

The onsite evolution is also driven by increased awareness among consumers and municipal regulators about the need to protect environmentally sensitive areas, which has resulted in the approval of more restrictive building and development codes and new regulations for wastewater treatment. As part of this trend, growing awareness of nutrient damage to the environment from nitrogen and phosphorus, aquifer protection, and the value of water as a resource have come to the forefront.

There is now a move toward the use of advanced wastewater treatment and onsite disposal technology in municipal applications and infiltration chambers have played a large role in the ever-expanding number of applications for decentralized treatment.

Municipal wastewater treatment facilities

As municipalities are stretched by reduced funding, a reluctance to increase taxes, and failing or under-capacity infrastructure, they are turning to new ideas to solve their challenges. To accommodate growth in the face of restricted government funding, municipal managers have turned to enhancing current facilities or co-ordinating wastewater treatment programs and needs regionally and even by community.

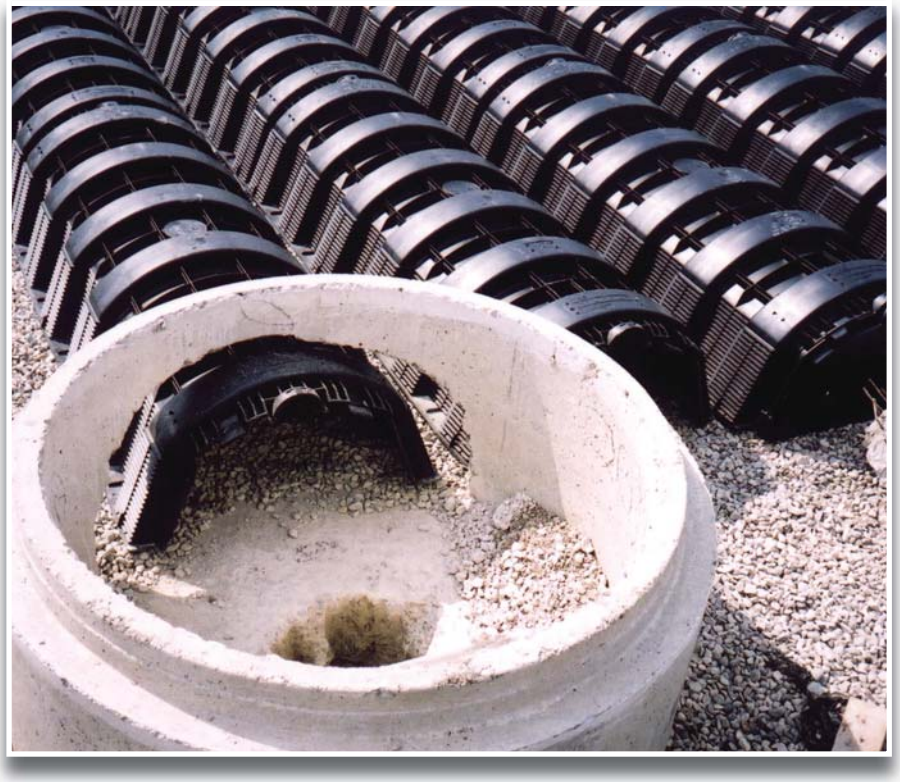
Chambers can be used in municipal applications to extend the life of municipal wastewater treatment facilities, and to provide effective treatment in community-wide wastewater treatment systems.

The catalyst for innovation

In most communities, sustaining development and growth while protecting the natural environment is the mandate. Watersheds and groundwater supplies are critical areas under careful scrutiny when in the proximity of any potential runoff or pollutant stream. Even municipalities themselves must closely regulate not only the capacity and quality of their infrastructure systems, but how any expansion or change to those systems will affect the surrounding area.

Case study: Ontario

The Port Burwell Sewage Treatment Plant sits on the shore of Big Otter Creek near Lake Erie in Bayham, Ontario.With steady growth in the surrounding area, providing expanded wastewater treatment services while protecting the lake environment was a challenge. To accommodate the growth, the decision was



The design at Port Burwell includes inspection ports and manholes so the bed can be physically inspected.

made to connect the surrounding communities to the Port Burwell plant and explore how this facility could be modified for future efficiency, added capacity and environmental stability.

Engineers evaluated the expansion options for the facility and created a conceptual design report based on projected population growth in and around the Big Otter Creek area. The report determined that the treatment capacity of the existing Port Burwell plant would have to be expanded from 528 m^3 per day to 1,060 m^3 per day to handle future demand, and presented three options for expansion of the facility.

After an extensive investigation of these options, an onsite solution was recommended to convert the originally designed outfall to an exfiltration bed utilizing Infiltrator® chambers. The exfiltration chamber system saved considerable cost and also provided additional pollutant removal.A key benefit of installing an exfiltration bed, in addition to expanding the overall capacity of the plant, is the resulting reduction in phosphorus, which is also naturally removed by the soil, thereby reducing the impact to the sensitive lake environment.

The chamber gallery is located in the existing plant outfall easement adjacent to the treatment facility and provides sufficient capacity to discharge the effluent from the sequenced batch reactors (SBRs) on a sequential basis, including a 25% surcharge. The design also includes inspection ports and manholes so the bed can be physically inspected. The entire bed area is excavated to a depth of approximately 1.2 metres.

A concern from the start was the fluctuating groundwater levels in the area, which could result in the bed becoming submerged. The system was designed so the hydraulics of the plant ensure that the plant effluent will enter the bed and filter through the soil, then into the groundwater. Adjustments to the system were made for the groundwater issue after operation began.

An update on this system and its operation in April 2008 reflected excellent results from the exfiltration system, which has more than met the original capacity projections and environmental requirements, and has performed trouble-free, according to Ed Roloson, manager of the Port Burwell facility.

Fluctuating groundwater levels continue to challenge the project but have

continued overleaf...

been managed through the addition of some tiling to control the flow to the exfiltration galleries. In addition, vegetation has grown above the system as planned, so it is nearly invisible and does not obscure the landscape.

Centralized treatment with disposal systems

In some jurisdictions, mandates require onsite septic system updates and affect individuals as well as municipalities. No one is exempt from meeting sanitary codes and often municipalities are charged with finding a way to promote business in their area, while recognizing that existing outdated systems are underperforming and may even be a threat to public health.

Case study: Massachusetts

Vineyard Haven is one of several small towns on Martha's Vineyard in Massachusetts. A prominent summer vacation spot, the downtown has numerous buildings used for retail and a whole host of services for the year-round and escalating summer populations. These buildings have been on individual septic systems for years, and until several years ago many were still operating substandard cesspools as their onsite wastewater treatment system. A percentage of the buildings in the downtown area were experiencing ongoing problems with their individual onsite sewage disposal systems, many of which did not meet Title 5 (Massachusetts Sanitary Code) standards.

Due to the close proximity of these buildings to Vineyard Harbor, there was concern that the inadequately treated wastewater would create a public health issue in this swimming and recreation area. As a result, the town was put under an Administrative Consent Order from the state Department of Environmental Protection to halt the discharge of inadequately treated wastewater to the harbor. Those systems in actual or imminent failure were identified, and a collection system of low-pressure and gravity sewers was designed to collect flow from only those buildings to correct the immediate and most critical problems.

Before the final decision was made, several types of upgraded onsite wastewater treatment systems and cluster septic systems were evaluated as possible options to stabilize the situation and provide for future needs. In most cases, the individual properties did not have sufficient land area to install a replacement system, or the groundwater levels in the immediate area were too high and would have compromised the treatment process.

It was decided that a centralized wastewater treatment facility with a groundwater discharge was the best solution. The system design was limited to the buildings identified with problems. A collection system including gravity and low-pressure small-diameter pumps and piping and a 100,000 gpd sequenced batch reactor was installed. Two separate leaching fields designed for 50,000 gpd each use Infiltrator chambers. The layout flexibility and ease of installation were key to the product's selection for this application, as was the possibility to use the surface area above the system for recreational fields for the town.

The SBR treatment facility pumps to both leachfields in the summer and alternates between the leachfields in the

The Port Burwell Sewage Treatment Plant sits on the shore of Big Otter Creek near Lake Erie in Ontario. The system has more than met the original capacity projections and environmental requirements.

off-season. The effluent is then pumped to the second leachfield about 1.5 miles from the treatment facility. In addition to servicing select buildings in the downtown area, the treatment system was designed with the capacity to accommodate additional intake of wastewater from septic trucks around the area as an added service to the town.

The treatment facility and the disposal fields are performing as expected, resulting in no further issues with the wastewater from downtown businesses.

Looking ahead, the town is planning to solve nitrogen loading issues in two pond areas, which could require an extension of the plant, including the need for an additional disposal field. A site for this additional field has already been selected close to the original disposal fields. The Martha's Vineyard Commission is currently studying the pond situation across the island and is expected to issue a report in the near future on needs and solutions.

Conclusion

Engineers, designers, installers and regulators faced with municipal projects in environmentally sensitive areas have a wealth of options to choose from. The need to develop areas away from sewers and the traditional wastewater treatment plant configuration continues to increase. Tightening environmental regulations drives progress in the development of technology and designs in order to meet the wastewater treatment needs of communities and countries worldwide.

Dennis F. Hallahan is with Infiltrator Systems. E-mail: hallahan@infiltratorsystems.net