

# Keeping It Shallow

A STEP system provides a sound treatment solution for a campus and community with high limestone bedrock

By **Scottie Dayton**

The multipurpose Englishton Park (Ind.) campus had closed because of a failed sand filter. One mile away, most septic tanks in the Scott County Town of Lexington drained into road ditches.

The park owners hired Kevin Chaffee, P.E., chief engineer of HydroLogex in Batesville, Ind., to design an onsite system for Englishton Park that could be expanded to serve the town. Chaffee and the owners worked with the Scott County Sewer District's engineer, Bill Saegesser, P.E., of Saegesser Engineering in Scottsburg, to design the treatment facility.

"The site is in the 100-year floodplain of Town Creek," says Chaffee. "A major concern was meeting the stringent NPDES discharge permit

limits because the creek has no water to dilute the treated effluent during the dry season."

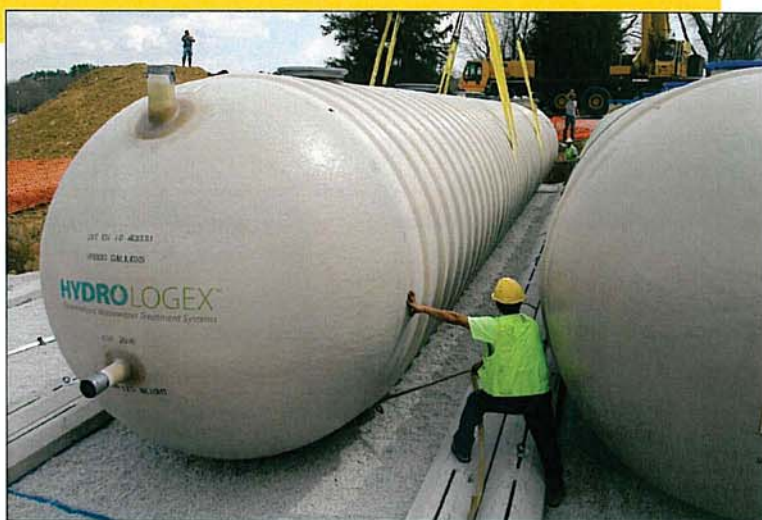
Saegesser chose an effluent sewer for the town because limestone is shallow and prevalent, making the cost of conventional gravity sewers prohibitive. The septic tank effluent pumping (STEP) system eliminated blasting through the stone to lay the pipes. The campus system has operated since November 2005 without permit violations. The Lexington system went into service in summer 2011.

## Site conditions

Soils are clayey loam with slate and limestone below. The high seasonal water table is three to four feet below grade.

## System Profile

<b>Location:</b>	Lexington, Ind.
<b>Facility served:</b>	Campus and town
<b>System designers:</b>	Kevin Chaffee, P.E., HydroLogex LLC, Batesville, Ind.; Bill Saegesser, P.E., Saegesser Engineering, Scottsburg, Ind.
<b>Installers:</b>	Richard Vuckson, R. L. Vuckson Excavating, Scottsburg; Chris Jackson, Dan Cristiani Excavating Co., Clarksville, Ind.
<b>Site conditions:</b>	Clayey loam with slate and limestone below; high seasonal water table three to four feet below grade
<b>Type of system:</b>	Recirculating media biofilters with STEP system
<b>Hydraulic capacity:</b>	50,000 gpd



Workers from Dan Cristiani Excavating set the second 10,000-gallon EnviroFilter biofilter from HydroLogex. (Photos courtesy of Saegesser Engineering)

## System components

The system is designed to handle 50,000 gpd. The major components are:

- Two 10,000-gallon dual-compartment fiberglass septic tanks in series with a Polylok PL-525 effluent filter in the second tank. Tanks made by Containment Solutions.
- 108 1,000-gallon single-compartment concrete septic tanks with ProSTEP high-head pump package from Orenco Systems. Tanks made by S&M Precast, Henryville, Ind.
- Five 10,000 gpd EnviroFilter package recirculating media biofilters with simple duplex pump control panels supplied by HydroLogex, Franklin, Tenn.
- Nitrification aeration unit from Siemens.
- Lift station with alternating

150 gpm, 2 hp Myers pumps on guide rails.

- LBX pressure-rated UV disinfection system from IIT Water & Wastewater – WEDECO.

## System operation

Wastewater from multiple buildings at Englishton Park flows through 6-inch PVC gravity sewers to the septic tanks. Effluent flows to a distribution box that directs it to the first biofilter.

Wastewater from the STEP collection system is pumped through 1.25-inch PVC laterals to 3-inch force mains. Each connection has a backflow preventer in a service valve. Every time the pump vaults run, they push effluent to the distribution box for dispersal to the remaining four biofilters.

Septic effluent, entering the bottom of the units, is stored in a

recirculation basin below the filter bed. The 2 hp duplex Myers effluent pumps charge five spray nozzles that evenly distribute effluent over a 24-inch-deep bed of polyester textile chips for the attached growth process. The liquid trickles through the media, falls through a porous underdrain, and mixes with the incoming effluent in the recirculation basin.

A programmable logic controller doses the media 72 times per day with a 4:1 recirculation ratio. During recirculation, 20 percent of the treated effluent enters the integral dosing basin with aeration system that raises the dissolved oxygen level above 6 mg/l to meet discharge limits. The system includes a HydroLogex control panel, a HiBlow GP40 air pump, and Stamford Scientific fine-bubble diffusers.

Two 0.5 hp duplex STA-RITE (Pentair) pumps in the dosing basin send the water on demand to the nitrification aeration polishing reactor in a 10-foot-diameter, 10-foot-deep concrete pit. The reactor has a

**“We played it by ear every day. In some areas, we needed hoe rams and excavators to hammer out limestone to set the tanks deep enough.”**

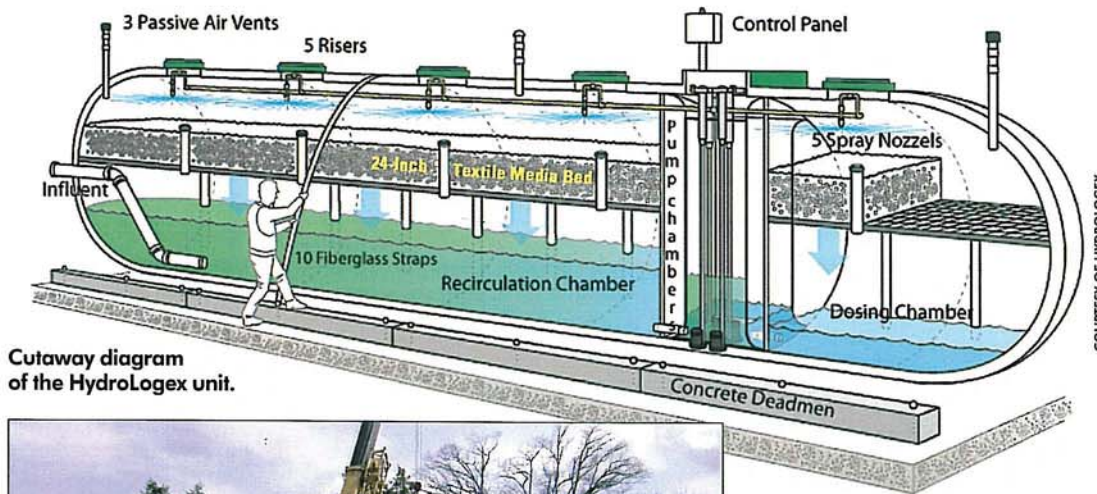
**Chris Jackson**

4:1 recirculation option, allowing the operator to return liquid to the distribution box if the inflow is low. At this point, it has less than 5 mg/l TSS and BOD, less than 1 mg/l ammonia, less than 20 mg/l total nitrogen, and less than 2 mg/l phosphorous with 99.4 percent reduction of total coliform.

Water then flows by gravity to the lift station, and 300-gallon doses are then pumped on demand to the disinfection chamber in the control building, also housing sampling ports and a flowmeter. Tightly positioned lamps in the chamber disinfect the water with low UV transmittance. The water then gravity flows to the creek.

### Installation

Richard Vuckson of R. L. Vuckson Excavating in Scottsburg, Ind.,



**Cutaway diagram of the HydroLogex unit.**



**Outriggers support a 200-ton crane as it lifts a 15,000-pound EnviroFilter biofilter tank and prepares to set it 90 feet away on a gravel bed.**



**A worker from Dan Cristiani Excavating connects a service lateral to the force main.**

installed the Englishton Park system. Chris Jackson of Dan Cristiani Excavating Co. in Clarksville, Ind., installed the Lexington system over nine months.

Jackson held meetings and went door to door preparing homeowners for the construction. Following easements wherever possible, his crews used rock trenchers and mini-excavators to install the force mains and laterals. Once inside yards, they worked wherever there were no utilities or old systems, which had to remain in use until the treatment plant was installed.

Setting the septic tanks with three feet of cover was equally challenging. Many lots were small and workers often found something in the way as they began to dig. “We played it by ear every day,” says Jackson. “In some areas, we needed hoe rams and excavators to hammer out limestone to set the tanks deep enough.”



**A hoe ram breaks up two feet of limestone before laying a 12-inch gravel base for the last four biofilters.**

Preparing the site for the 72-foot-long biofilters took two hoe rams and an excavator to remove two feet of limestone in preparation for the 12-inch gravel base. "We crushed that limestone and used it to bed the 200-ton crane," says Jackson.

Delivering the 15,000-pound units required drivers to back their tractor trailers around a 90-degree bend in a narrow country road, then between a stone wall on one side and trees on the other. Jackson brought in a shorter tractor to make the turn, then stationed three men on either side of the trailer as the driver kept reversing, pulling ahead, and straightening out until the trailer was in position.

The crane, supported by outriggers, then lifted and set the tanks 90 feet away between pairs of concrete deadmen. Workers secured each of them to deadmen with 10 straps and turnbuckles.

"Normally, we bury the tanks two to three feet below grade," says Jackson. "Because the risers had to be above the maximum flood height, we backfilled and covered the tanks with soil for support and insulation." With the treatment system in place, workers connected the homes and decommissioned existing septic tanks.

### **Maintenance**

Jason Combs, a licensed wastewater operator from the Scott County Regional Sewer District, operates and maintains the plant and STEP system. Twice a year, he cleans the filters on the recirculation pumps, cleans the spray nozzles, and checks the pumps and controls. The septic tanks are pumped

every two years. The textile chips self-clean and should require no maintenance. ■

### **MORE INFO:**

**Containment Solutions, Inc.**  
877/274-8265  
[www.containmentsolutions.com](http://www.containmentsolutions.com)

**HydroLogex, LLC**  
615/975-4773  
[www.hydrologex.com](http://www.hydrologex.com)

**ITT Water & Wastewater – WEDECO Products**  
704/409-9700  
[www.ittwww.com](http://www.ittwww.com)

**Myers**  
419/289-1144  
[www.femyers.com](http://www.femyers.com)

**Orenco Systems, Inc.**  
800/348-9843  
[www.orenco.com](http://www.orenco.com)  
(See ad page 3)

**Pentair Water**  
888/987-8677  
[www.pentairwater.com](http://www.pentairwater.com)

**Polylok, Inc.**  
877/765-9565  
[www.polylok.com](http://www.polylok.com)  
(See ad page 40)

**Siemens Water Technologies Corp.**  
866/926-8420  
[www.water.siemens.com](http://www.water.siemens.com)

**Stamford Scientific**  
845/454-8171  
[www.stamfordscientific.com](http://www.stamfordscientific.com)