

ONSITE MBR SYSTEMS AND EZFLOW DISPERSAL FIELDS ENABLE TRANSFORMATION OF

RECLAIMED STRIP MINE



By **Dennis Hallahan**

The ability to monitor MBR system 24/7 and download data via Aquaworx IPC Control Panel allowed for system adjustments based on usage to increase efficiency and performance.

Giant Goose Ranch covers more than 800 acres in Canton, Illinois and was a coal strip mine in the 1930s and 1940s. The coal veins left 60–80-foot deep holes in the ground, which were left to fill up with water creating some of the deepest lakes in the state of Illinois. The property was reclaimed in the 1950s and turned into a campground. In 2013, the Herman Brothers purchased the property and began an extensive rehabilitation of the existing campground including adding resort cabins and 90 campsites. www.infiltratorwater.com

The property features nearly 300 acres of water varying in size from 1/2 acre to numerous 5–10 acre ponds, some 10–30 acre lakes, and one lake that is 2.5 miles long. This series of 50 small lakes is famous for incredible fishing. The property also features 400 acres of timber and 130 acres of tillable land. Soils on the property were extremely variable.

To gain approval of the expansion of the resort, a wastewater treatment system was required

Fast Facts

- ▶ **Requirement: Wastewater Treatment System to handle fluctuating seasonal flows and protect the lake environment**
- ▶ **Product Used: NSF350 Water Recycling Membrane System, IMTM-Series Tanks, EZflow**



Giant Goose Ranch Excavating to Install IM-Tanks

that could handle fluctuating seasonal flows and protect the sensitive lake environment. Because the property and the lakes are pristine and a key feature of the resort is the fishing, the owners wanted a system designed that would not discharge to the lakes. The owners also wanted the new system with as small a footprint as possible to retain the majority of land for resort campsites and cabins. They hired Ray Tebo of New Excavating Technology in St. Anne, Illinois, to assess the options and to design and install a wastewater treatment solution that could handle current capacity and future needs.

Challenges

Since the property consists almost completely of reclaimed coalmine spoils and lakes in close proximity to each other, it posed some extremely challenging wastewater situations. The inconsistent soils, numerous lakes, and drastic elevation changes along with stringent new code requirements challenged system designers.

Two possible solutions were considered – an NPDES permit for discharge to surface waters, or a membrane bioreactor (MBR) system to discharge highly treated recycled water into the soil. Because the soils were so variable, engineers were brought in to test the soils and it was determined that the absorption rate did not meet state code for a traditional onsite wastewater system, therefore advanced treatment was going to be required.

Tebo determined that the MBR was the best solution due to the small footprint required to get an exceptional level of treatment and not impact the sensitive environment. The challenge remained that installing an MBR on each of the 340 campsites was not economically feasible. Tebo recommended a series of 17 separate decentralized wastewater treatment systems on the property where flows from several sites could be combined and treated. Using the MBR systems in this village environment required very little land and no federal or state NPDES permits were required.

System Design

NSF350 water recycling membrane systems were designed to meet the challenges of this project. The 500 or 1000 GPD units feature Bio-Microbics BioBarrier Membrane (MBR) systems installed within Infiltrator IMTM-Series Tanks.



Giant Goose Ranch IM-Tanks Installed

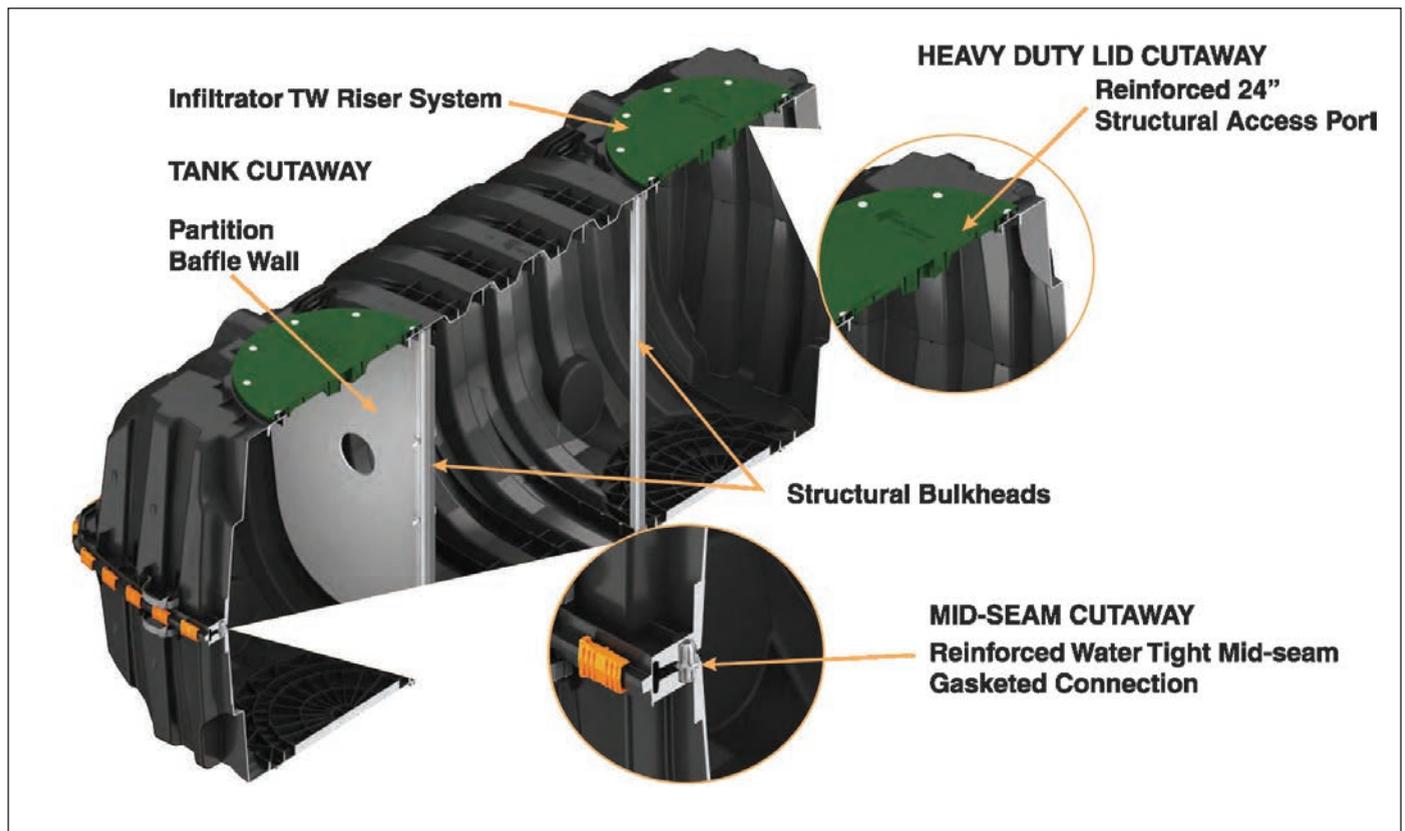
The project has had strong support from state and local public health officials. What was once a strip mine eyesore is now a first rate recreational resort.



EZflow Dispersal Field Install

The numerous MBRs were built to suit the location with single units for individual cabins and 1000 GPD MBRs to serve clusters of resort cabins, beach houses, a store, and a banquet hall. Installing the MBRs in the lightweight plastic Infiltrator IM-Series Tanks allowed the units to be constructed in a shop to specifications and then delivered and installed around the property without requiring a heavy boom truck thus saving substantial expenses. The Infiltrator IM-Series tank specification was critical to the project's feasibility.

A 4-inch standpipe is installed at each campsite, which is a stone platform designed for an RV or moveable cabin. The pipes from several sites direct flow to 4-inch main, which then flows to an 1000-gallon Infiltrator IM-tank that provides primary treatment as well as functioning as a trash tank. Wastewater flows from the trash tank through a Bio-Microbics SaniTEE and into a 1500-gallon Infiltrator IM-tank with two 500-gpd BioBarrier MBRs. A blower outside the



IM-1060 Cutaway Labels

tanks in a plastic enclosure provides air to scour the membrane to keep it clean which keeps the biomass alive and growing.

Lift stations were installed because of the elevation fluctuation. These lift stations feed the trash tanks and also send effluent to the EZflow™ by Infiltrator geosynthetic aggregate dispersal fields. EZflow provides excellent effluent dispersal and water channeling, which were two key factors in this installation. The ultimate goal with the EZflow dispersal fields was to make them uniform in size. Tebo determined that in the areas of the resort with the worst soils, approximately 240 feet of EZflow would be needed for the dispersal field. To meet the goal of future growth potential Tebo uniformly sized each of the fields at 300 feet of EZflow. Even at that size, the square footage of each of the dispersal fields was relatively small.

To accommodate the hilly terrain and the lakes, the dispersal fields are located as close to the MBR units as possible in various configurations. With mine spoils in the soils at anywhere from 20–90 feet deep, Tebo could vary the depth within the fields and still achieve a level field. The sites also had to adhere to the Illinois maximum depth of 36 inches for a septic system dispersal field to gain approvals from the Illinois Department of Public Health and Fulton County.

A 1.5 amp marine Champion pump is installed with each MBR and slowly pulls the recycled water out from the treatment system and then transitions to gravity flow to the EZflow dispersal fields. EZflow by Infiltrator was specified for the treated effluent dispersal fields because it eliminates heavy trucking and the spreading and compaction challenges of stone. The dispersal fields are time dosed by Aquaworx IPC Control Panels.

For initial system startup, the MBRs were seeded with microbes by using wastewater from a nearby wastewater treatment plant.

Monitoring and System Performance

A BioMicrobics panel controls the MBR systems and the lift stations are monitored via an Aquaworx by Infiltrator IPC Control Panel. The ability to monitor the system 24/7 and download data via the Aquaworx IPC Control Panel allowed for system adjustments based on usage to increase



Giant Goose Ranch IM-Tanks and EZflow

efficiency and performance. Following quarterly performance checks that include flow rate checks, adjustments are made to optimize the performance of the MBR systems. The systems have responded very well to the varying mix of sewage across the community and this is enabling system recovery for peak performance. There also have been no issues with plugged filters. The property usage is nearly year-round and meets treatment requirements in the colder seasons without challenges. In the spring, the microbes are reseeded, replenishing the system for high

season performance. Currently the areas above the dispersal fields are open space planted with grass and alfalfa. In the future they may be used for animal grazing or other low impact activities. Future expansion of the resort is planned to include a banquet hall, beach bathhouses, additional resort cabins, a store and other facilities that will each have their own MBR system. The banquet hall, designed to accommodate 200 people, will have a 3000 GPD system design for expansion as needed. Each of the bathhouses will have a 1000 GPD MBR.

About the Author

Dennis Hallahan has over 25 years of experience with onsite wastewater treatment systems design and construction. Currently Technical Director at Infiltrator Water Technologies, he is responsible for technology transfer between Infiltrator and the regulatory and design communities and consults on product research and testing for universities and private consultants. Dennis received his MS in civil engineering from the University of Connecticut and his BS in civil engineering from the University of Vermont. He is a registered Professional Engineer in Connecticut and holds several patents for onsite wastewater products.

Infiltrator Water Technologies provides the products and services which improve the performance of onsite systems by delivering greater infiltrative capacity, ensuring higher quality installations and making more efficient use of space. The company's systems are approved in all 50 states and all 10 Canadian provinces with up to a 50% smaller footprint as compared to stone and pipe systems. There are over 3 million Infiltrator Water Technologies systems installed and more than 25 million chambers in-ground worldwide.

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