Terra-Tubes™ Case Study: Water Filtration in Boulder Business Park

Terra-Tubes™ Fiber Filtration Tubes prevent coal seam runoff from entering trout stream

Situation

With environmental compliance in mind, a general contracting company was required to find a solution to turn turbid, coal-laden water into clean, clear water prior to discharge into a neighboring trout stream. Not doing so meant facing the possibility of stiff fines and a project shutdown for violations of National Pollutant Discharge Elimination System (NPDES) Phase II regulations. In response to these concerns, Whiting Turner, the general contractor for this project, sought an innovative solution to filter water exiting the storm water detention basin built in the spring of 2005 for Boulder Business Park, a large-scale distribution and retail complex, located just west of Allentown, Pennsylvania.

Terra-Tubes® FIBER FILTRATION

Problem

The detention basin was incorporated into the project design to collect excess storm water runoff from the large site. To excavate the basin, workers with Whiting Turner blasted through rock layers to get down to grade and encountered groundwater. Whiting Turner began dewatering the basin only to find that the water was contaminated with fine coal sediment seeping into the water from the surrounding deposits.

Pumping the water through traditional geotextile filter bags did not capture the sediment, resulting in the coal-laden water being discharged downstream and imperiling a wildlife habitat. Inspectors with the Lehigh County Conservation District (LCCD), located in Allentown, Pennsylvania, quickly spotted the problem.

"The contractor was not using adequate Best Management Practices (BMPs)," said John Bohman, lead resource conservationist for the LCCD. "We informed the contractor that the dewatering operation needed to stop until adequate BMPs were implemented."

Solution

Facing a shutdown of the project due to non-compliance with NPDES Phase II regulations and violating Pennsylvania's Clean Stream laws, Whiting Turner brought in a biologist/environmental compliance specialist with Haines and Kibbelhouse (the H & K Group), a parent organization to several construction services companies throughout the country. The specialist worked with local site consultants and Lehigh Valley Site Contractors to evaluate the situation and devise a solution.

Contractors were advised to line the 200-foot channel connecting the detention basin to the stream with a geotextile fabric to prevent contamination of the channel bed. Next, suggestions were made to place both small and large stones in the channel to help filter the water. The small stones were 1½-inch maximum diameter while the large stones were four-inch diameter rip rap (the classification of rocks often seen lining ditches and channels).

However, even with these measures, the problem hadn't been solved yet. Based on their experience, contractors knew that the stone filters and fabric would not be 100 percent effective and that they'd need additional measures to trap and treat the very fine sediment.

To devise a solution, contractors enlisted the help of Warren Cohn of ACF Environmental, a geosynthetic products supplier located in Norristown, Pennsylvania. Cohn called upon Profile Products' Phase II experts who suggested that Profile's Terra-Tubes Fiber Filtration Tubes would be an ideal product to use in this challenging situation. Encased in heavy-duty, knitted tubes, Terra-Tubes are engineered composites of wood fibers, man-made fibers and performance-enhancing polymers. Terra-Tubes have been proven through independent testing to be a highly effective storm water treatment device designed to effectively trap, filter and treat sediment-laden runoff.

Terra-Tubes are part of a full line of products and services provided by Profile, which incorporate Green Design Engineering™. This holistic approach combines the expertise of Profile's engineers and certified specialists to evaluate projects and work side-by-side with Profile's distributors and customers, producing environmentally responsible solutions particular to specific needs.

"Given the unique aspects of the water pollution, I thought that this would be an ideal application of the Terra-Tubes product," said Cohn.

After lining the channels with the geotextile fabric, contractors staked two tiers of 6 ½-foot Terra-Tubes at intermittent intervals along the channel. Once the Terra-Tubes were in place, the stone was carefully placed around the Terra-Tubes and throughout the channel bed. Within three days of the stop-pumping request made by the LCCD, contractors had installed the geotextile, Terra-Tubes and stone, and commenced filtration of the storm water detention basin.

The Result

Cohn reported that the Terra-Tubes have effectively eliminated the coal-laden water seepage problems via the product's core functions of flow, filtration and flocculation. The composite structure creates air space and cavities to facilitate flow, which is critical to the filtration process. Unlike compressed fiber rolls and wattles, Terra-Tubes' open structure contains far greater surface area and can trap more sediment. As water flows through the Terra-Tubes, flocculant crystals impregnated within the fiber matrix initiate coagulation or aggregation allowing the suspended soil particles to settle into collecting pools created by the Terra-Tubes or directly on the surface of the soil or complementary erosion control devices.

The warehouse distribution center opened for business in late 2005. With no more coal-laden water endangering the wildlife of the surrounding area, the fiber filtration tubes have been touted as an ideal solution for a unique situation.

"The Terra-Tubes have performed very well for our customers," said Steve Zwilling, Profile's market development manager. "It is apparent how well they've performed when you see the black sediment that's trapped in the tubes and see clear water leaving the site."

Cohn agreed with Zwilling's assessment.

"We overcame what we had considered to be a stumbling block," said Cohn. "Terra-Tubes proved to be an innovative tool in helping us to most cost effectively filter water in a challenging situation."

Key Product Properties

Terra-Tubes™ Fiber Filtration Tubes

Terra-Tubes Fiber Filtration Tubes have been proven through independent testing to be the industry's most effective storm water treatment device.

- Engineered composites of wood fibers, man-made fibers and performance-enhancing polymers provide greater sediment capture and reduced turbidity levels than other sediment retention technologies evaluated in Storm Water Lab research.
- Terra-Tubes are designed to effectively trap, filter and treat sediment-laden runoff while reducing hydraulic energy.
- Terra-Tubes are highly versatile and ideal for treating water in low-flow channels and across slopes. Terra-Tubes also offer efficient water treatment around detention ponds and drainage inlet structures.
- No other product delivers Terra-Tubes' three primary functions of flow, filtration and flocculation to effectively control sediment loss and treat storm water.
- Terra-Tubes are an ideal Best Management Practices tool for helping contractors achieve NPDES Phase II compliance on construction sites.

Profile
Solutions for your Environment™

Profile Products LLC
750 Lake Cook Road, Suite 440
Buffalo Grove, IL 60089
1-800-508-8681
www.profileproducts.com

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