



Abandoned Canadian gold mine site stabilized faster with HydroStraw

A once highly-contaminated former mining site in eastern Ontario is nearing complete decommissioning due in part to the use of HydroStraw Bonded Fiber Matrix (BFM). Initial specifications called for an erosion control blanket. Kurt Vanclief, owner of Willowlee Sod Farms – which was contracted to do the erosion control on the \$120 million project – says that the soil conditions and the need to quickly remediate the toxic conditions threatening the nearby potable water source called for what HydroStraw had to offer.

HydroStraw BFM is designed to be more cost effective than rolled erosion blankets and cost less to apply per acre than conventional BFM mulches on difficult sites, slopes and adverse soil conditions where extra erosion prevention is needed. The specially-formulated composition of annually renewable heat and mechanically treated wheat straw fibers, natural fibers for fiber matrix entanglement and a non-toxic soil stabilizer is designed for improved seed germination and vegetation establishment. The hydraulically applied mulch also includes an additional 10 percent of long natural fibers for maximum matrix entanglement for improved performance as well as 10 percent pre-formulated cross linked high-strength polymer binders.

Soil remediation halts contamination

The Deloro Mine site sits along the banks of the Moira River on the eastern boundary of the Village of Deloro, population 180, and drains into the river, which is a large tributary flowing into the Bay of Quinte and Lake Ontario. It feeds into the town of Belleville and serves as a drinking water source, says Vanclief.

Dating to 1867, the site flourished with major industry activities, including mining and refining of gold, cobalt metal, silver, nickel and stellite. Refining and manufacturing operations ceased in 1961. Not only were mine workings abandoned, but a century's worth of hazardous byproducts remained behind. Arsenic is the main contaminant of concern. Low-level radioactive slag and tailings resulted from re-refining of byproducts from uranium refining. The materials caused significant environmental impact at the site, including soil, sediment, surface water and groundwater contamination. The total site is approximately 202 hectares or nearly 500 acres, with a total volume of waste of about 650,000 cubic meters.



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Above the contamination is a meter and a half of a liner of sand layer and clay later. All of the soil was stripped to bedrock. Mitigation efforts included relocating and consolidating highly contaminated wastes to the industrial area. The waste cell is consolidated under a 1.5 meter 'clean' fill cover of imported unscreened topsoil cover, which also was placed in the remaining areas. The 120,000 square meter waste cell is designed to shed water in all directions, but not absorb it. The plateau on the top of the cell is approximately 30,000 square meters. The side slopes are 4.5:1 and approximately 65 meters down slope.

Extensive grading and inceptor ditches have been built to drain and divert surface water from the engineered cover. Surface water flow is being diverted away from the contaminated materials. A passive groundwater



interceptor well network is diverting clean groundwater away from the wastes. An arsenic water treatment plant constructed especially for the mitigation efforts is operating continuously to treat water from the waste cell. As part of the project team of the environmental solutions contracting firm Tervita and the engineering firm of McIntosh Perry, Willowlee Sod Farms executed the revegetation plan. Willowlee, which started in 2000 as a turf and sod producer, also now provides hydroseeding and ground cover erosion control serving eastern and central Ontario with 22 employees.

HydroStraw preferred method for vegetation

The province of Ontario “wants vegetation to naturalize the site it so it aesthetically looks better and holds dirt in place so no sediment or dirty water leaves the site,” says Vanclief, adding that the area will remain a landfill. Vanclief recommended the use of HydroStraw BFM on the project’s entire 160,000 cubic meters. The site is surrounded by woodland and wildlife. Previous use of erosion control blanket had caused issues with wildlife entanglement.



One of the driving factors in using the HydroStraw is that it’s very difficult to use an erosion control blanket on soil that isn’t of premium quality screened topsoil and get it to adhere evenly to the surface, Vanclief points out. “It often tents and isn’t as effective as it appears from distance to be. It’s difficult to install,” he says. “We were confident we would have failures with the product because it was an imperfectly prepared surface. Rolled erosion blankets require a perfectly graded soil with no lumps. But in projects of this scale, the cost to get that perfect surface is usually not a goal. “If we had to come back and do any repairs, we’d have to essentially pull the blanket back, fix areas and then put blanket back on top. Our likelihood for repairs is higher with the blankets and the challenge to complete them was a little more difficult.”

Vanclief chose HydroStraw as he had had previous experience with seed from its sister company Summit Seed, Inc. and was pleased with the products in terms of ease and efficiency of use. The final strategy was to drill seed with a Brillion seeder and apply HydroStraw BFM at a rate of 4,000 pounds per acre at the 40-acre site. “We power raked the soil to break up some clods of soil that were quite large,” says Vanclief. “We put about 75 percent of the seed on top of the ground with a Brillion seeder, and then applied 25 percent of the seed with the HydroStraw mulch slurry.” The seed is the Ontario Ministry of Transportation’s road specification mix of creeping red fescue, perennial ryegrass, bluegrass and white clover.

Willowlee crews initially worked on a tailings field, seeding between the rows of 22,000 poplar trees. “The goal is that the turf and the poplar trees would wick out as much soil moisture as possible to reduce the amount of hydraulic pressure that will go on that field,” says Vanclief. “The more moisture that soaks down into the soil, the more contaminants that are forced out on the tailings below. Water is collected as it leaves the site and increased volume means more water going to the treatment facility.”



Project delays pushed the seeding job to late November 2016. That meant that weather conditions wouldn't permit seed germination until late April, says Vanclief, adding that the only protection of the dormant seed would have been provided by the BFM. Vanclief says one of the challenges was the inability to physically get the truck in the ideal position to apply the product. "Various ditching and design made shooting slopes from the ideal angles not possible for all areas," notes Vanclief. "The Titan 400 was able to shoot the HydroStraw BFM a very good distance to get coverage." A haul road on the side of the berm has been removed as the work is conducted and will serve as a swale to move the water off. "We can't drive along the bottom of the slope in all areas," says Vanclief. "When you're applying mulch on a hill as big as this, you like to shoot the mulch at it from more than one direction for ideal coverage."



About a third of the site was seeded before winter with the HydroStraw applied for protection. Spring 2017 was expected to be a key point in the project to quickly complete the groundcover establishment in a window to allow typical spring rainfall to promote vigorous growth, says Vanclief. "Should some grading and reseeding be required, it will be much simpler to complete and spot treat compared the original design with all areas covered by erosion blanket," he adds. Willowlee's scope of work – which includes maintenance until the seed is grown in – is expected to be completed in the first half of 2018. After that, there will be a two-year period of over seeding and mowing.

An opportunity to 'heal the soil'

The Deloro Mine was perfectly suited for the use of HydroStraw Bonded Fiber Matrix, notes Ron Edwards, HydroStraw president. "We view these decommissioned restoration sites as our opportunity to heal the soil, the fragile skin that anchors the vegetation needed for a successful remediation," he says. These types of sites have been pushed to a level for which the soil's ability to maintain itself have been greatly diminished, Edwards points out. "The impact of soil compaction, loss of soil structure, and nutrient depletion all require additional remedial actions to put them back closer to their original state."

HydroStraw's products are designed to provide a valuable link in the restoration process by reducing sedimentation into streams and rivers and increasing vegetation on otherwise barren sites, notes Edwards. "The health of the soil is a primary concern to us, and it all begins with the dirt beneath our feet," he says. "While there are many solutions available in the marketplace, our industry faces many challenges to maintaining healthy soils. We pride ourselves in being stewards of the land and helping to maintain the earth's fragile skin from which biodiversity begins."