

Erosion Armor

By Brian Baker

A lakeside Wisconsin village keeps overflow damage in check with its turf mat-reinforced emergency spillway

Wisconsin's scenic Lake Delton is home to water parks, resorts and other recreational facilities that have made it a popular vacation destination for people from across the U.S. In fact, Lake Delton, which covers 267 acres and holds more than 600 million gal of water, is estimated to help bring 1.5 million visitors to the Wisconsin Dells-Lake Delton area—a crucial contribution to the local \$1-billion-a-year tourism industry.

On the morning of June 9, 2008, Lake Delton, swollen with more than 12 in. of rainfall, overflowed its banks along County Highway A near the Dell Creek Dam. The water caused a 400-ft portion of the highway to erode, creating a new drainage channel to the Wisconsin River. The channel drained the lake's 600 million gal of water—and the source of livelihood for many area residents—in just two hours.



Because the Lake Delton economy is dependent on a full lake, village trustees wanted it to be restored permanently by the start of the 2009 tourist season. In September 2008, a construction crew began filling in the 400-ft breach. By the end of October, the project was on schedule with 12,000 truckloads of sand and tons of rock in place, allowing other reconstruction projects to get underway.

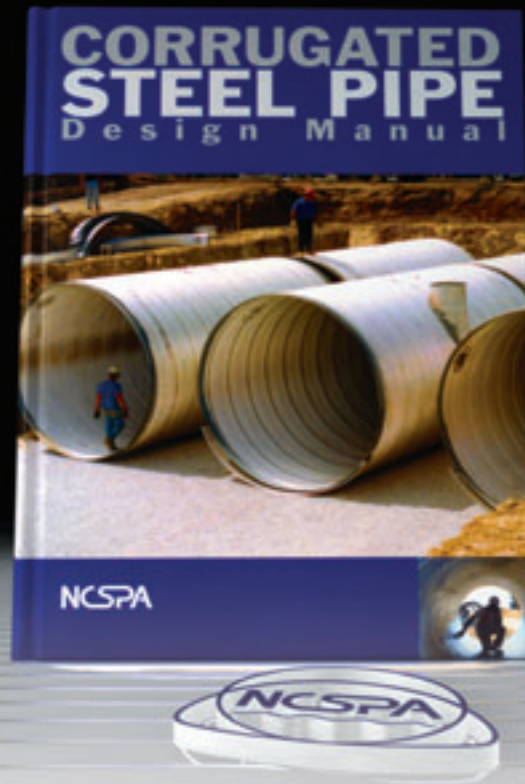
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One such project was the construction of a new emergency spillway that would increase the overflow capacity of the original spillway. This and other improvements would more than double the amount of water the Dell Creek Dam could handle—more than enough to accommodate a 100-year flood.

With a limited budget, the village of Lake Delton's board members sought a cost-effective reinforcement solution for the Lake Delton Spillway. Tennessee-based Propex Geosynthetics made their search easier by offering to donate 5,000 sq yd of its ArmorMax anchor-reinforced vegetation system.



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Installation crew members anchored the HPTRM one section at a time.

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ArmorMax, which consists of a high-performance turf reinforcement mat (HPTRM) and earth percussion anchors, is the most technologically advanced armoring system for severe erosion challenges, according to Brad Cooley of Propex Geosynthetics. The company offers it as a replacement for rock rip-rap, gabions, concrete paving and other hard armoring systems.

“The HPTRM protection layer consists of a woven three-dimensional fabric featuring X3 fiber technology that traps moisture, soil and seed for rapid and dense vegetative growth,” Cooley said. “The HPTRM offers the combination of high tensile strength, flexibility and UV stability to assure the necessary long-term design life for the spillway and to withstand any type of maintenance activity, such as mowing and traffic loading. For added reinforcement and factors of safety, the HPTRM is securely anchored to the ground with earth percussion anchors made of high-strength, corrosion-resistant aluminum alloy.”

To make sure the armoring system could withstand the erosive forces of a major storm event, Village Engineer John Langhans researched the product extensively. He discovered that it was quickly and easily installed, providing immediate protection. Langhans also found the armoring system to be an aesthetically pleasing vegetated solution that would help preserve the natural beauty of Lake Delton.

Most importantly, Langhans learned that ArmorMax, used to armor levees in Louisiana, successfully withstood the catastrophic storm

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conditions generated by Hurricane Ike in September 2008. Because of this and the armoring system's many other benefits, Langhans and the Village of Lake Delton Board approved its use on the Lake Delton Spillway.

Installation

In October 2008, Allan Steele Construction began preparing the 3,000-sq-yd installation site. A four-man crew cleared the area of mature hardwoods, ground up the remaining stumps and removed the roots so that the area could be graded.

After the site was graded and prepped for the installation of ArmorMax, the cold Wisconsin winter began to set in. This, however, did not prevent the village from moving forward with the project. On Nov. 26, with 5 to 6 in. of frost in the ground, anchor trenches approximately 1 ft wide and 1 ft deep were excavated at both the top and bottom of the slope, and the frost-laden soil was removed from the site.

After the trenches were dug, the HPTRM was anchored to the bottom of the top trench one section at a time. Once the mat was in place, the team backfilled the trench with frost-free topsoil to ensure good soil compaction and unrolled the HPTRM approximately 45 ft down the slope.

The team used pneumatic hammers to drive the anchors through the HPTRM and hard frost ground to a depth of 24 in. and on a checkerboard grid pattern at 4-ft centers. The anchors were then pulled in tension, leaving a total of 18 to 20 in. of cable in the ground. The team then anchored the HPTRM to the bottom trench and backfilled it with frost-free soil as well.

By Nov. 28, with a break for Thanksgiving, the installation was completed and about one-quarter of the area was soil filled. Before the rest of the area could be soil filled, a snowstorm carrying 3 in. of snow hit, preventing any additional work from being done on the spillway until spring 2009.

The armoring system will act as an erosion control device until soil filling is completed, the area is hydroseeded and vegetation is established. However, that will not stop the village from filling the lake this winter with confidence,

knowing that the HPTRM will hold its ground. **SWS**

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