

Geocell Deploys Rapid Deployment Flood Wall in Warroad, Minnesota



Where the water hits the wall



▲ This 4,400-foot-long dike, built to protect Warroad, Minn., from Lake of the Woods, uses three types of material.

► One experimental product being tested in Warroad is made up of plastic cells filled with sand. It is called Rapid Deployment Flood Wall.

Photos: Jackie Lorentz, Herald staff photographer

Warroad tests new flood-fighting system

By Rona K. Johnson
Herald Staff Writer

Warroad and Lake of the Woods are the testing grounds for an experimental dike system called the Rapid Deployment Flood Wall.

The city and the U.S. Army Corps of Engineers built a 4,400-foot-long dike on the shore of Lake of the Woods east of the city to protect city infrastructure from wave action. Lake of the Woods is predicted to reach a record-high 1,063 feet above sea level in the next couple of weeks.

The city built the dike to protect against high waves that could pound the shore, should there be strong northeast winds when the water is at its peak. The dike was built to protect the city to 1,065 feet.

A 100-foot section of the dike is the Rapid Deployment Flood Wall, which is made with a series of square plastic cells filled with sand.

The wall, designed and built by California-based Geocell Systems Inc., is being marketed as a replacement for sandbags.

The flood wall is referred to as a module sand-confinement system. The flood wall segments are made of recyclable plastic and resemble the cardboard dividers that are used in cases of wine to separate the bottles.

Once the segments are in place, they are filled with sand. When the flood fight is over, the segments can be picked up and collapsed for storage, and after they are certified by Geocell Systems, they can be reused.

Al Arellanes, president of Geocell Systems, was in Warroad about three weeks ago to demonstrate the system. It was called the Rapid Deployment Fortification Wall at one time because it was originally tested for use in artillery emplacement shelters for the military dur-

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Wall withstands wave test

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The Rapid Deployment Flood Wall was tested in April 2000 at the U.S. Army Corps of Engineers' Engineering Research and Development Center in Vicksburg, Miss.

"At that time, we knew how well it worked, but we didn't know how it failed," said Al Arellanes, president of Geocell Systems Inc., the company that designed the floodwall. "In order to evaluate its performance, we had to

put it under much more stringent testing criteria than you would normally see in an urban flooding event."

They were given a basin in the hydraulics lab that was 300 feet long by 50 feet wide, he said.

"We were told to build our section across the basin with untrained personnel," Arellanes said.

It took about an hour or two to build the 4-foot-high floodwall, he

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TEST/ Untrained people build section of wall

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said. They tested it by pouring 24 inches of water into the basin behind the wall.

"There were no signs of any fatigue in the wall, so I decided to raise the bar," Arellanes said.

They raised the water level to 40 inches and let it sit for 24 hours. They found that the wall had moved only about 300ths of an inch, even though it was placed on a smooth concrete surface.

"We then decided to take the test a little further, and we tried to simulate wave action that could occur due to wind-driven or typical wave-type action," Arellanes said. "We gave it over 40 hours of various wave energies and heights,

which amounted to 72,000 wave cycles."

Wave heights varied from 42 feet to 1.52 feet.

The flood withstood the tests with minimal, easily repairable damage. Total sand loss was about 8 percent.

"After the flood, all you do is lift them straight up and the sand escapes from the bottom," Arellanes said. "With regard to restoration, once the flood fight is over, we bring our staff out and we re-inspect the material and re-certify it for the next use. We will replace the material that needs to be replaced."

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ing combat missions.

Joining the fight

In 1983, Arellanes, in conjunction with the Corps, started to develop improved and innovative methods for combating floods.

"The idea behind this whole project was to create a tool that can be utilized in our flood-fighting arsenal that would better prepare us to protect ourselves," Arellanes said. "The most important thing is to be able to cover more ground and to be able to utilize people's energies more effectively, thereby gaining better control over the situation."

The Corps initially planned to use the system for the entire dike project in Warroad but then scaled back because of the cost, said Dave Christenson, chief of the Readiness Branch for the St. Paul District Corps of Engineers.

Each 4-foot-by-4-foot-by-8-inch-high segment costs \$90.

A 100-foot section of the flood wall was built into the dike in Warroad so that the Corps could evaluate the system's performance.

"We looked at doing this test to determine the effectiveness and get a real-world test of the system," Christenson said. "We see this as another possible tool in the flood-fighting basket. There may be specialized situations where this is the product that meets that need."

At sandbag cost

The flood wall system costs no more than sandbags when labor, efficiency and restoration costs are considered, Arellanes said.

"Most people look at the direct cost of a sandbag," he said. "But I have to ask: What does that buy you? Number one, it buys you a tremendous amount of labor; it buys you fatigue, and unless you are experienced with sandbags it buys you a structure that is probably not sound."

To compare the two dike systems, Arellanes said, you need to consider that the floodwall covers more ground and it can be put in place 100 times faster than sandbags.

"For every one foot of sandbag wall these folks can put up, we can put up 100 feet," he said. "And once the flood is over, you can reuse this material. We are advocating that you get the material, lift it up, collapse it back in place and reuse it. The next time you use the RDFW, the cost of the sandbags is not even in the picture. And if you were to reuse it again, the costs continue to diminish."

Also, the cost of the segments could start to drop once Geocell Systems starts to produce more of the segments.

Geocell Systems is also trying, through the U.S. Congress, to get the Corps to purchase flood wall segments and make them available to communities.

"Our primary flood-fighting method is earthen levees," Christenson said. "They go in quick and are very effective if they are done right and you have the room to place them."

The Corps also keeps a supply of sandbags on hand to support their efforts.

"And if these other techniques are needed or proved to be effective, there is a possibility that we would purchase them," he said.

But ultimately, he said, it is up to the community or the people who are affected by the flooding to choose the system with which they feel most comfortable.

Arellanes is aware of the other flood-fighting methods available, and he knows that his product isn't always appropriate for some applications.

"We wouldn't go into a rushing river and try to stop it, but we don't want to see groups of people in communities trying to sandbag when it's not necessary," he said.

Local interest

There is some interest in the floodwall system locally, but most emergency managers said they probably wouldn't give up on sandbagging.

"I think there is a place for it to be used," said Doug Qualley, Polk County sheriff and director of emergency management. "But I don't think it will ever replace sandbags."

Qualley said he would consider using the system in some flooding situations, such as the flooding that occurred in 1999 at Union Lake and Lake Sarah.

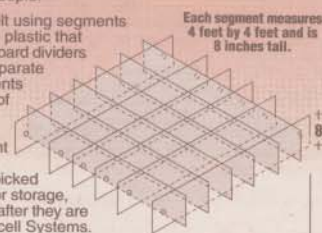
"I feel it would probably work the best in a situation such as at Union Lake, where you could put it up and use it for several months," he said.

But he said he would need more information about how

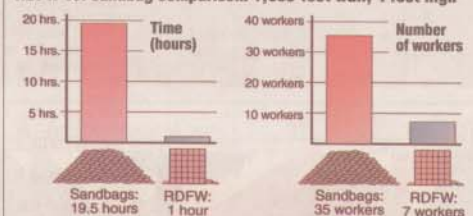
Flood fight

The Rapid Deployment Flood Wall is a new flood fighting system that is being tested as a possible replacement for sandbag levees. Geocell Systems Inc., the California company that designed the RDFW, says its system covers more ground in a shorter time period with fewer people.

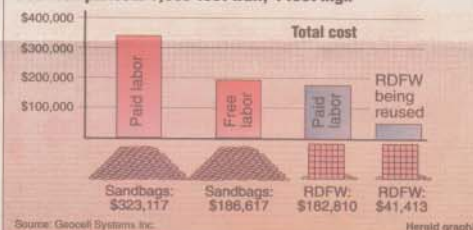
The RDFW is built using segments made of recyclable plastic that resemble the cardboard dividers that are used to separate bottles. The segments are stacked on top of each other and filled with sand. When the flood fight is over, the RDFW segments can be picked up and collapsed for storage, and can be reused after they are re-certified by Geocell Systems.



RDFW vs. sandbag comparison: 1,000-foot wall, 4 feet high



Cost comparison: 1,000-foot wall, 4 feet high



Source: Geocell Systems Inc.

Herald graphic

the wall would stand up to sun and rain, and for how long.

"We talked to the manufacturer (Wednesday) on it, and it sounds like the prices would be very competitive vs. the use of sandbags," Qualley said. "I don't think it is the solution to all of our problems, but I believe it has a part to play in our flood fight."

Qualley and other emergency management people from Polk County and East Grand Forks went to Warroad to see the system at work.

"I think it would in some instances work well," said Frank Ringstad, East Grand Forks fire chief and city emergency manager. "It seemed sturdy enough."

Ringstad, like most veteran flood fighters, is a firm believer in sandbagging.

"When they are made properly and built properly, you have more flexibility," he said. "I'm a little skeptical of it, I guess."

But Ringstad said if the rapid deployment wall was more cost effective, he would consider using the system in some instances.

"They might work fine for like a road closure or something to that effect," he said. "I think it does have a place."

Ringstad doesn't see any problems with the system's application in Warroad, but he's not sure how it would work on a surface that wasn't flat.

Ringstad didn't think he would invest in the product, but he did like the fact that the segments were reusable. He was also worried about the possibility for errors in building the system when it is being put together by volunteers.

Laurence Wright, Warroad police chief and emergency operations manager, said they are confident that the system would work in their operation.

"The weight of the sand and its size make it impenetrable," he said.

Wright said they had a little trouble setting up the first two layers of the wall, but after those were done, the next two layers went up quickly.

Anyone interested in seeing a demonstration of the wall may contact Arellanes at (415) 541-5300 or www.geocell-systems.com.



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