FEMA

Mitigation Project Reunites A Town Divided

Cambria, Wisconsin - Cambria, population 792, is one of many pleasant spots in the middle of Wisconsin corn country, about 33 miles north of Madison. It is quiet, clean and well managed by experienced and energetic individuals. And, although no sign announces it, it is recognized by many, in and around Cambria at least, as the lima bean capital of the world.

The town was settled in 1844 by Dutch immigrants. Early settlers built a dam forming what is now Tarrant Lake. They also built a sawmill and gristmill, both powered from the dam's spillway.

The day after a flood washed out the road over the dam in Cambria (May 1993), residents are astonished at the sight of the destruction.
Photo: courtesy of Town of Cambria

Cambria experienced its first destructive flood in 1858. Both mills were destroyed. Years later, a roadway was built over the old dam, which the settlers had constructed of earth, rock and brick. Culverts at lake level under the roadway provided outlets for the lake water. The roadway subsequently was paved and designated Wisconsin Route 146.

Tarrant Lake (to the right of the road) begins to overflow its dam during heavy, persistent rains in late May 1993.
Photo: courtesy of Town of Cambria

The town grew and prospered over the years. Today it is home to two major food canneries and a cornmeal mill. The three plants provide employment for approximately 300 people at peak times.

The roadway and dam are about 70 yards from the end of Cambria's main business district. The road is a major throughway for everyone including farmers, school busses, and trucks serving Cambria's three food processors. Any closure of Route 146 requires a five-mile detour around the town.

The ten acre, man-made Tarrant Lake is fed by two small tributaries and underground springs. Land on either side of Tarrant Lake slopes upward into farmland, so runoff during rains also adds to the lake's water levels.

Flooding is a common thread in Cambria's history, as it is in many Wisconsin towns.

In 1993, the Cambria Dam suffered a major washout. Damage to the old earthen construction was extensive.

As darkness falls on June 9, 2004, just eleven years after the previous major flood in Cambria, water from Tarrant Lake crests over the dam and begins to erode Wisconsin State Highway 146 once again. Photo: courtesy of Town of Cambria

Repairs included the installation of two new five-foot culverts under the road and fitting them with flood gates to control the release of water from the lake and to prevent water from overtopping the dam and roadway.

Eleven years later, floodwaters assaulted the Cambria dam again. In late May 2004, heavy rain began soaking the Cambria area and continued for weeks. The heavy rains caused dams elsewhere in the state to burst, forcing people out of their homes. Department of Public Works (DPW) Director Tom Tietz and members of the Cambria Volunteer Fire Department kept close watch on their dam.

In the early morning of June 11, 2004, Tietz's crew opened the flood gates as far as they would go, but the water in Tarrant Lake continued to rise. High winds accompanying the rains had broken many limbs from trees. These and other debris, such as cornstalks from the surrounding farmlands, washed into the lake and drifted to the outlet where they began to clog the debris guards on the culverts.

Tietz and his crew worked late into the evening of June 11 to remove the soggy, woven mesh of debris. But no matter how hard the DPW and other volunteers worked, they knew it was just a matter of time before water from the lake would begin to gnaw at earth and rock surrounding the cement culverts, "With all that rain pounding down and all of us being blown around by high winds, accompanied by lound thunder and bright flashes of lightning," Tietz said, "I wondered what we were doing out there. It certainly wasn't the safest place to be in a storm - and all of us could see we were fighting a losing battle."

By daybreak June 12, Tietz and his men could only stand and watch the water's terrible power as it swept over the road. They all knew that there was even more damaging action they couldn't see - the relentless tearing away of gravel, rock and earth below the surface of the water on the lake side of the roadway.

By three in the afternoon, chunks of roadway began popping loose. At eight p.m., the Cambria dam failed

Cleanup and new construction on new dam begins in September 2005. Photo: courtesy of Town of Cambria

The new dam, a perimeter weir overflow system type, nears completion. Tarrant Lake was drained, with its feeder streams and springs diverted around construction for two summers during the work. Photo: courtesy of Town of Cambria

and water from Lake Tarrant roared across Route 146, creating a gully more than 70 feet across. Fortunately no homes downstream were damaged, but the disaster had effectively cut the town in two. Now, residents in half the town had to travel five miles further to reach the main street, schools and businesses.

By June 14, when the rains of the summer of 2004 finally came to an end, Cambria's DPW Director, the town manager and town president received a letter from Wisconsin's Department of Natural Resources (DNR) informing them that an agreement had been reached regarding the construction of a newer and better dam. Town Clerk and Treasurer Lois Frank said, "We knew if we didn't build the best dam we could, we would be looking at trouble again down the road."

One month later, Route 146 was reopened to local traffic. The state highway department installed a large culvert across the road from the lake to the old spillway and a temporary roadway was paved. This roadway proved to be adequate until spring floods the following April wiped out the temporary repairs to Route 146. This time the road was closed permanently until the new dam construction was completed.

According to the requirements set forth by the DNR, Cambria would be required to retain the services of an engineering consultant who was experienced in dam design and repairs. After engineering, environmental and natural resource studies were complete and the state highway department became involved, the town borrowed $400,000 to get the work started on their largest-ever flood mitigation project. Preparation for this major undertaking would take time.

Construction on the project began on September 29, 2005. The result of the project was one main structure with integrated overflow discharge capabilities. The structure was almost entirely concrete with a lower mechanical gate and a perimeter-weir overflow system. This system was integrated into the roadway, with discharge water flowing under the road through a dual box culvert.

Massive amounts of rock and gravel were used to fill the washout. A pile driver worked for several weeks pounding wide slabs of lapped steel into the earth on the lake side of the roadway. Tons of muck and debris were scooped out and trucked away to prepare a foundation bed for the new dam. Forms for concrete were put in place and concrete was trucked in and poured. Finally, the new sliding gate was set into place, while massive amounts of concrete were poured on the opposite side of the road to harden that area.

By December 7, 2005, Cambria had a new dam, better than anything that had been built in its more than 161 year history. There was no fanfare, no brass bands and no ribbon cutting ceremony. The roadway across Cambria's new dam was simply opened, almost as if nothing special had occurred, and traffic began to pass through town as it always had. The total cost of

the new Cambria Mitigation Dam project amounted to $1,258,585. Of this amount, FEMA's funding share was $943,939.

The first test for Cambria's investment came during the heavy rains and flood of 2008. As in the flooding and resultant dam burst in 2004, there were high winds and torrential, horizontal rains; large amounts of debris began to clog the huge grates on Cambria's new dam.

DPW Director Tietz credited the turnout of a large group of citizens and volunteer firemen, all armed with long rakes and the use of a mini-excavator from one of the canneries, with helping to save the new dam by removing the gathering debris from the outlet grates.

The new perimeter weir overflow system provides an outlet for Tarrant Lake waters. Debris gates over openings on the sides facilitate easier removal of debris. The perimeter weir design helps prevent pressure on the dam itself during high water by allowing the water to pass through the concrete structure. Photo: Barbara Ellis, FEMA

In addition to human intervention during the storm of 2008, the design of the new dam helped to prevent a repeat of the 2004 washout. A *weir dam*, also called a perimeter weir overflow system, it is composed of a large concrete box (weir) constructed perpendicular to the old dam with openings on all sides into which the water flows from the lake under the road through the dual box culvert. The openings are covered with debris guards. This design reduces water pressure on the earthen berm dam.

A dual box culvert provides an outlet for Tarrant Lake under the highway and into Duck Creek in Cambria, Wisconsin.
Photo: Barbara Ellis, FEMA

Success this time resulted from a combination of their mitigation project's new technology along with the diligence of local residents and first responders. They avoided another disaster like the one Cambria witnessed in the summer of 2004. Town Clerk Frank exclaimed, "If we hadn't gotten the new dam, the road would have been gone again."