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PLANNING FOR EMERGENCIES:

LESSONS LEARNED FROM SILVER LAKE

By TERESA A. SCHWALBACH, PEM

In the event of a dam failure, emergency responders play a vital role. The author – Emergency Management Coordinator for Marquette County – recounts how an updated emergency action plan and ongoing communications between responders and dam owners contributed to a successful response by emergency personnel during the 2003 Silver Lake dam failure in Marquette County, Michigan.

The Silver Lake Basin is a 33,500 acre-foot storage reservoir in Marquette County, Michigan, near the headwaters of the Dead River in the Upper Peninsula. It is owned and operated by the Upper Peninsula Power Company (UPPCO) and is used to augment flows for power generation at UPPCO's two downstream hydropower projects, 4.4-MW Hoist and 8-MW McClure.

On May 14, 2003, the fuse plug spillway in the Silver Lake Dam failed, unexpectedly releasing nine billion gallons of water. Thanks to an updated emergency action plan and a coordinated response on the part of the dam's operators, local officials, emergency personnel, media, and other state and federal agencies, no lives were lost and no major injuries occurred. Several lessons learned during the Silver Lake incident can be useful to other dam owners in the event of a dam-related emergency.

THE IMPORTANCE OF PLANNING FOR EMERGENCIES

In our professional and personal lives, we know the importance of planning ahead; in emergency or disaster situations, it is crucial. The truth of this statement became clear on May 14, 2003 in Marquette County.

During the previous week, 4 to 5 inches of rain fell in a 48-hour period. Although considered normal for this time of year, this significantly high amount of rainfall – combined with 60-degree temperatures and a greater-than-normal frost depth of between 8 and 9 feet – created an unusual situation. On May 14, 2003, the earthen dam dike, also known as a fuse plug, at the Silver Lake Basin in Champion Township failed, causing a rapid spill of the basin, which held more than nine billion gallons of water. The 7.7-foot-tall concrete overflow spillway at this same location stayed intact.

FIGURE 2: Roads were washed out along the Dead River water system.

FIGURE 3: When the fuse plug in Silver Lake Dam failed, more than nine billion gallons of water unexpectedly rushed out of the reservoir and over Hoist Dam. No lives were lost and no major injuries occurred – thanks to an updated emergency action plan and a coordinated response of the part of all involved.

Silver Lake Dam is part of the Dead River Basin water system, which is approximately 25 miles long. The Silver Lake impoundment structures consist of the main earthen embankment, which incorporates a low-level outlet structure and a concrete overflow spillway, and four detached embankments (dikes) that fill low points in the reservoir shoreline near the main dam. Dike No. 2 was removed in September 2002 and was reconstructed as a fuse plug section to increase spillway capacity for extreme flood events.

The system features downstream of Silver Lake Dam include four other dams:

- Hoist Dam, a 3,674-foot-long, 63-foot-high concrete dam, impounds 31,563 acre-feet of water.
- McClure Dam – 51.4 feet at its highest point – impounds 1,832 acre-feet of water. It consists of various concrete structures and a penstock that leads to a 40-foot-high surge tank and a two-unit 8-MW hydro powerhouse.
- Forestville Dam, a 62-foot-high cyclopean masonry structure capped with concrete, impounds 2,943 acre-feet of water at normal pool level.
- Tourist Park Dam – which includes an intake and adjacent retaining walls, two flanking earth embankments, and a spillway consisting of two sections – impounds 600 acre-feet of water.

Once it became clear that the fuse plug had failed, the Upper Peninsula Power Company activated its emergency action plan (EAP), contacting my office, Marquette County Emergency Management, as one step in the implementation. In the event of an emergency or disaster situation, it is my responsibility to activate the county's emergency operations plan, alerting county officials and emergency personnel to the event and asking them to report to the county's Emergency Operations Center for a briefing. These decision makers then assess the situation and develop a plan of action.

In any disaster or emergency in Marquette County, the emergency management coordinator consults with the chair of the County Board of Commissioners to determine whether the event requires notification of personnel and resources (known as activation of the Emergency Operations Center, EOC). The chair of the County Board of Commissioners makes the determination if a local state of emergency should be declared. Depending on the size of the event, the number of people called to the center ranges from ten to 30. In the case of flooding, the county's Emergency Operations Plan, which contains 11 annexes, defines the roles and responsibilities of each discipline (law enforcement, fire, EMS, public works, damage assessment, public health, human services, communications, direction and control, public information, and warning) and provides guidance on how to proceed.

About 4:20 p.m. on May 14, 2003, the director of the Marquette County Road Commission received a call from

an employee, forwarding a citizen's report of high water at one of the county bridges over the Dead River about 2.5 miles downstream of Silver Lake. Five minutes later, the employee confirmed this report. At 4:33 p.m., the Marquette County Road Commission contacted Upper Peninsula Power Company and the Marquette County Central Dispatch Center (911). At 5:13 p.m., the power company activated its EAP as condition "A" (imminent failure). Utility personnel arrived on site about 6:40 p.m. and reported to their supervisors that the fuse plug had washed out. At that time, the reservoir level was at 1,483.26 feet. Based on records of reservoir elevations, the utility estimated that discharge from the reservoir was occurring at about 15,000 cubic feet per second (cfs). By 8:45 p.m., the reservoir level had dropped below the base of the fuse plug. Discharge peaked at almost 28,000 cfs at about 10:30 p.m.

Some four hours later, on May 15, 2003, at 2:20 a.m., the utility reported 3 feet of spill over the Hoist Dam, which is about 18 miles below Silver Lake. Due to concerns about the possible failure of the Hoist Dam, portions of the city of Marquette, Michigan, were evacuated. Peak elevation at Hoist Dam occurred at 9:00 a.m. on May 15, with water spilling over the dam at about 8,000 cfs. Peak elevation at McClure Dam, 3 miles below the Hoist, occurred at 2:00 p.m. that day. At 2:00 p.m., Tourist Park Dam, located approximately 4 miles below McClure and near the mouth of the Dead River, and owned by the Marquette Board of Light and Power Company, overtopped and failed. WE Energies' 617-MW Presque Isle coal-fired power plant that provides electrical power to most of the Upper Peninsula, situated at the mouth of the river, was flooded with 4 feet of water and became non-operational.

VALUE OF TESTING EMERGENCY PLANS

Every three to five years, Michigan dam owners test their emergency action plans by creating a realistic scenario in which participants play parts and give input on what works and what doesn't. The dam owner then corrects any deficiencies in the plan.

As fate would have it, a flood scenario similar to the May 2003 event had been tested in 1998 during a "functional exercise" with dam operators, local officials, emergency management personnel, emergency response personnel, media, and state and federal agencies who would be responding to a dam breach.

FIGURE 4: The dam failure at Silver Lake caused some $100 million in damages to homes and businesses, roads, and bridges, fisheries, soils, trees, public infrastructure, and the community's economy.

The 1998 exercise was planned by representatives from Upper Peninsula Power Company and emergency management personnel from Marquette County. This exercise involved approximately 50 to 60 emergency response personnel, including various groups from the National Weather Service, the local news media, and human service agencies (American Red Cross, Salvation Army, etc.). The exercise scenario consisted of a breach of the Hoist Dam and subsequent flooding. Emergency personnel were presented with a series of problems and asked to develop a course of action. Of course, some of those who participated said it would never happen …but it did, just not to the extent if one of the bigger dams had breached. However, because of the exercise, all participants knew what their roles were and went to work.

We also came through a major flooding event with no loss of life or major injuries. The event caused some $100 million in damages to roads and bridges, fisheries, soils, trees, public infrastructure, homes and businesses, and the community's economy.

It has not yet been determined if the Silver Lake fuse plug will be replaced. For details about the cause of the failure, see the August 2004 issue of Hydro Review, Dam Safety and Security Department, "FERC: Fuse Plug Not Suitable for Silver Lake Dam."

ROLE OF EMERGENCY MANAGEMENT COORDINATORS

Emergency management coordinators play an important role in your community. If you do not know who they are, you should find out. They are your contact if something happens in your community that you are not equipped to handle. In Michigan, the Emergency Management Act, Public Act 390 of 1976, as amended, created the Emergency Management Division within the Michigan State Police. Each county is mandated to have an emergency management program in place. That is where local emergency management coordinators come into play. It is the role of an emergency management coordinator to work with the public and private sectors to plan, train, and exercise for such emergencies.

What does that mean? Emergency management coordinators work to develop emergency action guidelines, plan and implement training for those who will assist during an event, and test or exercise those plans. By doing this, deficiencies can be identified and corrected prior to a disaster. This also enables representatives of public and private agencies to get to know each other and become familiar with what their roles are ahead of time. Emergency management coordinators also provide community outreach programs to educate the public on emergency preparedness.

Check with the emergency management office in your state, county, or province to find out if your community has an emergency management program in place.

LESSONS LEARNED

During the May 2003 flooding event in Marquette County, Michigan, lots of lessons were learned. These included:

- The dam owner's emergency action plan is vital;
- Coordination with all involved is key;
- Accurate inundation maps are invaluable;
- "Exercising" an emergency action plan is a must;
- Provide as much real-time information to the public as possible;
- Prevent "turf wars" from occurring;
- Include representatives from both the public and private sectors in the Emergency Operations Center during the emergency; and
- Organize town hall meetings and news conferences during an event.

Upper Peninsula Power Company's EAP was vital. Each year, this plan is updated and, if necessary, corrected. Copies are sent to all emergency service agencies, along with a copy to

the central dispatch center (911). The plan also is filed in the county of Marquette's emergency management office. The existing EAP program provided the means to effectively pre-plan for an emergency.

Coordination with all involved was the key. Coordinating and planning for this type of event ahead of time saved precious time in evacuating residents. Everyone knew what to do, and getting the necessary personnel and equipment to flooded areas was not delayed. For instance, at the onset of the event, emergency personnel were staged ahead of time in one of the local townships near one of the bridges threatened by high waters. The bridge was blocked off. No one was allowed to cross the bridge until the waters receded. This particular township lost power, which meant no communications. By coordinating with local law enforcement, EMS officials were provided 800 MHz radios to allow them to keep in contact with the county central dispatch center to be able to provide emergency services, if needed.

Inundation maps were invaluable and accurate. The EAPs for the Silver Lake, Hoist, and McClure dams all included inundation maps of those sites, developed by Upper Peninsula Power Company. These maps allowed personnel in the Emergency Operations Center to see where the waters would peak so that they could determine evacuation routes. It helped to have these maps ahead of time instead of waiting for someone to bring them to the center or have them developed.

The emergency response was significantly improved because of the exercise (test) in 1998. Exercising your plan is a must. Don't let your plan collect dust on a shelf. By exercising or testing your plan, staff in your organization will know what they have to do. And emergency response agencies will have better knowledge of what to expect from you, and you from them, if an event should occur. Your emergency management coordinator is a good source for emergency preparedness and resource information. This person can also help develop an exercise training program.

Real-time information helped the public. Our county and city information technology personnel provided real-time information via county and city internet sites. Information on the flooding event also was located on other local, state, and federal internet sites, including sites managed by the utility, the State of Michigan, and the National Weather Service. These sites specified the shelter sites, evacuation routes, length of evacuation, where to take pets,

times of news briefings, pictures of sites, etc. The county public information officer also met with the power company and other agencies to make sure information provided to the public was accurate.

There were no "turf" issues during the event, which made the process run smoothly. Being able to work together in an event is very important, and maintaining a good rapport with each other prior to the event is the key. Granted, not everyone gets along and we all have our "space" we defend, but in an emergency event, working together is essential. In Marquette County, all agencies (law enforcement, fire, EMS, etc.) have good rapport with one another and meet regularly to keep updated on services each can provide.

Having representatives from both public and private sector in the Emergency Operations Center was a ***must.*** Our county found that, by having a representative from each of the local power companies, the National Weather Service, the U.S. Army Corps of Engineers, the Department of Environmental Quality (DEQ), the Department of National Resources (DNR), and the Central Lake Superior Watershed Partnership in the EOC, we were able to receive regular updates on water elevations, power outages, and how much debris was coming down the river. This allowed the decision makers to provide emergency personnel with necessary local, state, or federal resources.

Since our Emergency Operations Center is in the basement of the Michigan State Police Post in Negaunee, Michigan, some minor communication issues with cellular telephone usage were identified and corrected by installing an antenna outside the building specifically for cell phones to boost power. Our county law enforcement agencies are currently using the 800 MHz radio system, which allows better communication throughout the county. This system operates on microwaves; if the telephone system goes down, it is still operational.

Town hall meetings and news conferences were important. During this event, two town hall meetings were organized and conducted by Upper Peninsula Power Company. This allowed residents to directly question local, state, and federal representatives. News conferences were broadcast daily on a local cable access channel as well as during the evening news on the local television station, WLUC-TV6. Many residents were concerned that the Hoist and McClure dams were going to fail. The broadcasting of these news conferences dispelled many of those rumors.

WHY EAPS WORK

The importance of testing your EAP and working with your local emergency management personnel is crucial. We recommend testing your EAP every three to five years with either a tabletop exercise (roundtable discussion) or functional exercise (play the game). When updating your EAP, meet with your emergency management coordinator face-to-face on an annual basis. To find out who the emergency management coordinator is in your area, contact your state or provincial emergency management office or local law enforcement agency. By doing that, you will know what his or her role is in an emergency and what is expected of you.

As an emergency management coordinator, I cannot stress enough the importance of planning ahead for an event.

- Don't assume that, since you live in a small community or don't have any major infrastructure, nothing will happen. It will. It doesn't have to be a terrorist or weapons of mass destruction type of event. It could be a power failure, tornado, or an earthquake.
- Be prepared and get to know the emergency response personnel in your area.
- Become a member of a local committee that these people attend. You will find that if you do have an event, the advantages of working with someone with whom you are acquainted will be apparent.

THE AUTHOR

Teresa A. Schwalbach, PEM
Emergency Management Coordinator
Marquette County Emergency Management
180 U.S. Highway 41 East, Negaunee, MI 49866
Office: 906-475-1134 • Fax: 906-475-9927
tschwalbach@mqtcty.org

Teresa Schwalbach is the Emergency Management Coordinator for Marquette County. She has worked in the public sector for 30 years and in emergency management for the past 16 years. She has received her Professional Emergency Management certification through the State of Michigan and is currently working on getting her BS/BA degree through Central Michigan University. She plans to go on and earn national certification as a Certified Emergency Manager. She coordinated the team of local, state, and federal agencies participating in the emergency response activities during the Silver Lake flood event. As a result, she wrote an article for the Hydro Review on the flooding event and the value of planning for emergencies and testing emergency plans.