

# HAZARD MITIGATION ACTIVITIES INVOLVING DAMS

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**Abstract.** In July 1994, Tropical Storm Alberto came ashore in Georgia dumping large amounts of rain and creating flooding situations over a large portion of the state. Thirty-one people lost their lives, hundreds of dams failed, three interstates were shut down, numerous bridges were destroyed, and thousands of people were left homeless. Tropical Storm Alberto became the worst natural disaster ever for Georgia.

Alberto tested many facets of government including floodplain management and emergency preparedness. Communities were able to judge their effectiveness in emergency preparedness and their need for improvements. In the two years since Alberto, some agencies and communities have made progress in certain areas. However, others made no changes.

This presentation will provide an overview of the aftermath of Alberto. Significant damage resulted from the flooding and dam failures. The awareness of dams and their associated floodplain issues has increased. Alberto provided everyone an opportunity to learn many lessons. Often though many lessons are not learned and we will experience some of the same problems with the next major storm.

FEMA has worked closely with the Georgia Safe Dams Program to rebuild many of the dams damaged or destroyed during Alberto. Our joint efforts have emphasized hazard mitigation from future flooding. This presentation will discuss the mitigation efforts and lessons learned from Alberto.

## INTRODUCTION

Georgia experienced one of its worst disasters on November 7, 1977. Thirty-nine people were killed that night when the Kelly Barnes Dam in Toccoa failed. This was at a time when several other significant dam failures had occurred across the nation. The most notable of these failures was the Teton Dam failure that took the lives of eleven people. The Kelly Barnes Dam (also known as the Toccoa Dam) became just as infamous when it failed. It was declared that steps would be taken to ensure an event like this would never happen in Georgia again.

The Safe Dams Program was created in 1978 as a result of the Kelly Barnes Dam failure. This program was created to inspect and permit certain dams in order to protect the citizens of Georgia by reducing the risk of dam failures. The legislature established the Safe Dams Act which defines a dam as a structure at least

twenty-five feet tall or one capable of storing at least 100 acre-feet of water. It was mandated that an inventory of all dams in the state would be developed. Those dams that pose a risk to residents downstream would be regulated with respect to construction and maintenance standards. These dams are classified Category I or high hazard. Any dam that does not pose a threat to citizens downstream shall be classified as Category II. All Category II structures shall be re-inventoried at least once every five years to verify that the hazard classification is still valid. Minimum design standards were also established for Category I dams. A permit is required to construct and operate a Category I dam. The plans for these dams must be developed by an engineer and reviewed and approved by the Safe Dams Program.

There are currently over five thousand dams on inventory. Approximately three-hundred and fifty of these dams are classified as high hazard. The number of high hazard dams is increasing on an annual basis as homes continue to be built below dams. There are between five and ten Category I dams added to the inventory each year. This number will continue to rise as Georgia's population grows.

The Safe Dams Program is like many other government agencies. The workload is increasing annually while the staff level remains the same or drops. This can be a cause for concern when the issue of public safety is considered.

## TROPICAL STORM ALBERTO

The Safe Dams Program's effectiveness was put to the test on July 5, 1994 when Tropical Storm Alberto caused widespread flooding throughout southeast Georgia. Estimates are that twenty-six inches of rain fell within a twenty-four period in the town of Americus. Fifteen of the cases of lives lost were in the Americus area. Other areas of the received rainfall on amounts comparable to the 300 year and 100 year storms.

This amount of rain caused significant problems for dams. There were over two-hundred and thirty dams that failed. These dams ranged from small farm ponds to the Lake Blackshear Dam. Only two of the dams that failed were regulated under the Safe Dams Act. One of these dams had yet to be brought into compliance. It was anticipated that the second structure would fail.

The above statistic suggests the Safe Dams Program is

effective. After reviewing the lessons learned, it appears that there is a plenty of room for improvement. Some of these lessons learned are discussed in detail in the following section. Actions taken will also be discussed.

## LESSONS LEARNED

The following lessons learned are presented as the viewpoint of the author based upon his experiences. These lessons are not in any specific order.

### **Staff level**

Tropical Storm Alberto demonstrated that additional staff is needed with the Safe Dams Program. This will allow the program to keep up with continual development downstream of dams potentially impacting the classification. A quicker turnaround on the permitting process would also be feasible.

### **Dam definition**

A significant number of the dams that failed did not meet the size criteria of the Safe Dams Act. Therefore, many dams were not regulated even though they posed a hazard to someone downstream. The Safe Dams Act originally listed a dam as twenty-five feet tall or fifty acre-feet. In the mid 1980's the fifty acre-feet was changed to 100 acre-feet.

### **Emergency action plans**

Emergency Action Plans (EAPs) are currently not required for Category I dams. During Alberto it became apparent that dam owners did not know what to do when a problem occurred with their dam. The Safe Dams Program found itself becoming more proactive in anticipation of situations. The staff spent most of July 5th and 6th going to Category I dams to verify conditions as opposed to responding to situations as they developed. This created a situation where time spent needlessly.

The owners also did not know who to call. Most of the owners called their local emergency management agency and not this office. In some cases valuable time was lost in getting the information to the Safe Dams Program. In one case, it was two days later before the owner called to notify us that his dam had failed. Fortunately, that information had already been verified.

Emergency Action Plans are now going to be required on all high hazard dams. Some of the Safe Dams staff have been trained by FEMA with respect to Emergency Action Plans. This training will be passed along to dam owners in 1997.

### **Drinking water reservoirs**

Several communities were impacted by Tropical Storm Alberto when their drinking water supply reservoir failed or was severely damaged. In recent years it has been the policy of the Environmental Protection Division to review the plans for all new drinking water reservoirs as though they were Category I dams. The drinking water reservoirs that had been reviewed by the Safe Dams Program suffered minor damage if any at all. Those drinking water reservoirs that were severely damaged or failed

had not been reviewed.

It will continue to be the policy of the Environmental Protection Division to review the plans for drinking water reservoirs. There is a proposal to modify the Safe Dams Act to include all drinking water reservoirs.

### **Complete inventory**

The rain had not stopped when the requests from the media started being received. One of the more often asked questions was how many dams are being impacted. The Safe Dams Program has a computerized inventory which facilitated quick response to these questions. However, it quickly became evident that the information was not complete.

The Safe Dams Program relies upon written notice, visual observation, and information provided by other government agencies to locate new dams. Several dams were discovered as a result of Tropical Storm Alberto.

The Safe Dams Program is currently reviewing ways to stay informed on the construction of dams. This includes educating local government agencies about the Safe Dams Act and working through them to gain this information.

### **Design storm**

The Safe Dams Act establishes minimum spillway criteria based upon the Probable Maximum Precipitation (PMP). The size of the dam dictates the percent (25, 33, 50, or 100) of the PMP the dam must handle safely. In Georgia, the PMP is around 30.5 inches in 6 hours. It is often difficult to convince people that rainfall of this magnitude is possible.

Tropical Storm Alberto demonstrated that rainfall of this intensity is possible. Many people now realize that rainfall on the order of 7.6, 10.2, 15.3, or 30.5 inches can occur.

### **Spillway standards**

Around forty Category I dams were impacted by this storm. Several of these dams suffered damage. In general, the larger the spillway capacity, the less the damage. Dams with a spillway design capacity of 25% of the PMP are damaged by storms of much less intensity than Tropical Storm Alberto. Since 1990, there have been at least three occasions where there was enough rain to impact these dams.

Consideration is being given to raising the minimum design spillway standard to 33 % of the PMP.

### **Real time weather information**

The National Weather Service has always cooperated with the Safe Dams Program. This was true during Tropical Storm Alberto. Unfortunately, the information they were able to provide was rainfall that had already fallen. Sometimes, this information was not available for six hours after that reporting time frame. It became clear that real time weather information is needed. The ability to estimate the amount of rainfall for a certain area will provide additional time.

The Safe Dams Program is currently developing a pilot project to set up early warning systems at a select few of the Category I dams. These systems will provide information such as a sudden

rise or drop in lake level to the local emergency management agency and the Safe Dams Program. This will then allow the local emergency management personnel and the Safe Dams Program to respond to adverse situations quickly. If this pilot project is successful, it will be implemented throughout the state.

#### **Inclusion of roads as a hazard**

Some states classify roadways as a potential hazard downstream based upon traffic counts. Georgia does not consider roads as a potential hazard.

It is believed that three of the deaths that occurred in the Americus area were the result of a roadway being washed away from a dam failure. There are other cases where the failure of a dam may have contributed to the failure of the dam.

#### **Improve awareness**

During Tropical Storm Alberto, the Safe Dams Program worked closely with many local emergency management agencies. It became obvious that some local emergency management officials were not familiar with the Safe Dams Program nor what if any dams they had in their county.

A presentation was made at the Emergency Managers Association of Georgia last year to educate these officials about the Safe Dams Program. Additional presentations are being planned.

#### **Good Samaritan Law**

As the rest of the nation started hearing about the impact Alberto was having on Georgia, the Safe Dams Program began receiving calls from other states offering assistance. This assistance was not accepted due to a concern over liability. This additional assistance would have made a drastic difference in how the entire emergency response situation was handled.

A mutual aid agreement is now setup between the southeastern states. The potential for calling upon the resources of the local engineering community is also being explored.

#### **Interagency assistance**

Several situation arose that were beyond the capabilities of the Safe Dams Program. Working through FEMA, the Safe Dams Program was able to call upon the resources of the United States Army Corps of Engineers, the Georgia National Guard, and Georgia's Forestry Service to name a few. Equipment, personnel, and technical advice were provided as needed.

Time was often wasted while trying to determine who had what resources. Advance planning is needed so that available resources can be determined. This will help reduce or eliminate wasted time in the future.

### **CONCLUSION**

Tropical Storm Alberto provided the Safe Dams Program a chance to evaluate itself. No lives were lost as a direct result of dams failing. Since the Toccoa failure and its tragic story, Georgia has been fortunate not to have any dams fail and kill

someone. If there is to be any hope of this continuing, then the lessons experienced during Tropical Storm Alberto should be a wake up call.

Hazard mitigation efforts need to include dams. Everyone needs to become better informed about dams and their potential impact. Failure to do so could result in another disaster like Toccoa.