

# **Virginia Soil and Water Conservation Board Work Group Meeting**

USDA Natural Resources Conservation Service Conference Room

1606 Santa Rosa Road, Suite 209

Richmond, Virginia 23229

October 20, 2005

10:00 am

## **Discussion of an Alternate Procedure for Existing Dams**

**Background** - At the May 19, 2005 meeting of the Virginia Soil and Water Conservation Board, the Board unanimously passed a motion that accepted the report of the Ad Hoc Dam Safety Study Committee and directed the Department of Conservation and Recreation staff to provide further information regarding two key regulatory alternatives at their July meeting.

At the subsequent Board meeting on July 21, 2005, the Department presented six key recommendations to the Board for their consideration. One of the six recommendations developed stated “[t]hat the Board Chairman and Department Director assemble a special Board chaired workgroup composed of staff and a subset of the Ad Hoc Dam Safety Study Committee to develop a draft regulatory concepts (strawman) document for consideration by stakeholders and the interested public during the subsequent public review process following the NOIRA public comment period”.

The Ad Hoc Committee report further specified that for Alternative #2, which recommended that the Board provide an “Alternate Procedure for Existing Dams” which allows spillway design floods (SDF) less than the PMF in cases where there would be no significant increase in downstream hazard, that the Board consider the following point:

“C. When considering spillway capacity for existing dams that are in a size and hazard classification currently requiring passage of a full PMF, the SDF would be presented as a range from ½ PMF to PMF for existing dams (statutory bounds). The selection of SDF would default to the full PMF, but could be considered for downward adjustment based upon the owner’s historic compliance with regard to all other dam safety requirements and taking into account meaningful site specific factors, such as:

- maximum depth and duration of overtopping
- robustness of the dam’s construction
- potential structural/operational changes
- number and type of structures and transportation corridors in the inundation zone
- number of people at risk
- flood wave travel time to impact areas
- simplicity or complexity of evacuation provisions
- existence of a well coordinated and regularly exercised Emergency Action Plan
- public education program

- flood recurrence and frequency data for relevant nearby streams
- likelihood of prior flooding from other nearby streams or rivers affecting the inundation zone
- other possible site-specific factors relating to the level of risk, potential impacts of a failure and mitigating circumstances.

This listing is not intended to be comprehensive, but rather to be indicative of the types of information and analysis that may be required for this process.”

“In no case would the spillway design flood be reduced to less than ½ of the PMF (except as is considered acceptable based on 4VAC50-20-130 B [an incremental analysis]).”

- **THE DEPARTMENT AGREES AND RECOMMENDS THAT AFTER AN APPLICANT COMPLIES WITH BASIC PROGRAM PROVISIONS IN SECTION 4 VAC50-20-50 AND TABLE 1, AND AN INCREMENTAL ANALYSIS HAS BEEN PERFORMED AND THE SDF STILL EXCEEDS ½ PMF (AND ANY REDUCTIONS HAVE NOT EXCEEDED 25% OF THE PMF), THAT FOR CLASS 1 AND 2 HIGH HAZARD DAMS, THAT AN ALTERNATIVE PROCEDURES PROCESS BE DEVELOPED BY REGULATION WHICH MAY BE CONSIDERED WHERE THERE WILL BE NO UNREASONABLE HAZARD TO LIFE AND PROPERTY.**
- **FURTHERMORE, AS RECOMMENDED IN THE AD HOC COMMITTEE REPORT, THE DEPARTMENT STAFF WILL WORK WITH A SPECIAL BOARD CHAIRED WORKGROUP TO DEVELOP A DRAFT REGULATORY CONCEPTS (STRAWMAN) DOCUMENT FOR CONSIDERATION BY STAKEHOLDERS AND THE INTERESTED PUBLIC DURING THE SUBSEQUENT PUBLIC REVIEW PROCESS.**

**Committee Selection** - As agreed to by the Board, the Chairman and Director requested the following individuals serve on the workgroup:

Susan Taylor Hansen – Workgroup Chair and Virginia Soil and Water Conservation Board Member

David B. Campbell, P.E. – Director of Dam Engineering, Schnabel Engineering

Joseph S. Haugh, P.E. – Retired, USDA Soil Conservation Service; Department of Conservation & Recreation, Dam Safety Director

Mathew J. Lyons, P.E. – State Conservation Engineer, USDA, Natural Resources Conservation Service

John W. Peterson, P.E. – President/CEO KEMPS Consultants, Inc.

William G. Browning – Department of Conservation and Recreation, Director, Dam Safety and Floodplain Management Division

James M. Robinson, P.E. – Department of Conservation and Recreation, Manager, Dam Safety Program

Dianna C. Sheesley, P.E. – Department of Conservation and Recreation, Regional Dam Safety Engineer

**Workgroup Charge** – Based on the direction received from the Board, the Department prepared the following work group charge: “develop a list of concepts for high hazard dams that could be used as criteria by the Department when considering a dam owner’s request for an alternative means to lower their dam’s spillway design flood (SDF). During an upcoming regulatory process the concept list will be considered by a technical advisory committee as potential regulatory changes to the Virginia Soil and Water Conservation Board Dam Safety Regulations.”

In an effort to guide the workgroup’s discussions and to assist them in carrying out their charge, the Department developed a series of questions for the work group’s consideration:

- “How would the selected criteria promote the safe operation of the dam from normal operation activities up to and including the Spillway Design Flood?
- What additional economic impact to lives, property, transportation systems, utility infrastructures, etc. downstream of the dam would be allowed by the selected criteria?
- Under what process or circumstances would the dam owner be able to utilize the selected criteria?
- What amount of historic compliance should the dam owner need to demonstrate? How, if at all, should this apply to new dams?
- Should these selected criteria require the dam owner to provide an extra measure of insurance in case of an emergency situation? How readily available is such coverage?
- What should be included in the Emergency Action Plan above what is already required?”

**Meeting Results** - Susan Taylor Hansen, Workgroup Chair, welcomed the work group and asked for self- introductions. John Peterson was in New England but participated by telephone during the morning portion. There were eight members of the work group, four representatives of the Lake of the Woods Association, David Dowling, DCR’s Policy, Planning and Budget Director, and a reporter from the Free Lance-Star newspaper in attendance (list available upon request).

Ms. Hansen read the Workgroup Charge and indicated that this is the formative phase of a process that will take 1.5 to 2 years. She emphasized that the alternative approach would need to maintain the same level of safety and that an adjustment to the level of risk would not be considered. Ms. Hansen noted that the meeting goal was to discuss specific criteria and determine what factors could be considered and recommended to the Virginia Soil and Water Conservation Board (Board) that would allow dam owners to lower their

Spillway Design Flood (SDF) requirement without diminishing the safety considerations required of the dam.

Ms. Hansen asked Dave Campbell to define SDF in generic terms, which he described as a maximum flood event based on hazard classification.

Ms. Hansen reviewed questions for consideration in carrying out the Workgroup Charge then began the discussions regarding the specific factors listed under Alternative 2 of the Ad Hoc Committee Report. The workgroup's thoughts on the questions were as follows:

Maximum depth and duration of overtopping: The workgroup recognized that earthen dams have spillways designed to erode, generally no overtopping of earthen dams is considered appropriate or safe, and some have overtopped and have not failed. Accommodating overtopping will change the level of safety (not considered by this Workgroup). The focus is on what is happening downstream of the dam. If damages have already occurred downstream prior to a dam failure, then the failure of the dam may not cause any additional loss of life or property damage. If overtopping is allowed, only theoretical analysis would take place since the circumstances and consequences of flow over the dam could range from minimal erosion damage to catastrophic damages. Federal standards require freeboard between the top of dam and the maximum SDF water surface elevation. The group agreed that this factor could not be considered.

Robustness of the dam's construction: The workgroup recognized that how well a dam is designed and constructed, and the embankment's resistance to erosion, are fundamental to the ability of a dam to pass a significant storm event. It was noted that during Hurricane Katrina, overtopping of the levees provided a good example that those levees were not designed for overtopping, thus they failed and caused major death and destruction. Most earth-fill structures will fail during overtopping. Emergency spillways are expected to erode some and repairs would be necessary after significant storm flows. Water retaining embankments are considered engineered devices or appurtenances that may increase the safety of the dam. Maintenance must be committed to prepare the dam for flood events. Deterioration does occur and repairs must be made. High hazard dams concentrate on the SDF requirements. The embankment is expected to remain sound during the life of the structure; however, some structures do get worse over time due to factors associated with soil settlement, poor compaction, lack of adequate maintenance, etc. Metal pipes used to pass water through a dam will deteriorate and have to be replaced. The workgroup recognized that this factor is already generally applied in the Dam Safety Program and does not offer any new opportunity for consideration.

Potential structural/operation changes: The workgroup recognized that some judgment calls are made throughout the life of a project whether under normal or storm conditions. Owners may choose to apply changes prior to certain storm events such as lowering the reservoir substantially or modifying gate operations to pass the SDF with clear evidence that adequate resources and enforcement are available. Reliability must be assured and it's likely that many dam owners would not have resources to fulfill such a requirement. Small drainage areas are more likely to be flashy while large drainage areas would

require tropical storms to apply maximum pressure. Permanently lowering the reservoir could result in increasing the storage potential of a dam; however, this option is usually not esthetically accepted. The workgroup concluded that this was not a viable approach in Virginia. Roller-compacted-concrete has been placed at some earth dams that provides protection from overtopping. Some areas have considered “Fuse plugs” that are designed to fail under a designed pressure loading. When the fuse plug washes out it increases the ability of the dam to pass flow through the dam. Owners should have their engineer determine changes that would be more efficient and there must be certification that there would be adequate staffing and resources. The question was asked, could there be one proposal that would be accepted associated with a tropical storm and the general answer was yes but limited in Virginia. Tropical storms are wide spread and many of the watersheds upstream of dams in Virginia are small and would be impacted by the large intense storms as well as the localized thunderstorms that can generate lots of precipitation over the area of most watersheds. This factor was not considered favorable for general use by the workgroup.

Number and type of structures and transportation corridors in the inundation zone: The workgroup stated this factor would only be allowed if the allowance for levels of risk is considered. Katrina showed how good plans for evacuation do not automatically work. Evacuation plans are necessary but not everything is predictable. NOAA developed the PMF standards and engineers apply the standards in their designs. Better procedures are available; such as, flood proofing structures, elevating property, and floodwalls may reduce or remove the risk to lives and property. Zoning approaches may be useful. Changing of road culverts downstream has in a few cases reduced the risk below dams. NRCS has the ability to purchase easements below dams although they have yet to buy any. These are all good strategies that currently exist to potentially reduce dam hazard classification and that do not require regulatory amendments or the development of an alternatives analysis to implement.

Number of people at risk: Concerns were expressed about the loss of a single life as well as multiple lives. This factor is not likely to be used.

Flood wave travel time to impact areas: It was noted by the workgroup that the amount of time available for communication of a danger and the resulting evacuation of the inundation zone is the determining factor. Dam owners must present dam break inundation zone maps that demonstrate potential impacts. Hazard classification is determined by what is downstream of the dam. If no change in risk is allowed, the factor is not useful.

Simplicity or complexity of evacuation provisions: It was recognized that Virginia’s Emergency Action Plan (EAP) requirements are simple and basic and currently do not comply with federal guidelines. It was stated that Virginia needs to come in line with the federal regulation requirements and require a more detailed EAP. The Workgroup recommended improving the standards of the EAP during the regulatory process; however, Class III dams may not be required to meet the improved process. The

workgroup felt that the use of an EAP does not provide a counter-balance for design and suggested that this factor should not be used to lower a SDF.

Existence of a well-coordinated and regularly exercised EAP: The workgroup reiterated their recommendation for an upgraded EAP process and suggested inclusion of a requirement to handle a test of the EAP procedures as part of any enhanced requirements.

Public education program: The workgroup noted that this is not required in the EAP or expected through the community. There should be an effort to notify the public of actions that should be made and this should be added to the EAP requirements.

Flood Recurrence and frequency data for relevant nearby streams: It was recognized that the existing data may not take into account future changes. Update analysis can be done already. The placement of a dam upstream of an existing dam may reduce inflow to the lower dam. The workgroup did not find this factor to be useful as an alternative procedure.

Other possible specific factors: It was noted that during a hazard assessment and establishment of the design SDF, that significant engineering judgment comes into play. The Regional Engineer reports to Headquarters and then the recommendations are passed on to the Board. Staff consideration for consensus occurs often. The workgroup was not able to come up with anything else, since many of the specific factors brought are already covered in the Regulations or used in current practice. Height and maximum storage capacity are prorated using Table 1 to determine the SDF where there is a range in storm events, using the higher of the two determinations. The elimination of ranges would make it easier for the engineer. The section 130 process was well written utilizing the idea that there would be no change to risk. Some states have used depths of flow on structures downstream of a dam during a dam failure to determine hazard classification.

After lunch, discussion was focused on specific potential factors that had been generated during the Ad Hoc Committee's work. Factors for specific consideration included:

1. EAP usage: EAP had already been discussed and it was decided that a recommendation to adopt the federal regulations would be made.
2. Controls on inundation zones below dams: This was determined to be a complicated issue. The state of Wisconsin claims to be able to control development below dams. Low hazard dams are more likely to see changes due to development downstream of dams that would result in a changed classification. Not likely to apply this as a factor.
3. I-Flows: Automated Warning System I-Flows transmit water levels and precipitation at the dam to a control center eliminating the need for a person the travel to the site. This does prevent the valuable visual interpretations that may help emergency coordinators make decisions. This is supplemental to an EAP and may cost \$20,000 each and require maintenance. This was not considered a useful factor to lower the SDF.

4. Emergency Spillway Velocity: This was discussed earlier and was not considered a useful factor to lower the SDF.

5. Dam overtopping: This was discussed earlier and was decided to not be acceptable for any earthen dam.

6. Dam construction with an impervious core: The general discussion was that one mistake in design or construction would allow a path for flow through a dam so the use or knowledge of a clay core was not significant to apply as a factor to lower the SDF. Some members expressed concern in any penetration of the earthen embankment therefore drilling core samples was discouraged. The factor was found not to be useful or applicable.

7. Maps and profiles: This was not considered upon reminder that no change in risk was allowed.

8. Compliance: It was recommended that this was not an alternative factor and should be addressed during discussions dealing with enforcement. Other states deal with penalties and fines that have demonstrated better success in those states to get dam owners to comply with state regulations.

Mr. Dowling emphasized two points. The first point was that the Board had directed the Department to consider legislative and budgetary actions to enhance law enforcement tools and to seek staff increases to address existing dam safety staffing shortfalls. He also noted that should an alternative process be developed, that the Board and the Department recognized that there would be a need for additional staff to address these new procedures. The second point articulated by Mr. Dowling was that the workgroup's discussions would be utilized as points of consideration during a much larger public process that would take place during the upcoming regulatory process. The publishing of a NOIRA will open the regulations and initiate a public regulatory process where a broad based group of individuals can participate in a technical advisory committee and express their viewpoints on this issue.

Ms. Hansen noted the need to prepare a document of the meetings accomplishments and her appreciation for the workgroup's efforts. She noted that the repair of dams and funding alternatives will be considered later and that it would be helpful to compile a list of other states that have funding mechanisms and possibly use as a starting basis. Pennsylvania and New Jersey are the most advanced states on the East Coast that provide funding.

Ms. Hansen requested staff to circulate a draft document to the workgroup participants for review and comments. Upon completion, the document would be provided to the Workgroup Chair and DCR Director Maroon.