

# **Department of Conservation & Recreation** **Division of Soil & Water Conservation**

## **Table Top Exercise**

**April 23, 2009**

**Presented by: Mark Meador, Ken Turner, P.E., Rob  
VanLier, P.E., & Kelly Ramsey, P.E.**



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# Show EAP DVD By ASDSO 3. EAP

## I. Presentation Contents

**A. Brief Definition of an EAP**

**B. Basic assumptions**

**C. Definition of Table Top Ex.**



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# Definition of an EAP

- **Formal Document**
- **Identifies potential emergency conditions at a dam**
  - **Accident at a dam or failure of a dam**
  - **Impending flood condition -- dam not in danger**
- **Specifies procedures to:**
  - **mitigate problems at a dam**
  - **for early notification**
- **Provides information for local emergency managers**



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# Basic Assumptions

- **EAP's are needed to provide early warning and notification of an emergency.**
- **Exercises are beneficial and worth the effort**
- **Dam owners and jurisdictions do not have equal emergency management capabilities and requirements.**



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# Basic Assumptions Cont'd

- **EAP exercise are part of a dam owner's commitment to improving the overall EAP program.**
- **The lack of an EAP may be interpreted as negligence on the part of the dam owner.**



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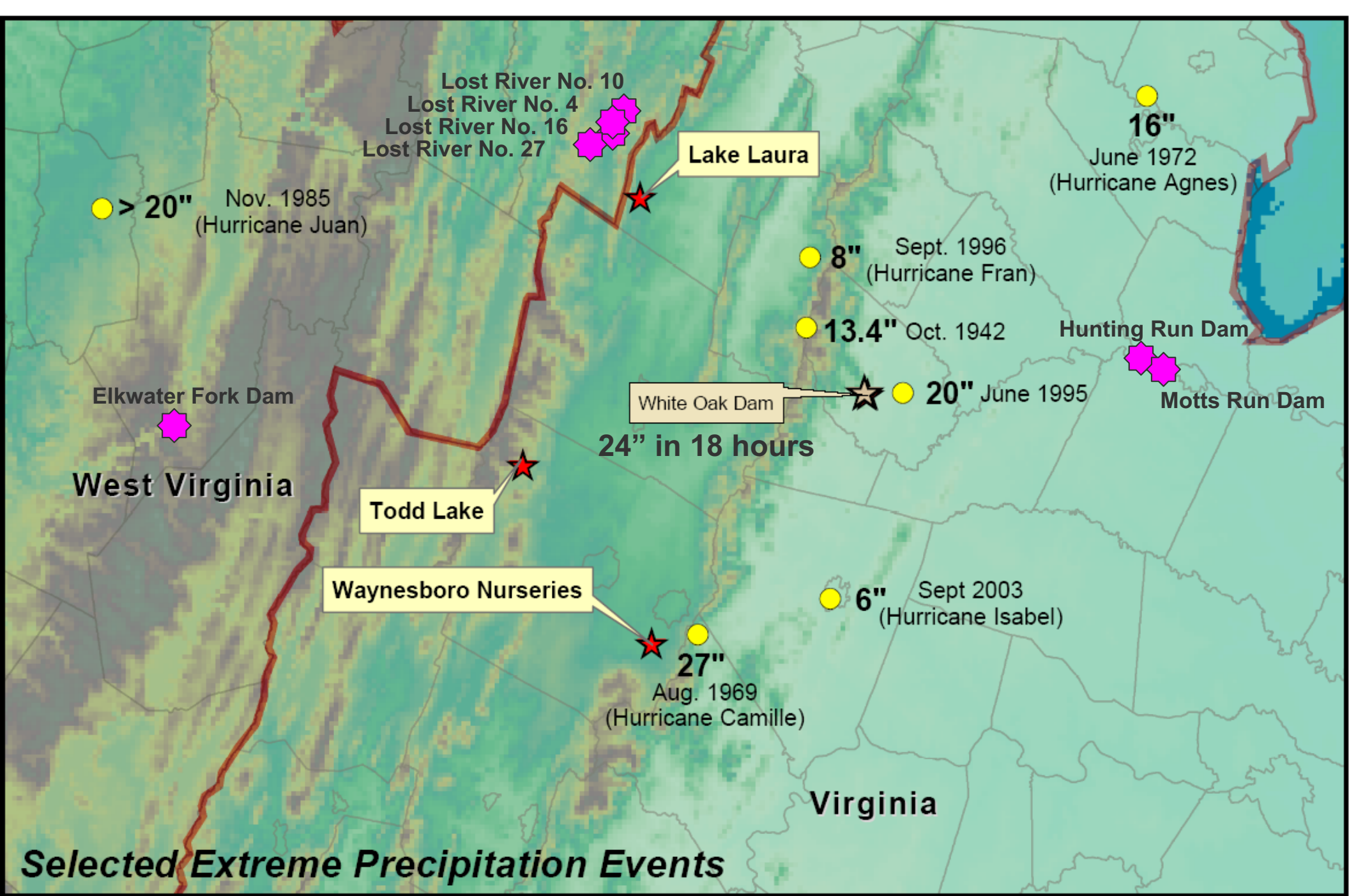


# Purpose of a Table Top Exercise

Provide a situation that could happen with any dam in Virginia and discuss actions that need to be taken as the situation changes. Desired outcome is that you all learn to identify life threatening situations and react to save lives and possibly reduce property damage without over reacting and possibly compromising your credibility and improve the emergency action plan in the bargain.







Slide provided by Gannett Fleming

EMERGENCY SPILLWAY CURVE DATA			
D = 40'	L = 100'	E = 142.19'	Δ = 40'
STATION	DEFLECTION	CHORD	
4+20	0	0	
4+25	5	24.96'	
4+30	10	49.92'	
4+35	15	74.88'	

Dam Embankment Crest

Earth Embankment

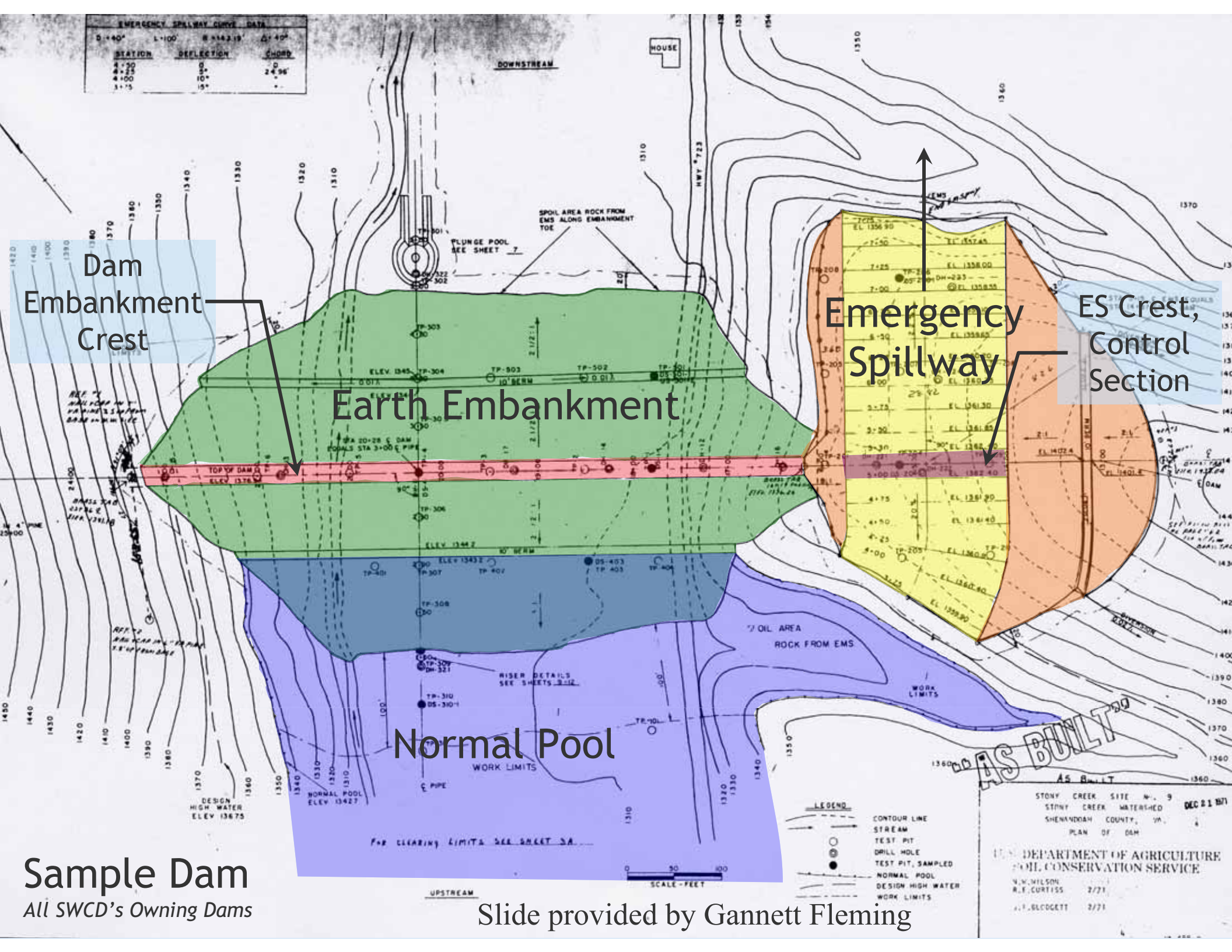
Emergency Spillway

ES Crest, Control Section

Normal Pool

Sample Dam  
All SWCD's Owing Dams

Slide provided by Gannett Fleming



**AS BUILT**

STONY CREEK SITE No. 9  
STONY CREEK WATERSHED  
SHERANDOAH COUNTY, VA.  
PLAN OF DAM

DEC 21 1971

U.S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

W.M. WILSON 2/71  
R.F. CURTISS 2/71  
J.L. BLODGETT 2/71

- LEGEND**
- CONTOUR LINE
  - STREAM
  - TEST PIT
  - DRILL HOLE
  - TEST PIT, SAMPLED
  - NORMAL POOL
  - DESIGN HIGH WATER
  - WORK LIMITS

SCALE - FEET  
0 30 60

UPSTREAM

DOWNSTREAM

HOUSE

SPOIL AREA ROCK FROM EMS ALONG EMBANKMENT TOE

PLUNGE POOL SEE SHEET 7

ROCK FROM EMS

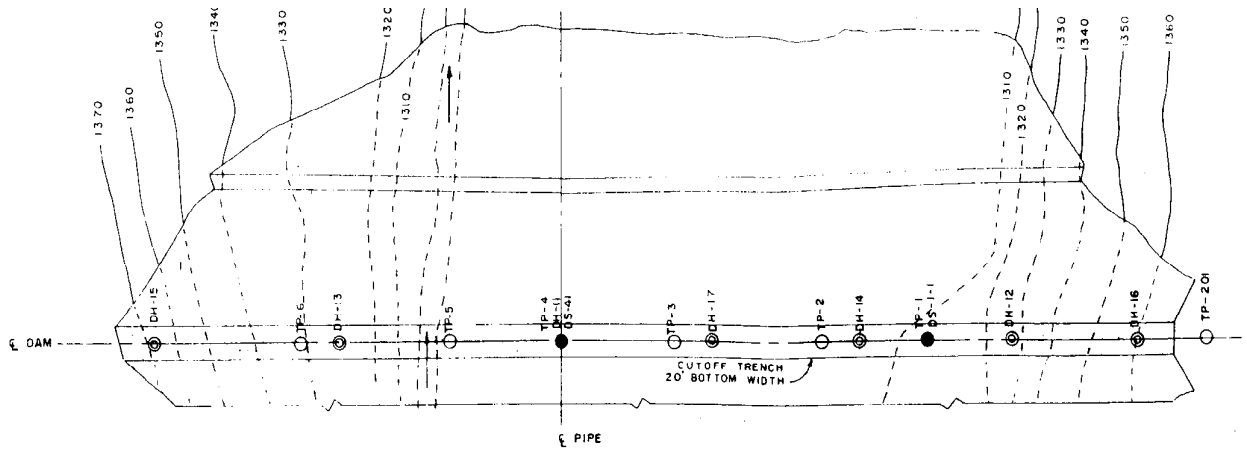
RISER DETAILS SEE SHEETS 2-12

DESIGN HIGH WATER ELEV 13675

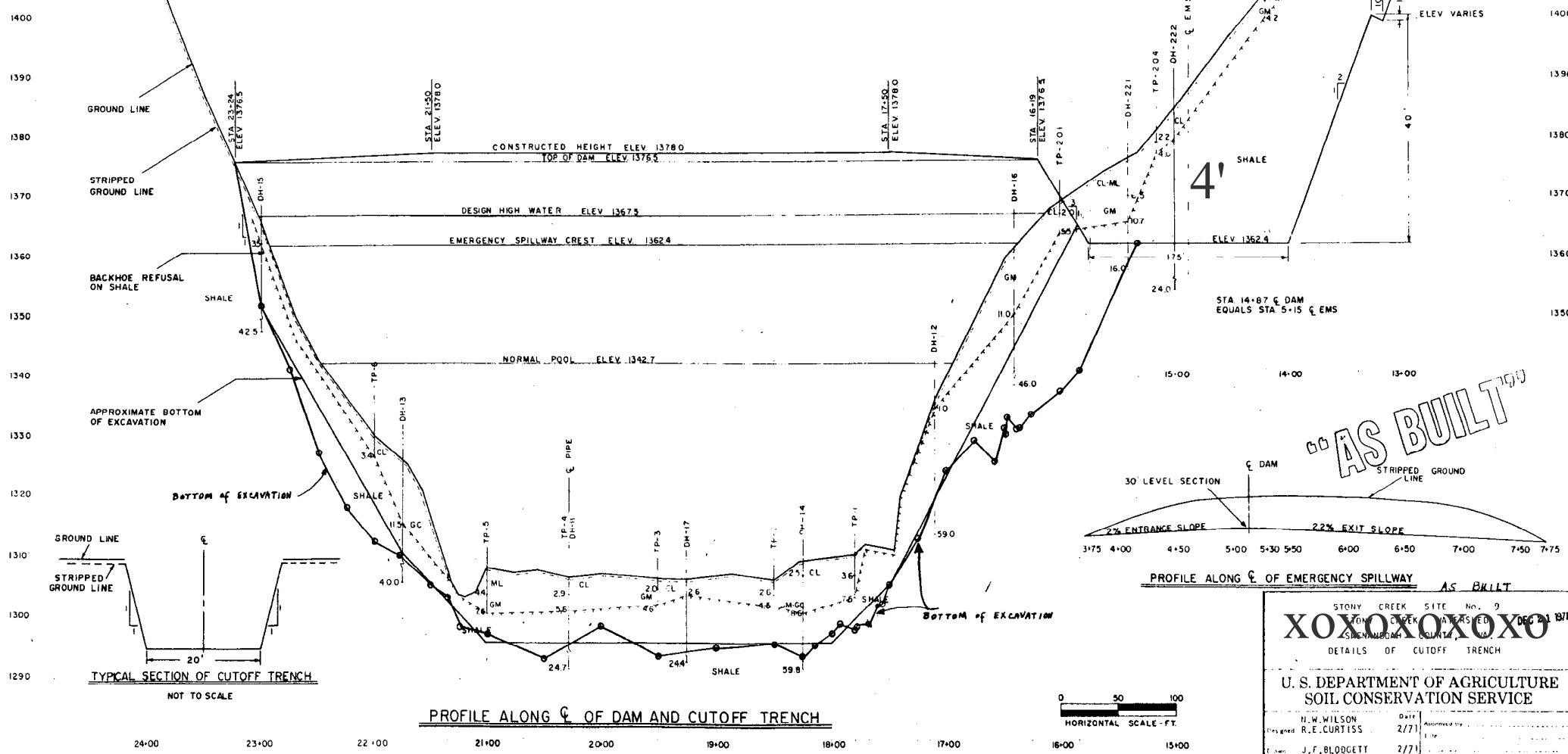
NORMAL POOL ELEV 13427

For clearing limits see sheet SA





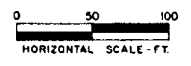
PLAN OF CUTOFF TRENCH



PROFILE ALONG C OF DAM AND CUTOFF TRENCH

- CONSTRUCTION DETAILS:
1. THE EXCAVATION LIMITS ARE APPROXIMATE AND WILL BE ADJUSTED IN ACCORDANCE WITH CONDITIONS ENCOUNTERED.
  2. ROCK EXPOSED IN THE BOTTOM OF THE CUTOFF TRENCH SHALL BE THOROUGHLY CLEANED AND SHALL BE INSPECTED BY THE ENGINEER PRIOR TO THE PLACEMENT OF COMPACTED FILL MATERIAL.

**"AS BUILT"**



STONY CREEK SITE No. 9  
 STONY CREEK DAM AND RESERVOIR  
 SHERMAN COUNTY, VA.  
 DETAILS OF CUTOFF TRENCH

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE

DESIGNED BY: R.E. CURTISS  
 DRAWN BY: J.F. BLODGETT  
 DATE: 2/71

PROJECT: STONY CREEK DAM AND RESERVOIR  
 SHEET: 5 OF 22  
 DRAWING NO.: VA-588-P

**For purposes of our exercise Ken or the groups will assign staff to fill the jobs below. Play the roles as you would during an actual emergency. If you fill a role as shown below already, fill that role in your work group. (Problem: We do not know how many people will attend.)**

**Emergency Services Coordinator/24 Hour Dispatch Center**

**Dam Owner – SWCD Groups are the Owner**

**Staff Gauge Observer – Group Assignment**

**Alternate Staff Gauge Observer – Group Assignment**

**VDOT Resident Engineer**



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# Let's start the Exercise. Scenario #1

**Last night when you went to bed (10:00 PM) it was raining real hard. It is still raining hard when you leave for work. You check your rain gauge or hear in the weather report that parts of your County have received 4" of rain in this storm and there is a flood watch in effect. Do you have any required EAP responsibilities? What should you do?**



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**Assuming you slept about 8 (not 6) hours, 4” of rain is not enough to justify going to a Stage I condition. See page 10 of the emergency action plan. Remember a flood watch just means that the conditions are right for flooding to occur but that it has not necessarily happened yet. The condition that initiates the EAP process is the flood watch but a warning indicates that flooding is occurring.**

**Perhaps the bigger issue here is who is responsible for starting the EAP process? Someone at the District (or maybe 2 people) should be aware that 4” of rain is a lot and bells and whistles should go off in their heads. Who do I need to alert? What do I need to do? Should come to mind.**

**4” of rain is certainly enough to justify reviewing your EAP process for each dam you own when you get to work and to turn on a radio or television to monitor the progress of the storm.**



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**As bulletins (in blue) are received, discuss the situation with the group, decide what is required and act out the necessary steps. It may sound lame but humor me. This gives you the opportunity to practice what you will say. Assume communications are working unless the person you are trying to reach says they can't be reached. Also assume the dam is accessible without putting anyone in danger.**



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**Other information sources for rainfall data include:**

**National Weather Service**

**Dept. of Emergency Management**

➤ **Virginia Criminal Information Network**

**IFLOW Gauge Data**

**Rain continues. At noon the local weather channel reports a flood warning has been declared with flooding in some areas of a 4 County wide area. Rainfall not reported.**

**Required Actions?**



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**On page 12 of the emergency action plan under item 2. it states that the Owner will initiate surveillance and notify the 24 hour dispatch center. At Stage I you or a designated person (staff gauge observer) are required to go to the dam site once a day. Someone from your SWCD should contact them as a backup to make sure they are doing their job. We are all working together on this so you will not be insulting them if you call.**

**In our exercise the staff gauge observer could not be contacted.**

**Now what? Simple right? Contact the alternate staff gauge observer. If they are unavailable, discuss how to proceed.**

**The trigger has been satisfied to alert the county that you all are initiating the EAP process. Who will make the notification? Think about what you will say and contact them, now if you haven't already. Recommendation on page 5.**

**NOTE: Notifying the dispatcher and/or someone else that you will be out and potentially in harms way should give the observer some peace of mind in case something unforeseen occurs. Letting someone local know you are going out would be a better idea. In either case, the notification should come with a return time that you follow up with a call so the person knows you are safe. Prior arrangement is needed for this to occur.**

**Rain is slowing down but has not stopped: It is now 4:00 PM. Your staff gauge observer returns home from work and gets the message you left on their recorder, went out to the dam and is reporting that it sounds like a freight train is running through the emergency spillway.**

**Water depth is 0.5' on the gauge and the water 300' downstream from the control section is chocolate brown. They can't tell if the water is rising or not.**

**They have an evening commitment and will be out until late that night and must get home to change.**

**Actions?**



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**Page 10, again in Section A. Shows the Stage II Condition starting when the water depth reaches 0.7'. So at 4:00 pm with only 0.5' flowing through the emergency spillway no notification is required.**

**Discussion:** At the Stage I condition the County was alerted. No alert needs to be done until the stage II trigger of 0.7' is realized. The watershed is large on most district dams so all the runoff may not have gotten to the dam yet. The work is not over, however. Should the observer go out again tonight?

It is not required. Passage through an area is more difficult at night but if you are concerned that the water will rise above the stage II depth then by all means make arrangements for your safety and go look again. Reflectors at the stage II and III triggers will help reflect light from a flashlight so depth can be seen.



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You wake up at my regular time, after sunrise. The sun is shining the birds are singing and the air is fresh from the recent rains. Time to enjoy life after your recent ordeal, right? Any other required duties from the EAP?



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The EAP requires that you continue the inspections until the dam breaks or the water level starts to recede. So at least 1 more site visit is required.

So you go down to the gauge observation point at 8:00 AM on your way to work and the gauge reads 1.2'. Are actions required?



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**Page 10, again in Section A. Shows the Stage II Condition starting when the water depth reaches 0.7'. This depth has now been exceeded. The correct step is to contact the County 24 hour dispatch center or Emergency Services Coordinator and declare a stage II condition exists. See page 6 for the recommended message.**

**Discussion:** The Stage II condition allows the County time to mobilize its evacuation team so it is a critical step in the emergency action plan. In some watersheds the water level rises and recedes very quickly. In others there may be days where the water level continues rise. Knowing how your watershed reacts is important information to know.

**So we are at Stage II now. Trips to the dam required at 2 per day.**



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**Different television and radio stations are reporting different rainfall totals. Most are over 6". Does this matter to you? At 2:00 PM your alternate gauge observer reports the water level at 1.0', a chocolate brown area starts about 200' downstream from the control section.**

**Action required?**



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**The water has dropped from 1.2' to 1.0'. Based on the Emergency Action Plan you can legally stop reading the staff gauge at this point. Should you stop inspecting the dam?**

**Discussion:** You have met your good stewardship threshold but the erosion occurring in the spillway would still bother me. I would continue to inspect the dam. The issue here is that if the erosion connects to the normal pool water then the dam may fail through the emergency spillway releasing a destructive wave downstream. That is what we are trying to warn people to get to safety from.

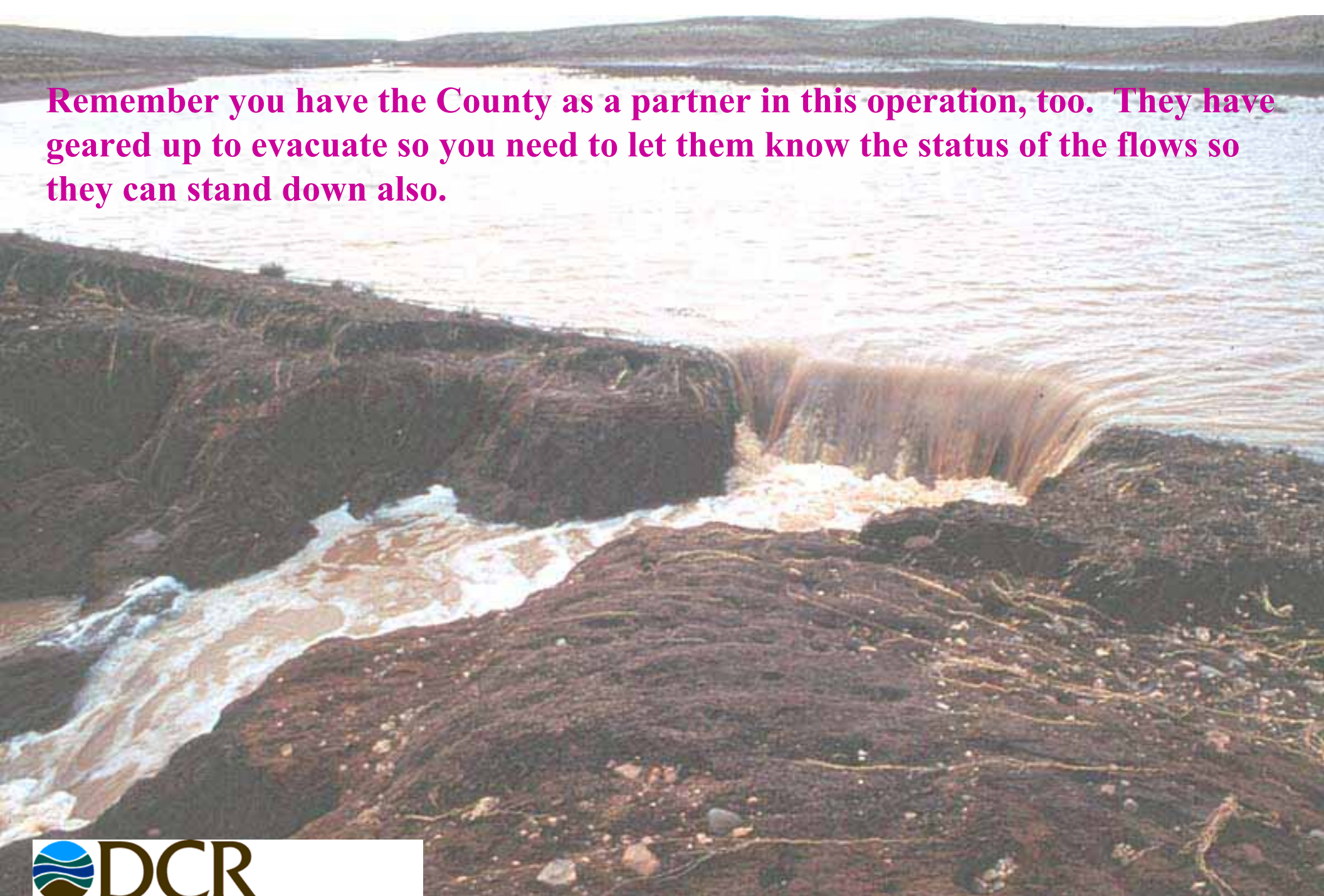
1' of flow is certainly enough to continue the erosion process once it is started.  
**Do we need to change the EAP to reflect a lower water level at which to stop the EAP process?**



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**Remember you have the County as a partner in this operation, too. They have geared up to evacuate so you need to let them know the status of the flows so they can stand down also.**



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CATARACT CANYON DAM



**We were lucky, no evacuation & no failure**

**End of First Exercise**

## Scenario #2

Let me change the situation slightly to make another point.

Go back to the 4:00 PM report. **At 4:00 pm with only 0.5' flowing through the emergency spillway no notification was required.**

This time the staff gauge observer reports that the chocolate brown area has passed the control section toward the pond. Does this change the situation?



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You bet it changes things. You know now that the sudden release of stored water in the impoundment is what causes the damage downstream. If the control section is compromised by erosion the dam could fail through the spillway. The proper action would be to decide if a breach is imminent. If the spillway is eroding rapidly then move to a Stage III condition and call the County and set the evacuation procedures into motion. At this point all the roads should be closed too.

Questions/Discussion



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Slide By: Darrel M. Temple, P.E. - USDA Agricultural Research Service



Failure through the Emergency Spillway

# Scenario #3

Go back to the 8:00 AM report except now the situation has changed as follows:

**Rain is not slowing down. You have already declared the Stage II condition and notified the County properly in accordance with the EAP based on your staff gauge observers report. The water rose 1.2' in the 1<sup>st</sup> 34 hours. At noon you call your staff gauge observer and get no answer. No response from the alternate observer either. Wide spread power outages and telephone system breakdowns reported by ESC. Should you be concerned?**



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In the EAP on Page 10, Section C. the recommendation is that inspections should be made every 12 hours (twice a day) after the Stage II levels are met. Your staff gauge observer saw the dam at 8:00 AM and declared the Stage II condition. Water is rising at about  $\frac{1}{2}$  in/hr (about 15" in 34 hrs). If it continued at this rate when would the stage III level occur? 0.8' more required to get to 2 feet equals about 10" so 20 hours to get 10" of water rise at the  $\frac{1}{2}$  inch/hr rate. That is past your next required inspection so you don't need to worry, or do you? Unfortunately, water rise is not linear so use it only as a rough guide. Point is that inspection times are flexible but you can't get your gauge observer. Now that is a problem.

**Discuss how to resolve this issue.**



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Many dam owners have radio communications (CB in home or car) between themselves and their gauge observer. An electrical generator would probably be needed also (if at home). Without this you are stuck. At this point roads would be impassable so driving any distance would be impossible.

Contact the County ESC and let them know the situation. They may have radio contact with a deputy or other emergency services person in the area. I would not worry about an inspection in the early afternoon but would suggest a late afternoon inspection. If evacuation is required a night time evacuation is more difficult so have someone check the gauge between 4:00 & 6:00 PM.



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Remember, failure by erosion after overtopping is our biggest concern and at 8:00 AM this morning we had 2.8' of safety margin but remember the erosion rill in the spillway. That may still cause us to go to the Stage III earlier.

With the rain still coming down and the wind blowing another safety issue arises. Wind can cause waves across your pond and the wave may overtop your dam. As the water level rises wave action should also be checked as it may be cause for early evacuation.



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You never got your gauge observer but a Deputy got to the dam at 5:00 PM. The water level was up to 2.1' on the gauge. It is still raining but the rain is not as hard as it had been. Is action required?

**KET Recommendation:** Emergency Services staff should be familiar with the gauge and observation locations on all high hazard dams.



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Read Page 10, page 12 Section A. Stage III (evacuation) water levels have now been exceeded. The deputy should report it to the ESC and you. This should satisfy the notification requirement on Page 12 Section A.4. to initiate warning of residents.

Time does exist between now and eminent dam failure. So there is still time to move to get people to higher ground. The question is always how much time do we have?

Engineers do have the capability to model the outflow hydrograph from a dam break that incorporates time and computes water level rise. I would suggest that this be done for high hazard dams.



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Make sure that VDOT is contacted to close the roads. Issues, where is VDOT staff coming from? Can they get there with all the flooding? Are barricades available nearby for use by ES staff?

## Are We Done Now?

The EAP states that the owner will be on the dam continuously after the Stage III declaration until the water level starts to recede. Notification of the actual dam break is important to let evacuation staff get to higher ground.

Our situation is that no EAP person is available and the deputy has other critical duties.

Discussion on this problem?

KET recommendation: Before notifying people to evacuate the deputy could go by the gauge observers home and find them or the alternate observers who should both live close to the dam. Get them out to the dam so they can provide advance warning of the actual dam break. That will give evacuation staff enough warning (usually only minutes) to get up the hill. If they can't be found putting someone there to report is important.

Communications may be a problem at this point. In other county's arrangements have been made to get the gauge observers county emergency radios. Getting the county to purchase additional emergency radios (with or without SWCD funding) would seem the best solution to this problem.

When the dam overtops failure may follow. Well maintained dams when overtopped can survive for a long time. The gauge observer should be able to see how quickly the dam is eroding and give the ESC advice on whether or not to get their evacuation team out of harms way.

Aren't we done now?

You are done when the dam breaks or the water level starts to recede. I am not completely comfortable with this threshold so would inspect periodically until the water level reached a non-erosive velocity but the choice is up to the gauge observer.



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**We were not lucky, evacuation & failure**

**Our lake is gone.**

**End of Third Exercise**

DISCUSSION? QUESTIONS?  
COMMENTS?