

Lessons Learned from Tabletop Reviews of Emergency Action Plans for High Hazard Dams in West Virginia, USA

J.D. Quaranta

*Department of Civil and Environmental Engineering
West Virginia University, Morgantown, West Virginia, USA*

H.M. Childers and P. Myles

Wheeling Jesuit University, Wheeling, West Virginia, USA

ABSTRACT: This paper presents two case histories on the application of the US Federal Emergency Management Agency (FEMA) tabletop exercise process on Emergency Action Plans (EAP) as applied to coal waste impoundments in West Virginia. Coal waste dams are important components in the processing of mined coal and are used for storing the coarse and fine coal slurry generated as a result of material washing and preparation. The FEMA established the following three classification levels for dams as: Low, Significant, and High hazard potential. Dams assigned the high hazard potential classification are those where failure will probably cause loss of human life.

The Coal Impoundment Project performed tabletop exercises in collaboration with two coal operators; county emergency management agencies; responders including local law enforcement and fire departments; and the WVDEP and MSHA regulatory agencies. The exercises were developed and facilitated using two different formats: One format involved a role-playing approach where participants received hand-delivered situation update messages. The second format was structured by scenarios and discussion questions within a project developed Situation Manual. The incident scenario for both exercises was based on a “sunny day” event failure. Both exercises were designed for participants to go through the four tiers of awareness in the mine specific Emergency Action Plan (normal conditions, adverse conditions, standby alert, and evacuation conditions). Results of the exercises are presented and discussed.

1 INTRODUCTION

West Virginia, with its mountainous terrain and historical coal mining production, has a legacy of pre-law (Surface Mining Control and Reclamation Act of 1977) and post-law coal waste impoundment sites. These sites were historically used as impounding structures for coal slurry, process black water, and coarse refuse disposal. These structures are regulated by the US Department of Labor - Mine Safety and Health Administration (MSHA) and by the West Virginia Department of Environmental Protection (DEP). In West Virginia there are over 135 Coal Waste Impoundments having a Hazardous rating; indicating that failure of these structures could cause significant human and property loss.

Following the breakthrough and release of coal slurry from the Martin County Coal Corporation impoundment near Inez, Kentucky on October 11, 2000 the United States Congress requested the National Research Council (NRC) to examine ways to reduce these types of accidents. The NRC completed their study which identified numerous areas of concern and the committee presented recommendations for improving the design, operation, and safety of coal waste impoundments (NRC, 2002). In 2003 the Coal Impoundment Project began as a program

of the National Technology Transfer Center (NTTC) at Wheeling Jesuit University (WJU) (Quaranta, et al. 2004).

The need for emergency planning and response review of critical facilities due to natural disasters is important to maintaining public safety and limiting property and environmental damage. In 2005, the hurricanes of Rita and Katrina caused death and destruction to the United States on a massive scale. Numerous emergency response breakdowns occurred during hurricane Katrina and resulted in an increase in human suffering. The lack of community knowledge and involvement in the Emergency Action Plan (EAP) process was identified in part through a risk assessment survey (McSpirit, 2005), through public meetings throughout West Virginia, and in light of the emergency response failures of the federal and local emergency responders in the Gulf States, September 2005.

The goal of this project was to support the safety of communities by developing and performing tabletop reviews of select coal waste impoundments in West Virginia. The project involved bringing together various federal and state agencies as well as select community emergency management agencies to participate in this pilot program. The FEMA has published a general guidance manual with information on how to develop and execute a tabletop exercise. This project used the FEMA training courses as a guide and then formed a working group to further develop real-life incident scenarios to tailor a program which could be offered to West Virginia coal companies as a useful and practical guide for performing tabletop reviews at their sites. This initial pilot program focused on developing and performing a tabletop reviews with two coal companies having coal waste impoundments with inundation maps affecting Ohio, Marshall, Boone, and Lincoln counties of West Virginia.

The NTTC, Center for Educational Technologies (CET), and West Virginia University collaborated with two coal companies to hold tabletop review exercises of their current EAP. These exercises involved the participation of various community emergency response agencies, and included both the West Virginia Department of Environmental Protection and the US Mine Safety and Health Administration.

2 BACKGROUND ON EMERGENCY ACTION PLAN DOCUMENTS

The West Virginia Department of Environmental Protection, Division of Water and Waste Management – Dam Safety Section requires that dam owners submit for approval and implementation a Monitoring and Emergency Action Plan in accordance with the West Virginia Dam Control and Safety Act (WVDEP, 2006). The DEP organized the EAP documents into the following four sections:

Part 1: Monitoring Plan and Inspection Schedule

- A. Normal Conditions
- B. Adverse Conditions
- C. Standby Alert
- D. Evacuation Conditions

Part 2: Emergency Action and Evacuation Plan

- A. Notification of Agencies
- B. Evacuation Notification of Downstream Persons
- C. Evacuation Map

Part 3: Post-Evacuation Notification Procedure

- A. No failure of dam
- B. Failure of dam

Part 4: Administrative and Record Keeping

- A. Qualified Persons for Monitoring and Inspecting the Impoundment
- B. Signature and Distribution List

C. Inspection Record

In practice the first three parts of the plan would function sequentially. Advancing actions in Part 1 lead to activities performed in Parts 2 and 3.

There is presently no requirement by the WV DEP or any county government requiring a mock disaster drill or tabletop exercise of an EAP. However, EAP documents are required to be reviewed and approved annually. The WV DEP also may conduct on-site reviews of the EAP procedures with mine owners on case-by-case situations. The WV DEP requires that the approved EAP be distributed by the mine owner to offices of emergency services, county sheriffs, and state regulators.

In December 2007, MSHA released a draft version of the updated Coal Refuse Disposal Engineering Manual recognizing the importance of emergency action plans and has dedicated *Chapter 14 – Emergency Action Plans* to this topic (MSHA, 2007). Currently MSHA does not require EAP documents for approval of permits (MSHA, 2008).

3 OBJECTIVES AND GOALS

This project's objectives were to: provide an exercise to bring together participants who would respond in a real emergency at a coal waste impoundment in West Virginia; familiarize the stakeholders with the anticipated response process; and demonstrate the effectiveness of the stakeholders to interact in the solution of the problem scenario addressing the emergency response and communication stages of an Emergency Action Plan. The exercises would be evaluated and feedback used to assess the effectiveness and the current format of the WVDEP-EAP document.

4 METHOD

The tabletop exercise process was developed and performed using two different formats. Both formats were prepared based on the Federal Emergency Management Agency training course for conducting tabletop exercises (<http://training.fema.gov/EMIWeb/IS/is139lst.asp>). Planning for these exercises was initially organized to include workgroups of developers, reviewers, evaluators, facilitators, and participants. The developers met first to prepare an incident scenario based on a FEMA "sunny day" event failure. A team of reviewers and evaluators prepared measures of monitoring the exercise to score evaluations for discussion. The participants were invited as listed within the coal company EAP. Members of the public community at large were not invited.

There were two different tabletop exercises performed on the project, the first occurred in August 2006 and the second followed in June 2008. Each of these exercises is discussed in this paper.

4.1 *Exercise #1 August 2006*

The first exercise followed a format which incorporated a hypothetical emergency at a coal waste impoundment. The participants were segregated into different rooms and brought into the exercise using hand written messages as the EAP advanced with notifications depending on the participant affiliation and anticipated sequence of notification. This version of the exercise in-

volved a role-playing approach with un-rehearsed response actions from the participant(s). A facilitator led the exercise and paced the communication events thru the EAP stages (normal conditions, adverse conditions, standby alert, and evacuation conditions). Exercise evaluators used criteria to rank the exercise for subsequent post meeting discussions and evaluations.

The exercise began with the facilitator reading of a short narrative which set the stage for the hypothetical emergency. The facilitator next stimulated discussion by introducing various event scenarios. These scenarios described detailed or major events which were addressed either to individual participants or to participating departments or agencies. Each statement was prepared in advance and the facilitator delivered the information as participants determined their response actions. The pre-scripted messages were written with the intent to trigger the expected actions and to involve all participants in the exercise. The facilitator adjusted the timing of information for more complex situations depending upon how the participants responded. Specifically, the exercise simulated a series of initiating events which could lead up to a critical point and then events at the impoundment stabilized. The scenario did not advance to a failure of the coal waste impoundment (CIP, 2006).

Discussion generated by the scenario focused on roles (how the participants would respond in a real emergency), plans, coordination, the effect of decisions on other organizations, and similar concerns. Participating organizations were able to reference emergency preparedness plans as well as the coal impoundment EAP. Maps, charts, and packets of materials were added for reference to enhance the realism of the exercise. The exercise ended when the scenario described the initiating seepage event had stopped due to corrective actions by the mine operator. No evacuation release was required to be issued. The Evaluator's and Participant's comments were recorded during the debriefing and were included in the after action report (CIP, 2006).

4.2 Exercise #1 Evaluation

Developers found the evaluation team to be the most difficult team to find volunteers. Comments included that for future exercises, recruitment for evaluators should happen during the initial planning stage. Travel stipends or other compensation might be necessary to field a team of experienced evaluators. Ideally, the evaluation would include both a performance-based evaluation and a standards-based evaluation.

The exercise evaluation plan included having experienced professionals in safety and emergency management observe the exercise to assess whether or not the exercise activities met the pre-defined objectives. Four evaluators were planned – two from the International Union of Operating Engineers National Hazmat Training Program and two from the Belmont County Emergency Management Agency. Developers asked the two evaluators from the National Hazmat Training Program to focus on the first two objectives and asked the emergency management agency to focus on the second two objectives. On the day of the exercise, the two evaluators from Belmont County were unavailable because of an actual emergency. The objectives and the evaluator assessments of whether the exercise met the objectives for Exercise # 1 were:

Objective 1 - During standby alert conditions, verify that the person responsible places the coal impoundment under constant surveillance and notifies the proper agencies according to the coal impoundment's emergency action plan.

Evaluator notes: "This objective, in my opinion, was met. From my observation of the company and WVDEP participants, they appeared to know specifically what response was needed based on the problem at hand. I think if we were to observe them in a real crisis, their process would be second nature. For the purpose of this exercise, it would have been nice to have company representatives, a technical, with a management person. I know that it is tough to get people to participate, but if the Consol guy has oversight of the impoundment then the right person was there. From a process standpoint, he seemed to know what needed to be done. Also, I

didn't have time to really look the company plan during this activity, but what they did appeared to be reasonable. I have to assume that they pretty well knew what was in there, because they dealt with it well. I focused on the company and WVDEP command center, rather than the emergency responders" (CIP, 2006).

Objective 2 - To determine whether or not there is a consensus among stakeholder participants as to the conditions for standby alert.

Evaluator notes: "This objective was also met. From a process standpoint, the command center worked well to reason out the problem, react to changes in the conditions, and then to proceed. It gives me hope that it appears that there is a good working relationship among these folks in real life, that they would handle problems reasonably. Everybody in this group knew their jobs, and they seem to work well in that environment" (CIP, 2006).

Objective 3 - During evacuation conditions, verify that the person responsible notifies the proper offices during an evacuation notice according to the coal impoundment's emergency warning plan and the county's all-hazards emergency action plan.

The evaluator for this objective was unavailable due to an actual emergency.

Objective 4 - To determine whether or not there is a consensus among stakeholder participants as to the conditions for an evacuation notice.

The evaluator for this objective was unavailable due to an actual emergency.

Examples of additional evaluator comments from the final report follow (CIP, 2006):

- "More notification advance is needed in order to have the response plans for all the key players
- I like the movement of all participants outside the discussion area until needed. It could be boring for the ones that don't participate early in the exercise but that are what they bought on to do. We need to be careful that we don't short change the deliberation time to accommodate waiting participants.
- I think the idea of some common timeline on the screen would be good for everybody to see. Also the computerized view you had for this exercise was great!
- The exercise went smoothly, but I think that we need to review and make sure that sufficient time is being allotted for analysis and reaction for each of the changes in conditions".

4.3 Discussion of Exercise #1 After-Action Report

In the after-action report (CIP, 2006), a review of the evaluator and participant comments was performed and the results tended to indicate that this form of blending mock notifications distracted the exercise away from the core content of testing the function of the EAP. What apparently tended to occur was that the exercise emphasis shifted into control by the emergency responder's and away from discussions of the Emergency Action Plan process. The exercise was intended as a half-day event; however, the meeting discussions forced the meeting into a full day event.

The project developers identified that many of the emergency response personnel were not knowledgeable about the EAP or what a coal waste impoundment was, the facility complexities, physical size and shape, and the significant impact a dam failure could produce. After the first initial minutes of the exercise, the EAP was not referenced by the first responders to determine what the process was and who / how communication was being established and performed.

The developers identified the need to produce a handbook for use by the coal industry, regulators, and emergency responders when testing their EAP. The handbook was intended to focus conversation onto the EAP, specifically the Part 1 activities occurring (normal conditions, adverse conditions, standby alert, and evacuation conditions). The exercise needed to be limited to one-half a day, and the participants needed a face-to-face layout where a conversation driven tabletop review could be performed. A site visit to the impoundment would have been worthwhile to expose participants to the magnitude of the potential problems.

To accomplish this effort, two manuals were prepared: a Situation manual for use by participants and a Facilitator/ Evaluator manual for use by the exercise evaluators and facilitators. This new form of the tabletop exercise focused only on the EAP monitoring plan main sections, specifically: Part 1 - Monitoring Plan and Inspection Schedule, Part 2 - Emergency Action and Evacuation Plan, Part 3 – Post-Evaluation Notification, and Part 4 – Administrative and Record Keeping.

5 SITUATION/EVALUATOR MANUAL

Figure #1 is a snapshot of a page from the manual. The exercise layout starts with presentation of the time/date and initial condition at the impoundment; the location and relevant facility information are presented to give the participant background on the site. Discussion questions then follow the description narrative. The questions establish the baseline for discussion such as what the impoundment inspection practice is under normal conditions. During the course of the exercise the questions become specific to the stage of the pending emergency event such as when the conditions change to Adverse Conditions, then to Standby Alert, and finally Evacuation Conditions. Figure #2 is a snapshot of an Evaluator Checklist form used to assess and measure aspects of the objectives.

Figure #1: Situation Manual Example



Monitoring and Emergency Response Exercise for Coal Refuse Impoundments Facilitator/Evaluator Handbook	
Situations and Discussion Questions	
<i>Situation 1: 3 p.m., July 14, 2008—Normal Day of Operations at the Impoundment</i>	
	<p>The Rocklick Branch Refuse Impoundment is a coal slurry refuse dam. The dam is a class C hazard dam and is located on Rocklick Branch of Pond Fork, located 1 mile upstream of Greenwood, in Boone County, WV. The coal refuse impoundment is built using upstream construction and is classified as having high hazard potential. The dam is approximately 470 feet high, measured from the downstream toe, with a 110-foot wide crest at an approximate elevation of 1,670 feet above sea level.</p>
<p>At the current crest elevation, the facility has the capacity of impounding approximately 20,3670 acre-feet (nearly 6.64 billion gallons) of fine coal refuse slurry/water. The impoundment is capable of storing two probable maximum floods (PMF). Evacuation of storm runoff is provided by the existing 42-inch outside diameter steel decant pipe. The impoundment does not have an open-channel emergency spillway.</p>	
<p>All is well at the facility. It is a normal day of operations at the impoundment.</p>	
Situation 1—Discussion Questions	
<ol style="list-style-type: none">1. What components of the impoundment are normally inspected?2. What components must be inspected per state and MSHA regulations?3. At what frequencies are these components inspected?4. What are critical conditions of these components that would lead to concern?5. What information is recorded? How is that information utilized? How is it archived?	
<i>Situations and Discussion Questions</i>	
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Figure #2 Evaluator Checklist

Monitoring and Emergency Response Exercise for Coal Refuse Impoundments Facilitator/Evaluator Handbook				
Evaluator Checklist				
Evaluator: _____		Date: _____		
Objective No.: 2				
<p>Objective: Examine the Emergency Action Plan and establish a working knowledge of the four tiers of awareness (normal conditions, adverse conditions, standby alert, and evacuation conditions) in an emergency action plan implementation process.</p> <p>Performance Criterion 1: The participants or represented organizations should have a current emergency action plan (EWP) and have read or reviewed the plan. Participants should be aware of regional emergency management programs.</p> <p>Points of Review:</p>				
Please answer the following: Y = Yes, N = No, NA = Not Applicable, NO = Not Observed				
	Y	N	NA	NO
1. Do participants have the latest approved EWP?				
2. Are all of the contacts and their contact information correct and up to date?				
3. Are the officials listed on the signature and distribution list correct and up to date?				
4. Do discussions include review of the EWP sections and highlight expected actions for each tier of awareness (Normal conditions, Adverse conditions, Standby Alert, and Evacuation conditions)?				
5. Are participants familiar with the Notification procedures, Evacuation procedures, and Post evacuation procedures?				
Comments:				

5.1 *Exercise #2 June 2008*

The second tabletop exercise was performed in June 2008 and followed a different format from the first August 2006 exercise. This second exercise limited participants to: the coal company, WV DEP, MSHA (District 4 and Pittsburgh Technical Center), and select emergency response agencies (Boone County Emergency Services and the county Sheriff's office), the participants totaled twenty-four.

This exercise was hosted at the mine company's training center and began with opening comments from the mine owner and review of safety training needed for site training and impoundment access. Following a field tour of the impoundment facility and discussion of the site operations the participants returned to the training center to begin the exercise. The exercise followed the format outlined in Figure #3 and had the following four key scenario events:

1. 10 a.m., July 15, 2008—Suspicious Seepage

On this beautiful sunny day, during the placement of coarse refuse, the dozer operator observes seepage around the outside of the decant pipe. The dozer operator radios the shift foreman that there appears to be seepage developing around the outside surface of the decant pipe. The shift foreman subsequently notifies the mine superintendent. They meet at the decant pipe and decide to start monitoring the flow of the seepage.

2. 8 a.m., July 16, 2008—Black Morning

The flow of the seepage has increased slightly, and the water has turned dark with fine coal particulate and erosion developing around the decant pipe. Suspended solids have increased, and the decant ponds are now black with suspended coal fines. Decant pumps have now started to transfer black water into clarifier and treatment ponds. The company decides to contact its consulting engineer, and in meetings with the engineer it develops a new monitoring plan.

3. 4 p.m., July 16, 2008—From Black to Worse

A whirlpool appears to be developing within the pond. Flow rate and suspended solids increase drastically at the seepage area. A visible sinkhole on the downstream face develops. Everything gets worse in all of the data messages—flow increases, suspended solids increases, sinkhole is observed. A link on the track on the company's dozer being used to move coarse refuse breaks, and the dozer is inoperable. The company does not have another D9 or D10 dozer immediately available.

The black water has broken through the settling/treatment ponds and has started to flow into the stream. People in the community are noticing the black water, and traffic traveling to the impoundment increases. People call 911 asking questions. The media are contacted and begin to show up on site.

4. 9 p.m., July 16, 2008—Disaster Averted

Slurry flow slows. There has been a large reduction in the seepage flow rate. Injury and damage to personal property have been avoided. However, slurry and black water have been released into Sunny Day Branch.

5.2 Exercise # 2 Evaluation

The objectives and the evaluator assessments of whether the exercise met the objectives for Exercise #2 are the following (CIP, 2008):

Objective 1 - Introduce participants to the complexities of the coal refuse impoundment and review the serious potential hazards associated with a High Hazard Potential impoundment.

Evaluator notes: "The presentation and site visit was good for the participants to get an appreciation of the size of the impoundment and the high hazard potential classification was explained. However, the exercise did not thoroughly explain specific site hazards of the coal and water material impounded".

Objective 2 - Examine the Emergency Action Plan and establish a working knowledge of the four tiers of awareness (normal conditions, adverse conditions, standby alert, and evacuation conditions) in an emergency action plan implementation process.

Evaluator notes: "Participants had the latest approved EAP. None of the participants indicated that any of the contact information was incorrect or out of date. Discussions included a review of the EAP sections and highlighted expected actions for normal conditions, adverse conditions, standby alert, and evacuation conditions. Participants were familiar with the notification procedures, evacuation procedures, and post evacuation procedures".

Objective 3 - Discuss impoundment monitoring programs and plans under normal conditions.

Evaluator notes: "This point was well covered. The person responsible was fully aware of the checkpoints and scheduled frequency for monitoring and checking the impoundment during normal conditions".

Objective 4 - Evaluate mechanisms to determine whether the impoundment is stable or developing into a hazardous condition.

Evaluator notes: "Based on the discussion, these points were complied with. The person responsible increased the frequency of monitoring, monitored additional parameters, and compared data to previous conditions and critical thresholds as expected".

Objective 5 - Verify that during standby alert conditions, the person responsible places the coal impoundment under constant surveillance and notifies the proper agencies according to the coal impoundment's emergency action plan.

Evaluator notes: "The Company notified all agencies as expected. Excellent discussion and food for thought unfolded on how soon to contact the local emergency responders. A highlight was when the superintendent of Patriot Coal asked the Sheriff and emergency manager when they would want to be notified. This demonstrated one of the main points of the whole exercise – the exchange of perspectives".

Objective 6 - Discuss the decision-making process used to determine whether a downstream evacuation is warranted.

Evaluator notes: "There was good discussion about the command post; incident commander; transportation of evacuees; evacuation centers; and notification of utilities. However the exercise didn't get into the detail level of police security and roadblocks. When participants determined that an evacuation was not warranted, they communicated that to all agencies".

Objective 7 - Examine the effectiveness of internal communication, understanding, and response execution within the coal company at the exercise level.

Evaluator notes: “Company personnel emphasized the need for them to communicate a problem – when the conditions warrant – to higher level of management. When asked what he would do if he saw a problem, one of the “qualified persons” said he’d go get the prep plant superintendent. It was also good that the company indicated early on that they would notify their engineering consultant”.

Objective 8 - Examine the effectiveness of communication, understanding, and response execution between and among the coal company and all responding agencies.

Evaluator notes: “I don’t recall much discussion about how the agencies will communicate with one another (i.e. Radios, Internet, emergency warning systems). However, there was some discussion about the use of direct personal phone numbers or cell phone numbers rather than the company calling a main number for a Sheriff Office or Office of Emergency Services. Explanations of the incident and possible impacts were clearly communicated to the emergency responders. Inundation maps, evacuation times, and routes were discussed. Discussions addressed resources needed for evacuation and evacuation centers”.

Examples of additional evaluator comments follow:

- “The facilitator opened the exercise by explaining that one of her main jobs as facilitator was “to get everyone here.” My thought was that just getting all of the involved parties in the same room accomplished a great deal, because it created the opportunity for the exchange of information, perspectives, ideas and concerns.
- I thought the exercise was extremely beneficial for all of the parties. While Patriot Coal personnel and representatives from MSHA and WVDEP are used to working with one another, this was not the case with respect to the Boone County Sheriff’s Office or the Boone County Emergency Management Agency.
- The exercise demonstrated the importance of building relationships with local emergency responders prior to a real incident occurring. The Sheriff and Emergency Manager had never before met the Prep Plant Superintendent or the agency representatives.
- The exercise allowed the Sheriff and Emergency Manager to provide insights from their perspectives during a dam-related emergency. The Emergency Manager, for example, explained that he would like a heads-up as early as possible during the incident so that he could locate personnel – even if it were just on a standby basis.
- The Sheriff expressed the same opinion, indicating that, depending on the circumstances, he would need to contact off-duty deputies and possibly enlist deputies from surrounding counties for assistance. This would be especially true if the situation was progressing to the point where an evacuation was ordered.
- The Sheriff expressed the opinion that too often they get their information from the public (e.g., a person living downstream notices a black water discharge). The Sheriff said that a rumor that the dam is leaking “can be the same as a dam break” for its effect on the public.
- The Plant Superintendent asked the Sheriff and Emergency Manager when they would want to be notified. This resulted in a good discussion. The consensus seemed to be that as soon as persons on site recognize that there is a real potential for the situation to deteriorate to the point where the dam may actually fail, the local emergency responders should be notified and advised of the situation.

- The Emergency Manager made an interesting point that he would be concerned with the judgment and integrity of the people who contacted him. He would be concerned that they may downplay the seriousness of the situation, so he would want to get someone from his office to visit the site. The issue of the credibility of the persons contacting the local emergency responders is another benefit of the local responders being familiar with key coal company and agency personnel”.

5.3 Discussion of Exercise #2 After-Action Report

This after-action report identified several key findings, comments and suggestions for improvement.

- “The coal operator gained a new perspective as to how much advance notice the Sheriff’s office needs in order to conduct a successful evacuation and now realizes that the Sheriff and Office of Emergency Services needs to have a “heads up” prior to a possible evacuation situation.
- WV DEP gained an appreciation for the National Incident Management System (NIMS) and will explore the possibility of altering the EAP format so that the EAP’s may be NIMS compliant in the future.
- One participant suggested that a similar exercise be done county-by-county so that the Sheriff and Emergency Response Manager for each county would gain the benefit of the exercise.
- Another participant suggested that the scenarios used in the exercise should not be ideal, because in a real situation, “what can go wrong, will go wrong.” They suggested not having the scenario be a “sunny day” when a problem is more likely during a rainy period or when it’s extremely cold”.

This exercise maintained close adherence to discussing the process of the EAP. The exercise was paced to complete on schedule as a partial day event (CIP, 2008).

6 CONCLUSIONS

The feedback results from the participants indicated that both of the Table Top Exercises benefited all organizations. Based on the participant and reviewer’s comments along with achieving individual task objectives we believe the goals of the project were reached.

Each exercise format identified strengths and weaknesses when implementing the individual company Emergency Action Plan. The Situation Manual (June 2008) exercise appeared to be more conducive to working with the specific stages and details of the EAP. This exercise format also led to more direct interactions at the front-line of the response between the mine owner, emergency management agencies, state, and federal regulatory agency staff.

A drawback of the Situation Manual (June 2008) approach was that the current format was not flexible to permit participants to respond and react to changing events as the exercise developed; specifically the scenarios assumed responses at critical events and did not allow for the participant’s input prior to the action. This did effect the interaction of the participants.

The second exercise identified communication methods and requirements needed for the EAP which the first exercise did not identify. These include that the emergency management and law enforcement agencies require earlier engagement than initially planned for in the EAP and that communication pathways need to be direct to the heads of the agencies in order to minimize communication leaks. Similarly, the EAP format used does not currently conform to the National Incident Management System (NIMS). The NIMS process establishes the structure for incident command and was refined after the Katrina disaster.

The beneficial outcome of identifying NIMS compliance is that this process can be evaluated by the state engineers for incorporation into future EAP format requirements. Further refinement of the Situation Manual format will be performed prior to releasing the document for industry and regulatory use.

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8 REFERENCES

McSpirit, Stephanie (2005). *Coal Impoundment Risk Assessment: A Survey of Mingo and Wyoming County, West Virginia Households July 2005*. Wheeling, WV: National Technology Transfer Center, Wheeling Jesuit University. Retrieved December 6, 2006, from http://www.anthropology.eku.edu/martincounty/Webpage/CoalImpoundmentReport/CIP_TOC2.htm

MSHA. 2007. Engineering and Design Manual: Coal Refuse Disposal Facilities Advance Draft For Industry Review And Comment. U.S. Department of Labor, 937 pp.

MSHA. 2008. [Title 30 Code of Federal Regulations]. 30 CFR §77.216 Water, sediment, or slurry impoundments and impounding structures; general. U.S. Department of Labor.

NRC [National Research Council]. 2002 *Coal Waste Impoundments: Risks, Responses, and Alternatives*. Washington, DC: National Academy Press, 230 pp.

J.D. Quaranta, B. Gutta, B. Stout, D. McAteer, and P. Ziemkiewicz, “Improving the Safety of Coal Slurry Impoundments in West Virginia,” *Tailings 2004*, Vail CO

WVDEP, 2006 [West Virginia Department of Environmental Protection] 47CSR34, 15.7, TITLE 47, Legislative Rules, Division of Water and Waste Management, Dam Safety Rules.

CIP [Coal Impoundment Project]. 2006 “Coal Impoundment Tabletop Exercise - August 16, 2006 Final Report.”, Wheeling Jesuit University, Wheeling, WV

CIP [Coal Impoundment Project]. 2008 “Coal Impoundment Tabletop Exercise - June 2008 Final Report.”, Wheeling Jesuit University, Wheeling, WV