

Coal Impoundment Risk Assessment:
A Survey of
Mingo and Wyoming County, West Virginia
Households
July 2005

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EXECUTIVE SUMMARY

The Coal Impoundment Project at the National Technology Transfer Center, Wheeling Jesuit University contracted with our research team at Eastern Kentucky University to conduct a survey of WV residents. The objective of the survey was to assess risk perceptions and levels of concern of West Virginia residents regarding coal waste, coal waste impoundments and other related matters through a systematic door-to-door survey of households. In April 2005, using standard survey drop-off/ pick-up methods, university students and faculty surveyed residents of Mingo and Wyoming Counties across two four-day weekends.² The decision to survey these Mingo and Wyoming counties was based on much discussion among our team and staff members of the CIP and, in the end, it was decided to survey these counties due to the large number of coal waste impoundments within each and due to the fact that they were largely representative of coal mining communities across West Virginia.

It is important to note that during the survey sweep, many residents expressed a “pro-coal” position. Many said that either they or a family member worked for the coal industry and this was heard repeatedly at the door-steps of many area residents. For this reason, in the analysis of the survey data and the report that follows, it was decided to focus on possible differences in views and opinions between mining versus non-mining households. Subsequent analysis of the survey data, however, led to perhaps our most important overall survey “finding:” That is, there seems to be very little difference in opinion between mining and non-mining households on questions related to coal waste, coal waste impoundments, emergency action planning, compensation strategies and other environmental and water quality issues. Some of our key findings are summarized below.

Summary of Survey Findings:

1. Level of Impoundment Awareness: On this dimension, survey findings reinforce what would be expected insofar as those tied to the coal mining industry through employment or other business-related activities were more likely to report knowing of a coal waste impoundment near their community. However, on the next question, “*I know about the emergency response procedures in my community if the local impoundment were to rupture in the future,*” survey responses showed mining households as just as unaware as non-mining homes of the emergency action and preparedness (EAP) plans for their community. Emergency plans that are on file with W. Va. state regulatory officials and county responders in the event of an impoundment breakthrough.
2. Level of Perceived Risks: Survey findings show an overriding concern among the public -across both mining and non-mining sectors- of the possible imminent dangers associated with coal waste impoundments. On the questions, “*An impoundment break would involve certain death*” and “*An impoundment break would kill many people at one time,*” both mining and non-mining households were equally likely to agree with both statements that an impoundment break would have serious consequences for populations downstream.
3. Level of Perceived Threat: On the following question: “*There is little chance that the coal waste impoundment near my community will rupture in the future,*” survey results showed that the majority of those surveyed strongly disagreed, disagreed or just didn’t know about the safety and stability of the impoundment in their community. As with other questions, there was little difference in opinion between mining and non-mining households. On another survey question, “*Emergency preparedness and response plans for coal waste*

² Over the two 4-day sweeps of contacting area households door-to-door, our survey teams contacted 605 homes with over 407 homes accepting the survey. Others either refused (18%) or weren’t at home at the time when we arrived. Of those that agreed to participate, over 250 surveys (256) were returned making for a respectable rate of return of 63%. This return rate was often facilitated by the use of “door tags.” Door-tags served as “*post card reminders*” and reminded residents that a survey had been dropped-off and that our survey teams were still working in the area and that we would try again at a later time to pickup the completed questionnaire and often times, upon return, residents would have it for pickup.

impoundments are adequate,” over half of respondents either strongly disagreed or disagreed that the emergency action plans (EAPs) for coal waste impoundments were adequate, and again, with no difference in opinion between household types.

4. *Level of Perceived Toxic Hazard:* The following question, attempted to assess WV resident views on the chemical impacts of coal waste on the environment: *“coal sludge is not hazardous.”* As in past survey work in Kentucky, there were no mine sector differences between WV households on this particular question. An equal 7 (nearly 8) out of 10 mining and non-mining households either strongly disagreed or disagreed with this survey statement on the benign chemical nature of coal waste. On the next question, *“we may never know the extent of the damage caused by the coal waste spill in Martin County, KY,”* there was also very little difference between mining and non-mining households. An approximate 7 out of 10 mining and non-mining households either agreed or strongly agreed that the environmental damage of the 2000 coal waste spill might never be known.
5. *Level of Water Quality Concerns:* In order to measure water quality concerns, the following set of questions were asked: *“poor water quality is associated with poor health in my community,” “the water from my faucet is always of good quality,” “the water treatment facility does a good job of meeting water quality standards.”* Once again, there was relatively little difference in opinion between residents tied to the mining sector versus other residents. Over half of mining households as well as non-mining households agreed or strongly agreed *“that poor health was associated with poor water quality”* in their community.
6. *Bottled Water Purchase:* A question on bottled water purchase was also on the assessment, *“our home purchases distilled or bottled water.”* With regard to this question, survey findings report close to 7 out of 10 area households reporting that they purchased bottled or distilled water. Here again, there was very little difference between mining and non-mining households with respect to outside purchase of store water over the use of tap water.
7. *Compensation Strategies:* Survey responses show equal agreement between persons involved in both the mining and non-mining sectors of the local economy across the following questions: *“The water treatment facility should enforce stricter water quality standards,” “An independent citizen’s committee should monitor and test water quality,” “The mining industry should contribute financially to independent tests of water quality”* and *“Coal severance taxes should be used to upgrade the water facility.”*

Summary of Report Recommendations:

Based on the survey responses summarized here, and that are presented in full within the following report, a series of report recommendations follow that address the need for better outreach, communication and evaluation over impoundment regulations, impoundment emergency action planning and increased citizen involvement in the risk planning and communication process. These recommendations are summarized below:

1. Recommend expanded citizen involvement in evaluation and assessment of emergency action planning protocols over coal waste impoundments.
2. Recommend support and expansion of 2002 National Research Council (NRC) recommendations from the *Committee on Coal Waste Impoundments* for better communication and public outreach over emergency action planning for Impoundments.
3. Recommend support and expansion of 2002 NRC Recommendation of improving regulations and instrumentation to monitor impoundment stability and integrity.
4. Recommend support, expansion and action on 2002 NRC Recommendation of constituent analysis of coal slurry

5. Refute, rather than recommend, 2002 NRC Recommendation of deep mine slurry injection methods as a potential alternative to coal waste impoundments
6. Recommend the expansion of citizen involvement in evaluation and assessment of not only emergency action planning protocols for coal waste impoundments, but also the expansion of citizen involvement in evaluating coal waste impacts on the environment and watershed through citizen oversight, advisory committees and taskforces.

SECTION ONE: INTRODUCTION

Acknowledgements

The survey data that was collected for this report was the result of a multi-university initiative between the Coal Impoundment Project at Wheeling Jesuit University, Eastern Kentucky University and West Virginia University. As part of this university collaboration, faculty and staff members from each of these universities participated in various stages of this research effort: In fact, it is unlikely that this report could have been produced without the help, guidance and field assistance received by the following faculty and staff from the above three institutions: Ben Stout, Ph.D. (Wheeling Jesuit University); Sharon Hardesty (Eastern Kentucky University); Jodie Hoover (Wheeling Jesuit University) and Ahmed El-Sotouhy (West Virginia University).

In addition, university students from both *Wheeling Jesuit University* (WJU) and *Eastern Kentucky University* (EKU) were involved in distributing and collecting surveys door-to-door. The help and undying enthusiasm of these university students during this intense data collection effort must also be fully acknowledged. The students who participated in surveying area citizens included: Rhon Blevins, Josh Boyda, Jaspal Brar, Tony Burnett, Christopher Cordell, Jonathan Franks, Stella Gibson, A.J. Harris, Lawrence Lee, Kendrick Lewallan, Patti Matthews, Megan McDavid and Davina Newton.

The eleven university students from Eastern Kentucky University, who were involved in this initiative, did so as a part of a university-accredited field course in survey research design and field methods. This represented a highly unique opportunity for a team of undergraduate university students to be involved in a federally funded research project. The commitment of the *Coal Impoundment Project* in financially underwriting this training initiative must be acknowledged as well.

Finally, Steve Kroll-Smith with extensive experience and expertise in environmental and community impact assessment agreed to peer-review the contents of this report. Though the author takes full responsibility for the substance and conclusions contained within, the help received by Steve in improving this document must also be publicly recognized.³

Overview:

The methods that were used to assess community views of coal waste impoundments in Mingo and Wyoming Counties W.Va. were adopted from prior methods used to evaluate the community impacts of the massive coal waste impoundment breakthrough in Martin County, KY.⁴ After the 2000 impoundment break that released over 300 million gallons of coal sludge, slurry and black water materials into area waterways, our research team developed a series of methods to gage community perceptions in the wake and aftermath of the environmental disaster. First, through intensive field interviews with over 30 area residents, our team identified a series of consistent themes and concerns

³ Steve Kroll-Smith is Head of the Department of Sociology at the University of North Carolina at Greensboro. He has investigated technological disasters for over 20 years and was recently awarded the American Sociological Association's Section Award for Distinguished Contributions to the study of technological hazards and disasters. He recently co-edited an issue of *Law & Policy* that examines the role of sociologists in toxic tort litigation.

⁴ Prior community impact research in Martin County, KY was internally supported through Eastern Kentucky University and federally supported by the Appalachian Regional Commission.

being expressed by area citizens. During these formal interviews, it was revealed, for example, that many were concerned over the long term impacts of the sludge spill on the local environment. Other residents, on the other hand, expressed serious concern (even anger) over the sore lack of any emergency warning or notification during the breakthrough. Still others in their interviews commented more generally on a history of ineffective regulation and enforcement over impoundments, black water releases and of the coal industry generally. However, the most pressing concern among those that we formally spoke to remained the spill's impact on the area watershed and the subsequent quality and long-term safety of the drinking water supply.

Several months later, we developed a questionnaire to reflect these community themes and concerns and we made plans to assess the views of a wider majority of Martin County citizens regarding these issues. In March 2001, our research team conducted a door-to-door survey of area households and collected 290 surveys across an intensive week-long field sweep. A review of survey findings showed that many of the issues expressed in our initial interviews were also the concerns of a wider majority of Martin County citizens. Then, in September of 2001 with Appalachian Regional Commission funding and support, the same survey was distributed in other coal impoundment communities in Perry County, KY. This comparison allowed our team to measure community differences in risk perceptions across disaster-impacted and non-impacted communities and subsequently, allowed our research team to more fully assess the impacts of the 2000 sludge spill on community life in Martin County, KY.⁵ In July 2003 we published the first of a series of community impact reports.⁶

While our team continues with research and capacity building projects in Martin County, KY,⁷ in November 2004 the Coal Impoundment Project at the National Technology Transfer Center (NTTC), Wheeling Jesuit University subcontracted with the "Martin County Project Team" at Eastern Kentucky University to conduct a general risk assessment of resident views and perceptions pertaining to coal waste impoundments in West Virginia.

The survey assessment that was developed (and that is reported here in this report) was a modification of the instrument that was previously used in Martin and Perry Counties. The original survey had been based on the themes and concerns that were raised among Martin County residents, and since many of those issues were discussed among staff members of the Coal Impoundment Project as also potentially legitimate concerns facing other residents living downstream from other coal waste impoundments, many of the original questions were retained in developing the W.Va. impoundment risk assessment.

Of course, the assessment that was developed for W.Va. also reflected the goals, objectives and the specific needs for specific information by the Coal Impoundment Project, NTTC and subsequently, other potentially relevant questions from other risk assessments were considered and reviewed in further developing the instrument. Naturally, these other questions that were reviewed and considered were modified to capture the particular issues, regulations and potential compensation mechanisms associated with coal waste impoundments. In the further review and development of

⁵ General results from our Martin and Perry County survey are available online:
http://www.anthropology.eku.edu/MCSPiRIT/PDF/Survey_codebook_survey_report.pdf

⁶ The reports from our past research in Martin County are available online via the following web page:
http://www.anthropology.eku.edu/MCSPiRIT/Martin_Cnty_Final_Report.html

⁷ The Martin County Project Team will be administering a capacity building initiative to assess and improve the municipal water system under a \$150,000 appropriation from the Natural Resource Damage Settlement claim authorized in 2005 by the KY General Assembly. For a summary of this 2005 water testing initiative, see: Kentucky State Environmental Quality Commission. May 2005 Newsletter: *Kentucky's Environment: The bimonthly Electronic Newsletter of the Environmental Quality Commission*. "Citizens to Monitor Water Quality in Martin County," p. 6. Available online though: www.eqc.ky.gov

the survey, questions were fine-tuned and finalized after a series of intensive review and comment sessions between our research team and various staff at the Coal Impoundment Project. The final draft survey then went through a final review and pilot-test by a group of citizens in Martin County, KY. Citizens from SAVE, -*Supporting Appalachia's Vital Environment* agreed to review and add public comment. The help and assistance of these four citizens in improving the W.Va. coal impoundment risk assessment must also be fully acknowledged at the start of this report.

With the onset of spring weather, a survey field team consisting of university faculty and university students from Eastern Kentucky University, Wheeling Jesuit University and West Virginia University was recruited and trained to conduct and carry-out the survey assessment. In early April 2005, university students went door-to-door and distributed surveys to citizens in both Mingo and Wyoming Counties W.Va.

The following report presents the results of this survey of W.Va. public opinion and citizen risk perceptions on coal waste, coal waste impoundments and other related issues. Policy makers and regulatory officials might do well to consider the contents of this report insofar as it provides a systematic and objective effort at capturing W.Va. resident views and opinions that could, in turn, inform the development of more effective policy regarding coal waste impoundment regulations, compensation strategies and emergency / contingency planning over such impounding structures.

[National Research Council 1996 Recommendations on Expanding Public Input in Environmental Risk Assessment:](#)

In terms of the time sequence of writing and issuing this report, it is important to note that the following was written after a public meeting held at the end of April 2005. During this public meeting in Williamson, Mingo County, WV, preliminary survey results were presented and discussed at length with the over 30 area residents in attendance. The frank discussion that ensued has in subtle ways helped to inform the contents and framework of this report, particularly in the writing of some of the recommendations contained here in.

Based on the feedback obtained from the public meeting, for example, one of the principal recommendations of this report is for the Coal Impoundment Project and other state and federal regulators to continue to develop methods and ways to expand public involvement in the deliberation and assessment of coal impoundment risks on local communities in West Virginia. Most especially, such risk assessments should perhaps focus specifically on people living directly downstream from such holding facilities. On the latter point, it was pointed out at the Williamson meeting by one local citizen, that a general survey of county residents cannot fully capture the legitimate and overriding concerns and worries of people living in narrow stream valleys (hollows) where an impoundment reservoir is embanked at the top of the stream head. Indeed, as this individual explained those immediately in the potential impact area and who thus, face the gravest threats in the event of an impoundment breakthrough, are naturally more likely to perceive the risks associated with impoundments differently than other county residents. Subsequently, within this report, one of the central recommendations is for the Coal Impoundment Project (CIP) and other state and federal regulators to develop additional public input methods, beyond even surveys and public meetings, to more effectively tap into and assess the specific risk concerns of the downstream impoundment public. As a first step, the CIP might do well to consider initiating a series of focus group sessions or an advisory panel of downstream citizens to even better understand some of the risk concerns of area residents regarding coal waste impoundments.

It was clearly apparent during the two hour public meeting in Williamson, Mingo County that many of those residents in attendance had knowledgeable questions and information related to impoundment risks as well as insightful questions related to the regulatory and enforcement system. It would, therefore, seem that more such in-depth discussion and deliberation with local residents should occur between the CIP and other federal and state regulators. Such discussion between residents, regulators and the CIP would like result in a productive and intelligent dialogue. Such

public involvement mechanisms in the policy discussion and policy making process would provide the CIP and regulators with a better understanding into the true scope and levity of citizen risk concerns and would facilitate channels for better risk communication via the exchange of knowledge and information between citizens, agencies as well as the coal industry.

Admittedly, as was respectfully expressed at the Williamson public meeting, such a two-way dialogue process cannot be well done via a survey. Surveys do have their advantages in generally characterizing area concerns and risk perceptions within a particular population. But even citizens who were surveyed in Mingo and Wyoming Counties recognized the limits in the method. Many of them spent more time more fully explaining their particular views related to impoundments and other community issues from their porch steps. In fact, there were plenty of residents who didn't particularly want to "fool" with the survey but rather wanted to have a meaningful conversation. In fact, there were plenty of times that members of the survey team were invited to come-in, sit-down and have a decent conversation. Unfortunately though, time constraints in delivering the questionnaire often prevented this type of meaningful interaction, communication and dialogue between residents and the research team. For other residents, who completed the survey, there were those who took time to include added written comments. Some of these comments were typed and others were carefully hand-written across several sheets. This report, in opportune places, attempts to share these written comments in an added attempt to better communicate the range of risk concerns and points of view of area residents over coal waste, coal waste impoundments and other potentially related local risk concerns beyond the rehashing of survey percentages. And again, it is highly recommended and encouraged that the Coal Impoundment Project (CIP) and other entities continue on this path of finding multiple ways to elicit meaningful public input that could, in turn, potentially inform the development of more effective impoundment regulatory and enforcement strategies that could even better protect the W.Va. public and environment.

This recommendation of expanding public input is in keeping with the National Research Council (NRC) and its oft-cited 1996 Report, *Understanding Risk: Informing Decisions in a Democratic Society*. The NRC recommended in 1996 that efforts be made to involve the public through *various mediums* in the deliberation and decision-making process of the impacts and risks associated with high hazard technologies. As the NRC well stated:

Adequate risk characterization depends on incorporating the perspectives and knowledge of the spectrum of interested and affected parties from the earliest phases of the effort to understand the risks. If a risk characterization is to illuminate the relevant facets of a risk decision and be credible to the interested and affected parties, it must address what these parties believe may be at risk in the particular situation, and it must incorporate their specialized knowledge. Often, the best way to do this is by the active involvement and representation of the parties.⁸

The following report represents a small effort at following through on the recommendations issued by the NRC in 1996. By involving and representing the public via a survey and their written comments as well as what citizens had to say at the Williamson public meeting, the following report attempts to better characterize and understand the issues facing area residents regarding coal waste and coal waste impoundments. Once again, it is highly recommended that the CIP continue to explore multiple methods for expanding public input into the assessment of coal waste impoundment risks in W.Va. The CIP's willingness to underwrite the costs of this survey project and research report is obviously a solid first step in that direction.

⁸ Taken from: p. 157: National Research Council. 1996. *Understanding Risk: Informing Decisions in a Democratic Society*. Washington, D.C.: National Academy Press. Other NRC report on increasing the role of lay citizens in assessing and characterizing technological and environmental risks, see also: National Research Council. 1989. *Improving Risk Communication*. Washington, D.C.: National Academy Press. National Research Council. 2000. *Waste Incineration and Public Health*. Washington, D.C. National Academy Press, Section 7: *Social Issues and Community Interactions*.

National Research Council 2000-2002 Committee on Coal Waste Impoundments:

The following report also reiterates and reinforces, in places, some of the recommendations issued by the 2000-2002 National Research Council (NRC) *Committee on Coal Waste Impoundments*. In other places, given our own assessment of W.Va. public opinion, we sometimes go beyond some of the NRC recommendations. In still other places, we provide some caution over other NRC recommendations based on our survey assessment and other types of input from local citizens. As background, the NRC *Committee on Coal Waste Impoundments* was formed through a congressional act in the aftermath of the 2000 impoundment breakthrough in Martin County, KY.⁹ The Committee mandate was to:

- to examine engineering standards for coal waste impoundments
- to provide recommendations for improving impoundment structure stabilization
- to determine the adequacy of mine maps; and
- to evaluate potential alternatives for future coal waste disposal, including the benefits of each alternative.¹⁰

The NRC report was issued in 2002 under the title, *Coal Waste Impoundments: Risks, Responses and Alternatives*. With the issuance of this report, as well as other investigative reports into the 2000 breakthrough in Martin County, KY¹¹ -there has been some important follow through in reviewing and evaluating engineering and regulatory standards over coal waste impoundments and reviewing and evaluating alternative disposal methods. The Coal Impoundment Project (CIP) at the Robert C. Byrd National Technology Transfer Center, Wheeling Jesuit University is, for example, an offshoot of some of the recommendations issued by the 2002 NRC. In 2002, via a continuing congressional resolution to the Mine Safety and Health Administration, monies were appropriated to the Coal Impoundment Project for further research and evaluation into best management engineering and regulatory practices over impoundments, as well as research into disposal alternatives and evaluation and assessment of coal waste impacts on the environment. Moreover, another important charge of the CIP, in accord with an NRC recommendation that emerged out of a series of public meetings that were held with coalfield residents, is to develop and improve emergency planning and response protocols for coal waste impoundments communities in West Virginia.¹² The following report, contracted and underwritten

⁹ See: Press Release. Lexington. (October 25, 2000) Rogers Seeks Independent Study of Coal Slurry ponds. The Martin County Sun, p.15:

“Rogers is seeking Congressional Approval for a 2.0 million dollar study by the National Academy of Sciences, a private non-profit organization that provides scientific and technical advice to the federal government. Funding would be provided in the budget of the federal Mine Safety and Health Administration.”

¹⁰ National Research Council, Committee on Coal Waste Impoundments. 2002. *Coal Waste Impoundments: Risks, Responses and Alternatives*. Washington, D.C.: National Academy Press.p.33.

¹¹ See, for example: Triad Engineering, Inc. (March 2001) Subsurface Investigation Big Branch Slurry Impoundment Martin County, Kentucky. Triad Project No. C 00553 Submitted to: United States Department of Labor Mine Safety and Health Administration. Available online: <http://www.msha.gov/impoundments/martincounty/triad.pdf>

United States Department of Labor. Mine Safety and Health Administration Coal Mine Safety and Health. (October 17, 2001) Report of Investigation. Surface Impoundment Facility Underground Coal Mine. Non-Injury Impoundment Failure/ Mine Inundation Accident. Available online: <http://www.msha.gov/impoundments/martincounty/martincountya.pdf>

United States Department of Interior. Office of Surface Mining. (March 2002). Report on October 2000 Breakthrough a the Big Branch Slurry Impoundment. Available online: <http://www.osmre.gov/martincounty030402.htm>

¹² The expansion of these coal impoundment initiatives into perimeter states of Kentucky, Virginia, Ohio and Pennsylvania has been approved via a 2005 continuing resolution to the Mine Safety and Health Administration.

by the CIP, is yet a further effort at expanding the evaluation of coal waste impoundment regulations, alternatives and emergency action planning by including input from the WV public. Beyond the 2002 NRC, assessing the views of WV residents is, to restate, in accord with prior 1996 NRC recommendations to expand mechanisms for public input into the risk characterization and risk communication process over high hazard technologies.

Report Contents and Format

The following report is divided into the following sections:

Section II:

The second section of this report explains in some detail the research design and sampling methods that were used to collect and assess the views of W.Va. residents.

Section II also includes some discussion and assessment of community views regarding a series of more general community and quality of life issues as reported through our survey percentages. Reports on these other community / quality of life questions will allow us to better understand the broader context of local public concerns and will allow us to better fit citizen concerns over coal waste impoundments within the broader context of other community issues.

Section III:

The third section of this report provides our analysis of resident views regarding their risk perceptions and concerns over coal waste, coal waste impoundments and other possibly related issues. When we knocked on the doors of many residences in Mingo/ Wyoming counties, and invited persons to register their views by completing the survey, a good number of residents were initially hesitant and stated that they or someone in their family worked for the industry and that they were “for coal” or “pro coal.” Such persons were gently encouraged to fill-out the survey as it was explained to them that this assessment was designed to be an objective, scientific assessment of *overall* community views relating to coal waste and coal waste impoundments.

Due to what we consistently heard in our initial contacts with many residents about their ties and relationship to the coal industry, we thought it important -when writing this report- to examine mining and non-mining household differences in opinion. Consequently, most of the tables within this report, within this third section (as well as the bulk of the text) focus on exploring mining and non-mining household differences in views, opinion and risk perceptions across the following topics and issues:

- Awareness and concern over coal waste impoundments
- Other risks and hazards associated with coal waste impoundments
- Emergency action planning and preparedness with regard to coal waste impoundments
- Compensation and regulatory strategies for coal waste impoundments
- Various alternatives to impounding coal waste
- Water quality, the watershed and other environmental concerns

Concluding Section:

The final section of this report summarizes our most interesting and important findings from our Mingo/ Wyoming County survey data and our comparisons of mining versus non-mining households. Perhaps our most resounding finding as consistently reported in the third section of this report and, as summarized here in this final section, is that there seems to be very little difference in opinion and in risk perceptions across mining and non-mining households across a wide range of survey questions. In our concluding section, we summarize these consistencies and agreements between household types and also summarize and reinforce the recommendations that we made throughout the body of

this report. Here, it is important to emphasize that given that the recommendations contained within this report and summarized at the end were born out of our observations and conversations with WV citizens and our analysis of their survey responses, we feel that the set of recommendations contained within and summarized at the end of this report, should hold some weight and implications toward improving the regulatory and emergency response structure over coal waste, coal waste impoundments and other related matters facing WV citizens. We therefore encourage policy-makers to thoughtfully consider the recommendations contained herein.

SECTION TWO: METHOD AND SAMPLE CHARACTERISTICS

Research Design and Sample Methodology:

Community impact assessments designed to survey public attitudes and perceptions on the risks associated with various hazardous technologies have been conducted elsewhere and have been used in the past to assess public views on nuclear power, the storage of radioactive waste, the disposal of hazardous waste and environmental disasters.¹³ But whereas some of these other assessments have been conducted over the phone or through mass mail-outs, the following survey relied upon systematic residential sample methods as a means by which to collect public input. Such residential sample methods, often referred to as *door-to-door*, "*drop-off/pick-up*" methods, have been used in other risk

¹³ See for example: Bailey, Conner, Charles Faupel, and Susan Holland. 1992. "Hazardous Wastes and Differing Perceptions of Risk in Sumter County, Alabama." *Society and Natural Resources* 5:21-36; Benford, Robert, Helen Moore, and Allen Williams. 1993. "In Whose Backyard? Concern About Siting a Nuclear Waste Facility." *Sociological Inquiry* 63:30-47; Bord, Richard. 1987. "Judgements of Policies Designed to Elicit Local Cooperation on LLRW Disposal Siting: Comparing the Public and Decision Makers." *Nuclear and Chemical Waste Management* 7:99-105; Bord, Richard and Robert O'Connor. 1992. "Determinants of Risk Perceptions of a Hazardous Waste Site." *Risk Analysis* 12:411-416. Bourke, Lisa. 1994. "Economic Attitudes and Responses to Siting: Hazardous Waste Facilities in Rural Utah." *Rural Sociology* 59:30-47. Brody, Julia and Judy Fleishmann. 1993. "Sources of Public Concern About Nuclear Waste Disposal in Texas Agricultural Communities." Pp. 115-135 in *Public Reactions to Nuclear Waste: Citizens' Views of Repository Siting* edited by R. Dunlap, M. Kraft, and E. Rosa. Durham, N.C.: Duke University Press; Desvousges, William, Howard Kunreuther, Paul Slovic, and Rosa, Eugene. 1993. "Perceived Risk and Attitudes Toward Nuclear Wastes: National and Nevada Perspectives." Pp. 175-208 in *Public Reactions to Nuclear Waste: Citizens' Views of Repository Siting* edited by R. Dunlap, M. Kraft, and E. Rosa; Dunlap, Riley, Michael Kraft, and Eugene Rosa. 1993. "Public Reactions to Nuclear Waste: Citizens' Views of Repository Siting." Durham, NC: Duke University Press; Easterling, Douglas and Howard Kunreuther. 1993. "The Vulnerability of the Convention Industry to the Siting of a High-Level Nuclear Waste Repository." Pp. 209-238 in *Public Reactions to Nuclear Waste: Citizens' Views of Repository Siting* edited by R. Dunlap, M. Kraft, and E. Rosa. Durham, North Carolina: Duke University Press; Flynn, James, William Burns, C.K. Mertz, and Paul Slovic. 1992. "Trust as a Determinant of Opposition to a High-Level Radioactive Waste Repository: Analysis of a Structural Model." *Risk Analysis* 12:417-429; Freudenburg, William and Rodney Baxter. 1984a. "Host Community Attitudes Toward Nuclear Power Plants: A Reassessment." *Social Science Quarterly* 65:1129-1136.; Freudenburg, William and Rodney Baxter. 1985a. "Nuclear Reactions: Public Attitudes and Policies toward Nuclear Power." *Policy Studies Review* 5:96-110.; Freudenburg, William. 1993. "Risk and Recreancy: Weber, the Division of Labor, and the Rationality of Risk Perception." *Social Forces* 71:909-932.; Gill, Duane and Steven Picou. 1998. "Technological Disaster and Chronic Community Stress." *Society and Natural Resources* 11:795-815. Krannich, Richard and Stan Albrecht. 1995. "Opportunity/Threat Responses to Nuclear Waste Disposal." *Rural Sociology* 60:435-453.; Slovic, Paul, Mark Layman, Nancy Krauss, James Flynn, James Chalmers, and Gail Gesell. 1991. "Perceived Risk, Stigma, and Potential Economic Impacts of a High-Level Nuclear Waste Repository in Nevada." *Risk Analysis* 11:683-696.; Spies, Sherrill, Steve Murdock, Steve White, Richard Krannich, J.D. Wolfhorst, Krissa Wrigley, Larry Leistriz, Randy Sell, and Joann Thompson. 1998. "Waste Facility Experience and Perceptions of Waste-Related Health and Safety Risks." *Society & Natural Resources* 11:719-743.

assessments to assess resident views over radioactive waste storage and disposal.¹⁴ Moreover, and as stated at the outset of this report, in our past survey and research into the impacts of the massive 2000 coal waste release on community and civic life in Martin County, KY we also relied on such drop-off / pick-up methods to distribute questionnaires to area households. In short, this impoundment study of W.Va. households replicates standard residential survey and sampling methods that have been used in the past in other risk assessments regarding hazardous technologies as well as in our own past disaster impact assessments in Martin County, KY.

Moreover, such door-to-door survey methods have recently been used to evaluate public opinion on other mining-related issues in that they have been used to assess local views regarding reclamation activities at mine sites out west. Here, it has been argued that beyond their research purposes, such residential survey methods are a good means of public outreach to communicate and explain site-related activities regarding mining operations.¹⁵ Our own door-to-door survey of area residents in Mingo and Wyoming County suggested as much: Our time in the field distributing packets and surveys provided some of the public with information on coal waste impoundments, regulatory policy and the Coal Impoundment Project. However, what transpired on the porch-steps of Mingo/ Wyoming County was more often than not more than public outreach and more of a two-way exchange where many residents took some time beyond the filling out of the survey to further explain to a member of the research team their points of views and their concerns with regard to coal mine impoundments and other mining activities in their particular area. Therefore, outside of outreach for public relations purposes, perhaps more importantly -from our perspective of expanding public input into risk assessment process, door-to-door household methods help to facilitate (or at least initiate) two-way risk communication that ultimately can breed better understanding of the risk and regulatory issues facing local and impacted publics.

In terms of survey details and the specifics of survey distribution: First off, though coal waste impoundments are a regular part of the West Virginia landscape, the counties of Mingo and Wyoming were selected due to the relatively high number of coal waste impoundments within each county as revealed in Map 1 of Appendix A. A review of Map 1 shows a good number of MSHA regulated coal waste impoundments in Mingo and Wyoming counties. Once our sampling area had been identified, our research team then surveyed door-to-door areas of Mingo and Wyoming Counties across two separate 4-day weekend field sweeps during March 31-April 3 and April 7-April 11, 2005. During the first 4-day sweep, we surveyed a large part of Mingo County which covered the areas from Kermit, Williamson, Delbarton and Matewan (see Map 2, Appendix A). During the second sweep, our teams covered the Gilbert area of Mingo County as well as the Wyoming County areas of Coal Mountain, Lillyhaven to Pineville and Mullens (see Map 3, Appendix A). To cover and distribute surveys across this wide reach, areas were further subdivided into "survey districts." During each 4-day field sweep there were three teams in the field –each weekend- distributing and collecting surveys across three separate survey districts. The districts that were covered by each of the survey teams are represented by various colors in both Maps 2 and 3 in Appendix C.

Our survey teams, which consisted of one faculty member (vehicle driver) and at least two university students, randomly selected routes, streets and branch roads within their assigned districts and then proceeded to survey approximately every 6th home on the selected routes. Unfortunately, poor weather and driving conditions during the first 4-day sweep, forced our survey teams to make some slight compromises in systematically selecting each 6th house; safety decisions on where to pull-over to avoid road and other weather hazards sometimes compromised our efforts at staying within our sampling interval. Sometimes, therefore, our survey teams were forced to sample households in clusters of 3 or 4 to avoid undue stops, starts and pull-outs onto busy mountain highways during times of low visibility.

¹⁴ See: Steele, Jennifer, Lisa Bourke, A.E. Luloff, Pei -Shan Liao, Gene Theodori, and Richard Krannich. 2001. "The Drop-off/ Pick-up Method for Household Survey Research." *Journal of Community Development Society* 32:238-250.

¹⁵ Ekstrom, K.L. 2004. "Facilitating Investigation and Remediation of Mining Sites through the use of Simple and Effective Community Involvement Tools." *Tailings and Mine Waste*:371-380.

As one will note, the cost procurements and labor intensiveness of such residential drop-off/ pick-up methods in comparison to mail-back or telephone methods are worth underscoring, especially when surveying during poor weather conditions. However, we believe that this more labor and cost intensive method allowed our research team to reach members of the public that might not otherwise turn-out for a public meeting or even mail back a survey. In reflecting upon our contacts and the people that we met, we feel that through our sample methods we have captured and registered the views of a broader range of Mingo and Wyoming County residents than if we had applied other sampling and data collection methods. And again, the additional comments and porch step conversations have greatly improved our empirical understanding of the issues facing area residents and these porch step conversations have also informed the content of this report.

In terms of more specifics on the survey, over the two 4-day sweeps of contacting area households door-to-door, our survey teams contacted 605 homes with over 407 homes accepting the survey. Others either refused (18%) or weren't at home at the time when we arrived. Of those that agreed to participate, over 250 surveys (256) were returned making for a respectable rate of return of 63%. This return rate was often facilitated by the use of "door tags," such door-tags served as "*post card reminders*" and reminded residents that a survey had been dropped-off and that our survey teams were still working in the area and that we would try again later, at a later time, to pickup the completed survey. Often times, upon return, residents would have completed the questionnaire for pickup. Door tag reminders have been used in other residential surveys and have been noted as an important method in improving response rates.¹⁶ In terms of overall responses to our survey, Appendix B Table 1 provides the general percentage breakdown on how Mingo/ Wyoming County residents responded generally to the questions contained within our survey assessment.

Tables in Appendix C, on the other hand, contain specifics with respect to our sample and reports on our analyses. Table 1 in Appendix C, for example, reports survey acceptance rates, return rates and refusals. Table 1 also reports on the spatial distribution of the sample by survey district and reports the percentage of surveys distributed in Kermit (14%), Williamson (18%), Delbarton/ Matewan (13%), Gilbert (16%), Lillyhaven/ Coal Mountain (20%) and Pineville (18%). Demographic breakdowns and other characteristics of our sample of Mingo and Wyoming County residents (n=256) are reported across Tables 2, 3 and 4. Table 2 reports on demographic characteristics of our sample by gender, age, income and employment characteristics. Table 3 goes further and compares some of these sample characteristics with population data for Mingo and Wyoming Counties based on the 2000 U.S. Census. Such comparisons are often important in determining whether the sample represents a "representative" cross-section of the county population.

It appears, as reported in Table 3, based on sample versus population comparisons that our sample is slightly more educated than the population generally. Of those residents that we surveyed, 36% reported having more than a high school degree whereas U.S. Census data reports only 25% and 23% of Mingo and Wyoming residents respectively having more than a high school education. In addition, surveyed respondents also appear more likely to be homeowners than what is typical for both counties with 88% of our sample reporting owning their own home in comparison to general home ownership rates for Mingo (66%) and Wyoming (66%) counties. Those that were surveyed also appear slightly more likely to have children present in the home with 40% reporting children under the age of 18 living at home in comparison to census data for Mingo (32%) and Wyoming (30%) county. Our sample also tends to draw upon higher income earning groups with only 10% of survey respondents reporting an annual income of less than \$10,000, whereas census data for both Mingo and Wyoming counties respectively report 26% and 21% of households earning less than \$10,000 per year. Thus, while we remain confident that our residential sample methods have allowed us to collect the views and opinions of a broader range of county residents, it appears that our sample tends to slightly over represent more educated, higher income homeowners for both Mingo and Wyoming counties than what is typical in both counties.

¹⁶ *Ibid.* Steele, Jennifer, et.al. *Journal of Community Development Society*; *Ibid.* Ekstrom, K.L. *Tailings and Mine Waste*.

Other survey characteristics of those that we surveyed (household type, public water/ private well, voting and civic activity) are presented in Table 4. In addition, Table 4 also reports on mining sector involvement through the following survey question:

- *Is any person in your family involved in the mining industry either through being employed, the sale of mineral rights or through other business-related activities?*

Of those that completed the survey, over half (54%) reported linkages to the industry through employment or other business activities while a little less than half (46%) reported otherwise. In other analyses of this report, and as stated at the outset of this report, these distinctions between “mining” and “non-mining” households are used to explore differences in local public opinion regarding the risks and benefits associated with coal waste impoundments. These comparisons will allow us to determine whether there are meaningful differences in public opinion over impoundments and impoundment regulations, compensation strategies and emergency action planning between mining and non-mining households.

Community and Quality of Life Issues:

In assessing the impacts of various hazardous activities and technologies on communities, general questions are often used to assess general views regarding overall quality of life. These types of questions are used to assess, identify and rank the most pressing community issues and to determine the extent to which the risks and problems associated with a particular technology or environmental hazard are, in fact, one of the principal issues in the lives of community residents. Moreover, such general community scales have been used in disaster-impact studies and have been used to measure the extent to which there has been a fundamental shift in resident perceptions regarding the overall liveability of their community in the face or aftermath of a technological and environmental breakdown. In our prior impact assessment in Martin County, KY, we used such standard quality of life questions to assess the extent to which there had been a fundamental shift in resident public opinion regarding the overall liveability of the community in the face of the 2000 impoundment breakthrough. In the case of Martin County, in comparison to non-impacted Perry County KY, our survey findings showed that general views on overall quality of life in the community seemed to have been drastically shaken. Table 5 Appendix C reports on some of the community and quality of life questions for Martin and Perry County residents as a point of illustration. In the case of disaster-hit Martin County, for example, only 22% of Martin County residents rated the overall quality of life in their community as “good” to “very good” in comparison to nearly half (46%) of Perry County residents for the same year.

We also used the same standard scales in the Mingo and Wyoming County risk assessment. These results from Mingo and Wyoming county residents are also presented in Table 5. As might be expected, general community views of Mingo and Wyoming County residents seem to compare more so with the views of Perry County, KY residents than they do with the opinions of disaster-impacted Martin County citizens. As in Perry County, for example, nearly 4 out of 10 of Mingo/ Wyoming county residents (37%) reported the overall quality of life in their community as “good” to “very good.”

The next set of questions, presented in Table 5, report on primary community problems as rated by area residents on the following scale: *not a problem, a slight problem, a moderate problem, a serious problem*. In disaster-impacted Martin County, for example, the highest rated community problem was drinking water with 80% of those surveyed in 2001 reporting it as a “serious problem.” At the time, these extraordinarily high percentages were striking in comparison to Perry County where only 25% of those surveyed reporting their drinking water a serious problem during the same year. These striking differences seemed to capture well the impacts of the 2000 coal waste disaster on community life in Martin County from a citizen perspective and seemed to empirically document overriding community concerns over drinking water impacts in disaster impacted Martin County. In fact, these contrasting numbers have been used by our own research team to consistently argue and demonstrate that many Martin County residents remained worried over the long

and short-term impacts of the sludge spill on the watershed and drinking water supply, despite repeated regulatory and industry assurances that claimed otherwise.

Table 5 also reports on the highest rated community problem for Mingo/ Wyoming counties. Survey results report similar percentages for Mingo/ Wyoming Counties W.Va. as with Perry County KY on drinking water and other community-rated problems. As with residents in Perry County, over a quarter to a third of Mingo/ Wyoming county residents (29%) rated drinking water as a serious problem. Though certainly not as striking as 8 out of 10 citizens in Martin County rating drinking water as a serious issue, these other percentages seem worth also emphasizing as they do seem to reflect a high overall concern over drinking water within Appalachia KY and W.Va. In short, based on our survey data from Perry, Mingo and Wyoming counties, it seems that over 1 out of 4 households rate drinking water a “serious problem” in their community and that seems worth noting.

Drinking water, however, unlike in disaster-impacted Martin County, was not the principal community problem in either Mingo or Wyoming County. Unlike the pressing environmental concerns in Martin County in the face of the 2000 sludge spill's aftermath, the highest rated community problems in Mingo/ Wyoming counties in 2005 remain more or less the same as those identified among Perry County residents in 2001. Crime/ drugs, unemployment, health problems and sewage were all rated a “serious problem” among area residents. Notably, in contrast to Perry County, economic growth also remains an overriding and principal issue among Mingo/ Wyoming County residents with 61% of those surveyed reporting economic growth as a serious issue facing their communities.

In the Mingo/ Wyoming County impact assessment, two other questions were added to the survey in order to better assess community views regarding the possible economic benefits associated with coal waste impoundments and the coal industry generally. These questions were adapted from other impact assessments. But given that these questions were not asked in the earlier Martin/ Perry County survey, for comparison and discussion purposes, the views of “mining” and “non-mining” Mingo/ Wyoming households were compared on this particular set of questions and are presented in Table 5, at the end:

Here, we anticipated that households with direct linkages to the industry through employment or other business related activities would be more inclined to identify the economic benefits and opportunities associated with coal mining. These findings were somewhat confirmed via responses to the following question:

- *The coal industry provides jobs and economic opportunity to local people in my community:*

Table 5 reports that households with employment or business ties to coal mining were more likely to agree (53%) or strongly agree (33%) that the coal industry provides jobs and economic opportunity to local people. But whereas 88% of those linked to the industry saw the benefits associated with coal mining on the local economy, only 56% (40% agree, 16% strongly agree) of those with no direct linkages to the industry were able to identify local economic benefits associated with coal mining activities.

On the next question, we also anticipated mining households to be more likely to identify the economic benefits associated with coal and coal waste impoundments. The following question was used to assess the extent to which this was so:

- *The Economic Benefits associated with coal and coal waste impoundments outweigh the risks:*

Here, however, the percentages provide less clear distinctions between household types. While we anticipated mining households to be more in agreement with the above statement, survey results show an equally similar level of disagreement regarding this question between mining and non-mining households: Of households with ties to the coal industry, 43% either disagreed (21%) or strongly disagreed (17%) and likewise, among households with no direct links to

the coal industry, a similar 45% either disagreed (29%) or strongly disagreed (19%) that the economic benefits associated with coal and coal waste impoundments outweigh the risks. These findings tend to suggest that the public, even those with employment or business linkages to the coal industry, are reluctant to concede that the possible economic benefits of impoundments outweigh their costs.

SECTION THREE: RISK PERCEPTION AND COMPENSATION STRATEGIES:

A Comparison of Mining versus Non Mining WV Households

General Risk Perceptions and Ratings:

Mining and non-mining household differences (or lack of differences) are the theme and focus of the remaining contents of this report. Such comparisons between households involved in the mining and non-mining sectors will allow us to determine whether there are any meaningful departures in opinion between households with ties to the coal industry versus other area households and the extent to which there represents a clear split in public opinion on issues surrounding coal waste and coal waste impoundments.

But while all other tables in Appendix C address particular concerns related to coal impoundments specifically, Table 6 represents a small departure. Table 6 reports on general differences between mining and non-mining households with regard to a series of general household, occupational, environmental and national risks. On this set of survey questions, in keeping with questions used elsewhere in other risk assessments, Mingo and Wyoming county residents were asked to rate a list of twelve potential daily risks on a scale of 1 (not serious at all) to 10 (very serious). To summarize findings on these questions, given the 1 to 10 scale, Table 6 reports the average reported ranking (rather than percentages) for mining and non-households on each measured risk dimension.

A review of Table 6 suggests that the highest average rated risk across both mining and non-mining households is flooding and flash flooding with the average rating being 7.24 and 8.02 respectively. These rankings seem quite valid. In our casual conversations with area citizens while surveying, it seemed that when distributing the survey the principal concern was, in fact, flooding. For example, several people that we talked to mentioned living in a "40-year flood plain" but where high water and flooding was occurring relatively regularly even seasonally. Some that we talked to made connections between the high incidences of flooding, increased strip mining activities in their area and the subsequent uncontrolled run-off and siltation in the creeks that tended to, in their view, exacerbate flood conditions during times of heavy rains. As one resident took the time to write, "right now my concern is with the flooding that occurs each time it rains heavy. We have done a lot to our property and now that a mine has gone into the head of the hollow I fear our property is worth nothing now." In short, conversations with area residents seemed to be confirmed through our survey percentages with flooding and flash flooding being ranked the highest rated risk among our sample of respondents from both mining and non-mining households alike.

The second highest rated risk was also the same for both household types: Coal trucks were perceived as a principal danger across both household types and were rated, on average, on the 1 to 10 scale as high for mining (6.81) and non-mining (7.28) households respectively.

Abandoned mine sites was the third highest ranked risk among both household types with mining (5.65) and non-mining (6.02) rating abandoned mines as a principal risk concern.

There was some slight variation between household types with respect to other hazard rankings. Nevertheless, a review of Table 5 shows the following risks to be also of primary concern among Mingo and Wyoming county residents:

- Coal Waste Impoundments
- Exposure to hazardous chemicals in the watershed and water supply.
- Exposure to hazardous chemicals from mining activities
- Other man-made hazards (hazardous material spills, fire and shortages of critical resources)

These reported community and environmental risks as prioritized in Table 6, and as reported to citizens at the Williamson public meeting, received some nods of confirmation from various community members present at the public meeting. However, these ratings and rankings raised some thoughtful questions among other residents present. One resident pointed out the possible discrepancies in the target population. As already mentioned at the start of this report, one citizen commented that those living elsewhere in other places in the community would naturally be less concerned over coal waste and coal waste impoundments than those living downstream from such facilities. Their pointed question and comment:

- How many persons in the sample lived directly downstream from a coal waste impoundment?
- And how did they rate these risks?

Unfortunately, an exact answer to either question could not be provided. As we explained, our survey was designed like other community risk assessments that have been used in other studies insofar as we attempted to broadly assess community views of a high hazard technology and didn't attempt to over sample direct impact (downstream) households downstream. Rather, than targeting particular households, we attempted to capture a general ("non-biased") sense of community concerns related to coal waste and coal impoundments based on a cross-section of county residents.

Yet as we also explained, though we did not attempt to target residents living near impoundments, we no doubt surveyed any number of households on routes and branch roads where an impoundment was marked in the near vicinity. See, for example, Map 1 in Appendix C for a wider view of the number of impoundments within our survey area of Mingo and Wyoming counties. But, the fact remains, on whether these surveyed households on these particular routes were actually downstream from a coal waste impoundment. Such information would have required a set of questions that had asked residents to self-report on their location and proximity to an area impoundment. Unfortunately, such a question or set of questions were not included on this particular instrument. In addition, such self-reports of physical location and physical proximity to an impoundment would probably have to be validated via a review of local topography and the MSHA classification of the impoundment.¹⁷ Moreover, self-reporting on geographic location would not have met standard geographic (GPS) procedures. And this type of mapping of surveyed households was not possible given that our research protocols did not allow us to retain any specific address information on surveyed households and so, mapping GPS household address data and matching it by topography, impoundment location and impoundment hazard rating was not a possibility. As we explained at the public meeting, the reason we did not retain specific address information was to maintain the complete confidence and privacy of those that we surveyed. In the end, we believe such research protocols of guaranteeing full anonymity had the added benefit of encouraging the participation of people who might not otherwise

¹⁷ Mine Safety Health Administration ranks impoundment hazards based not on breakthrough but on impact potential. MSHA uses the following classification scheme in its hazard ranking of MSHA regulated coal waste impoundments:

- *Low Hazard Potential* – Facilities in rural areas where failure would cause only slight damage, such as to farm buildings, forest, agricultural land and minor roads.
- *Moderate Hazard Potential* – Facilities in predominantly rural areas where failure may damage isolated home or minor railroads, disrupting services or important facilities.
- *High Hazard Potential* – Facilities whose failure could reasonably be expected to cause loss of human life, serious damage to houses, industrial and commercial building, important utilities, highways and railroads.

Ibid. National Research Council, *Coal Waste Impoundments: Risks, Responses and Alternatives*. p.31.

have participated for various reasons. This seemed to arouse some nods of acknowledgement among some residents present at the community meeting.

In the end, this explanation (defense) of our research design and procedures is not meant to dismiss that particular citizen's particularly pointed set of questions on the number of downstream residents in our sample. It would certainly be important to know whether downstream households rated their risks and concerns differently from the rest of the community. It is certainly feasible that downstream residents would possibly place more of an overriding emphasis on the risks related to coal waste impoundments than coal trucks or even flooding. This, however, remains an empirical question that perhaps can be addressed in future impoundment research.

Outside of these particular questions on risk perceptions among downstream residents, there are perhaps other related questions that pertain more directly to residents living directly downstream from an impoundment. For example, it seems crucial to understand levels of household knowledge of the emergency monitoring, action and evacuation plans in place in the event of a potential impoundment failure among downstream residents. Assessing awareness of contingency plans among such residents would seem an overriding future research question for the Coal Impoundment Project (CIP). This recommendation is reinforced by what transpired at the Williamson public meeting. It was apparent at the meeting that many residents were unaware of the emergency monitoring and evacuation protocols in place in the event of an impoundment failure and when citizens at the public meeting were told of these plans on file with state and county responders, they were then broadly dismissed by many in attendance as being probably inadequate in protecting them and their families. Survey percentages for Mingo/ Wyoming County that are reported in a later section of this report reinforce (validate) what transpired at the Williamson meeting, with most surveyed residents reporting being largely unaware of emergency action plans for impoundments and also rating them as largely inadequate.

It would seem that a research design to better understand risk perceptions among downstream residents specifically could potentially be a two-way communication process, where the research team not only learned at a more in-depth level about the risk concerns and preparedness levels of downstream citizens, but also used this opportunity to inform area residents of the monitoring, regulatory and preparedness apparatus in place for MSHA regulated impoundments in order to raise public awareness levels. Such systematic outreach and research where there is effective two-way risk communication between the CIP, regulators and downstream residents could potentially lead to overall improvements in regulation, enforcement and emergency preparedness that might begin to allay some of the public's fears and apprehensions over impoundments and their skepticism over the attendant emergency preparedness plans. As stated at the start of this report, a two-way risk characterization / risk communication process as envisioned here between regulators and downstream residents would be in direct accord with the 1996 recommendations issued by the National Research Council of better integrating citizens and other stakeholders into the deliberation and assessment of risks and hazards.

Though we do recommend future changes in research design to address other perhaps, more specific questions related to impoundments and potentially impacted populations, we remain confident over the standard residential sample methods that were applied in this particular study to broadly assess area resident views on impoundments. By relying on a broad cross-section of community residents, we believe that we are potentially positioned to make better generalizations and sounder recommendations with regard to a series of impoundment issues that might be more acceptable to a wider cross-section of WV residents. And thus, with respect to the analyses that ensue, the remaining set of tables (Tables 7 through 14) attempt through our residential survey of Mingo and Wyoming county resident to report on *general community views* with percentage breakdowns presented for mining versus non-mining households. Such comparisons between household types, as stated previously, will allow us to assess the extent to which there are differences in views and risk perceptions between households tied to the mining and non-mining sectors and hopefully, these survey methods and analyses will allow us to reach a wider and perhaps fuller understanding of

community public opinion pertaining to coal waste and coal waste impoundments than if we had applied other methods or analyses.

Coal Waste Impoundments: Level of Community Awareness and Concern:

Table 7 summarizes general levels of community awareness over coal waste impoundments across mining and non-mining households for Mingo/ Wyoming counties, with the first question presented in Table 7 reading:

- *Prior to this survey, were you aware that there was a coal waste impoundment near your community?*

Here, percentages reinforce what might be expected, with those tied to the coal mining industry through employment or other business-related activities more likely to report knowing of a coal waste impoundment near their community with 80% reporting “yes” in comparison to only 50% of non-mining households reporting the same.

The next question reported in Table 7 reports on general levels of public awareness regarding emergency action planning protocols over coal waste impoundments, with the second question in Table 7 reading:

- *I know about the emergency response procedures in my community if the local impoundment were to rupture in the future.*

Interestingly and what suggests an important “finding” is that while mining households were generally more aware of coal waste impoundments, they were just as unaware as their non-mining counterparts of the emergency action and preparedness (EAP) plans that are on file with state regulatory officials and county responders in the event of a breakthrough. Table 7 shows 59% of mining households either strongly disagreeing (26%) or disagreeing (33%) that they know about the emergency response procedures in their community if the impoundment were to rupture in the future. A roughly similar 53% of non-mining households either strongly disagreed (23%) or disagreed (30%) that they know about such emergency response procedures.

These findings reinforce what transpired at the Williamson public meeting with regard to what seems to be an overall lack of public knowledge regarding emergency action and contingency plans for MSHA regulated coal waste impoundments in W.Va. and suggest the need for better outreach on the part of industry, state and federal regulatory officials and county first responders as well as the Coal Impoundment Project (CIP). Area residents need to be better educated with respect to the EAPs on file with the state and county and now available online via the Coal Impoundment Project through its *Coal Impoundment Location and Warning System*.¹⁸ Moreover, the lack of knowledge of emergency action plans among households directly tied to the mining industry suggests some relatively easy outreach through MSHA and through other job and industry-related postings to update and inform mining households of impoundment preparedness plans and protocols for downstream communities and households.

Coal Waste Impoundments: Community Risk Perceptions

Table 8 reports on particular risk concerns regarding coal waste impoundments for mining and non-mining households. The set of questions that are reported in Table 8 are also adopted from prior risk assessments that have been used to measure community risk perceptions surrounding other high hazard technologies and have been modified slightly to measure public risk concerns associated with coal waste impoundments.

¹⁸ See: Coal Impoundment Project, National Technology Transfer Center: Coal Impoundment Location and Warning System. Available online: <http://www.coalimpoundment.com/>

Across the first set of items presented in Table 8 it appears that mining households are significantly more likely to concede that engineers, the coal company and state and federal regulatory officials understand the risks associated with coal waste impoundments. For example, of mining households 58% either agreed (43%) or strongly agreed (15%) that engineers understand the risks, while only 40% of non-mining homes agreed that engineers understand the risks associated with coal impoundments (28% agreed, 12% strongly agreed).

On the next set of questions, on the other hand, regarding issues of emergency preparedness and subsequent risks, there is more common agreement between household types:

With regard to the following question:

- *People living near the impoundment are prepared for the risks*

Persons from both mining and non-mining households were equally likely to disagree that residents possess a level of preparedness in the event of an impoundment emergency. Of those tied to the mining industry, 68% disagreed (33%) or strongly disagreed (35%) in comparison to a similar 63% of other households that either disagreed (32%) or strongly disagreed (31%) that people living near impoundments are prepared for the risks.

On the next question:

- *People and county personnel living near the impoundment can control and monitor the risks*

Table 8 reports that persons from both household types equally disagreed (60% = strongly disagreed or disagreed) that people and local county personnel living near the impoundment can control and monitor impoundment risks.

And likewise, as stated previously via another similar question, there was also common consensus between household types with respect to economic benefits, trade-offs and risks associated with coal waste impoundments. On the following survey question,

- *The economic benefits of coal waste impoundments outweigh their risks*

Here again, a reported elsewhere on another survey question, there was no difference between households. Of those tied to the industry, 40% either strongly disagreed (15%) or disagreed (25%) that the economic benefits of impoundments outweigh their risks in comparison to a similar 41% of other households (18% strongly disagreed, 23% disagreed with the above statement).

On the next question there was also common consensus among households:

- *People dread living near the impoundments*

Of mining households 67% strongly agreed (33%) or agreed (34%) that people living near impoundments are apprehensive over the risks. A similar 64% of non-mining households reported the same (strongly agreed 27%, agreed 36%).

To summarize so far, both types of households tended to be of the view that people living downstream from impoundments, as well as county personnel, are unprepared in the event of an emergency or potential danger. These survey findings tend to reinforce (and validate) what transpired at the Williamson public meeting with those in attendance feeling that they and their families as well as other county personnel were helplessly unprepared for an impoundment emergency. In addition, percentages showed both mining and non-mining households disagreeing *–at the same rate–* that the economic benefits of coal waste impoundments outweigh the risks. Finally, both types of households reported a similar high level of perceived dread among residents living near or downstream from coal waste impoundments.

The last set of questions in Table 8 report on citizen perceptions regarding potentially severe hazards and consequences associated with impoundments. These questions too were adopted from questions used to assess public risk perceptions regarding other hazardous technologies (nuclear facilities). With regard to the next set of questions,

there seemed to be an overriding fear among the public across both mining and non-mining sectors of the imminent and serious dangers associated with coal waste impoundments, based on the response to the following two survey questions:

- *An impoundment break would involve certain death*
- *An impoundment break would kill many people at one time*

It seems from the survey percentages being reported across both questions that the majority of people in Mingo/ Wyoming County -across both household types- consider coal waste impoundments a high hazard "high consequence" technology: With respect to the first question, 53% of mining households either agreed (34%) or strongly agreed (19%) that an impoundment break would involve certain death, whereas 61% of non-mining homes agreed (32%) or strongly agreed (29%) with that statement. Moreover, an equal 60% of both mining and non-mining households either agreed or strongly agreed that an impoundment breakthrough would kill many people at one time.

Public fears over the uncertainties associated with various hazardous technologies are sometimes described (dismissed) as "irrational" among regulatory and industry officials, -especially when there is a clear history of high reliability in maintaining operations as well as a sound regulatory track record. However, the history of mine processing is a spotty track record at best. Worse, such operations have a sad history of being marred by a series of catastrophic events that have occurred relatively consistently over the last decades. For example:

- 1966 Aberfan, Wales: A colliery tip on a mountainside slid down into the village, engulfing the school, killing 144 people, including 116 children, 109 of whom were in the school at the time.¹⁹
- 1972 Buffalo Creek Logan County, West Virginia: A Slurry dam overtopped and collapsed, releasing a torrent of black water and slurry destroying 16 communities, permanently dislocating over 4,000 persons and killing 125 people.²⁰
- 1986 Stava Italy: A dam holding back a massive reservoir of wastewater from fluorite mine operations collapsed, releasing a colossal surge of waste materials killing 268 people and destroying everything downstream in its path.²¹
- 1981 Ages, Harlan County, Kentucky: A slurry dam failed, releasing 25 million gallons of saturated coal refuse, killing one resident.²²

The above list by no means represents an exhaustive or global list of deaths associated with mine preparation and tailing accidents, but simply documents the number of direct deaths (538) from some of the major mine waste disasters in the U.S. and Europe over the past forty year period.²³

¹⁹ See: Turner, Barry. 1976. "The Organizational and Inter Organizational Development of Disasters." *Administrative Science Quarterly* 21:378-397.

²⁰ See: Erikson, Kai T. 1976. *Everything in its Path : Destruction of Community in the Buffalo Creek Flood*. New York: Simon and Schuster; Bethell, Thomas and Davitt McAteer. 1978. "The Pittston Mentality: Manslaughter on Buffalo Creek." Pp. 259-275 in *Colonialism in Modern America: The Appalachian Case* edited by H. Lewis, L. Johnson, and D. Askins. Boone, N.C.: Appalachian Consortium Press; *Ibid.* National Research Council, *Coal Waste Impoundments: Risks, Responses and Alternatives*. p.25.

²¹ *Seconds from Disaster: Flood at Stava Dam*. Episode 11. The National Geographic Channel.
Note: The author would like to thank an anonymous citizen at the Williamson public meeting for giving the author this videotape.

²² *Ibid.* National Research Council, *Coal Waste Impoundments: Risks, Responses and Alternatives*. p.27.

The second listed incident, the 1972 Buffalo Creek catastrophe that occurred in Logan County West Virginia, remains a bleak reality for some that we surveyed. While the disaster occurred in Logan County, Buffalo Creek, it is only a 15 to 20 minute drive time from various points of both Mingo and Wyoming counties. As was explained to us by some area residents that we talked to, many families after Buffalo Creek, relocated to the Mingo/ Wyoming County area; several even mentioned family members or pointed to houses of various neighbors who had survived the flood. One of these persons, who gave us permission to use her name, stood in her driveway on a first spring evening and told us of her husband's ordeal and recollections (nightmare) of the Buffalo Creek disaster. When we returned to pick up the survey, she had written down some of her experiences for the record and gave us permission to use, "what we might need in writing the report." We feel compelled to move momentarily from the percentages and provide the reader with what Sue McCoy wrote:

My family is very aware of coal sludge dam dangers.

I lost my grandfather in the Buffalo Creek dam break. My husband lost his entire family (his wife and two children). He was in the floodwater for over one mile, before climbing onto a car hood that was jammed near the mountainside. His wife and daughter were not found until 13 days after the flood. His son 13 months old was never found, so he has no closure on this.

We knew many of the victims of this disaster and the trauma and effect on the people of Buffalo Creek.

No warning was given to my grandfather or my husband's family. Just on Big Loud Road and then the panic and fear and death and destruction started, and it is a never -ending battle just to go on day to day. Lives and families were changed and destroyed forever.

No one should have to live through this or the effects that last a lifetime. So I think that Buffalo Creek should have been a wakeup call, but apparently not. God bless the people who live below these dams, prayfully they won't have to go through what we've suffered through. –*Sue McCoy, April 2005.*

The NRC *Committee on Coal Waste Impoundments*, in its review of federal impoundment regulations, described the history of stringent regulatory changes that have been implemented since the aftermath of Buffalo Creek.²⁴ The current regulatory and enforcement system that is in place over MSHA regulated coal waste impoundments was also explained to citizens at the April 2005 Williamson public meeting by an MSHA official who was part of the panel. Some of what was said is summarized here:

- MSHA is required to conduct an inspection twice a year if the site is associated with a surface mine/facility. Facilities associated with underground mines must be inspected four times a year.
- MSHA enforcement districts may increase inspection frequency by their impoundment specialists during critical construction phases. An operator also conducts regular field tests to confirm the embankment construction material is being placed according to the approved plan. The results of these density tests must be maintained for MSHA review.
- Federal regulations require that a registered professional engineer annually certify that all construction, operation, and maintenance performed at the site be in accordance with the approved plan.²⁵

²³ For another list of global accounts of fatalities (878) from mine impoundment accidents, see: Davies, Michael. 2001. "Impounded mine tailings: What are the failures telling us?" *Bulletin*: 53-59. *Note*: Curiously, this fatalities database does not include resident deaths from coal mining incidents and subsequently, does not include the major disaster at Aberfan, Wales (144 deaths), Buffalo Creek WV (125) nor in Harlan County, KY (1) nor other international incidences associated with coal mine activities and coal waste impoundments.

²⁴ *Ibid.* National Research Council, *Coal Waste Impoundments: Risks, Responses and Alternatives* see: Chapter 2 "Current Regulatory Framework" pp. 35-50.

²⁵ Section 77.216-4 of Title 30 of the Code of Federal Regulations (CFR)

In terms of routine on-site monitoring of the impoundment facility:

- Federal regulations require that all dams or impoundments falling under MSHA jurisdiction 1) be examined at intervals not exceeding 7 days, and 2) have their instrumentation monitored at intervals not exceeding 7 days.²⁶
- All inspections are required to be performed by a "qualified person."²⁷ The applicable definition of a "qualified person" is provided as "(1) An individual deemed qualified by the Secretary and designated by the operator to make tests and examinations required by this Part 77."
- To be designated as qualified, a person must take an 8-hour training course primarily pertaining to recognition of hazardous conditions and monitoring of instruments and then pass a written test. A yearly 4-hour refresher course must be attended to maintain the qualified status. Though the qualified person typically does not inspect day-to-day activities at the site. They do perform the weekly inspections and monitor any instruments.²⁸

Due to an overhaul in the regulatory system since Buffalo Creek, there has not been another "overtopping" and collapse of an impoundment dam (embankment) in the United States since the horrific disaster of 1972. As the NRC *Committee on Coal Waste Impoundments* wrote:

...Following that accident, regulations were promulgated to govern the design of the embankment structures used in future impoundments. Since then, no engineering embankments have failed....²⁹

This statement could have been used to allay public apprehensions and fears over coal waste impoundments if not for the impoundment breach of 2000 in Martin County, KY. While the Martin County dam did not overtop, the impoundment basin did bottom-out releasing slurry and sludge materials into underground mine works that ultimately escaped out two mine portals on opposite sides of the mountain. In the spill's aftermath, there was speculation and talk among local residents over an even worse case scenario having been avoided: What if materials burst out only one portal rather than two? Several that we interviewed speculated that the subsequent force and volume of mine waste would have probably posed a grave danger for those residents unfortunate enough to be on the receiving-end of such a massive blowout of materials.

Other possible worse case scenarios circulated through the community in Martin County in the aftermath of the 2000 disaster. When the impoundment bottom breached, it was estimated that the 72-acre Big Branch Impoundment released approximately 10 % of its reservoir contents. At the time of the breakthrough, company bulldozers were brought in during the early morning hours and began immediately pushing materials into the cavity to stop the vortex of sludge and

²⁶ 30CFR Section 77.216-3

²⁷ 30CFR Section 77.2

²⁸ The Code of Federal Regulations that apply to impoundment inspections and that are cited and explained here are based upon a further correspondence with Stanley J. Michalek, P.E. Pittsburgh Safety and Health Technology Center, Mine Waste and Geotechnical Engineering Division, Mine Safety Health Administration. Note, outside of federal inspection standards over coal waste impoundments, states also employ qualified persons to inspect impoundments on varying schedules. See: *Ibid.* National Research Council. *Coal Waste Impoundments: Risks, Responses, and Alternatives*. p. 44.

Moreover, federal statutes require expanded monitoring and surveillance, "(b) when a potentially hazardous condition develops." In those instances, "the person owning, operating or controlling the impounding structure shall immediately: (1) Take action to eliminate the potentially hazardous condition; (2) Notify the District Manager; (3) Notify and prepare to evacuate, if necessary, all coal miners from coal mine property which may be affected by the potentially hazardous conditions; and (4) Direct a qualified person to monitor all instruments and examine the structure at least once every eight hours, or more often as required by an authorized representative of the Secretary. See: 30 CFR § 77.216-3.

²⁹ *Ibid.* National Research Council. *Coal Waste Impoundments: Risks, Responses and Alternatives* p. 26.

black water into underground mine works.³⁰ The immediacy of the onsite company response no doubt prevented an even more massive inundation of mine waste materials being released. But, as some area citizens also speculated, it was also fortunate that the bottom break was near enough to the impoundment beach that it could be readily reached by machinery. At the time, the editor of the local newspaper, *The Mountain Citizen*, speculated on another potential catastrophic scenario having been avoided:

- Last week's rupture reportedly occurred near a cove in the pond, easily accessible to heavy equipment that quickly plugged the hole with dirt and rocks. The scene reportedly looked much like pulling the plug in a bathtub as this black goo swirled in whirlpool fashion to the void below. But what if a major roof collapse in the coal seam below were to occur near the middle of the 80 acre pond? If just 10% leakage caused this much damage, what kind of devastation would 20, 30, or 40 percent leave in its wake? ³¹

Moreover, there had been several other major basin failures prior to the major breach in Martin County, KY of 2000:³²

- In 1994, an earlier breakthrough occurred in Martin County, releasing nearly 32 million gallons of black water into an abandoned and sealed off portion of an underground mine.³³
- In 1996, a breakthrough occurred in St. Charles, Virginia, releasing 1 million gallons of black water into an area creek through an abandoned mine.
- In 1996, another breakthrough occurred in St. Charles, Virginia, releasing 6 million gallons of water and slurry into the area water system.

The NRC in its 2002 report described basin failures as an emerging engineering, regulatory and enforcement issue facing MSHA and state regulators. As the NRC Report states,

The principles that govern regulation of the design of structure that were promulgated in response to the Buffalo Creek disaster are well understood and fully documented. While continued vigilance concerning design, construction and operation of impoundments is clearly warranted (Chapter 6), *the Committee concludes that uncertainties remain in the characterization of the basin area and, therefore, in the mitigation of risks associated with the breakthrough potential.* The potential for underground coal mine workings to be in close proximity to an impoundment is a factor in the design of new and in modification of existing coal waste impoundments in Appalachia....³⁴

³⁰ United States Department of Labor. Mine Safety and Health Administration Coal Mine Safety and Health. (October 17, 2001) *Report of Investigation. Surface Impoundment Facility Underground Coal Mine. Non-Injury Impoundment Failure/ Mine Inundation Accident.* Pp.3-5.

³¹ Gary Ball (October 18, 2000) Estimating the damage: Coal Sludge release doubles that of 1972 Buffalo Creek Disaster. *The Mountain Citizen.* .p.1.

³² Michalek, Stanley, George Gardner and Kelvin Wu. 1996. *Accidental Releases of Slurry and Water from Coal Impoundments through Abandoned Underground Coal Mines.* Pittsburgh, PA: Mine Safety and Health Administration, Safety and Health Technology Center.

³³ In fact, this incident at the same impoundment that breached in 2000 raised some serious concerns over the regulatory and enforcement system among Martin County citizens. The regulatory record showed that the company had been cited and fined for the 1994 event, but records also showed that there was no follow up inspection on compliance with required engineering changes.³³ Whether follow up inspection could have prevented the massive failure of 2000, however, is up for speculation given that investigations revealed that the 2000 basin failure was the result of other engineering design flaws and the result of barrier/ wall instability between the basin bottom and underground mine works, -the barrier / wall thickness should have been 100 ft but core drilling revealed that it was less than 20 ft. See: *Ibid.* United States Department of Labor. Mine Safety and Health Administration Coal Mine Safety and Health. *Report of Investigation. Surface Impoundment Facility Underground Coal Mine. Non-Injury Impoundment Failure/ Mine Inundation Accident.*

³⁴ *Ibid.* National Research Council *Coal Waste Impoundments: Risks, Responses and Alternatives* , p. 70.

Outside of the NRC Report, and as it was in our more formal interviews with Martin County residents in 2001, local concerns over the regulatory and enforcement system over impoundments were a consistent theme in some of our short conversations with some Mingo/ Wyoming Citizens during our survey and also during the Williamson public meeting. Several residents that we talked to in Mingo and Wyoming counties pointed to a seeming history of industry noncompliance and an overall lack of regulatory enforcement over impoundments. One resident, in their written comments, made it a point to state upfront, "my family has been employed or otherwise involved in the coal business all our lives," and then went on to state, "but really we need some stronger regulations and controls." Several residents spoke of the lack of regulatory oversight over smaller holding ponds and holding cells that are not MSHA regulated. One citizen at the Williamson community meeting mentioned a breach in a holding pond in the area of Varney, Mingo County (see Map 2 Appendix C) that flooded out his and other residents' homes in late spring of 2004. Other citizens, as was also our experience in KY, mentioned what appeared to be regular and routine impoundment releases of black water into area creeks. One citizen wrote, "Are laws being enforced about sludge in rivers? Sludge pond run-off runs into the Tug River all of the time."

In short, a series of past major disasters, recent NRC statements regarding possible engineering flaws, combined with a record of smaller though relatively frequent failures,³⁵ does not impart much public confidence in coal waste impoundments with respect to their maintenance, their regulation and their subsequent reliability, stability and safety. A spotty record of facility maintenance and regulatory enforcement, as evidenced here, would instead tend to validate and exacerbate public fears and apprehensions over the possible grim, impending potential of yet another unchecked, massive impoundment breakthrough. This sense of impending dread was expressed and reinforced in our survey percentages with a majority of citizens both tied and not tied to the coal mining industry viewing coal waste impoundments as high hazard facilities that can and do cause human death and destruction. Thus, in the case of coal waste impoundments in Appalachia, risk perceptions may well reflect reality. Consequently, in allaying these potentially, legitimate public fears and apprehensions, the industry and state and federal regulatory agencies will have to go far beyond 'risk communication' as mere 'public relations' and "outreach" and commit instead to a long-term track record of stringent regulation, enforcement and industry compliance in order to restore public confidence and appease public anxieties over coal waste impoundments.³⁶

³⁵ See: *Ibid.* Davies. What are the failures telling us?" *Bulletin*. For a definition of an impoundment "failure"(versus a major impoundment incident): A "failure" is a "unacceptable difference between expected and observed performance (p.1052)." According to Davies:

... Failures need not be catastrophic flow failures... In fact, there are dramatically more "mundane" failures to learn from.... While the more catastrophic failures gather the most attention and certainly dominate the typical failure databases that get developed, the same trends and lessons are available from the lesser failures (also called "upsets" by many in the industry). As the lesser failures tend to get very little publicity, and almost never any technical publication, practitioners of tailings impoundment design should keep their own database developed from observations obtained from reviews, audits and the like (p.1052).

Note: The Coal Impoundment Project has developed a "failures database" for coal impoundments for the Appalachian Region of the United States (mostly based on KY and West Virginia failures). The database ("spill list") in progress is available online: <http://www.coalimpoundment.com/spill/default.asp>

³⁶ For a similar position stated within the context of nuclear waste and the Nuclear Regulatory Commission and Department of Energy, see: Slovic, Paul, Mark Layman, and James Flynn. 1991a. "Lessons from Yucca Mountain: Risk Perception Trust and Nuclear Waster." *Environment* 33:7-30.

Coal Waste Impoundments: Emergency Action Planning (EAP) and Preparedness:

No technology is completely full proof. Yet this statement seems particularly relevant when speaking of the engineering technologies and regulatory system associated with impounding coal waste. Outside of making recommendations in improving the maintenance, monitoring and enforcement apparatus over impoundments as the first front in protecting workers and the public, there seems to be an equally apparent need for a candid appraisal of emergency preparedness and response plans that are in place insofar as such plans mark the second line of public defense and protection in the event of a major impoundment incident. The NRC in its 2002 report on coal waste impoundments makes similar recommendations that are worth quoting at length:

Public concern regarding emergency response and evacuation plans was another recurring theme in public comments made to the committee: Some residents were unaware of emergency evacuation plans; others had seen evacuation plans but disagreed with the logic behind the evacuation routes and would not have used the plan in the event of an emergency. Conversely, coal industry and regulatory agency representatives stated that these plans are being developed and shared with the public through the various community contacts (e.g. local fire departments, police, health care providers). The lack of realistic communication constitutes a fundamental barrier to the industry's ability to make stakeholders aware of the risk associated with coal refuse impoundment, construction, operation and closure and of steps taken to mitigate the risk. The committee concludes that communication concerning coal impoundment risk and emergency response between the industry and the local communities could be improved substantially. The committee suggests that the industry take steps through the appropriate emergency response agencies to address these problems.³⁷

Beyond better communication, however, and in accord with what the NRC heard -as well as what we also heard- at public meetings among citizens with respect to the overall lack of public awareness and what the public perceives as the overall inadequacy of current preparedness plans, we would recommend a fuller assessment and evaluation into the emergency action planning protocols in place over coal waste impoundments. In addition, in accord with 1996 NRC public involvement recommendations, and as said already in various places within this report, we would strongly recommend involving the public (especially the downstream public) in the emergency action planning, evaluation and assessment process. On this point, the following section of this survey report could perhaps be considered an initial effort at public evaluation of impoundment emergency planning by presenting the public's general perspective on EAPs via our survey percentages. But again, we recommend that more be done in establishing a two-way dialogue on emergency planning that includes meaningful input from W.Va. citizens, again, particularly from downstream residents.

In terms of the survey, Table 9 reports on public views of impoundment emergency action planning. The first question and percentages simply reinforce the percentages represented in Table 8 in terms of a seeming overall public apprehension over coal waste impoundments. When asked to respond to the following question:

- *There is little chance that the coal waste impoundment near my community will rupture in the future.*

The majority of those surveyed strongly disagreed, disagreed or just didn't know about the safety and stability of the impoundment in their community. On this particular question, there was no significant difference between mining and non-mining households: A clear 70% of mining households strongly disagreed (15%), disagreed (27%) or just didn't know (28%) with respect to the above statement. Likewise, 73% of non-mining households strongly disagreed (18%), disagreed (18%) or just didn't know (37%) about the overall stability of the impoundment in their community. In short, 7 out of 10 Mingo / Wyoming County homes seemed to be of the view that there is some possibility (uncertainty) that the impoundment in their community might (or might not) rupture in the future.

³⁷ *Ibid.* National Research Council. Coal Waste Impoundments: Risks, Responses and Alternatives p. 14.

The second question is simply a repeat from Table 7, but it is used here in the specific context of a discussion on emergency action planning rather than just as a measure of general levels of public awareness. The question is,

- *I know about the emergency response procedures in my community if the local impoundment were to rupture in the future.*

Again, as presented in Table 7, survey percentages reinforce what transpired at the community meetings conducted by the NRC, as well as at the 2005 meeting in Williamson that we attended, that is, most surveyed persons reported being unaware of the impoundment emergency plans in their community. As in the prior question, there was no difference in opinion between mining and non-mining households with over half (59%) of mining and non-mining households (53%) reporting some level of disagreement (strong disagreement or disagreement) that they have knowledge about the emergency response procedures in their community if the local impoundment were to break in the future. The lack of awareness among households tied to the coal industry is interesting insofar as one might expect a significantly higher level of EAP awareness among citizens tied to the mine sector. As said before, it would seem that the industry and regulators could readily take steps and target better information sharing among citizens/ workers/ families within this sector especially.

While we recommend going beyond communication and outreach of EAP plans towards a fuller assessment and evaluation on their overall adequacy and protectiveness, it would seem that if area residents are unaware of the emergency protocols in place over the impoundment nearest to them, it would also seem that emergency response, alert and evacuation measures might invariably be less than adequate in the event of an impoundment emergency. The first responders at the scene of any emergency event are regular citizens.³⁸ Subsequently, at the most basic level, a first step in improving emergency protocols would be for the coal industry, state and federal regulatory officials and the Coal Impoundment Project to conduct better outreach in providing area residents with EAP information. As the NRC writes and recommends and as quoted above, "Communication concerning coal impoundment risk and emergency response between the industry and the local communities could be improved substantially."³⁹

The third survey question actually measures the extent to which the public believes that impoundment emergency response plans are designed to be effective and protective of the public, the question reads:

- *Emergency preparedness and response plans for coal waste impoundments are adequate.*

Survey findings here also confirm and reinforce public sentiments expressed at various public meetings as observed by the NRC and our own project team. Recall, at the Williamson public meeting, most persons respectfully scoffed at the adequacy of such plans when they were told of them and the NRC found the same during its own public forums insofar as "others had seen evacuation plans but disagreed with the logic behind the evacuation routes and would not have used the plan in the event of an emergency."⁴⁰ Based on our survey results, the same sentiment seems to pervade across other households of Mingo and Wyoming counties. Over half of respondents either strongly disagreed or disagreed that the emergency action plans (EAPs) for coal waste impoundments were adequate. Here also there were no difference between mining and non-mining sectors on this particular question with 59% of mining households either strongly disagreeing or disagreeing with the above statement in comparison to 53% of non-mining households reporting more or less the same that impoundment EAPs were inadequate. This overall public skepticism concerning the ability of emergency action protocols to protect the public reinforces one of our main recommendations for a complete assessment of impoundment emergency response plans with full citizen input.

³⁸ The National Commission on Terrorist Attacks upon the United States. 2004. *The 9/11 Commission Report. Authorized Edition*. New York: W.W. Norton & Company. p.317.

³⁹ *Ibid.* National Research Council *Coal Waste Impoundments: Risks, Responses and Alternatives*. , p. 14.

⁴⁰ *Ibid.* National Research Council. *Coal Waste Impoundments: Risks, Responses and Alternatives* p. 14.

On the fourth question,

- *I have trust in the Emergency Preparedness and Response Plan for the coal waste impoundment in my community.*

On this question, mining households were slightly more likely to confer a level of trust in the emergency protocols on file with industry, county and state officials with 39% agreeing (either strongly agreeing/ agreeing) that they had trust in the emergency response protocols –whereas only 26% of non-mining households placed some trust in such plans.

In terms of trust in those entities and agencies that would have to be relied upon in the event of an impoundment emergency, a series of general trust questions were asked of local residents. The last questions in Table 9 report on levels of public trust for the following entities:⁴¹

- *I have trust in the coal company*
- *I have trust in the federal Mine Safety and Health Administration (MSHA)*
- *I have trust in the State agencies*
- *I have trust in emergency responders*

A review of Table 9 shows that the public tends to trust county emergency responders first; the federal Mine Safety and Health Administration (MSHA) second; state agencies third and coal companies fourth. In terms of differences in county views, mining households were slightly more likely to concede more trust and authority in coal companies, MSHA and state agencies than other households in Mingo/ Wyoming counties.

On trust in emergency responders, there were no differences between households on levels of confidence in county emergency responders with close to half of citizens in both mining (55%) and non-mining (47%) households either strongly agreeing or agreeing that they had trust in county emergency personnel. One citizen, in responding to the trust question on county first-responders, included written comment and though they reported full confidence in local emergency management, they wrote that the ability of firefighters specifically to respond to an emergency was severely limited by a sore lack of county resources. They wrote:

Fire units don't have the funds for these emergencies.

We don't have what it takes because of funds.

We have already suggested the need for better outreach, communication, assessment and evaluation of emergency planning protocols over coal waste impoundments in this section as well as in other sections of this report. We certainly stand behind that recommendation. However, we are also aware of the conflict and contradiction that such a recommendation brings to industry, regulators and county personnel insofar as expanded outreach and information sharing over emergency response planning may tend to heighten rather than alleviate public fears. This is a contradiction that faces other county and emergency planners in other high hazard settings. Yet, lack of outreach and public information may seriously frustrate emergency response in the event of a major emergency and subsequently, the trade-offs and stakes are high.

Based on our observations and conversations with area residents and with public meeting attendees, as well as based on our survey percentages, we believe that these very real conflicts and contradictions that face county and industry officials can be alleviated through the development and improvement of county-wide integrated and coordinated mass emergency and response procedures. Coordinated emergency response plans could be developed to confront not only impoundment emergencies but also other public emergencies especially with respect to flooding and flash flooding – which, recall, was the highest ranked public risk concern among Mingo/ Wyoming county households based on our survey

⁴¹ For the full set of public trust questions used on the risk assessment see Appendix A (fourth page).

assessment. Thus, we also recommend in improving emergency response over coal waste impoundments, that counties and the State of West Virginia commit to improving and developing the overall emergency response infrastructure throughout WV coal mining communities, in keeping with the above gentlemen's insight and subtle recommendation. Concerted statewide and countywide efforts at improving local emergency response should and could be made through Homeland Security and Federal Emergency Management Agency (FEMA) grants. Here, the Coal Impoundment Project could do well to earmark a separate initiative in assisting rural WV communities in applying for federal monies to improve emergency response capabilities at the local level. This would perhaps be a solid step in possibly improving public trust in various officials. But more importantly, would measurably improve the ability of fire units and other county first-responders to effectively respond and protect the public in the event of a public emergency.⁴²

Coal Waste Impoundments: Compensation, Regulatory and Alternative Strategies to Coal Waste Impoundments:

Possible Compensation Strategies for Coal Waste Impoundments

Table 10 presents a series of compensation and regulatory strategies that might make coal waste impoundments more acceptable to local residents. These proposed strategies were adopted from various other risk assessments that were used to assess other resident views over possible forms of compensation related to hosting other hazardous technologies and disposal facilities. As with other scales taken from other risk assessments, the questions used here were modified to pertain to coal waste impoundments specifically.

The first question in Table 10 refers to emergency action planning. Across this question, there was resounding agreement among both mining and non-mining households over the need for the industry to develop such plans. Nine out of every 10 people either agreed or strongly agreed with the following question:

- *The mining industry should provide the community with an emergency safety plan.*

As with Martin and Perry County, where this question was also asked, there was widespread public support in Mingo and Wyoming Counties across both mining and non-mining households with 93% of mining households either agreeing (52%) or strongly agreeing (41%) and 91% of non-mining household either agreeing (44%) or strongly agreeing (47%) that the industry should provide communities with emergency action plans.

The Mine Safety Health Administration recommends that coal operators file emergency planning and response protocols with county emergency responders.⁴³ However, the implementation of this recommendation varies from state to state. In the state of Kentucky, for example, there is currently no state law that reinforces this federal recommendation. Kentucky statute does not expressly mandate that the industry file emergency protocols with either the state or county. In fact, this fact added to the frustration of some county emergency response personnel in Martin County at the time of the 2000 breakthrough based on our interviews with several of them. One county employee explained the differences in laws and emergency response protocols between KY and W.Va. As he explained, unlike in WV where the state requires coal companies to file impoundment emergency procedures with the state and counties, to his frustration, his county KY office did not have any emergency protocols on file to follow at the time of the major impoundment breach.⁴⁴

⁴² The effort would need to be a *concerted* and *coordinated* effort with clear performance standards in improving emergency response infrastructure. According to one citizen's written comment, federal emergency response dollars are currently not being used to their maximum potential. They write that currently, "FEMA monies are used to further political favors by politicians."

⁴³ See: Appendix D for 1994 MSHA Ruling.

⁴⁴ See also: Gary Ball. (December 20, 2000) An Act of God? MSHA warned Martin County Coal of impoundment danger a year ago. *The Mountain Citizen*:

But apparently, based on Mingo/ Wyoming County WV survey responses and based on other reactions at the Williamson public meeting, many WV citizens seem largely unaware of the laws guiding emergency action procedures (EAP) for impoundments in West Virginia. Again, in WV, the state mandates that coal companies file emergency action plans with the state and county responders.⁴⁵ But again, when told of these emergency plans, most residents at the Williamson 2005 meeting scoffed at their probable adequacy in protecting them and their families. This skepticism was further reinforced in the survey percentages presented in the previous section (Table 9) with a high number of households strongly disagreeing or disagreeing that such emergency response plans were adequate.

In other sections of this report, we have consistently recommended the need for improving emergency response procedures through initiating a two-way dialogue/ risk communication process between citizens and regulatory and industry officials and other stakeholders. An open and candid evaluation with the clear intent of developing integrated emergency response strategies to better prepare for an impoundment emergency and other mass emergencies would increase community awareness, lead to improvements in the adequacy of such plans and increase overall public confidence in the emergency response infrastructure in place in W.Va. to protect the public. Based on extraordinarily high survey numbers reported here (Table 10) of 9 out of 10 community residents agreeing with the need for EAPs for impoundments, such a policy initiative to improve emergency response protocols and infrastructure would no doubt receive overwhelming and widespread public support.

With respect to other compensation mechanisms for coal producing communities, there was some common agreement as well as some difference in opinion between mining and non-mining households on some other proposed "compensatory mechanisms" such as stakeholder panels to guide and monitor site activities, ongoing on-site inspection and monitoring, added financial reimbursement to the community and protecting property values downstream. Compensation mechanisms such as these have been proposed at other high hazard sites and have not only been used as a means by which to compensate communities for assuming the technological uncertainties and potential environmental risks associated with certain hazardous technologies, but have also been proposed by various industries

MSHA official Bernie Dalton. In the first public meeting with county residents, MCC president Dennis Hatfield was asked why homeowners were not alerted to evacuate. The disaster struck shortly after midnight. Residents awakened early the next morning to find sludge blocking driveways and stranding some residents on Coldwater. Hatfield replied that he didn't feel anyone was in danger... According to MSHA's report of the failure, MCC did not alert its office until nearly three hours had passed. When asked about an evacuation plan a few days after the disaster, MCC spokesperson Bill Marcum said the company was "putting one together."

See also: Lilly Adkins. (October 18, 2000) Coal Slurry Spills, area devastated. *The Martin County Sun*:

When the slurry pond broke, families along both Coldwater and Wolf Creek were trapped. On Wolf Creek, the road was blocked. Some residents feared that the black sludge would get into their home... Driveways at Coldwater were blocked leaving residents no way to get out of its path (note: in some cases on Mullett Branch). "My daughter goes to work early in the morning around 3:30 am, and when she got up to go to work she came out here and saw all of this sludge."

However, the State of Kentucky has recently made some inroads in providing impoundment communities with emergency procedures: In 2004, a resolution was introduced in both the State House and Senate to require all KY dam owners of significant and high hazard dams with the state after "sufficient notice and comment." In 2005, the Kentucky Black Water Taskforce endorsed the need for emergency action planning and response protocols for coal waste impoundments and all other significant and high hazard dams. See Appendix A. Kentucky Cabinet of Environmental and Public Protection. April 2005. Report of the Black Water Taskforce. Available online: <http://www.environment.ky.gov/NR/rdonlyres/3C01D442-6E3B-4430-8D6A-ACC82AB21BEF/0/BlackWaterTaskForce042205.pdf>

⁴⁵ See: WV Statute Guiding Emergency Actions Plans (EAPs) for MSHA Rated Coal Waste Dams and Impoundments: Chapter 22. Subchapter 14: Dam Control Act: Section 10: See also Code of State Rules: West Virginia Rules and Regulations for Emergency Action Plans (EAPS) at MSHA Rated Coal Waste Dams and Impoundments: Title 38. Section 22.4.e; Title 38. Section 38.4.32; Title 47. Section 15.7

as a possible means to mediate local conflict and opposition to site-related activities. As with other questions, the questions used here to assess public views on possible compensation strategies were modified from other risk assessments to fit coal waste impoundments and coal mining activities within the context of coal mining economies. The proposed compensations strategies asked on the Mingo/ Wyoming county survey and listed in Table 10 include:

- *A local committee should have the power to shut down the impoundment if they decide it is unsafe.*
- *An impartial inspector should be at the mining site at all times.*
- *The mining industry should contribute more financially for improving community facilities (schools, parks, sewage systems).*
- *The coal company should protect property values in communities downstream of the coal waste site.*
- *The coal company should dredge the creeks of sludge and silt*
- *The mining industry should establish a local outreach office in town to keep residents informed of mining activities.*

The most acceptable of these strategies dealt with protecting property values downstream from impoundments with 86% of mining households agreeing or strongly agreeing and with 94% of non-mining households agreeing or strongly agreeing that coal companies should protect property values in communities downstream of coal waste sites.

The second highest ranked compensation strategy dealt with dredging area creeks with an equal 8 out 10 citizens in both types of households (82% of mining households and 83% of non-mining households) either agreeing or strongly agreeing that the coal company should dredge the creek of sludge and silt.

Of the four remaining proposed compensation strategies, there were some slight differences in opinion among households involved in the mining versus non-mining sectors. Nevertheless, Table 10 reports close-to or well-over 60% of both household types either agreeing or strongly agreeing with the following proposed strategies as possible measures to mediate some of the conflicts between the coal industry and area communities over coal waste impoundments and other site related activities, with the majority of residents from both households agreeing with the following possible compensation strategies: 1) The establishment of a local outreach office to keep residents apprised of mining activities 2) The establishment of a local committee that would have the power to shut-down the impoundment 3) The requirement that an impartial inspector be at the mine site at all times and 4) that coal companies be required to contribute more financially for community improvements.

Three of the four compensation mechanisms above, propose either more citizen or regulatory oversight in monitoring mining and impoundment activities. Such added oversight should not be readily dismissed insofar as citizen advisory panels and outreach offices are standard practices in other high hazard settings and in fact, were used by the Environmental Protection Agency (EPA) in site mitigation activities in Martin County, KY.⁴⁶ With regard to a local outside committee that could monitor impoundment activities, many mining companies already require third party assessments of tailings facilities for any number of reasons.⁴⁷ Some of those reasons for third party oversight of impoundments, for example, may be to avoid legal responsibilities in the event of a breakthrough and of course, loss to human life. Other reasons for such voluntary oversight over impoundments may include avoiding production disruptions, environmental damages, damages to the company image and avoiding the potentially huge economic consequences to the company and industry generally that would follow a major impoundment accident.⁴⁸

⁴⁶ See, for example, Lilly Adkins. 2001. EPA Opens Office in Inez to Address Spill Concerns. *The Martin County Sun*, 2 May; Gary Ball. 2001. EPA opens Office in Inez. *The Mountain Citizen*, 2 May. See also: U.S.EPA. Guidance for Community Groups at Superfund Sites. (Doc. No. 540-k-96-001, 1995)

⁴⁷ See: *Ibid.* Davies. What are the failures telling us?" *Bulletin.* p.58

⁴⁸ See: *Ibid.* Davies. What are the failures telling us?" *Bulletin.* p. 55.

With respect to an “impartial inspector at the mine site at all times,” currently regulatory law requires that a company employee trained in impoundment monitoring make weekly checks on impoundment stability. Naturally, monitoring and inspection is required to increase to daily oversight if there are potential indicators of impoundment upset.⁴⁹ In any event, it is certainly feasible that MSHA rules could be upgraded to include more stringent rules, requirements and training regarding on-site impoundment inspection and monitoring. Moreover, the NRC has recommended that coal companies adopt *state-of-the art* instrumentation to monitor impoundment operations and embankment stability. The NRC recommends:

“...that MSHA and OSM [Office of Surface Mining] consider requiring additional continuous monitoring in specific instances and evaluate automation of monitoring instruments.”⁵⁰

In short, it is feasible that industry investments in automated technologies could replace the need for an impartial inspector on site at all times.

Finally, a majority of citizens –based on our survey results – are of the view that the coal industry could better compensate local communities for bearing the risks and hazards associated with coal waste impoundments and other mining activities by contributing “more financially for improvements in community facilities (schools, parks, sewage systems).” On this latter compensation strategy, and in accord with the already stated recommendation on improving and developing the overall emergency response infrastructure in coal impoundment communities, it is certainly feasible that the industry might do more financially in contributing to local first responder emergency alert and preparedness systems across coal producing counties of West Virginia.

Possible Alternatives to Coal Waste Impoundments

In contrast to industry compensation to communities for bearing the burden of an existing hazardous facility, another option is an aggressive investment into research and development of safer alternatives. One of the principal charges of the National Research Council, *Committee on Coal Waste Impoundments*, for example, was to evaluate possible alternative methods of disposal of coal waste that might in the future eliminate the need for slurry impoundments.⁵¹

In our own past conversations with Martin County residents, however, many were not too concerned with alternative disposal methods per se but rather were more concerned with the production processes used in the preparation and treatment of coal. Several had serious issues with the chemical and material inputs (magnetite, flocculants, fuel oils, etc.) used in coal preparation and processing and that were subsequently impounded as effluent in coal waste impoundments. One citizen with a long work history in coal preparation and treatment mentioned previous cleaner water-based methods of preparation used in the 1970s and noted, based on his own working past, that it wasn't until the late 1970s that intensive chemical inputs were used in preparing coal for end-use.

During our Mingo/ Wyoming County survey sweep, we had the opportunity to meet several gentlemen who had worked their entire careers in coal preparation and treatment plants. One elderly gentleman took the conscious time to type (with a type-writer) three pages of extensive comments on various items pertaining to our survey. With respect to our question on alternative methods of coal preparation he wrote:

⁴⁹ See, again: 30CFR Section 77.2 and for the rules guiding increased daily inspections, see: 30 CFR 77.216-3.

⁵⁰ *Ibid.* National Research Council *Coal Waste Impoundments: Risks, Responses and Alternatives*. p.166.

⁵¹ See: *Ibid.* National Research Council. *Coal Waste Impoundments: Risks, Responses and Alternatives*. For final NRC Recommendations / assessments of alternative methods of disposal see Chapter 7, “Reducing or Eliminating Slurry Generation, (135-140); “Direct Utilization of Slurry” (141-156); “Alternatives to Disposal Impoundments (151-159); Remining Slurry Impoundments (159-164).

The use of slurry ponds to trap and store waste “fines” by the coal industry in this region is a more recent phenomenon; meaning, this was not the case when I worked for Island Creek Coal Company in the 40’s and 50’s. My classification while there was a “Tipple Operator or Washer Operator” –two classifications and two different positions. The washing unit was of the same basic design as those now in use for the purpose of removing impurities from the coal. What is radically different today, compared to past decades is in the manner by which “fines” are transported from the plant to their final disposal area. During my tenure, the washing unit was of a ‘closed circuit’ design; meaning the water was reused and the fines were separated from the water by a series of slurry screens. After being removed from the water, ‘fines’ were directed into a storage bin, and then trucked to a solid waste disposal area. There were no messy and dangerous slurry ponds to break and spill over the landscape. Slurry ponds are not needed in the disposal process for coal waste. They are used today because the industry has found another way to utilize machinery and, in turn, lay off employees. But the trade-off is a no win situation for, both, employee and community.

Admittedly, the NRC recognizes that changes in coal preparation and treatment are the result of changes in coal mining methods and different standards of coal quality required by coal-fired energy plants at the end-use stage. However, it is precisely these changes in preparation and treatment methods that raised major concerns among Martin County citizens in 2000/ 2001 and which were mentioned informally by various residents that we talked with recently in Mingo and Wyoming County. (We also had several conversations with various residents in Perry County over the same issues in the fall of 2001). In any event, to reflect these views on alternative production technologies that are more related to preparation and treatment than alternative methods of disposal, we had developed the following survey question:

- *The mining industry should explore other (cleaner) technologies to wash coal.*

Based on survey percentages presented in Table 11 most of those that we surveyed either agreed or strongly agreed that the mining industry should explore other cleaner technologies in the preparation and treatment of coal. Though there was some difference in opinion between mining and non-mining households, 61% of mining households still either agreed or strongly agreed with the need for research and development into cleaner preparation methods in comparison to 81% of non-mining households.

With respect to the next question on the industry investing in technologies to cleanup sludge spills, there was little difference in opinion between mining and non-mining households on the following question:

- *The mining industry should invest in technologies to cleanup sludge spills.*

A similar, nearly 9 out of 10 mining (88%) and non-mining (89%) households either agreed or strongly agreed with the need for investment, research and development in the area of cleanup and removal of sludge / coal waste.

Addendum: On Alternative Disposal Methods, Deep Mine Slurry Injection Methods:

The NRC *Committee on Coal Waste Impoundments* reports in one of its final chapters (Chapter 7) on its review of future alternative methods of coal waste disposal. Again, our formal interviews and past consultation sessions with area citizens in Martin County, KY suggested that the issue was not with alternative disposal methods but rather with alternative production methods given overriding concerns regarding the current chemical inputs used in coal preparation and treatment. For this principal reason, the NRC review of one alternative to impoundments in particular of underground, deep-mine injection of slurry is probably not a palatable alternative given the concerns consistently heard and expressed among local citizens.⁵² This was made apparently clear at the April 2005 Williamson public meeting when citizens in the Delbarton, Merrick and Rawl areas of Mingo County (see Map 2, Appendix C) expressed serious worries about possible slurry deep-mine injection activities occurring in their area and the possible (or probable) contamination of local groundwater and well-water sources. Likewise, at the time of Martin County incident, there were also similar conflicts

⁵² *Ibid.* National Research Council. *Coal Waste Impoundments: Risks, Responses and Alternatives* . pp. 156-159.

over deep-mine slurry injection methods as a disposal (removal) alternative in the Peter Cave / Wolf Creek area of Martin County, KY.⁵³

Such citizen risk concerns over the environmental impacts associated with deep-mine injection methods hold a level of legitimacy based on a 1985 federal EPA decision: In 1985, a proposed permit to deep mine inject slurry in the Williamson KY area of Pike County represented, according to the EPA, an “imminent and substantial threat” to area ground and well-water systems. Subsequently, before issuing the said permit to Eastern Coal Company in 1985, EPA mandated that the company hook area residents to the municipal water supply in Williamson WV.⁵⁴ It would, therefore, seem that this past EPA decision on deep mine slurry injection should potentially be reviewed by the NRC before making further recommendations of deep-mine injection as an alternative disposal method. Admittedly, the NRC acknowledges that disposal alternatives are based upon “regional and site-specific conditions”.⁵⁵ But what transpired at the Williamson public meeting clearly suggests that such deep-mine disposal methods should be seriously reevaluated as an alternative

⁵³ See, for example: Lilly Adkins. (December 6, 2000) Martin County Coal denies fault for slurry spill. The Martin County Sun. p.12.

According to Hatfield, Martin County Coal is in the process of trying to get the EPA to approve an underground injection of coal slurry into one of two mines, Peter Cave or Wolf Creek #4. Hatfield said the Peter Cave mine appeared to be the more favored of the two and they ‘would have to wait and see if it would be approved.’

Resident, T.J. Howell complained that the Peter Cave mine was already full of sludge (and other debris) and that if the company starts making injections into the shut down mine, it could contaminate his water supply. “I’ve spent my life working for what little I have. I’ve been around a long time and I know in my heart that it (coal waste) will come out in the food we grow, “Our potatoes and everything.” Hatfield had no response.

⁵⁴ See: Eastern Coal Corporation. Docket No. IV-85-UIC-101 (Proceeding under Section 7003 of the Solid Waste Disposal Act 42 U.S.C. § 6973). Note the *Endangerment Assessment* reads (p.3) “The principal pollutant of coal washing water is suspended solids; the clays, shales and coal fines present in the raw coal are responsible for the large quantities of semi-colloidal particles present in suspension, giving the slurry its “black water appearance.” Moreover, the fine clay particles absorb significant amounts of the chemical constituents of the slurry to their surface areas, thus compounding the water quality problems associated with the presence of the suspended solids. Eastern’s slurry contains a number of significant chemical contaminants. The following contaminants are present in Eastern’s injected slurry at concentrations that exceed the maximum contaminant levels (MCLs) as stated in the National Interim Primary Drinking Water Regulations under the Safe Drinking Water Act:”

<u>Parameter</u>	<u>MCL</u>	<u>Observed</u>	<u>% Exceeded</u>
Arsenic	.05 Mg/l	1.82 mg/l	3,540
Barium	1.0 mg/l	38.60 mg/l	3,760
Cadmium	.01 mg/l	.54 mg/l	5,300
Chromium	.05 mg/l	11.92 mg/l	23,740
Lead	.05 mg/l	3.89 mg/l	7,680
Selenium	.01 mg/l	.23 mg/l	2,200
Silver	.05 mg/l	.58 mg/l	1,060

“The injected slurry also exceeds the following secondary MCLs as adopted by the state”

<u>Parameter</u>	<u>MCL</u>	<u>Observed</u>	<u>% Exceeded</u>
Copper	1.0 mg/l	5 mg/l	400
Iron	.3 mg/l	3833 mg/l	1,277,567
Manganese	.05 mg/l	20 mg/l	300

See also: the *Determination* (22): “On the basis of the information recited above and other information available, EPA has determined that the slurry injection operation conducted by Eastern Coal Corporation constitutes handling and disposal of a solid waste which may present an imminent and substantial endangerment to health and the environment within the meaning of Section 7003(a) RCRA, 42, U.S.C 6973 (a).”

⁵⁵ *Ibid.* National Research Council. *Coal Waste Impoundments: Risks, Responses and Alternatives* . p159.

method of slurry disposal in the Mingo County area particularly. Many of the public in attendance at the Williamson meeting were *expressly adamant* that such methods of disposal represent new threats and risks to human health via contamination of the watershed and local ground water sources. We felt compelled to note, within the contents of this report, these citizen concerns for the record and that is why we included this addendum.

Water Quality, the Watershed and Environmental Concerns

Questions presented in Table 12 address some of the principal and overriding risk concerns among the people that we formally interviewed in Martin County with respect to both short and long-term impacts of the 2000 coal waste spill on the watershed and environment. These concerns expressed in our first interviews were then shaped into our survey of Martin County residents in March 2001 and they are the same questions presented in Table 12. In fact, door-step conversations in W.Va., as well as what was expressed at the Williamson public meeting, suggests that environmental, watershed and drinking water issues associated with coal waste are also a principal and heavily expressed concern among citizens in Mingo and Wyoming and our survey percentages tend to suggest that these expressed concerns are embodied by a broader body of the W. Va. public. In short, the questions presented in Table 12 were based on what we first heard in our Martin County interviews, which were then developed into a series of survey questions to assess the views of the broader public in Martin County. The same environmental and watershed issue questions were retained in our Mingo/ Wyoming County risk assessment. Our decision to retain them seemed well-justified based on a number of door-step conversations with area residents while conducting our survey in Mingo and Wyoming counties.

To start, given current and past public comment over the chemicals used in coal preparation and treatment, the first question in Table 12 attempts to measure overall public opinion regarding the toxicity of coal waste. Citizens were asked to respond to the following question:

- *Coal sludge is not hazardous*

Responses in Mingo/ Wyoming County WV reflected just what was found in Martin/ Perry County KY in that there appears to be very little difference in opinion between mining and non-mining households on coal sludge and its toxicity. As in Kentucky, there were no mining and non mining differences between W.Va. households with 77% of mining households either strongly disagreeing (39%) or disagreeing (46%) and a similar 76% of non-mining households either strongly disagreeing (46%) or disagreeing (32%) with the statement that coal sludge is not hazardous.⁵⁶ It seems, therefore, that across-the-board over 7 out of 10 surveyed residents, irrespective of mine sector, may be concerned about the chemical constituents that comprise coal sludge.

⁵⁶ Table of survey findings for Martin and Perry County residents by mining and non-mining household breakdowns on the question, “*coal sludge is not hazardous:*”

Martin County (n=290) and Perry County (n=250) Comparisons Mining Versus Non-Mining Households on the following question:

Coal Sludge is Not Hazardous						
Martin County	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
(X2=5.8,df=4, p=.212) NS						
Mining	67%	16%	6%	7%	4%	
Non-Mining	73%	17%	3%	2%	5%	
Perry County						
(X2=1.6, df=4, p=.807) NS						
Mining	53%	31%	4%	8%	4%	
Non-mining	48%	39%	6%	6%	2%	

The second question in Table 12 was also a consequence of our conversations with Martin County citizens. In our original interviews many expressed worry over the sludge spill's long-term impact on the watershed and the environment. Subsequently, in assessing the views of a wider range of area residents the following survey question was asked:

- *We may never know the extent of the damage caused by the coal waste spill*

A similar question was used in the Mingo / Wyoming County risk assessment with reference to what occurred in Martin County, KY. Table 12 reports that nearly five years after, persons still agreed or strongly agreed that the environmental impacts of the Martin County sludge spill might never be known. On this question as well there was very little difference between mining and non-mining households. A similar 63% of mining versus 70% of non-mining households either agreed or strongly agreed that they may never know the extent of the damage caused by the coal waste spill in Martin County, KY.

Certainly, there has been a steady series of environmental impact assessments by various regulatory agencies and other entities on the Martin County coal waste spill.⁵⁷ In our conversations with Martin County residents, however, these environmental impact reports that have concluded “no long-term impacts on either human health or the environment” have typically produced an equally critical skepticism on the part of various Martin County citizens. Citizens, who had been past members of our research team’s advisory committee, and with whom we regularly consulted with, simply distrusted these environmental impact reports due to the fact that much of the data and analysis used in these assessments were from private environmental engineering firms under subcontract with the coal company. For this reason, in our past Martin County community impact reports, we consistently recommended independent testing of the watershed with full citizen oversight. In 2005, due to supporting recommendations from the KY State *Environmental Quality Commission* (EQC), the KY legislature released monies from the Martin County Natural Resource Damage settlement fund for the purpose of independent testing and assessment of slurry impacts on the Martin County watershed with mechanisms for citizen oversight and collaboration into the sampling and testing protocols.⁵⁸ The details of this initiative are explained at the end of this section. It is simply worth stating here that such collaborative stakeholder initiatives could be instituted elsewhere and that such initiatives could potentially lead to more objective and rigorous assessments of coal waste impacts on the environment and watershed that could provide citizens with perhaps more definitive and acceptable information with regard to the impacts of coal waste on the environment, watershed and drinking water sources.

Moreover, in moving towards objective scientific assessment of coal waste impacts on the environment, we might also recommend that the Coal Impoundment Project and other regulatory entities follow through with a key recommendation of the NRC *Committee on Coal Waste Impoundments*. The NRC recommended complete constituent analysis of coal slurry:

⁵⁷ See, for example: U.S. Department of Health and Human Services. Agency for Toxic Substances and Disease Registry. 2001. ATSDR Record of Activity. Site Name: Martin County Coal Slurry. ERS Log # 01-2117. February 6.

U.S. Department of Health and Human Services. Agency for Toxic Substances and Disease Registry. 2003. Petitioned Health Consultation. Public Comment Release: Martin County Coal Slurry Release. Inez, Martin County Kentucky. EPA Facility ID: KTN000407233.

Kentucky Cabinet of Environmental and Public Protection. April 2005. Report of the Black Water Taskforce. Available online: <http://www.environment.ky.gov/NR/rdonlyres/3C01D442-6E3B-4430-8D6A-ACC82AB21BEF/0/BlackWaterTaskForce042205.pdf>

⁵⁸ For a summary of this 2005 water testing initiative, see: Kentucky State Environmental Quality Commission. May 2005 Newsletter: *Kentucky’s Environment: The bimonthly Electronic Newsletter of the Environmental Quality Commission*. “Citizens to Monitor Water Quality in Martin County,”p. 6. Available online though: www.eqc.ky.gov

... [A] theme mentioned repeatedly in town meeting with coalfield citizens was their concern and desire for information concerning the chemical constituents in the coal waste, and how it affects their ground and surface water. As a result, the committee recommends that research be performed to identify the chemical constituents contained in the liquid and solid fractions of coal waste, and to characterize the hydrogeologic conditions around impoundments.⁵⁹

An added reason for the NRC in recommending a full cataloguing of the chemicals contained in coal waste was in monitoring and tracking impoundment instabilities through “forensic petrologic and geochemical investigations:”

... An additional benefit to this research is that the characterization of the wastewater will aid in monitoring schemes that could aid in leak detection, which could foreshadow impoundment failure... [T]hese investigations and monitoring programs... may act as an early warning system for mine operators to change their management of the impoundment system.⁶⁰

Alongside laboratory analyses of the chemical constituents of coal waste, it would seem logical that information be available on the chemical inputs used at the front-end of the production and preparation process and that ultimately ends as coal waste effluent. Here, it seems important to recommend that the Material Safety Data (MSD) sheets of the chemicals used in coal preparation and treatment be on file and readily accessible for scientific inspection and public access.⁶¹ This recommendation is facilitated by recent rule changes within the federal Mine Safety and Health Administration. As of 2002, MSHA now requires that mining companies, in keeping with other industries in other sectors, maintain on file and on site the MSD sheets for the materials and chemicals used in on-site mining activities.⁶² Federal and state regulators should assure company compliance with this recent MSHA ruling as this would then lead to improvements in a community's *right-to-know* about the chemical hazards used at mine sites. At the time of the Martin County spill, for example, and in the ensuing years after it was difficult, *if not impossible*, for concerned citizens to obtain the MSD sheets of the chemicals used in coal preparation and treatment despite repeated and persistent attempts in their dialogue and advisory committee sessions with EPA.⁶³ Admittedly, the new rule changes have been designed to reduce occupational hazards and for worker protection, but these current federal MSHA requirements that stipulate that the MSD sheets be on-record and on-site should also assist citizens, in the future, in gaining public access to chemical hazards information.

⁵⁹ *Ibid.* National Research Council, *Coal Waste Impoundments: Risks, Responses and Alternatives*. p.127

⁶⁰ *Ibid.* National Research Council, *Coal Waste Impoundments: Risks, Responses and Alternatives*. p. 127

⁶¹ This recommendation was previously made by our research team in the following technical assessment of the Agency Toxic Substance and Disease Registry's, Public Health Consultation on the Martin County coal waste release. See: McSpirit, Stephanie and Melissa Dieckmann. 2003. Research and Technical Assessment. *In Response to*: ATSDR Petitioned Health Consultation, Public Comment Release. Martin County Slurry Release. Inez, Martin County Kentucky: EPA Facility ID: KYN000407233. Available online: http://www.anthropology.eku.edu/MCSPRIT/PDF/Section1_Response.pdf pp.1-5

⁶² The *Hazard Communication Final Rule* requires all mine operators regardless of size, without exception, to prepare a written program that explains how hazards communications will be implemented at that mine site. The communications plan must cover the following topics: a system for labeling and other forms of warning, how hazard determinations will be performed, the list (inventory) of hazardous chemicals, the location and accessibility of MSDSs or equivalent for all hazardous chemicals. See as published in the *Federal Register*, June 21 2002. Fed Regulatory Doc. 02-15396, Department of Labor, Mine Safety Health Administration. 30 CFR Part 42 et.al. Hazard Communication (HazCom): Final Rule and Withdrawal of Interim Rule. Available online: <http://www.msha.gov/regs/fedreg/final/2002finl/02-15396.pdf>

⁶³ See, for example: April 16, 2002 teleconference minutes between EPA and area citizens. One and a half years after the release, citizens are still attempting to secure the MSD sheets from the Martin County Coal Corporation. As per the minutes:

“[The On-Site Coordinator] indicated that he had requested material safety data sheets (MSDS) for all chemicals and additives used in the MCCC prep plant since the prep plant was constructed. In addition, he has requested the MCCC provide information concerning its use of magnetite during coal washing and preparation.” April 16, 2000 Teleconference Minutes: Available through the author.

The next questions in Table 12 do not pertain to coal waste or coal waste impoundments per se, but rather to local water concerns. Though again, based on our past interviews with Martin County citizens and, based on our discussions with residents at the Williamson public meeting and other area residents, it seems that a good number of citizens believe that coal waste and local water quality issues are connected.

Table 12 reports on responses to the following set of water quality questions:

- *Poor water quality is associated with poor health in my community*
- *The water from my faucet is always of good quality*
- *The water treatment facility does a good job of meeting water quality standards*

With respect to the above water questions, there was once again relatively little difference in opinion between Mingo and Wyoming County residents that were tied to the mining sector with the opinion of other residents on issues related to water and water quality: Over half of mining households (52%) as well as non-mining households (58%) agreed or strongly agreed, for example, *“that poor health was associated with poor water quality”* in their community.

On the next question, though approximately one-third to approximately one-half of all households reported being relatively satisfied with the quality of their water and reported being relatively satisfied with overall plant operations at the local water treatment facility, it may be important to note that approximately 4 out of 10 mining (40%) and non-mining (45%) households disagreed or strongly disagreed that *“the water from my faucet is always of good quality.”*

The last question on Table 12 on bottled water purchase was adapted from a set of questions developed by a Martin County citizen who was a member of one of our past citizen advisory committees. In their own assessment of community impacts of the coal waste spill three years after, they used a “take-home” survey method and encouraged their students to have one of their parents complete and return the next day. In their survey of homes with high school-age children, they found that over 70% of surveyed households still regularly purchased bottled or distilled water. In our systematic sample of Mingo/ Wyoming County households, we used the following adapted question to assess store water purchases:

- *Our home purchases distilled or bottled water*

We had roughly similar results as was reported in Martin County. That is, close to 70% of area households reported that they purchased bottled or distilled water. Here again, there was very little difference between mining and non-mining households: 71% of mining households agreed (42%) or strongly agreed (29%), 63% of non-mining households reported that they agreed (35%) or strongly agreed (28%) that their home purchases store water.

Given the possible general interest in this question among the WV public and WV policy-makers who might read this report, Table 13 provides some further breakdowns and analyses on outside water purchase by county, survey area, income, well-water and children present in the household. Interestingly, outside of the first income category where 46% of households making less than \$10,000 agreed (19%) or strongly agreed (27%) that their home purchases outside water (in comparison to approximately 65 % to 75% of other households in other income groups), there seems to be very little percentage difference across other categories and other factors in explaining the purchase of bottled and distilled water among WV households. Table 13 reports relatively equal percentages of other income categories and relatively equal percentages of persons from both Mingo and Wyoming County and relatively equal percentages of households with or without children purchasing bottled or distilled water. Likewise, there was no significant difference in household purchase of water by municipal (public) or (private) well-water source. The lack of variation in percentages suggests that store water purchases across Mingo and Wyoming counties are not dependent on income or on another particular factor, but rather possibly represents an overriding public sentiment and concern across both Mingo and Wyoming counties concerning the quality of both municipal and private drinking water supplies.

Possible Regulatory and Compensation Strategies to Facilitate Better Water Quality

Table 14 presents our last questions regarding public opinion on possible other regulatory and compensation strategies to facilitate better water quality in Mingo/ Wyoming Counties. Unlike the compensation / regulatory strategies proposed for coal waste impoundments, Table 14 shows no difference in opinion between mining and non-mining households as there are high levels of common agreement across the following questions:

- *The water treatment facility should enforce stricter water quality standards*
- *An independent citizen's committee should monitor and test water quality*
- *The mining industry should contribute financially to independent tests of water quality*
- *Coal severance taxes should be used to upgrade the water facility*

Table 14 reports over 60% of households –both mining and non-mining- agreeing (or strongly agreeing) that the local water plant should enforce stricter water quality standards, that an independent body of citizens should monitor and test water quality and that the industry should contribute more financially to independent tests of water quality. Yet, as one citizen wrote on their survey, they would support such an initiative if it was absolutely clear that such independent testing was clearly independent of coal company purview. Their views reflected the views of various persons that we had talked with and consulted regularly with in Martin County and as this citizen wrote,

Only to the degree that such tests would be completely free of coercion by the coal industry. To the extent this is not possible then it is my considered opinion that other forms of financing such efforts should be explored.

Finally, as with the other questions, approximately 6 out of 10 mining (60%) and non-mining homes (67%) either agreed or strongly agreed that coal severance taxes should be earmarked for improvements in water quality, water treatment and the water facility.

As with compensation strategies for coal waste impoundments (outreach centers, oversight committees and additional monetary compensation to communities), the above strategies for improving drinking water infrastructure and protecting the watershed seem to be relative “ideals” on a first pass. But, it is important to point out that many of these citizen oversight and financial mechanisms are already in place in other places in protecting and maintaining other water sources and resources elsewhere. Perhaps the most relevant other case, and which has already been briefly mentioned in this section, is the 2005 independent water-testing initiative with citizen involvement and oversight slated for Martin County, KY. Apart from independent testing and assessment of the impacts of the 2000 slurry release and recurrent black water releases on the watershed, the agreement also includes consultation and collaboration with county officials and the county water board in identifying needed improvements in the municipal water treatment plant and for the project team and citizen advisory committee to work closely with the county in writing grants for water infrastructure improvements and water source protection projects.⁶⁴

This water quality and water improvement project is the result of repeated recommendations by our Martin County project team and the KY State Environmental Quality Commission (EQC) for independent outside testing of the Martin County watershed with citizen oversight of the sampling and testing protocols. These recommendations emerged out of past survey responses to the above question, “*an independent citizen's committee should monitor and test water quality.*” This question, like other questions on our survey, was developed out of conversations with Martin County residents. In this particular case, this particular question was tailored after what transpired during a public meeting that was held upstairs in the County Courthouse among Martin County citizens in early February 2001. At the meeting, there arose some discussion among citizens over the need to establish a citizen's committee that would over see and protect

⁶⁴ See, Martin County Water Testing Project: Project Plan, Statement of Work and Proposed Dispensation of Funds: Available upon request from author.

the water supply and monitor the municipal treatment plant. There was also some discussion on how to finance such a citizen's commission and the need for possible technical advisors and technical equipment to follow through on such an initiative. At the meeting, a subcommittee of Martin County citizens was appointed to look into further prospects. While the citizens on the subcommittee left to investigate possibilities, we left the February 2001 meeting with a possible survey question in hand.

Several reports later and several years later, in 2004, the KY EQC commissioned a legal opinion to determine whether monies from the Natural Resource Damage (NRD) settlement claim in Martin County could be used to finance and underwrite such an independent citizen's waters testing initiative. The legal opinion that came back from the KY Legal Services Division concluded that it could,

The funds in the NR Martin County Damage Trust Fund were recovered by the cabinet as trustee for the citizens of the Commonwealth, for damages to resources belonging to the Commonwealth. To fulfill this fiduciary duty the money must be spent to benefit the resources impacts by the spill. Public participation and public confidence are prominent themes in CERCLA. Drinking water is defined as a "natural resources" by CERCLA and I believe that testing and monitoring of a drinking water source in the area impacts by the spill by private contractors would be consistent with the letter and the spirit of CERCLA.⁶⁵

In 2005, through the efforts of several groups, the KY General Assembly earmarked monies to:

Provide independent water testing and technical assistance to the citizen's of Martin County.⁶⁶

In short, the State of Kentucky, specifically the Environmental and Public Protection Cabinet / Division of Water, has set an important precedent with its support of this citizen-based water quality improvement project in Martin County, KY. In this case, monies from the NRD settlement will be used to underwrite project costs. It is now certainly feasible that future NRD monies as well as future fines and penalty monies could be earmarked and tagged for other water improvement projects throughout the region and again, with citizen and other stakeholder input being a necessary component in overseeing such projects. We recommend that WV citizens, public officials and officials in the W.Va. Department of Environmental Protection look into the possibility of earmarking fines, penalty and settlement monies for independent water improvement projects and with citizen advisory oversight over such projects. Citizen oversight via an advisory panel of citizens will assure quality control and accountability over project outcomes and will assure that such projects stay on schedule in meeting stated performance standards of improving water resources and drinking water sources.

CONCLUSION

This report represented an attempt to assess and measure the views and risk perceptions of WV citizens over coal waste impoundments through a systematic door-to-door survey of Mingo and Wyoming County residents. Apart from our survey, we have also drawn upon a discussion between our research team and citizens that attended a community meeting as a further means to more fully understand and represent the views of area residents. In addition, in

⁶⁵ See: Kentucky Environmental and Public Protection Cabinet. September 16, 2004. Memorandum, RE: Legal Opinion Request from Commissioner's Office. Martin County Coal Corporation Agreed Order, July 31 2002. Prepared by Mary Stevens, Attorney, Water Legal Section.

Note: CERCLA = Comprehensive Environmental Recovery Compensation and Liability Act, otherwise known as "Superfund." This federal statute provides the statutory mechanisms that allow governments to recover natural resource damages in the event of a major environmental incident. In 2002, the Commonwealth of Kentucky invoked its own authority under CERCLA and settled with the Martin County Coal Corporation for one million dollars in natural resource damages. Monies from these settlement claims will be used to finance the independent water testing initiative in Martin County.

⁶⁶ See: Kentucky Commonwealth 2005 Budget Conference Report, 2005 Regular Session of the General Assembly. Section F: Environmental and Public Protection. Available online: <http://lrc.ky.gov/budget/05rs/50f.pdf> Martin County Damage Trust Fund. p.F14.

opportune places within this report, we also have made reference to some of the written comments that some citizens included when returning the survey.

When we distributed and picked up surveys, we talked to many citizens at their doors and these door step conversations have also framed the contents of this report. Moreover, it seemed that many whom we talked to wanted to qualify their position by stating they were “pro coal,” “for coal” or that they or a family member worked in the industry. In this case, we encouraged these citizens to participate and complete the survey and we explained to them that this was an objective risk assessment and that we wanted to capture as many views and opinions as possible in understanding the views and opinions of WV citizens. But because “pro-coal” statements were heard relatively often, we decided to analyze and examine the extent to which there were departing views and opinions between mining versus non-mining households in presenting our survey findings and in writing this report. Interestingly, and perhaps our most important “finding” was that there seemed, based on our analysis of the survey data, to be very little difference in opinion between mining and non-mining household on questions related to coal waste, coal waste impoundments, emergency action planning, compensation strategies and other environmental and water quality issues. The bulk of our report presents on these sets of findings. For the purposes of concluding this report, some of our key findings that are found within the contents of this document and presented in Tables 5-14 of Appendix C are summarized here.

Summary of Survey Findings:

- Table 5: We originally anticipated that mining households would be more likely to identify the economic benefits associated with coal and coal waste impoundments. Subsequently, the following survey question was used to assess the extent to which this was so, “*the Economic Benefits associated with coal and coal waste impoundments outweigh the risks.*” Here, however, survey results showed an equally similar level of disagreement between mining and non-mining households. Irrespective of household type, many were reluctant to report that the economic benefits of impoundments outweigh their risks.
- Table 6: Overall findings reported in Table 6 suggested that the highest average rated risk across both mining and non-mining households was flooding and flash flooding while the second highest ranked risk was also the same for both mining and non-mining households: coal trucks were perceived as a principal danger across both households. Abandoned mine sites were the next highest rated risk. Finally, though there was some slight variation between mining and non-mining households with respect to other hazard rankings. But overall, Table 6 findings showed the following risks to be also of primary concern among Mingo and Wyoming county residents: “*Coal Waste Impoundments,*” “*Exposure to hazardous chemicals in the watershed and water supply,*” “*Exposure to hazardous chemicals from mining activities*” and “*Other man-made hazards (hazardous material spills, fire and shortages of critical resources).*”
- Table 7: Responses to the first question in Table 7 reinforced what we had expected with those tied to the coal mining industry through employment or other business-related activities more likely to report knowing of a coal waste impoundment near their community. However, on the next question in Table 7, “*I know about the emergency response procedures in my community if the local impoundment were to rupture in the future.*” Survey responses showed mining households as just as unaware as their non-mining counterparts over the emergency action and preparedness (EAP) plans that are on file with state regulatory officials and county responders in the event of a breakthrough.
- Table 8: Table 8 reported mining households as significantly more likely to concede that engineers, the coal industry and state and federal regulatory officials understand the risks associated with coal waste impoundments. However, on the next set of questions in Table 8, regarding issues of emergency preparedness and the risks associated with coal waste impoundments, percentages showed more common agreement between household types: Based on the following question, “*people living near the impoundment are prepared*

for the risks,” persons from both household types were equally likely to disagree that residents possess a level of preparedness in the event of an impoundment emergency. On the next question, “*people and county personnel living near the impoundment can control and monitor the risks*,” persons from both mining and non-mining households also equally disagreed. And likewise, on the following question, “*people dread living near the impoundments*,” there was also common agreement between household types, with a majority of households equally agreeing with this statement.

- Table 8, Continued: On the last set of questions in Table 8, with respect to the potentially severe hazards and consequences associated with coal waste impoundments, there seemed to be an overriding fear among the public across both mining and non-mining sectors of the possible imminent dangers associated with coal waste impoundments. The survey questions were, “*An impoundment break would involve certain death*” and “*An impoundment break would kill many people at one time*,” both mining and non-mining households were equally likely to agree with both statements that an impoundment break would have serious consequences for populations downstream.
- Table 9: The next table, Table 9 reported on public responses towards impoundment emergency action planning, with the first reported percentages simply reinforcing the percentages represented in Table 8 on a seeming overall public apprehension over coal waste impoundments. When asked to respond to the following question: “*There is little chance that the coal waste impoundment near my community will rupture in the future*,” Table 9 percentages showed that the majority of those surveyed strongly disagreed, disagreed or just didn’t know about the safety and stability of the impoundment in their community. As with other questions, there was little difference in opinion between mining and non-mining households. On another survey question included in Table 9, “*Emergency preparedness and response plans for coal waste impoundments are adequate*,” over half of respondents either strongly disagreed or disagreed that the emergency action plans (EAPs) for coal waste impoundments were adequate, with no difference in opinion between household types.
- Table 10: Table 10 presented a series of compensation and regulatory strategies that might make coal waste impoundments more acceptable to local residents. The first question in Table 10 referred to emergency action planning, “*the mining industry should provide the community with an emergency safety plan*.” Here, there was widespread public support in Mingo and Wyoming Counties across both mining and non-mining households with an equal 9 out of 10 mining and non-mining households agreeing that the industry should provide communities with emergency action plans.
- Table 10, Continued: Other proposed compensations strategies asked on the Mingo/ Wyoming county survey and listed in Table 10 included, “*A local committee should have the power to shut down the impoundment if they decide it is unsafe*,” “*an impartial inspector should be at the mining site at all times*,” “*the mining industry should contribute more financially for improving community facilities (schools, parks, sewage systems)*,” “*the coal company should protect property values in communities downstream of the coal waste site*,” “*the coal company should dredge the creeks of sludge and silt*,” and “*the mining industry should establish a local outreach office in town to keep residents informed of mining activities*.” The most acceptable of these strategies dealt with protecting property values downstream from impoundments with over 8 out of 10 mining and non-mining households agreeing or strongly agreeing that coal companies should protect property values in communities downstream of coal waste sites. The second highest ranked compensation strategy dealt with dredging area creeks with an equal 8 out of 10 citizens in both the mining and non-mining sectors either agreeing or strongly agreeing that the coal company should dredge the creek of sludge and silt. Of the four remaining proposed compensation strategies, there were some slight differences in opinion among households involved in the mining versus non-mining economy. Nevertheless, Table 10 reported close-to or well-over 6 out of 10 households of both types either agreeing or strongly agreeing with these other proposed strategies as possible measures to mediate some of the conflicts between the coal industry and area communities over coal waste impoundments and other site related activities.

- Table 11: Public views on alternatives to coal waste impoundments were presented in Table 11. The following question on alternative preparation and treatment methods was asked survey respondents, “*the mining industry should explore other (cleaner) technologies to wash coal.*” Though there was some difference in opinion between mining and non-mining households, the majority of mining households still either agreed or strongly agreed with the need for research and development into cleaner preparation methods in keeping with the views of non-mining households. On the next question, “*the mining industry should invest in technologies to cleanup sludge spills,*” nearly 9 out of 10 mining and non-mining households either agreed or strongly agreed with the need for investment in the area of cleanup and removal of sludge / coal waste.
- Table 12: Questions presented in Table 12 addressed some of the principal and overriding risk concerns among past citizens that we formally interviewed in Martin County KY, regarding both the short and long-term impacts of the 2000 coal waste spill on the watershed and environment. These questions pertaining to the possible impacts of coal sludge on the environment were also seen as relevant to Mingo/ Wyoming residents. For example, given past public concerns over the chemicals used in coal preparation and treatment, the first question in Table 12 attempted to measure overall public opinion regarding the toxicity of coal waste based on the following question, “*coal sludge is not hazardous.*” As in Kentucky, there were no sector differences between WV households on this particular question. An equal 7 out of 10 mining and non-mining households either strongly disagreed or disagreed with this survey statement. On the next question, “*we may never know the extent of the damage caused by the coal waste spill in Martin County, KY,*” there was also very little difference between mining and non-mining households. Likewise, an approximate 7 out of 10 mining and non-mining households either agreed or strongly agreed that the damage caused by the 2000 coal waste spill might never be known.
- Table 12, Continued: Other questions in Table 12 do not pertain to coal waste or coal waste impoundments per se, but rather to local water concerns. Though, as in the past in Martin County, it seemed that a good number of WV citizens to whom we talked to believed that coal waste and local water quality issues were connected. In order to measure water quality concerns, the following set of questions were asked in Table 12, “*poor water quality is associated with poor health in my community,*” “*the water from my faucet is always of good quality,*” “*the water treatment facility does a good job of meeting water quality standards.*” On issues related to water and water quality, there was -once again, relatively little difference in opinion between residents tied to the mining sector versus other residents. For example, over half of mining households as well as non-mining households agreed or strongly agreed “*that poor health was associated with poor water quality*” in their community.
- Table 12, Continued: A question on bottled water purchase was also included in Table 12, “*our home purchases distilled or bottled water.*” With regard to this question, survey findings report close to 7 out of 10 area households reporting that they purchased bottled or distilled water. Here again, there was very little difference between mining and non-mining households.
- Table 13: The responses reported in Table 13 go beyond mining and non-mining comparisons and examine other possible household factors that could potentially explain differences in household water purchase. Using the same question, “*our home purchases distilled or bottled water,*” percentages showed very little difference in other household factors/ predictors: Outside of the first income category of homes making less than \$10,000, there seemed to be very little difference or variation in bottled water purchase across other income categories. Likewise, Table 13 also reported relatively equal responses for persons from both counties as well as households with or without children, reporting that they purchased bottled or distilled water. In addition, there was no significant difference in bottled water purchase by municipal (public) or (private) well-water source. The lack of variation in percentages suggested that store water purchases across both Mingo and Wyoming counties are perhaps not dependent on one particular factor or explanation but rather, such relatively equal responses across various possible explanatory categories suggests that perhaps there is an overriding public sentiment and concern across counties regarding the quality of both municipal and private well water sources.

- Table 14: Our last set questions focus on public opinion over possible other regulatory and compensation strategies to facilitate better water quality in Mingo/ Wyoming Counties were presented in Table 14. Percentage here showed solid common agreement between mining and non-mining households across the following questions: “*The water treatment facility should enforce stricter water quality standards,*” “*An independent citizen’s committee should monitor and test water quality*” “*The mining industry should contribute financially to independent tests of water quality*” and “*Coal severance taxes should be used to upgrade the water facility.*”

Based on our analyses, and the survey responses presented in this report and set of tables, we made a series of recommendations regarding the need for better outreach, communication and evaluation over impoundment regulations and enforcement, impoundment emergency action planning as well as making other recommendations concerning other forms of outreach and assessment on other dimensions. In terms of our recommendations on emergency planning, for example, we went beyond the 2002 recommendations made by the *National Research Council Committee on Coal Waste Impoundments* of better communication and outreach and instead, we recommended a full evaluation and assessment of W.Va. emergency impoundment protocols with mechanisms built in for citizen involvement in the deliberation, assessment and evaluation process. This recommendation was born out of survey percentages that showed most WV citizens were largely unaware of the emergency action plans (EAPS) for coal waste impoundments and that a corresponding high number of citizens reported that such plans were probably “inadequate.” Moreover, these survey responses were reinforced at the public meeting to which we attended where preliminary survey findings were presented and discussed. Many of the residents in attendance seemed largely unaware of the EAPs for impoundments and when told of them scoffed at their probable adequacy in protecting them and their families in the event of a major impoundment breakthrough. Based on our assessment of community views, we believe that more should be done beyond outreach and communication and that a fuller public assessment into improving the overall adequacy and protectiveness of EAPs be initiated.⁶⁷ And once again, this is in strict accord with 1996 NRC recommendation of expanding public involvement in the deliberation process over high risk technologies and subsequently, we fully recommend that any evaluation and assessment of EAPs include meaningful public input from W.Va. citizens.

Summary of Recommendations:

Before starting to summarize our set of recommendations, here again, it seems important to stress that the recommendations contained within our full report and summarized here were born out of our observations and conversations with WV citizens on porch steps and public meeting but were principally driven by our survey findings and our subsequent objective assessment of the opinions of WV citizens that we collected door-to-door based on the use of systematic residential sampling methods. Since the following set of recommendations are scientifically grounded in the opinions of W.Va. citizens, we feel that for this reason the recommendations contained herein should hold some heavy implications in improving the regulatory and emergency response structure over coal waste, coal waste impoundments and other related matters. Consequently, we therefore strongly encourage policy-makers to thoughtfully consider the recommendations that have been more thoroughly presented within this report and that are summarized on the following pages:

⁶⁷ Appendix E provides the Federal Emergency Management Agency (FEMA) criteria for evaluating emergency action plans (EAPs) for dams and impoundments. These criteria might assist citizens who might read this report with a preliminary set of criteria for evaluating the adequacy of EAPS for coal waste impoundment in their communities.

First Recommendation: Recommend Expanded Citizen Involvement in Evaluation and Assessment of Emergency Action Planning Protocols over Coal Waste Impoundments

This first recommendation is an extension of the recommendations issued by the National Academy of Science, *National Research Council Committee on Risk Characterization*.⁶⁸ In 1996, the NRC recommended that mechanisms be created to increase citizen and stakeholder involvement in the deliberation and assessment of technological risks. In keeping with this recommendation, it would seem that continued assessment of the level of awareness of contingency plans among residents downstream from coal waste impoundments would seem an overriding and principal objective for the Coal Impoundment Project (CIP). Once again, based on our survey results commissioned by the CIP, most surveyed residents of Mingo and Wyoming county reported being largely unaware of the emergency action plans for impoundments in their community and also, through another survey question, rated such plans as probably “inadequate.”

Based on our findings from our survey of Ming and Wyoming counties, one of the principal recommendations of this report is for the CIP and other state and federal regulators to develop methods and ways to expand public involvement in the deliberation and assessment of coal impoundment risks on local communities in West Virginia. Naturally, this systematic survey of WV resident opinion and risk perceptions is a first step in meeting 1996 NRC recommendations on expanding public input into the scientific assessment of technological risks. Thus, the CIP is to be acknowledged for its efforts in already expanding opportunities for citizen input in risk characterization and regulatory policy.

With regard to next steps, we might recommend that further risk assessment and risk characterization of impoundments focus more directly on people living directly downstream from such holding facilities. On the latter point, it was pointed out by one local citizen at a public meeting where our initial survey findings were presented and discussed, that a general survey of county residents cannot truly capture the legitimate and overriding concerns and worries of people living in narrow stream valleys (hollows) where an impoundment reservoir is embanked at the top of the stream head. Indeed, as this individual explained those immediately in the potential impact area and who thus, face the gravest threats in the event of an impoundment breakthrough, are naturally more likely to perceive the risks associated with coal waste impoundments differently than other county residents.

One of our possible sub-recommendations for the Coal Impoundment Project (CIP) is to develop and commission additional public input methods, beyond even surveys and public meetings to more effectively tap into and assess the specific risk concerns of the downstream impoundment public. Thus, as a *possible sub-recommendation*, the CIP might do well to consider initiating either a series of focus groups or advisory panels of downstream residents and begin working with these groups of citizens to better understand and characterize local risk concerns regarding coal waste impoundments. It was clearly apparent, for example, at the above-mentioned public meeting that many of those residents in attendance had knowledgeable questions and information related to impoundment risks as well as questions and information regarding matters of regulation and enforcement in general. It would therefore seem advisable and recommendable that more such in-depth discussion and deliberation with local citizens should occur more regularly between the CIP as well as other federal and state regulators. Such discussion and dialogue could potentially lead to a meaningful exchange of knowledge and information. We believe, based on our assessment, that additional public involvement mechanisms in the policy discussion and policy making process would provide the CIP and other regulators

⁶⁸ National Research Council. 1996. *Understanding Risk: Informing Decisions in a Democratic Society*. Washington, D.C.: National Academy Press.

with a better understanding into the true scope and levity of citizen risk concerns and would facilitate channels for better risk communication via this kind of collaborative exchange between citizens, agencies as well as the coal industry.

Once again, this recommendation of expanding public input is in keeping with the National Research Council (NRC) and its oft-cited 1996 Report, *Understanding Risk: Informing Decisions in a Democratic Society*. The NRC recommended in 1996 that efforts be made to involve the public through *various mediums* in the deliberation and decision-making process of the impacts and risks associated with high hazard technologies. Following through on the 1996 NRC recommendations of expanding citizen involvement in the development and deliberation of more “adequate” and protective emergency action planning protocols over coal waste impoundments would be yet another important step by the CIP on expanding the channels for effected parties to share their knowledge and concerns over environmental and technological risks.⁶⁹ In fact, the 2002 NRC report on coal waste impoundments, for example, in keeping with prior NRC public input recommendations, includes and incorporates in places the expressed concerns of area citizens as identified via several public forums that the committee held in making its own assessment and recommendations regarding the risks associated with impoundments. We recommend that such public forums and other channels for *meaningful* citizen input continue and increase and that the CIP, as well as other federal and state regulators, help facilitate this public exchange of information.

The next set of recommendations summarized and issued by our team, address and elaborate on the specific recommendations issued by the 2002 *NRC Committee on Coal Waste Impoundments*.⁷⁰ In some cases, based on our own survey assessment of public risk perceptions and opinions, we have strongly advocated for the recommendations issued by the 2002 NRC. In other places, given our assessment of public opinion, we have sometimes gone beyond some NRC recommendations and still, in other places, we have provided some serious caution over other recommendations that have been issued by the NRC. What follows next is a summary of the NRC recommendations that have been supported, expanded and criticized within the contents of this final report and which are summarized here:

Second Recommendation: Recommend Support and Expansion upon 2002 NRC Recommendation: Emergency Action Planning for Coal Waste Impoundments

The NRC, in its 2002 report on coal waste impoundments, recommended that “communication concerning coal impoundment risk and emergency response between the industry and the local communities could be improved substantially.” We firmly agree that communication of emergency response protocols should be improved and this was reinforced in our survey percentages with the majority of residents reporting being largely unaware of emergency action plans for coal waste impoundments in their communities. Therefore, it seems that area residents need to be better educated with respect to the EAPs on file with the state and county and now available online via the Coal Impoundment Project through its *Coal Impoundment Location and Warning System*.⁷¹ Moreover, our survey findings show that there is just as much of a lack of knowledge of emergency action plans among households directly tied to the mining industry as with other households. This suggests some relatively easy forms of outreach through the Mine Safety Health

⁶⁹ See, for example, National Research Council. 1989. *Improving Risk Communication*. Washington, D.C.: National Academy Press. National Research Council. 2000. *Waste Incineration and Public Health*. Washington, D.C. National Academy Press, Section 7: *Social Issues and Community Interactions*.

⁷⁰ National Research Council, Committee on Coal Waste Impoundments. 2002. *Coal Waste Impoundments: Risks, Responses and Alternatives*. Washington, D.C.: National Academy Press.p.33.

⁷¹ See: Coal Impoundment Project, National Technology Transfer Center: Coal Impoundment Location and Warning System. Available online: <http://www.coalimpoundment.com/>

Administration (MSHA) and through other job and industry-related postings that could be used to update and inform mining households of impoundment preparedness plans and protocols.

Outside of outreach and information campaigns, we would also recommend a fuller assessment and evaluation into the emergency action planning protocols in place over impoundments. This again, would be in accord with earlier 1996 NRC public involvement recommendations and therefore, to reiterate, we would strongly recommend involving the public in the EAP evaluation and assessment process. It would seem that a research design to better understand risk perceptions among WV citizens, especially downstream citizens, could potentially be a two-way communication process, where the research team not only learned at a more in-depth level about the risk concerns and preparedness levels of downstream citizens, but also used this opportunity to inform area residents of the monitoring, regulatory and preparedness apparatus in place for MSHA regulated impoundments and hence, such public participation mechanisms would readily meet the 2002 NRC *Committee on Coal Waste Impoundment* recommendation of better outreach and communication of existing EAP plans. More importantly, such systematic outreach and research where there is effective two-way risk communication between the CIP, regulators and downstream residents could potentially lead to overall improvements in regulation, enforcement and emergency preparedness that might begin to allay some of the public's fears and apprehensions over impoundments and their current skepticism over emergency preparedness plans that has been identified as riding high based on our survey percentages.

We have suggested above the need for better citizen outreach, communication, assessment and evaluation of emergency planning protocols over coal waste impoundments. We stand behind that recommendation. However, as stated within the contents of this report, we are also aware of the conflict and contradiction that such a recommendation brings to industry, regulators and county personnel insofar as expanded outreach and information sharing over emergency response planning over coal waste impoundments may (or may not) tend to heighten rather than alleviate public fears and public perceptions of risks.

Based on our observations and conversations with area residents and with public meeting attendees, as well as based on our systematic survey percentages, we believe that these very real conflicts and contradictions that face county and industry officials can be alleviated through the development and improvement of county-wide integrated and coordinated mass emergency and response procedures. Coordinated emergency response plans could be developed to confront not only impoundment emergencies but also public emergencies especially with respect to flooding and flash flooding which, based on our conversations and survey assessment, is the highest ranked public risk concern among Mingo/ Wyoming county households. Subsequently, in improving emergency response over coal waste impoundments, we therefore recommend that counties and the State of West Virginia commit to improving and developing the overall emergency response infrastructure throughout W.Va. coal mining communities, such a recommendation is in keeping with one particular citizen's written comments about the overall lack of adequate resources for public safety throughout the county where he resides.

We further recommend that concerted statewide and countywide efforts at improving local emergency response infrastructure be made through Homeland Security and Federal Emergency Management Agency (FEMA) grants. In fact, we recommend that the Coal Impoundment Project earmark a separate initiative in assisting rural W.Va. communities in applying for federal monies to improve emergency response capabilities at the local level. This would be a solid step in possibly improving public trust in various officials which, based on our survey assessment, was also identified as riding relatively low. But perhaps more importantly, such an initiative would *measurably* improve the ability of county first-responders to effectively respond in the event of a public emergency irrespective of whether it is an impoundment emergency, a flash flood or another public crisis.

In addition, our survey findings report that a majority of citizens are of the view that the coal industry could better compensate local communities for bearing the risks and hazards associated with coal waste impoundments and other mining activities by contributing "*more financially for improvements in community facilities (schools, parks, sewage systems).*" On this latter compensation strategy, and in accord with the above recommendation of improving and

developing the overall emergency response infrastructure in coal impoundment communities, it is certainly feasible and therefore recommendable, that the coal industry commit more financially in contributing to local first responder emergency alert, preparedness, response and warning systems across coal producing counties of West Virginia.

Third Recommendation: Support and Expand upon 2002 NRC Recommendation of Improving Regulations and Instrumentation to Monitor Impoundment Stability and Integrity

The contents of this report contain a series of recommendations on improving the front-end of public protection by recommending, in keeping with some of the recommendations issued by the 2002 NRC, upgrades in the regulatory and enforcement apparatus over coal waste impoundments. We especially recommended that regulatory agencies commit to a long-term track record of strict regulation and stringent enforcement to restore public confidence and reduce public apprehensions over coal waste impoundments as our survey identified public risk perceptions over coal waste impoundments as running relatively “high” across any number of survey questions/ risk dimensions. In terms of some specifics of the recommendations that we issued in our report, current regulatory law, for example, requires that a company employee trained in impoundment monitoring make weekly checks on impoundment stability and with employee monitoring and inspection naturally mandated to increase to daily oversight if there are potential indicators of impoundment upset.⁷² In strengthening the regulatory and monitoring protocols over impoundments, it is certainly feasible that MSHA rules could be upgraded to include more stringent rules, requirements and training regarding routine on-site impoundment inspection and monitoring as well as stricter monitoring protocols during points when onsite indicators suggest a potential threat and where potential hazards are potentially high. Moreover, the NRC has recommended that coal companies adopt *state-of-the art* instrumentation to monitor impoundment operations and embankment and basin stability. The NRC recommends, “That MSHA and OSM [Office of Surface Mining] consider requiring additional continuous monitoring in specific instances and evaluate automation of monitoring instruments.”⁷³ Here, it is certainly feasible and therefore recommendable, in accord with NRC recommendations, that the coal industry invest in automated technologies to monitor the stability and integrity of active and inactive coal waste impoundments at all times as a first front in public and environmental protection.

Fourth Recommendation: Support and Expansion upon 2002 NRC Recommendation of Constituent Analysis of Coal Slurry

In terms of monitoring impoundment stability, the NRC Committee on Coal Waste Impoundments recommends a complete constituent analysis of coal slurry. As stated within the contents of this report, the NRC recommends a full cataloguing of the chemicals contained in coal waste as a means of monitoring and tracking impoundment instabilities through “forensic petrologic and geochemical investigations:” Here, it is important to stress, that the NRC recommended the complete constituent analysis of coal slurry as a result of its own public hearings and the expressed public concerns that the Committee heard over the potential chemical impacts of coal sludge on the environment:

... [A] theme mentioned repeatedly in town meeting with coalfield citizens was their concern and desire for information concerning the chemical constituents in the coal waste, and how it affects their ground and surface water. As a result, the committee recommends that research be performed to identify the chemical

⁷² Section 77.216-4 of Title 30 of the Code of Federal Regulations (CFR) ; 30CFR Section 77.216-3; ⁷² 30CFR Section 77.2

⁷³ *Ibid.* National Research Council *Coal Waste Impoundments: Risks, Responses and Alternatives*, p.166.

constituents contained in the liquid and solid fractions of coal waste, and to characterize the hydrogeologic conditions around impoundments.

Concerns over the chemical inputs in coal waste and the long term impacts of coal waste and black water releases on the environment and human health were consistent and repeated themes in our previous risk assessment in Martin County, KY after the major impoundment breakthrough of 2000. Moreover, our recent survey findings in Mingo and Wyoming County show that concerns over coal waste have not dissipated but remain just as high now in W.Va. as in the past in KY. Five years after the major environmental release, current survey findings show high levels of reported concern among W.Va. citizens over coal waste impacts on the environment, watershed and water supply. Subsequently, we strongly support 2002 NRC recommendations for a complete accounting of the chemical constituents contained in coal slurry.

Moreover, outside of laboratory analyses of the chemicals in coal waste, it would seem logical, as stated within this report, that information also be made available on the chemical inputs used at the front-end of the production and preparation process and which ultimately, end as coal waste effluent. Here, we recommended to go beyond the NRC recommendations and recommended that the Material Safety Data (MSD) sheets of the chemicals used in coal preparation and treatment be on file and readily accessible for scientific inspection and public access. This recommendation is facilitated by recent rule changes within the federal Mine Safety and Health Administration. As of 2002, MSHA now requires that mining companies, in keeping with other industries in other sectors, maintain on file and on site the MSD sheets for the materials and chemicals used in on-site mining activities.⁷⁴ This report, therefore, further recommends that federal and state regulators assure company compliance with these 2002 MSHA rules as this would then facilitate a community's *right-to-know* about the chemical hazards used at mine sites, -which was also identified based on our survey assessment as a principal risk concern among WV residents. At the time of the Martin County spill, and in the ensuing years thereafter, it was difficult -*if not impossible*- for concerned citizens to obtain the MSD sheets of the chemicals used in coal preparation and treatment despite repeated and persistent attempts in their dialogue and advisory committee sessions with EPA. Though an interim MSHA rule at the time of the Martin County breakthrough and therefore, enforceable -but never enforced, the now final 2002 ruling should assist future citizens in gaining access to MSD sheets in the event of a future impoundment event and release. And true, while the new rule changes have been mostly designed to reduce occupational hazards and were designed for worker protection mostly, these current federal MSHA requirements that stipulate that the MSD sheets be on-record and on-site should also assist area citizens and local emergency response personnel in gaining public access to chemical hazards information in the event of a public emergency.

Fifth Recommendation: Refute 2002 NRC Review and Recommendation of Deep Mine Slurry Injection Methods as a Potential Alternative to Coal Waste Impoundments

The NRC *Committee on Coal Waste Impoundments* was charged to also review alternative methods of coal waste disposal.⁷⁵ However, in our past formal interviews and past consultation sessions with area citizens in Martin

⁷⁴ The *Hazard Communication Final Rule* requires all mine operators regardless of size, without exception, to prepare a written program that explains how hazards communications will be implemented at that mine site. The communications plan must cover the following topics: a system for labeling and other forms of warning, how hazard determinations will be performed, the list (inventory) of hazardous chemicals, the location and accessibility of MSDSs or equivalent for all hazardous chemicals. See as published in the *Federal Register*, June 21 2002. Fed Regulatory Doc. 02-15396, Department of Labor, Mine Safety Health Administration. 30 CFR Part 42 et.al. Hazard Communication (HazCom): Final Rule and Withdrawal of Interim Rule. Available online: <http://www.msha.gov/regs/fedreg/final/2002finl/02-15396.pdf>

⁷⁵ See: *Ibid.* National Research Council. *Coal Waste Impoundments: Risks, Responses and Alternatives.*

County, KY, the issue was never with alternative *disposal* methods per se but rather with alternative *production* methods. At the time of our initial interviews with Martin County citizens, for example, there seemed to be an overriding concern regarding the chemical inputs used in the coal preparation/ production process. This theme was repeated at the porch steps of some of the residents that we talked to in Mingo and Wyoming Counties as well as adamantly expressed at the public meeting with area residents within Mingo County. Moreover, based on our survey responses to some survey questions, most surveyed residents reported being concerned about the toxicity and chemical inputs in coal waste. For this principal reason, the NRC review of one particular alternative to impoundments -the underground injection of slurry- is not seen by our research team as a palatable alternative method of disposal.

As explained within the contents of this report, this was made abundantly clear at our public meeting when citizens in the Delbarton, Merrick and Rawl areas of Mingo County expressed serious worries about possible slurry deep-mine injection activities occurring in the area and possible contamination of local groundwater and well-water sources. Likewise, at the time of Martin County incident, there were also similar conflicts over deep-mine slurry injection methods as a disposal (removal) alternative in the Peter Cave / Wolf Creek area of Martin County, KY.⁷⁶ In short, the conversations that have transpired at various places between citizens and our project team, have clearly suggested to us that deep-mine disposal methods should be seriously reevaluated as an alternative method of slurry disposal and therefore, we strongly recommend that such deep mine injection methods be thoroughly reevaluated as a potential and suggested safe alternative to coal waste impoundments.

Sixth Recommendation: Beyond 2002 NRC Recommendations, Recommend the Expansion of Citizen Involvement in Evaluation and Assessment of Coal Waste Impacts on the Environment and Watershed

There has been a steady series of environmental impact assessments by various regulatory agencies and other entities on the Martin County coal waste spill, with the most recent being a 2005 report issued by the KY Black Water Taskforce.⁷⁷ Yet it has been our experience, based on our conversations with Martin County residents, that these environmental impact reports that have typically concluded “no long-term impacts on either human health or the environment” have typically produced an equal amount of public skepticism among area residents. For this reason, in our past community impact assessments in Martin County, KY, we have consistently recommended independent outside testing and assessment with full citizen oversight. When writing this report, we felt that it might be important for the reader of this report to know that this year, in 2005, due to supporting recommendations from the KY State *Environmental Quality Commission* (EQC),⁷⁸ there was a major breakthrough on this front: The KY legislature released monies from the Martin County Natural Resource Damage Trust fund for the purpose of independent testing and assessment of slurry impacts on

For final NRC Recommendations / assessments of alternative methods of disposal see Chapter 7, “Reducing or Eliminating Slurry Generation, (135-140); “Direct Utilization of Slurry’ (141-156); “Alternatives to Disposal Impoundments (151-159); Remining Slurry Impoundments (159-164).

⁷⁶ See, for example: Lilly Adkins. (December 6, 2000) Martin County Coal denies fault for slurry spill. The Martin County Sun. p.12.

⁷⁷ Kentucky Cabinet of Environmental and Public Protection. April 2005. Report of the Black Water Taskforce. Available online: <http://www.environment.ky.gov/NR/rdonlyres/3C01D442-6E3B-4430-8D6A-ACC82AB21BEF/0/BlackWaterTaskForce042205.pdf>

⁷⁸ See: Kentucky Environmental and Public Protection Cabinet. September 16, 2004. Memorandum, RE: Legal Opinion Request from Commissioner’s Office. Martin County Coal Corporation Agreed Order, July 31 2002. Prepared by Mary Stevens, Attorney, Water Legal Section.

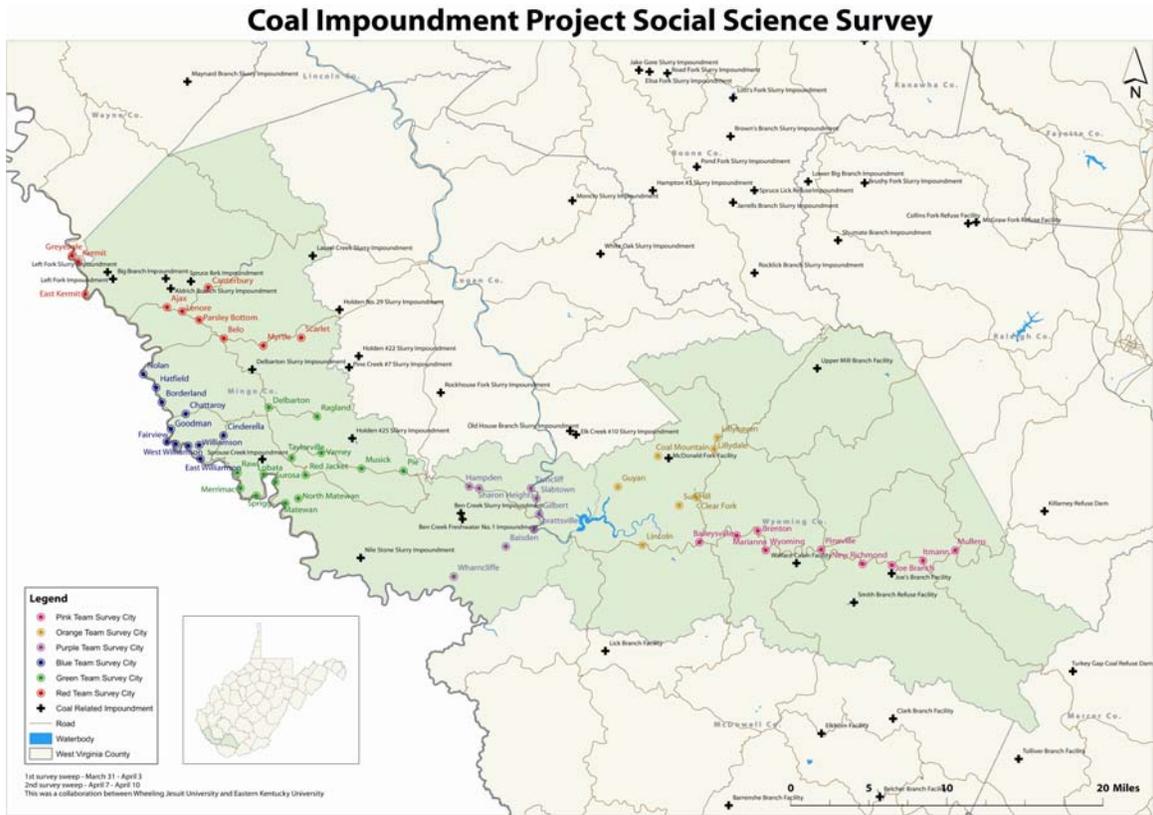
the Martin County watershed with mechanisms for citizen oversight and collaboration into the sampling and testing protocols.⁷⁹ Some of the details related to this initiative are explained more fully within the contents of this report.

Here, for the purposes of summarizing, it is certainly worth stating and therefore recommending, that such collaborative stakeholder initiatives that assess and evaluate the impacts of coal waste on the environment and watershed should be instituted elsewhere and potentially funded through other penalty and settlement monies. Such stakeholder / scientific initiatives with citizen involvement could potentially lead to more objective and rigorous assessments of slurry environmental impacts and could provide citizens with perhaps more definitive and acceptable information with respect to the potential long and short term effects of coal waste on the environment, watershed and drinking water sources. Moreover, we believe that such environmental impact initiatives with mechanisms for public involvement in the deliberation and evaluation process would be in direct accord with the 1996 NRC recommendation of expanding citizen and stakeholder input in risk assessments –in its most purest form of engaging citizens fully in the science of risk assessment- and, therefore, we fully recommend that the citizen participation models being developed now in KY, under the Environmental and Public Protection Cabinet, be reviewed, studied and applied elsewhere.

⁷⁹ See: Kentucky Commonwealth 2005 Budget Conference Report, 2005 Regular Session of the General Assembly. Section F: Environmental and Public Protection. Available online: <http://lrc.ky.gov/budget/05rs/50f.pdf> Martin County Damage Trust Fund. p.F14.

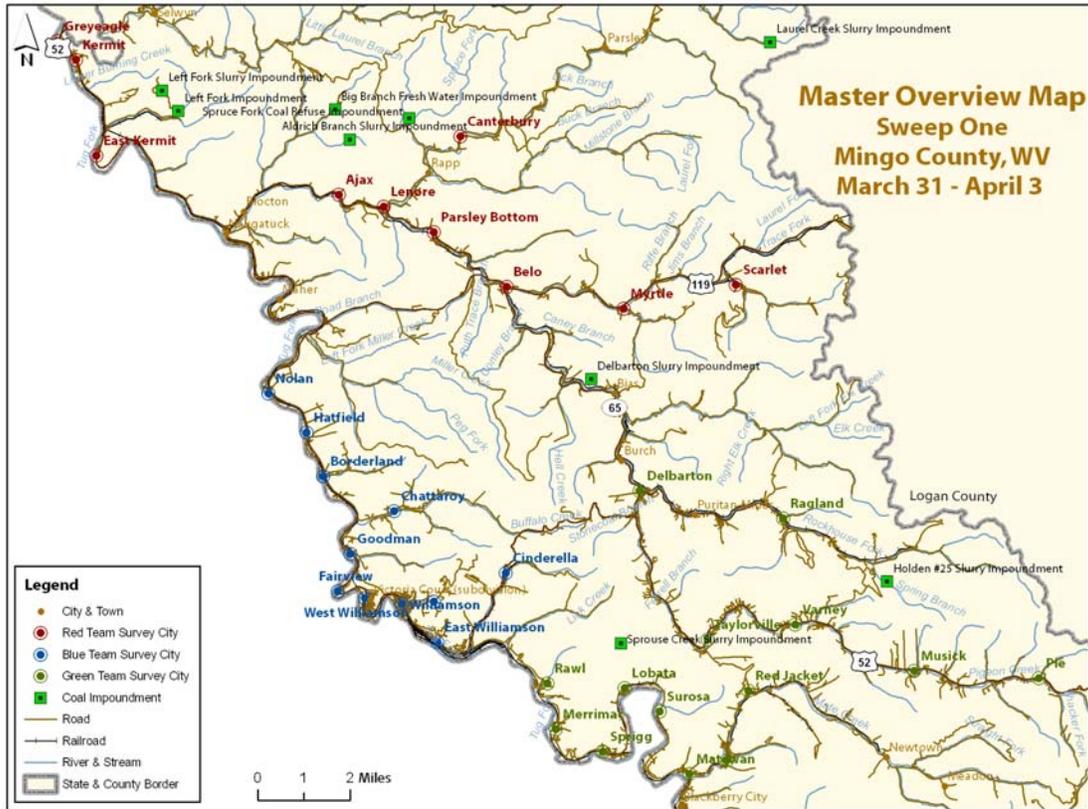
**Appendix A:
Maps of Survey Districts and WV Survey Area**

Map 1: Full Survey Area of WV Coal Waste Impoundment Risk Assessment Survey, Mingo and Wyoming Counties



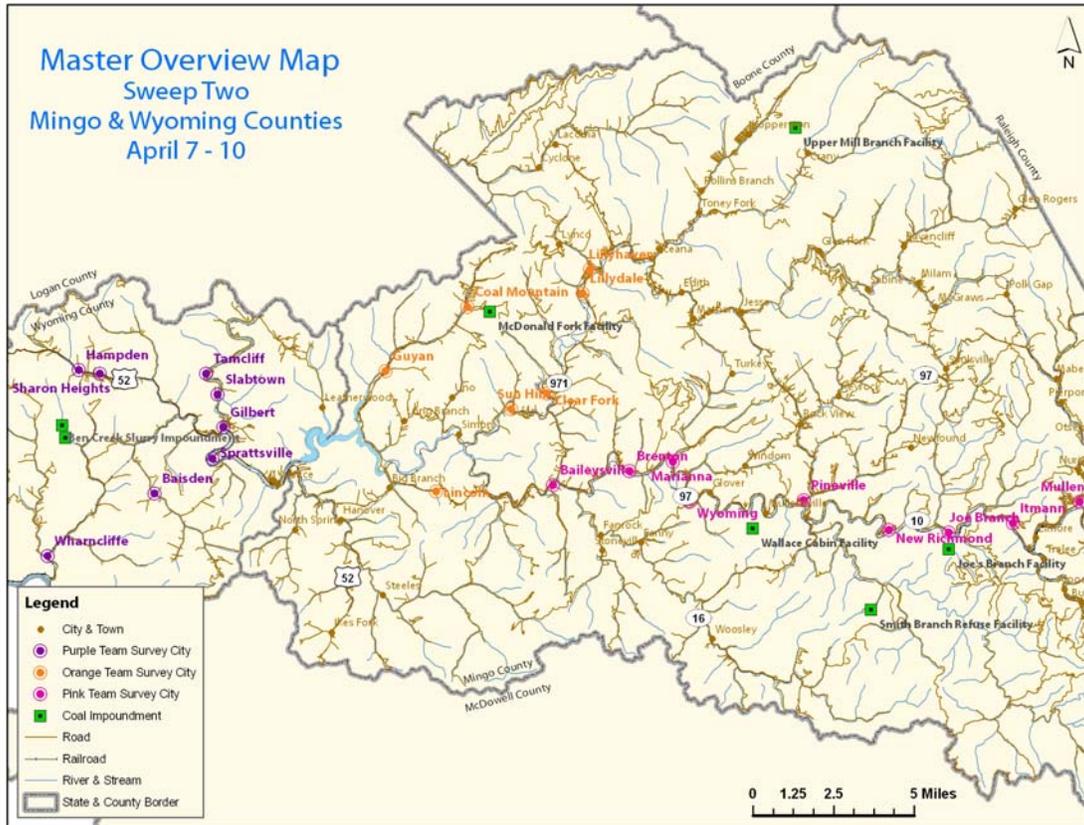
Source: Jodie Hoover -GIS Analyst/Geographer; Center for Educational Technologies, Wheeling Jesuit University WV

Map 2: Mingo County: March 31- April 3, 2005: Survey Districts



Source: Jodie Hoover -GIS Analyst/Geographer; Center for Educational Technologies, Wheeling Jesuit University WV.

Map 3: Mingo and Wyoming Counties: April 7-10, 2005



Source: Jodie Hoover -GIS Analyst/Geographer; Center for Educational Technologies, Wheeling Jesuit University WV

**Appendix B:
General Percentage Breakdown of Survey Findings for
Mingo and Wyoming Counties, WV. 2005**

Question Set I: WHAT ARE YOUR GENERAL VIEWS ABOUT YOUR COMMUNITY?

We've surveyed residents in Martin and Perry County, Kentucky on their views on their community. Now we would like to know your views. In general, how would you rate your community? Please rate each item (**very good, good, fair, poor, very poor**) by checking the appropriate box.

Between 245 to 250 residents responded to the following questions:	Very				Very	Don't
	Good	Good	Fair	Poor	Poor	Know
• The quality of local government is	4 (%)	14	46	28	6	2
• The quality of the natural environment (air, water, soil, etc) in our community is...	3 (%)	28	35	22	10	1
• Job opportunities in the community are	2 (%)	4	13	39	42	0
• Outdoor recreational opportunities are	4 (%)	14	24	34	23	0
• The coal economy in this community is	12 (%)	33	34	15	4	2
• The quality of life in this community is	5 (%)	31	42	15	6	1
• As a place to raise children, this community is	15 (%)	36	28	13	8	0
• Opportunities for young people are	1 (%)	2	11	43	42	4

Also in our survey of Martin and Perry County residents, many people expressed various community concerns. Now we'd like to find out how much of a problem the following are for you in your community. Please rate each item, by checking the appropriate box based on the following scale (**not a problem at all, a slight problem, a moderate problem, a serious problem**).

Between 239 and 254 residents Responded to the following questions:	Not a				Don't Know
	problem at all	A Slight problem	A Moderate Problem	A Serious Problem	
• Economic Growth	5 (%)	12	21	59	3
• County government	6 (%)	26	35	37	6
• City government	13(%)	19	29	24	15
• State government	12 (%)	26	38	18	7
• Crime / Drugs	1 (%)	9	20	69	1
• Coal Waste	9 (%)	23	31	24	12
• Unemployment	1(%)	10	20	66	2
• Education	21 (%)	24	26	26	3
• Health Problems	6 (%)	20	32	39	3
• Environment	12 (%)	33	27	24	5
• Housing	17 (%)	25	31	24	4
• Drinking Water	26 (%)	21	24	28	2
• Sewage	27 (%)	17	21	33	3
• Garbage	26 (%)	18	22	33	1

Question Set II: HOW SERIOUS ARE THE FOLLOWING RISKS?

The following survey items were developed in light of the specific goals and objectives of the Coal Impoundment Project led by Wheeling Jesuit University. We would like you to please take a moment to respond to them. **On a scale from 1 to 10 with 1 being “not serious at all” and 10 being “very serious” how serious are the risks THAT YOU FACE EACH YEAR from...** (Please check the appropriate box from either 1 to 10 for each item).

Between 209 and 248 residents responded to the following questions	Not at all serious									Very serious	Don't know *
	1	2	3	4	5	6	7	8	9	10	
• Accidents at Home	43%	20	12	6	12	3	1	0	0	2%	
• Accidents on the Job	25%	9	9	10	16	10	6	5	0	9%	
• Coal waste impoundments	20%	11	8	5	17	9	5	5	3	17%	
• Coal trucks	6%	7	4	8	9	7	11	9	2	38%	
• Abandoned mine sites	16%	7	10	4	14	8	7	7	4	25%	
• Active mine sites	23%	12	11	5	15	5	6	9	2	12%	
• Exposure to hazardous chemicals from mining activities	27%	9	10	7	10	6	6	9	3	14%	
• Exposure to hazardous chemicals in watershed and water supply	23%	10	7	6	12	6	5	7	4	21%	
• Oil and gas exploration and drilling	22%	14	11	7	14	8	5	5	2	12%	
• Flooding and flash flooding	6%	5	2	4	10	5	9	7	7	45%	
• Other natural hazards (Winter storms, tornados etc.)	25%	14	10	11	14	8	6	3	1	8%	
• Other man-made hazards (Hazardous material spills, fire, shortages of critical resources etc.)	23%	14	8	11	12	5	5	6	3	12%	
• Terrorism	49%	12	10	6	8	1	3	1	2	7%	

Question Set III: WHAT ARE YOUR VIEWS ON COAL WASTE IMPOUNDMENTS?

The following statements focus on the possible risks possibly associated with coal waste impoundments in the Appalachian region and were developed in light of the goals and objectives of the Coal Impoundment Project led by Wheeling Jesuit University. We would like to know the extent to which you disagree or agree with each statement based on the following scale (**strongly disagree, disagree, neutral, agree, strongly agree, and don't know**). Please check the appropriate box for each item.

Between 251 and 253 residents responded to the following questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't know
• Engineers understand the risks	9 (%)	13	18	35	13	12
• The coal company understands the risks	10 (%)	16	14	35	15	10
• State regulatory officials understand the risks	9 (%)	15	15	36	15	9
• Federal regulatory officials understand the risks	11 (%)	14	13	36	15	11
• People living near the impoundment are prepared for the risks	32 (%)	32	11	6	4	14
• Emergency preparedness and response plans for coal waste impoundments are adequate	26 (%)	32	13	8	2	19
• People and county personnel living near the impoundment can control and monitor the risks	24 (%)	30	12	13	3	18
• People dread living near the impoundment	5 (%)	6	16	34	24	15
• The impoundment poses a serious risk to future generations	5 (%)	7	13	33	24	16
• The economic benefits outweigh the risks	15 (%)	25	19	13	7	20
• An impoundment break would involve certain death	3 (%)	9	13	32	23	18
• An impoundment break would kill many people at one time.	3 (%)	8	14	28	25	20

Question Set IV: WHAT ARE YOUR VIEWS ON THE COAL INDUSTRY AND THE FOLLOWING AGENCIES?

Many people we interviewed in Martin County after the October 2000 coal waste spill expressed various views on how the spill was handled by various groups and agencies. People in your community might share or hold different views. Please tell us how you feel by rating each statement (**strongly disagree, disagree, neutral, agree, strongly agree or don't know**) by checking the appropriate box.

Between 251 and 253 residents responded to the following questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't know
• I have trust in the coal company.	28 (%)	27	25	12	4	4
• I have trust in local government.	18 (%)	37	24	17	1	4
• I have trust in the State agencies.	15 (%)	33	26	20	1	3
• I have trust in spill clean-up companies.	18 (%)	23	27	19	2	10
• I have trust in the federal Environmental Protection Agency (EPA).	14 (%)	19	27	30	3	7
• I have trust in the federal Mine Safety and Health Administration (MSHA).	12 (%)	21	25	30	5	6
• I have trust in emergency responders.	7 (%)	13	28	40	7	5
• I have trust in the Emergency Preparedness and Response Plan for the coal waste impoundment in my community.	18 (%)	23	25	13	3	17

Question Set V: WE WOULD ALSO LIKE TO KNOW YOUR VIEWS ON THE FOLLOWING.

In our field interviews with residents in Martin County, people suggested ways that the mining industry and regulatory agencies could make coal waste impoundments safer and more acceptable to local residents. How important are the following to you with regard to the impoundment near your community? Please rate each item (**strongly disagree, disagree, neutral, agree, strongly agree or don't know**) by checking the appropriate box.

Between 248 and 254 residents responded to the following questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't know
• The federal government should set stricter mining standards.	4 (%)	11	16	38	24	6
• A local committee should have the power to shut down the impoundment if they decide it is unsafe.	6 (%)	15	12	36	24	6
• The mining industry should provide the community with an emergency safety plan.	0 (%)	2	5	48	43	2
• An impartial inspector should be at the mining site at all times.	4 (%)	14	15	40	23	4
• The mining industry should contribute more financially for improving community facilities (schools, parks, sewage systems).	2 (%)	8	15	35	38	3
• The coal company should protect property values in communities downstream of the coal waste site.	1 (%)	2	7	45	44	1
• The coal company should dredge the creeks of sludge and silt.	2 (%)	4	8	40	43	2
• The mining industry should establish a local outreach office in town to keep residents informed of mining activities.	1 (%)	4	18	42	31	3
• The mining industry is already well regulated by federal and state agencies.	11 (%)	19	25	24	10	11
• The mining industry should explore other (cleaner) technologies to wash coal.	2 (%)	2	18	43	27	8
• The mining industry should invest in technologies to cleanup sludge spills.	1 (%)	2	6	49	38	3
• Current mining laws should be better enforced.	1 (%)	4	9	39	41	6

Question Set VI: WHAT ARE YOUR VIEWS ON THE FOLLOWING OTHER ISSUES?

During our field interviews with Martin County residents, some citizens had opinions on other issues that may (or may not) be related to coal waste impoundments. By responding to the next set of statements, we would like to know your views on some of these other issues. Please rate each item (**strongly disagree, disagree, neutral, agree, strongly agree or don't know**) by checking the appropriate box.

Between 248 and 254 residents responded to the following questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't know
• We may never know the extent of the damage caused by the coal waste spill in Martin County, Kentucky.	1 (%)	7	10	44	23	16
• Impounding coal waste is the best storage and disposal method.	10 (%)	16	19	10	4	40
• Coal waste impoundments stimulate local economic growth.	17 (%)	22	20	13	2	26
• With so many experts telling us what is safe and what is not, one really doesn't know what to believe.	1 (%)	6	9	53	26	6
• Emergency preparedness and response plans for coal waste impoundments are adequate.	16 (%)	24	15	10	3	31
• People have the right to change the natural environment to meet their needs.	20 (%)	23	19	20	6	12
• Poor water quality is associated with poor health in my community	3 (%)	14	13	32	21	16
• There is little chance that the coal waste impoundment near <u>my community</u> will rupture in the future.	16 (%)	22	10	15	4	33
• The coal industry provides jobs and economic opportunity to local people in my community.	3 (%)	6	10	47	24	9
• There is no use in contacting public officials because they aren't interested in the average person.	3 (%)	12	15	35	23	11
• Coal sludge is not hazardous.	41 (%)	35	5	4	3	12
• I know about the emergency response procedures in my community if the local impoundment were to rupture in the future.	24 (%)	31	7	5	3	31
• The economic benefits associated with coal and coal waste impoundments outweigh the risks.	17 (%)	25	18	12	5	22

Question Set VII: WHAT ARE YOUR VIEWS ON YOUR DRINKING WATER?

In other field interviews with other residents in Martin County, some citizens expressed some concerns with the drinking water supply in their county. Some offered suggestions on improving water quality. Now we would like to know your views on the drinking water supply in your community and how important the following water quality and water treatment issues are to you. Please rate each item (**strongly disagree, disagree, neutral, agree, strongly agree or don't know**) by checking the appropriate box.

Between 248 and 254 residents responded to the following questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
• The water from my faucet is always of good quality	16 (%)	27	13	30	10	4
• The water treatment facility should enforce stricter water quality standards.	3 (%)	7	14	41	24	9
• An independent citizen's committee should monitor and test water quality.	2 (%)	7	21	43	20	6
• The water treatment facility does a good job of meeting water quality standards	7 (%)	17	19	27	7	23
• The mining industry should contribute financially to independent tests of water quality.	3 (%)	7	12	47	25	7
• Coal severance taxes should be used to upgrade the water facility.	2 (%)	7	18	39	24	11
• Our home purchases distilled and bottled water	7 (%)	13	10	39	28	4

Question Set VIII: CAN YOU PLEASE TELL US A LITTLE ABOUT YOURSELF?
FOR ANALYSIS AND COMPARISON PURPOSES

The following basic questions might help us understand some differences in opinions and experiences among residents across communities in Kentucky and West Virginia. These differences and similarities might be important in identifying clusters of concerns among different groups of citizens and subsequently targeting better policy. Could we ask you to please take just several more minutes to respond to each item? When checking the appropriate box for each question, **please check only one box** for analysis reasons.

1. Male <u>49%</u>		2. Female <u>51%</u>	
<ul style="list-style-type: none"> Age _____ (please write in number of years) 			
<ul style="list-style-type: none"> How long have you lived in this county? 		_____ Years (Please write in number of years)	
<ul style="list-style-type: none"> Where do you live closer to? 	1. Kermit 10%	2. Williamson 23%	3. Delbarton 11%
	4 Gilbert 22%	5. Pineville 30%	6. Neither 5%
<ul style="list-style-type: none"> How many years of schooling do you have? 		_____ Years of school. (Please include years in public school, high school as well as college)	
<ul style="list-style-type: none"> Do you own or rent your home? 		1. Own 88%	2. Rent 8%
		3. Neither 4%	
<ul style="list-style-type: none"> Which of the following categories best describes your home? 			
1. Single family home 76%	2. Mobile Home 20%	3. Apartment 3%	4. Other Specify <u>1%</u>
<ul style="list-style-type: none"> How do you draw your water? 	1. public water system 66%	2. private well 33%	3. Other Specify <u>1%</u>
<ul style="list-style-type: none"> How many children (under 18) live with you in your home? <p style="text-align: center;"><u>60% no children present/ 40% 1 or more children</u> <i>If there are no children under the Age of 18 present, please write "0"</i></p>			

<ul style="list-style-type: none"> Is any person in your family involved in the mining industry-either through being employed, the sale of mineral rights, or through other business-related activities? 						1. Yes 54%	2. No 46%
<ul style="list-style-type: none"> What is your employment status? <i>For analysis reasons, please check only one box that best applies.</i> 							
1. Employed, Full time 31%	2. Housewife 16%	3. Employed, Part time 3%	4. Unemployed 4%	5. Retired 18%	6. Disabled 24%	7. Self Employed 3%	
<ul style="list-style-type: none"> We realize that asking for information on income is a sensitive topic, but we certainly would appreciate your response. For the year 2004, what general category best represents your <u>household income before taxes</u>? 							
Under \$10,000 10%	\$10,000-\$20,000 22%	\$21,000 -\$40,000 32%	\$41,000-\$60,000 19%	Over \$60,000 17%			
<ul style="list-style-type: none"> Did you vote in the last local election? 			Yes 78%	No 22%			
<ul style="list-style-type: none"> Do you consider yourself active in community affairs? 			Not Active 33%	Somewhat Active 55%	Very Active 13%		
<ul style="list-style-type: none"> If you could live any place in the United States you wanted to, would you choose the area where you are living now? 							
Definitely Yes 24%		Probably Yes 29%		Probably Not 28%		Definitely Not 19%	
<ul style="list-style-type: none"> Do you expect to live most of the rest of your life in this community? 							
						1. Yes 84%	2. No 16%
<ul style="list-style-type: none"> <i>Prior to this Survey</i>, were you aware that there was a coal waste impoundment near your community? 						1. Yes 67%	2. No 33%
<ul style="list-style-type: none"> <i>Prior to the Spill in Martin County, Kentucky</i>, were you aware that there was a coal waste impoundment near your community? 						1. Yes 64%	2. No 36%

**Appendix C:
Report Tables:
Mining versus Non Mining Households**

Table 1: Survey Acceptance, Refusal and Return Rates *

	House Contacts	Accepts	Refusals	Returns
<u>Survey Sweep #1:</u>				
Williamson, Kermit, Delbarton, Matewan areas of Mingo County (March 31-April 3, 2005)	280	197	52	116
<u>Survey Sweep #2:</u>				
Gilbert, Lillyhaven, Coal Mountain, Pineville Areas of Mingo and Wyoming Counties (April 7-April 11, 2005)	325	210	56	140
Totals	605	407	108	256
		Acceptance Rate ⁽¹⁾ 67%	Refusal Rate ⁽²⁾ 18%	Rate of Return ⁽³⁾ 63%
Distribution of Surveys				
	Number	Percentage		
Mingo County	159	62(%)		
Wyoming County	87	38%		
Totals	256			
Distribution of Surveys (Continued)				
	Number	Percentage		
Kermit	37	14(%)		
Williamson	47	18		
Delbarton/ Matewan	32	13		
Gilbert	43	16		
Lillyhaven/ Coal Mountain	50	20		
Pineville	47	18		
Totals	256			

* **Note:** (1) Acceptance Rate = Number of Accepts/ Number of Contacts
 (2) Refusal Rate = Number of Refusals Number of Contacts
 (3) Rate of Return = Number of Returns/ Number of Acceptances

Tables for Section Two: Method and Sample Characteristics

Table 2: Demographic Characteristics of Sample: Mingo/Wyoming WV. Counties

Gender (n= 247) *	Male 49(%)	Female 51		
Age (n=245)	Ave =49yrs Mdn=50yrs	S.D = 15 **	Min =18	Max =94
Years spent living in community (n=240)	Ave =41	S.D =18	Min =2	Max =88
Educational Level (n=246)	Ave=12.38	S.D =2.89	Min =0	Max=20
Number of children present in household (n= 246)	Ave=.6 Mdn=0	S.D =.92	Min =0 (60 %)	Max=6
Home ownership (n=243)	Own 88(%)	Rent 8	Neither 4	
Household Income (n=209)	Under \$10,000 10(%)	\$10,000- \$20,000 22	\$21,000- \$40,000 32	\$41,000- \$60,000 19
Employment Status (n=244)				
• Employed Full time	31(%)			
• Housewife	16			
• Employed, Part time	3			
• Unemployed	4			
• Retired	18			
• Disabled	24			
• Self Employed	3			

* *Note:* Number in parentheses report the number of respondents that answered question

** *Note:* S.D= Standard Deviation which is the plus/minus range around the mean where most persons reported.

Table 3. Sample Representativeness: Comparison of Sample Demographics with 2000 Mingo and Wyoming County WV. U.S. Census Data *

		Mingo/ Wyoming County Sample (n=256)	U.S. Census 2000 Mingo County (N= 28,253)	U.S. Census 2000 Wyoming County (N= 25,708)
Gender	Male	49%	48%	49%
	Female	51%	52%	51%
Education				
	Less than H.S. School	21%	40%	35%
	High School	42%	36%	42%
	More than H.S.	37%	25%	23%
Household				
	Children under 18 present	40%	32%	30%
Homeownership Rates				
	Own	88%	66%	66%
	Rent	8%	34%	34%
Unemployment Rates				
		4%	4%	4%
Household Income				
	Less than \$10,000	10%	26%	21%
	Median Income	\$21,000-\$40,000	\$21,347	\$23,932

**Source:* U.S. Census Bureau. Census 2000 Demographic Profile: American Fact Finder. Available online: <http://factfinder.census.gov>

Table 4: Other Characteristics of Mingo/ Wyoming County WV. Sample

Household Type (n=244) *			
Single Family Home	Mobile Home	Apartment	Other
76(%)	20	3	1
	Public Water System	Private Well	Other
	66(%)	33	1
Mining: Is any person in your family involved in the mining industry ** (n=241)			
	Yes	No	
	54(%)	46	
Voting: Did you vote in the last local election? (n=239)			
	Yes	No	
	78(%)	22	
Civic Engagement: Do you consider yourself active in community affairs? (n=239)			
Not Active	Somewhat Active	Very Active	
33%	55%	13%	

* **Note:** Numbers in parentheses are number of responses to each question

** **Note:** Full survey question: Is any person in your family involved in the mining industry either through being employed, the sale of mineral rights or through other business-related activities? Persons could respond either “yes” or “no.”

Table 5: Community and Quality of Life Issues: West Virginia and Kentucky Coal-Producing Counties Compared

	Mingo/ Wyoming Counties, WVA, 2005 n=256	Perry County, KY, 2001 n=250	Martin County, KY 2001 n=290
	Very Good/ Good	Very Good/ Good	Very Good/ Good
Quality of Local Government	17(%)	42(%)	10 (%)
Quality of Natural Environment	32	38	10
Quality of Life	37	46	22
As a place to raise children	51	51	38
Coal economy	46	46	19

Highest Rated Community Problems in Mingo/ Wyoming Counties

	A Serious Problem
Crime/ Drugs	70(%)
Unemployment	68
Economic growth	61
Health Problems	40
Sewage	34
Drinking water	28

Highest Rated Community Problems in Perry County

	A Serious Problem
Crime/ Drugs	74(%)
Unemployment	68
Health Problems	26
Sewage	26
Drinking water	24

Highest Rated Community Problems in Martin County

	A Serious Problem
Drinking water	80(%)
Unemployment	71
Coal waste	69
Economic growth	65
Sewage	53

The Coal Industry provides jobs and economic opportunity to local people in my community:

(Asked in Mingo / Wyoming Counties only) (n=236) *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Tied to Mine Sector	2(%)	4	6	53	33	3
Not Tied	6(%)	9	15	40	16	16

The Economic Benefits associated with coal and coal waste impoundments outweigh the risks:

(Asked in Mingo/ Wyoming Counties only) (n=238)*

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Tied to Mine Sector	17(%)	21	22	17	7	16
Not Tied	19(%)	29	14	5	5	29

Tables for Section Three: Risk Perceptions and Compensation Strategies:
A Comparison of Mining versus Non Mining WV Households

Table 6: General Community Risk Perceptions and Ratings* Mingo/ Wyoming County, WV: Mining versus Non Mining Households Compared **

	Mining Households	Non Mining Households	Significance Test
Accidents at Home	Ave= 2.43	Ave = 2.67	t =-.89 df =228 p= .37 NS ***
Accidents on the Job	Ave= 4.54	Ave = 4.02	t = 1.3 df = 207 p=.19 NS
Coal waste impoundments	Ave= 4.90	Ave= 5.34	t = -.08 df =202 p=.327 NS
Coal trucks	Ave= 6.81	Ave= 7.28	t = -1.19 df =232 p=.2 NS
Abandoned mine sites	Ave= 5.65	Ave= 6.02	t =-.81 df =209 p=.42 NS
Active mine sites	Ave= 4.18	Ave= 5.02	t = -1.9 df =209 p=.05 S
Exposure to hazardous chemicals from mining activities	Ave= 4.17	Ave= 5.42	t =-2.69 df =195 p=.008 S
Exposure to hazardous chemicals in watershed and water supply	Ave= 4.89	Ave= 5.81	t =-1.87 df =197 p=.063 NS
Oil and gas exploration and drilling	Ave= 3.94	Ave=5.21	t = -2.99 df =200 p=.003 S
Flooding and flash flooding	Ave= 7.24	Ave= 8.02	t = -2.04 df =228 p=.042 S
Other natural hazards (Winter storms, tornados etc.)	Ave= 3.79	Ave= 4.35	t =-1.54 df =229 p=.124 NS
Other man-made hazards (Hazardous material spills, fire, shortages of critical resources etc.)	Ave= 4.18	Ave= 4.91	t =-1.70 df =210 p=.09 NS
Terrorism	Ave= 3.07	Ave= 2.92	t = .37 df =203 p=.708 NS

* **Note:** General risk perception questions asked on a 1 (Not serious) to 10 (Very Serious) scale, see Appendix A, Question Set II for scale and wording.

** **Note:** Based on the survey question: Is any person in your family involved in the mining industry either through being employed, the sale of mineral rights or through other business-related activities? Persons could respond either “yes” or “no.”

*** **Note:** NS = “Not Significant” means that the difference between the average report for mining versus non mining households in rating the particular risk was not a large enough difference to suggest any meaningful difference in risk perceptions between mining and non mining households. S = “Significant” means that the difference in average risk rating between households may be large enough to suggest some meaningful difference in perceptions between mining versus non mining households.

Tables for Section Three: Risk Perceptions and Compensation Strategies:
A Comparison of Mining versus Non Mining WV Households

Table 7: Coal Waste Impoundments and Levels of Community Awareness in Mingo/ Wyoming County, WV: Mining (*Percentages in Bold*) versus Non Mining Households Compared *

Aware of Coal Waste Impoundments	Yes	No
<i>Prior to this Survey</i> , were you aware that there was a coal waste impoundment near your community? (n=238) ($X^2=20.3, df=1, p=.000$) S **	80(%) 52	20 48
<i>Prior to the Spill in Martin County, Kentucky</i> , were you aware that there was a coal waste impoundment near your community? (n=237) ($X^2=14.8, df=1, p=.000$) S	75(%) 51	25 49

Aware of Emergency Action Plans	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	DK***
I know about the emergency response procedures in my community if the local impoundment were to rupture in the future. ($X^2=8.59, df=5, p=.126$ NS)	26(%) 23	33 30	6 6	9 2	3 4	24 36

* **Note:** Based on the survey question: Is any person in your family involved in the mining industry either through being employed, the sale of mineral rights or through other business-related activities? Persons could respond either “yes” or “no.”

****Note:** S = “Significant” means that the difference in percentages being reported for mining versus non mining households was large enough to suggest some meaningful difference in levels of impoundment awareness or awareness in emergency action planning between mining versus non mining households. NS = “Not Significant” means that the differences in percentages being reported for mining versus non mining households were not large enough to suggest any meaningful difference between households

* * **Note:** DK =Don’t Know

Tables for Section Three: Risk Perceptions and Compensation Strategies:
A Comparison of Mining versus Non Mining WV Households

**Table 8: Risk Perceptions regarding Coal Waste Impoundments:
Mingo/ Wyoming County, WV: Mining (*Percentages in Bold*) versus Non Mining
Households Compared ***

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
• Engineers understand the risks $X^2=13.8, df=5, p=.017$ S**	5 (%) 13	15 13	16 16	43 28	15 12	6 17
• The coal company understands the risks $X^2=11.5, df=5, p=.041$ S	6 15	15 18	15 13	42 25	15 16	7 12
• State regulatory officials understand the risks $X^2=15.4, df=5, p=.009$ S	5 14	13 18	14 17	45 27	16 13	6 12
• Federal regulatory officials understand the risks $X^2=12.16, df=5, p=.033$ S	8 15	12 17	13 13	44 27	17 14	6 14
• People living near the impoundment are prepared for the risks $X^2=11.9, df=5, p=.036$ S	35 31	33 32	13 8	8 4	3 6	8 20
• People and county personnel living near the impoundment can control and monitor the risks $X^2=5.7, df=5, p=.331$ NS	26 23	34 27	10 13	15 10	3 4	12 23
• People dread living near the impoundment $X^2=3.21, df=5, p=.666$ NS	7 4	7 4	15 16	34 36	33 27	15 14
• The impoundment poses a serious risk to future generations $X^2=11.9, df=5, p=.042$ S	8 2	9 5	16 9	30 40	23 28	14 17
• The economic benefits outweigh the risks $X^2=5.25, df=5, p=.386$ NS	15 18	25 23	23 16	14 14	8 6	15 24
• An impoundment break would involve certain death $X^2=8.4, df=5, p=.131$ NS	6 1	11 6	12 13	34 32	19 29	17 20
• An impoundment break would kill many people at one time. $X^2=11.2, df=5, p=.047$ S	6 1	10 5	16 12	30 27	20 32	18 23

* *Note:* Based on the survey question: Is any person in your family involved in the mining industry either through being employed, the sale of mineral rights or through other business-related activities? Persons could respond either “yes” or “no.”

***Note:* S = “Significant” means that the difference in percentages being reported for mining versus non mining households was large enough to suggest some meaningful difference in either levels of trust in those bodies responsible for monitoring impoundment risks or risk perceptions regarding impoundments between mining versus non mining households. NS = “Not Significant” means that the differences in percentages being reported for mining versus non mining households were not large enough to suggest any meaningful difference between households

Tables for Section Three: Risk Perceptions and Compensation Strategies:
A Comparison of Mining versus Non Mining WV Households

Table 9: Emergency Action Planning and Coal Waste Impoundments: Mingo/ Wyoming County, WV: Mining (Percentages in Bold) versus Non Mining Households Compared *

Concerns of Breakthrough	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
There is little chance that the coal waste impoundment near <u>my community</u> will rupture in the future. $X^2=4.7,df=5, p=.45$ NS **	15 (%) 18	27 18	11 7	16 15	4 5	28 37
Emergency Action Plans	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
I know about the emergency response procedures in my community if the local impoundment were to rupture in the future. $X^2=8.59,df=5, p=.126$ NS	26 (%) 23	33 30	6 6	9 2	2 4	24 36
Emergency preparedness and response plans for coal waste impoundments are adequate. $X^2=10.25,df=5, p=.068$ NS	27 26	34 28	14 13	11 5	1 4	13 25
I have trust in the Emergency Preparedness and Response Plan for the coal waste impoundment in my community. $X^2=12.53,df=5, p=.028$ S	11 18	18 22	28 24	34 24	5 1	4 11
Trust in Responsible Authorities	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
I have trust in the coal company. $X^2=10.1,df=5, p=.07$ S	24 (%) 33	28 27	25 22	16 8	6 3	2 8
I have trust in the federal Mine Safety and Health Administration (MSHA). $X^2=16.46,df=5, p=.006$ S	7 17	23 21	25 25	33 26	9 1	4 10
I have trust in the State agencies. $X^2=14.36,df=5, p=.013$ S	10 21	31 38	27 23	28 12	2 1	3 5
I have trust in emergency responders. $X^2=7.3,df=5, p=.19$ NS	6 9	13 14	25 31	44 32	9 5	3 8

* **Note:** Based on the survey question: Is any person in your family involved in the mining industry either through being employed, the sale of mineral rights or through other business-related activities? Persons could respond either “yes” or “no.”

****Note:** NS = “Not Significant” means that the differences in percentages being reported for mining versus non mining households were not large enough to suggest any meaningful difference between mining and non mining households with respect to either concerns over an impoundment breakthrough, emergency action planning or trust in responsible authorities. On the other hand, S = “Significant” means that the differences in percentages being reported for mining versus non mining households were large enough percentage difference to suggest a meaningful difference between households.

Tables for Section Three: Risk Perceptions and Compensation Strategies:
A Comparison of Mining versus Non Mining WV Households

Table 10. Compensation and Regulatory Strategies towards Coal Waste Impoundments: Mingo/ Wyoming County, WV: Mining (*Percentages in Bold*) versus Non Mining Households Compared *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Provide Community with EAP						
The mining industry should provide the community with an emergency safety plan.	0 (%) 1	2 2	4 4	52 44	41 47	2 3
$X^2=2.7, df=5, p=.734$ NS **						
Other Compensation and Regulatory Strategies:						
A local committee should have the power to shut down the impoundment if they decide it is unsafe. $X^2=21.35, df=5, p=.001$ S	10 (%) 3	22 7	9 15	36 38	22 27	2 9
An impartial inspector should be at the mining site at all times. $X^2=12.5, df=5, p=.028$ S	6 2	18 7	15 16	41 41	17 29	2 5
The mining industry should contribute more financially for improving community facilities (schools, parks, sewage systems). $X^2=2.69, df=5, p=.747$ NS	2 2	10 8	16 13	33 33	37 41	2 5
The coal company should protect property values in communities downstream of the coal waste site. $X^2=12.23, df=5, p=.032$ S	2 0	2 1	10 3	43 47	43 47	0 2
The coal company should dredge the creeks of sludge and silt. $X^2=7.54, df=5, p=.183$ NS	3 1	2 5	11 6	42 35	40 48	2 5
The mining industry should establish a local outreach office in town to keep residents informed of mining activities. $X^2=11.64, df=5, p=.040$ S	2 0	5 2	23 14	41 44	27 35	2 6

* *Note:* Based on the survey question: Is any person in your family involved in the mining industry either through being employed, the sale of mineral rights or through other business-related activities? Persons could respond either “yes” or “no.”

***Note:* NS = “Not Significant” means that the differences in percentages being reported for mining versus non mining households were not large enough to suggest any meaningful difference between mining and non mining households with respect to emergency action planning and other possible compensation and regulatory strategies for coal waste impoundments. On the other hand, S = “Significant” means that the differences in percentages being reported for mining versus non mining households were large enough percentage difference to suggest a meaningful difference between households.

Tables for Section Three: Risk Perceptions and Compensation Strategies:

Table 11. Alternatives to Coal Waste Impoundments: Mingo/ Wyoming County, WV: Mining (*Percentages in Bold*) versus Non Mining Households Compared *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Invest in Alternatives:						
The mining industry should explore other (cleaner) technologies to wash coal. <i>X</i> ² =22.28,df=5, p=.000 <i>S</i> *	2 (%) 3	4 0	27 7	39 48	22 33	6 9
The mining industry should invest in technologies to cleanup sludge spills. <i>X</i> ² =13.33,df=5, p=.020 <i>S</i>	2 1	2 2	9 3	55 43	33 46	1 6

* *Note:* Based on the survey question: Is any person in your family involved in the mining industry either through being employed, the sale of mineral rights or through other business-related activities? Persons could respond either “yes” or “no.”

***Note:* *S* = “Significant” means that the differences in percentages being reported for mining versus non mining households were a large enough to suggest a meaningful difference between households with regard to views on investing in impoundment alternatives. (But note that the difference in views is in strength of agreement rather than opposing views).

Tables for Section Three: Risk Perceptions and Compensation Strategies:
A Comparison of Mining versus Non Mining WV Households

Table 12: The Environment, Water Quality and the Watershed: Mingo/ Wyoming County, WV. Mining (*Percentages in Bold*) versus Non Mining Households Compared *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Environmental Concerns and Coal Waste						
Coal sludge is not hazardous	39 (%)	38	5	3	5	10
$X^2=3.6,df=5, p=.60$ NS	46	32	5	4	2	13
We may never know the extent of the damage caused by the coal waste spill in Martin County, Kentucky.	2	10	10	43	23	13
$X^2=6.6,df=5, p=.25$ NS	0	4	9	45	25	18
Water Quality Concerns						
• Poor water quality is associated with poor health in my community	5 (%)	18	13	34	18	14
$X^2=6.2,df=5, p=.283$ NS	2	12	12	30	27	18
• The water from my faucet is always of good quality	13	27	12	30	13	4
$X^2=2.9,df=5, p=.705$ NS	18	27	15	28	8	4
• The water treatment facility does a good job of meeting water quality standards.	6 (%)	13	23	32	9	17
$X^2=14.33,df=5, p=.014$ S**	10	22	13	21	5	29
• Our home purchases distilled and bottled water	9	12	7	42	29	2
$X^2=7.07,df=5, p=.215$ NS	5	15	12	35	28	6

* *Note*: Based on the survey question: Is any person in your family involved in the mining industry either through being employed, the sale of mineral rights or through other business-related activities? Persons could respond either “yes” or “no.”

***Note*: NS = “Not Significant” means that the differences in percentages being reported for mining versus non mining households was not large enough to suggest a meaningful difference between households with regard to views on the impacts of coal waste on the environment and/ or with regard to matters of risk concern over the watershed or drinking water quality.

Tables for Section Three: Risk Perceptions and Compensation Strategies:
A Comparison of Mining versus Non Mining WV Households

Table 13: Purchase of Distilled and Bottled Drinking Water: Comparisons by County, Survey Area, Income, Well-Water and Children Present in the Household. Mingo/ Wyoming County, WV.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Our home purchases distilled and bottled water						
County	Mingo	7 (%)	15	12	39	27
	Wyoming	7	10	8	43	32
		$X^2 = 2.7, df=4, p=.602$ NS				
Survey District	• Kermit/ Canterbury/ Myrtle, Mingo County	12 (%)	21	6	36	24
	• Williamson/ Cinderella/ Nolan, Mingo County	2	21	14	38	23
	• Delbarton/ Matewan/ Musick/ Rawl, Mingo County	7	10	13	42	29
	• Gilbert, Sprattsville, Sharon Heights, Mingo County	8	7	13	41	31
	• Coal Mountain/ Lincoln/ Lillyhaven, Wyoming County	4	13	9	44	30
	• Baileysville/ Pineville/ Mullens, Wyoming County	9	7	7	43	34
			$X^2 = 13.5, df=20, p=.855$ NS			
Income	• Under \$10,000	19 (%)	19	14	19	27
	• \$10,000-20,000	7	16	19	44	14
	• \$21,000-40,000	3	13	6	34	44
	• \$41,000-60,000	5	13	5	45	44
	• Over \$60,000	9	9	6	50	25
		$X^2 = 25.3, df=16, p=.066$ NS				
Water Source	Public Water System	7 (%)	15	11	41	27
	Private Well	8	12	9	39	32
		$X^2 = 1.12, df=4, p=.891$ NS				
Children Present	No children present	6 (%)	15	10	43	26
	Children present	8	12	11	37	33
		$X^2 = 2.2, df=4, p=.698$ NS				

Tables for Section Three: Risk Perceptions and Compensation Strategies:
A Comparison of Mining versus Non Mining WV Households

Table 14: Compensation and Regulatory Strategies to Protect the Watershed and Improve Water Quality: Mingo/ Wyoming County, WV: Mining (Percentages in Bold) versus Non Mining Households Compared *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Don't Know
Compensation and Regulatory Strategies						
The water treatment facility should enforce stricter water quality standards	1	8	19	41	25	6
$X^2=7.9,df=5, p=.158$ NS	5	7	10	42	26	11
An independent citizen's committee should monitor and test water quality.	3	10	22	44	18	4
$X^2=3.7,df=5, p=.585$ NS	3	5	19	42	25	6
The mining industry should contribute financially to independent tests of water quality.	5	9	14	48	20	4
$X^2=9.6,df=5, p=.085$ NS	1	5	10	44	32	7
Coal severance taxes should be used to upgrade the water facility.	4	9	19	41	19	10
$X^2=6.0,df=5, p=.305$ NS	1	6	16	36	31	10

* **Note:** Based on the survey question: Is any person in your family involved in the mining industry either through being employed, the sale of mineral rights or through other business-related activities? Persons could respond either "yes" or "no."

****Note:** S = "Significant" means that the differences in percentages being reported for mining versus non mining households was large enough to suggest a meaningful difference between mining and non mining households with respect to regulatory and compensatory strategies to protect and maintain the watershed. On the other hand, NS = "Not Significant" means that the differences in percentages being reported for mining versus non mining households is not large enough to suggest a meaningful difference in views between households on regulatory and protective strategies regarding the watershed.

**Appendix D:
1994 MSHA Recommendation on
Emergency Action Planning**

MSHA 1994 Ruling

Emergency Action Plans (EAPS)

MSHA Rated Coal Waste Dams and Impoundments

Taken from: **U.S. Department of Labor. Mine Safety and Health Administration**

<http://www.msha.gov/regs/complian/pib/1994/pib94%2D18.htm>

ISSUE DATE: June 18, 1994

PROGRAM INFORMATION BULLETIN NO. P94-18

FROM: MARVIN W. NICHOLS, JR.
Administrator for Coal Mine Safety and Health

SUBJECT: Emergency Action Plans Recommended by the
National Dam Safety Program of 1979 for Downstream
Areas of Coal Mine Waste Impoundments

Scope

This program information bulletin applies to Coal Mine Safety and Health (CMS&H) enforcement personnel and coal mine operators who own, operate, or control an impoundment that constitutes a hazard to life or property in the event of failure.

Purpose

The purpose of this program information bulletin is to inform CMS&H enforcement personnel and mine operators of the need to develop an Emergency Action Plan (EAP) for impoundments that constitute a hazard to life and property in the event of failure.

Information

The Mine Safety and Health Administration (MSHA) is encouraging mine operators to develop EAPs in accordance with the Emergency Action Planning Guidelines for Dams. The EAPs should include the following:

- a delineation of the hazard area, so that the area requiring warning or evacuation is known in advance;
- procedures for identification and evaluation of potential emergencies;
- procedures for notification of key personnel and officials;
- arrangements for coordination of warning and evacuation activities with State and local officials;
- contingency planning for preventive action, including sources of equipment, material, labor, and engineering expertise; and

-training of all involved personnel and periodic testing of the emergency action plan, as well as a regular review and update of the plan.

MSHA recommends that the mine operator keep the EAP at the mine site where the impoundment is located. MSHA also recommends that the mine operator, in cooperation with State or local government officials, conduct a comprehensive review of the adequacy of the EAP at intervals not exceeding one year. In addition, the mine operator is encouraged to provide MSHA with an EAP approval document from the appropriate State or local regulatory authority when a plan for a new impoundment, or the annual report required by 30 CFR 77.216-4, is submitted.

In order for a mine operator to comply with present MSHA regulation 77.216-3(e), the operator must submit and obtain approval for a plan to examine each impoundment that meets the size or hazard criteria specified in 77.216(a). To meet this requirement, the mine operator may elect to submit an EAP if each program element, including inspection of an impoundment and action taken if a potentially hazardous condition develops, is specifically addressed in the submittal.

Background

Criteria for a comprehensive EAP are described in many State regulations promulgated to comply with the National Dam Safety Program of 1979. The Emergency Action Planning Guidelines for Dams, FEMA Report No. 64 (February 1985), found in the Federal Guidelines for Dam Safety, define the need and provide guidance for the development of an EAP. These guidelines are available from the Publications Branch, Federal Emergency Management Agency (FEMA), P.O. Box 70274, Washington, DC 20024.

In Presidential Executive Order No. 12148, all federal agencies were directed to adopt and implement these federal guidelines for dam safety. The directive dictates that agencies report progress toward implementation to the director of FEMA on a biennial basis.

Authority

Public Law 95-164, CFR 30, Part 77.216
Public Law 95-620, CFR 6, Section 601(i)

Issuing Office and Contact Person

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Roger Schmidt, (703) 235-1337

Distribution

Program Policy Manual Holders
Coal Mine Operators
Coal Special Interest Groups

**Appendix E:
Federal Emergency Management Agency (FEMA) Criteria for Evaluating
Emergency Action Plans for Dams and Impoundments**

Toward Developing More Protective Impoundment EAPS
according to the following
FEMA Dam Safety Guidelines:

Preparedness: FEMA recommends that preparedness plans (to prevent possibility of dam failure and /or limit its impact) be included in the EAP. This might include the following:

1. Surveillance (for unattended dams a remote surveillance system).
2. Response During Darkness
3. Access to the site –under various conditions, boat, snowmobile, helicopter etc.
4. Response during adverse weather
5. Alternative systems of communication
6. Emergency supplies and information
7. Stockpile materials needed for emergency repair.

Emergency Detection, Evaluation and Classification: FEMA recommends that the conditions, events or measures for detection of a breach be listed in the EAP. FEMA recommends that the methods for collecting data and evaluating measures be also listed and that formulas (rule curves) for early warning detection be also devised.

In addition, FEMA recommends that emergencies be classified by severity and urgency: 1. Failure has occurred 2. Failure is imminent and 3. Potential failure situation is developing. According to FEMA, no true distinction should be made between classification 1 and 2. In both cases, according to FEMA guidelines, time has officially “run out” and warnings should be issued.

Notification Flowchart: FEMA recommends that the notification flowchart include who is responsible for notifying (typically the dam owner) and who is to be notified. Emergency notification flowcharts should also specify the order of notification, be updated regularly and be posted in clear view at the dam site. In terms of the notification order, FEMA recommends that local emergency management persons be notified first. FEMA advises the following order: a. Local emergency management, b. appropriate federal and state managers, c. residents, d. operators of other dams, e. National weather service, f. news media

Inundation Maps: FEMA recommends inundation maps of potential impact areas be included for both “sunny day” failure conditions and “flood failure” conditions, by which dam owners prepare for dam failures at extreme peaks in water levels.

Addendums: FEMA EAPS are also to include appendices related to 1) site-specific concerns, 2) plans for training and 3) exercise of the EAP as well as include reports and summaries of prior dam breaks and incidences.