PLACEMENT OF COAL COMBUSTION BY-PRODUCTS AT SURFACE MINING CONTROL AND RECLAMTION ACT (SMCRA) MINES: A SHORT HISTORY OF OSM TECHNICAL EFFORTS AND RESPONSES TO ENVIRONMENTAL CONCERNS[1]

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Abstract. The use and disposal of Coal Combustion By-Products (CCBs) (i.e. fly ash, bottom ash, flue gas desulfurization material, and fluidized bed combustion material) at coalmines has become an area of intense interest, research, activity, and controversy during the last decade. Beginning in May of 1994, the Office of Surface Mining (OSM) has taken an active role in encouraging and promoting technological advances, research, and technology transfer related to the use and disposal of those material residues remaining after the combustion of coal to produce electric power. Currently, approximately 2 percent of the CCBs that are produced in the U.S. are placed back at about 2 percent of the mines sites where they originated. Research indicates that the placement of these materials on the mine site usually results in a beneficial impact to human health and the environment when it is used to mitigate other existing potential mining hazards. Beneficial uses include: (1) a seal to contain acid forming materials and prevent the formation of acid mine drainage; (2) an agricultural supplement to create productive artificial soils on abandoned mine lands where native soils are not available; (3) a flowable fill that seals and stabilizes abandoned underground mines to prevent subsidence and the production of acid mine drainage; (4) a construction material for dams or other earth like materials where such materials are needed as a compact and durable base; and (5) a non-toxic, earthlike fill material for final pits and within the spoil area. Concerning CCB placement at coal mines, some environmental groups believe, based on historic problems experienced at some power plants, that the use of these materials at coal mines places an unacceptable risk on public health and environmental quality. This paper will attempt to provide a response to criticism that SMCRA programs are not adequate to protect public health and the environment when CCBs are placed at a SMCRA permitted mine.

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A Brief History of OSM CCB Technology Transfer Initiatives

The CCB Steering Committee

In May of 1994, OSM solicited recommendations for technical studies and applied research topics from the States, industry, and public interest groups. A wide variety of responses to this outreach identified Coal Combustion By-Products (CCBs) (i.e. fly ash, bottom ash, flue gas desulfurization material, and fluidized bed combustion material, all by-products from the generation of electric power from coal and the associated processes to remove air pollutants) as a priority topic for consideration by OSM. OSM initiated a survey in September of 1995 to determine interest in holding a national technical interactive forum on the topic of CCBs. Based on the results of this survey, OSM organized a multi-interest group steering committee, in February of 1996, to plan for and implement a wide range of technology development and transfer events and products to advance the application of good science wherever CCB placement occurred on surface coal mines. The steering committee is composed of recognized experts related to all aspects of CCBs from universities, the appropriate State and Federal agencies, the coal industry, electric utilities, and the CCB recycling industry.

CCBs Associated with Coal Mining – Interactive Forum

In October of 1996, OSM cosponsored its first technical interactive forum related to CCBs. In cooperation with the Mining Engineering Department at Southern Illinois University at Carbondale, OSM produced a post-forum proceedings (Chugh, 1996) that includes a series of 28 papers summarizing topics related to coal combustion by-products and their application at surface coal mines nationwide. Topics include activities related to beneficial use and disposal. The papers are presented by university researchers, State regulatory personnel, industry experts, consultants, and citizen interest groups. The papers are presented in the categories of: Coal Combustion By-Product Characterization; Site Characterization; Regulatory Requirements; Designing/Engineering/Planning; Environment: Land and Water; Monitoring and Evaluation; and Case Studies.

An edited discussion section provides a summary of the issues raised, different perspectives, and controversies brought out during the forum. Subject category workgroups at the forum outlined the remaining issues needing further work and attention. At the conclusion of the forum, the CCB Steering Committee met and identified the following five items as the most important needs identified by the 1996 forum: (1) a guidance document for the use and disposal of CCB materials within the coal mining environment; (2) acceptable monitoring procedures for evaluating the interaction of ground water at CCB disposal sites; (3) development of formal education and training opportunities on various aspects of CCB handling; (4) additional forums, workshops, or symposia to address various aspects of CCB handling that have not yet been sufficiently addressed; and (5) develop better methods for communicating aspects of CCB handling to the public. All future forums would follow a similar organization.

The CCB Steering Committee made the following recommendations to its sponsoring organization management: the highest priority and energies of the sponsoring organizations should be to pursue the development of a AState of the Science Resource Manual@ on the evaluation and handling of CCB materials on mines for use or disposal; and there should be a follow-up forum to address concerns raised by the work groups on aspects of CCB evaluation and handling that were not sufficiently addressed by the SIUC forum.

Summary of OSM Director Comments on CCBs and Mining at the 1996 CCB Forum. The following remarks summarize relevant comments concerning the disposal or use of CCB materials on the mine site made by the then Acting Director of OSM, Kathrine Henry (Henry, 1996). *OSM supports those efforts to recycle coal combustion by-products into commercial items for use on or off the mine site. Despite everything that=s been done to create economically viable products for those residues, however, only about one-quarter of them are used in that way. The remainder of the coal combustion by-products still has to be stockpiled or disposed of, somewhere. Interest in coal mines as potential disposal facilities or markets for new products produced from coal combustion by-products has gone up with the dramatic cost increases and mounting difficulties involved in handling those residues on site at coal fired power plants.*

In 1993, the Environmental Protection Agency issued its final regulatory determination that coal combustion by-products were deemed non-hazardous and were to be regulated by the individual States under Subtitle D of the Resource Conservation and Recovery Act when disposed of as a solid waste. As a result, the States have been challenged to develop appropriate strategies for integrating the concerns of State solid waste programs with SMCRA programs when disposal occurs on permitted State Primacy coal mines.

When the use or disposal of coal combustion by-products happens at surface coal mines, State coal mining regulators are involved to the extent that SMCRA requires: the mine operator to ensure that all toxic materials are treated, buried, and compacted, or otherwise disposed of, in a manner designed to prevent contamination of the ground or surface water; making sure the proposed land use does not present any actual or probable threat of water pollution; and ensuring the permit application contains a detailed description of the measures to be taken during mining and reclamation to assure the protection of the quality and quantify of surface and ground water systems, both on and off-sites, from adverse effects of the mining and reclamation process also to assure that rights of present users of such water are protected.

Any disposal of coal combustion by-products at mines must be in accordance with those standards and with applicable solid waste disposal requirements. The States differ in their regulatory requirements for disposal of coal combustion by-products as solid waste. Trace element concentrations in coal combustion by-products vary according to where the coal was mined. Chemical and physical characteristics differ by region, as do mine site conditions. Accordingly, regulatory programs to allow use or disposal must be designed to handle those differences. At OSM, we are supportive of State efforts to develop appropriate methods and criteria. We will do what we can to help on request.

Currently, the debate over use or disposal of coal combustion by-products at coal mines centers on the potential for the materials to release toxins back into the environment. We recognize that improved knowledge of the risks and benefits associated with the disposal and use of CCBs is badly needed, as is a greater acceptance of that knowledge by regulators and the public. The more we know, the more options we have.

CCB Information Network Website

In March of 1997, OSM invited resource agencies and organizations that are working with or have access to significant information on CCBs, to participate as a voluntary Steering Committee that would develop a system for making this information accessible to potential users in the coal mining community. The Steering Committee developed a Website that can be accessed directly at http://www.mcrcc.osmre.gov/ccb/ that contains: a user friendly guide, including abstracts, of

existing scientific and technical literature; sources and location of CCB literature; access to the OSM library for copies of significant literature for loan to potential users; definitions of basic terminology; name and phone numbers of State CCB contacts; information and access to upcoming CCB special events; copies of CCB Forum Proceedings from 1996 and 2000; a chronology of relevant dates and events related to rule-making by the U.S. EPA; and access to related Websites that contain information on active researchers and research programs.

The Use and Disposal of CCBs at Coal Mines Forum

Many of the questions and concerns raised at the 1996 Interactive Forum, however, remained unanswered. In response to these additional concerns, the CCB Steering Committee resolved to conduct an additional technical interactive forum in the year 2000 to address the more important concerns and new developments related to coal mining and CCBs that were either identified at the 1996 forum or since that time.

The purpose of the technical interactive forum held on April 12 & 13, 2000, at the facilities of the U.S. DOE National Energy Technology Laboratory in Morgantown, West Virginia, was to provide: (1) an organized format for discussion of issues concerning the use and disposal of CCBs at coal mines; an easily understood, state of the art summary talk by knowledgeable speakers; (2) a published proceedings that summarizes the presentations and participant discussions; access to the discussions for all interested participants at the forum; (3) opportunity for poster presentations on CCB projects and research; (4) opportunity for exhibits of CCB use, technology, services, and equipment; and (5) optional technical CCB workshops and field trips.

The 22 talks covered four topics in the following categories: CCB Basics; Regulatory; Beneficial Uses at the Mine Site; and Hydrology.

At the conclusion of the forum, the participants recommended that the steering committee focus on the following initiatives for future actions: provide assistance to the U.S. EPA on documentation of mine related damage cases; provide assistance to the American Society for Testing Materials on development of improved standard testing methods for CCBs on mine sites; conduct region specific technical forums; and enhance educational and Internet opportunities on CCB issues and information.

CCBs and Western Coal Mines Forum

On April 16-18, 2002, OSM cosponsored the third in a series of forums on issues related to CCBs and mining in Golden Colorado. This forum addressed regional applications of CCBs at mines in the arid and semi-arid Western United States as well as issues related to proposed rule changes by the U.S. Environmental Protection agency. The major topics for discussion at the forum were: CCB Basics; Testing and Terminology; Western Mining Applications/Case Studies; Environmental Impacts to Ground Water; and Regulatory Direction.

State Regulation of Coal Combustion By-Product Placement at Mine Sites Forum**:**

On May 4-6, 2004, OSM held a fourth Technical Interactive Forum on "State Regulation of Coal Combustion By-Product Placement at Mine Sites" at the Wyndham Hotel in Harrisburg, PA. The forum was co-sponsored by the Illinois Clean Coal Institute, EPRI, U.S. DOE NETL, and OSM. There was a one day field trip to several AML sites where FBC Ash generated by the burning of waste coal is used to reclaim these sites. There were four forum sessions on Use of Fluidized Bed Combustion Materials in Mine Reclamation, State Program Regulation of CCBs with Case Studies, Environmental Damage Cases, and Response to Public Concerns about CCB Placement in Pennsylvania.

Regulation, Risk, and Reclamation with CCBs at Mines Forum

On April 13 & 14, 2005, OSM will sponsor its fifth forum, to be held in Lexington Kentucky, that will be included within the World of Coal Ash Symposium sponsored by ACAA and the University of Kentucky Center for Applied Energy Research Center. There will be three sessions on: case studies of CCB mine placement design, implementation, and monitoring; leaching protocols and studies supporting CCB risk assessment at mines; and regulation of CCB placement at mines.

Combustion By-Products Recycling Consortium: National Steering Committee

OSM participates with USDOE National Energy Technology Laboratory (NETL) on the National Steering Committee for the Combustion By-Products Recycling Consortium (CBRC) that is attempting to develop technologies, for use by coal utilities and their suppliers, that will assist in solving problems related to the handling of by-products from their clean coal processes. The main strategies of the consortium are to: (1) characterize product streams from flue gas desulfurization materials and low nitrous oxide burners; (2) develop a list of potential market opportunities and disposal options; and (3) develop and implement research and demonstration programs around identified priority topics. The CBRC has funded 37 CCB research projects to date with 14 projects that have direct applicability to CCB placement on mines.

International Ash Utilization symposium: Technical Steering Committee

OSM has served on the technical program committee planning for the above event since 1999. The biennial event covers all aspects of coal combustion by-product utilization. The program includes recent research findings in over a dozen topical areas. OSM encourages the presentation of papers, present technical papers, assist in panel presentations, and serve as a session co-chair in the areas of mining, underground injection, government programs, and treatment of acid forming materials.

ASTM Standard Guide for the Use of Coal Combustion Products (CCPs) for Surface Mine Reclamation

Since June of 2000, OSM and the CCB Steering Committee has been actively participating with the American Society for Testing Materials (ASTM) in the development of: (1) a standard guide for technical methods to be used in evaluating CCBs for use or disposal at mines; and (2) standardized definitions of terms related to CCBs. Committee members are actively reviewing and commenting on draft guidance documents being prepared by ASTM. OSM has provided information to ASTM on how the Surface Mining Control and Reclamation Act is utilized to regulate the placement of CCBs on surface coalmines.

A Brief History of U.S. Environmental Protection Agency (EPA) Rule-making on CCBs Related to their Use and Disposal on Mine Sites.

U.S. Congress Passes Solid Waste Disposal Act Amendments

In October of 1980, Congress temporarily exempted from regulation, under Subtitle C of the Resource Conservation and Recovery Act (RCRA), certain large volume fossil fuel wastes (FFW) and then directed the U.S. EPA to conduct a detailed and comprehensive study of fossil fuel wastes based on 8 study factors.

U.S. EPA Exempts four of the Large Volume CCBs from Hazardous Waste Regulation

On August 9, 1993, the U.S. EPA made a regulatory determination that the 4 large volume

FFWs . (fly ash, bottom ash, flue gas desulfurization material, and fluidized bed combustion material) do not warrant regulation as hazardous under Subtitle C of RCRA. EPA also commited to a schedule to complete the Report to Congress for the remaining wastes.

U.S. EPA Proposed Solid Waste Regulations for CCBs at Coal Mines

In its decision on May 22, 2000, the U.S. EPA determined that national regulations under subtitle D (Solid Waste) of the Resource Conservation and Recovery Act (RCRA) [and/or possible modifications to regulations under the Surface Mining Control and Reclamation Act (SMCRA)] were warranted when these wastes are used to fill surface or underground mines. EPA believed this to be necessary so that CCBs will be consistently managed across all waste scenarios. Since that time, OSM, EPA, and the States through the Interstate Mining Compact Commission have been cooperating in the review of information on all aspects of CCB placement at mines that would potentially impact human health or the environment.

Additional Federal Regulation at SMCRA Mine Sites: Arguments For and Against

EPA Concerns

EPA has expressed several concerns to OSM as to why they feel EPA regulation under RCRA may be necessary. EPA has found a small number (less than 12 from about 1000 monitoring wells at CCB disposal sites nationwide) of unlined solid waste disposal facilities at electric utilities where leachates from the facility have been determined to contain elements (0.29 mg/L in the one mercury case (RCRA limit 0.2), 1.1 mg/L in the one selenium case (RCRA limit 1.0) at levels of toxicity determined to be detrimental to public health and/or the environment (Kim et al., 2001). Although they have not found any such examples at mine sites, they feel that the similarities between these utility disposal sites and mine sites where CCBs are placed as fill warrant similar regulation. Ground Water monitoring at SMCRA mine sites may be inadequately designed to detect toxicity. Bonding of SMCRA mine sites (a minimum of 5/10 years after reclamation and revegetation has been completed) may be of insufficient duration to detect long term toxic release.

OSM Concerns

OSM has expressed concerns to EPA as to why additional EPA rulemaking for mine sites may not be warranted. OSM believes that the SMCRA regulations already provide at least as much protection of the public health and environment as anything as yet proposed by EPA. The extensive mining and reclamation designs, environmental investigations, leachate testing required to support the Probably Hydrologic Consequences finding as to whether toxic forming materials are present that would result in contamination of water supplies, requirements to protect or replace drinking water sources, performance bonding, and post reclamation water monitoring requirements of SMCRA make mines significantly more protective of the environment that what is found at electric utility ash disposal sites where toxic leachate has occurred and therefore are not similar to them. It is not valid to compare utility CCB disposal sites where toxic leachate has occurred with SMCRA mines as they differ significantly in terms of regulatory requirements, geology, geography, hydrology, characteristics of CCBs used as fill, and reclamation practices. EPA has yet to bring forward any data or scientific evidence that CCBs placed at mines under SMCRA have resulted in any toxic release that would poses a threat to public health or the environment. The SMCRA performance bond lasts as long as is necessary to determine that the environmental performance requirements of the SMCRA program and the applicable permit have been met. The release of the bond is not determined by time but by

environmental performance. The minimum 5/10 years phase III bond release requirement only pertains to the proof of vegetation success performance standard.

Electric Utility CCB Disposal Characteristics. Electric utility disposal sites, where toxic leachates have occurred, are typically characterized by: geographic placement in a floodplain; a geologic setting of alluvial sand and gravel usually close to a river; ground water that is plentiful and of high quality; all types of CCB materials are placed in these facilities in a wet slurry without any chemical characterization of the material; reclamation is accomplished with a shallow layer of fill over the area and revegetated; and the Clean Water Act usually covers the area during operation and State Solid Waste regulations at disposal (Fig. 1).

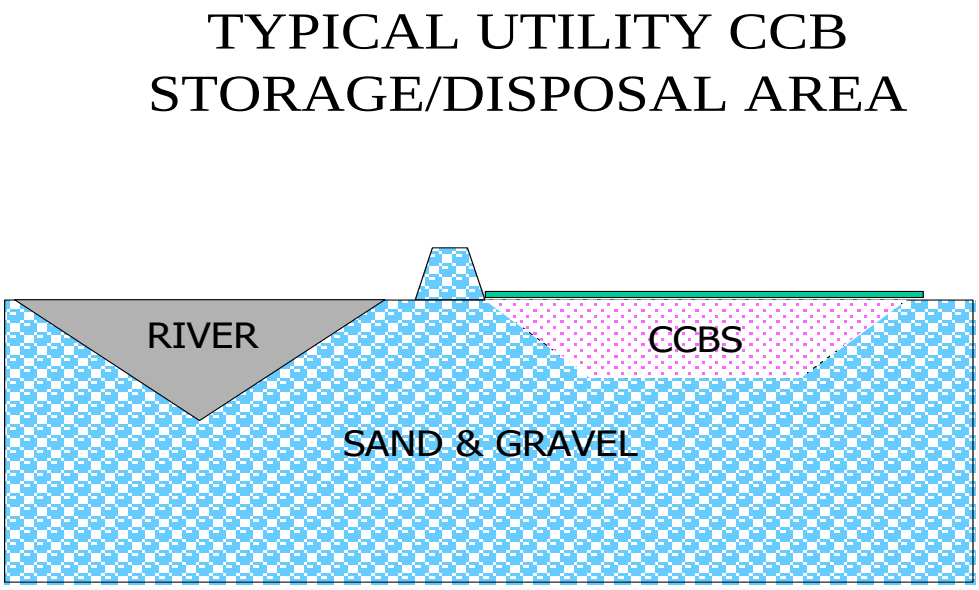

Figure 1. Typical cross-section of an electric utility disposal site where toxic leachate has occurred.

SMCRA Mine CCB Placement Characteristics. CCB placement at a SMCRA surface mine typically is characterized by: a geographic placement in an upland position; a geologic setting of bedrock sandstone, shale, and limestone underlain by an impermeable fire clay below the lowest coal seam that was mined; ground water is limited and of poor quality; only those CCBs that are leachate tested and approved in the SMCRA permit are allowed for placement on the mine site; reclamation is accomplished with a deep layer of spoil over the area followed by topsoil and then revegetated; and at all phases, the placement is regulated by the environmental protection permitting and performance standards of SMCRA, which include the requirements of the Clean Water Act and applicable State Solid Waste program requirements (Figure 2). Exceptions to the above would include above ground disposal at underground mines and mixing with coal waste to improve the stability of the coal waste.

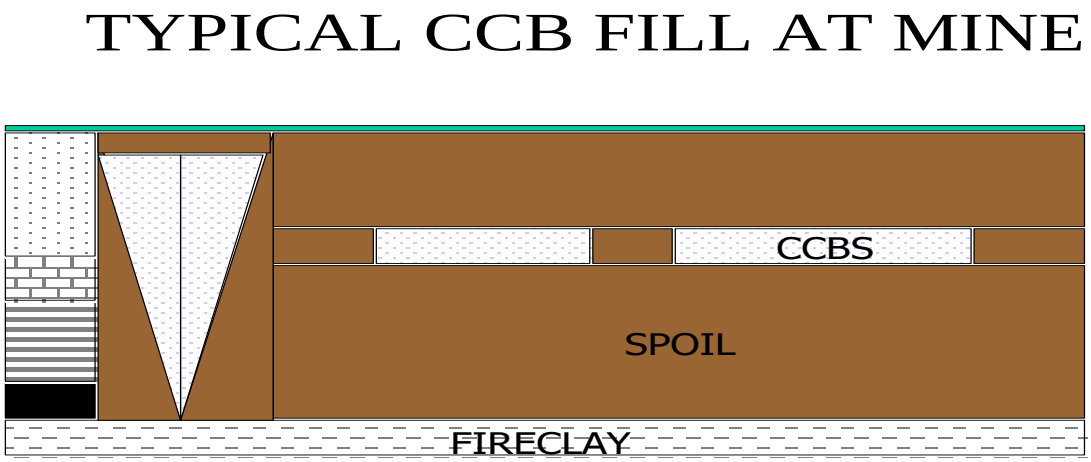

Figure 2. Typical cross-section of CCB placement at a reclaimed coalmine site.

The Author's Response to Concerns about the Placement of Fly Ash, Bottom Ash, Flue Gas Desulfurization Material, and Fluidized Bed Combustion Ash at SMCRA Mines

Concern #1: Mine filling (with CCBs) is not adequately addressed by SMCRA

There is no exemption for any coal combustion by-product placed at a SMCRA mine site from any of the permitting requirements and environmental performance standards contained in SMCRA. When the use or disposal of coal combustion by-products occurs at surface coal mines, State and Federal coal mining regulators are involved to the extent that SMCRA requires (Henry, 1996): the mine operator to ensure that all toxic materials are treated, buried, and compacted, or otherwise disposed of, in a manner designed to prevent contamination of the ground or surface water; making sure the proposed land use does not present any actual or probable threat of water pollution; and ensuring the permit application contains a detailed description of the measures to be taken during mining and reclamation to assure the protection of the quality and quantify of surface and ground water systems, both on and off-sites, from adverse effects of the mining and reclamation process also to assure that rights of present users of such water are protected.

Any disposal of coal combustion by-products at mines must be in accordance with SMCRA standards, State and Federal Clean Water Act requirements, and with applicable State solid waste disposal requirements. The States differ in their regulatory requirements for disposal of coal combustion by-products as solid waste. Trace element concentrations in coal combustion by-products vary according to where the coal was mined and how it was processed. Chemical and physical site characteristics differ by region. Accordingly, State regulatory programs that allow use or disposal must be designed to handle those differences.

Based on the extensive body of research (Chugh et al., 1996; Vories et al., 2000; Vories

et al., 2002) that has been focused on this issue over the last 20+ years that has shown many positive environmental effects and no negative effects, the author concludes that SMCRA is providing adequate protection of public health, safety, and the environment.

Concern #2: These materials (CCBs) are wastes containing significant quantities of hazardous constituents

Research (Kim et al., 2001) has shown that less than 1 percent of tested CCBs have the potential to leach hazardous constituents (according to nationwide analysis by the U.S. Department of Energy with only 2 out of 288 sources, or 0.7 percent, of the CCBs tested demonstrated the potential to leach trace elements at levels that would be classified as hazardous by the TCLP method).

Concern #3: Only RCRA has the authority to address the problems presented by solid and hazardous waste.

Although no regulatory authority can contradict the Resource Conservation and Recovery Act (RCRA), many other State and Federal regulations can and do apply to the handling of wastes or recycled materials. RCRA is not exclusive.

Concern #4: These materials, when exposed to ground water, leach hazardous constituents.

Research (Kim et al., 2001) has shown that less than 1 percent of tested CCBs have the potential to leach hazardous constituents based on laboratory testing with the TCLP method. Based on U.S. EPA ground water monitoring of over 1,000 wells at electric utility CCB disposal areas nationwide, the data has demonstrated that only 12 of those wells have produced water at levels considered hazardous and none from SMCRA mines. All of the SMCRA water monitoring data I am aware of to date, indicate that placement of these materials at SMCRA mines does not produce ground water that has hazardous constituents above regulated levels of concern and in most cases is environmentally beneficial.

Concern #5: The leaching process may take decades, but significant quantities of toxic constituents will exit a deposit of these materials, often severely impacting ground and surface water.

The SMCRA permitting process is designed to prevent both the acceptance of any CCB materials that have the potential to harm public health or the environment and the placement of materials in such a manner on the mine that they would have the potential to leach toxic levels of constituents. The SMCRA mining and reclamation plan is designed to ensure that the placement of the material will not have the potential to contaminate either the ground or surface water. The SMCRA water-monitoring plan is designed to demonstrate that the SMCRA permitting and planning process has been successful in protecting the environment both during and after mining.

The author would agree that in some hydrogeologic settings it may take decades to restore the long term water table at a mine (specifically in the arid Western U.S.). The chemical nature of these CCB materials, however, is such that any constituents leached from them typically leach very rapidly at first and then be reduced to barely detectable levels. This means that water-monitoring data should quickly identify the worst possible leachate characteristics that could be expected from placement of these materials at a mine. Based on the extensive body of research

(Chugh et al., 1996; Vories et al., 2000; Vories et al., 2002) that has been focused on this issue over the last 20+ years that has shown many positive environmental effects and no negative effects, the author concludes that SMCRA is providing adequate protection of public health, safety, and the environment.

Concern #6: The use of these materials as mine fill threatens to cause problems more severe than the conditions it was intended to ameliorate (i.e. reduce acid mine drainage)

Recent studies by the U.S. Geologic Survey (Haefner, 2001) have successfully utilized magnesium to calcium ratios and sulfur-isotope ratios as tracers on Pressurized Fluidized Bed Combustion (PFBC) by-product placed in an abandoned coalmine to mitigate the effects of acid mine drainage. The study demonstrates that the application has been environmentally beneficial both in dramatically decreasing the effects of acid mine drainage and that any remaining trace elements in the ground water are due to acid mine drainage and not leachate from the PFBC.

Concern #7: The standard leaching test on a typical sample of these materials yields results indicating that these materials meet SMCRA's definition at 30 CFR 701.5 of a "toxic forming material" which means "earth materials or wastes which, if acted upon by air, water, weathering, or microbiological processes, are likely to produce chemical or physical conditions in soils or water that are detrimental to biota (life) or uses of water." Yet nowhere in SMCRA, its regulations or in OSM guidance is there any explanation or numerical standard that can be used to apply this definition in the field. Furthermore, SMCRA regulations employ confusing language that requires "contact (of water) with toxic producing deposits" to be either "prevented," removed," or "minimized" without explaining what such deposits are or which of these directives should be applied in any particular case. The result is mine filling programs throughout the U.S. that range from those isolating these materials many feet above water tables to those allowing millions of tons of toxic forming materials to be dumped directly into groundwater aquifers that are being used for private and public water supplies.

Most of these materials would not meet the SMCRA definition of toxic forming material because most of them have leachate characteristics in the same range as non-toxic native soil materials. Less than 2 percent of these materials have the potential to produce toxic levels of leachate. Because leachate tests are required as part of the SMCRA permit applications, the permit can not be approved until the operator demonstrates that the placement of the material in question on the mine will not cause or contribute to contamination of the ground or surface water.

SMCRA language is not confusing. SMCRA requirements differ from RCRA requirements however, because they are based on performance standards rather than design standards. By using performance standards, which are minimum levels of environmental protection, SMCRA allows for each State Regulatory Authority to develop methods and techniques that are most appropriate for the climate, geology, geography, and other site conditions that occur locally. It also allows the operator to design the site-specific mining and reclamation techniques that maximize the operator's efficiency and still insure the appropriate level of environmental protection. The result is that each State is allowed to develop a program specifically suited to its needs to protect the environment based on local conditions while maintaining a uniform national level of environmental protection. This result is supported by all existing scientific research and water monitoring which finds no evidence of damage to public health or environment due to the placement of these materials at SMCRA mines and, in most cases, actual improvement of ground

or surface water quality. In those cases where they are used as soil amendments on abandoned mine projects, both researchers and State AML programs report improved plant growth.

Concern #8: Ground water monitoring programs at active and inactive mines in Indiana, Illinois, Ohio, Kentucky, West Virginia, Pennsylvania, Texas, North Dakota, and New Mexico have been reviewed and found that, without exception, none of the ground water monitoring at these sites approaches the standard level of ground water monitoring undertaken at RCRA solid or hazardous waste disposal facilities.

SMCRA is different from RCRA in that SMCRA uses minimum environmental performance standards that allow adaptation to site specific conditions while RCRA applies uniform engineering design standards without regard for local site conditions. Each uses different methods to achieve the same end of protection of public health and the environment. SMCRA requires that water monitoring plans at a SMCRA mine site, including those where placement of these materials takes place on the mine, must be designed to protect the current and approved post-mining land use and to protect the hydrologic balance and to comply with existing State and Federal Water Quality laws and regulations. The final proof is that there is no credible evidence that SMCRA has not protected the public or the environment where these materials have been placed at a SMCRA mine. All of the scientific evidence to date shows that placement of these materials at SMCRA mine sites has either been environmentally beneficial or has had no negative effect.

Concern #9: At many inactive mines used as fills for these materials, there is no monitoring at all because OSM and the States fail to require such monitoring at abandoned mine reclamation projects.

At SMCRA abandoned mine land projects, the State Regulatory Authority is required to apply for a NPDES permit under the Clean Water Act. If the State Clean Water Authority requires an NPDES permit, then the project must obtain the permit and comply with any applicable monitoring or water quality requirements. A recent study by Ralph Haefner (2001) of the U.S. Geologic Survey conducted testing and monitoring to determine the impact of placing CCBs at an abandoned mine land reclamation site contaminated by acid mine drainage. This study proved that water quality after application of the CCBs was greatly improved following CCB placement at this site and that any remaining potentially toxic elements were a result of the historic acid mine drainage and not due to leachate from the CCBs.

Concern #10: In EPA's May 2000 Determination on Wastes from the Combustion of Fossil Fuels, the agency expressed concern over the lack of groundwater monitoring at (ELECTRIC UTILITIES NOT COVERED BY SMCRA) CCW landfills and surface impoundments. EPA pointed out that 62 percent of (ELECTRIC UTILITIES NOT COVERED BY SMCRA) CCW surface impoundments lack ground water monitoring systems. The commenter supports EPA's concern about the lack of monitoring and liners at (ELECTRIC UTILITIES NOT COVERED BY SMCRA) CCW landfills and surface impoundments and the need for RCRA controls. The commenter believes it follows logically that this concern should extend to the much greater quantities of these materials placed in mines, sometimes in direct contact with ground water.

As previously discussed, it is not valid to compare utility fossil fuel waste disposal sites where toxic leachate has occurred with SMCRA mines where toxic leachate has not occurred, as they differ significantly in terms of regulatory requirements, geology, geography, hydrology,

characteristics of materials placed, and reclamation practices.

According to the U.S. Geologic Survey and the American Coal Ash Association (Kalyoncu, 2001), in 2000 the total production of these materials was 98.2 million metric tons. Of that total, 29.1 percent was recycled as commercial products and 1.55 million metric tons or 1.6 percent was placed at mines sites. The remaining 69.6 million metric tons or 70.9 percent was placed in surface impoundments of landfills under the control of the electric utility industry. This simple arithmetic would not support the claim that much larger quantities of these materials are placed at mines than by electric utilities in surface impoundments or landfills.

Concern #11: Without exception, OSM and State mine regulatory officials interpret the requirements of SMCRA to mean that groundwater monitoring at mine fills need only take place through the final release of mine reclamation bonds. This typically occurs within 3 to 8 years after mining when surface revegetation is met and mine operators have demonstrated that the post-mine groundwater recharge capacity exists. Thus, given the slow and usually unpredictable rate of groundwater re-saturation around mine fills, monitoring is stopped many years if not decades before down gradient flows of groundwater, much less plumes of fossil fuel waste contaminants, would even be detectable from these sites. Without the bonds being held for much longer periods, no financial assurance is available. Furthermore, the commenter has yet to find a mine reclamation bond valued at a level that would cover the costs for post-closure monitoring or maintenance of a mine fill placement site nor has the commenter found a ground water monitoring program at such a site with a numeric standard or concentration of pollution that could constitute a corrective action standard.

OSM has not provided any interpretation of the SMCRA requirements for duration of performance bonds other than the plain language of 30 CFR 800.13(a)(1) that performance bond liability shall be for the duration of the surface coal mining and reclamation operation and for a period which is coincident with the operator's period of extended responsibility for successful revegetation provided in 816.116 or until achievement of the reclamation requirements of the Act, regulatory programs, and permit, whichever is later. At a minimum, 30 CFR 816.116(c) requires the period of extended responsibility for successful revegetation after the last year of augmented seeding…. And in areas with more than 26 inches of annual precipitation for 5 full years and in areas with less than 26 inches of annual precipitation for 10 full years.

In practice, OSM has found that most operators do not achieve a phase III release until long after this minimum time period. In the year 2000 OSM annual report, OSM records that there were 4,530,710 acres under SMCRA permit. In that same year 63,071 acres, or 1.4 percent of that acreage, received a full Phase III bond release. At that rate of release, it would take almost 72 years to release the remainder of the acreage currently under permit.

What is important, concerning SMCRA performance bonding duration, is that SMCRA requires that the bond not be released until all of the reclamation requirements of the SMCRA, including protection of water quality, is achieved. To date, there has been no scientific evidence to support the claim that water monitoring, where these materials are placed at a mine, needs to be longer than that required for proof of revegetation success. If such evidence were eventually produced, then SMCRA would require that the bond be maintained until the minimum performance standards were met, regardless of the time it took.

The argument that a determination of potential water quality contamination cannot be determined until the volume of ground water has reached complete re-saturation is not valid. Research to date (Chugh, 1996; Vories, 2000; Vories 2002), indicates that release of leachable trace elements from CCBs placed at mines: (1) is not at levels that threatens public health or the environment, (2) takes place very quickly when placed in contact with water, (3) that most elements leached from these materials are usually quickly absorbed by the surrounding spoil materials (usually dominated by clay and silt sized particles produced by shale rock in the overburden), and (4) that any long term leachate from these materials at SMCRA mines does not pose any threat to public health or the environment.

Concerning the bond amount, no value for post closure monitoring and maintenance of the placement sites can be assessed when the best science available indicates that none will be necessary. Concerning a numeric standard for water quality, SMCRA requires that water monitoring plans at a SMCRA mine, including those where placement of these materials takes place on the mine, must be designed to protect the current and approved post-mining land use and to protect the hydrologic balance and to comply with existing State and Federal Water Quality laws and regulations. SMCRA is based on performance standards rather than design standards. By using performance standards, which are minimum levels of environmental protection, SMCRA allows for each State Regulatory Authority to develop methods and techniques that are most appropriate for the climate, geology, geography, and other site conditions that occur locally. It also allows the operator to design the site-specific mining and reclamation techniques that maximize the operator's efficiency and still insure the appropriate level of environmental protection. The result is that each State is allowed to develop a program specifically suited to its needs to protect the environment based on local conditions while maintaining a uniform national level of environmental protection. This result is supported by all existing scientific research and water monitoring which finds: (1) no evidence of damage to public health or the environment due to the placement of these materials at SMCRA mines; (2) in most cases, actual improvement of ground or surface water quality; and, (3) in the cases where they are used as soil amendments, improved plant growth on the surface.

Concern #12: In contrast to (RCRA) landfills, there are no on-site restrictions for future use of mine fill properties. Placement of these materials at mine sites can cover large areas up to several thousand acres. The commenter has yet to find a State mine fill program or OSM requirement that obligates a mine operator to post a notice that disposal of fossil fuel waste has even occurred at a mine fill, no matter how large the scale.

SMCRA requires mining and reclamation plans, including those incorporating placement of these materials at the mine site, to be proposed, reviewed, and approved as a part of the permitting process. SMCRA requires at 30 CFR 773.13 that all permit applications, significant revisions, and renewals of all permits be advertised in local newspapers and copies of the application materials be made available to the public. All SMCRA permitting documents, except for certain proprietary information, are a matter of public record. Since SMRCA also requires that the pre-mining capability of the land be restored following mining and reclamation, there is no need for on-site restrictions.

Conclusion

The author has been extensively involved with the development and distribution of technical

information related to the beneficial placement of CCBs at coal mines since 1995. To date, the author is not aware of any scientific evidence that placement of CCBs on SMCRA mines has negatively impacted human health or the environment. Because of the complexity of the issues involved and the importance of protection of public health and the environment during surface coal mining and reclamation, the author is very supportive of additional research into the potential environmental effects of CCB placement at coal mine sites. Any additional Federal regulation of CCB placement at SMCRA mine sites, however, should only be based on sound scientific evidence that the existing regulatory framework is not adequate.

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