From: Smith, Eliot R <esmith4@indiana.edu>
Sent: Sunday, June 19, 2016 3:38 PM
To: SEWELL, JEFF
Subject: Comment on coal ash management plan

Dear Mr. Sewell:
I am writing as a citizen to strongly support Indiana's adoption of a strong and thorough management plan for coal ash. The ash dumps in our state threaten public health, including potential contamination of drinking water.

This is an especially important issue to handle now — because coal-fired power plants have no long-term future (because of their high carbon emissions and increasingly strict environmental rules). The power companies that operate them may face financial difficulties as a result. We don't want them to go bankrupt and leave taxpayers with the responsibility of cleaning up coal ash dumps! Let's get the dumps cleaned up properly now, at the companies' own expense.

Thanks for listening to the public on this important matter.

Eliot Smith
Bloomington, IN

From: Scott <scot.willis@gmail.com>
Sent: Monday, June 20, 2016 9:43 AM
To: SEWELL, JEFF
Subject: Coal Combustion Residuals Part 256 Solid Waste Management Plan Amendment

Mr. Jeff Sewell
Indiana Department of Environmental Management
IGCN 1101
100 North Senate Avenue
Indianapolis, IN 46204-2251

Dear Mr. Sewell;

I am writing to express my concerns with the proposed Coal Combustion Residuals Part 256 Solid Waste Management Plan Amendment.

I am appalled to learn that IDEM appears to intend to eliminate that key provision of these public accountability requirements from the state plan.

I am urging the agency to reconsider and make that element part of the enforceable state plan and to to require utilities to post coal ash data online.

There is way too much secrecy in the toxic waste being dumped by the coal industry in general.

I live in Pike county which has been decimated by the coal industry in supplying Indianapolis power and wish that these practices be put to an end.

V/R
Scott Willis (retired engineer)
921 South State Road 57
Petersburg, IN 47567

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Ex astris, scientia

"Scientists study the world as it is; engineers create the world that has never been." -- von Karman

"If we long for our planet to be important, there is something we can do about it.
We make our world significant by the courage of our questions and the depth of our
answers." ~ Carl Sagan, Cosmos

From: Thomas Adams <thadams@acaa-usa.org>
Sent: Tuesday, June 21, 2016 10:24 AM
To: SEWELL, JEFF
Subject: RE: Proposed coal ash regulation

Jeff,

Thank you for clarifying this issue for me. While our association is focused on the beneficial use of coal combustion products (or CCP as we refer to them) we do engage in disposal discussions to the extent that disposal regulations may impact beneficial use. For example, in its rulemaking process the US EPA suggested that they could manage disposal of CCP under hazardous waste rules while exempting beneficial use from those rules. In our view this concept was not rooted in reality and we vehemently opposed such a concept. Eventually the EPA was convinced that they could not manage CCP as a hazardous waste for disposal without destroying beneficial use markets.

One important area to consider in the IDEM deliberations is the emerging interest in recovering CCP from disposal in landfills and surface impoundments for beneficial use. This concept is getting a lot of attention and is beginning to grow commercially. I would be happy to provide details if you are interested in learning more.

Best regards,

Thomas H. Adams, Executive Director
American Coal Ash Association
38800 Country Club Drive
Farmington Hills, MI 48331
(720)870-7897
(720)375-2998
thadams@acaa-usa.org

ACAA Fall Membership Meeting, September 27 & 28 - Birmingham, AL

From: SEWELL, JEFF [mailto:JSEWELL@idem.IN.gov]
Sent: Monday, June 20, 2016 12:29 PM
To: Thomas Adams <thadams@acaa-usa.org>
Subject: RE: Proposed coal ash regulation

Mr. Adams,

We have not begun writing coal ash regulations yet. The story covered a public hearing where we received comments on the draft CCR Part 256 Solid Waste Management Plan document posted at this webpage:

www.in.gov/idem/landquality/ccr

This draft plan describes our plan to write rules. We do not anticipate beginning work on rules until sometime next year. We'd welcome your comments on draft rules when that time comes. I hope this addresses your questions.

Thanks,
Jeff

Jeff Sewell, Chief
Permits Branch
IDEM, Office of Land Quality
jsewell@idem.in.gov
317.234.1000

From: Thomas Adams [mailto:thadams@acaa-usa.org]
Sent: Monday, June 20, 2016 10:47 AM
To: SEWELL, JEFF
Subject: Proposed coal ash regulation
Importance: High

Mr. Sewell,

I just read a story that reports on a proposed coal ash regulation with comments due by June 30. I cannot find that regulation on your website. Can you direct me to it? Our association is dedicated to the beneficial use of coal ash and would like to comment as appropriate.

As I am a resident of Bloomington, IN I want to make sure my home state is dealing with facts and not responding to the myths and partial truths disseminated by the Sierra Club and other ENGOs.

Thank you.

Thomas H. Adams, Executive Director
American Coal Ash Association
38800 Country Club Drive
Farmington Hills, MI 48331
(720)870-7897
(720)375-2998
thadams@acaa-usa.org

ACAA Fall Membership Meeting, September 27 & 28 - Birmingham, AL

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Mark T. Maassel, President

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Boonville Natural Gas Corp.

Citizens Energy Group

Community Natural Gas Co., Inc.

Duke Energy

Fountaintown Gas Co., Inc.

Indiana Michigan Power

Indiana Natural Gas Corp.

Indianapolis Power & Light Company

Midwest Natural Gas Corp.

Northern Indiana Public Service Co.

Ohio Valley Gas Corp.

South Eastern Indiana Natural Gas Co., Inc.

Sycamore Gas Co.

Vectren Energy Delivery of Indiana, Inc.

THE VOICE FOR INDIANA ENERGY

June 22, 2016

Mr. Jeff Sewell
IDEM - OLQ
IGCN 1101
100 N Senate Ave
Indianapolis, IN 46204-2251

RE: Indiana Coal Combustion Residuals Part 256
Solid Waste Management Plan Amendment

Dear Mr. Sewell:

These comments are provided on behalf of the Indiana Energy Association ("IEA") in response to the April 12, 2016 draft Indiana Coal Combustion Residuals Part 256 Solid Waste Management Plan Amendment.

The IEA represents 13 investor owned electric and gas utility companies and one public charitable trust energy utility that represent 97% of the base load electric generation in the state of Indiana as well as the district steam system in Indianapolis. We are an association of electric power companies and natural gas companies that provide Indiana consumers with affordable and reliable energy, benefiting families and businesses across the Hoosier state. Our mission is to advocate policies that promote the general welfare of the energy industry to enhance its role in improving the economy and quality of life in Indiana.

IEA supports IDEM's rulemaking efforts to establish a state-based permit program. The federal rule is self-implementing, which means there is no requirement that states adopt these new federal standards into their existing solid waste management programs; however, many states, Indiana included, have requirements that regulate some of the same CCR units. IDEM has started rulemaking to incorporate the federal CCR standards into their existing solid waste permit programs to avoid a dual or conflicting set of regulations on the same CCR units which helps to limit compliance uncertainty for Indiana utilities.

The IEA member companies look at our environmental management over the short- and long-term to make the best technology investment decisions on behalf of our customers. Protecting the environment, minimizing impacts to communities and managing costs are examples of ways our companies support the economy and the people of Indiana. We feel that the adoption of the Federal CCR rule as outlined in the CCR Part 256 Plan will help balance these goals, by not making state rules more restrictive than the federal rules. We believe all of our customers will benefit from science-based closure approaches because it allows the companies to pursue a range of closure options that have been proven to be protective of the environment, safe and cost effective, including, dewatering and capping the CCR material on site with long-term monitoring, also known as closure in place. It is also important to allow for state authorized compliance schedules to avoid unnecessary expenditures on short term solutions.

IEA recognizes that early next year, IDEM will begin the process of developing a state CCR program with rules adopted and effective by December 31, 2018 and that additional discussion on specific aspects of the rule and additional comment periods will take place to support this rulemaking. We appreciate the clarity that adoption of the Federal rule through the CCR Part 256 plan will provide to members in the interim until the state program can be developed.

Thank you for your consideration of these comments.

Sincerely,

Tim Rushenberg
Vice President – Indiana Energy Association

Comments of Charah, Inc. on

Indiana Coal Combustion Residuals Part 256- Solid Waste Management Plan Amendment

Draft dated April 12, 2016

Charah, Inc. (Charah), is a Louisville, Kentucky based company that specializes in management and beneficial use of coal combustion residuals (CCRs). Charah is pleased to offer comments on the Indiana Department of Environmental Management (IDEM) proposed draft to the Indiana Coal Combustion Residuals Part 256 Solid Waste Management Plan Amendment (CCR Plan).

Charah is one of the largest companies in the US that specializes in the management and beneficial use of coal combustion residuals. Charah manages coal ash in 23 states across the US and employs a team of professional engineers and scientists to ensure that CCRs are managed and beneficially used in a manner that is protective of humans and the environment while preserving the resource value of CCRs in construction materials and through new product developments. Charah designs, builds, operates and closes CCR impoundments and landfills for our utility clients. Charah manages and beneficially uses 15-20 million tons per year of CCRs generated by coal fueled electric generating stations, including CCRs generated by several power plants located within Indiana. With our broad base of hands on experience in handling CCRs, Charah offers our comments on Indiana's CCR Plan from a position of intimate knowledge of the proper methods involved in safe management of disposal facilities and maximum resource recovery of the Coal Combustion Products (CCP). As used in our comments, Charah refers to coal ash handled for disposal as CCRs and CCP refers to coal ash destined for beneficial use. Throughout the US, Charah has operated under various state and federal regulatory programs and we have experienced how key regulatory provisions can ensure effective safe disposal practices while at the same time maximizing the utilization of CCPs, preserving landfill capacity and avoiding disposal.

General Comments: The central focus of any state Solid Waste Management Plan should always be safe and protective handling of the CCRs and maximum resource recovery of the value of CCRs whether the products are diverted from disposal into a beneficial use or reclaimed from a solid waste holding unit to extract the value remaining with the CCRs.

Charah supports Indiana's efforts to update the state regulations to incorporate the federal CCR program requirements. We believe that control and oversight, including enforcement of the CCR regulations must rest with the state of Indiana and IDEM and not rely upon self-implementation and citizen suits as an enforcement mechanism. IDEM is by law the appropriate party to represent the citizens of Indiana in managing and regulating coal combustion residual disposal while protecting health and the environment; and while ensuring that reasonable and affordable methods of CCR management are required. Scientific based affordable options are available for proper management of CCRs and the guidelines set by EPA and administered by IDEM will provide proper protection.

Charah supports Indiana's position that IDEM currently publishes and makes available pertinent information related to CCR disposal management without the need for a public website. Since IDEM already makes records available on the IDEM websites, a redundant public website serves no value and should be eliminated as a requirement to avoid wasting resources on redundant filings.

As it relates to Beneficial Use, Charah supports amending Indiana Code 13-19-3-3 to allow the Environmental Rules Board to adopt rules that support and promote the beneficial use of coal combustion products (CCPs). The national policy outlined under RCRA establishes resource conservation and recovery a national priority and directs EPA to assist states in ensuring the resource value of products that are destined for landfills be recovered and utilized to reduce the dependency on new production resources. Recovery and utilization of CCPs is one of the most successful resource recovery efforts undertaken by American industry and Indiana should develop regulations that follow the national priority established by RCRA and ensure that CCP recovery is maximized to preserve natural resources and prevent additional landfilled tons. The Indiana Department of Transportation relies on CCPs to improve the quality and reduce the costs of concrete produced for its highway and bridge construction. The life cycle of concrete in Indiana highways and public facilities that use concrete with coal fly ash are extended and the costs to Indiana taxpayers for highways and infrastructure are reduced by including CCPs produced by Indiana Coal fueled power plants. Each Indiana taxpayer receives this benefit through reduced taxes and through lower cost electricity. Beneficial use of CCPs must be fostered through supportive regulatory programs that avoid encumbering recovery of the resource value and incentivize disposal avoidance.

Charah supports incorporating the EPA CCR regulations that provide for beneficial use to be exempted from further regulation. Charah also recommends that Indiana establish a specific list of common CCP beneficial uses which are named by Law and Regulation as specifically approved pre-qualified beneficial uses. Those listed applications should include the standard list of CCP uses that have proven successful for decades and saved natural resources while avoiding needless disposal of a valuable product.

Charah notes that the CCRs produced and stored in landfills and impoundments have strategic defense value because they may serve as an enriched source of key rare earth elements necessary in the electronic components required by modern commerce and defense. Charah recommends that Indiana also provide a regulatory mechanism that streamlines the ability for CCRs that have been placed in landfills or impoundments which are closed to be reclaimed and mined for beneficial use. The value of CCRs both to support the construction materials industry and for recovery of strategic rare earth elements will become more important to national security and Indiana's continued infrastructure growth in future years when less volumes of CCRs are produced to supply the industrial needs. Indiana regulations should acknowledge the resource value of the CCRs and support the RCRA concept to utilize these valuable resources.

Charah appreciates this opportunity to submit comments on the CCR Part 256 Solid Waste Management Plan Amendment and we request to be be included in Indiana's list of interested parties regarding this ongoing plan development process.

CITIZENS ACTION COALITION * EARTH CHARTER INDIANA * HOOSIER ENVIRONMENTAL COUNCIL
INDIANA DIVISION, IZAAK WALTON LEAGUE * INDIANA NAACP
SAVE THE VALLEY * SIERRA CLUB * VALLEYWATCH

June 30, 2016

Via email

Mr. Jeff Sewell
Branch Chief, Permits Branch
Office of Land Quality
Indiana Department of Environmental Management
IGCN 1101
100 North Senate Ave
Indianapolis, IN 46204-2251
jsewell@idem.in.gov

RE: Draft Indiana Coal Combustion Residuals Part 256 Solid Waste Management Plan Amendment

Dear Mr. Sewell,

The undersigned organizations appreciate the opportunity to comment on IDEM's proposed plan to cover coal combustion residuals (CCR) in Indiana's Solid Waste Management Plan according to the process described in 40 CFR 256, also known as the CCR Part 256 Plan.

I. Coal Ash Threatens Public Health

As with many waste materials, coal ash, if improperly handled, can be a threat to human health. Reducing or eliminating that threat should be a primary goal of the new rule. There are three principal ways coal ash can be a threat to public health: spills, fugitive dust, and water contamination.

Spills

Coal ash spills like those at Kingston, Tennessee in 2008, the Dan River in North Carolina in 2014, and Martinsville, Indiana, in 2007 and 2008, and others - damage property, pollute waterways, and threaten human life through the release of millions of gallons of coal ash slurry from weak or defective impoundments.

Fugitive dust

When the ash is dry, it can become airborne during loading, unloading, transport, landfill grading, or windy conditions. The finest dust in coal ash can be as small as 1 micron (EPRI, 2009). Particles that small can get deep into the lungs and even be absorbed into the blood. Exposure to airborne fine particles increases the risk of cardiovascular disease and reduces life expectancy. The longer a person has been exposed, the more the risk, but even exposures of hours to days have a measurable impact (Brook, et al., 2010). Fine particles irritate the lungs and worsen lung diseases like asthma (Bell & Samet, 2005).

Water contamination

Unfortunately, when coal is burned, a number of the constituents left behind in the ash are toxic including arsenic, selenium, hexavalent chromium, and many others. The toxic contaminants get into surface water via the effluent discharged pursuant to an NPDES permit from coal ash ponds or from seeps through the enclosing structures around the ponds. Once they are in surface water, people can be affected if that water is a source of drinking water or when the contaminants get into the fish that people eat.

Impact on Ground Water

Coal ash contaminants get into ground water when water from a coal ash pond soaks into the ground or precipitation passes through a landfill and carries contaminants into the ground water in a process known as leaching. Ground water does not stay in one place, so the contaminants can get into nearby drinking water wells.

Some contaminants leach more readily from coal ash than others. A study by the Electric Power Research Institute (EPRI) analyzed 81 leachate samples from 29 coal ash sites (2006). They found that the contaminants that can leach in the highest concentrations were aluminum, boron, chromium VI, iron, lithium, manganese, molybdenum, silicon, sodium, sulfate, strontium, and vanadium.

Table 1 lists many of the substances that can leach from coal ash in high enough concentration to pose a threat to health. For each substance the range of concentrations that were found in leachate from fly ash and FGD waste in the EPRI study are listed. The US drinking water standards are listed for comparison. The possible health effects listed are those that could occur from eating or drinking a low dose over a long period of time. They are not the effects from acute high doses or from inhalation. The health effects for all of these substances depend on how a person was exposed, how much they were exposed to, and for how long. There is not room in this comment for complete toxicological information.

Table 1.	**Possible Health Effects**	**Drinking Water Standard or Health Advisory (mg/L)**	**Range in Coal Ash Leachate mg/L**
Arsenic	warty skin growths, fetal damage arsenic is a known carcinogen (liver, bladder, lung, skin)	0.010	0.0014 - 1.38
Cadmium	kidney damage probable carcinogen	0.005	BDL - 0.065
Chromium VI	stomach ulcers, sperm damage known carcinogen (lung, stomach)	NA	BDL - 5.09
Iron	liver & heart damage in patients with hemochromatosis	0.3	BDL - 25.6)
Manganese	nervous system damage	0.3	BDL - 4.17
Nickel	allergic reactions, stomach ache, kidney damage some forms are carcinogenic	0.1	BDL - 0.597
Selenium	selenosis (hair loss, numbness & abnormal sensations)	0.05	0.000071 - 2.36
Sodium	high blood pressure, cardiovascular disease	20	3.8 - 4,630
Strontium	impaired bone growth	4	0.030 - 16.9
Uranium	kidney damage	0.02	BDL - 0.061

Vanadium	nausea, diarrhea possible carcinogen (lung)	NA	BDL - 5.02

Because of this potential to impact public health and impact our water resources, how IDEM writes the rule on coal ash is important now and has implications for future generations.

II. Response to the draft CCR Part 256 Plan

1. Approving Compliance Schedules.

Circumstances when IDEM can grant approval. We understand that some of Indiana's utilities have expressed interest in alternative compliance schedules given some of the challenges they face with their coal ash storage. IDEM's draft CCR 256 Plan lists many important criteria that should be taken into account in considering a variance from a compliance schedule, such as whether other disposal units can be used and whether there has been a good faith effort to meet the original deadlines.

The federal provision for an alternate compliance timetable is at 40 CFR 256.26 and it reads:

> "Requirement for schedules leading to compliance with the prohibition of open dumping.
> In implementing the section 4005(c) prohibition on open dumping, the State plan shall provide that any entity which demonstrates that it has considered other public or private alternatives to comply with the prohibition on open dumping and is unable to utilize such alternatives to so comply, may obtain a timetable or schedule for compliance which specifies a schedule of remedial measures, and an enforceable sequence of actions, leading to compliance within a reasonable time (not to exceed 5 years from the date of publication of the inventory)."

There are additional details on implementation of this provision in the Federal Register, vol 80, no. 74, April 17, 2015, under IX. Implementation of the Minimum Federal Criteria and State Solid Waste Management Plans, page 21432:

> " . . . RCRA Section 4005 provides an incentive in certain circumstances for states to obtain EPA approval on revised SWMPs. Under section 4005, States with approved SWMPs can provide additional time for facilities that do not meet the national minimum criteria (i.e., 'open dumps'), to come into compliance. As noted above, . within one year of the promulgation of federal criteria under RCRA section 4004(a), section 4005(b) directs EPA 'to assist the states in complying' with the directive in section 4003(a)(3) that state SWMPs shall provide for closure and upgrading of open dumps (i.e., facilities that do not meet the revised Federal criteria) by publishing an inventory of all 'open dumps' in the US. 42 U.S.C. 6945(b). Facilities on this inventory are eligible to obtain a 'schedule of compliance' from a state with an approved management plan . . ."

Thus, for this provision to apply, the EPA must first determine that a facility is an 'open dump' and place it on a published list of open dumps. EPA's rulemaking preamble also states that this provision is an incentive to states to "obtain EPA approval on revised SWMPs" and that the provision is available to states that receive that approval.

IDEM's draft CCR Part 256 Plan has a statement implying that IDEM already has the authority to grant compliance schedules, but that is not correct. The draft plan cites the fact that the federal CCR rules on surface impoundments were incorporated by reference into an emergency rule adopted by the Indiana Environmental Rules Board on February 12, 2016. The draft plan then states, "This enables IDEM to grant compliance schedules under Indiana Code (IC) 13-14-8-8 . . ." However, according to the portion of the Federal Register cited above, states will not be able to approve alternate compliance schedules

until a facility has been listed in EPA's published inventory of open dumps, and the EPA has approved the state's revised SWMP. Since the EPA has not published the first list of coal ash facilities that qualify as open dumps and Indiana does not have an EPA-approved, revised SWMP, we believe Indiana does not yet have the authority to grant compliance schedules. Any compliance extensions that Indiana purports to grant before its SWMP is approved are therefore not legally effective.

To stay in keeping with the federal regulation, we believe IDEM should add these actual requirements for granting an alternative compliance schedule to the draft plan. The draft plan section on Approving Compliance Schedules should state that coal ash facilities will only be eligible for extended compliance dates if they are listed by the EPA as open dumps. The plan should also state that IDEM will not be able to approve compliance schedules until Indiana's revised SWMP has been approved. The deadlines IDEM approves must be consistent with (or more stringent than) the federal rule. 42 U.S.C. 6929 explicitly prohibits the adoption of less stringent state requirements.

In the Federal Register, the EPA goes on to explain that approvals of alternate compliance schedules will be infrequent. (vol 80, no. 74, April 17, 2015, page 21432)

> "... only a limited number of facilities or units will fall into the category of open dumps within the relevant timeframes. As noted, an open dump is defined as a solid waste facility that does not meet the federal minimum criteria. 42 U.S.C. 6903(14). As also explained, the final criteria establish timeframes for facilities to implement the technical requirements, ranging between six months to several years, including certain provisions that authorize extensions. Until those deadlines pass, the facility is not an open dump and therefore would not be eligible for or need a compliance schedule under section 4005. Because the statute limits the states' ability to set compliance schedules to five years from the publication of the criteria, if a facility is out of compliance with the criteria either shortly before or after this time five-year timeframe, from a purely practical perspective, compliance schedules are no longer a viable option. Thus for certain of the provisions (e.g., closure, which generally must be completed within five years) compliance schedules would never be available."

Public notice and comment. We request that all requests for extensions in achieving compliance with the CCR rule and Indiana's revised SWMP be a matter of public information and open to public comment.

2. Interim Regulation of CCR Facilities

Indiana should ensure that all CCR landfills are brought up to the standards in the CCR Rule as soon as possible. The plan states that "IDEM will impose permit conditions as necessary to achieve the minimum criteria in the CCR Rule when granting, modifying, or renewing a permit for a CCR landfill." We interpret this to mean that CCR landfills will only have to meet the CCR rule standards if they need a new, modified or renewed permit during the interim period.

The interim period is going to be too long to take this approach. It is estimated to extend to December of 2018, two and a half years from now. Instead, IDEM should require the CCR rule standards of all CCR landfills, not just those that come up for new, modified or renewed permits.

3. Developing an Indiana CCR Program

The federal rule still pertains. The Indiana plan should state explicitly that compliance with the Indiana regulation does not affect the duty of the owner or operator to comply with the federal regulation. The duty to comply with the federal rule remains. The EPA clearly states that the federal CCR requirements will still pertain in the Federal Register Vol 80, no 74, April 17, 2015, page 21333:

"Section 4002 contains nothing that explicitly or implicitly authorizes state requirements to operate 'in lieu of ' the federal requirement as a consequence of EPA approval of the state plan. . . Congress only authorized the states to modify the timeframes by which such facilities must be in compliance, not the substantive requirements themselves. 42 U.S.C. 6945(a)."

CCR Websites. We noted the statement in the draft plan that the Indiana CCR rule will not be 'self-implementing'. We take this to mean that IDEM will be able to enforce the provisions of the rule. We believe that an enforceable rule will be more effective than self-implementation and commend IDEM for taking this approach. However, we disagree with the contention that Indiana should therefore not incorporate the section of the federal rule on CCR websites, section 257.107.

First, the CCR websites will still be required for compliance with the federal rule and thus all owners and operators of CCR units in Indiana will have to continue to maintain their CCR websites regardless of the state's action. As stated above, having a state CCR rule does not affect the duty to comply with the federal rule. Since the websites will still be required by the federal rule, and all owners and operators of CCR units have already established one (or relied on the website of a parent corporation), leaving this requirement out of the Indiana rule, as the only portion of the federal rule that is left out, could lead to needless confusion only.

Second, the failure to include the CCR website requirement in IDEM's draft plant means EPA will not be able to fully approve the state's plan and instead could partially approve it only. EPA has stated clearly that it will only approve a state's plan if it meets the minimum federal criteria. *See* 80 Fed. Reg. 21, 303, ("EPA would then review and approve the revised plan provided it demonstrates that the minimum federal requirements in this final rule will be met. In this way, EPA's approval of a revised SWMP signals EPA's opinion that the state SWMP meets the minimum federal criteria."). Further, there is no doubt that minimum federal criteria include the requirement for each owner or operator of a CCR to maintain a CCR website: "Each *owner or operato*r of a CCR unit subject to the requirements of this subpart must maintain a publicly accessible Internet site (CCR Web site) containing the information specified in this section." 40 C.F.R. § 257.107 (emphasis added). This language could not be more clear as to the minimum requirements of the rule. But, in any event, EPA has explicitly confirmed the meaning of the plain language, noting that, "Respondents are obligated to keep records, make the required notifications, and maintain the publicly available Internet site. *These requirements are part of the minimum federal criteria under 40 CFR part 257*." 80 Fed. Reg. 21,463 (emphasis added); *see also id*. at 21429 (providing tables that list minimum federal criteria for impounds and landfills, both of which explicitly include the website requirement as a minimum requirement). If Indiana chooses to submit a plan that clearly does not meet minimum federal criteria, the plan will at best only be partially approved, causing unnecessary confusion for regulated industry and the concerned public alike.

Finally, even if the requirement for an owner- or operator-maintained CCR website were not a minimum federal requirement, which it is, the argument against a replacement state-maintained website would still be overwhelming. Owners and operators of CCR units have the best access to information about their operations and thus it makes good Indiana common sense to put the requirement to maintain the website on them. The owner- and operator-maintained CCR websites provide valuable information for the communities living near coal ash and they provide it in a readily accessible form. The draft plan states "IDEM does not believe it would be necessary for Indiana's program to require the utilities to maintain records on a website since IDEM already makes records available through a public website." The public website cited is IDEM's Virtual File Cabinet, and while the Virtual File Cabinet provides a valuable portal for transparency in Indiana environmental regulation, for the average person it is a difficult place to find a specific document, like an impoundment inspection or a fugitive dust plan. In the VFC, those documents will be buried in long lists of documents for each power plant, and each power plant will be buried in long lists of all the other regulated entities. The lists in the VFC are available, but they are not readily searchable so sifting out the document of

interest can be time consuming. In contrast the CCR websites put documents of interest on coal ash facilities together in one location where members of a local community would have ready access.

Beneficial use of CCR. The draft Solid Waste Management Plan amendment calls attention to the Indiana statutory prohibition on regulating beneficial use of coal ash, meaning that Indiana may be unable to fully implement the requirements of §257.53 which defines beneficial use. IDEM should have the ability to adopt a precautionary approach to the regulation of beneficial use, and allow only those uses demonstrated to pose minimal environmental risk which encapsulate the ash before its reuse. Use of ash for structural fill or in agricultural applications exposes the ash to contact with water which greatly increases the likelihood of ground or surface water contamination and contamination of food crops, and these uses should not be considered beneficial. In its Federal Register publication of 40 CFR 257 (Volume 80, No. 74, page 21328-21329), the U.S. EPA identified seven proven damage cases associated with unencapsulated uses of ash. Several of these damage cases are identified on pages 8-9 of these comments.

A number of studies conducted on agricultural application of coal ash have found negative impacts, including:

- Leaching of metals into soils with leachate levels for lead, for example, well above drinking water standards;
- Boron toxicity found in French beans grown on ash-amended land;
- Reductions in corn germination and delayed growth associated with high boron levels;
- Elevated concentrations of arsenic, boron, magnesium, and selenium in crops grown in fly ash-amended soil.

A listing of these studies is included as attachment 1.

In addition to "explor[ing] ways to structure requirements that satisfy the CCR Rule criteria within the framework provided in the Indiana Code," the plan amendment should recommend that the Indiana Code be amended to eliminate this prohibition.

Changes to the federal CCR rule. In a lawsuit settlement, the EPA has agreed to make changes to the federal CCR rule, and those changes will be final once they are court approved. IDEM should include those changes as it incorporates CCR into the Indiana Solid Waste Management Plan. The changes include the following:

(1) Addition of boron to Appendix IV assessment monitoring constituent list.

In its motion to federal court, EPA agreed to propose the addition of boron to "Appendix IV to Part 257—Constituents for Assessment Monitoring." Adding boron to Appendix IV means that boron will be on the list of pollutants that can trigger cleanup actions. Adding boron to the assessment monitoring list will enable states to better protect the environment and surrounding communities from health risks since boron is one of the first pollutants to be detected in coal ash-contaminated groundwater. The requirement to initiate cleanup upon detection of boron above background levels will help ensure timely protection of groundwater near coal ash ponds and landfills.

(2) Requirement for inactive coal ash ponds to comply with all requirements applicable to existing coal ash ponds.

EPA has also agreed to eliminate § 257.100(b) from the CCR rule, with the result that all inactive ponds at sites that are still generating electricity will be subject to the requirements applicable to existing coal ash ponds. IDEM should similarly remove the exemption for inactive ponds. In incorporating the CCR rule, IDEM should amend the following three sections: (1) § 257.100 by removing § 257.100(b); (2) §

257.90 by removing the phrase "Except as provided for in § 257.100 for inactive CCR surface impoundments"; and (3) § 257.104 by removing § 257.104(a)(3).

(3) Inactive coal ash ponds should comply immediately with the inspection requirements.

Although EPA has agreed to propose changes in the CCR rule that will require inactive ponds (at active power plant sites) to comply with requirements applicable to existing ponds, EPA plans to extend all CCR rule deadlines approximately 1.5 years for these inactive surface impoundments. Some inactive coal ash ponds contain many millions of tons of contaminated sludge and wastewater, and the lack of inspections may substantially increase the risk of a spill. State regulations should require the owner/operators of inactive ponds to inspect the units and monitor equipment according to the schedule set forth at 40 C.F.R. § 257.83, including weekly, monthly and annual inspections until final closure. Inspections should be completed by experienced, trained engineers as needed according to the dam's size, importance, and potential for loss of life and damage to property. The necessity for frequent inspection of high and significant-hazard inactive ponds is well illustrated by Duke Energy's Dan River spill, which occurred when an inactive pond breached in 2014, spilling 39,000 tons of coal ash and 27 million gallons of wastewater into the Dan River.

4. Coordination with other programs

IDEM should immediately undertake coordination with the Indiana Department of Natural Resources concerning the inspection requirements at § 257.83 (b) to:

a) Ensure that issues identified in the annual inspection reports conducted by the electric utilities are addressed appropriately; and,
b) Ensure that any coal ash surface impoundments that have not been inspected as required by the rule are immediately inspected and the required report submitted.

Inspections conducted to date by Indiana utilities have found a variety of structural problems at coal ash surface impoundments, including:

a) "(M)ultiple areas requiring general maintenance including erosion rills, vegetation, tire rutting, and sparse vegetation were observed." And, "Slope stability analyses indicate calculated factors of safety for post earthquake conditions at all four pond locations are below target values indicated by § 257.73." (Duke Energy Gibson Generating Station).
b) "The [east ash] pond is not equipped with a principal or emergency spillway as originally designed." And, "Due to the height of the pool level and presence of accumulated ash, the west berm of the pond is in danger of failure and release of coal ash into Culley Station during a storm event." (Vectren F.B. Culley Generating Station)

No annual inspection reports as required by §257.83 (b) have been posted for surface impoundments at NIPSCO's Michigan City Generating Station.

III. Indiana's Opportunity to Improve on the Federal CCR rule

With IDEM revising Indiana's Solid Waste Management Plan to incorporate coal ash disposal, there is an opportunity to improve on the federal CCR rule. Indiana's rule could do a better job than the federal rule of protecting Indiana's water resources and reducing the threats to public health.

1. Ground Water Protection

Ground water contamination by coal ash is common. In 2007, the EPA reported on a total of 54 coal ash sites around the US where ground water contamination had been documented. Since then, advocacy groups have documented additional cases (Stant, 2010). As of February, 2014, the group Earthjustice reported a total of 208 cases of known ground water contamination or spills of coal ash in the US (Earthjustice, 2014). In 2015, North Carolina tested 313 private water wells that were close to 14 unlined coal ash ponds. 291 of them (93%) failed at least one North Carolina drinking water standard, most of those for contaminants associated with coal ash (Southern Environmental Law Center, 2015; North Carolina DHHS, 2015).

In particular, unlined landfills and unlined coal ash ponds lead to contaminated water. This has been documented in multiple locations:

- the Chisman Creek Superfund site in Virginia where 500,000 tons of fly ash were put into unlined pits leading to heavy metal contamination of groundwater including wells for 55 homes (U.S. EPA, 1999)
- the coal ash in the Yard 520 landfill and used as fill in Pines, Indiana, resulted in groundwater contamination, shutting off wells for over 300 homes, and designation as a Superfund site (U.S. EPA, 2015)
- Dominion's unlined coal ash pond in Chesapeake, VA, where there is arsenic leaching into groundwater (Bowers, 2010)
- Unlined coal ash fill at the Battlefield Golf Course near Chesapeake, VA, led to groundwater contamination (Rodriguez, 2012)
- NIPSCO Bailly where an old disposal site has caused contamination that has migrated to the Dunes lakeshore (communication from EPA Region 5, Land and Chemicals Division)
- Gibson Generating Station where groundwater contamination from an ash pond led Duke Energy to supply safe drinking water to nearby homes (Environmental Integrity Project & Earthjustice, 2010)
- Clifty Creek in Madison, Indiana where the coal ash landfill and ash pond contaminated groundwater (Environmental Integrity Project & Earthjustice, 2010)
- Petersburg Station where arsenic and boron contamination has been found in ash pond monitoring wells (Petersburg Proposed Ash Pond System Closure and Post Closure Plans, IPL, August 2014)
- AB Brown in Indiana unlined landfill that contaminated groundwater (U.S. EPA, 2007)
- The many private wells tested in North Carolina near coal ash sites that have coal ash contaminants (Southern Environmental Law Center, 2015; North Carolina DHHS, 2015).
- The recent study of coal ash sites in 5 states showing that ground water was impacted at all of the sites studied (Harkness, 2016)

The best method for protecting groundwater from coal ash is lined, capped, dry storage. In the eastern United States where there is a wetter climate and shallower ground water, this is the only disposal method for coal ash that protects water resources.

Capping coal ash in place without a liner allows continuing impact to water. Two sites with coal ash capped in place were part of the recent 5-state study (Harkness, 2016). Water was impacted at both of those sites. Especially where coal ash storage is adjacent to rivers, as much of it is, the aquifer levels are known to fluctuate and those fluctuations will continue to bring the water into contact with the ash.

Other types of waste disposal sites provide further evidence that cap-in-place does not protect ground water. Superfund sites that are capped continue to have leaching that then requires pump and treat systems. For example, the Lemberger Landfill Superfund Site in WI which employed a cap had to use a groundwater extraction well system (U.S. EPA, 2016).

We also have evidence from South Carolina that removing coal ash from an unlined site reduces the impact on the ground water. Arsenic levels in the groundwater at South Carolina Electric and Gas's Wateree facility have dropped 80 to 90% (Southern Environmental Law Center, 2016, Feb 1).

In South Carolina, a lawsuit resulted in a settlement in which all coal ash is being moved to lined landfills, on high ground and other states are moving that direction. It will be less expensive in the long run to start Indiana's rule with what we know to be the better solution - dry, lined and capped landfills on high ground - than to start down some other path and then have to backtrack.

In order to be fully protective of human health and our water resources, we respectfully request that IDEM consider the following while drafted the rules regarding coal ash disposal in Indiana:

1. Coal ash storage should not be permitted in the 100-year floodplains.

2. The liners under coal ash must be composite, not just compacted soil. A composite liner should have both clay and an impermeable membrane. Compacted soil or clay alone will not prevent leaching.

3. Before creation of a new coal ash landfill, possible sites should be carefully investigated and potential impact to the local environment and human health should be assessed.

4. Coal ash should not be used for fill or soil amendment. Using coal ash for fill or soil amendment is equivalent to putting it in an unlined landfill, and we have already listed the extensive evidence that unlined coal ash leads to contaminated water.

5. Since we know that unlined storage leads to ground water contamination, all drinking water wells within one half mile of unlined coal ash ponds and landfills in Indiana should be sampled for coal ash pollutants and, if contamination is detected, the utility should be required to supply an alternative water supply. Indiana would not be alone in taking this step to protect human health. This requirement was included in North Carolina's Coal Ash Management Act (CAMA) in 2014.

6. The state should require additional inspection of coal ash storage facilities after local events that could stress them, such as earthquakes, floods, or suspected sabotage.

2. Financial Assurance Requirements

The undersigned organizations urge Indiana to maintain the financial assurance requirements for CCR landfills that exist under current State regulations. Indiana leaders need to ensure that enough money is set aside to clean up the coal ash landfills and ponds so that Hoosier taxpayers aren't stuck with the bill if a utility were to attempt to walk away. And Indiana law provides just that protection, at least for coal ash landfills.

Current regulations require that a landfill permittee establish financial responsibility for closure and post-closure care for all the permitted acreage for the solid waste land disposal facility before waste is placed in a landfill. 329 Ind. Admin. Code 10-39-2. These requirements are good Indiana common sense. If a company wants to place dangerous substances in a landfill, it should be required to ensure that the land and water is protected if that company were to walk away, leaving the pollutants behind. IDEM should

maintain those landfill financial-assurance requirements. Of course, nothing in the federal CCR rule prevents a State from going beyond federal minimum requirements. There has been no demonstration that these financial-assurance requirements are burdensome for the utilities.

Sincerely,

Kerwin Olson
Executive Director
Citizens Action Coalition

Rosemary Spalding
President
Earth Charter Indiana

Jesse Kharbanda
Executive Director
Dr. Indra Frank
Environmental Health and Water Policy Director
Tim Maloney
Senior Policy Director
Hoosier Environmental Council

Tim Russell
President
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Denise Abdul-Rahman
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Beau Gray
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Save the Valley

Richard Hill
Chair, Hoosier Chapter
Jodi Perras, Senior Indiana Beyond Coal Campaign Representative
Tony Mendoza, Staff Attorney, Environmental Law Program
Sierra Club

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Attachment 1

Coal Ash as Agricultural Amendment

Summary of Studies Showing Negative Agricultural Outcomes

- ***J.J. Bilski & A.K. Alva, *Transport of Heavy Metals and Cations in a Fly Ash Amended Soil*, 55 Bull. Envtl. Contamination & Toxicology 502 (1995).**

  This study looked at the leaching of heavy metals into soils in Central Florida with high sand content and little organic matter. Overall, the authors found that the "recovery of most elements…in the leachate increased with an increase in the rate of fly ash application." Their results showed that the quantity of lead in the leachate reached a concentration of 60.31 µg/L, which "would be unacceptable for drinking water quality." They also concluded that "Se appears to be of some concern with regard to its accumulation in soil at high rates of fly ash application."

- ***R.L. Aitken & L.C. Bell, *Plant Uptake and Phytotoxicity of Boron in Australian Fly Ashes*, 84 Plant and Soil 245 (1985).**

  Authors looked at the effects of various Australian fly ashes on French bean and Rhodes grass. Authors reported boron toxicity symptoms in French bean. They also reported lower crop yield related to the toxicity. Toxicity was reported even for fly ashes with boron content that might not be toxic itself.

- ***J.T. Sims et al., *Evaluation of Fly Ash as a Soil Amendment for the Atlantic Coast Plain: II. Soil Chemical Properties and Crop Growth*, 81 Water, Air and Soil Pollution 363 (1995).**

  Authors reported reductions in corn germination and delayed growth in crown grown in fly ash-treated soil. These effects were associated with boron levels. Furthermore, "[p]lant shoot and root weight decreased with increasing fly ash rates." Authors also reported marginal leaf necrosis associated with the boron content of fly ashes. Levels of boron in plant tissue exceeded the threshold for phytoxicity (authors used a level of 25-30 mg/kg as their threshold).

- **Duane A. Tolle et al., *Microcosm/Field Comparison of Trace Element Uptake in Crops Grown in Fly-Ash Amended Soil*, 31 Science of the Total Envt. 243 (1983).**

  Authors tested acidic fly ash mixed with silt-loam topsoil. "Boron was the only element which accumulated in plant tissue at levels reported to be toxic to plants and may have caused the yield declines in all plants at high fly ash treatment levels. Plant uptake of Mo, Se, and As, particularly at the highest fly ash amendment levels, was sufficient to make the crops hazardous as a forage for cattle or sheep."

- ***A.T. Vollmer et al., *Effects of Coal Precipitator Ash on Germination of and Early Growth of Desert Annuals*, 22 Envtl. & Experimental Botany 409 (1992).**

  Authors observed that ash "retarded rates of germination" of four of the plants studied and that "the sizes of seedlings varied inversely with amounts of ash in soil." These effects were found to be statistically significant. Root growth was also inhibited for one of the species.

- **Leonard H. Weinstein et al., *Elemental Analysis of Grasses and Legumes Growing on Soil Covering Fly Ash Landfill Sites*, 9 J. Food Safety 291 (1989).**

  Forage grasses and legumes growing in the soil covering four coal fly ash landfill sites in Central New York were sampled and analyzed for 20 elements. Selenium, boron and molybdenum were most consistently higher in concentration in these crops than the corresponding control plants sampled from adjacent upwind locations. Legumes absorbed greater amounts of these elements than grasses probably owing to their deep-rooted penetration of the fly ash layer below.

- **M.F. Arthur et al., *Effects of Fly Ash on Microbial CO_2 Evolution from an Agricultural Soil*, 22 Water, Air, and Soil Pollution 209 (1984).**

  Unweathered, acidic fly ash from coal-fired power plant was applied to alfalfa-meal amended *agricultural* soil. The authors suggested "that soil heterotrophic microbial activity … may be inhibited by higher levels of fly ash. Several metals were present at potentially toxic levels in the fly ash employed and may have accounted for the inhibition of CO2 C evolution."

- ***D.C. Adriano et al., *Growth and Elemental Composition of Corn and Bean Seedlings as Influenced by Soil Application of Coal Ash,* 7 J. Envtl. Qual. 416 (1977).**

  Extracts of slag and fly ash from bituminous coal. Authors reported that "[a]nalyses of tissues of both crops indicated that P concentrations were at deficiency levels." Beans also showed visible signs of boron toxicity.

- **D.C. Adriano et al. *Effects of High Rates of Coal Fly Ash on Soil, Turfgrass, and Groundwater Quality,* 139 Water, Air, and Soil Pollution 365 (2002).**

  "Ash application significantly increased the concentrations in plant tissue of B, Mo, As, Be, Se, and Ba while also significantly reducing the concentrations of Mg, Mn, and Zn."

- ***Anurag Singh et al., *Effects of Fly Ash Incorporation on Heavy Metal Accumulation, Growth and Yield Responses of* Beta vulgaris *Plants*, 99 Bioresource Tech. 7200 (2008).**
  - Studied effects of fly ash at various concentrations on heavy metal growth
    - "The concentrations of all the heavy metals increased significantly with increasing concentrations of FA."
    - "Metal pollution index (MPI) of both roots and shoots showed significant and negative relationships with the yield of B. vulgaris plants."
  - Studied crop yield and biomass of *B. vulgaris*
    - "The results showed that application of FA caused significant reductions in growth, biomass and yield responses of B. vulgaris plants at different ages of observations."
  - "It is further recommended that leafy vegetable like B. vulgaris is not a suitable crop to be grown in a region where FA is used for amendment of agricultural soils."

- **Naveen Kalra et al., *Impact of Flyash Incorporation in Soil on Germination of Crops*, 61 Bioresource Tech. 39 (1997).**

Ash incorporation tested in terms of germination and stand establishment on wheat, chickpea, mustard, lentils, rice, and maize. "Ash addition in soil delayed germination of crops due to the increased impedance offered by the soil matrix to germinating seeds."

- ***A. Keith Furr et al., *Absorption of Elements by Cabbage Grown in Fly Ash-Soil Mixtures*, 11 Envtl. Sci. & Tech. 1194 (1977).**

  Authors studied fly ash from 21 states. Arsenic, boron, molybdenum, selenium, and strontium "in the cabbage showed a high degree of correlation with those in the respective fly ashes."

- ***S. S. Brake et al., *Effects of Coal Fly Ash Amended Soils on Trace Element Uptake in Plants*, 45 Envtl. Geology 680 (2003).**

  Authors looked at the effects of fly ash-amended soil on basil, tomato, zucchini, and sunflower plants and various stages of development. They found "nearly all of the crops sequestered higher concentrations of As and Tl with increasing amounts of fly ash, suggesting that these elements remained available for bioabsorption during the experiment." Although most of the trace elements were below reported toxic levels, they found "potentially toxic" levels of Arsenic in basil and zucchini. Effect on plant uptake could be understated because authors did not look at all plant tissue, including roots.

- ***Finn Bertelsen & Gunnar Gissel-Nielsen, *Toxicity of Root-Applied Sulphite in* Zea mays, 9 Envtl. Geochem. & Health 12 (1987).**

  Researchers studied the effects of sulphite and sulphate, which are components of flue gas desulphurization (FGD) ash, on corn. They observed visible injury to the plants treated with sulphite.

- **R.B. Clark et al., *Benefits and Constraints for use of FGD Products on Agricultural Land*, 80 Fuel 821 (2000), *available at***
  https://www.researchgate.net/profile/V_Baligar/publication/222831788_Benefits_and_constraints_for_use_of_FGD_products_on_agricultural_land/links/543eadbd0cf2e76f0224042b.pdf

  "FGD scrubber sludges often contain high levels of sulfite. Sulfite applied to acidic soil even at low levels can be toxic to plants, so use of high sulfite FGDs may be detrimental to plants unless sulfite is oxidized."

- ***R.B. Clark et al., *Boron Accumulation by Maize Grown in Acidic Soil Amended with Coal Combustion Products,* 78 Fuel 179 (1999), *available at***
  https://www.researchgate.net/profile/V_Baligar/publication/222475082_Boron_accumulation_by_maize_grown_in_acidic_soil_amended_with_coal_combustion_products/links/543eae820cf2eaec07e7d1fe.pdf*.

  Authors looked at the effect of 15 different coal combustion products, including two fly ashes, as a soil amendment onto acidic soil. "[S]ome of the CCPs used in these studies increased accumulation of B in shoots to the extent that the B level could have been toxic." CCPs of concern include the two fly ashes.

- ***M. Ghodrati et al., *Evaluation of Fly Ash as a Soil Amendment for the Atlantic Coast Plain*, 81 Water, Air and Soil Pollution 349 (1995).**

  Authors applied fly ash from two Delaware power plants onto Hammonton loamy sand at various rates. Leaching studies found that boron "leached rapidly from soils amended with 30% fly ash." (More than 92% of the boron initially present had leached.)

- ***A. Riehl et al., *Changes In Soil Properties in a Fluvisol (Calcaric) Amended with Coal Fly Ash*, 155 Geoderma 67 (2010).**

  Their results show sulfo-calcic (SCa) fly ash is less adapted to integration in soils from an agricultural and farming point of view. "Paired tests show that some trace element contents increase significantly in soils mixed with ash with respect to the control soil."
  After 7 weeks of incubation, lead levels exceeded the Fixed Impact Value (400 mg/kg of dry matter of soil) value in all mixtures. The authors note that these results may not hold in regions with more acidic soils.

- ***Prashanta K. Sarangi et al., *Soil Biochemical Activity and Growth Response of Rice* Oryza Sativa *in Flyash Amended Soil*, 76 Bioresource Tech. 199 (2001).**

  Authors found fly ash amended soil was related to an increase in plant biomass and grain yield, but also observed a decrease in underground biomass (i.e., roots). They caution that this "will require additional research based on long-term studies" before going forward with the practice.

- ***I. A. M. Yunusa et al., *Growth and Elemental Accumulation by Canola on Soil Amended with Coal Fly Ash*, 37 J. Envtl. Qual. 1263 (2008).**

  Authors investigated effects of Australian fly ash, which was alkaline, on the growth of canola. They found molybdenum increased in seeds of canola grown on soil with Australian coal fly ash used as a soil amendment. Accumulation of all heavy metals was found mostly in the leaves, with Cu and Mo increasing at any rate of fly ash. Overall authors promote agronomic use of coal fly ash.

- ***Amit K. Gupta & Sarita Sinha, *Growth and Metal Accumulation Response of* Vigna radiata *L. var PDM 54 (Mung Bean) Grown on Fly-Ash Amended Soil: Effect on Dietary Intake*, 31 Envtl. Geochem. & Health 463 (2009).**

  The authors found that the "total accumulation of toxic metals, particularly Ni and Pb, was many times higher for plants grown on FA-amended soil than for plants grown on [garden soil.]" This includes accumulation in the seeds. They found the "total daily intake (TDI) of all the tested metals in seeds was within the recommended dietary allowance (RDA)/provisional tolerable daily intake (PTDI) for adults" except for Cd, which was higher than recommended values.

- ***A. M. Hammerstein et al., *Implications of Fly Ash Application to Soil for Plant Growth and Feed Quality*, 19 Envt. Tech. 143 (1998).**

  Authors investigated the effects of fly ash amended soil on the growth of barley. They found barley growth was delayed, and they also observed symptoms of phytotoxicity (dark brown necrotic spots) that increased with fly ash rate. Authors observed that "[w]ater soluble concentrations of B, Mo, Ca, Cr, K, Mg, Mo, Na, P, Se, and Sr variably increased with increasing

fly ash rate." Most alarmingly, "[b]oron concentration in plant tissue increased significantly to toxic levels with symptoms evident at early stages of barley development and increasingly severe at later stages." They concluded: "Because of the source dependent variability in chemical composition of fly ash and lack of field data, further research is required before fly ash can be routinely used as a soil amendment."

- ***Rajani Kanta Sahu & Rabindra N. Padhy, *Growth, Yield and Elemental Status of Rice (Oryza Sativa) Grown in Fly-Ash Amended Soil*, 16 Ecotoxicology 271 (2007).**

  Authors investigated the effects of fly ash from coal in Orissa, when used as a soil amendment, on the growth of rice. Despite concluding that the use of fly ash-amended soil benefited the soil and the crop, they downplayed potential toxicity effects in soil and rice. Their data showed that "[t]he increase of Pb contents in roots was in an alarming rate. The soil without any amendment had 6.6 mg Pb per kg dry weight roots, whereas roots from soils with 15 metric tons FA per ha amendment had 12.0 mg Pb per kg dry weight roots. Cu too, increased at a faster rate from 0.01 to 7.6 mg kg–1 dry weight roots, from 0 and 15 Mg ha–1 FA, respectively."

- ***A. Keith Furr et al., *Elemental Content of Vegetables, Grains, and Forages Field-Grown on Fly Ash Amended* Soil, 26 J. Agric. & Food Chemistry 357 (1978).**

  Fly ash from Milliken Station in Lansing, New York was applied to Arkport fine sandy loam. Coal was mostly from Pennsylvania and the authors investigated effects on many vegetables, grains and forage crops. Results showed that concentrations of arsenic, boron, magnesium and selenium were consistently elevated in crops grown on fly ash amended soil, and that this increase was highly significant. Arsenic in particular was detected at greater than 2x the control for many plants.

- ***David A. Mays et al., *Impact of Fluidized Bed Combustion Waste on Metal Content of Crops and Soil*, 57 Water, Air and Soil Pollution 307 (1991).**

  Authors reported no significant effect on corn or soybeans, but did observe "a tendency for high rates of FBCW to increase the B content of leaf tissue." "A single 112 t/ha application had no adverse effect, but repeated applications of that rate
  lowered corn and soybean yields." "The rate of 560 t/ha resulted in depressed or eliminated growth of all crops.

- ***T. Matsi & V.Z. Keramidas, *Fly Ash Application on Two Acid Soils and Its Effect on Soil Salinity, pH, B, P and on Ryegrass Growth and Composition*, 104 Envtl. Pollution 107 (1999).**

  Authors investigated the effects of two fly ash samples from two power plants in Northern Greece on two different soil samples, also from Northern Greece. While they found that boron levels remained below the toxicity threshold of 200 mg/kg in plant shoots, they did find "[c]umulative plant uptake of B and P in the two acid soils increased significantly following fly ash application." They also allowed for the possibility that boron could release from the fly ash and become bioavailable slowly. It is worth noting that the 200 mg/kg threshold used in this study is not without controversy.

- **U. Kukier et al., *Boron Release from Fly Ash and its Uptake by Corn*, 23 J. Envtl. Quality 596 (1993).**

Authors studied the effects of two fly ashes from Georgia on two different boron-deficient soils in the Southeastern United States. They tested potential boron toxicity on corn. They found "[i]ncreased rates of B application in fly ash resulted in much higher tissue B contents and caused marked reductions in growth on both soils."

From: Philip Schonhoff <PSchonhoff@intera.com>
Sent: Thursday, June 30, 2016 9:39 PM
To: SEWELL, JEFF
Cc: Philip Schonhoff
Subject: Indiana Coal Combustion Residuals (CCR) - Part 256- Solid Waste Management Plan Amendment

Dear Mr. Sewell,

In reviewing the Section 3., Developing an Indiana CCR Program, Paragraph 2: “The existing landfill requirement in 329IAC for CCR Landfills is based on a compacted soil liner landfill design.” In reviewing CCR Solid Waste Management Plan Amendment it occurred to me that operating coal mines provide superior conditions for CCR waste isolation. Illinois Basin coal seam underclays are highly impervious (hydraulic conductivity in the 10-7 to 10-9 range) and are most suitable as a natural bottom soil liner, better than a mechanically compacted clay soil liner. If engineered properly, a native underclay liner will hydraulically isolate CCR heavy metal concentrations from migrating into groundwater.

I'm sure their are many problems where two federal regulatory authorities (SMCRA and RCRA) and their state counterparts might regulate a surface coal mine/solid waste landfill operation. However, the legal ability to make deliveries to coal-fired electric utilites and return with CCR waste for permanent internment at the mine of origin is environmentally sound, highly protective, and cost effective for both the coal producer and consumer.

Effort towards this type of solid waste management operation arrangement is likely worthwhile.

Thank you for the opportunity comment on Indiana's CCR draft plan.

Phil Schonhoff, LPG
INTERA, Inc.
812.340.3297