BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	R 2020-019
STANDARDS FOR THE DISPOSAL OF	)	
COAL COMBUSTION RESIDUALS IN	)	(Rulemaking – Water)
SURFACE IMPOUNDMENTS:	)	
PROPOSED NEW 35 ILL. ADM.	)	
CODE 845	)	

NOTICE OF FILING

To: Service List

PLEASE TAKE NOTICE that I have today electronically filed with the Office of the Clerk of the Pollution Control Board Midwest Generation, LLC's Pre-Filed Answers, a copy of which is herewith served upon you.

Dated: September 24, 2020

MIDWEST GENERATION, LLC

By: __/s/Kristen L. Gale _____

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CERTIFICATE OF SERVICE

The undersigned, an attorney, certifies that a true copy of the foregoing Notice of Filing, and Midwest Generation, LLC's Pre-Filed Answers was electronically filed on September 24, 2020 with the following:

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and that copies were sent via e-mail on September 24, 2020 to the parties on the service list.

Dated: September 24, 2020 /s/Kristen L. Gale

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
STANDARDS FOR THE DISPOSAL OF COAL COMBUSTION RESIDUALS IN SURFACE IMPOUNDMENTS: PROPOSED NEW 35 ILL. ADM. CODE 845	)	R 20-19 (Rulemaking – Land)

MIDWEST GENERATION LLC'S PRE-FILED ANSWERS

Midwest Generation, L.L.C. ("Midwest Generation" or "MWG"), by and through its attorneys, Nijman Franzetti, LLP, submits the following Pre-filed Answers on behalf of its witnesses Sharene Shealey, Richard Gnat, and David Nielson in response to Pre-filed Questions submitted by the Illinois Pollution Control Board, the Illinois Environmental Protection Agency ("Illinois EPA"), and the "Environmental Group" (collectively the Environmental Law and Policy Center, Prairie Rivers Network, and Sierra Club).

I. Sharene Shealey's Answer to the Illinois Pollution Control Board's Question

17. On page 15, you state, "[r]emoval and replacement of a competent liner that is not contaminated with CCR constituents adds even more unnecessary costs for retrofitting a CCR surface impoundment without any added benefit or protection. Accordingly, MWG recommends that the Board remove the phrase "including any liners" from 845.770(a)(1) so that existing liners that are not contaminated and in fact may be protective can remain in place for retrofitting." Please comment on whether it would be acceptable to MWG, if the Board were to revise Section 845.770(a)(1) to specify "including any contaminated liners."

Answer: Yes, that proposed modification is acceptable to MWG.

II. Sharene Shealey's Answers to the Environmental Group's Questions

1. On page 3 of your testimony, you state "Since MWG began operating the Stations in 1999, the coal ash ponds have been used only for temporary storage of coal ash until the material is removed from the ponds for beneficial reuse."
   a. Is this statement true about operations prior to MWG's ownership?

Answer: MWG objects to the question to the extent it requests site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public*

Comment of Illinois Attorney General's Office, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site specific questions are not appropriate.). Without waiving the objection, MWG cannot specifically comment about operations before its ownership. Generally, under information and belief, before MWG began operating the stations, the coal combustion residual ("CCR") was routinely removed from the active CCR surface impoundments.

b. Has Lincoln Stone Quarry been used only for temporary storage of CCR?

Answer: MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site specific questions are not appropriate.). MWG also objects to the question because any area that may be disputed as a CCR surface impoundment is outside the scope of this rulemaking. 415 ILCS 5/22.59(j); 8/13/20 Tr., PCB20-19, 100:17-101:1. Without waiving these objections, as stated in footnote 1 of the testimony, the Lincoln Stone Quarry is a monofill landfill which has been operated as a landfill, as well as regulated and permitted by the Illinois EPA as a landfill, for over forty years (Permit No. 1994-241-LFM). S. Shealey Pre-filed Testimony, PCB 20-19, p. 2, n. 1.

c. Has the Former Ash Basin at Powerton been used only for temporary storage of CCR?

Answer: MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3 *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate.). MWG further objects to the question because it is regarding an area subject to active litigation in front of the Illinois Pollution Control Board, *Sierra Club v. Midwest Generation, LLC,* PCB13-15. Without waiving these objections, as stated in footnote 3 of the testimony, the Powerton Former Ash Basin ("Powerton FAB") is an inactive CCR surface impoundment. The most recent placement of ash into the Powerton FAB was more than 40 years ago -- prior to 1980. The Powerton FAB does not have a liner. S. Shealey Pre-filed Testimony, PCB 20-19, p. 3, n. 3.

d. Has the Old Pond at Waukegan been used only for temporary storage of CCR?

Answer: MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3 *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate.). The question is also objectionable because it addresses an area subject to active litigation in front of the Illinois Pollution Control Board, *Sierra Club v. Midwest Generation, LLC,* PCB13-15. MWG further objects to the question because any area that may be disputed as a CCR surface impoundment is outside the scope of this rulemaking and the dispute may be subject to an enforcement action and/or litigation. 415 ILCS 5/22.59(j); 8/13/20 Tr., PCB20-19, 100:17-101:1. 8/13/20 Tr., PCB20-19, 100:17-101:1. Without waiving its objection, there is no "Old Pond" at Waukegan.

e. Has the source of the coal burned at the plants changed over time?

Answer: MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site specific questions are not appropriate). MWG objects to the term "time" as vague and subject to varying interpretations. Without waiving these objections, generally, the current source of the coal used to generate electricity at the coal-fired MWG Stations is Powder River Basin coal and that has not changed since Midwest Generation purchased the plants.

f. Did the coal burned at the plants change over time from high-sulfur coal to lower-sulfur Powder River Basin coal?
   i. If so, at which plants?
   ii. If so, when?
   iii. If so, is CCR generated from high-sulfur coal mixed with CCR generated from low-sulfur coal in any of MWG's CCR surface impoundments?

Answer: See Answer to 1.e.

g. Has MWG installed dry sorbent injection (DSI) on any of its plants?
   i. If so, which ones?
   ii. If so, when?
   iii. If so, is CCR generated after DSI use commenced mixed with CCR generated before DSI use commenced in any of MWG's CCR surface impoundments?

Answer: MWG objects on the basis that the question is not relevant and is beyond the scope of this rulemaking, which addresses coal combustion residuals ("CCR") and CCR surface impoundments.

h. Has MWG installed activated carbon injection on any of its plants?
   i. If so, which ones?
   ii. If so, when?
   iii. If so, is CCR generated after activated carbon injection commenced mixed with CCR generated before activated carbon injection began?

Answer: MWG objects on the basis that the question is not relevant and is beyond the scope of this rulemaking, which addresses coal combustion residuals ("CCR") and CCR surface impoundments.

2. On pages 2 to 3 of your testimony, including in footnote 1, you indicate that IEPA designated sixteen of MWG areas as CCR surface impoundments. On page 4 of your testimony, you state that "MWG completed its installation of new HDPE liners in all nine of its CCR surface impoundments."

a. Did MWG reline Lincoln Stone Quarry?

Answer: See Answer to Question 1.b.

   i. Does Lincoln Stone Quarry have any liner?

Answer: See Answer to Question 1.b.

b. Did MWG reline the Former Ash Basin at Powerton Station?

Answer: See Answer to Question 1.c.

i. Does the Former Ash Basin at Powerton Station have any liner?

Answer: See Answer to Question 1.c.

c. Did MWG reline the Old Pond at Waukegan Station?

Answer: See Answer to Question 1.d.

d. Of the nine CCR surface impoundments that MWG relined, did MWG install compound liners at any of those impoundments? If so, please describe in detail the composition of all components of any such compound liner.

Answer: MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site specific questions are not appropriate.). MWG further objects to the question to the extent that it may be regarding areas subject to active litigation in front of the Illinois Pollution Control Board, *Sierra Club v. Midwest Generation, LLC,* PCB13-15. Without waiving these objections, as stated in the pre-filed testimony, MWG began a systematic relining of its CCR surface impoundments with high-density polyethylene ("HDPE") liners in the early 2000's before there were any regulations or requirements for liners in CCR surface impoundments. MWG installed HDPE liners in its CCR surface impoundments pursuant to construction permits issued by the Illinois EPA. An HDPE liner is the least permeable type of liner, is resistant to chemicals, and the same type of liner used for hazardous waste landfills. *See* S. Shealey Pre-filed Testimony, PCB20-19, pp. 4.

3. On page 2 of your testimony, in footnote 1, you state that Illinois EPA has designated seven areas as CCR surface impoundments that "MWG contends are not CCR surface impoundments as that term is defined in the Act. Six of the areas either do not contain liquid, are not designed to hold an accumulation of CCR and liquid, or do not treat, store or dispose of CCR."

a. What is MWG's basis for contending that the Former Ash Basin at Powerton Station is not a CCR surface impoundment?

Answer: See Answer to Question 1.c.

b. What is MWG's basis for contending that the Lincoln Stone Quarry is not a CCR surface impoundment?

Answer: See Answer to Question 1.b.

c. What is MWG's basis for contending that the remainder of the areas noted are not CCR surface impoundments? Please separately specify the contentions for each such area.

Answer: MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site specific questions are not appropriate.). MWG further objects that to the question to the extent that it may involve areas subject to active litigation in front of the Illinois Pollution Control Board, *Sierra Club v. Midwest Generation, LLC,* PCB13-15. MWG also objects to the

question because any area that may be disputed as a CCR surface impoundment is outside the scope of this rulemaking and the dispute may be subject to an enforcement action and/or litigation. 415 ILCS 5/22.59(j); 8/13/20 Tr., PCB20-19, 100:17-101:1. 8/13/20 Tr., PCB20-19, 100:17-101:1.

d. Is there CCR in any of the seven areas you reference? If so, please identify which areas.

Answer: See Answer to Question 3.c.

e. Are there liquids in any of the seven areas you reference? If so, please identify which.

Answer: See Answer to Question 3.c.

f. Has groundwater monitoring been performed at any of the seven areas you reference?

i. If so, has that monitoring revealed exceedances of proposed Part 845 groundwater protection standards or Part 620 groundwater quality standards? If yes, please state for which of those seven areas such exceedances were found.

Answer: See Answer to Question 3.c.

4. On page 3 of your testimony, you state that the five relevant stations—Joliet 29 Station, Joliet 9 Station, Powerton Station, Waukegan Station, and Will County Station (the "Stations")—are "located in industrial areas"?

a. How do you define "industrial areas"?

Answer: Generally, "industrial areas" are defined as an area with dense industry.

b. Do you know how far the nearest residential dwelling is to each Station?

Answer: MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). MWG further objects to the term "nearest" as vague and subject to varying interpretations. Without waiving these objections, generally, based on information and belief, there may be residences located in or near industrial areas.

c. Do you know the density of residential units within 1 mile of each Station?

Answer: See Answer to Question 4.b.

5. On page 4 of your testimony, you state that "[t]he CCR surface impoundments at the Stations have been subject to multiple federal and state statutes and regulations for decades" and "the Draft Rule is seeking to fine tune regulations for specific areas of power-generating stations."

a. Prior to the "Disposal of Coal Combustion Residuals from Electric Utilities" (80 Fed. Reg. 21,301 (April 17, 2015)), codified at 40 CFR Part 257 ("the Federal CCR Rule"), did any rule explicitly require any specific liner to be installed at CCR surface impoundments in Illinois?

Answer: As stated in the pre-filed testimony, power stations and CCR surface impoundments were subject to regulation under the Illinois Environmental Protection Act and regulations, including Section 12 of the Act, the NPDES permit regulations, and the Part 620 groundwater regulations. While there may not have been a rule with explicit liner requirements before April 17, 2015, the purpose of the testimony was to demonstrate that CCR surface impoundments were not wholly unregulated, but instead subject to multiple environmental and safety regulations and statutes.

b. Did any rule specify closure requirements for all CCR surface impoundments in Illinois?

Answer: See Answer to Question 5.a. Also, based on information and belief, prior to the Federal CCR Rule, CCR surface impoundments were subject to regulation by the Illinois EPA under the NPDES permit program because existing impoundments at an operating power station were included in a power station's NPDES permit. Further, based on information and belief, Illinois EPA has reviewed and approved closure plans and final closure reports for CCR surface impoundments in Illinois. *See* PCB20-19, Pre-filed Testimony of Cynthia Vodopivec, pp. 4-6; PCB 20-19, Pre-filed Testimony of Gary King, pp. 10, 12-14, 16.

c. Did any rule explicitly require groundwater monitoring at or around CCR surface impoundments in Illinois?

Answer: See Answer to Question 5.b. Further, as of at least 2009, the Illinois EPA stated that Sections 4 and 12 of the Act required groundwater monitoring at or around CCR surface impoundments

d. Referring to the nine CCR surface impoundments that MWG does not dispute are "CCR surface impoundments as that term is defined in the Act" (as discussed in your testimony at page 2, footnote 1), has MWG conducted groundwater monitoring at or around those impoundments for decades?

Answer: MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site specific questions are not appropriate.). MWG further objects to the question because it may address areas subject to active litigation in front of the Illinois Pollution Control Board, *Sierra Club v. Midwest Generation, LLC,* PCB13-15. Without waiving its objection, generally, MWG installed groundwater monitoring wells around its CCR surface impoundments in 2010, and since 2010 has conducted groundwater sampling on a quarterly basis. Additionally, in 2015, MWG began conducting groundwater sampling pursuant to the federal CCR rule, 40 CFR 257.90 through 257.94.

e. Has MWG conducted groundwater monitoring at or around those impoundments for more than one decade or ten years?

Answer: See Answer to Question 5.d.

f. Do you know if MWG ever argued that IEPA did not have the authority to require MWG to conduct monitoring of CCR surface impoundments prior to effectiveness of the Federal CCR Rule?

i. If so, when and where?

Answer: MWG objects to the questions because they request site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). MWG further objects that the question is not relevant and beyond the scope of this rulemaking.

6. On page 5 of your testimony, you state "[t]he groundwater at the Stations has always been subject to the groundwater regulations under 35 Ill. Adm. Code 620."

   a. Is it possible to determine ongoing compliance with groundwater regulations without groundwater monitoring? If so, how?

Answer: MWG objects to the term "possible" as vague and subject to varying interpretations. Without waiving its objection, one method to determine the concentrations of constituents in the groundwater is to sample the groundwater.

   b. Would it be difficult or impossible to establishing background by just taking samples of groundwater instead of monitoring?

Answer: MWG objects to the terms "difficult" and "impossible" as vague and subject to varying interpretations. MWG further objects that the question is vague and requests clarification.

7. On page 6 of your testimony, you discuss "disposal location[s] for the excavated CCR.
   a. How many landfills in Illinois have available space?

Answer: MWG objects to the question, because the term "available space" is vague and subject to varying interpretations. Without waiving that objection, MWG has not conducted a formal evaluation of available landfill space or landfill capacity in Illinois.

   b. How much space does each of those landfills have?

Answer: See Answer to Question 7.a.

   c. How many new landfills have been constructed in Illinois in the last 3 years? Of what size?

Answer: MWG has not conducted a formal evaluation of landfills in Illinois.

   d. Do you know how many years of landfill capacity Illinois landfills are predicted to have?

Answer: See Answer to Question 7.a.

      i. If so, is your answer based on no new landfills being constructed and no expansions of existing landfills?

Answer: See Answers to Question 7.a and 7.c.

   e. Do you know if it possible to transport CCR for disposal outside of Illinois?

Answer: MWG objects to the term "possible" as vague and outside the considerations for a rulemaking. Under Section 27 of the Illinois Environmental Protection Act, when promulgating regulations,

the Board must take into account various factors including the character of the area involved, the character of surrounding land uses, zoning classifications, the nature of the existing air quality, or receiving body, and the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution. (415 ILCS 5/27). Without waiving its objection, MWG has not conducted a formal evaluation on the feasibility of moving CCR out of state for disposal, nor the available space in landfills in other States for disposal of the CCR.

8. On page 6 of your testimony you state that closure by removal would, in certain circumstances, have "considerable" impact "because of…the much higher potential for exposure to human and environmental receptors associated with removal."

   a. Exposure to human and environmental receptors can be reduced, correct?

Answer: MWG objects to this question as vague, and requests clarification.

   b. Do you agree that measures including but not limited to covering vehicles transporting CCR, drop distance limits for loading and transfer points, truck wheel washing, and limitations on activity during high winds mitigate exposure to CCR dust during removal? If not, please provide the basis for your answer.

Answer: MWG agrees that there are mitigation measures that may be taken to reduce CCR fugitive dust. In fact, CCR fugitive dust emissions are currently regulated under the Board rules at 35 IAC Part 212 Subpart K, which requires minimization of all fugitive particulate matter emissions using mitigation measures, including those from CCR fugitive dust. Specific fugitive dust minimization measures employed by a power station are dependent on technical feasibility, including the availability of the mitigation measures, the space available at a power station, and any potential infrastructure requirements.

   c. Do you agree that air monitoring helps to determine whether ongoing air pollution controls are effectively limiting air pollution, including dust pollution? If not, please provide the basis for your answer.

Answer: MWG objects to the term "helps" because that term is vague, subject to varying interpretations, and outside the considerations for a rulemaking. Under Section 27 of the Illinois Environmental Protection Act, when promulgating regulations, the Board must take into account various factors including the character of the area involved, the character of surrounding land uses, zoning classifications, the nature of the existing air quality, or receiving body, and the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution. (415 ILCS 5/27). Without waiving its objection, MWG does not agree that air monitoring will significantly assist in determining whether the fugitive dust controls are effective at all times. Because many power stations are in industrial areas that have other industries nearby, with their own truck traffic and operations that create dust, it may not be feasible to distinguish between the fugitive dust emissions from the CCR and the fugitive dust emissions from the other operations.

   d. Do you agree that transportation plans can help mitigate safety concerns associated with transport of CCR? If not, please provide the basis for your answer.

Answer: MWG objects to the term "help" because that term is vague, subject to varying interpretations, and outside the considerations for a rulemaking. Under Section 27 of the Illinois Environmental Protection Act, when promulgating regulations, the Board must take into account various factors including the character of the area involved, the character of surrounding land uses, zoning classifications, the nature of the existing air quality, or receiving body, and the technical feasibility and

economic reasonableness of measuring or reducing the particular type of pollution. (415 ILCS 5/27). Without waiving its objection, Section 845.220(a)(2)(E) of the proposed rule requires a transportation plan for the operation of a CCR surface impoundment and Section 845.740(c)(1)(B) of the proposed rule requires a transportation plan for closure by removal of a CCR surface impoundment.

e. Do you agree that full evaluation of all potential CCR transport methods assists communities and the Agency in evaluating which options are most protective of human health and the environment? If not, please provide the basis for your answer.

Answer: MWG objects to the term "full evaluation" because that term is vague and subject to varying interpretations. Section 845.740(c)(1)(B) requires a transportation plan which identifies transportation methods considered and including various methods to evaluate which options are protective. Illinois EPA also stated that part of its evaluation of the closure alternatives analysis will include a thorough review of the transportation methods. *See* 8/13/20 Tr., PCB20-19, pp. 229:20-230:4.

9. On page 7 of your testimony you state "Any new method of transportation of CCR, where new is determined on a case-by-case basis, from an existing CCR surface impoundment for off-site disposal would likely require new infrastructure."
   a. Would the determination as to whether there is a need for new infrastructure also have to be made on a case-by-case basis?

Answer: As stated in the pre-filed testimony, any new method of transportation of CCR is determined on a case-by-case, and that includes any new infrastructure that may be required. *See* S.Shealey Testimony, PCB20-19, p. 12.

   b. How does coal currently get delivered to Powerton Station?
      i. Is there a rail line or spur on the Powerton Station property?
      ii. Is the Illinois River immediately adjacent to the Powerton Station property?
      iii. Do you know if barges travel on the Illinois River adjacent to Powerton Station?

Answer: MWG objects to the questions because they request site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site specific questions are not appropriate.). MWG further objects to the question because it may address areas subject to active litigation in front of the Illinois Pollution Control Board, *Sierra Club v. Midwest Generation, LLC,* PCB13-15.

Without waiving these objections, the question appears to be based on the premise that the handling of coal and the handling of CCR may be treated similarly. However, not only are coal and CCR physically different, the processes of unloading and loading are also different. Accordingly, it is wrong to assume that the methods used to move coal may also be effectively used to move CCR.

Generally, coal that is delivered to a power station via rail is taken to a building or structure with equipment specifically designed to unload coal from railcars and to control fugitive emissions from the unloading process. Coal is emptied from railcars into specifically designed equipment and moved via a conveyer belt system that directs the coal to the coal pile (collectively the "coal handling equipment"). The coal handling equipment at a power station is permanent infrastructure, meaning that it is secured in place. It is not designed or constructed to be moved to other areas of a power station.

Generally, at a power station, there is no infrastructure or material handling systems designed or installed to move CCR from a CCR surface impoundment to any other location at a power station, including between an existing rail line and the CCR surface impoundments. Moreover, even without a specially built CCR surface impoundment material handling system, moving CCR from a CCR surface impoundment to a rail car would require infrastructure to physically transfer the CCR from a truck to a rail car. Further, the building of such infrastructure would likely require additional permitting by Illinois EPA and possibly local agencies.

As for the potential to use barges to move CCR from a CCR surface impoundment at a power station, even if a power station is located near a water body capable of supporting barge traffic, that does not mean that the power station has a port or dock capable of supporting barge traffic, nor does it mean that the power station has infrastructure to move CCR from a CCR surface impoundment to a barge dock. Under information and belief, not all power stations have a dock or port capable of supporting barge traffic. If there is not a port or dock at the power station, the building of such infrastructure would likely require additional permitting from various federal, state, and possibly local agencies. If the power station has a port or dock for coal handling, similar to the infrastructure for rail, that infrastructure is specifically designed to move coal, and is permanent and likely cannot be converted for an alternative use. Also, generally, there is no similar infrastructure or conveyer belt system between any available port or dock and the CCR surface impoundment, nor is there a structure to move CCR from a truck to a barge. Moreover, depending on the design of the power station, the dock or port may be located on the opposite side of the power station from the surface impoundments, which could make it infeasible to transfer the CCR to a barge.

Additionally, as stated in the pre-filed testimony, transporting via barge or rail would likely increase fugitive CCR emissions because it would increase the number of CCR related material transfer points. S. Shealey Pre-filed Testimony, PCB20-19, p. 12. Removing CCR from a CCR surface impoundment and loading into trucks is two on-site transfer points – (1) removal of the CCR from the CCR surface impoundment and (2) placement of that CCR into a truck. If the on-site disposition of the CCR is rail car or barge for transport off-site, CCR would have to be removed from the truck and likely stockpiled (creating a new CCR fugitive dust source) and then picked up again and placed in a rail car or barge, adding at least three additional transfer points and a stockpile – (1) removal of the CCR from the CCR surface impoundment, (2) placement of that CCR into a truck, (3) placement of CCR into a stockpile, (4) removal of CCR from a stockpile, and (5) placement of CCR in a rail or barge. This does not include the potential increase in transfer points at the final disposition location. The increase in transfer points increases the potential emissions of CCR fugitive dust and for accidental spills as the material is transferred.

The closure alternatives analysis required in Section 845.710 includes consideration of all of these factors.

c. How does coal currently get delivered to Waukegan Station?
   i. Is there a rail line or spur on the Waukegan Station property?

Answer: See Answer to Question 9.b.

d. How does coal currently get delivered to Will County Station?
   i. Is there a rail line or spur on the Will County Station property?
   ii. Is the Des Plaines River immediately adjacent to the Will County Station property?
   iii. Is the Chicago Sanitary and Ship Canal immediately adjacent to the Will County Station property?
   iv. Do you know if barges travel on the Des Plaines River or Chicago Sanitary and Ship Canal adjacent to Will County Station?

Answer: See Answer to Question 9.b.

e. How did coal formerly get delivered to Joliet 9 Station?
   i. Is there a rail line or spur on the Joliet 9 Station property?
   ii. Is the Des Plaines River immediately adjacent to the Joliet 9 Station property?
   iii. Do you know if barges travel on the Des Plaines River adjacent to Joliet 9 Station?

Answer: See Answer to Question 9.b.

f. How did coal formerly get delivered to Joliet 29 Station?
   i. Is there a rail line or spur on the Joliet 29 Station property?
   ii. Is the Des Plaines River immediately adjacent to the Joliet 29 Station property?
   iii. Do you know if barges travel on the Des Plaines River adjacent to the Joliet 29 Station property?

Answer: See Answer to Question 9.b.

10. On page 7 of your testimony you state, in reference to moving material by methods such as barge or train, that "depending on the method, could increase risks to the environment."

a. What is the basis for your opinion that the barge method of moving material "could increase risks to the environment?"

Answer: See Answer to Question 9.b.

b. What is the basis for your opinion that the train method of moving material "could increase risks to the environment?"

Answer: See Answer to Question 9.b.

11. On page 7, you state that "Without new infrastructure, transporting ash via barge or rail would increase fugitive CCR emissions from material handling by increasing the number of transfer points."

a. Is this based on the premise of no new infrastructure being installed for handling CCR?

Answer: See Answer to Question 9.b.

b. If new infrastructure is installed, could an increase in fugitive emissions from CCR handling be avoided?

Answer: See Answer to Question 9.b.

c. If new infrastructure is not installed, do you contend that controls could not be implemented to limit fugitive emissions from existing infrastructure? If so, please provide the basis for that contention.

Answer: See Answer to Question 9.b.

12. On page 7 of your testimony, you discuss "considerations that are critical in Environmental Justice communities."

a. What is the basis of your statement that "these types of considerations are critical in Environmental Justice communities"?

Answer: As stated in the testimony, considerations of how a CCR surface impoundment is closed and how CCR is moved from a power station are critical in Environmental Justice communities because how the CCR is moved could directly affect the daily lives of the people who live near a power station. *See* S. Shealey Prefiled Testimony, PCB 20-19, p. 7.

b. Have you asked members of Environmental Justice communities whether such considerations are "critical" to them? If so, please describe with whom you spoke and which Environmental Justice community they belong to.

Answer: MWG objects to the question to the extent it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). MWG further objects to the question to the extent it requests personal information of people who are not parties to this rulemaking. Generally, MWG has been and continues to be in contact with residents who live near its power stations, and responds to comments or questions by residents that live near its power stations to the extent it is able.

c. Is Lincoln Stone Quarry located in an Environmental Justice community?

Answer: See Answers to Question 12.a. and 12.b.

d. Did MWG host a meeting to present the Assessment of Corrective Measures for Lincoln Stone Quarry to the public on August 27, 2019?
   i. Did you attend that August 27 meeting?
   ii. Did MWG follow up with answers to members of the public who asked questions that MWG was not able to answer at that meeting?

Answer: See Answers to Question 12.a. and 12.b.

e. Are you familiar with the letter that William Naglosky sent to Jennifer Cassel on Sept. 6, 2019 (Attachment 1) in response to a letter Jennifer Cassel sent on Aug. 23, 2019 (Attachment 2)?
   i. Mr. Naglosky stated in that letter that "MWG is reviewing community input received at the August 27 meeting."
   ii. Were you involved in reviewing community input received at that meeting?
   iii. What did "reviewing community input received the August 27 meeting" entail?
   iv. Did MWG respond to any community input after that meeting?
      1. If so, what community input did MWG respond to?
      2. How did MWG respond?
      3. To whom did MWG respond?
      4. When did MWG respond?

Answer: See Answers to Question 12.a. and 12.b.

f. Jennifer Cassel sent two follow up letters to Mr. Naglosky's letter (Attachments 3 and 4). Are you familiar with those letters?
   i. Did MWG respond to either one of those letters?
   ii. One of those letters contained questions asked at the August 27th meeting and repeated in that letter (Attachment 4). Did MWG ever communicate answers to those questions to any member of the community?
      1. If so, what question did MWG respond to?
      2. How did MWG respond?
      3. To whom did MWG respond?
      4. When did MWG respond?

Answer: See Answers to Question 12.a. and 12.b.

g. NRG spokeswoman Pat Hammond, stated to the Herald News that "the company is 'committed' to holding another meeting" as reported in an article published on Sept. 12, 2019 (Attachment 5).
   i. Did MWG ever hold "another meeting" as Pat Hammond referenced in this article?

Answer: See Answers to Question 12.a. and 12.b.

h. Did NRG offer Attachment 6 as a public presentation at that meeting?
   i. Did MWG make that presentation available on its Federal CCR website after the meeting?
   ii. Does that presentation mention anywhere that LSQ has caused exceedances of Part 620 IL groundwater standards?
   iii. Does that presentation mention anywhere that without pumping, groundwater exceeding Part 620 standards would travel outside the property lines of LSQ?
   iv. If LSQ were to close in place, does modeling indicate when groundwater standards would be achieved?
   v. If LSQ were to close in place, does modeling indicate when pumping could be discontinued?
   vi. Does that presentation state anywhere that there are benefits to removal?
      1. If so, what benefits are mentioned?
      2. If so, where in the presentation are those benefits mentioned?

Answer: See Answers to Question 12.a. and 12.b.

13. On page 9 of your testimony, you state: "While the cost of financial assurance will vary across impoundments based on size and risk, a general rule of thumb is that each $1,000 of financial assurance costs $10."
   a. What is the basis for your "general rule of thumb?

Answer: MWG conducted discussions with various insurance providers concerning the estimated cost of financial assurance.

   b. Does MWG currently have any financial assurances covering any of its CCR surface impoundments? If yes, what are the costs of those financial assurances and what do they cover?

Answer: MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate).

14. On page 9 of your testimony, you state: "While MWG does not object to financial assurance, the increased cost must be properly accounted for in an analysis of the economic impact to the people of Illinois."

    a. What does "properly accounted for in an analysis of the economic impact to the people of Illinois" mean?

Answer: As stated in the pre-filed testimony, the purpose of that section was to describe to the Board the additional estimated costs to implement the draft rule, of which financial assurance is one such additional cost. S. Shealey Pre-filed Testimony, PCB 20-19, p. 7-8. Accordingly, part of the costs to implement the rule are the annual costs to maintain the financial assurance required by the draft rule.

    b. Do you offer a methodology on how to "properly account" the cost of financial assurance and its impact on the people of Illinois? If yes, how did you arrive at that methodology?

Answer: Yes, the general rule of thumb for the costs of financial assurance is that each $1,000 of financial assurance costs $10.

15. On page 9 of your testimony, you state "[a] leachate collection system placed above the liner of a CCR surface impoundment, as proposed in the Draft Rule, serves no functional purpose."

    a. Are you familiar with the purpose that IEPA has articulated for such a leachate collection system?

Answer: MWG heard Illinois EPA's testimony at the hearing on August 12, 2020. *See* 8/12/20 Tr., PCB20-19, pp. 135-160.

    b. Would a leachate collection system placed above the composite liner minimize the hydraulic head on the composite liner? If not, why not?

Answer: As stated in the testimony of David Nielson, U.S.EPA's risk assessment did not identify any damage cases for composite-lined CCR surface impoundments. D. Nielson Pre-filed Testimony, PCB 20-19, p. 5. Mr. Nielson further testified that collection and removal of leachate from a CCR surface impoundment is "not an industry standard, because it is not practical given the inherent operation of a surface impoundment." D. Nielson Pre-filed Testimony, PCB 20-19, p. 6. Please also see D. Nielson's answers to the questions posed by the Illinois EPA.

    c. Would minimizing the head on the liner system "decrease the potential for the movement of fluids through the liner"? If not, why not?

Answer: See Answer to Question 15.b.

    d. Would having a filterable layer placed above the leachate collection system reduce the amount of leachate that would reach the leachate collection system? If not, why not?

Answer: See Answer to Question 15.b.

16. On page 12 of your testimony, you state: "Accordingly, to allow for the development of a scientifically sound groundwater monitoring program and allow for preparation of a complete operating permit application, operating permits should be due fifteen months after the effective date of the Draft Rule."
    a. Does MWG currently conduct groundwater monitoring at or near any of its CCR surface impoundments?
        i. If yes, which impoundments have existing groundwater monitoring and which impoundments do not?
        ii. If yes, could existing groundwater monitoring be used to comply with the rule's requirements at all of MWG's CCR surface impoundments? Why not all? At which ones could existing groundwater monitoring not be used to comply with the rule's requirements at all of MWG's CCR surface impoundments?
        iii. If not all, could existing groundwater monitoring be used to comply with the rule's requirements at some of MWG's CCR surface impoundments?
        iv. If yes, is existing groundwater monitoring conducted according to a "scientifically sound groundwater monitoring program?"

Answer: See Answer to Question 5.d.

III. Sharene Shealey's Answers to the Illinois EPA's Questions

1) On Page 3 of your testimony you state that Midwest Generation (MWG) stores CCR in surface impoundments only temporarily before removal for off-site beneficial use.

    a) Does MWG have to remove ponded liquids from above the CCR prior to removing the CCR?

ANSWER: When CCR is removed from a CCR surface impoundment, water is drained from the CCR surface impoundment before beginning to remove the CCR.

    b) Prior to removing CCR does MWG have to remove free liquids from within the CCR?

ANSWER: See Answer to Question 1.a.

    c) How is the removal of free liquids within the CCR accomplished?

ANSWER: Generally, water is drained from the impoundment by gravity flow. Depending on the size of the impoundment, CCR can be moved within the impoundment to allow for additional drainage of water, and if necessary, pumps are used to remove the water that drains from the CCR.

    d) The Agency acknowledges that the time required would vary based on multiple factors, but based on your experience, what is the time range typically required to pump out ponded liquids and remove free liquids from within the CCR pore space at MWG's fleet of CCR surface impoundments? Please discuss both smaller and larger impoundments.

ANSWER: MWG objects to the question to the extent it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). Without waiving its

objection, generally, the approximate time required to drain the water from the CCR surface impoundment sufficient to remove the CCR varies significantly. Typically, draining water from the CCR begins a couple of weeks before removal of the CCR begins, and continues until the CCR surface impoundment is sufficiently empty because as the CCR is excavated, water is continuously draining from the CCR in the impoundment. The length of time to remove the CCR and water depends upon the size of the impoundment, the amounts of water and CCR to be removed (which could be less than all of either water or CCR contained within the impoundment), and also the amount of precipitation that occurs during the removal process. A CCR surface impoundment removal project generally takes approximately 6 to 8 weeks to remove the water and enough CCR to allow for operation for a smaller impoundment, and for a larger impoundment, generally takes approximately 3 to 6 months. None of MWG's active CCR surface impoundments are over 40 acres.

e) The Agency acknowledges that the time required would vary based on multiple factors, but based on your experience, what is the time range typically that has been required to remove CCR from the CCR surface impoundments at MWG's fleet of CCR surface impoundments? Please discuss both smaller and larger impoundments.

ANSWER: See Answer to Question 1.d.

f) How often is the water removed from each CCR surface impoundment at MWG's fleet of CCR surface impoundments for the purpose of removal of CCR from the impoundments? Please discuss both smaller and larger impoundments.

ANSWER: MWG objects to the question to the extent it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). Without waiving its objection, generally, the frequency of removal of CCR and water from a CCR surface impoundment depends upon the size of the CCR surface impoundment and the amount of CCR directed to the CCR surface impoundment. Depending on these factors, water and CCR may be removed from a CCR surface impoundment as frequently as annually for some impoundments, and up to every 8 eight years between removal events in others.

g) When the free liquids have been removed and excavation has begun, do precipitation events ever occur requiring the removal of additional liquids in order to complete the removal of CCR at the CCR surface impoundments operated by MWG?

ANSWER: MWG objects to the question to the extent it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). Without waiving its objections, generally, precipitation events can occur during removal operations and could require additional liquids to be drained. See also Answer to Question 1.d.

h) Does MWG consider the dewatering of CCR surface impoundments, as is its practice at most of its CCR surface impoundments, to be overly burdensome?

ANSWER: Generally, MWG's current practice of dewatering and removing CCR is practicable and reasonable.

i) Does MWG consider the dewatering of CCR surface impoundments, as is its practice at most of its CCR surface impoundments, to be overly protective of groundwater?

ANSWER: Generally, MWG's current practice of dewatering and removing CCR is protective of groundwater. Additionally, there are other CCR handling practices, up to and including leaving CCR in-place with an engineered final cover system, that may be equally protective of groundwater.

2) On Page 3 of your testimony, you state that MWG has lined their CCR surface impoundments with "poz-o-pac" since the late 1970's. According to a US Department of Transportation article https://www.fhwa.dot.gov/publications/research/infrastructure/pavements/97148/020.cfm poz-o-pac was a patented formulation until its patents expired in the early 1970's.

a) Do you know if the "poz-o-pac" materials used in the impoundments met the patented formula when installed?

ANSWER: MWG objects to the question to the extent it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). MWG further objects that the question is not relevant and beyond the scope of this rulemaking. Without waiving its objections, MWG does not have any documents indicating whether the poz-o-pac met the patented formula.

b) Poz-o-pac was used and evaluated as used with road construction projects. Is MWG aware of any studies suggesting poz-o-pac is an appropriate material for lining surface impoundments?

ANSWER: MWG objects to the question to the extent it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). MWG further objects that the question is not relevant and beyond the scope of this rulemaking. MWG also objects to the question to the extent it suggests that there were any regulations, rules or statutes requiring a specific type of liner for CCR surface impoundments when the poz-o-pac was installed in the late 1970's. Without waiving its objections, MWG is not aware of any studies from the late 1970's when the poz-o-pac was installed.

IV. Richard Gnat's Answers to the Illinois Pollution Control Board's Questions

14. On page 2, you note that the Agency correctly defines a "landfill containing CCR" as a "CCR landfill" as defined in the Federal Coal Combustion Residual Rule (Federal CCR Rule) in 40 CFR 257.53. Please clarify if you are referring to the Agency's proposal. If so, identify the specific section of the rule where the term "CCR landfill" is defined.

Answer: The term CCR landfill is not formally defined within the proposed draft rule and I do not believe there is a need to do so. The Illinois EPA provided clarity on this issue on pages

35 and 36 of their answers to pre-filed questions dated August 3, 2020 where Illinois EPA clearly states that it believes a landfill containing CCR has the same meaning as a CCR landfill in the federal CCR Rule Part 257. These Illinois EPA answers were what I was referring to in my pre-filed testimony.

15. On pages 12-15 and 18, you recommend the proposed rules should allow for additional time for confirmation resampling and alternative source demonstration. Please clarify whether your recommendations for additional time allowance are intended to be incorporated within the proposed rule without reverting to a two-tiered monitoring program.

Answer: Yes, while I believe the two-tiered approach is the better approach, I also believe that the additional time can be incorporated within the proposed rule without reverting to a two-tiered monitoring program. The purpose of my testimony was to demonstrate that the proposed single tier monitoring approach in draft Part 845 is in and of-itself far more stringent than the two tiered approach used in the federal CCR Rule, particularly as it relates to timeframes and availability of time to reliably identify an actual release from a CCR surface impoundment. Because the draft Part 845 is so much more stringent, there is significant latitude for developing longer answer timeframes (e.g., for the ASD) and still be overall more stringent than the federal CCR Rule. I would suggest that the deadlines to conduct an ASD or initiate corrective action may be doubled, and still be significantly more stringent than Part 257.

16. On page 13, you state, "the Draft Rule establishes a more rigid and unnecessarily shorter in that quarterly monitoring is required (as opposed to semi-annual)".

    a. Please explain why you believe that quarterly monitoring frequency is unnecessarily shorter.

Answer: The referenced discussion was comparing monitoring requirements under the federal CCR Rule which provides for semi-annual groundwater monitoring once the detection monitoring program is initiated (i.e., after completion of background sampling requirements). The proposed draft Part 845 does not allow for semi-annual monitoring as it stipulates a quarterly requirement during this phase. This is just another example of how the draft Part 845 is more stringent than the federal CCR Rule.

    b. Comment on whether the quarterly monitoring frequency is routinely required under other Board rules, such as the nonhazardous landfill regulations (35 Ill. Adm. Code 811.319) cited in your testimony on page 14.

Answer: The groundwater monitoring program outlined under Part 811.319 for solid waste landfills is a standard two-tiered monitoring approach (similar to that defined in federal 40 CFR 257.90-257.96) which facilitates reducing quarterly sampling frequencies to semi-annual as well as facilitating development of streamlined/focused analytical parameters. It is specifically some of these features that I am suggesting to incorporate into the current proposed Part 845 yet understanding that Illinois EPA intends to maintain the overall single-tier monitoring approach.

V. Richard Gnat's Answers to Illinois EPA's Questions

1. On page 20 of your testimony, you state that "the definition and concept of 'free liquids' as only liquid waste has been consistent over time" and "is always used to refer to the characteristic of the waste stream itself."
   a. Wouldn't precipitation water percolating through a landfill or surface impoundment constitute or form leachate?

Answer: Yes, precipitation water percolating through a landfill or surface impoundment can form a leachate.

   b. Wouldn't leachate be considered a free liquid?

Answer: The term "free liquid" as defined in the examples given in my testimony is part of the characteristic of the waste which includes the leachate, because if the ash was removed from the impoundment for off-site landfill disposal, the material would need to be dried/drained of free liquid sufficiently for transport and disposal.

   c. Can CCR be removed in a saturated or nearly saturated condition?

Answer: Saturated or nearly saturated CCR may be removed from an impoundment, depending on the availability of equipment and the destination of the saturated CCR. However, generally, any landfill disposal of CCR and beneficial use of CCR requires removal of the water within the CCR. Further, if saturated, destinations such as temporary storage piles before transport and transport vehicles would have to manage any release of liquids from the CCR material.

   d. Would CCR need to dry out (such as to remove free liquid) before effectively removing it?

Answer: MWG objects to the term "effectively" as vague and subject to varying interpretations. Without waiving the objection, there are multiple methods to remove CCR from a surface impoundment, both saturated and dry. However, as noted in the answer to Question 1.c. above, removing saturated material is a far more complex undertaking

2. You testify that 180 days to establish background groundwater quality will not provide representative data.
   a. How long does Part 257 allow for new and lateral expansions of CCR surface impoundments to collect background data?

Answer: 40 CFR 257.94(b) states that new and lateral expansions of CCR surface impoundments must collect eight independent samples for each background well "during the first six months of sampling." Because the new or lateral expansion is a planned event, the owner/operator can plan ahead of time and conduct other investigations, including any potential pre-construction investigations to assess the condition of the property for the potential of use as a new CCR surface impoundment or expansion. Further, if it is an expansion, the facility would likely have an established 40 CFR Part 257 monitoring program in place for the facility and

surrounding area that would provide additional information on groundwater quality

b. Has Part 257 required existing surface impoundments to collect data since approximately 2016?

Answer: Section 257.94(b) states that existing CCR surface impoundments must conduct a minimum of eight rounds of background data by October 17, 2017. Part 257 became effective October 19, 2015 which provided for over two years to collect eight rounds of groundwater data to establish background. This facilitates quarterly sampling intervals to achieve this minimum monitoring requirement and to account for seasonal variation as well as sample "outliers."

c. Does Part 845 prohibit the use of existing groundwater data for background calculations?

Answer: Part 845 allows the use of existing groundwater data for background calculations. Further, any existing CCR surface impoundment that is regulated under the federal CCR Rule will use the benefit of the background data set already established. However, the proposed Part 845, appears to expand the interpretation of the definition of CCR surface impoundment to include units that are not currently regulated under the federal CCR Rule. The units that are not federal CCR surface impoundments may not have an existing groundwater monitoring system in place would be limited to the 180 days for background development. As stated in my pre-filed testimony, the 180 days limit for background data development, will potentially lead to a non-representative initial background database. *See* R. Gnat Pre-filed Testimony, R20-19, pp. 10-12. For the existing CCR surface impoundments that are not federal CCR surface impoundments, the proposed Draft Part 845 can be modified to mimic the federal CCR Rule in terms of time allotment for background data generation.

3. Are you familiar with 35 Ill. Adm. Code Part 620?

Answer: Yes.

a. Are there numerical GWPS as proposed in Part 845 similar to the numerical GWQS in Part 620?

Answer: Yes.

b. Does Part 620 contain a set of rules regarding how a corrective action must be completed?

Answer: No, Part 620 does not have specific rules on how a corrective action must be completed. However, Section 620.450 states that an alternative groundwater standard may be established through a groundwater management zone ("GMZ"), which includes a requirement for a corrective action. 35 Ill. Adm. Code 620.450. A GMZ may be used in conjunction with corrective actions conducted as part of the Illinois Risk Based Cleanup Objectives, in the Site Remediation Program (35 Ill. Adm. Code Part 740) and the Tiered Approach to Corrective Action Objectives (35 Ill. Adm. Code Part 742), which contain rules on how corrective action is to be conducted and completed.

4. Does Part 845 contain both a set of GWPS and a set of rules regarding how a corrective action must be completed?

   Answer: Yes.

   a. Won't a specific set of rules governing how corrective action must be completed give owners and operators of CCR surface impoundments regulatory certainty as to the requirements they must meet?

Answer: Whether an owner or operator has certainty under a specific set of rules depends upon the final rule. If the final rule is too onerous, impractical, or technically infeasible, then compliance with the specific set of rules could become unnecessarily difficult, creating significant uncertainty on how to continue operation. As described in my testimony, certain provisions of the proposed CCR rule appear to be unrealistic and/or technically infeasible resulting in uncertainty as to how proper compliance will be met. *See* R. Gnat Pre-filed Testimony, R20-19, pp. 10-15.

5. You testify that the timeline from detection to initiation of assessment of corrective measures as proposed in Part 845 in not reasonable.
   a. How long after a confirmed exceedance of an Appendix IV GWPS does Part 257 allow for an owner or operator make an alternative source demonstration?

Answer: Under Section 257.95(g)(3)(ii) of the federal CCR rule, if there is a confirmed exceedance of an Appendix IV groundwater protection standard ("GWPS"), an owner/operator may conduct an alternative source demonstration within 90 days of confirmation. However, as discussed in my pre-filed testimony, the timeline for detections of a confirmed exceedance in Part 257 does not begin after detection of a confirmed exceedance of an Appendix IV GWPS. Instead, in Part 257, there is already an approximate 270 days of additional data collection and evaluation, including detection monitoring under Section 257.94. The draft Part 845 as drafted has eliminated additional data collection and evaluation under Part 257.

The purpose of my testimony is to describe to individuals who are not tasked to manage and interpret large environmental data sets how often it is difficult, even impossible, to explain every small blip or anomaly in the data, including a single detection occurrence. Instead, I suggest that additional time be added to allow for a broader interpretative view of groundwater data, particularly when there are large data sets. For example, consider having 12 years of quarterly monitoring data for numerous monitoring wells with each sampling event having 21 data points per well. In year 12, there is a detection of vanadium in one well, which has never occurred before in this well, much less in any of the other wells. The well is quickly resampled and it is still detected. There are not any other constituents, including the primary expected suite of CCR indicators[1] that would suggest that there may be a release from the regulated unit. In my experience, when there is 12 years of quarterly sampling data without any detections and the primary expected suite of CCR indicators are not detected at statistically significant levels or showing increasing trends, two hits of one constituent in one quarter with nothing else should not require any immediate corrective action. Instead, it requires observation via the next round of quarterly sampling to confirm it was merely an anomaly, or whether there is actually a release from a CCR surface impoundment.

[1] I consider the primary expected suite of CCR indicators to be Appendix III parameters from the Federal CCR Rule.

However, that type of larger interpretive view is not available in the existing draft regulation. In the proposed rule, as drafted, an owner/operator has 60 days from the date of detection of one constituent to complete and submit an ASD that the Illinois EPA agrees with or 90 days to initiate an assessment of corrective measures, regardless of the constituent or its potential to be an anomaly. During that time additional wells also need to be installed to address the nature and extent definition requirements of the draft proposed rule. The current rule as drafted gives no space or consideration for aberrations or unexplained inconsistences, which in my opinion, can occur in the environment. This flaw in the draft rule is further demonstrated by continuing with my example above. Following a detection of vanadium in one well in one quarter, vanadium is not detected in the well in the next two quarterly rounds of sampling and there are no other detections of constituents in the well. However, by that time, an owner/operator has already conducted an ASD, installed additional wells for nature and extent evaluations and/or initiated a corrective action, even though the constituent that initiated all of the activity is no longer present. In my opinion, that does not make any sense. Based upon my experience, the rule should allow for additional time to better understand the groundwater and the constituents that may, or may not be, detected. *See* R. Gnat Pre-filed Testimony, R20-19, pp. 12-15.

b. How long after a confirmed exceedance of an Appendix IV GWPS does Part 257 allow for an owner or operator to begin an assessment of corrective measures?

Answer: Under Section 257.95(g)(3)(i) of the federal CCR rule, if there is a confirmed exceedance of an Appendix IV groundwater protection standard ("GWPS"), an owner/operator may begin an assessment of corrective measures within 90 days. However, as in my Answer to Question 5.a., limiting the timeframe to only the Assessment Monitoring under Section 257.95, ignores the purpose of the discussion in my pre-filed testimony that the timeline from detection to initiation of assessment of correction measures in the proposed Illinois CCR rule is not reasonable. The federal two-tiered groundwater monitoring program (detection monitoring and assessment monitoring with conformation sampling events with each of those tiers), provides up to a cumulative 360 days of additional data gathering and interpretation to determine the need for triggering an assessment of corrective measures. By eliminating two-tiered groundwater monitoring program, the proposed Part 845 reduces that entire decision-making process to 90 days based on one sample/resample event. As I stated in my testimony, in my opinion, this is unreasonable. *See* R. Gnat Pre-filed Testimony, R20-19, pp. 12-15.

c. Does USEPA review or provide any evaluation of either the alternative source demonstration or the assessment of corrective measures?

Answer: No, however, the ASD is included as an appendix within in the annual report and posted on the owner/operator website for review.

d. Does Part 845.650(d)(4)(A) require that the Agency provide a written Answer, which either concurs or does not concur with the alternative source demonstration?

Answer: Yes. However, the purpose of my testimony is that the proposed single tier monitoring approach in draft Part 845 is in and of-itself more stringent than the two-tiered approach used in the federal CCR Rule and that it does not provide sufficient time to collect data and conduct

an analysis. Because the single tiered monitoring program is significantly shorter than the federal two-tiered program, there is a great deal of time to allow latitude for developing longer timeframes (e.g., for the ASD) and still be more stringent than the federal CCR Rule.

VI. Richard Gnat's Answers to Environmental Group's Questions

1. At page 2 of your testimony, you say that "Illinois EPA correctly defines a 'landfill containing CCR' as a 'CCR landfill' defined in the Federal Coal Combustion Residual Rule (Federal CCR Rule) in 40 CFR 257.53."

   a. Does any definition of landfill appear in Propose Part 845?

Answer: No.

   b. Would it add clarity to Part 845 to include a definition of landfill?

Answer: There is no need for a definition. The Illinois EPA provided clarity on this issue on pages 35 and 36 of their answers to pre-filed questions dated August 3, 2020 where Illinois EPA states that a landfill containing CCR has the same meaning as a CCR landfill in the federal CCR Rule Part 257.

2. At page 3 of your testimony, you mention the need for "technically sound Alternate Source Demonstrations."

   a. Have you reviewed Alternate Source Demonstrations ("ASDs") submitted under the Federal CCR Rule?

Answer: I have conducted and reviewed ASDs under the federal CCR Rule.

   b. Have you conducted Alternate Source Demonstrations under the Federal CCR Rule for MWG?

Answer: See Answer to Question 2.a.

   c. Have you conducted Alternate Source Demonstrations for MWG's Powerton Station?

Answer: MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. See 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and the Board should limit questions about specific sites). Without waiving the objection, see Answer to Question 2.a.

   d. Did you conduct the March 25, 2019 ASD for MWG's Powerton Station?

Answer: See Answer to question 2.c.

e. Was that ASD attached as Appendix B to the 2019 Annual Groundwater Monitoring and Corrective Action Report for Powerton Station's Ash By-Pass Basin and Ash Surge Basin (Attachment 1)?

Answer: See Answer to question 2.c.

f. Were you involved in the preparation of the 2019 Annual Groundwater Monitoring and Corrective Action Report for Powerton Station's Ash By-Pass Basin and Ash Surge Basin? If so, how?

Answer: See Answer to question 2.c. Without waiving the objection, generally, I have been involved in preparing annual groundwater reports under the federal CCR Rule.

g. What did you conclude in that ASD regarding arsenic, barium, molybdenum, selenium and thallium concentrations detected above the Groundwater Protection Standards at Powerton?

Answer: See my Answer to question 2.c. and 2.f.

h. Did you include any further description of what the potential alternate source was?

Answer: See my Answer to Question 2.c above. Additionally, without waiving any objection, generally under the federal CCR rule, identifying a specific alternate source of impacts is not part of the ASD requirements.

i. Did your analysis suggest that the source was "another potential historical source in the vicinity of the ash ponds" (2019 Annual Report p. 5)?

Answer: See Answer to Question 2.h.

j. Why did you include that specific language to identify the possible alternate source?

Answer: See Answer to Question 2.h.

k. What did you mean by "in the vicinity of the ash ponds"? Would that suggest that the source was on the Powerton Station Property?

Answer: See Answer to Question 2.h.

l. Does the annual report discuss wells MW-15 and MW-17?

Answer: See Answer to Question 2.c. above.

m. Can you describe what those wells are completed in?

Answer: Please see Answer to Question 2.c. above.

3. At page 4 of your testimony, you state discuss (*sic*) Section 845.610(b)(3)(D) and its requirement to submit groundwater monitoring data and analysis. You state "If 'completion of sampling' means the date of sample collection, then the 60-day clock for analysis of the data starts running even before any actual 'sampling data' to be analyzed has been received from the laboratory. Such an interpretation would afford a very limited time to review and analyze the data upon receipt as it can typically take 14 to 21 days to receive the laboratory analytical results, depending upon the type of analytical work being performed (receipt of radium data generally takes on the order of 30 days or more)."

a. If it takes 14 to 21 days to receive the laboratory analysis, wouldn't that leave 39 to 46 days to send the samples to the lab and receive, review and analyze the lab results?

Answer: MWG objects to the question as vague and confusing, because it discusses receiving laboratory analysis but then discusses additional days to send the samples back to the lab. Without waiving the objection, and assuming that the question is asking whether that leaves 39 to 46 days to receive, review, and analyze the data (the samples were already previously sent to the laboratory), the events identified in the question do not include potentially having to coordinate and schedule a resampling event which can take two to three weeks which will then be followed by another 14 to 21 days of time prior to receiving that data.

Additionally, the purpose of my testimony was that I believe the term "completion of sampling" is vague and I suggest language consistent with the federal CCR Rule to be used in this section for clarity.

b. How many days does it take to send the samples to the lab?

Answer: Samples are generally sent to the laboratory between the date the sample is collected to several days after collection but within the storage time limit for a sample.

c. Assuming it takes two to four days to send groundwater samples to the laboratory, does that still leave 35 to 42 days to review and analyze the lab results?

Answer: The 35 to 42-day timeframe described in the question does not account for potentially having to coordinate and schedule a resampling event which will generally take 14-21 days to schedule the sampling crew, collect that samples and send them off to the lab for analysis. Analysis of the collected resamples will likely take an additional 14 to 21 days of time to receive the resample data. Accordingly, the additional time to schedule and conduct the immediate resample, and receive the analytical data is 28 to 44 days. In effect, an owner/operator would likely be receiving the final data from the analytical laboratory at the time the reporting is due.

d. Why isn't 35 to 42 days sufficient to review and analyze the lab results?

Answer: See Answers to Questions 3.a. and 3.c.

e. Assuming it is radium data, doesn't that still leave 26 to 28 days to review and analyze the lab results?

Answer: See Answers to Questions 3.a. and 3.c. above. Additionally, because receipt of the radium data generally takes longer than as described in the Answers to Question 3.a. and 3.c., collection of any resample of radium would likely not occur within the deadline required in the proposed Part 257.

f. Why isn't 26-28 days sufficient to review and analyze radium results?

Answer: See Answers to questions 3.a., 3.c. and 3.e.

g. Is it possible to specify required turn-around times in analytical laboratory contracts? If not, why not?

Answer: MWG objects to the term "possible" as vague, subject to varying interpretations, and outside the considerations for a rule. Under Section 27 of the Illinois Environmental Protection Act, the Board must take into account various factors including the character of the area involved, the character of surrounding land uses, zoning classifications, the nature of the existing air quality, or receiving body, and the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution. (415 ILCS 5/27). Without waiving the objection, yes, it is possible, however, the timeframe cannot be shorter than the time required for the lab to properly complete the analyses and be reviewed by the internal laboratory quality assurance/quality control officer. Additionally, at times analytical results from a lab are delayed due to equipment performance and maintenance issues. There is also no technically nor economically reasonable basis for a generally applied groundwater monitoring program to require the owner/operator of a facility to unnecessarily encounter additional laboratory costs for expedited analytical turnarounds to meet reporting requirements. *See* 415 ILCS 5/27.

h. Is it possible to ask the Agency for an extension if lab results are delayed or the analysis is unusually complex? If not, why not?

Answer: MWG objects to the term "possible" as vague, subject to varying interpretations, and outside the considerations for a rule. Under Section 27 of the Illinois Environmental Protection Act, the Board must take into account various factors including the character of the area involved, the character of surrounding land uses, zoning classifications, the nature of the existing air quality, or receiving body, and the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution. (415 ILCS 5/27). Without waiving the objection, my review of the draft Part 845 did not identify a provision or allowance to request an extension of the reporting requirement. I would agree with the questioner that the deadlines for the groundwater monitoring program in the final rule should be extended to allow for accurate data collection and analysis.

4. At page 6 of your testimony, you state "While additional specific chemistry information may need to be developed in future evaluations to support potential numerical modeling

of contaminant transport and chemical reactions between impacted groundwater and the aquifer matrix, that would be a very specific situational requirement that would warrant the development of more extensive chemical and physical properties of the geologic layers at that time."

a. Does Part 845 as proposed require this?

Answer: My testimony was regarding the specified requirements for the initial hydrogeologic site characterization. In general, initial hydrogeologic characterizations for the purposes of establishing leak detection monitoring systems, such as being required under this proposed rule, do not require specific chemical analyses to be performed on individual matrices of each stratigraphic unit. General local and literature knowledge of stratigraphic chemistry along with the site-specific boring log data and water level data is sufficient for development of the site conceptual model. If a subsequent numerical groundwater modeling is necessary, the development of that model and subsequent testing of that model will determine the need, if any, for additional more detailed, site-specific chemical or physical characterization requirements. *See* R. Gnat Pre-filed Testimony, R20-19, pp. 5-6.

b. If not, how do you assure that information gets developed to support modeling when needed?

Answer: See Answer to question 4.a. Additionally, under information and belief, for conducting a groundwater model, specific data needs vary from site to site based on site conditions and complexities. The numerical model is developed based upon the site conceptual model. As model sensitivity analysis and calibration runs are being made for various input parameters, it may be determined that some additional detailed, specific site characterization will be necessary for model performance. If that is true, a data collection program may be developed and implemented to provide the additional characterization information required (physical and/or chemical). This information would then be input into the model for further refinement. It is my understanding that these are very site and model specific needs.

5. On page 7 of your testimony, you discuss 35 IAC § 620.420 which references fill material, slag and ash.

a. Section 620.420 contains the Class II groundwater standards, right?

Answer: Part 620.420 establishes groundwater quality standards for Class II general resources groundwater.

b. Do you know what groundwater gets classified as Class II groundwater?

Answer: In accordance with Section 620.220 general resource groundwater is (a) groundwater which does not meet the provisions of Section 620.210 (Class I), Section 620.230 (Class III), or Section 620.240 (Class IV) or (b) groundwater which is found by the Board, pursuant to the petition procedures set forth in Section 620.260, to be capable of agricultural, industrial, recreational or other beneficial uses.

c. If groundwater beneath fill, ash or slag is classified as Class I groundwater then does Section 620.420 apply?

Answer: Yes, however, that was not the purpose of referring to that section in my testimony. The purpose of identifying that section was to support and concur with Illinois EPA's approach to accurately represent the quality of the groundwater passing the waste boundary of the CCR surface impoundment, because the purpose of Part 845 is to specifically regulate CCR surface impoundments. As stated in the Part 620 Rulemaking record and in the final Part 620 rule, other areas of fill, including slag and ash, were considered and included in Part 620, and so do not need to be included in Part 845.

d. Section 620.420 provides an exception to a subset of Class II groundwater for "groundwater within fill material or within the upper 10 feet of parent material under such fill material".

Answer: There is no question. This appears to be a statement and does not require answering.

e. Does this exception apply to groundwater more than ten feet beneath fill material?

Answer: No, it does not, however, the purpose of my testimony was that there are currently other existing regulations which cover groundwater impacts associated with historic fill materials and therefore this issue is sufficiently addressed outside the scope of this proposed draft Section 845 rule.

6. On page 5-6 of your testimony, you discuss §845.620(b)(15) and on page 6 you state "geologic chemistry information are generally not required or necessary for the development of groundwater monitoring systems."
   a. Do you know all the ways the Proposed Rule provides for the use of the Hydrogeologic Site Characterization data?

Answer: MWG objects to the question as overly broad and vague. Without waiving that objection, the complete universe of what can be considered hydrogeologic site characterization data and how it is to be used is wide ranging depending on the intent of the study. The initial hydrogeologic characterization requirements set forth in Part 845.620 are the basics for establishing an understanding of the subsurface conditions with which to develop a conceptual site model and establish as appropriate groundwater monitoring system for the units proposed to be regulated. As discussed above in the Answers to the subparts of Question 4, additional specific site characterization needs may be required as part of subsequent numerical groundwater model development.

b. Will it just be used for development of the groundwater monitoring system?

Answer: See Answer to Question 6.a.

c. Does it also need to be used to develop groundwater contaminant transport models?

Answer: See Answer to Question 6.a.

d. Does it also need to be used to develop remediation plans in support of corrective action and closure?

Answer: See Answer to Question 6.a.

7. On page 6 of your testimony, you state "While additional specific chemistry information may need to be developed in future evaluations to support potential numerical modeling of contaminant transport and chemical reactions between impacted groundwater and the aquifer matrix, that would be a very specific situational requirement that would warrant the development of more extensive chemical and physical properties of the geologic layers at that time."
   a. You say may but don't both the Corrective Action Construction 845.220 (c)(2) and Closure Construction 845.220 (d)(3) require models to be developed?

Answer: That is correct, however, depending on the specific model and complexity of the site, specific data needs for model input refinement will vary. See also Answers to the subparts of Question 4 and 6.a.

8. On page 9 of your testimony, you discuss proposed §845.640, and state "If it can be shown through leach testing that ash placed within a specific impoundment does not contain or leach a specific compound on the list of parameters provided in Section 845.600, then there is no reason to monitor for that parameter on a quarterly basis for 30- plus years."

   a. Do you know if ash contained in individual impoundments at MWG plants varies in leachable constituents?

Answer: MWG objects to the question because it requests site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and the Board should limit questions about specific sites). Without waiving the objection, generally, based on information and belief, it is my understanding that if the source of coal is the same, the process burning the coal is the same and all handling processes pre- and post-burning are the same, the primary chemical composition of the resulting ash material should be consistent. *See* R. Gnat Pre-filed Testimony, R20-19, pp. 9.

   i. Do you know if ash contained in an individual impoundment would vary in leachable constituents due to changes in coal feedstock over time?

Answer: See Answer to Question 8.a.

ii. Do you know if ash contained in an individual impoundment would vary in leachable constituents due to changes plant processes over time?

Answer: See Answer to Question 8.a.

iii. Do you know if ash contained in an individual impoundment would vary in leachable constituents due to changes additives over time?

Answer: See Answer to Question 8.a.

iv. If ash contained in an individual impoundment varies, would the constituents contained in a particular sample of ash be representative of the composition of the entire impoundment?

Answer: See Answer to Question 8.a.

9. On page 16 of your testimony, you state that "Once the flow system is sufficiently understood, measuring water elevations on a monthly schedule only provides duplicative and unnecessary data."

a. Do you know if periods of flooding change flow directions?

Answer: MWG objects to the question as overly broad, and objects to the term "periods" as vague and subject to varying interpretations. Without waiving the objection, generally, it depends on the conditions of the river and the flooding.

b. Do you know how often the Des Plaines River floods?

Answer: MWG objects to the question to the extent it requests site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and the Board should limit questions about specific sites). Without waiving the objection, no.

c. Do you know how often the Illinois River floods?

Answer: MWG objects to the question to the extent it requests site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. *See* 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3; *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and the Board should limit questions about specific sites). Without waiving the objection, no.

d. Does flooding occur every year?

Answer: MWG objects to the question as overly broad because it does not limit the location of the flooding to Illinois, does not limit the location of flooding to rivers, and does not define the timeframe. MWG further objects to the term "flooding" as vague and subject to varying interpretations. Without waiving the objection, generally flooding may or may not occur every year at a particular location.

e. Does flooding always occur in the same month?

Answer: MWG objects to the question as overly broad because it does not limit the location of the flooding to Illinois, does not limit the location of flooding to rivers, and does not define the timeframe. MWG further objects to the term "flooding" as vague. Without waiving the objection, generally flooding may occur in varying months.

f. Can flow systems change over time?

Answer: MWG objects to the phrase "over time" as overly broad, vague and subject to varying interpretations. Without waiving the objection, if this question is in reference to my testimony regarding the flow system in page 16, the purpose of that testimony was that in my experience in the first few years of monitoring, generally stable conditions are documented and the groundwater flow system beneath the regulated unit is sufficiently understood by the Professional Engineer to evaluate and assess the ongoing effectiveness of the monitoring system. While in my opinion, monthly groundwater elevation is not necessary to understand a flow system, once that flow system is understood, monthly measuring of water elevations is unnecessary. *See* R. Gnat Pre-filed Testimony, R20-19, pp. 16.

10. On page 16 of your testimony, you state that Section 650 "should allow an owner/operator to reduce the monitoring list if a compound is not detected after a set period of time (e.g., 3 or 5 years)."

a. What should the frequency be if there is no release, leaking or leaching for 3-5 years, the list of monitored constituents is reduced, and then there is a release after 5 years?

Answer: The purpose of my testimony was not a proposal to desensitize the monitoring program which could mask identifying a potential release, but rather to streamline the program to focus on the constituents of concern for the specific unit. The current list of 20 compounds identified in draft Section 845.600(a) plus calcium includes constituents which are commonly associated with CCR (*e.g.* See footnote 1) and less common constituents (*e.g.* antimony, cadmium and beryllium). My testimony is not suggesting removing the primary signature suit of CCR constituents, which are expected to be detected in the CCR stored in the CCR surface impoundment. However, for the less common constituents, there should be a mechanism within the proposed rule to allow for an owner/operator to petition to remove that constituent from at least continued quarterly monitoring if that constituent is not detected in the CCR stored in the CCR surface impoundment. This request can be further bolstered, if necessary, by site specific CCR characterization data as also discussed in my testimony. *See* R. Gnat Pre-filed Testimony, R20-19, pp. 16.

b. How would an owner-operator detect a release, leaking or leaching if the monitoring list is reduced removing compounds not detected?

Answer: See Answer to question 10.a.

c. What if the leachable constituents in the ash in an impoundment changed after the 3-5 year period and the list of monitored constituents was reduced?

Answer: See Answer to question 10.a. Further, as discussed in the Answers to the subparts in Question 8 and consistent with my testimony, if there is a change in items such as coal feedstock, combustion processes and/or CCR material handling, then the monitoring program would need to be re-evaluated to take any potential changes in chemistry into account within the monitoring system. *See* Answers to Question 8.a. and R. Gnat Pre-filed Testimony, R20-19, pp. 9, 16.

i. In this scenario, how would an owner operator detect a release, leaking or leaching if the monitoring list is reduced removing compounds not detected?

Answer: See Answers to Questions 8.a, 10.a, and 10.c.

d. Are there any factors that you are aware of that could slow the transport of constituents leaching from coal ash? If so, what are they?

Answer: MWG objects to the term "factors" as vague and subject to varying interpretations. Without waiving the objection, if this question is referring to closure in-place of an impoundment, then the placement of a proper cap on the unit will minimize and/or eliminate the migration of precipitation through the ash effectively reducing constituents leaching from the ash.

e. Are there any factors that you are aware of that could slow the detection of constituents leaching from coal ash? If so, what are they?

Answer: MWG objects to the term "factors" as vague and subject to varying interpretations MWG further objects to the question because the phrase "slow the detection of constituents" is vague and confusing. Without waiving the objection, my testimony is associated with the hydrogeologic aspects of developing and implementing an appropriate groundwater monitoring system for the detecting potential releases from the regulated unit. The placement of downgradient monitoring points is by rule at the waste boundary. The system should be able to detect a potential release regardless if the migration of constituents may be slowed or impeded. At some point they will pass the monitoring point(s) and be detected.

f. What would be the cost savings of reducing the list of monitored chemicals?

Answer: My testimony did not include a calculation or estimation of any potential cost savings there may be, because that was not the purpose of my testimony. The purpose of my testimony was to show that the benefit to streamlining a groundwater monitoring program is in reliable detection of any actual release from a CCR surface impoundment, based upon the site-

specific data including the chemical composition of the CCR in the CCR surface impoundment. Also see answer to Illinois EPA question 5.a.

g. Is most of the cost associated with groundwater sampling in the labor required to travel to the site, purge and sample the well, and deliver the sample to a laboratory? Please see discussion above.

Answer: Please see Answer to question 10.f.

11. On page 22, you discuss 845.750(a)(1).

a. When an impoundment has intersecting groundwater, is it possible to control the infiltration of liquids into the waste? If so, how?

Answer: MWG objects to the term "possible" as vague, subject to varying interpretations, and outside the considerations for a rule. Under Section 27 of the Illinois Environmental Protection Act, the Board must take into account various factors including the character of the area involved, the character of surrounding land uses, zoning classifications, the nature of the existing air quality, or receiving body, and the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution. (415 ILCS 5/27). Without waiving the objection, I am not an engineer, but my understanding is that a properly designed cap can control the infiltration of liquids through the waste.

i. Is it possible to minimize the infiltration of liquids into the waste? If so, how?

Answer: See Answer to Question 11.a.

VII. David E. Nielson's Answers to the Illinois Pollution Control Board's Questions

18. On page 5, you state, "Based on the conclusions made in US EPA's Risk Assessment (Reference 4) and the lack of damage cases for composite-lined CCR surface impoundments, I agree with the US EPA's determination that a leachate collection and removal system is not necessary for CCR surface impoundments to be protective of human health and the environment."

a. Please clarify whether the USEPA's risk assessment was intended to evaluate the rate of release of chemical constituents from surface impoundment liners with, and without leachate collection system.

Response:

The stated purpose of the Human and Ecological Risk Assessment of Coal Combustion Residuals, December 2014, Regulation Identifier Number: 2050-AE81 ("Risk Assessment") from p. ES-1 is:

> "The purpose of the risk assessment is to characterize the risks that may result from the current disposal practices for coal combustion residuals (CCRs) and provide a scientific basis for the development of regulations necessary to protect human health and the environment under the Resource Conservation and Recovery Act (RCRA)."

Risk Assessment, p. ES-1. In other words, the purpose of the Risk Assessment was to evaluate the risks of CCR surface impoundments to human health and the environment, evaluate mechanisms such as liners, to prevent the release of chemical constituents into the environment, and ultimately use the evaluation to determine regulations necessary to protect human health and the environment. One of the mechanisms evaluated was a leachate collection system. See also my Response to Illinois Pollution Control Board Question 18.b. The Risk Assessment is over 1,200 pages and is publicly available on US EPA's website. The pages cited herein from the Risk Assessment are attached as Exhibit 1.

b. If so, please provide specific references in the USEPA's risk assessment report that address the issue of leachate collection system.

Response:

The Risk Assessment is not explicitly clear if the surface impoundments modeled contained leachate collection and removal systems.
Pages 4-8 and 4-9 of the Risk Assessment summarize the approach to determine infiltration rates of each waste management unit (WMU, which includes both landfills and impoundments), a liner design was assigned based on responses to EPA surveys. The modeling of composite lined WMUs by the US EPA assumed a leachate collections system exists between the waste and the liner system. Based on this discussion it can be concluded that leachate collection was considered for composite lined WMUs. However, in subsequent sections of the Risk Assessment, it appears that the US EPA assumed that a leachate collection and removal system were not installed or operational based on the US EPA's discussions of hydraulic head of the ponded water in CCR surface impoundments.

Since differing conclusions can be drawn from this discussion of leachate collection systems and hydraulic head at the base of impoundments, I also consider the comparison of model results to damage cases addressed in the Risk Assessment. While the models numerically evaluated fate and transport of leakage from WMUs and their risk on human health and the environment, actual damage cases are the real-world validation of the models. Page 5-47 of the Risk Assessment states:

> "EPA reviewed the available data on both proven and potential damage cases and compared the findings with the results of the sensitivity and uncertainty analyses. Each damage case reflects a combination of site-

> specific conditions present at that site. This contrasts with the risk assessment, which is nationwide. Due to the differing nature of these two sources of information, a direct comparison would not be relevant. However, general characteristics and conclusions from the damage cases are relevant to support the findings of the risk assessment, and are discussed below.
>
> The vast majority of damage cases were associated with unlined surface impoundments and landfills. **No damage cases were identified for composite-lined units. This agrees well with the results of the sensitivity analyses, which showed that risks were significantly higher for unlined WMUs than for other units, and that risks for composite-lined units were far below all cancer and noncancer criteria**." (Bolding added for emphasis)

I am not aware of any CCR surface impoundment that has been constructed with a leachate collection system, as discussed on page 4-8 and 4-9 of the Risk Assessment. Thus, I conclude that the proven and potential damage cases reviewed by the US EPA did not incorporate leachate collection and removal systems in the impoundments evaluated. In my opinion, the absence of proven and potential damage cases for composite-lined units that do not contain leachate collection systems demonstrates that such a collection system is not necessary for the protection of human health and the environment.

The Federal CCR Rule does not require leachate collection and removal for any type of CCR impoundment. This fact supplements my opinion that CCR surface impoundments that have composite liner systems do not warrant leachate collection and removal systems to be protective of human health and the environment.

c. If not, comment on whether the installation of leachate collection system at new surface impoundments would reduce the movement of leachate chemical constituents through the composite liner.

Response:

Please see my Answer to Question 18.b. Also, as I understand the Illinois EPA's position, under the proposed Illinois CCR Rule, the leachate collection system is not required to operate. In my opinion, a requirement to install but not operate a leachate collection system does not reduce the movement of CCR constituents through a composite liner. In any case, the Risk Assessment states that there were not any identified damage cases for composite lined units and the risks determined for composite lined units was far below all cancer and noncancer criteria. *See* Risk Assessment, p. 5-47. This agreement between damage cases and

the Agency's modeling should provide the Board reassurance that the US EPA's position of not requiring leachate collection and removal systems in CCR impoundments is appropriate.

Moreover, in my opinion US EPA's decision to not require a leachate collection system reflects the unique design and operation of impoundments, which are:

- Significantly different than landfills, as evidenced by the different requirements under the Federal CCR Rule.
- Not practical with leachate collection and removal systems above a single composite liner. This is supported by the fact that hazardous waste surface impoundments must be designed and constructed with a top liner, above a leachate collection and removal system with a bottom composite liner. This clearly demonstrates that the US EPA understands that putting a drainage layer at the base of an impoundment that is designed to treat, store and dispose of liquid waste is not practical.

VIII. David E. Nielson's Answers to the Illinois EPA's Questions

1. Is it true that in addition to treating wastewater, significant amounts of CCR have been deposited in CCR surface impoundments?

Response:

Yes, depending upon the specific impoundment function, that is often true. It is also true that some CCR surface impoundments are designed and operated to be regularly dredged to remove CCR.

2. How is the CCR and wastewater moved from the generation station to the CCR impoundment?

Response:

Typically, the flows to the CCR surface impoundments are via a sluice pipeline and the return flow of recycled ash transport water is also via pipeline.

3. Does Midwest Generation operate CCR landfills?

Response:

MWG objects to the question because it is requesting site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. See 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). Without waiving the objection, as stated in footnote 1 of Sharene Shealey's Pre-filed testimony, the MWG owns the Lincoln Stone Quarry, a monofill landfill operated as a landfill and has been regulated and permitted by

the Illinois EPA as a landfill for over forty years (Permit No. 1994-241-LFM). S. Shealey Pre-filed Testimony, PCB 20-19, p. 2, n. 1.

a. Could you describe how CCR materials are moved from the generation station to the CCR landfills?

Response:

Generally, CCR materials may be moved from a generation station to a CCR landfill in various methods, including but not limited to via truck or conveyor.

b. Is transporting CCR to a landfill more labor intensive than moving CCR to a CCR surface impoundment?

Response:

MWG objects to the phrase "more labor intensive" as vague and subject to varying interpretations. Without waiving the objection, generally, the effort required to move CCR is dependent on the method. See also Answer to Question 3.a.

c. Is it cheaper to transport CCR to a surface impoundment compared to transport it to a landfill?

Response:

MWG objects to the term "cheaper" as vague and subject to varying interpretations. Without waiving the objection, generally, the relative cost to transport CCR to a surface impoundment compared to transport to a landfill is dependent on numerous factors, including method of transport, proximity to landfill, and cost of disposal at the landfill.

4. Is it true that Part 814 of the Board's regulations requires that onsite landfills be constructed with low permeability liner, leachate collection and removal system as well as a low permeability final cover?

Response:

I am not aware of an Illinois definition of "onsite landfill" so I will answer this question based on municipal solid waste (MSW) landfills, which are also known as putrescible landfills.

Part 814 is written to regulate existing landfills and it does reference the requirements for design and construction found in Part 811. Illinois regulations require MSW landfills to be constructed with low permeability liner, leachate collection and removal systems, low permeability final covers and landfill gas management systems.

However, any question related to landfills is not necessarily applicable in consideration of a CCR surface impoundment. Since this testimony is in regard to

CCR surface impoundments, MSW landfills have not been discussed in detail. Thus, I offer a quick summary of important characteristics of MSW landfills, including but not limited to:

- Waste is typically delivered by large trucks that drive on the stored waste.
- Waste is typically compacted with very heavy compactors with steel sheepsfoot type kneading compaction wheels/drums.
- Waste can contain a multitude of sharp materials such as sheet metal, glass, wire, etc.
- Leachate is highly variable due to the variability in the landfilled waste. It often contains significant dissolved organic matter, along with a mixture of hydrocarbons, acids, pesticides, herbicides, heavy metals, etc.
- Landfills are designed to accept waste for permanent disposal.
- Landfills are generally not allowed to accept liquids.

It is noted that CCR landfills, unlike MSW landfills, do not typically have sharp debris, nor sources of hydrocarbons, acids, herbicides and pesticides.

In my opinion these characteristics warrant the level of protection required by the USEPA and State of Illinois for MSW landfills.

In contrast, CCR surface impoundments are, by definition, designed to collect the CCR and water from the power station (415 ILCS 5/3.143), and treat the water through sedimentation, (*i.e.*, allowing the CCR to fall to the bottom of the surface impoundment). Waste in CCR surface impoundments typically is not compacted with heavy compactors, and the leachate is generally less variable since it is not generated from degradation of waste materials. Also, in some cases, CCR is routinely removed from CCR surface impoundments, instead of being a permanent disposal site.

It is also my opinion that the risk posed by MSW landfill and CCR surface impoundments are not the same. Rather, the risks from CCR surface impoundments are less than MSW landfills due to the nature of the stored wastes. Additionally, in my opinion, landfills and CCR surface impoundments should be treated differently because the operation of landfills and CCR surface impoundments are different. For further discussion on the operation of a CCR surface impoundment, see my response to Environmental Groups' Question 9.b.

5. Is it true that landfills in Illinois are required to have a leachate collection system which will limit the amount of leachate in a CCR landfill to less than 30 centimeters?

Response:

I am aware of requirements for 1 ft maximum leachate depth above the liner as mandated in the requirements for Subpart C: Putrescible And Chemical Waste Landfills (Section 811.307). See also Answer to Question 4.

6. Do you consider the current practice in Illinois of requiring low permeability liner, leachate collection and removal system as well as a low permeability final cover for onsite landfills to be overly protective?

Response:

I am not aware of an Illinois definition of "onsite landfill" so I will answer this question based on MSW landfills.

Considering the risks and operations of MSW landfills, I consider the requirements for low permeability liner, leachate collection and removal system as well as a low permeability final cover to be an appropriate level of protection for human health and the environment. However, as stated in my answer Question 4, the evaluation of the risks of landfills is not the same as evaluation of risk of surface impoundments. Further, the operation of landfills is different than the operation of CCR surface impoundments, and the regulatory schemes for each should reflect their operation. See also Answer to Question 4.

a. If so, why?

Response:

See Answer to Illinois EPA Questions 4 and 6.

b. If not, why not?

Response:

See Answer to Illinois EPA Questions 4 and 6.

7. Do you consider the proposed final cover requirements of Part 845 to be overly protective for closure of CCR impoundment which was not constructed with a low permeability liner nor a leachate collection and removal system?

Response:

MWG objects that this question is beyond the scope of the testimony of David Neilson, which did not discuss nor comment upon the final cover requirements of Part 845. MWG further objects to the phrase "overly protective" as vague and subject to varying interpretations.

Without waiving the objections, Dr. Rudolph Bonaparte's pre-filed testimony on behalf of Dynegy is a detailed discussion of the final cover requirements. I suggest that the Illinois Pollution Control Board and the Illinois EPA consider his testimony in its entirety. Although my testimony does not address closure in

place, it appears that the proposed final cover requirements in the Illinois CCR Rule is far more restrictive than the Federal rule, even though in my review it does not appear that the heighten restrictions are based upon scientific or technical materials. *See* Illinois EPA Answers to Question, Exhibit 3, pp. 54-55; Aug 25, 2020 Tr. pp. 107-108. Accordingly, it does not appear that the additional restrictions will be more protective of human health or the environment than the final cover requirements in the Federal CCR Rule, which was based on a detailed scientific risk assessment.

a. If so, why?

Response:

See Answer to Question 7.

b. If not, why not?

Response:

See Answer to Question 7.

8. Are you familiar with the Part 257 requirements for placing CCR in a landfill?

Response:

Yes.

a. Are there leachate collections system requirements in Part 257?

Response:

There are requirements for leachate collection and removal systems for CCR landfills, but not CCR surface impoundments in Part 257.

b. Have there been valid scientific studies which support the practice of limiting head on a landfill liner in order to minimize migration of leachate through the liner of a landfill?

Response:

There are valid scientific studies which support the practice of limiting head on a landfill liner, but I am not aware of any similar valid scientific studies for liners in CCR surface impoundments.

c. What is the scientific basis of the concept of increased hydraulic head on a CCR liner increasing the risk of contaminant leaching from the disposal of CCR in an impoundment?

Response:

Increases in hydraulic head will increase the flow rate of fluids through a hypothetical hole in a geomembrane and then through porous media (compacted clay liner) as described by various theories of fluid dynamics. However, the increased potential leakage does not necessarily result in statistically significant

risks to human health and the environment. A complete fate and transport analysis is needed to understand the risks, as presented by the Risk Assessment. Moreover, as stated in my answer to Illinois EPA Question 4, in my opinion, CCR landfills and CCR surface impoundments should not be treated the same because the operation of the two is different. See also Answer Illinois Pollution Control Board Question 18.b.

d. Would this scientific basis of limiting head accumulation to reduce the risk of contaminant leaching from the disposal of CCR in an impoundment provide clear evidence that such a minimization of hydraulic head on a CCR impoundment liner would lead to meaningful environmental benefits for the construction of new CCR impoundments?

Response:

If a risk to human health and the environment was documented from CCR surface impoundments with proper design and construction of a composite liner, yes this would be a proven technique. However, this risk to health and the environment has not been documented in model studies or damage cases (either proven or potential) by a scientifically based risk assessment by the US EPA. Also, as stated in my answer to Illinois EPA Question 4, in my opinion, CCR landfills and CCR surface impoundments should not be treated the same because the operation of the two is different. See also Answer to Illinois Pollution Control Board Question 18.b.

e. Is it true that minimization of hydraulic head on a CCR impoundment liner as proposed in Part 845 is a very similar practice to what Part 257 requires for a CCR landfills?

Response:

I understand that on paper they may appear the same, but based on practical real-world experience, I do not consider that they are "very similar." Leachate collection system from landfills:

- Is mandated to maintain leachate levels to less than 12 inches deep over the liner system.
- The landfill leachate flow rate is a very small fraction of what would be pumped from a similar sized operating CCR surface impoundment for an equivalent level of control.
- Landfill leachate collection and control systems are exposed to regular traffic from large trucks and very heavy compactors.

Also, as stated throughout herein and in my testimony, Part 257 does not treat CCR landfills and CCR surface impoundments, similarly, including requiring a minimization of a hydraulic head. In my opinion, it is improper for Part 845, which is to regulate CCR surface impoundments, to mimic the requirements for a CCR

landfill in Part 257 and *not* mirror the requirements for a CCR surface impoundment in Part 257. See also Answer to Illinois Pollution Control Board Question 18.b and Answer to Illinois EPA Question 4.

9. Referring to page 18 of Lisa Bradley's testimony on behalf of Dynegy, Dr. Bradley notes that USEPA's risk assessment shows the highest risk associated with CCR surface impoundments is due to hydraulic head.

   a. What is the scientific basis of the concept of hydraulic head being the greatest source of risk of contaminant leaching from the disposal of CCR in an impoundment?

      Response:

      In my opinion, Dr Bradley is very qualified to address questions to her testimony. This question is very similar to the IL EPA question 8.c. Thus, see my response to the IL EPA question 8.c., and also Responses to the other subparts of Question 8, and Answer to Illinois Pollution Control Board Question 18.b.

   b. Would this scientific basis of limiting head accumulation to reduce the risk of contaminant leaching from the disposal of CCR in an impoundment provide clear evidence that such a requirement would lead to meaningful environmental benefits for the construction of new CCR impoundments?

      Response:

      Reducing the head and thus leakage could be meaningful to the protection of the environment if a risk was known to exist, but I am not aware that a statistically significant risk has been identified. The Risk Assessment did not identify a statistically significant risk and the Federal CCR Rule does not require the reduction of head on liner systems in CCR surface impoundments. See also Answer to Illinois Pollution Control Board Question 18.b.

10. As a licensed professional engineer who believes that valid scientific studies should be the basis for environmental regulation would you consider there to be merit to reducing the hydraulic head on the liners of both landfills and surface impoundments? If not, why not?

    Response:

    There is merit to reduction of head on liners when the risks are real, statistically significant and quantifiable. See also Answer to Illinois Pollution Control Board Question 18.b.

11. On page 9 of your testimony you propose an alternative method of leachate collection which you indicate is at least as protective as the system proposed in Part 845 as follows:

    "For example, a collection system similar to that shown in Figure 2 would provide a proactive means of protecting groundwater since the lower geomembrane liner would impede the flow of any leakage from the primary composite liner and direct the flow to the leachate pumping system. The leachate collection and removal system in this case would

effectively act as a leak detection system, which would provide immediate notice to the owner or operator that the surface impoundment's liner is leaking."

a. Under your alternate method would the hydraulic head on the primary composite liner be reduced or minimized?

Response:

No, the stated purpose of this design is not to reduce the head on the primary composite liner. The alternate method presented is designed to allow a CCR surface impoundment to operate as an impoundment and also to capture any leachate that did penetrate the primary composite liner. As I stated in my pre-filed testimony

> "For example, a collection system similar to that shown in Figure 2 would provide a proactive means of protecting groundwater since the lower geomembrane liner would impede the flow of any leakage from the primary composite liner and direct the flow to the leachate pumping system." D. Neilson Pre-filed Testimony, p. 9.

b. For what period of time would there continue to be hydraulic head on the primary composite liner?

Response:

Until the CCR surface impoundment is dewatered and closed by removal or closure in place.

12. Is there an advantage to the system proposed in 845 which would enable the hydraulic head on the composite liner to be minimized any time during the operation of the impoundment potentially meeting the operation requirements for the CCR impoundment and allow the CCR impoundment to be minimized at the time of closure.

Response:

As is the case with most engineered systems that have different design philosophies each system has specific advantages.

The system proposed by the IL EPA has the following advantages:

- The ability to reduced head on the liner system if it is operated.
- Potentially the ability to pump water from the base of the impoundment, which may be beneficial during closure activities. However, in some CCR waste streams this may not be effective. For instance, FGD waste and fly ash could conceivably foul the required filter layer. While perimeter ditches and filtered sumps have proven successful in dewatering numerous impoundments that have been closed.

The system proposed as a possible alternate in my testimony has the following advantages:

- If any leak occurs through the composite system, which is unlikely, it detects and collects leaks as they occur.
- It has a significantly lower impact on parasitic load (*i.e.* - power requirements to operate the equipment at generating stations) and plant operations.
- Is not likely to become fouled by fly ash and FGD waste streams.
- It does not increase the risk of fugitive dust throughout the operating life of the surface impoundment.
- It does not require the construction of very large tanks to hold and manage the transport water for re-use in the closed loop ash transport system.
- It allows a CCR surface impoundment to conduct its primary function, which is to separate the ash and slurry water, as well as store the ash transport water which is recycled in the closed loop system.

13. Does reduction of hydraulic head on the composite liner reduce the potential for the migration of contaminants through the composite liner? If not, why?

Response:

See my responses to the following questions by the IL EPA 8.c., 8.d., 9.b., and 10.

14. In your testimony regarding Section 845.770, you discuss the potential of decontaminating liners.

a. Do synthetic liners have holes and imperfections?

Response:

There are numerous types of synthetic liners used for various purposes. Depending on the use, installation process including the quality assurance and quality control ("QA/QC"), and quality of a liner, it is possible that there may be holes and imperfections. If a properly designed and installed geomembrane liner is installed following proper QA/QC measures, then the likelihood of imperfections and holes is minimized. Moreover, if a liner is somehow compromised during operations, such as a hole, then there are methods to repair the liner such that the seal of the liner is restored.

It is also noted that the Risk Assessment assumed small holes in the geomembrane liner element of composite lined systems and still did not identify any risk to human health or the environment. The Risk Assessment (p. 4-1) was conducted using the EPA Composite Model for Leachate Migration with

Transformation Products (EPACMTP). The 2003 version of the EPACMTP Technical Background Document, which is reference EPA 2003a in the Risk Assessment p. A-1 states:

> "For composite-lined Sis [surface impoundments], we used the Bonaparte (1989) equation to calculate the infiltration rate assuming circular (pin-hole) leaks with a uniform leak size of 6 mm^2 , and using the distribution of leak densities (number of leaks per hectare) assembled from the survey of composite-lined units (TetraTech, 2001).

Therefore, I conclude that the Risk Assessment accounted for potential holes in the geomembrane component of composite liners and the Risk Assessment did not identify statistically significant risks to health and the environment for composite lined CCR surface impoundments.

b. Could the heavy equipment that is likely to be used for removing CCR damage the liner?

Response:

If the operators are aware and focused on avoiding damage, then the likelihood of damage to a liner is diminished. Due to the possibility of damage to a liner during CCR removal, I suggested an inspection and repair in the final paragraph of my pre-filed testimony. *See* D. Nielson Pre-filed Testimony, p. 13

c. Could tears too small to see compromise the integrity of the liner?

Response:

While that may be true, my testimony is supporting the reuse of the liner as a supplemental liner system or as part of a different process entirely, and would not be in contact with CCR. If a decontaminated existing geomembrane liner is reused as a supplemental liner system, in addition to the regulatory mandated composite liner system, the combined liners would be more protective than the Federal CCR Rule or any other state rule requirement. *See* response to Illinois EPA Question 14.a.

d. How do you believe an owner or operator would assure the clay portion of a composite liner was decontaminated, which you agree can become saturated with CCR constituents, without removing the synthetic?

Response:

MWG objects to the question as a mischaracterization of Mr. Nielson's Pre-filed testimony. In no part of the testimony did I suggest that the clay portion of a composite liner system (*i.e.* had a geomembrane liner *and* a clay liner) could become saturated with CCR constituents. In fact, I stated the opposite. I stated that there was no basis to conclude that a geomembrane liner could become saturated with CCR constituents. D. Nielson Pre-filed Testimony, pp. 12-13. It

appears that Illinois EPA misread this section, because in the sentence before I stated that clay-liners *alone* may become saturated with CCR constituents. *Id*. However, I then distinguished the clay-liners to the geomembrane liners, which are one part of the composite liner system. *Id*. As stated in my testimony, I am not aware of any study showing that a geomembrane liner may become saturated with CCR constituents. *Id*. By extension, I am not aware of a composite liner system that became saturated with CCR constituents. Additionally, as stated in my Answer to Illinois Pollution Control Board Question 18.b., there has been no damage case found for a CCR surface impoundment with a composite liner – a geomembrane liner with a clay-liner underneath.

e. Have you ever been involved with or overseen a project where the decontamination of a composite liner in a CCR surface impoundment has been performed? If so, please provide a summary of the site(s), the liners, and the processes used.

Response:

I am not personally aware of any instance where a composite lined CCR impoundment has been taken out of service.

f. Have you read or researched about a project where the decontamination of a composite liner in a CCR surface impoundment has been performed? If so, please provide a summary of the site(s), the liners, and the processes used.

Response:

See my response to question 14.e.

g. For what purpose would the allegedly decontaminated liner be reused?

Response:

MWG objects to the question because it is premised on the assumption that a geomembrane liner may not be decontaminated. I am not aware of any study showing that a geomembrane liner becomes saturated with CCR constituents. I am also not aware of any study or information demonstrating that a geomembrane liner may not become decontaminated. Moreover, no party to this rulemaking has entered into the record any study or information showing that a geomembrane liner may not be decontaminated. In fact, for retrofitting a CCR surface impoundment, the Federal CCR rule does not require removal of a liner system, but instead only requires removal of any contaminated soils and sediments. 40 CFR 257. 102(k)(i).

Because of the absence of such studies or information, I do not believe HDPE will become contaminated with CCR constituents such that decontamination methods will be ineffective.

As stated in my testimony, the possible purposes of reuse for a decontaminated liner are:

> "It is recognized that the existing geomembrane liner cannot be considered as a component of a new compliant composite liner system. Although not incorporated into the composite liner system, it is my opinion that allowing existing, effective liners to stay in place could add an additional level of protection of the environment. It is certainly a better alternative than requiring removal of a decontaminated liner and transporting it to a solid waste landfill…"
>
> "I recommend that the language of section 845.770 be modified to allow existing geomembrane liners to be decontaminated, similar to the Federal CCR Rule requirements. The decontamination could include cleaning with high-pressure water washes, visual inspections for any damage, repair if damage was a result of the removal of CCR, and reuse as a supplemental layer below a new composite liner as suggested in Figure 2." D. Nielson Pre-filed Testimony, p. 13.

Additionally, a decontaminated liner could be used for holding process waters at a generating station.

I have had an opportunity to review the suggested language by the Illinois Pollution Control Board in its Question 17 to Sharene Shealey. I believe the Board's suggested revision to Section 845.770(a)(1) to state "including any contaminated liners" will resolve the concerns expressed in my testimony.

IX. David E. Nielson's Answers to the Environmental Group's Questions

1. On Page 2 of your testimony, you state: "This essentially requires a drainage layer at the base of new and retrofitted CCR surface impoundments with the purpose of reducing the hydraulic head on the impoundment's composite liner system." As used in this quoted sentence:

   a. What does "drainage layer" mean?

      Response:

      A drainage layer is a layer in the engineered system, that is specifically designed and constructed to allow rapid drainage (removal) of water (leachate) from an impoundment (pond).

   b. What does "hydraulic head" mean?

      Response:

      In static (minimal flow or movement) conditions, hydraulic head is the vertical measurement from the surface of the water or another fluid to the point of

reference. In this usage, it is the vertical measurement or depth of water in an impoundment above the uppermost low-permeability (not allowing fluid to quickly pass through) layer of the composite liner.

c. What does "composite liner" mean?

Response:

The term composite liner is a two-part liner system that typically consists of a very low permeability geomembrane over a compacted low permeability clay liner.

Composite liner is defined in Section 257.70(b) of the Federal CCR Rule and Section 845.400(b) of the Proposed Illinois CCR Rule. To quote the Proposed Illinois CCR Rule "A composite liner must consist of two components; the upper component consisting of, at a minimum, a 30-mil geomembrane liner, and the lower component consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec). The geomembrane liner components consisting of high-density polyethylene (HDPE) must be at least 60-mil. The geomembrane liner or upper liner component must be installed in direct and uniform contact with the compacted soil or lower liner component."

It should be noted that both the Federal CCR Rule (Section 257.70(c)) and the Proposed Illinois CCR Rule (Section 845.400(c)) allow for Alternative Composite Liners that consist of an upper geomembrane and a lower layer that is not a geomembrane with a liquid flow rate less than the soil component of a composite liner.

The Risk Assessment (p. ES-7) states "Composite liners were the only liner type modeled that effectively reduced risks from all pathways and constituents far below human health and ecological criteria in every sensitivity analysis conducted." Thus, in my opinion, composite liners are an appropriately protective engineered barrier to reduce the risks of constituent migration and are protective of human health and the environment as defined and determined by the US EPA.

2. On Page 3 of your testimony, you provide Figure 1, which is reproduced in the Appendix following these prefiled questions.

a. What does "geomembrane" mean as used in Figure 1?

Response:

The pre-filed questions submitted to the Illinois Pollution Control Board did not contain the Appendix discussed in the question. Figure 1 from p. 3 of my pre-filed testimony is duplicated below.

A geomembrane is a very low permeability synthetic membrane liner or barrier to control fluid (vapor or gas) migration (movement through) in engineered and

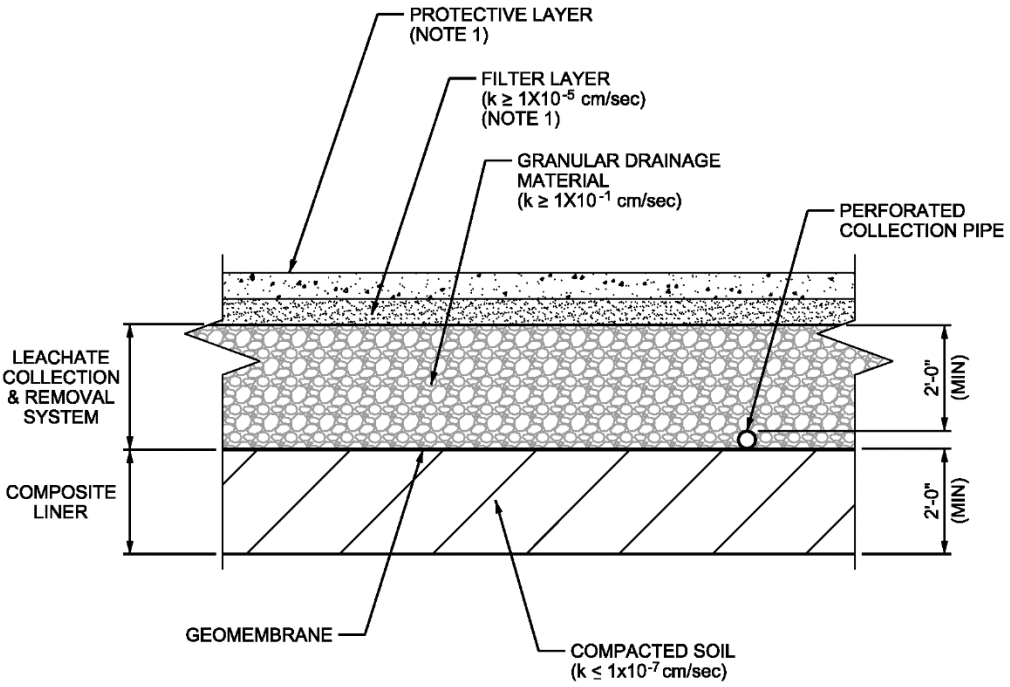
constructed facilities. In some technical publications a geomembrane is also known as a flexible membrane liner (FML).

Page 21369 of the US EPA CCR Rule defines geomembrane as:

> "Geomembranes (GMs), which are flexible membrane liners (FMLs), are thin materials manufactured from polymers and reinforced with woven fabric or fibers which are used as hydraulic barriers. Resins used to manufacture geomembrane liners typically include high density polyethylene (HDPE), linear low density polyethylene (LLDPE), low density linear polyethylene (LDLPE), very low density polyethylene (VLDPE) and polyvinyl chloride (PVC)."

I also defined geomembrane on p. 12 of my pre-filed testimony, as repeated herein:

> "Geomembrane liners are flexible membranes that are manufactured of resins such as polyethylene (HDPE, LLDPE, LDPE) and polyvinyl chloride (PVC), which are energy intensive to manufacture and very low permeability. ASTM International defines geomembrane as "an essentially impermeable geosynthetic composed of one or more synthetic sheets.""



MINIMUM REQUIREMENTS PROPOSED BY ILLINOIS EPA FOR
CCR SURFACE IMPOUNDMENT LINER & LEACHATE COLLECTION & REMOVAL SYSTEM

FIGURE 1

NOTE 1: PROPOSED 35 ILL. ADM. CODE 845.420 DOES NOT SPECIFY THICKNESS REQUIREMENTS FOR THE PROTECTIVE AND FILTER LAYERS.

3. On Page 3 of your testimony, you state: "In the 2010 proposed rule (Reference 3), the US EPA proposed a leachate collection and removal system be installed between the flexible membrane liner (FML, i.e., geomembrane) and low-permeability soil components of the impoundment's composite liner system."

   a. How does US EPA's 2010 proposed rule's leachate collection and removal system compare to the Proposed Illinois CCR Rule?

Response:

From the following points, I conclude that both leachate collection systems share the following important similarities:

- Both are engineered systems that are designed to collect and remove leachate (water) from above an impoundment liner system.
- The Risk Assessment found that neither of the leachate collection and removal systems that this question addresses are deemed necessary to reduce the risks associated with leachate (water) penetrating composite liners that are designed and constructed to protect human health and the environment from the risk of leakage from CCR impoundments. This Risk

Assessment, which was the basis of the Federal CCR Rule stated the following when discussing composite liners:

> "Composite liners were the only liner type modeled that effectively reduced risks from all pathways and constituents far below human health and ecological criteria in every sensitivity analysis conducted." Risk Assessment, p. ES-7.
>
> "Due to the differing nature of these two sources of information, a direct comparison would not be relevant. However, general characteristics and conclusions from the damage cases are relevant to support the findings of the risk assessment, and are discussed below. … …No damage cases were identified for composite-lined units. This agrees well with the results of the sensitivity analyses, which showed … … that risks for composite-lined units were far below all cancer and noncancer criteria." Risk Assessment, p. 5-47.

- Neither are required or recommended by the Federal CCR Rule.

b. Is a flexible membrane liner the same thing as a geomembrane liner? If not, what are the differences?

Response:

See Answer to Environmental Groups' Question 2.

4. On Page 4 of your testimony, you cite to page 21369 of Reference 2 (Federal CCR Rule), and quote the following excerpt: "The proposed requirement for CCR surface impoundments to construct a leachate collection system between the FML and soil components would prevent the direct and uniform contact of the upper and lower components."

a. Does the quoted observation also apply to the Proposed Illinois CCR Rule?

Response:

No, it does not.

b. If not, why not?

Response:

The leachate collection and removal system discussed in the Proposed Illinois CCR Rule mandates the placement of the leachate collection and removal system above both components of the composite liner, not between these liner layers, as discussed in the preamble of the Federal CCR Rule. In my opinion, US EPA recognized that very few if any existing CCR surface impoundments include leachate collection and removal systems of any kind. Moreover, if the US EPA identified risks of damage to human health or the environment, they could have required a leachate collection system similar to that proposed by the Illinois EPA or what is required for hazardous waste impoundments under current federal

rules. Instead, the Risk Assessment states, "No damage cases were identified for composite-lined units." (Risk Assessment, p. 5-47). In my opinion, this is indicative that leachate collection and removal systems are not needed to protect the public health and the environment from leachate leakage from CCR impoundments with composite liners.

5. On page 4, you state: "The agency could have required the leachate collection and removal system be installed above the impoundment's composite liner system (as the Proposed Illinois CCR Rule), which would maintain the integrity of the liner."

   a. Is it your opinion that the Proposed Illinois CCR Rule "would maintain the integrity of the liner?"

      Response:

      In my opinion, the installation of a granular drainage material such as crushed limestone directly above a composite liner could possibly result in tears of the geomembrane. Thus, it is possible that the liner system could be damaged during the placement of the granular drainage material or over the life of the impoundment. I do not consider this risk to be significant provided an experienced engineer designs the system and an experienced, competent contractor installs the system, but the risk still exists.

6. On page 4, you state: "However, after performing an exhaustive risk assessment, which included modeling of and reviewing the available data on both proven and potential damage cases, the agency determined that a leachate collection and removal system was not necessary for CCR surface impoundments to be protective of human health and the environment."

   a. What is the basis for your conclusion that US EPA "determined that a leachate collection and removal system was not necessary for CCR surface impoundments to be protective of human health and the environment?"

      Response:

      The Risk Assessment and the fact that the Federal CCR Rule does not require leachate collection and recovery systems for CCR impoundments.

      Section 257.50(a) of the Federal CCR Rule states "This subpart establishes minimum national criteria for purposes of determining which solid waste disposal facilities and solid waste management practices do not pose a reasonable probability of adverse effects on health or the environment under sections 1008(a)(3) and 4004(a) of the Resource Conservation and Recovery Act." In my opinion, the US EPA had adequate time, resources and skill to use scientific methodologies to evaluate the risks associated with CCR impoundments and they developed a rule that appropriately establishes minimum criteria for CCR facilities that do not pose a reasonable probability of adverse effects on health or the environment. See also Response to Illinois Pollution Control Board Question 18.a. and 18.b. and Response to Environmental Groups' Questions 3.a and 7.b.

b. Did US EPA make that determination as to leachate collection and removal systems generally? If not, did US EPA make that the determination specifically regarding EPA's 2010 proposal?

Response:

The US EPA performed a multi-part, detailed risk assessment that was used to quantify and evaluate risks and reasonable probability of adverse effects on health or the environment. As a result of this study the US EPA did not require any type of leachate collection and removal system for CCR impoundments. See also Response to Illinois Pollution Control Board Question 18.a. and 18.b. and Response to Environmental Groups' Questions 3.a and 7.b.

7. On page 5, you state: "I agree with the US EPA's determination that a leachate collection and removal system is not necessary for CCR surface impoundments to be protective of human health and the environment."

a. What is the explicit US EPA determination that you agree with?

Response:

See Answer to Illinois Pollution Control Board Questions 18.a. and 18.b. and Answer to Environmental Groups' Questions 3.a and 7.b.

b. Can you cite to the explicit US EPA determination you agree with? If so, please provide a citation.

Response:

40 CFR Part 257 Subpart D, "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments", as published April 17, 2015, does not require leachate collection and removal systems for CCR surface impoundments. Moreover, page 21369 of the Federal CCR Rule states "EPA is not requiring a leachate collection and removal system for new surface impoundments or any lateral expansion of a CCR surface impoundment."

Additionally, Section 257.50(a) of the Federal CCR Rule, states "This subpart establishes minimum national criteria for purposes of determining which solid waste disposal facilities and solid waste management practices do not pose a reasonable probability of adverse effects on health or the environment…".

Because the Federal CCR Rule does not require leachate collection and removal systems for CCR surface impoundments, and because it establishes a minimum national criteria for determining the facilities and practices that do not pose a reasonable probability of adverse effects on health or the environment, in my opinion US EPA determined that leachate collection and removal systems are not necessary for CCR surface impoundments to be protective of human health and the environment. See also Response to Illinois Pollution Control Board Question 18.a. and 18.b. and Response to Environmental Groups' Questions 3.a.

c. Can you quote from the explicit US EPA determination you agree with?

Response:

See Answer to Questions 3.a. and 7.b.

8. On page 5, you state: "As a licensed professional engineer, I believe that valid scientific studies, similar to the US EPA's Risk Assessment, should be the primary basis for environmental regulation, which does not appear to be the case for the leachate collection and removal system requirements in the Proposed Illinois CCR Rule."

a. Did US EPA's Risk Assessment analyze leachate collection and removal systems?

Response:

The US EPA performed a multi-part, detailed risk assessment that was used to quantify and evaluate risks and reasonable probability of adverse effects on health or the environment. As a result of this study the US EPA did not require any type of leachate collection and removal system for CCR impoundments.

For additional discussion please see my response to the Illinois Pollution Control Board's Question 18.a. and 18.b and Response to Environmental Groups' Questions 3.a, 7.a., and 7.b.

b. Can you cite to EPA's analysis of and quote from where EPA analyzed leachate collection and removal systems in the US EPA Risk Assessment? If so, please provide a citation.

Response:

Please see my response to the Illinois Pollution Control Board's Question 18.b. and Response to Environmental Groups' Questions 3.a.

c. Can you quote from EPA's analysis of leachate collection and removal systems in the US EPA Risk Assessment? If so, please provide a quotation?

Response:

Please see my response to the Illinois Pollution Control Board's Question 18.b. and Response to Environmental Groups' Questions 3.a.

9. On page 6, you state: "However, removing CCR transport water (leachate) from surface impoundments is not an industry standard because it is not practical given the inherent operation of a surface impoundment."

a. What is the basis for your opinion that removal of leachate from surface impoundments is "not practical?"

Response:

See Answers to Illinois Pollution Control Board Question 18.c., Illinois EPA Question 4 and Answer to Environmental Groups' Question 9.b.

b. Why does the "inherent operation of a surface impoundment" render leachate collection and removal "not practical?"

Response:

Operationally CCR surface impoundments typically have several distinct functions in the operation of a coal fired power plant. These operations include:

- Treat the CCR transport water through sedimentation to separate the CCR from the transport water.
- Store the transport water prior to recycling it back to the boiler house to be reused as CCR transport water.
- Provide storage for upset conditions such as outages when the quench tank at the bottom of the boiler is drained for maintenance. See my response to Environmental Groups' question 10.d for more discussion of the quench tank.
- Store CCR until it is dredged, dewatered, and transported for beneficial use or disposal. I also note that some CCR impoundments serve as the final disposal site and thus they are not dredged.

When a leachate collection and removal system is installed, it is essentially a drain on the impoundment floor, which functions to remove hydraulic head from the liner system and thus remove the water from the impoundment. Since the impoundment is continuously drained, the impoundments functionality as CCR transport water storage is negated. It is likely plants would then need to construct numerous very large tanks to function as transport water storage.

It is also noted that both the Proposed Illinois CCR Rule Section 845.120 and the Federal CCR Rule Section 257.53 define a CCR surface impoundment as:

> "CCR surface impoundment" or "impoundment" means a natural topographic depression, man-made excavation, or diked area, which is designed to hold an accumulation of CCR and liquids, and the surface impoundment treats, stores, or disposes of CCR.

If a leachate collections system is installed, the surface impoundment is not designed to hold an accumulation of water. Thus, it would not meet the strict definition of a CCR surface impoundment.

10. On page 6, you state: "The flow rate of leachate collected in an MSW landfill is typically less than 1/10th of the typical flow rate of CCR transport water system, which are usually about 3,000 to 5,000 gpm."

a. How did you derive the MSW landfill leachate flow rate?

Response:

Based on my experience working on MSW landfills, most MSW operators limit the area of open landfill cells and the leachate flows are typically less than 250 gpm. Of course, this is dependent on the size, age, open area of cells and other landfill characteristics.

i. What did you derive it from?

Response:

Please see my response to the Environmental Groups' question 10.a.

b. How did you derive the flow rates for CCR transport water systems?

Response:

Based on my personal experience.

i. What did you derive them from?

Response:

Please see my response to the Environmental Groups' question 10.b.

c. When you say "typical" and "usually about," does that mean flow rates can be lower than 3,000 gpm or higher than 5,000 gpm for CCR transport water systems?

Response:

By using "typically" and "about," I mean that the range I provided is a non-exact generalization, since the design and operation of coal fired power plants varies depending on the generating capacity, fuel characteristics and system design philosophy.

d. How do owners or operators of surface impoundments regulate or control the flow rates of CCR transport water systems?

Response:

A power plant is a very complex combination of systems that are highly engineered to function together in various load (power demand) and ambient (temperature and humidity) conditions. The control of these systems varies by plant. Thus, my response is general and not based on any single plant owned by Midwest Generation or any other owner/operator. I am also assuming the question is limited to ash that is directed to the CCR surface impoundments.

Bottom ash is the residuals from coal combustion that do not exit the furnace with the flu gas. It is typically a mixture of solid and molten materials. As this material flows or falls down to the base of the furnace (a part of most large boilers) it drops into a very large tank full of water. This quenches (cools) the

molten material. At select intervals, typically once or twice per shift, the plant operators activate the bottom ash sluicing system that:

- Energizes crushers at the base of the tank to crush the hardened bottom ash to smaller particles.
- Energizes pumps that flush water and bottom ash from the quench tank/crushers to the CCR impoundment. The pump rate is established to keep the bottom ash suspended in the ash transport water as it is sluiced from the bottom ash quenching tank to the CCR impoundment. These pumps are often called ash transport pumps.
- Simultaneously, the plant energizes a pumping system that removes water from the CCR impoundment and returns it back to the ash quenching tank to refill the tank. These pumps are often called ash transport water recycle pumps.

Flow out of the tank by the ash transport pumps needs to generally equal the flow of the ash transport water recycle pumps. This ash transport system is designed to be operated intermittently at set flow rates.

e. Do you know the flow rates for CCR transport water systems at the coal power plants owned or operated by Midwest Generation?

Response:

MWG objects to the question to the extent it requests site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. See 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). Without waiving the objection, generally I am aware of the flow rates for CCR transport water systems at the power stations owned by MWG.

f. Did you review or consider the flow rates for CCR transport water systems at the coal power plants owned or operated by Midwest Generation?

Response:

MWG objects to the question to the extent it requests site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. See 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). Without waiving the objection, the purpose of my testimony was to give general testimony on the operation of a typical CCR surface impoundment and the impracticability of installing a leachate collection system.

11. On page 6, you state: "One additional significant difference in MSW landfill leachate and transport water is that while MSW leachate is a waste product, the transport water is a vital part of the operation of a power plant to cool and move the CCR from a power station to waste treatment unit such as a CCR surface impoundment."

    a. Does the "significant difference in MSW landfill leachate and transport water" affect whether a leachate collection and removal system can be installed and operated at a surface impoundment? If so, how does the "significant difference" impact the ability to install and operate a leachate collection and removal system at a surface impoundment?

       Response:

       Yes, it does. Because one of the operational functions of the CCR surface impoundment is to store the CCR transport water prior to its recycled use in the closed loop system, if a leachate collection and removal system is operated to effectively dewater the impoundment, several very large water storage tanks would be required for reliable plant operations.

       By comparison, the leachate at MSW landfills is typically pumped using submersible pumps that are designed for flow rates of about 75 gpm. In a typical landfill cell, there may be one primary pump and a redundant backup pump installed in each landfill cell. If this standardized pump design is used to manage the flow rate equal to a CCR sluice water flow rate of 3,000 gpm, 40 pumps plus redundant backups would be required. If the CCR sluice stream flow is 5,000 gpm, 67 pumps plus redundant backups would be required.

    b. Once CCR transport water flows into a surface impoundment, does that transport water recirculate back to the coal power plant to "cool and move the CCR from a power station to waste treatment unit?"

       Response:

       See my response to Environmental Groups' Question 10.d.

    c. What does "waste treatment unit" mean?

       Response:

       As used, "…waste treatment unit such as a CCR surface impoundment" means a waste treatment unit includes CCR impoundments. *See* D. Nielson Pre-filed Testimony, p. 6.

    d. What makes a CCR surface impoundment a "waste treatment unit?"

       Response:

       Section 257.2 of the Federal CCR Rule states:

       "CCR surface impoundment means a natural topographic depression, manmade excavation, or diked area, which is designed to hold an accumulation of CCR and liquids, and the unit treats, stores, or disposes of CCR."

This definition states that "CCR surface impoundments mean… … and the unit treats, stores or disposes…" At some time during a CCR surface impoundments operating life the vast majority will store and treat CCR, but not all CCR surface impoundments dispose of CCR. Thus, I often use the term waste treatment unit to describe the CCR surface impoundments.

e. What treatment occurs at a CCR surface impoundment?

Response:

Sedimentation is the primary treatment in many CCR surface impoundments.

12. On page 6, you state: "However, the Proposed Illinois CCR Rule does not mandate the removal of leachate or the maximum hydraulic head level on a pond liner system."

a. What's the basis for your opinion that the Proposed Illinois CCR rule "does not mandate the removal of leachate?"

Response:

The following demonstrates that the Proposed Illinois CCR Rule does not mandate the removal of leachate:

- Removal of leachate or a maximum depth of leachate is not stated as a requirement within the Proposed Illinois CCR Rule.
- Repeating from my pre-filed testimony, Page 140 of the transcript of the August 12, 2020 hearing in this matter states:

  "MS. GALE: So are you saying that under these rules the head should be limited to 30 centimeters?

  MR. BUSCHER: Well, you know, it sure makes – no, I don't think that can be done because it's an operational consideration of the CCR impoundment. I think that that might not allow the owner or operator of a CCR impoundment the flexibility they would need to properly operate the impoundment.

- Furthermore, page 160 of the transcript of August 12, 2020 testimony presented in this matter states:

  "MS. GALE: Okay. And I'm about finished. Does the Agency have any intent or methodology to regulate the depth of water above a liner in a pond?

  MR. BUSCHER: No, that's strictly an operational concern of the owner/operator and it's really a side-by-side basis depending on the type of geometry and so on of the impoundment."

13. On page 6, you state: "In my opinion, the decision whether to install a leachate collection and removal system that will be operated as determined by the Owner/Operator should be made by the Owner/Operator."

    a. What's the basis for your opinion?

    Response:

    Page 144 and 145 of the transcript of August 12, 2020 testimony presented in this matter states:

    > "MS. GALE: And so, is the Agency saying that it is the operator's ability to reduce the head and there is no limit on the head of the liner?
    >
    > MR. BUSCHER: There is – there is no limit on the head of the liner, but it would be a prudent operation of the facility to minimize that. That's the purpose of – of having leachate collection system and it would also further the closure of the impoundment because once that impoundment is – is full if it is left in place machinery needs to get out and work on that to put on a final cover and there have been instances where that material is not at all workable and it needs to be dewatered first. So that would be another advantage to having this leachate collection system in the bottom of – or on top of the liner in the CCR surface impoundment."

    From this exchange and those in my answer to Environmental Groups' Question 12, my understanding is:

    - That the decision to operate or not operate a leachate collection and removal system is solely that of the operators, to afford operational flexibility, and
    - That in the opinion of the Illinois EPA, it may benefit the operator to use the leachate collection and removal system during closure activities.

    I do not think it is reasonable to require the installation of a system, that is not required to be operated.

14. On page 6, you state: "Installing a leachate collection and removal system in a CCR surface impoundment is not practical because, if the system was to operate, the pond would likely be dry, causing negative consequences such as fugitive dust emissions."

    a. You stated, "the pond would likely be dry," what is the basis for your opinion that the pond would "likely" be dry with a leachate collection and removal system?

    Response:

    Imagine a hypothetical swimming pool with a 2 ft thick layer of very free draining gravel and pipes across the floor and a filter layer of coarse sand above the gravel. Now we decide to pump water from the pipes with a goal to limit the column of water to 1 ft above the bottom of the pool. The pool would drain quite rapidly.

Now, imagine this hypothetical pool was then used as a CCR surface impoundment to store and treat bottom ash. Bottom ash is often very similar to sandy gravel in its particle size distribution (gradation). This sandy gravel like material would likely allow the water to drain very rapidly through the filter layer to the lower gravel layer. Thus, this pool would also be dry.

b. Does a "dry" pond render a leachate collection and removal system "not practical?" If so, how does a "dry" pond render a leachate collection and removal system "not practical?"

Response:

See Answer to Environmental Groups' question 9.a.

c. Are there circumstances where a pond would not be "dry" with a leachate collection and removal system?" If so, under what circumstances would a pond not be "dry" with a leachate collection and removal system?

Response:

Yes, if the leachate collection system is not operating.

d. Is it possible to reduce or eliminate "fugitive dust emissions" at surface impoundments? If so, what techniques or technology are used to reduce or eliminate "fugitive dust emissions" at surface impoundments?

Response:

MWG objects to the term "possible" as vague and outside the considerations for a rulemaking. Under Section 27 of the Illinois Environmental Protection Act, when promulgating regulations, the Board must take into account various factors including the character of the area involved, the character of surrounding land uses, zoning classifications, the nature of the existing air quality, or receiving body, and the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution. (415 ILCS 5/27). Without waiving its objection, yes by covering the waste with impounded water.

e. Would the installation and operation of a leachate collection and removal system affect the techniques or technologies used to reduce or eliminate "fugitive dust emissions" at surface impoundments?

Response:

Yes, the operation of a leachate collection and removal system would adversely affect the techniques of fugitive dust control because the primary mechanism to reduce fugitive dust emissions, the water covering the impoundment, would be eliminated.

15. On page 7, you provided some calculations:

a. For your calculation that resulted in Q = 7.5 million gal/day:

i. Was 42,000 ft^3 rounded to the nearest thousand? If so, what would the value be if you rounded the calculation to the nearest hundredth?

Response:

Yes, the calculated value of 42,000 ft^3/hr was rounded to the nearest thousand. This rounding is based on the use of significant figures, which is another way of saying implied accuracy.

For numerical accuracy, it is best to perform a chain calculation without reporting intermediate values. In my pre-filed testimony, I chose to include an intermediate step to supplement the reader's understanding. I will repeat the calculation here without the intermediate step.

$Q = 3.28 \times 10^{-7}$ ft/sec x ((20./.50) +1) x 3600 sec/hr x 20. Ac x 43560 ft^2/ac = 42,177.23 ft^3/hr

Implying seven significant figures (as requested in your question) when none of the inputs had seven significant figures would have been erroneous.

Using significant figures, I consider the most accurate report of this calculation to be 42,000 ft^3/hr.

ii. What was the conversion value you used to convert 42,000 ft^3/hr to 5,300 gpm?

Response:

To calculate the hypothetical flow rate in gpm:

$Q = 3.28 \times 10^{-7}$ ft/sec x ((20./.50) +1) x 60 sec/min x 20. Ac x 43560 ft^2/ac x 7.48 gallons/ft^3 = 5,258.09 gpm

Using significant figures, I consider the most accurate report of this calculation to be 5,300 gpm.

iii. Is 0.12 usually the conversion value to convert ft^3/hr to gpm? E.g., 1 ft^3/hr equals 0.12 gpm?

Response:

I do not agree that 0.12 is the common conversion value to convert ft^3/hr to gpm. I prefer to use 7.48/60.

iv. Was 5,300 rounded to the nearest hundred? If so, what would the value be if you rounded the calculation to the nearest hundredth?

Response:

See my response to Environmental Groups' question 15.a.ii.

v. What was the conversion you used to convert 5,300 gpm to 7.5 million gal/day? Was the conversion gpm x 60 x 24?

Response:

To calculate the hypothetical flow rate in million gal/day(mgd):

Q = 3.28 x 10^{-7} ft/sec x ((20./.50) +1) x 3600 sec/hr x 24 hr/day x 20. ac x 43560 ft^2/ac x 7.48 gallons/ft^3 = 7,571,656.57 gallons/day

Using significant figures, I consider the most accurate report of this calculation to be 7.6 mgd.

My pre-filed testimony included a typographic error. The correct flow rate for the postulated surface impoundment is 7.6 mgd.

vi. What would the following calculation equal in gal/day if you did not do any rounding: Q = 20 ac x 43,560 ft^2/ac x 0.048 ft/hr = 42,000 ft^3/hr = 5,300 gpm = 7.5 million gal/day?

Response:

See my response to Environmental Groups' question 15.a.v.

b. Using your same formula, all other variables remaining the same, what would the total flow per hour for the 20-acre pond if the filter layer was 1 foot (12 inches) thick?

Response:

Q = 3.28 x 10^{-7} ft/sec x ((20./1.) +1) x 3600 sec/hr x 24 hr/day x 20. ac x 43560 ft^2/ac x 7.48 gallons/ft^3 = 3,878,165.56 gallons/day

Using significant figures, I consider the most accurate report of this calculation to be 3.9 mgd.

In most engineered systems changes in the design parameters results in changes in the systems response. This is true that if the filter layer is thicker or less permeable the flow is reduced. By the Illinois rule a very thin and porous geotextile could be used as a filter layer. I chose to use the minimum permeability and reasonable thickness of filter layer to provide a reasonable estimate of the flow.

Even if the system "only" yielded 3.9 mgd that flow would be a significant impediment to the operation of a CCR management system that is not required by the Federal CCR Rule.

c. Using your same formula, all other variables remaining the same, what would the total flow per hour be for the 20-acre pond if the hydraulic conductivity of the filter layer was 1 x 10^{-6} cm/sec?

Response:

The CCR surface impoundment you ask about would be in violation of the Proposed Illinois CCR Rule.

Section 845.420(a)(2) of the Proposed Illinois CCR Rule states: "have placed above it a filter layer that has a hydraulic conductivity of no less than $1x10^{-5}$ cm/sec;". Since 1×10^{-6} is less than 1×10^{-5} this would be a noncompliant filter layer.

16. On page 7 and page 8, you mention a hypothetical 20-acre surface impoundment:

    a. Why did you choose a 20-acre surface impoundment?

    Response:

    To aid in my testimony's demonstration of what the requirements of the Proposed Illinois CCR Rule would dictate for a hypothetical CCR Impoundment.

    b. Did you review surface impoundments in Illinois to arrive at the 20-acre hypothetical?

    Response:

    No

    c. Did you review the acreage of surface impoundments owned or operated by Midwest Generation? If so, what is the range of acreage for the impoundments you reviewed?

    Response:

    MWG objects to the question to the extent it requests site specific information. The Hearing Officer has limited questioning to general questions, and has held that site-specific information is outside the scope of the rulemaking. See 8/13/20 Tr., PCB20-19, pp. 17:7-10, 215:23-216:3. *See also Public Comment of Illinois Attorney General's Office*, PC #15, PCB 20-19, August 10, 2020 (PCB20-19 is a rulemaking of general applicability and site-specific questions are not appropriate). Without waiving the objection, in preparing my testimony I did not review the acreage of surface impoundments owned by MWG.

17. On page 8, you state: "The installation of a leachate collection and removal system in the hypothetical 20-acre surface impoundment presented earlier is expected to require the mining, transportation, and placement of over 70,000 cubic yards (3,500 to 4,500 truckloads) of free-draining gravel, which may not be considered to be a prudent use of natural resources, given the US EPAs position on the adequacy of composite liners without leachate collection."

    a. What's the basis for the "70,000 cubic yards" value?

    Response:

    Calculation as follows

    20 acres x 43560 ft^2/acre x 2.3 ft (average nominal thickness of drainage layer) / 27 ft^3/yd^3 = 74,213 yd^3

    Considering significant figures, I could have testified 74,000 cubic yards. Instead I stated, "over 70,000 cubic yards."

i. Did you conduct any analysis to arrive at that value?

Response:

See Answer to Environmental Groups' Question 17.a.i.

ii. If yes, what was that analysis?

Response:

See Answer to Environmental Groups' Question 17.a.i.

b. What's the basis for the "3,500 to 4,500 truckloads" range?

Response:

The correct calculation as follows:

70,000 yd^3 / 15 yd^3/truck load = 4667 trucks.

70,000 yd^3 / 20 yd^3/truck load = 3500 trucks

Using significant figures, my testimony could also have stated:

> The installation of a leachate collection and removal system in the hypothetical 20-acre surface impoundment presented earlier is expected to require the mining, transportation, and placement of over 70,000 cubic yards (4,000 to 5,000 truckloads) of free-draining gravel, which may not be considered to be a prudent use of natural resources, given the US EPAs position on the adequacy of composite liners without leachate collection.

The volume of trucks is based on the physical volume of the dump bed, the legal weight restrictions, the weight of the truck and trailer. The values of 15 to 20 yards per truckload are rules of thumb based on my experience.

i. Why is there a difference of 1,000 truckloads from least to greatest in the range of truckloads for 70,000 cubic yards?

Response

Dump trucks, belly dumps, and end dumps all have different legal capacities, see also Answer to Environmental Groups' Questions 17.b.

ii. Did you conduct any analysis to arrive at the range of 3,500 to 4,500? If so, what was that analysis?

Response

See my response to Environmental Groups' question 17.b. and 17.b.i.

c. Can free-draining gravel be brought to an impoundment through other means than trucks, such by barge or by rail?

Response:

MWG objects to the question to the extent it is outside the considerations for a rulemaking. Under Section 27 of the Illinois Environmental Protection Act, when promulgating regulations, the Board must take into account various factors including the character of the area involved, the character of surrounding land uses, zoning classifications, the nature of the existing air quality, or receiving body, and the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution. (415 ILCS 5/27). While it may be theoretically possible to bring gravel to a CCR surface impoundment through other methods such as a barge or by rail, under information and belief, there are practical considerations to moving materials to a power station via rail and barge that may not make the other methods feasible.

18. On page 8, you state: "To date, two states (Oklahoma and Georgia) have obtained US EPA approval of their CCR programs. Neither of these states have a requirement to install a leachate collection and removal system in a CCR surface impoundment. Also, I am not aware of any other state requiring (or proposing to require) a leachate collection and removal system in a CCR surface impoundment."

    a. What is the relevance, if any, of whether other states have required leachate collection and removal systems?

Response:

In my opinion, recognizing what other states regulators consider to be an appropriate and prudent level of protection to human health and the environment is a relevant input to the Illinois Pollution Control Board. Since the responsible regulators of the US EPA, Oklahoma, and Georgia have all developed CCR regulation without the requirement for leachate collection in CCR impoundments, it is indicative that other agencies share a regulatory position that is not in agreement with the Illinois EPA.

19. On page 8, you state: "The Federal CCR Rule and the Proposed Illinois CCR Rule both require a system of groundwater monitoring wells near the waste boundary of a CCR surface impoundment (Reference 1, Section 845.630.a.2), which is effectively an early leak detection system and thus allow any required remedial actions to be implemented before offsite groundwater impacts."

    a. What does the phrase "early leak detection system" mean?

Response:

A system that would allow testing and detection of CCR constituents in the groundwater sampled from groundwater monitoring wells located at the edge of the CCR surface impoundment.

    b. Are there any other types of leak detection systems?

Response:

Yes, but I consider the use of groundwater monitoring wells at or near the waste boundary to be the most proven and appropriate method of leak detection.

c. Is your statement referring to surface impoundments generally or only new or retrofitted impoundments?

Response:

My pre-filed testimony did not indicate limited applicability, and the statement is applicable to both types of surface impoundments.

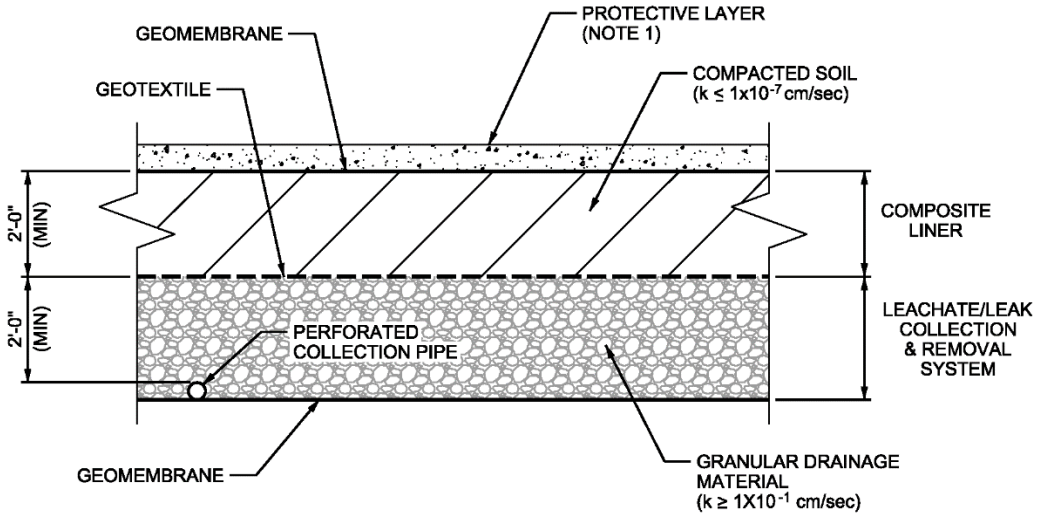
20. On page 9, you state: "Given my concerns with the system described in the Proposed Illinois CCR Rule, I suggest the Illinois Pollution Control Board should allow an alternative method of leachate collection that is at least as protective as the system required by the Proposed Illinois CCR Rule. For example, a collection system similar to that shown in Figure 2 would provide a proactive means of protecting groundwater since the lower geomembrane liner would impede the flow of any leakage from the primary composite liner and direct the flow to the leachate pumping system."

a. Is it your opinion that the collection system similar to Figure 2 is as protective or more protective than the collection system proposed by IEPA?

Response:

Since the US EPA determined that CCR surface impoundments are not required to include leachate collection and removal systems under the Federal CCR Rule, it is my opinion that surface impoundments with a properly designed and constructed composite liner system are protective of human health and the environment.

I estimate that owner operators of a CCR surface impoundment with a leachate collection system as presented in Figure 2 of my pre-filed testimony (reproduced herein) are more likely to pump any fluids from the drainage layer or leak collection layer since the flow rate of water would be significantly less than the flow rate associated with the proposed Illinois design. Therefore, I consider that the design depicted in Figure 2 is more protective than what is proposed by the Illinois EPA.



POSSIBLE ALTERNATE LINER FOR CCR SURFACE IMPOUNDMENTS WITH PROACTIVE LEAK COLLECTION SYSTEM IN LIEU OF LEACHATE COLLECTION SYSTEM

FIGURE 2

NOTE 1: PROPOSED 35 ILL. ADM. CODE 845.420 DOES NOT SPECIFY THICKNESS REQUIREMENTS FOR THE PROTECTIVE LAYER.

21. On page 10, you state: "As a licensed professional engineer, I believe that valid scientific studies should be the basis for environmental regulation, which does not appear to be the case for the leachate collection and removal requirements in the Proposed Illinois CCR Rule."

    a. Did you review any of the materials in the proceedings that adopted the leachate collection system requirements for solid waste landfills in Illinois?

    Response:

    MWG objects to the question as not relevant and beyond the scope of this rulemaking, which is regarding coal combustion residuals ("CCR") and CCR surface impoundments. Without waiving the objection, I did not review documents with a focus on landfill leachate collection systems since the Proposed Illinois CCR Rule is specifically written to address surface impoundments as stated in section 845.100 (h) of the proposed rule states "This Part does not apply to landfills that receive CCR." See also Response to Illinois EPA Question 4.

22. On page 13, you state: "The decontamination could include cleaning with high-pressure water washes, visual inspections for any damage, repair if damage was a result of the

removal of CCR, and reuse as a supplemental layer below a new composite liner as suggested in Figure 2."

a. If an owner or operator was to install the alternative leachate collection system you proposed on pages 9 and 10, how could the existing geomembrane liner be reused?

Response:

The existing geomembrane liner in a CCR impoundment could be reused as the lower layer of geomembrane as depicted in Figure 2.

EXHIBIT 1

HUMAN AND ECOLOGICAL RISK ASSESSMENT OF COAL COMBUSTION RESIDUALS

Final

December 2014

U.S. Environmental Protection Agency
Office of Solid Waste and Emergency Response
Office of Resource Conservation and Recovery

Regulation Identifier Number: 2050-AE81

Executive Summary

Purpose

The purpose of the risk assessment is to characterize the risks that may result from the current disposal practices for coal combustion residuals (CCRs) and provide a scientific basis for the development of regulations necessary to protect human health and the environment under the Resource Conservation and Recovery Act (RCRA).

Scope

CCR is a broad term used to refer to the byproducts that are generated either directly by coal combustion or as a result of applying certain pollution control devices to emissions from coal-fired combustion units. The distinct CCR categories identified in the rulemaking include fly ash, bottom ash, boiler slag, and flue gas desulfurization (FGD) materials. All coal-fired electric utility plants in the United States generate at least one of these wastes. These different CCR wastes may be generated separately or mixed together. Once generated, CCRs may be either beneficially used or disposed of in surface impoundments and landfills (collectively referred to as "waste management units" or "WMUs"). The regulatory scope of this rulemaking is limited to current disposal practices for CCRs generated by coal-fired electric utilities and independent power producers covered by the North American Industry Classification System (NAICS) code 221112. The scope of this risk assessment is limited accordingly. The United Stated Environmental Protection Agency (EPA) did not evaluate disposal of wastes other than CCRs, disposal of CCRs at off-site locations, WMUs that have ceased receiving waste, or historical disposal of CCRs by facilities that are no longer operating or not otherwise covered by NAICS code 221112.

Some coal-fired power plants conduct coal preparation activities prior to combustion. These activities may include, but are not limited to, coal handling by conveyor systems, coal washing for removing mineral matter, and coal "sizing" to reduce the average particle size of coal. The wastes generated from these coal preparation activities are collectively referred to as "coal refuse." However, some facilities are known to dispose of coal refuse together with CCRs because the chemical characteristics of the coal refuse can have a pronounced effect on the release of chemical constituents from CCRs, EPA also considered the codisposal of this additional waste stream (referred to as "ash and coal refuse") in the risk assessment.

Overview of Risk Assessment

EPA used mathematical models to determine the rate at which chemical constituents may be released from different WMUs, to predict the fate and transport of these constituents through the environment, and to estimate the resulting risks to human and ecological receptors. Modeling was conducted in a stepwise fashion, with more refined analyses used at each subsequent step. The findings at each of the analyses conducted for this risk assessment are summarized below.

Conclusions

Based on the analyses presented in this document, EPA concludes that current management practice of placing CCR waste in surface impoundments and landfills poses risks to human health and the environment within the range that OSWER typically regulates. On a national scale, surface impoundments presented higher risks than landfills. Risks to ecological receptors were identified from exposures to aluminum, arsenic, barium, beryllium, boron, cadmium, chloride, chromium, selenium and vanadium through direct exposure to impoundment wastewater. Risks to residential receptors were identified primarily from exposures to arsenic and molybdenum in ground water used as a source of drinking water, but additional risks from boron, cadmium, cobalt, fluoride, mercury and thallium were identified for specific subsets of national disposal practices.

Sensitivity analyses on liner type indicate that disposal of CCR wastes in unlined surface impoundments and landfills presents the greatest risks to human health and the environment. As modeled, the national risks from clay-lined units are lower than those for unlined units, but such units can exceed risk criteria at individual sites. Composite liners were the only liner type modeled that effectively reduced risks from all pathways and constituents far below human health and ecological criteria in every sensitivity analysis conducted. Sensitivity analyses on waste type indicate that the acidic conditions that result from codisposal of CCR waste with coal refuse and the basic conditions that result from disposal of FGD waste result in higher risks from arsenic and other constituents than CCR waste disposed alone.

The risk results are consistent with the ground water damage cases compiled by EPA. These damage cases were primarily associated with unlined units and were most frequently associated with releases of arsenic. Recent surveys of the industry indicate the majority of newly constructed units are lined, and that that the practice of codisposal with coal refuse has declined. However, this risk assessment presents a static snapshot of current disposal practices. While newer units may be managed in a more protective manner, older units, which still comprise the majority of current units, continue to operate in a manner that poses risks to human health and the environment within the range that OSWER typically regulates.

4 Probabilistic Analysis

The screening analysis presented in **Section 3** identified the potential for risks to human health and the environment through multiple exposure pathways. This screening provided adequate characterization of the risks associated with several of the evaluated pathways. However, due to the conservative nature of the screening, additional characterization of human ingestion of ground water and fish, as well as ecological contact with and ingestion of surface water and sediment, were necessary to support a robust set of conclusions about current CCR disposal practices. The Agency conducted this further analysis using a probabilistic, site-based approach that combined site-specific data with regional and national data. This section describes the overarching analytical framework, as well as the specific models and inputs used within this framework to predict the fate and transport of COPCs through subsurface soils and ground water. The discussion of the probabilistic analysis is divided into the following sections:

- **Section 4.1:** Outlines the probabilistic modeling framework used by EPA to quantify the potential risks to human and ecological receptors that result from WMU leaching.
- **Section 4.2:** Details the selection of modeled leachate concentrations.
- **Section 4.3:** Details the selection of modeled leaching durations.
- **Section 4.4:** Details the selection of modeled infiltration rates.
- **Section 4.5:** Details the selection of modeled depth of WMUs below ground surface.
- **Section 4.6:** Details the selection of modeled receptor locations.
- **Section 4.7:** Provides an overview of subsurface transport modeling used to calculate exposures resulting from drinking water ingestion (human health).
- **Section 4.8:** Provides an overview of the surface water models used to calculate exposures resulting from ingestion of fish (human health) and direct contact with both surface water and sediment (ecological).
- **Section 4.9:** Provides an overview of the exposure and risk models used to quantify the risks associated with calculated exposure concentrations.
- **Section 4.10**: Presents the modeled probabilistic risks results.

4.1 General Analytical Framework

Ground water fate and transport modeling was conducted with the EPA Composite Model for Leachate Migration with Transformation Products (EPACMTP) (U.S. EPA, 1996a, 1997a, 2003a,b,c). EPACMTP consists of two coupled modules: a one-dimensional module that simulates infiltration and dissolved constituent transport through unsaturated soils in the vadose zone and a three-dimensional module that simulates transport through ground water. EPACMTP models ground water concentrations present at a specified location (such as a private well or a stream) as

For arsenic, the available data collected with the LEAF methods have demonstrated that the leaching of arsenic can be limited through oxidation by and complexation with calcium. As a result, the duration of arsenic leaching from CCRs is better represented by accounting for the presence of calcium. Arsenic leaching from landfills was modeled as having one of the following two relationships with dissolved calcium concentrations as a function of the cumulative L/S ratio (discussed further in **Appendix I**):

- **Case 1, Low Calcium Concentration (≤ 5,000 mg/kg):** Arsenic leaching begins at an initial concentration defined by the LEAF Method 1313 data and is held constant until the total available mass is depleted.
- **Case 2, High Calcium Concentration (> 5,000 mg/kg):** Arsenic leaching begins at an initial concentration defined by the LEAF Method 1313 data and is held constant until all of the free arsenic has been depleted. Empirical data available in LEACHXS Lite have shown that this generally occurs when the cumulative amount of water that has infiltrated through the ash relative to the mass of waste present approaches a ratio of 1. A typical landfill may take around a hundred years of leaching to reach this cumulative L/S ratio. At this point, further arsenic leaching is inhibited by the calcium present and effectively ceases until the time at which around 90 percent of the available calcium has been leached away. Arsenic then begins to leach again at the previous concentration until all remaining available arsenic is depleted.

4.4 Infiltration Rate

The following subsection summarizes the approach used to assign infiltration rates to each WMU within the probabilistic framework. Infiltration is the process through which water migrates through WMUs and enters the subsurface environment. The rate at which water can pass through a WMU is limited primarily by the hydraulic conductivity of the liner (if any) present. The 2009/2010 EPA Surveys contained information on the type of liner at different WMUs. Based on the descriptions of liners reported in survey responses, each surface impoundment and landfill was assigned one of three modeled liner types: no liner, clay liner or composite liner. These three liner types are the conceptual liner scenarios developed in support of EPA's Industrial Subtitle D Guidance (U.S. EPA, 2006b), and are described as follows:

- **No Liner Scenario:** Waste is placed directly on local soils, either on grade or excavated to some design depth and without a leachate collection system. At closure, two feet of native soil cover, the minimum required by Subtitle D regulations, is installed and assumed to support vegetation.
- **Clay Liner Scenario:** Waste is placed on a three-foot compacted clay liner that is installed over local soils without a leachate collection system, either on grade or excavated to some design depth. At closure, a three-foot clay cover is installed and covered with one foot of loam to support vegetation and drainage.
- **Composite Liner Scenario:** Waste is placed on a liner system that consists of a plastic liner (e.g., high-density polyethylene membrane) underlain by either a natural or geosynthetic clay

liner. A leachate collection system is assumed to exist between the waste and the liner system. At closure, a three-foot clay cover (graded and otherwise designed to prevent ponding) or functional equivalent is assumed to be installed and covered with a one foot of loam to support vegetation and drainage.

During the data preparation loop, liner types were assigned to each WMU where known from survey data. In cases where available survey data indicated that a WMU was lined, but did not specify the type of liner, a clay or composite liner was selected probabilistically based on the relative prevalence of those liner types. In cases where neither the presence nor absence of a liner was specified in the available survey data, one of these three types was probabilistically assigned to that WMU based on the prevalence of liner types reported for other surface impoundments or landfills, as appropriate. During the Monte Carlo loop, EPACMTP used the assigned liner type, together with the assigned WMU type and local climate data to calculate an infiltration rate, as described in Appendix A of the EPACMTP background document (U.S. EPA, 2003b).

4.5 Depth Below Grade

The following subsection summarizes the approach used to assign a depth below grade to each WMU within the probabilistic framework. Depth below grade represents the total depth that a given WMU extends below the ground surface. This parameter was used during model iterations to determine the distance from the bottom of the WMU to the ground water table. EPA used the following two data sources to characterize this parameter for both surface impoundments and landfills:

- A collection of site-characterization reports published by EPRI (EPRI 1991; 1992; 1994a,b; 1996a,b; and 1997b-k); and
- A Council of Industrial Boiler Owners (CIBO) voluntary survey (CIBO, 1997).

The EPRI/CIBO reports provide diagrams of the layout of different WMUs that EPA used to determine the total depth that each extended below ground. These data were used to compile distributions that were probabilistically sampled during each model iteration. Because the designs of surface impoundments and landfills differ, separate distributions were developed for each. The selected value was constrained to be no deeper than the water table present in that model iteration. During a given model iteration, if the resulting depth below grade resulted in a unit below the ground water table, a new value was selected until the unit fell at or above the water table.

Figure 4-3 below displays the distributions of the data collected for surface impoundments. EPRI and CIBO provided data on a total of 16 surface impoundments. These reported depths tended to be mostly or entirely below-grade. The measured depths below grade at these 16 facilities were used to create an empirical distribution that was sampled during each model iteration.

uncertainty. EPA used two comparisons to assess whether the results of the probabilistic analysis accurately reflect with what may occur in the field. First, EPA examined the leachate data measured with LEAF methods and compared these concentrations to those measured in the field. Second, EPA examined the damage cases to identify the WMU types and constituents most frequently found at damage cases and compared these to the result of the sensitivity and uncertainty analyses.

Leachate Concentrations

EPA characterized leachate from surface impoundments using pore water data and leachate from landfills using LEAF data. Pore water data were collected from core samples both in and beneath surface impoundments. Since the cores take leachate directly from the field, these data are known to represent field conditions and no further comparison is necessary. For landfills, U.S. EPA (2014b) compared LEAF test methods to actual field leachate, both in Europe and the United States. In general, the report demonstrates that LEAF methods accurately capture the leachate characteristics found in the field. Properly accounting for both the pH of the waste in field conditions, as well as the liquid-to-solid ratio of the leachate and waste, was shown to result in lab results very close to those found in the corresponding field conditions.

Comparison of Results to Damage Cases

EPA reviewed the available data on both proven and potential damage cases and compared the findings with the results of the sensitivity and uncertainty analyses. Each damage case reflects a combination of site-specific conditions present at that site. This contrasts with the risk assessment, which is nationwide. Due to the differing nature of these two sources of information, a direct comparison would not be relevant. However, general characteristics and conclusions from the damage cases are relevant to support the findings of the risk assessment, and are discussed below.

The vast majority of damage cases were associated with unlined surface impoundments and landfills. No damage cases were identified for composite-lined units. This agrees well with the results of the sensitivity analyses, which showed that risks were significantly higher for unlined WMUs than for other units, and that risks for composite-lined units were far below all cancer and noncancer criteria.

Arsenic was by far the most common constituent associated with damage cases. Similarly, it was the constituent that exceeded the risk criteria in the most scenarios, and by the greatest magnitude. Other common constituents from the damage cases such as boron and cadmium also exceeded the criteria in the sensitivity analyses. Additional damage cases were identified for other constituents for which no risks were identified in the sensitivity analyses. There are a number of reasons why modeled ground water risks and damage cases do not perfectly align:

- **Different Benchmarks:** In some cases, state standards are more conservative than EPA standards. Other times, state standards exist for constituents where EPA has not yet established a benchmark.
- **Closer Monitoring Distances:** In many of the potential damage cases, ground water exceedances were discovered near the boundary of the WMU. The risk assessment

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