BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

In the Matter of:	)	
	)	
STANDARD FOR THE DISPOSAL OF COAL COMBUSTION RESIDUALS IN SURFACE IMPOUNDMENTS: PROPOSED NEW 35 ILL. ADM. CODE 845	)	R2020-19(A) (Rulemaking - Land)
	)	

NOTICE OF ELECTRONIC FILING

To: Attached Service List

PLEASE TAKE NOTICE that on August 2, 2022, I electronically filed with the Clerk of the Illinois Pollution Control Board the **ENVIRONMENTAL LAW & POLICY CENTER, LITTLE VILLAGE ENVIRONMENTAL JUSTICE ORGANIZATION, PRAIRIE RIVER NETWORK, AND SIERRA CLUB'S RESPONSE COMMENTS ON ENVIRONMENTAL GROUPS' RECOMMENDED RULES**, copies of which are served on you along with this notice. Exhibits D through H will be filed separately.

Dated: Aug. 2, 2022

Respectfully Submitted,

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In the Matter of:	)	
	)	R2020-19(A)
STANDARDS FOR THE DISPOSAL	)	
OF COAL COMBUSTION RESIDUALS	)	(Rulemaking – Land)
IN SURFACE IMPOUNDMENTS:	)	
PROPOSED NEW 35 ILL. ADM.	)	
CODE 845	)	

RESPONSE COMMENTS ON ENVIRONMENTAL GROUPS' RECOMMENDED RULES

Pursuant to the Illinois Pollution Control Board ("the Board" or "IPCB")'s order dated May 26, 2022, the Environmental Law & Policy Center ("ELPC"), Little Village Environmental Justice Organization ("LVEJO"), Prairie Rivers Network ("PRN"), and Sierra Club (collectively, "Environmental Groups" or "Commenters"), hereby submit these Response Comments on Environmental Groups' Recommended Rules in the above-referenced docket. We appreciate the Board's prompt consideration of these important matters.

I. Environmental Groups' Proposed Rules Comply with the Act and Board Rules.

In May 2021, the Board adopted rules implementing the Coal Ash Pollution Prevention Act, codified at Section 22.59 of the Illinois Environmental Protection Act ("the Act"). These new Part 845 rules create standards for the disposal of coal combustion residuals ("CCR" or "coal ash") generated by coal-fired power plants and establish a State permitting program to regulate all aspects of CCR surface impoundments. Among the rules' primary goals is to protect groundwater from being contaminated by CCR pollutants leaking from surface impoundments. However, CCR can pollute from more sources than just surface impoundments regulated under Part 845. Therefore, Environmental Groups urged the Board to critically review such sources, either by expanding the rulemaking or by opening a sub-docket to explore the issue further.[1]

The Board agreed that there is a threat to Illinois' environment posed by historic, unconsolidated ash fills and piles, including temporary accumulations, which have not been systemically catalogued by Illinois Environmental Protection Agency ("IEPA" or "the Agency") or any other state agency.[2] The Board concluded, however, that CCR piles do not fit the definition of "CCR surface impoundments" and therefore are not included in the mandate of Section 22.59(g). To address the threat that unconsolidated ash fill poses and to evaluate additional protections against pollution from CCR piles and fugitive coal ash dust, the Board directed the Clerk to open a sub-docket to explore those subjects in detail using the Board's rulemaking authority under Sections 13(a) and 22(b) of the Act.[3] On February 4, 2021, IPCB opened sub-docket A to address these additional concerns:

[1] Env't Groups' Final Post-Hearing Comments at 61, R2020-19 (Oct. 30, 2020) ("Env't Groups' Post-Hearing Comments").
[2] Op. and Order of the Bd. at 12, R2020-19(A) (Feb. 4, 2021) ("Feb. 2021 Order").
[3] *Id*.

1) Historic, unconsolidated coal ash fill in the State;
2) The use of temporary storage piles of coal ash, including time and volume limits;
3) Fugitive dust monitoring plans for areas neighboring CCR surface impoundments; and
4) The use of additional environmental justice screening tools.

It should be noted that multiple parties appealed the Board's April 15, 2021 Order in R2020-19. Midwest Generation, LLC ("MWG");[4] AmerenEnergy Medina Valley Co-Gen, LLC and Union Electric Company;[5] and Dynegy Midwest Generation, LLC ("Dynegy") together with Illinois Power Generating Company, Illinois Power Resources Generating, LLC ("IPRG"), Electric Energy, Inc., and Kincaid Generation, LLC[6] all sought review of certain sections in Part 845. None of the petitioners sought review of the Board's decision to open the sub-docket to discuss the four mentioned topics.

On May 6, 2021, to facilitate the discussion regarding the four above topics, the Board opened a ninety-day comment period and sought "comments, information, and specific proposals on rule language from any interested party on these four issues."[7] In total there were fourteen comments submitted during that initial comment period—including comments from individual community members affected by specific nearby facilities, American Coal Ash Association, Illinois Environmental Regulatory Group ("IERG"), Clean Power Lake County, MWG, Dynegy, and a joint comment from Environmental Groups. Environmental Groups' comments were the only comments submitted that both addressed all four topics and proposed rule language to address those four topics. Environmental Groups' proposed rule consists of a new Part 846 to regulate CCR that is not found in surface impoundments, along with amendments to Part 845, which regulates CCR surface impoundments. None of the fourteen comments submitted—including those submitted in opposition to the Board's approval of the rulemaking—contested the Board's authority to open the sub-docket.

On March 3, 2022, the Board presented the Environmental Groups' proposed rule language contained in their comments, in their entirety, for additional public comment.[8] The public had ninety days, until June 3, 2022, to submit their comments on the proposed rules. On May 26, 2022, the Board granted Environmental Groups' motion requesting that the Board allow for an additional sixty-day window following the June 3, 2022, deadline to allow for responsive comments from participants.[9] On June 2, 2022, IEPA submitted its comments on the proposed rule, with Environmental Groups, Dynegy

[4] MWG, Pet. for Direct Admin. Rev., R2020-19 (May 25, 2021) (seeking review of (1) the definitions of "Inactive CCR surface impoundment" in 35 Ill. Adm. Code 840.120, (2) the requirements for closure by removal in 35 Ill. Adm. Code 845.740, and (3) the requirement for groundwater elevation monitoring in 35 Ill. Adm. Code Part 845.650).
[5] AmerenEnergy Medina Valley Co-Gen, LLC, and Union Elec. Co., d/b/a Ameren Missouri, Pet. for Direct Admin. Rev., R2020-19 (May 26, 2021) (seeking review of (1) the definitions of "Inactive CCR surface impoundment" and "Inactive Closed CCR surface impoundment" in 35 Ill. Adm. Code 840.120, (2) the requirements for closure by removal in 35 Ill. Adm. Code 845.740, and (3) the requirement for groundwater elevation monitoring in 35 Ill. Adm. Code Part 845.650).
[6] Dynegy, Ill. Power Generating Co., Ill. Power Res. Generating, LLC, Elec. Energy, Inc., and Kincaid Generation, LLC, Pet. for Direct Admin. Rev., R2020-19 (May 26, 2021) (seeking review of (1) the requirements for closure with a final cover system in 35 Ill. Adm. Code Part 845.750, (2) the definition of "Inactive Surface Impoundment" in 35 Ill. Adm. Code Part 845.120, and (3) the requirement for monthly groundwater elevation monitoring in 35 Ill. Adm. Code Part 845.650).
[7] Hr'g Officer Order at 1, R2020-19(A) (May 6, 2021) ("May 2021 Order").
[8] Order of the Bd. at 4, R2020-19(A) (Mar. 3, 2022).
[9] Order of the Bd. at 2, R2020-19(A), (May 26, 2022).

and Southern Illinois Power Cooperative ("SIPC"), MWG, and IERG submitting comments the following day.

In its comments, IEPA contends that Environmental Groups' Initial Comments and Recommended Rules, dated August 6, 2021, fall short of the standards for rulemaking proposals required by Section 28(a) of the Act, 415 ILCS 5/28(a) and 35 Ill. Adm. Code 102.202. Dynegy and SIPC similarly argue that the Environmental Groups' proposed rule submittal fails to include a Statement of Reasons that meets the requirements of 35 Ill. Adm. Code § 102.202(b).[10][11] Section 102.202[12] requires:

> A statement of the facts that support the proposal, and a statement of the purpose and effect of the proposal, including environmental, technical, and economic justification. The statement must discuss the applicable factors listed in Section 27(a) of the Act. The statement must include, to the extent reasonably practicable, all affected sources and facilities and the economic impact of the proposed rule . . . .

For the reasons discussed herein, Section 102.202 does not apply to the proposed rules solicited by the Board itself in this sub-docket. As discussed in greater detail below, however, the Initial Comments that Environmental Groups submitted with our proposed rules meet all the requirements of Section 102.202 even if they were not labeled a "Statement of Reasons."[13]

Finally, IEPA argues that the Board is acting outside of its rulemaking directive to address surface impoundments of CCR as set forth in Section 22.59 of the Act,[14] and thus Environmental Groups' proposed rule cannot be adopted by the Board. However, the Environmental Groups' proposed rules are not subject to the standards detailed in Section 28(a) as this is not a citizen-initiated rulemaking, but rather a Board-initiated one. The Board has authority to open a sub-docket and request proposed rules under sections 5(b), 13(a), 10(A) and 21 of the Act, and their decision to do so is entitled to deference.

A. <u>The Board Has Authority to Adopt The Rules As Proposed, And Were It to Do So, It Would be Entitled to Deference.</u>

IEPA argues that the IPCB does not have authority to adopt Part 846 as proposed, claiming that it does not meet the rulemaking standards detailed in Section 28(a) of the Act and 35 Ill. Adm. Code 102.202. Part 846 was presented by the Board, an entity that is tasked with, "determin[ing], defin[ing] and implement[ing] the environmental control standards applicable to the State of Illinois."[15] In arguing that the proposal does not meet these rulemaking standards, IEPA points to the absence of: (1) a petition signed by at least 200 persons; (2) an adequate statement of reasons; (3) a synopsis of all testimony to be presented at hearing; and (4) an electronic version of the proposed rule language in Microsoft Word. Without meeting these conditions, IEPA says that the IPCB cannot adopt the proposed rule.

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[10] Dynegy and SIPC Joint Pub. Comment in Response to the Board's March 3, 2022 Order at 15–19, R2020-19(A) (June 3, 2022) ("Dynegy Comments").
[11] For simplicity's sake, Environmental Groups refer to Dynegy and SIPC together as "Dynegy" in these response comments.
[12] 35 Ill. Adm. Code 102.202(b).
[13] ELPC, LVEJO, PRN, and Sierra Club's Initial Comments and Recommended Rules at 1–35, R2020-19(A) (Aug. 6, 2021) ("Env't Groups' Initial Comments").
[14] 415 ILCS 5/22.59.
[15] 415 ILCS 5/5(b).

IEPA's assertions are misplaced. Although IEPA correctly states the conditions for a rulemaking detailed in Section 28(a), those conditions do not apply here, as Section 28(a) only requires proposed rules to meet such conditions if they are proposed by "any person."[16] Section 28(a) speaks to citizen-initiated proposals being subject to the conditions listed, which has not occurred in the sub-docket. Environmental Groups never formally proposed their rules, but rather offered them in response to the Board's request to offer comments and proposed language on the sub-docket topics. The Board then chose to present the rule language for further comment. Section 28(a) does not restrain the Board's authority to seek further comments on rule language that was offered in comments. Further, Section 13(a) of the Act gives the Board explicit authority to adopt regulations to promote the purposes and provisions of Title III Water Pollution.[17]

IEPA's statements that the Board's consideration of rules setting out safeguards for CCR outside of coal ash surface impoundments goes beyond the authority granted to it under the Coal Ash Pollution Prevention Act ("CAPPA"),[18] are—even if true—not relevant here. As the Illinois Supreme Court has confirmed, the Board has broad authority to adopt regulations "to promote the purposes and provisions" of the Act.[19] Rejecting an argument that the Board had exceeded its authority in repealing microbiological water quality standards, the court explained that "Section 11(b) provides that the purposes of the Act are 'to restore, maintain, and enhance the purity of the waters of this State in order to protect health, welfare, property, and the quality of life, and to assure that no contaminants are discharged into the waters of this State," and held that it was "within the Board's extensive regulatory powers to decide whether a microbiological indicator was necessary to protect recreational waters."[20]

Here, the Board is similarly within their authority, as delegated by Section 13(a) of the Act, to adopt regulations "to restore, maintain, and enhance the purity of the waters of this State in order to protect health, welfare, property, and the quality of life, and to assure that no contaminants are discharged into the waters of this State."[21] So long as the Board is acting to promote the purposes and provisions of the Act, the Board is empowered by Section 13(a) to prescribe regulations that prevent and abate water pollution.[22] Based on the evidence provided by Environmental Groups, coal ash fill and piles both cause and threaten to cause the contamination of groundwater in the state, and, as discussed below, no existing rules adequately address such fill. The Board agrees that, based on the evidence provided, historic coal ash fill poses a threat to the quality of groundwater in the State; therefore, it is appropriate and necessary for the Board to take advantage of their powers delegated by Section 13(a) of the Act to address this threat.

As stated in Environmental Groups' previous comments, the Board has additional authority to regulate coal ash landfills and coal ash piles beyond the authority granted to it in Section 13(a) of the Act, as CAPPA does not limit the Agency or the Board from regulating more broadly than what is specified in CAPPA.[23] One additional source of authority to regulate these sources comes from Title V of the Act,

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[16] 415 ILCS 5/28.
[17] 415 ILCS 5/13.
[18] Comment Submitted by IEPA at 25, R2020-19(A) (June 2, 2022) ("IEPA Comments").
[19] *People v. Pollution Control Board*, 103 Ill. 2d 441, 447 (Ill. 1984); 415 ILCS 5/5(b), 10(A), 13(a), 21.
[20] *People v. Pollution Control Board*, 103 Ill. 2d 441, 448 (Ill. 1984).
[21] *Id.* (citing 415 ILCS 5/11(b)).
[22] 415 ILCS 5/13(a).
[23] Env't Groups' Post-Hearing Comments at 57–58.

which covers Land Pollution and Refuse Disposal.[24] For example, the Board may regulate these pollution sources in order to further implement the Act's prohibition on open dumping set out in Section 21 of the Act, which has been held to apply to the current owner/operator even if the waste was placed on the site prior to the current owner/operator's involvement.[25] Finally, with temporary coal ash storage piles, historic ash fill, and coal ash surface impoundments all having the potential to emit fugitive dust,[26] the Board likewise has authority to issue regulations that protect against such pollution under Section 10 of the Act.[27]

Accordingly, the Board is operating well within its authority in opening the sub-docket, requesting comments and proposed rules on the four concerns therein, and considering the rules proposed by Environmental Groups on those topics—and will be well within its authority if it decides, after a complete rulemaking proceeding, to adopt those rules. According to the Administrative Procedure Act and as enforced by courts, such agency actions and factual determinations are presumed to be proper, with only narrow exceptions.[28] In *Watra, Inc. v. License Appeal Commission*, the plaintiffs argued that each member of the License Appeal Commission was required to consider and appraise evidence related to their appeal, and that the Commission had not shown that they performed such consideration and appraisal.[29] In coming to their decision that the order of revocation was not void, the court said that "[a]n administrative agency . . . is entitled to a presumption that all of its official acts have been performed properly and this presumption extends to a reading and consideration of the evidence."[30] Here, the Board has authority under sections 5(b), 13(a), 10(A), and 21 of the Act to adopt regulations to improve water quality and to regulate the disposal of CCR, respectively, and its decision to request—and if warranted, adopt—rules on those topics is entirely proper.

1. The Board has Deference in Determining When a Rule Proposal is Technically Feasible and Economically Reasonable, and There is Not Set Evidentiary Threshold That Needs to be Met to Justify Board Action.

In an attempt to curtail the procedural history and robust record that has been built up in both the main R2020-19 docket and sub-docket A, Dynegy draws comparison to previous Board actions that were dismissed due to inadequacy under the rulemaking process contained in 35 Ill. Adm. Code 102.202.[31] Dynegy claims that Environmental Groups' Rule Proposal does not contain the requirements called for in 415 ILCS 5/28—mainly an adequate statement of reasons, petition with 200 signatures, and the

[24] 415 ILCS 5/21.
[25] *Illinois Environmental Protection Agency v. Rawe*, No. AC 92-5, 1992 WL 315780, at *3–5 (IPCB Oct. 16, 1992); *Illinois Environmental Protection Agency v. Coleman*, No. AC 04-46, 2004 WL 2578712, at *7 (IPCB Nov. 4, 2004); *see also People v. Lincoln*, 2016 IL App (1st) 143487 ¶ 51.
[26] *See, e.g.*, Env't Groups' Comments on Env't Groups' Proposed Rules, R2020-19(A) (June 3, 2022) ("Env't Groups' Comments on Proposed Rules"); *infra* Sections IV and V.
[27] 415 ILCS 5/10 (The Board, "pursuant to procedures prescribed in Title VII of this Act, may adopt regulations to promote the purposes of this Title. Without limiting the generality of this authority, such regulations may among other things prescribe: (b) Emission standards specifying the maximum amounts or concentrations of various contaminants that may be discharged into the atmosphere; **(c)** Standards for the issuance of permits for construction, installation, or operation of any equipment, facility, vehicle, vessel, or aircraft capable of causing or contributing to air pollution or designed to prevent air pollution; . . . (g) Requirements and standards for equipment and procedures for monitoring contaminant discharges at their sources, the collection of samples and the collection, reporting and retention of data resulting from such monitoring.")
[28] *Glaser v. City of Chicago*, 2018 IL App (1st) 171987 ¶ 17–18.
[29] *Watra, Inc. v. License Appeal Comm'n*, 71 Ill. App. 3d 596, 600 (1st Dist. 1979).
[30] *Id*. at 601.
[31] Dynegy Comments at 12–14.

applicable factors listed in 415 ILCS 5/27(a)—and thus the Rule Proposal may not be considered nor should the Proposal proceed to hearings. However, Dynegy fails to acknowledge subsequent language in 415 ILCS 5/28 that states, "The Board may also in its discretion schedule a public hearing upon any proposal without regard to the above conditions."[32] Dynegy does not account for the wide deference given to the Board in rulemaking proceedings such as this one.

Several cases elaborate on the wide discretion of, and broad deference given to, the Board in rulemaking proceedings. In *Granite City Division v. Illinois Pollution Control Board*,[33] the Illinois Supreme Court held that,

> [S]ection 27(a) does not impose specific evidentiary requirements on the Board, thereby limiting its authority to promulgate only regulations that it has determined to be technically feasible and economically reasonable. Rather, section 27(a) requires only that the Board consider or take into account the factors set forth therein. The Board must then use its technical expertise and judgment in balancing any hardship that the regulations may cause to dischargers against its statutorily mandated purpose and function of protecting our environment and public health.

In that case, as is similar here, petitioners argued that there was insufficient evidence in the record concerning the technical feasibility and economic reasonableness of the rules at issue, and therefore that the Board failed to meet the statutory requirements under section 27(a) of the Act, rendering the rulemaking invalid.[34] The heart of the issue in *Granite City Division* was to determine what the Board was required to "take into account" under section 27(a) of the Act.[35] The Illinois Supreme Court determined that "the authority granted to the Board is a general grant of *very broad authority* and encompasses that which is necessary to achieve the *broad purposes* of the [Environmental Protection] Act."[36] It explained,[37]

> The factors set forth in Section 27(a) which the Board must consider in promulgating regulations, including the technical feasibility and economic reasonableness of compliance, do not control the Board's authority to adopt a regulation. Rather than imposing a specific evidentiary burden on the Board, … section 27(a) provides general standards to guide the Board in the exercise of its broad authority to ensure that the regulations adopted by the Board are reasonable.

As an example of the breadth of the Board's discretion, the Illinois Supreme Court has held that the Board may promulgate standards which it has found to be technically infeasible.[38] If the Board, in its discretion and based on its technical expertise, determines that a proposed regulation is necessary to carry out the purpose of the Act, it may adopt technology-forcing standards which are beyond the reach of

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[32] 415 ILCS 5/28.
[33] *Granite City Division of National Steel Co. v. Illinois Pollution Control Board,* 155 Ill. 2d 149, 183 (Ill. 1993).
[34] *Id.* at 180.
[35] *Id.*
[36] *Id.* at 182 (emphasis added).
[37] *Id.*
[38] *Monsanto Co. v. Pollution Control Board*, 67 Ill. 2d 276, 292–293 (Ill. 1977).

existing technology.[39] It is Environmental Groups' position that the Board-presented language is technically feasible and necessary to carry out the purpose of the Act. But even if the Board were to agree with the technical criticisms raised by commenters in opposition, technology-forcing regulations are not a bar to the Board from carrying out the act's purpose.

In the Board's February 4, 2021 Order in R2020-19, creating sub-docket A, the Board stated:

> The Board recognizes the current threat to Illinois' environment posed by historic, unconsolidated ash fills, piles, including temporary accumulations. As described by the Environmental Groups, these ash piles have not been systematically cataloged by IEPA or any other state agency. PC 124 at 60. These unconsolidated coal ash piles do not fit the definition of "CCR surface impoundments" and would therefore not be regulated by the framework of Part 845, nor were they included in the mandate of Section 22.59(g). Due to the expedited nature of this rulemaking, the Board does not now have enough information regarding unconsolidated ash coal fills and piles to develop appropriate rules. A more substantial record is required. The Board finds that regulation of these unconsolidated coal ash fills and piles is beyond the scope of Section 22.59(g) and therefore, *on its own motion*, directs the Clerk to open a subdocket to explore the subject in detail using the Board's rulemaking authority under Sections 13(a) and 22(b) of the Act (415 ILCS 5/13(a), 22(b) (2018)).[40]

Given the Board's recognition that coal ash stored outside of CCR surface impoundments poses a threat to Illinois' environment, the Board was well within its authority to open the sub-docket and may use its "technical expertise and judgment in balancing any hardship that the regulations may cause to dischargers against its statutorily mandated purpose and function of protecting our environment and public health."[41] No specific showing of technical feasibility or economic reasonableness is required.

2. *Examples of Previous Board Action Cited by Dynegy Do Not Support Their Argument That The Rule Proposal Has Been Procedurally Improper and Therefore Should Be Dismissed.*

The Board's May 6, 2021 order sought "comments, information, and *specific proposals on rule language* from any interested party on these four issues."[42] Environmental Groups' Initial Comments were the <u>only</u> comments that supplied the Board with specific proposed rule language. In the Board's next order on March 3, 2022,[43] it requested comments on Environmental Groups' rule language to further

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[39] The Illinois Supreme Court has stated: "[I]t is not necessarily arbitrary and capricious conduct for the Board to set a standard which a petitioner *cannot adhere to at the present time* or, if absolutely necessary to protect the public, *set a standard with which there can be no foreseeable compliance by petitioner." Id.* at 293 (emphasis added).
[40] Feb. 2021 Order at 12.
[41] *See Granite City Division of National Steel Co.,* 155 Ill. 2d at 183.
[42] May 2021 Order at 1 (emphasis added).
[43] Environmental Groups are operating under the assumption that the Board "presented" the Environmental Groups' rule language for comment: "Today, in sub-docket A, the Board *presents* – for a 90-day public comment period – rule text jointly proposed by [Environmental Groups]" Order of the Bd. at 1, R2020-19(A) (Mar. 3, 2022) (emphasis added). However, in the May 6, 2021 order in this sub-docket, it states, "On March 3, 2022, in this sub-docket, the Board *proposed* rule text which consisted of both a new Part 846 and amendments to part 845, and set a 90-day comment period on the *proposed* text to end on June 3, 2022." May 2021 Order at 1 (emphasis added). Environmental Groups are requesting clarification on whether the Board proposed or presented the Environmental Groups' rule text.

explore the issues raised.[44] Thus, Dynegy's efforts to draw comparisons to previous rulemaking cases are misguided. Environmental Groups' comments did not propose rule language pursuant to 415 ILCS 5/28(a); rather, they responded to the Board's request to provide rule language, a request that no other participant responded to. Following this, the Board presented the Environmental Groups' Part 846 rule language on its own accord, because they were the only commenters that included rule language.[45] This distinction is important when looking at the cases that Dynegy cited to support the position that this case should be dismissed.

The rulemaking cases that Dynegy cites can be distinguished from the current rulemaking based on their false assertion that Environmental Groups initiated a rulemaking. Dynegy cites numerous examples of rulemaking cases that were dismissed for inadequacy because they did not meet the requirements of 35 Ill. Adm. Code 102.202, which includes section 27(a) of the Act. This is a misguided comparison since the Board presented the rule language for comment, and nothing was proposed by Environmental Groups that would be subject to 35 Ill. Adm. Code 102.202. Nonetheless, the cited cases demonstrate the deference given to the Board in the rulemaking process. Rather than constrain the Board's authority, the various examples pointed out by Dynegy underscore the wide flexibility the Board has in the rulemaking process as well as the deference granted to the Board in such processes. The cited cases are as follows:

Dynegy incorrectly cites *In the Matter of: Amendments to 35 Ill Adm. Code Subtitle C,* R1992-08 (Aug. 13, 1992) as an example of refusing to proceed on a rule proposal for failure to provide all information required by Section 102.202. This is not accurate; this proposal went through multiple rounds of hearings which resulted in the case record occupying roughly eight feet of shelf space.[46] That rule proposal contained five distinct actions, and the Board decided not to move forward with the rulemaking because "[m]any of the initiatives that the Joint Proponents would have the Board mandate under the instant proposal are under way, and in some cases well-advanced, in other arenas."[47] This is distinguishable from the present matter, as the four topics being addressed in the sub-docket address different potential threats from coal ash not covered in Part 845 or other existing rules. Additionally, this was a proposed rulemaking subject to 35 Ill. Adm. Code 102.202 and not rule language on which the Board requested comments in a sub-docket that was opened by the Board on their own Motion.

Dynegy cites *In the Matter of: Proposed Amendments to Chapter 4: Mine Related Pollution,* R1980-03 (Feb. 21, 1980) as an example of when the Board did not authorize a hearing because Section 28 requirements were not met. Again, Dynegy mischaracterizes the docket. In R1980-03, two private citizens sent in letters requesting to comment on a current rulemaking.[48] The Board opened a new rulemaking docket because the second letter contained 200 signatures along with proposed amendments, but then dismissed the regulatory proposal after the proponents advised the Board that they would not pursue this matter any further.[49] The current proceedings are distinguishable since the Board opened the sub-docket on its own motion based on the record developed in R2020-19, not based on two letters.

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[44] May 2021 Order at 1.
[45] Order of the Bd. at 1, R2020-19(A) (Mar. 3, 2022).
[46] Op. and Order of the Bd. at 4, R1992-08 (Apr. 4, 1996).
[47] *Id.* at 5.
[48] Order of the Bd. at 1, R1980-03 (Feb. 21, 1980).
[49] *Id.*; Order of the Bd. at 1, R1980-03 (Mar. 20, 1980).

Dynegy cites *In the Matter of: Chemung Site-Specific Rule Amendments to Water Regulation Part 304 by Dean Foods*, R1982-25 (Oct 14, 1982) as an example of a rulemaking where the statement of reasons did not address all requirements of Section 102.202, and the rulemaking proposal was dismissed. This example is again not analogous to the present rulemaking. This was a site-specific rulemaking, and Dean Foods sought voluntary dismissal once it became clear that their pending National Pollutant Discharge Elimination System permit covered the same issue as the rule proposal and rendered the proposal moot.[50]

Dynegy cites *In the Matter of: Petition of Amerock Corporation, Rockford Facility, for Site-Specific Rulemaking Petition for Amendment to 35 Ill. Adm. Code 304.303,* R2001-15 (Feb. 21, 2002) as an example of a dismissal of a site-specific rulemaking petition due to deficiencies in their proposal. While that is accurate, it differs significantly from the present sub-docket. In this site-specific rulemaking, Amerock petitioned the Board to remove a sunset provision from its site-specific rule at 35 Ill. Adm. Code 304.303. The petition was deficient, and the Board gave Amerock multiple opportunities to cure those deficiencies,[51] even specifying the precise problems that needed to be cured before the rule proposal could move forward.[52] Notwithstanding these repeated opportunities to fix its petition, Amerock instead chose not to cure the deficiencies and the petition was dismissed.[53]

Rather than illustrate that the Board is obligated to simply dismiss a petition if it has deficiencies, the *Amerock* matter shows that the Board may, and does, work with petitioners in rulemakings to cure deficiencies in a proposal. Unlike the *Amerock* petition, the Board has not noted any deficiencies in Environmental Groups' suggested rule language. If the Board were to decide that Environmental Groups' proposal is subject to any requirements that it has not met (as discussed herein, we believe not), Environmental Groups would gladly remedy those deficiencies.

Dynegy further states "that it would be inappropriate and unprecedented to hold an inquiry hearing on the merits of the proposed rule language submitted to the Board without an adequate statement of reasons. Inquiry hearings are held to 'gather information on any subject the Board is authorized to regulate' (35 Ill. Admin. Code § 102.112) and are meant to 'provide a public forum where scientific, technical, and regulatory testimony and other informational on a given subject can be presented on the record before the Board,' not to discuss the merits of a rule proposal."[54]

These objections are meritless. The Board already has held multiple hearings in this matter. As Dynegy admits, the Part 845 rulemaking included six hearings, portions of which included scientific, technical, and regulatory testimony on the four issues that are the subject of the proposal.[55] Environmental Groups' proposal is an outgrowth of the original docket and was opened on the Board's own motion. Every commenter had a chance to submit rule language, and Environmental Groups were the only commenters that presented such language. The Board has the authority to open an entirely new

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[50] Order of the Bd. at 1, R1982-25 (Dec. 2, 1982).
[51] *See* Order of the Bd. at 2, R2001-15 (Oct. 5, 2000); Order of the Bd. at 5, R2001-15 (Jan. 18, 2001).
[52] Order of the Bd. at 5–7, R2001-15 (Jan. 18, 2001).
[53] Order of the Bd. at 2, R2001-15 (Feb. 21, 2002).
[54] Dynegy Comments at 13–14.
[55] *Id.* at 15, n.9.

docket and incorporate the record from another docket as the basis for the rule proposal;[56] accordingly, it certainly may incorporate the record of a main docket in a sub-docket, as it has done here.[57]

And here, the Board need not rely on the record of R2020-19 alone. This sub-docket is now in the third round of comments. Every commenter has had ample opportunity to submit scientific, technical, and regulatory evidence in opposition or in support of Environmental Groups' proposed rule. No commenter has been deprived of the opportunity to offer their views, opinions, and evidence in support or in opposition to the current proposed rule; indeed, every commenter has had the same opportunity in the sub-docket to propose rules that align with their priorities. If a commenter's views, stances, or objectives are not adequately represented in the record, it has not been for lack of opportunity.

In sum, the Board has broad authority in the process of rulemaking, and it has sought comments on the suggested rule proposal, which is to be commented on and further discussed to determine if the Board should adopt it to address the pollution concerns which the Board recognizes as valid. That proposal is grounded in the record of R2020-19 as well as that of this sub-docket A. Should the Board decide to hold a hearing on Environmental Groups' proposed rules, that decision would be amply supported and squarely within the Board's broad rulemaking authority.

3. The Board has Authority to Require Permit Fees Sufficient to Cover the Permitting Program.

IEPA argues that "legislative action by the General Assembly is first needed to not only provide the necessary statutory basis and State policy for the regulatory program proposed in new Part 846, but also the revenue and appropriations required to fund the program's implementation, administration, and enforcement."[58] IEPA disregards the fact that the Board has the authority to prescribe fees for permits, and those fees can provide the Agency with the revenue necessary to cover the costs to the Agency for the permitting program. Specifically, "[t]he Board may prescribe reasonable fees for permits required pursuant to this Act. Such fees in the aggregate may not exceed the total cost to the Agency for its inspection and permit systems."[59] Although the Board "may not prescribe any permit fees which are different in amount from those established by this Act,"[60] the Act does not specify fees for permits for historic CCR fill; therefore, the Board is vested with authority to require fees to cover the Agency's expenses for inspection and permitting of historic CCR fill. No additional legislative action is needed.

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[56] *See In the Matter of: Development, Operation and Reporting Requirements for Non-Hazardous Waste Landfills,* R1988-07 (Feb. 25, 1988). In that matter, the Board opened the docket and on the same day proposed rules that were derived from the record in R1984-17, Docket D. Order of the Bd. at 2, R1988-07 (Feb. 25, 1988). The Board's proposal was largely based on the proposal submitted by the Board's Scientific/Technical Section which was the subject of hearing in R1984-17, Docket D. *Id.* at 2. By adopting parts of record developed in R1984-17 Dockets A–D, the Board used its authority to propose a rule on first notice and open the docket for comments. *Id.*

[57] May 2021 Order at 1.

[58] IEPA Comments at 6.

[59] 415 ILCS 5/5(f).

[60] *Id.*

II. Environmental Groups' Proposed Rules to Regulate Historic Coal Ash Areas are Justified and Technically Feasible.

A. Contamination to Groundwater That Remains on the Property Is Environmental Harm.

MWG argues that there is no threat to drinking water, public health, or the environment beyond the property boundaries caused by the ash fill.[61] In making this argument, MWG disregards the violations of the Illinois groundwater quality standards found on the properties. The Illinois Legislature, in passing the Illinois Groundwater Protection Act, has already concluded that polluting groundwater on a property is unacceptable:[62]

> (a) The General Assembly finds that:
> (i) a large portion of Illinois' citizens rely on groundwater for personal consumption, and industries use a significant amount of groundwater;
> (ii) contamination of Illinois groundwater will adversely impact the health and welfare of its citizens and adversely impact the economic viability of the State;
> (iii) contamination of Illinois' groundwater is occurring;
> (iv) protection of groundwater is a necessity for future economic development in this State.
>
> (b) Therefore, it is the policy of the State of Illinois to restore, protect, and enhance the groundwaters of the State, as a natural and public resource. The State recognizes the essential and pervasive role of groundwater in the social and economic well-being of the people of Illinois, and its vital importance to the general health, safety, and welfare. It is further recognized as consistent with this policy that the groundwater resources of the State be utilized for beneficial and legitimate purposes; that waste and degradation of the resources be prevented; and that the underground water resource be managed to allow for maximum benefit of the people of the State of Illinois.

In short, the Legislature has already found that contamination of groundwater is already occurring; it harms health, the welfare of Illinois residents, and economic development; and Illinois groundwater needs to be protected for future use. None of those findings are qualified as applying to only groundwaters beyond an owner's property line. Contamination of groundwater that remains on a property is an environmental harm, and groundwater needs to be protected—even from exclusively onsite contamination—for future use.

B. Legislative Action and Vast Evidence Support Regulation of Historic Coal Ash Fill.

Dynegy and the Agency assert that the Board should not regulate historic coal ash fill because certain draft legislation that may have regulated such fill, or done so only in a limited geographical area, was not signed into law. The Agency references two "nearly-identical" bills that would regulate historic ash fill in facilities within a limited geographical area in the state,[63] while Dynegy claims—with no

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[61] MWG's Comments on the Env't Groups Initial Comments and Recommended Rules at 4, R2020-019(A) (June 3, 2022) ("MWG Comments").
[62] 415 ILCS 55/2.
[63] IEPA Comments at 8–9 (referencing HB4358 and SB 3073).

citation to legislative intent or other discussion by lawmakers—that Illinois lawmakers "rejected" the regulation of landfills and fill areas in adopting CAPPA.[64]

Neither argument supports the Board putting the brakes on this sub-docket. First, as discussed in detail herein and in Environmental Groups' earlier comments in R2020-19 and this sub-docket, the Board has abundant authority under *pre-existing* statutory provisions to regulate historic coal ash fill, in addition to fugitive dust and CCR piles. No legislative action was or is necessary for the Board to carry out what the legislature, in the Act, authorized the Board to do decades ago in order to limit pollution fouling Illinois' waters, air, and land.

Furthermore, the Legislature's 2019 decision to prioritize and expand regulation of CCR surface impoundments—a prudent decision in light of the imminent closure deadlines for Illinois' vast, and many, unlined CCR surface impoundments, under the then-recently decided *USWAG* decision[65]—in no way evidences that the Legislature intended for historic fill <u>not</u> to be regulated. The Agency's argument is similarly flawed; the Legislature's decision not to adopt legislation focused on a limited geographical area within the state, and not the state at large, casts no shadow on the Board's longstanding authority to regulate historic ash fill throughout the state.

Dynegy's similar argument[66] concerning United States Environmental Protection Agency's ("USEPA") failure to regulate historic coal ash fill fares no better. As Earthjustice and many other organizations set out in a recent Notice of Intent to sue USEPA,[67] soon after the 2015 rule was passed, groundwater monitoring data from landfills, coupled with alternate source determinations blaming polluted groundwater on "other sources" of onsite CCR, revealed that historic coal ash fill plays a much larger role in polluting waters and land than USEPA had previously contemplated.[68] Moreover, USEPA did not, in 2015, have before it the Board's 2019 order[69] determining that historic coal ash fill is contributing to groundwater pollution at numerous sites in Illinois. In short, rather than suggest that historic ash fill should not be regulated, this recent, large body of evidence demonstrates just how dire the need is for safeguards limiting pollution from historic coal ash fill.

C. <u>The Historic Ash Problem.</u>

MWG argues that Environmental Groups failed to justify why CCR fill areas at power stations should be regulated differently than areas of CCR fill at locations other than power stations throughout Illinois.[70] First, Environmental Groups' Proposed Rule does not recommend treating onsite coal ash at power plants differently from offsite coal ash. Environmental Groups recommend treating coal ash

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[64] Dynegy Comments at 16.
[65] *See Utility Solid Waste Activities Group v. Environmental Protection Agency*, 901 F.3d 414, 422 (D.C. Cir. 2018) ("*USWAG*"), in the record of R2020-19 in IEPA, Statement of Reasons, Attachment C, R2020-19 (Mar. 30, 2020). As IEPA explained in its Statement of Reasons, in the August 2018 *USWAG* decision, "[t]he court held that USEPA acted contrary to RCRA in failing to require the closure of unlined CCR surface impoundments and classifying clay-lined CCR surface impoundments as lined. *Id.* at 449." IEPA, Statement of Reasons at 7, R2020-19 (Mar. 30, 2020).
[66] Dynegy Comments at 16.
[67] Ex. A, Earthjustice to USEPA, Notice of Intent (May 17, 2022) ("Earthjustice NOI").
[68] *See id.* at, *e.g.*, 5–10.
[69] Hr'g Ex. 9, R2020-19 (Oct. 7, 2020), *Sierra Club v. Midwest Generation*, Interim Bd. Order and Op. at 28, 35, 41–42, 57, 68, 69, 75–76, 79, PCB 2013-15 (June 20, 2019) ("Interim Bd. Order and Op.").
[70] MWG Comments at 9–11.

produced by electric generating utilities and independent power producers differently because, as explained by USEPA in adopting the federal CCR rule, they generate the vast majority of coal ash, among other reasons.[71] Based on the five MWG sites, the Hennepin site, and the SIPCO Marion site all discussed in Environmental Groups' proposal,[72] power plants dumping coal ash in unlined areas was a common historical practice. The Board has concluded that at least some of those fill areas are responsible for groundwater contamination.[73] Thus, the most justifiable place to start with an investigation of coal ash fill is where the Board has evidence of contamination: coal ash fill from power plants.

D. The Environmental Justification for Regulating Unconsolidated, Historic CCR Fill.

Dynegy criticizes the numerous examples of coal ash fill causing contamination contained in Environmental Groups' Proposal, labeling those examples as "irrelevant."[74] Dynegy argues that all the examples that Environmental Groups included were "speculative" or "addressed" through existing programs.[75] Dynegy misses the mark with both of these arguments. For instance, Dynegy states that the MWG coal ash fill was addressed because "the Midwest Generation coal plants were subject to enforcement for claimed violation [sic] of Part 620 and existing prohibitions on pollution under Illinois law."[76] The enforcement case involving MWG's coal plants has been ongoing for ten years thus far and a remedy-phase hearing has not even occurred yet.[77] The enforcement case was initiated over violations caused by coal ash surface impoundments, and those violations were detected by IEPA-required monitoring around surface impoundments.[78] The contribution from the coal ash fill was uncovered through discovery in the proceeding.[79] The duration of the case and the happenstance nature of how the coal ash fill contamination was discovered demonstrate the impracticality of continuing to address contamination from ash fill exclusively through existing Illinois law and enforcement cases.

Dynegy is disingenuous in suggesting that Environmental Groups' reliance on the Hennepin coal ash contamination scenario is unsupported by evidence. At Hennepin, there are multiple ash pond systems constructed on top of ash ponds and/or ash fill. By way of example, the following is a description of the construction of a single pond in the ash pond system:

> Pond 2E was constructed within the footprint of the eastern portion of the decommissioned Pond 2 of the [East Ash Pond System or "EAPS"], by excavating and removing a portion of the ash fill. Pond 2E was . . . also designated to provide sediment control, storm flow storage, and leachate detention to the dry ash landfill that was constructed on the western portion of the Pond 2 area of the EAPS . . . .The landfill has been constructed with a liner

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[71] *See* Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities, 80 Fed. Reg. 21,302, 21,340 (Apr. 17, 2015) (grounding USEPA's decision to limit the federal CCR rule to CCR produced at coal-fired boilers owned by utilities that sell power on the grid on EPA's finding that other industries burn only a tiny fraction of the coal that electric generating units do).
[72] Env't Groups' Initial Comments at 2–7.
[73] Interim Bd. Order and Op.
[74] Dynegy Comments at 16.
[75] *Id.*
[76] *Id.* at 16, n. 13.
[77] Complaint, PCB 2013-15 (Oct. 3, 2012); Hr'g Officer Order, PCB 2013-15 (Apr. 7, 2022).
[78] Complaint, Exs. K–N, PCB 2013-15 (Oct. 3, 2012).
[79] Amended Complaint, PCB 2013-15 (Jan. 14, 2015).

> placed on the existing ash fill that was subsequently covered with several feet of ash during construction of Pond 2E.[80]

In such a scenario (in fact, Hennepin is much more complex with two separate ash pond systems, each consisting of multiple ash ponds), where a pond was constructed on top of pond and ash fill, and a landfill is constructed on top of a pond, it is not readily possible to determine whether contamination is coming from a pond, the ash landfill, historic unconsolidated ash fill, or all three. Where it is not possible to pinpoint a source as either ponds or historic ash fill on a single property, it is justifiable to hold the owner/operator responsible for both,[81] which is exactly what Environmental Groups' proposal does.

E. <u>The Technical Feasibility and Economic Reasonableness of the Environmental Groups' Proposed Rule.</u>

Dynegy argues that Environmental Groups failed to provide the costs associated with monitoring, closure, and permitting requirements.[82] Environmental Groups do not have figures for those costs because the owners and operators of power plants and the coal ash fill sites have not investigated ash fill sites or groundwater contamination coming from ash fill sites. The Board has placed the responsibility for the failure to investigate coal ash on the owner or operator's property squarely on the owner or operator:[83]

> The monitoring results show that contamination persists after MWG concluded corrective actions required by its CCAs and GMZs. MWG is aware of these results but is not undertaking any further actions to stop or even identify the specific source: no further investigation of historic areas is taking place; no additional monitoring wells are installed; and, no further inspection of ash ponds or land around the ash ponds in the locations that show persistent exceedances is taking place.
>
> MWG knew that contaminants that include coal ash constituents are leaking from its property but did not fully investigate specific source or prevent further release, claiming that IEPA did not ask it to do so. MWG, however, cannot use IEPA's actions to excuse MWG's violations of the Act or the Board rules.

Without such investigation, Environmental Groups and the public are left with incomplete information about how many sites there are, how much coal ash is at any given site, or the cost to remediate, remove, or—if the fill is and will remain out of the groundwater and otherwise meet applicable standards—cap each of those sites.

Part 845 and Proposed Part 846 have many overlapping requirements. IEPA pointed out, regarding the economic reasonableness of Part 845, that the rule requires "groundwater monitoring

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[80] USEPA, Damage Case Compendium, Technical Support Document, Volume IIa: Potential Damage Cases at 30, n. 111 (Dec. 18, 2014) (attached as Ex. 1 to Env't Groups' Initial Comments).

[81] Bd. Order at 79, PCB 2013-15 (June 20, 2019) ("It is immaterial whether any specific ash pond or any specific historic ash fill area can be pinpointed as a source to find MWG liable. The groundwater monitoring results narrow the contamination to defined areas within each of MWG Stations delineated by the monitoring wells. *Davinroy* at 796. As the owner or operator of these Stations, MWG has control over both its active ash ponds and historical coals ash storage areas.").

[82] Dynegy Comments at 19.

[83] Interim Bd. Order and Op. at 79.

systems and periodic groundwater monitoring, closure and post-closure care plans, corrective action, if necessary, to achieve groundwater protection standards … and the maintenance of publicly available records."[84] Similarly, Proposed Part 846 requires "groundwater monitoring systems and periodic groundwater monitoring, [cover] and post-[cover] care plans, corrective action, if necessary, to achieve groundwater protection standards … and the maintenance of publicly available records."[85] IEPA went on to state that Part 845 "requires the owner or operator of CCR surface impoundments to complete a thorough alternatives analysis for corrective action and closure, the technical feasibility and economical reasonableness of which, will be a facility-specific determination based on multiple factors, including constructability, long and short-term effectiveness, reliability and protection of human health and the environment."[86] Similarly, Proposed Part 846 also requires the owner or operator of power plant sites containing coal ash fill to complete a thorough alternatives analysis for corrective action. Under Part 846, therefore, the technical feasibility and economical reasonableness of corrective action will also be a "facility-specific determination based on multiple factors, including constructability, long and short term effectiveness, reliability and protection of human health and the environment."[87]

Finally, removal is required for failure to meet location standards but can be weighed against monitoring or installing a cover in other instances—again allowing a "facility-specific determination" which allows for technical feasibility and economic reasonableness to be considered by the facility as it determines how to comply. Based on the reasons above, IEPA indicated that it "believes proposed Part 845 is technically feasible and economically reasonable."[88] These same reasons support Proposed Part 846 being technically feasible and economically reasonable.

The rule's language limiting applicability to coal ash fill from electric generating utilities and independent power producers, where there is evidence of such fill, suggests that the scope of the rule's applicability will be very similar to Part 845. As a result, the scope of the monitoring will be similar to the monitoring required under Part 845. Environmental Groups expect that monitoring under Proposed Part 846 can use some of the existing monitoring infrastructure under Part 845 and that sampling under Proposed Part 846 can follow the existing processes being used for Part 845 sampling. In addition, reporting under Proposed Part 846 can be consolidated with existing reporting under Part 845. Again, this overlap makes Proposed Part 846 technically feasible and economically reasonable.

F. <u>The Scope of the Impact of the Environmental Groups' Proposal.</u>

IERG criticizes Environmental Groups' proposal for not estimating how many sites in Illinois will be potentially impacted by proposed Part 846.[89] Again, the Board has made clear that the responsibility to investigate sources of coal ash contamination falls on the owner/operator of the property.[90] Environmental Groups do not bear the responsibility for lack of information on coal ash fill areas and sources of coal ash contamination. The power plant owners and operators and their representatives cannot use their lack of diligence in investigating sources of coal ash contamination as

[84] IEPA, Statement of Reasons at 244, R2020-19 (Mar. 30, 2020).
[85] *Id.*; Env't Groups' Initial Comments at Appx. 1 (proposed Part 846 Subparts B, D, E).
[86] IEPA, Statement of Reasons at 244, R2020-19 (Mar. 30, 2020).
[87] *Id.*
[88] *Id.*
[89] Comment Submitted by IERG in Response to the Env't Groups' August 6, 2021 Recommended Rules at 8, R2020-19(A) (June 3, 2022) ("IERG Comments").
[90] Interim Bd. Order and Op. at 79.

an excuse to justify a continued lack of regulation of coal ash fill. Based on the sites that we do know of, some or most of the ash fill sites are likely on coal plant properties,[91] in addition to at landfills that received ash like the one owned by White and Brewer Trucking.[92] This gives us an approximation of the number of sites as a starting point.

III. Environmental Groups' Proposed Rules Are Necessary Complements to Existing Rules.

Contrary to the arguments of other participants in this rulemaking, Environmental Groups' proposed rules are not redundant of existing regulatory programs. Rather, they are essential complements to provisions that leave communities and the environment exposed to undetected or uncharacterized pollution that puts them at risk. This regulatory gap is most apparent for historic coal ash fill: existing regulations fail to ensure that the extent of historic coal ash fill is identified and the scope and severity of pollution from such fill, determined. Existing regulations likewise fail to incorporate and take into account community voices in determining what should be done to remedy such pollution. In sum, as Environmental Groups discussed in our initial comments in this sub-docket,[93] existing regulations are not sufficient to provide comprehensive, needed protections against contamination from historic coal ash fill.

A. Existing Regulatory Schemes are Inadequate to Protect Against Pollution from Historic Fill.

Part 620 and other existing provisions, such as open dumping prohibitions, do not adequately protect against pollution from coal ash fill. Part 620 does not require groundwater monitoring. Rather, IEPA has sometimes asked companies to monitor groundwater to evaluate compliance with those standards.[94] Moreover, Part 620 includes no mandate to investigate and characterize potential sources of pollution, such as historic fill areas. Only *if* groundwater pollution is found—an unlikely prospect absent groundwater monitoring or other periodic testing—do Part 620 and open dumping prohibitions give the Agency and the public tools to address that pollution. Even then, those tools are faulty: IEPA's "compliance commitment agreement" process excludes public input[95] and may not comprehensively address the problem,[96] while the only tool available for the public is lengthy, expensive litigation.

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[91] There are twenty-three to twenty-four coal plant or former coal plant properties in Illinois. IEPA, Pre-Filed Answers at 181–82, R2020-19 (Aug. 3, 2020); Earthjustice et al., *Cap and Run: Toxic Coal Ash Left Behind by Big Polluters Threatens Illinois Water* at 9 (Nov. 2018), https://illinoiscoalash.files.wordpress.com/2018/11/capandrun-ilcoalash_web.pdf.

[92] *See* Env't Groups' Initial Comments at 6.

[93] *See id.* at 7–8.

[94] *See, e.g.*, Ex. B, Excerpt of Hydrogeological Assessment Plan, Joliet Generating Station No. 29 (July 2010); Ex. C, Excerpt of Hydrogeological Assessment Plan, Waukegan Generating Station (Feb. 2011).

[95] *See* 35 Ill. Adm. Code 620.250 (provisions concerning Groundwater Management Zones; no mention of public engagement or input included); Order at 22, PCB 2013-15 (Oct. 3, 2013) ("CCAs are part of the pre-enforcement process conducted by the Agency, which . . . are administrative, non-judicial procedures between the Agency and an alleged violator that are not open to citizen participation").

[96] *See e.g.* Interim Bd. Order and Op. at 28, 35, 41–42, 57, 68, 69, 75–76, 79 (finding that historic CCR fill areas outside of then-recognized CCR surface impoundments at Waukegan, Will County, Powerton and Joliet, as well as a CCR pile at Powerton, are contributing to groundwater pollution); MWG's Mot. to Dismiss, Ex. 1–4, PCB 2013-15 (Nov. 5, 2012) (Compliance Commitment Agreements to resolve violation notices for exceedances of Part 620 standards at Powerton (Ex. 1), Will County (Ex. 2), Joliet 29 (Ex. 3) and Waukegan (Ex. 4), none of which identify coal ash fill or CCR piles as a source of pollution, require investigations to determine if fill or piles are present, or require remediation for pollution from any such fill or piles).

After-the-fact enforcement is *not* as good as comprehensive regulations, particularly in the case of unlined coal ash dumps where no barrier exists between the coal ash and the underlying soil or, in some cases, groundwater. Enforcement—a resource-heavy and time-demanding tool that neither the Agency nor the public can broadly wield—necessarily targets a single or limited group of polluting sites, rather than the larger universe of them. Further, enforcement is only available where the problem has already been uncovered. Vast contamination may be concealed where groundwater is not monitored or monitoring is inadequate[97]—which, contrary to MWG's claims, it would not be under the groundwater monitoring system proposed by Environmental Groups.[98] Because, as the Board has explained, it is in Illinois' interest to locate and halt all such damaging contamination;[99] because we already know of significant volumes of historic coal ash fill that are damaging our environment;[100] and because evidence strongly indicates that there is more historic coal ash fill that has not yet been delineated,[101] isolated enforcement actions do not suffice.

Relatedly, contrary to IEPA's assertions, the fact that we do not yet know the full extent and location of <u>all</u> historic coal ash fill is not a reason to avoid regulation; rather, it underscores why a proactive approach that requires comprehensive identification of historic coal ash fill is necessary. Where a pollution problem is apparent, as is the case with historic coal ash fill,[102] the Board need not wait for all known sources of such pollution to foul the environment—sometimes in irreversible ways[103]—before acting. As discussed herein, the Board has broad authority to regulate to achieve the purposes of the Act. Given that unabated pollution from historic CCR fill is a known problem that almost certainly is present beyond what is already identified, regulations are justified here.

Like Part 620, other existing regulatory programs are likewise inadequate to address the problem of historic coal ash fill. The Site Remediation Program ("SRP") under 415 ILCS 5/58.1–.17, does not render additional regulations unnecessary. As detailed in comments submitted by LVEJO in R2020-19 on June 15, 2020, the SRP is a *voluntary* program: an applicant has no obligation to seek remediation under the program and, even if a company chooses to participate in the program, it may do so only for a portion of the contaminated area at its site.[104] The Agency can hardly be certain that owners of coal plant properties would jump at the chance to explore currently concealed or unevaluated sources of pollution

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[97] *See, e.g.*, Env't Groups' Comments on Proposed Rules at 7–9; *id.* at Exs. B–F.

[98] MWG's assertion that groundwater monitoring such as that proposed that Environmental Groups is not "sound" does not hold water. *See* MWG Comments at 14. Once the extent of the historic CCR fill is delineated properly, it is similar to an unlined impoundment: there is no barrier separating it from the underlying soil or groundwater and analysis of background groundwater quality as compared to quality of groundwater downgradient of the fill will elucidate whether the fill is contaminating groundwater.

[99] In Illinois, even if groundwater is not presently used for drinking or other domestic uses, polluting it in a way that renders it un-usable is not permissible. *See* Interim Bd. Order and Op. at 85 (citing *Central Illinois Public Service Co. v. Pollution Control Board*, 116 Ill. 2d 397, 408, 507 N.E.2d 819, 824 (1987) and explaining that the Illinois Supreme Court "concurred with Board's interpretation of water pollution to include 'any contamination which prevents the State's water resources from being usable' because it allows 'the Board to protect those resources from unnecessary diminishment'"); *id.* at 84 (noting that, under the Illinois Groundwater Protection Act, "'it is the policy of the State of Illinois to restore, protect, and enhance the groundwaters of the State, as a natural and public resource.' 415 ILCS 55/2(b) (2016).").

[100] *See supra* Section I; Env't Groups' Initial Comments at 1–7.

[101] *See id.* at 5–8; Env't Groups' Post-Hearing Comments at 50–53, 60; Ex. A, Earthjustice NOI.

[102] *See* Env't Groups' Initial Comments at 1–8.

[103] *See USWAG*, 901 F.3d at 422, in the record of R2020-19 in IEPA, Statement of Reasons, Attach. C, R2020-19 (Mar. 30, 2020) ("[US]EPA has acknowledged that it 'will not always be possible' to restore groundwater or surface water to background conditions after a contamination event").

[104] *See* Comments of LVEJO at 9, R2020-19PC (June 15, 2020).

and characterize and clean up unknown volumes of CCR and polluted groundwater. The SRP has existed for years;[105] participation by owners of coal plant properties—even when they have had information indicating the presence of sources of uncontrolled pollution onsite[106]—has been minimal.

Moreover, public participation is not a required component of the SRP, meaning that the voices of affected communities are left out of fundamental decisions regarding how, or to what extent, to characterize a source of pollution at an SRP site and how to remediate contamination that is found.[107] Finally, the SRP does not require assessment—much less remediation—of several CCR-related pollutants, including sulfate, chloride, and total dissolved solids, all of which the Board, IEPA, and USEPA have recognized as CCR constituents.[108] The SRP simply does not ensure that historic coal ash fill is identified and characterized, or that pollution from such fill or piles of CCR—which MWG correctly notes has been identified as a "hazardous substance" under Comprehensive Environmental Response, Compensation, and Liability Act[109]—is wholly and promptly cleaned up. Nor, as the Attorney General's Office made clear,[110] does the SRP affect the need for additional regulations for CCR surface impoundments (such as fugitive dust monitoring, also proposed by Environmental Groups), since it does not apply to CCR surface impoundments.

The Tiered Approach to Corrective Action Objectives ("TACO") program suffers from similar limitations. First, like the SRP, it is unavailable for CCR surface impoundments.[111] Second, like the SRP, it is purely voluntary[112] and it applies, in relevant part, only to remediation undertaken under the voluntary SRP program that lacks public participation.[113] Thus, for the same reasons as the SRP, the TACO program is inadequate to protect Illinois communities and the environment from pollution from historic coal ash fill, CCR piles, or fugitive dust associated with CCR in fill, piles, or impoundments.

Finally, as Environmental Groups previously discussed,[114] landfill regulations also do not suffice to address the problem of historic coal ash fill. As the Agency noted, Environmental Groups intend to exclude active landfills subject to comprehensive, modern regulatory regimes—but provisions for new landfills under Part 811 clearly do not apply to historic CCR fill. Even where *some* landfill provisions may apply—for example, if an old CCR landfill is deemed a closed landfill under Part 807 or is subject

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[105] *See* 35 Ill. Adm. Code Part 740 regulations, https://pcb.illinois.gov/documents/dsweb/Get/Document-33436/ (noting that the regulations for the SRP were first adopted in 1997).
[106] *See*, *e.g*., Interim Bd. Order and Op. at 91.
[107] *See* Comments of LVEJO at 9–10, R2020-19PC (June 15, 2020).
[108] *See*, *e.g*., 35 Ill. Adm. Code 845.600(a); 40 C.F.R. Part 257, Appx. III; IEPA, Statement of Reasons at 3, R2020-19 (Mar. 30, 2020) (recognizing that CCR can contain chloride and sulfate).
[109] *See* MWG Comments at 12; *Eagle-Picher Industries, Inc. v. United States Environmental Protection Agency*, 759 F.2d 922, 930–31, (D.C. Cir. 1985).
[110] *See* Post-Hearing Comments of the Illinois Attorney General's Office at 8–9, R2020-19 (Nov. 6, 2020) (explaining that CCR surface impoundments are excluded from the SRP).
[111] *See id*.
[112] 35 Ill. Adm. Code 742.105(a) ("Any person, including a person required to perform an investigation pursuant to the Illinois Environmental Protection Act [415 ILCS 5] (Act), *may elect to proceed under this Part* to the extent allowed by State or federal law and regulations and the provisions of this Part and subject to the exceptions listed in subsection (h) below. A person proceeding under this Part *may do so* to the extent such actions are consistent with the requirements of the program under which site remediation is being addressed.") (emphasis added).
[113] *Id*. at 742.105(b) ("This Part is to be used in conjunction with the procedures and requirements applicable to the following programs: 1) Leaking Underground Storage Tanks (35 Ill. Adm. Code 731 and 734); 2) Site Remediation Program (35 Ill. Adm. Code 740); and 3) RCRA Part B Permits and Closure Plans (35 Ill. Adm. Code 724 and 725).").
[114] *See* Env't Groups Post-Hearing Comments at 58–60.

to other provisions that impose few safeguards—those would not adequately protect against pollution from the coal ash fill. Both the record in R2020-19 and evidence from USEPA[115] make abundantly clear that certain protections—including separation between the coal ash and groundwater and proper, comprehensive groundwater monitoring and corrective action—are essential to prevent ongoing contamination of aquifers. Absent such mandates, existing regulations must be supplemented.

B. New Regulations for Historic CCR Fill and Additional Regulations for CCR Piles and Impoundments Are Consistent with Existing Regulatory Programs.

The proposed Part 846 rules set out by Environmental Groups would not conflict with existing federal or state provisions. As explained above, existing Illinois rules either do not apply to historic CCR fill, or leave critical gaps in protection. The same is true of federal rules. While the Resource Conservation and Recovery Act ("RCRA") may provide a basis for enforcement actions in individual circumstances,[116] USEPA has issued no comprehensive rules regulating historic coal ash fill. Indeed, the Federal CCR Rule explicitly exempts landfills that did not continue to receive CCR after October 2015.[117] Given the absence of federal rules regulating historic coal ash fill, there is decidedly no conflict between Environmental Groups' proposed rules and federal provisions.[118]

It is sensible to subject historic coal ash fill areas to more than one regulatory regime. For owners and operators of coal plants—for which Environmental Groups' proposed regulations would apply—that is nothing new. Coal plants must comply with Clean Air Act requirements, Clean Water Act requirements, RCRA requirements, and more—together with those statutes' Illinois counterparts. The same is true for mines[119] and landfills.[120] Following R2020-19, coal ash impoundments are simultaneously subject to Part 620 and Part 845 groundwater protection mandates: Part 620 continues to apply for those constituents not addressed by Part 845 and after obligations of Part 845 cease.[121] There is nothing improper or novel about applying multiple regulatory programs to a single site where those regulatory programs complement each other to protect against different pollutants or types of pollution.

Finally, if the Board were to find that any of the concerns that Environmental Groups have raised regarding historic coal ash fill are already addressed by existing regulations, proposed Part 846 can be modified to account for those existing provisions. The fact that some existing regulatory provisions

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[115] *See generally*, Env't Groups' Comments on Proposed Rules; *id.* at Exs. B–F.

[116] *See* 42 U.S.C. § 6972(a)(1)(A) (citizen suits for violations of RCRA or implementing provisions); *Id.* § 6972(a)(1)(B) (citizen suits for situations of "imminent and substantial endangerment"); *Id.* § 6944(a)–(b) (prohibition on open dumps); 40 C.F.R. § 257.1(a)(1) ("Facilities failing to satisfy any of the criteria in §§ 257.1 through 257.4 or §§ 257.5 through 257.30 or §§ 257.50 through 257.107 are considered open dumps"); *id.* § 257.3–4 (setting out groundwater standards, surface water standards, and flood-related standards, inter alia, that must be met for a disposal site not to be an open dump, but not setting out groundwater monitoring mandates, inspection requirements, pre-approval processes, or other measures to document and ensure compliance with those standards).

[117] 40 C.F.R. § 257.50(d).

[118] If USEPA were to issue such regulations, Illinois rules would have to meet or exceed the federal rules. *See* 42 U.S.C. § 6944(a). With no existing or proposed federal rules, that circumstance is neither present nor imminent.

[119] *See* 35 Ill. Adm. Code Part 309 (setting out regulations broadly addressing water pollution); *Id.* Parts 403 and 405 (setting forth regulations for National Pollutant Discharge Elimination System permits for mine related water pollution).

[120] *See* 35 Ill. Adm. Code Part 811 (setting out multi-faceted standards for new landfills); *Id.* 811.320 (specifying that landfill mandates may be adjusted to meet Part 620 groundwater standards in certain circumstances); *Id.* Part 620 (groundwater quality standards for different classes of groundwater in Illinois).

[121] *See, e.g.*, IEPA, First Supplement to IEPA's Pre-Filed Answers at 46, R2020-19 (Aug. 5, 2020); Feb. 2021 Order at 61.

might, in a limited way and in limited circumstances, provide some level of protection against pollution for historic coal ash fill does not negate or undermine the need for broad, comprehensive safeguards for this widespread source of contamination. Just as Part 845 did not do away with Part 620 for coal ash impoundments, Part 846 can be drafted to complement, rather than supplant, current programs.

IV. Further Protections Against Pollution from Coal Ash Piles Are Warranted.

As explained in detail in Environmental Groups' prior comments,[122] further regulation of "temporary" coal ash piles is not only justified, but essential. Evidence of harm—including fugitive dust pollution and contamination of groundwater and surface waters from such piles—continues to amass,[123] and the protections set out in Part 845, while important, are not sufficient. As IEPA indicates,[124] volume and time limits are critical to ensure those protections are designed and maintained to effectively limit pollution from piles. The remainder of the additional provisions that we propose serve to either confirm compliance with those limits or already-required protections, allowing for prompt fixes if necessary (*e.g.*, fugitive dust monitoring, inspection, and record-keeping provisions), or to further limit pollution where the existing Part 845 Rules have gaps (*e.g.*, drop distance limits, setbacks from surface waters, silt curtains). These are reasonable, well-warranted protections—protections that are, as previously explained, necessary in order for temporary CCR piles to potentially be excluded from classification as CCR landfills under the federal coal ash rule.[125]

IEPA spends little time discussing our proposed provisions for temporary piles; in fact, they are hardly mentioned in the body of its comments. In its appendix, the Agency criticizes Environmental Groups' proposal as allowing too much site-specific leeway for setbacks from surface waters, arguing that it is a "vague and unenforceable requirement."[126] Environmental Groups welcome further specifications if the Agency believes a uniform setback requirement, or several subsets of setback requirements, could be applied to the differing site conditions at sites where temporary CCR piles may be located. On the other hand, even as it concedes that "the desire to control the size of the pile is understandable (to reduce fugitive dust and runoff potential),"[127] the Agency asserts that *more* flexibility should be added to the three-month time limit for pile accumulations to allow for site-specific conditions.[128] Environmental Groups believe that the three-month limit provides adequate operational flexibility to account for logistical or other challenges, while maintaining the protections that the Agency notes are important; after all, the limit is necessarily site-specific as the volume of CCR that will be extracted from different impoundments over a three-month period will vary. Moreover, the Act includes provisions that allow for variances in unique circumstances that could be utilized if an owner or operator satisfies the relevant factors.[129]

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[122] *See* Initial Public Comments of ELPC, PRN, and Sierra Club at Section II(E), Section IV n.46, and Section VII, R2020-19 (June 15, 2020); Env't Groups Post-Hearing Comments at 53–57, 107–109; Env't Groups' Initial Comments at 11–15; Env't Groups' Comments on Proposed Rules at 13–16.
[123] *See* Env't Groups' Initial Comments at 11–15; Env't Groups' Comments on Proposed Rules at 13–16.
[124] *See* IEPA Comments, Appx. A at 24 (acknowledging that "the desire to control the size of the pile is understandable (to reduce fugitive dust and runoff potential) …").
[125] *See* Env't Groups' Comments on Proposed Rules at 15–16.
[126] *See* IEPA Comments, Appx. A at 24.
[127] *Id.*
[128] *Id.*
[129] *See* 415 ILCS 5/35–38; 35 Ill. Adm. Code Part 104, Subpart B.

Other protests against the proposed enhanced protections for piles carry little weight. As explained herein, requirements for parties initially requesting a rulemaking are not applicable to Environmental Groups—or any other possible participant commenter—when they are responding to the Board's request, on its own motion,[130] for comments and proposed rules. Even if those requirements did apply, the numerous comments, testimonies, and other evidence offered in the sub-docket and in the R2020-19 docket provide more than an adequate basis for the Board to adopt additional rules for CCR piles. As it did in R2020-19,[131] the Board may request a study of the proposed rules from the Department of Commerce and Economic Opportunity ("DCEO");[132] if DCEO declines to conduct such a study, the Board may evaluate those factors itself, as discussed herein.

V. Fugitive Dust Monitoring and Modeling Are Justified to Protect Public Health.

A. The Board Should Take a Proactive Approach to Regulating Fugitive CCR Dust and Preventing Harm to Nearby Communities and Facility Employees.

Although the Agency and Industry commenters would prefer to take a "wait and see" approach[133] to fugitive CCR dust monitoring, a proactive approach will better ensure that the Illinois communities that have been burdened by coal ash pollution for decades will be protected from the likely increase in fugitive CCR dust that is common when coal ash is moved and transported—as it will be when many of the regulated facilities in Illinois close their surface impoundments.[134] Environmental Groups' previous comments in the sub-docket have detailed the grave threat that fugitive CCR dust poses to nearby communities and facility employees.[135] As such, Environmental Groups' proposed fugitive CCR dust monitoring requirements are intended to complement and strengthen Part 845's required dust control measures to ensure that the controls are in fact minimizing CCR dust pollution, and any harmful fugitive CCR dust is promptly identified and addressed.

Although the Agency seems to prefer that fugitive CCR dust monitoring not be required industry-wide, local regulations including similar fugitive dust monitoring plan requirements have been implemented and effective in protecting nearby communities and facility employees from the impacts of fugitive dust.[136] In fact, even though Industry commenters claim that Environmental Groups have not shown that the proposed fugitive CCR dust monitoring requirements are technically and economically feasible,[137] they are almost identical to what has been implemented and proven to be effective at regulating fugitive dust in Chicago and Detroit.

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[130] Feb. 2021 Order at 12.
[131] Letter from Barbara Flynn Currie, IPCB, to Erin Guthrie, DCEO, R2020-19 (dated Apr. 16, 2020) (filed Apr. 22, 2020).
[132] 415 ILCS 5/27.
[133] IEPA comments at 15–16.
[134] *See* Pless Env't, Inc., Review of EPA Screening Assessment (Nov. 16, 2010) (attached as Ex. 13 to Env't Groups' Initial Comments) (discussing and documenting the substantial amount of fugitive dust emissions associated with many of these activities); Ranajit Sahu, Expert Report (2020) (attached as Ex. 14 to Env't Groups' Initial Comments) (same).
[135] Env't Groups' Initial Comments at 15–19; Env't Groups' Comments on Proposed Rules at 16–17.
[136] *See* Environmental Groups' Initial Comments, Ex. 8, Rules for Control of Emissions from Handling and Storing Bulk Materials, Chicago Dept. of Public Health, (Jan. 25, 2019); Env't Groups' Initial Comments, Ex. 15, Excerpt, Rules for Bulk Solid Materials Storage, City of Detroit, Ch. 42 (2019).
[137] Dynegy Comments at 18–19; MWG Comments at 18–20; IERG Comments at 10–11.

Like these local regulations, Environmental Groups' proposal would require that monitor locations be consistent with USEPA protocols and guidance for ambient air quality monitoring siting criteria and that monitors be located at upwind and downwind locations to assure as best as possible the detection of fugitive CCR dust from the regulated facility.[138] Environmental Groups' proposal would also require quarterly, twenty-four-hour, high-volume, filter-based air sampling events to obtain more accurate and precise data about the specific types of metals being emitted at each facility.[139] These requirements would help distinguish fugitive CCR dust or particulate matter from a regulated facility from the emissions of neighboring industries.

Industry commenters also suggest that fugitive CCR dust is not a problem at coal ash facilities, attempting to distinguish the examples provided by Environmental Groups by claiming that the causes of the fugitive CCR dust issues are no longer a problem due to the implementation of fugitive dust controls or that Illinois facilities are somehow immune from the same potential issues. [140] While Environmental Groups agree that fugitive dust control plans are necessary to limit the impact of fugitive CCR dust, Environmental Groups believe that the addition of fugitive CCR dust monitoring is vital to ensure that fugitive dust controls are effective. Fugitive dust controls and air monitoring, especially during the closure of surface impoundments, will help prevent Illinois communities from experiencing the harms that the community near the Beckjord plant in Ohio has recently experienced during the closure of the facility's CCR surface impoundments.[141]

The burden of ensuring that fugitive dust controls are actually minimizing CCR dust pollution should not be placed on the communities near regulated facilities. Additionally, relying on community complaints and potential Agency enforcement actions to detect and respond to fugitive CCR dust impacts severely underestimates the significant harm that fugitive CCR dust and particulate matter can inflict on nearby communities and facility employees.[142]

B. <u>The Proposed Fugitive Dust Monitoring Requirements Would Strengthen Existing Regulations.</u>

Industry commenters claim that complaints from the community and the Occupational Safety and Health Administration ("OSHA") requirements are sufficient to ensure accountability and compliance with existing regulations related to fugitive dust.[143] However, as previously mentioned, community complaints place a disproportionate burden on the community rather than the regulated entity and are only required to be submitted to the Agency on a quarterly and annual basis.[144] This process requires a community member to observe fugitive dust, track down the appropriate state regulations, locate the facility's fugitive dust control plan and complaint procedures, and file a complaint with the facility—rather than the Agency. Even when such filing occurs, the Agency is not alerted of the

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[138] *See* Proposed 35 Ill. Adm. Code 845.500(c)(1).
[139] *See id.* 845.500(c)(3).
[140] Dynegy Comments at 17; MWG Comments at 16–22.
[141] *See* Ex. D, Paula Christian, *New Richmond residents worry about blowing dust clouds as cleanup of former Beckjord site begins*, WCPO 9 News (last updated May 5, 2021), https://www.wcpo.com/news/local-news/i-team/new-richmond-residents-worry-about-blowing-dust-clouds-as-cleanup-of-former-beckjord-site-begins (including videos and photos of severe fugitive CCR dust storms).
[142] *See* Env't Groups' Initial Comments at 15–19; Env't Groups' Comments on Proposed Rules at 16–17.
[143] Dynegy Comments at 8–10; IERG Comments at 9.
[144] *See* 35 Ill. Adm. Code 845.500(b)(2)(B).

complaint until potentially several months later. Environmental Groups' proposed fugitive CCR dust monitoring requirements would rightfully place the burden on the regulated entity rather than the community, and ensure that the Agency is alerted of exceedances within twenty-four hours.[145]

In addition, Part 845 should explicitly protect nearby communities rather than rely on OSHA regulations to tangentially protect them. Such protection should not be assumed. OSHA regulations have previously proven ineffective at protecting the health and safety of facility employees.[146] If they are inadequate to protect workers *onsite*, it is far from clear how they could suffice to protect communities outside of site boundaries. Even assuming that OSHA regulations are sufficient to protect facility employees from fugitive CCR dust—which Environmental Groups do not concede—the proposed air monitoring requirements would go beyond onsite activity and help ensure that offsite handling of coal ash does not harm communities that have already borne the brunt of air pollution from the associated coal-fired power plant for decades.

C. An Online Public Database is a Minimal Request and Already Utilized at the State and Federal Level.

The Agency also opposes Environmental Groups' proposed online public database for monthly monitoring reports, instead suggesting that these reports be made available through Freedom of Information Act ("FOIA") requests.[147] However, the FOIA process puts an unnecessary burden on the Agency and the public that is inconsistent with Part 845's goals to increase public participation and transparency. In addition, an online public database is a minimal request, and similar databases for monitoring data are utilized at both the state and federal level.[148]

D. Environmental Groups Provided Sufficient Information Regarding Costs in Response to the Board's Request.

The Board specifically requested information regarding the "cost of monitoring," and Environmental Groups provided that information.[149] Environmental Groups did not provide detailed costs for equipment, personnel time, etc., as Industry commenters mention,[150] because the costs can vary

[145] *See* Proposed 35 Ill. Adm. Code 845.500(c)(5).
[146] *See* Jamie Satterfield, *OSHA Officials Admit to Shredding Documents in Tennessee Valley Authority Coal Ash Case*, Tenn. Lookout (Apr. 12, 2022), https://tennesseelookout.com/2022/04/12/osha-officials-admit-to-shredding-documents-in-tennessee-valley-authority-coal-ash-case/; Jamie Satterfield, *Judge Rejects TVA Contractor's Ask for a New Trial over Coal Ash Contamination Lawsuit*, Knox News (Mar. 1, 2019), https://www.knoxnews.com/story/news/crime/2019/03/01/judge-says-evidence-backs-jury-verdict-kingston-coal-ash-contamination/3017696002/; Jamie Satterfield, *Sickened Kingston Coal Ash Workers Left with Faulty, Manipulated Test Results*, Knox News (Sept. 2, 2018), https://www.knoxnews.com/story/news/crime/2018/09/02/kingston-coal-ash-spill-faulty-manipulated-testing/1126963002/; J.R. Sullivan, *A Lawyer, 40 Dead Americans, and a Billion Gallons of Coal Sludge*, Men's Journal (Aug. 26, 2019), https://www.mensjournal.com/features/coal-disaster-killing-scores-rural-americans. Seventy-three plaintiffs, comprising sick workers and families of deceased workers, won a jury verdict in November 2018 that found that exposure to toxic heavy metals and radiation in coal ash could be responsible for the workers' illnesses, including skin rashes, lung disease and cancer. *Id.*
[147] IEPA Comments at 17.
[148] *See IEPA's PFAS Sampling Network*, https://illinois-epa.maps.arcgis.com/apps/opsdashboard/index.html#/d304b513b53941c4bc1be2c2730e75cf (last accessed July 28, 2022); EPA, *National Contaminant Occurrence Database*, https://www.epa.gov/sdwa/national-contaminant-occurrence-database-ncod (last updated Dec. 27, 2021).
[149] May 2021 Order at 2.
[150] Dynegy Comments at 19; MWG Comments at 8; IERG Comments at 11.

depending on, amongst other factors: the type of monitoring equipment used, the amount of personnel used, the size of the facility, and the size of a particular project. All of this specific information would be included in a facility's Fugitive Dust Monitoring and Mitigation Plan and reviewed by the Agency under Environmental Groups' proposal.[151] These types of details are not specifically included in Environmental Groups' proposal just as they are not included in Part 845's requirements for fugitive dust control plans because they will vary by facility and plan. Furthermore, none of the other commenters claimed that any of Environmental Groups' estimated costs were inaccurate.

VI. Enhanced Definitions of Areas of Environmental Justice Concern Should Be Considered.

A. The Use of Additional Environmental Justice Screening Tools is Relevant and Not Moot.

1. The Board Requested Comments and Proposed Rule Language to Define Areas of Environmental Justice Concern.

On May 6, 2021, the Board requested "comments, information, and specific proposals on rule language" on the application of environmental justice screening tools that rely on both environmental and demographic indicators to identify areas of environmental justice concern.[152] The Board found that the issues raised by the commenters should be further explored and requested on March 3, 2022 for comments on Environmental Groups proposed rules which included information and proposed language regarding environmental justice mapping tools and their application.[153] In response, other participants generally argued that Environmental Groups' comments on environmental justice were unwarranted.[154] However, as discussed above, Environmental Groups were simply responding to the Board's request for comments.[155] IERG in particular notes that Part 845 already contains environmental justice requirements, the Illinois Legislature is addressing environmental justice, and Part 845 was "so recently adopted that the effects of the existing requirements have yet to be seen."[156] Environmental Groups make no attempt to legislate environmental justice through a rulemaking. Even though a broad topic like environmental justice may be covered by regulations or by legislation, that does not mean that the Board cannot open a sub-docket on the matter. Environmental Groups accordingly responded to the Board's request for more information and specific proposals on rule language on environmental justice mapping tools.

2. The Permitting Process Under Part 845 is Ongoing and The Board May Still Establish Rules on Identifying Areas of Environmental Justice Concern.

The Part 845 Rules require owners and operators to submit their proposed categorical designation for surface impoundments in the operating permit applications—due October 31, 2021[157]—and closure permit applications for impoundments in areas of environmental justice concern on February

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[151] *See* Proposed 35 Ill. Adm. Code 845.230.
[152] May 2021 Order at 1.
[153] Op. and Order of the Bd. at 3, R2020-19(A) (Mar. 3, 2022).
[154] IERG Comments at 5, 12; Dynegy Comments at 10–11, 18; IEPA Comments at 17–19.
[155] *See supra* Section I.
[156] IERG Comments at 12.
[157] 35 Ill. Adm. Code 845.230(d)(2)(T) ("The initial operating permit application for existing or inactive CCR surface impoundments that have not completed an Agency approved closure before July 30, 2021, must contain the . . . proposed closure priority.")

1, 2022.[158] The passing of these deadlines, however, does not render the issue of identifying areas of environmental justice concern moot; moreover, the issue affects more than just the timing for submittal of closure construction permits, as indicated by IERG, the Agency, Dynegy, and MWG[159] As discussed above, the Board has found that an issue is not moot where environmental "concerns may still exist."[160]

Here, there are still open questions related to areas of environmental justice concerns. First, IEPA has yet to publish any draft operating permits. Accordingly, IEPA must still finalize the prioritization designation for CCR surface impoundments. As the Agency reviews permits, it could deny an operating permit for failing to list the appropriate category in accordance with the Part 845 Rules or CAPPA.[161] With additional clarification of the definition of areas of environmental justice concern, owners or operators may also need to amend their applications and adjust the schedule of their submission of closure construction permits accordingly. Next, as discussed previously by Environmental Groups, the designation of areas of environmental justice concern is still relevant for any regulation of CCR used as fill.[162] Because there are still opportunities to clarify or establish the designation of areas of environmental justice concern, this issue is still live.

3. The Rules Should Prioritize All Areas of Environmental Justice Concern.

The Board should ensure every environmental justice community is prioritized in the clean-up of coal ash. The Legislature in enacting CAPPA recognized the importance of protecting and improving the "well-being of communities in this State that bear disproportionate burdens imposed by environmental pollution."[163] CAPPA mandates the specification of a procedure to identify areas of environmental justice concern in relation to surface CCR impoundments and a method to prioritize CCR surface impoundments required to close in those areas.[164] Environmental Groups do not believe, as suggested by MWG, that every site is located in an area of environmental justice concern—to designate all sites as such would only harm marginalized communities and run counter to CAPPA. For far too long, pollution has overburdened certain communities, and CAPPA recognizes the importance of meaningfully involving vulnerable populations and prioritizing environmental justice. The Part 845 Rules attempt to do just that. However, the Part 845 Rules leave out considerations that would otherwise characterize an environmental justice community.

While the EJ Start mapping tool does cover most areas of environmental justice concern prioritized under the Part 845 Rules, the tool has the potential to leave out communities that bear disproportionate burdens imposed by environmental pollution. During the hearing, IEPA explained that EJ Start was more inclusive because it included more communities and corrected for missing any other areas of environmental justice concern by creating a one-mile buffer.[165] Dynegy notes that Environmental Groups gave example of communities—Waukegan and Wood River—that have already been captured by Category 3 under the Part 845 Rules.[166] Environmental Groups do not disagree that

[158] *See* 35 Ill. Adm. Code 845.230(h)(1).
[159] IERG Comments at 12, 13; Dynegy Comments at 10–11, 18.
[160] *See* Order of the Bd. at 2, R2001-15 (Oct. 5, 2000).
[161] 415 ILCS 5/22.59(g)(8), (9).
[162] *See* Env't Groups' Comments on Proposed Rules at 18.
[163] 415 ILCS 5/22.59(a)(5).
[164] *Id*. 5/22.59(g)(8), (9).
[165] Tr. of Aug. 13, 2020 hearing at 195:2–14, R2020-19 (Aug. 21, 2020).
[166] Dynegy Comments at 11.

these sites already fall into Category 3. Environmental Groups provided these examples because without the one-mile buffer or the requirement that only part of the parcel need be in the area to receive prioritization, EJ Start would have left out these communities.

Industry commenters also argue that the designation process already occurred. Environmental Groups agree that most, if not all, owners and operators have submitted operating permit applications. However, this does not mean that every proposed category designation was accurate. Although the rules required submission of operating permit applications by October 31, 2021—after Environmental Groups first provided comments as to the importance of additional environmental justice mapping tools—there were communities with a questionable priority designation under the Part 845 Rules. For instance, the owner/operator once categorized Wood River in Category 7, but changed it to Category 3, and Vistra categorizes the Edwards site as Category 5 even when IEPA has classified it as falling within an area of environmental justice concern.[167] In fact, IEPA's EJ Start tool now shows that the Pekin area—adjacent to the Edwards site—is in an area of environmental justice concern.[168]

Indeed, there have long been indications that the Pekin and Peoria areas include communities that bear disproportionate burdens. For instance, data from the Restore, Reinvest, Renew ("R3") program depicts areas of Pekin near the Edwards plant as under-resourced.[169] In addition, the environmental pollution of Edwards affects the communities in the Peoria area—which EJ Start recognizes as an area of environmental justice concern—even though the area is more than one mile from the Edwards site. In 2019, IPRG came to a settlement agreement with Sierra Club, Natural Resources Defense Council, and Respiratory Health Association over allegations of Clean Air Act violations at Edwards. The consent decree required the Edwards owner to provide $8.6 million in funding for projects to benefit the greater Peoria area.[170] Also, during the rulemaking, Environmental Groups' witness, Jo Lakota, noted that people in the area near Edwards rely on the nearby waters for subsistence fishing.[171] The National Environmental Justice Advisory Council to USEPA has recognized the importance of this practice in frontline and otherwise marginalized communities.[172] While this information is not all tied to demographic data, both this information and the recent change in IEPA classification of the area underscore that EJ Score can, and has, left areas of environmental justice concern outside of its framework, highlighting the importance of the Board relying upon more than EJ Start to prioritize all areas of environmental justice concern.

In summary, this issue is not moot: IEPA still must—and given the above evidence, should—take a close look at proposed category designations for CCR surface impoundments rather than simply accepting the category proposed. Furthermore, if IEPA rejects the proposed category designations and

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[167] Ex. E, Letter from Phil Morris, Senior Environmental Director, IPRG, to Darin LeCrone, Manager, IEPA (May 19, 2021) (Attach. T to IPRG, Operating Permit Application for Edwards Power Plant Ash Pond (Oct. 25, 2021)); Ex. F, Email from IEPA to Environmental Justice Distribution List (June 10, 2022).
[168] *See* Ex. G, IEPA, EJ Start, Screenshot of Pekin Area (July 28, 2022).
[169] *See* Ex. H, R3, Eligibility Map (July 28, 2022).
[170] Consent Decree at 4–5, *Natural Resources Defense Council v. Illinois Power Resources Generating, LLC*, No. 1:13-cv-00181-JBM-TSH (C.D. Ill. Nov. 13, 2019), https://www.nrdc.org/sites/default/files/consent_decree.pdf.
[171] *See* Pre-filed Test. of Jo Lakota at 2, R2020-19 (Aug. 27, 2020) ("They often are fishing for supper in these waters. Along Kickapoo Creek by Edwards, I see everyday people fishing—young people, young black men, and families, some even from Pekin. They sometimes throw the fish back, but usually they keep the fish for food. They should not be eating this fish.").
[172] *See generally* Nat'l Env't Just. Advisory Council, *Fish Consumption and Environmental Justice* (Nov. 2002), https://www.epa.gov/sites/default/files/2015-02/documents/fish-consump-report_1102.pdf.

concludes that a given impoundment is located in an area of environmental justice concern, its designations would impact the process for any CCR fill remediation at those sites under Environmental Groups' proposed rules.

Waiting for federal and state level initiatives, as suggested by Dynegy, is also not the most appropriate approach. Dynegy cannot in the same breath suggest a delay for evaluating this issue and say it is too late for the Board to consider the matter. While there are different state and federal initiatives to define what makes an environmental justice community and how to engage in cumulative impacts analyses, the Board has access to several of these initiatives. The Board, IEPA, and the public have access to the R3 and the Solar for All data, as well as the updated USEPA EJScreen mapping tool. Nor would the Board be the first to move forward with deciding what tools and parameters to use to define areas of environmental justice concern. Other states such as Michigan, New Jersey, and Maryland have programs that are similar to EJScreen with some state-specific differences.

Moving forward with this matter is not going to be confusing, as Dynegy suggests.[173] The state of Illinois already has different ways to determine if communities bear disproportionate burdens via the Solar for All and R3 programs. Environmental Groups simply wish to account for the variety of methods to identify areas of environmental justice concern to ensure the process does not leave out any overburdened community. As discussed below and in the Environmental Groups' initial comments,[174] it will be important to consult the Illinois Commission on Environmental Justice because it is the designated authority as to how to identify areas of environmental justice. Accordingly, there is still space in this sub-docket to engage on environmental justice mapping tools.

B. Environmental Groups Did Not Need to Provide a Technical Basis for Their Proposal.

Dynegy and MWG incorrectly argue that Environmental Groups should have provided a technical basis for the proposal on identifying areas of environmental justice concern. As explained above, Environmental Groups were not required to provide a technical basis; rather, there is deference to the Board on this issue.[175] The Illinois Supreme Court held that there are not specific evidentiary requirements on the Board with regard to the Board's determination of whether regulations are technically feasible and economically reasonable.[176] Instead, the Board must use technical expertise and judgment, under Section 27(a), when balancing any hardship that the regulations may cause to dischargers against its statutorily mandated purpose and function of protecting our environment and public health.[177] Nothing in Section 27(a) limits the Board from consulting another agency, as Environmental Groups recommend, in determining appropriate regulations.

Dynegy is also incorrect in their critique of Environmental Groups' suggestion to solicit the advice of the Commission on Environmental Justice in this proceeding. This consultation is in accordance with principles of environmental justice because it is important to include environmental justice communities at all levels of decision-making, and the Commission on Environmental Justice is a

[173] Dynegy Comments at 12.
[174] *See* Env't Groups' Initial Comments at 28–29, 35.
[175] *See supra* Section I.
[176] *Granite City Division of National Steel Co.*, 155 Ill. 2d at 182–183.
[177] *See id.*

part of that conversation.[178] Furthermore, under the Illinois Environmental Justice Act, the Commission advises Illinois governmental entities on environmental justice issues and reviews and analyzes the impact of state laws and policies on environmental justice.[179]

Given the Board has deference to determine the technical basis or feasibility of this sub-docket, Environmental Groups were not required to provide justification for increasing the radius to three miles.[180] Environmental Groups, however, note that this radius was once common on EJScreen. Environmental Groups nevertheless again recommend that the Board consult the Environmental Justice Commission for the best approach.

C. Environmental Groups Did Not Need to Present the Economic Basis for Their Proposal.

Environmental Groups, as discussed above, need not provide justification as to the economic burden of their proposed rules. MWG and Dynegy argue that evaluation of costs from a construction permit deadline change following re-categorization—including personnel costs to collect and evaluate the air monitoring data, costs to maintain the voluminous monitoring records that would be generated, and costs to include these records in the operating record and to post them on the publicly available website. None of these suggestions include information required by Environmental Groups. Furthermore, costs involved in reprioritizing a facility are implicated by Part 845; the Part 845 Rules contemplate that IEPA might reject a permit applicant's proposed prioritization category—meaning such measures may be necessary—and the Board has already concluded that Part 845 is economically reasonable. Environmental Groups were simply commenting in response to a request from the Board, which opened a sub-docket of a rule proposal based on the testimony of over twenty witnesses, seven days of hearings, and subsequent briefing from several parties. The Board receives deference as to the adequacy of the economic basis of this sub-docket.

As the Board evaluates the economic basis of the sub-docket and Environmental Groups' comments, it should consider data from existing mapping tools and programs. Using existing tools would be low-cost for the Part 845 permitting program.[181] EJ Start could combine information from other mapping tools, such as the R3 program, Solar for All, and EJScreen to its existing parameters to account for every community that bears disproportionate burdens. The Board may likely find this approach economically feasible because the tools are free and open to the public. The Board could be more robust by including other data points specific to Illinois.[182] Either way, the Board has deference when it determines the proposal and evaluates the proposal's economic basis.

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[178] Delegates to the First Nat'l People of Color Env't Leadership Summit, *Principles of Environmental Justice*, Energy Just. Network (Oct. 1991), http://www.ejnet.org/ej/principles.pdf.
[179] 415 ILCS 115/10(d).
[180] *See supra* Section I.
[181] This could include the R3 program, which identified eligible communities via an analysis of community-level data on gun injury, child poverty, unemployment, and state prison commitments and returns, combined with disproportionately impacted areas identified by the DCEO. Although the R3 program does not include natural environment factors, it is still similar to Illinois Solar for All mapping tool. Both tools aim to address, protect, and improve the well-being of communities that bear disproportionate burdens. Other existing tools with publicly available data are the EJScreen and Solar for All mapping tools. Notably when applying socioeconomic data from these mapping tools, the Edwards site appears to be in or near an environmental justice community.
[182] Env't Groups' Initial Comments at 24–35; Env't Groups' Comments on Proposed Rules at 18–22.

VII. The Board May Rely on Its Findings in Its Interim Order in the *Sierra Club v. Midwest Generation* Proceeding.

MWG criticizes Environmental Groups' reliance of the Board's Interim Order in *Sierra Club v. Midwest Generation*, PCB 2013-15 (June 20, 2019), suggesting that somehow the label "interim" or MWG's opposition to that Order make the Interim Order unreliable or not good law.[183] The distinction between an interim order and a final order is whether there are any proceedings remaining or issues to litigate before the lower court, which in turn affect whether the decision is appealable.[184] Indeed, in the *Sierra Club v. Midwest Generation* enforcement case, remedy-phase proceedings remain. But the stage of remedy-phase proceedings does not call into question the conclusive nature of the liability findings in the Board's Interim Order.

MWG argues that they "contested many of the factual findings as against the manifest weight of the evidence" and suggest that their "objections" to the Interim Order somehow render the Interim Order less reliable.[185] Whether MWG contested the Board's findings is neither here nor there. MWG has no more opportunities before the Board to further contest the Board's liability phase findings.[186] MWG has already brought a motion for reconsideration and to clarify, and the Board has already decided that motion. The Board's decision on MWG's motion for reconsideration has not affected the Board's following conclusions on liability:

> The Board therefore affirms its June 20, 2019 decision, in which the Board: (1) found MWG violated Section 12(a) of the Act, 415 ILCS 5/12(a) (2016); found MWG violated Section 12(d) of the Act, 415 ILCS 5/12(d) (2016; (3) found that MWG violated Section 21(a) of the Act, 415 ILCS 5/21(a) (2016); (4) found MWG violated Sections 620.115, 620.301(a) and 620.405 of the Board regulations, 35 Ill. Adm. Code 620.115, 620.301(a), 620.405.[187]

MWG's opposition to the factual findings and their objections do not render the Board's Interim Order a tentative determination.

MWG also states that it is going to appeal. The bar on appeal is high.[188] Until a state court says otherwise, the liability findings in the Interim Order stand. As of now, the Interim Order in *Sierra Club v. Midwest Generation* is the Board's decisive ruling on MWG's liability for the violations of the Act and Illinois groundwater regulations caused by MWG's coal ash management practices, and the only issue

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183 MWG Comments at 22–23.
184 *People v. Pollution Control Board*, 190 Ill. App. 3d 945, 947 (2d Dist. 1989); *People v. Illinois Commerce Comm'n*, 114 Ill. App. 3d 383, 388 (1st Dist. 1983).
185 MWG Comments at 23.
186 The Board's decision on MWG's motion for reconsideration and to clarify affected only the Board's conclusions as to the whether the groundwater monitoring zones in place at three of MWG's plants expired, whether MWG's witnesses testified as experts or laypersons, and whether three wells at Joliet 29 were background wells. Order of the Bd. at 16, PCB 2013-15 (Feb. 6, 2020).
187 *Id.*
188 *See City of Freeport v. Pollution Control Board*, 187 Ill. App. 3d 745, 750 (2d Dist. 1989) ("An administrative order will not be disturbed upon review unless it is clearly arbitrary, capricious or unreasonable." (first citing *Illinois Coal Operators Ass'n v. Pollution Control Board,* 59 Ill. 2d 305, 310 (1974); and then citing *Southern Illinois Asphalt Co. v. Pollution Control Board*, 60 Ill. 2d 204, 207 (1975))).

remaining for the Board to decide is remedy.[189] As such, it is perfectly reasonable for Environmental Groups and the Board itself to rely on the Interim Order.

VIII. Conclusion

Environmental Groups continue to appreciate the Board's attention to this sub-docket and the need to establish or enhance rules to address historic coal ash fill, temporary coal ash piles, fugitive dust monitoring for coal ash dust, and environmental justice screening tools. As the Attorney General's Office emphasized in supporting the sub-docket, "the closure of dozens of impoundments statewide, . . . with related corrective action to address groundwater at power plant sites that may also be contaminated from historic ash landfills and piles, calls for a comprehensive examination of coal ash beyond the setting of CCR surface impoundments."[190] We ask the Board to heed the evidence presented, the demands of concerned communities from across the state, and the Attorney General's statement and move swiftly to adopt safeguards for historic coal ash fill. Similarly, we urge the Board to enhance existing rules in 35 Ill. Adm. Code Part 845 to protect against fugitive dust pollution and pollution from CCR piles, and to strongly consider expanding how environmental justice communities are identified in order to expedite protections for such communities. Finally, if the Board determines that Environmental Groups' proposal is subject to any procedural requirements that it has not met, Environmental Groups ask that the Board grant us the opportunity to remedy any deficiencies.

Thank you in advance for your consideration of these response comments.

Dated: Aug. 2, 2022

Respectfully Submitted,

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[189] *See id.* at 748.
[190] Ill. Att'y Gen.'s Off.'s Reply to Post-Hearing Comments at 2, R2020-19 (Nov. 6, 2020).

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LIST OF EXHIBITS FOR ENVIRONMENTAL GROUPS' RESPONSE COMMENTS ON ENVIRONMENTAL GROUPS' RECOMMENDED RULES	
	Group 1
Exhibit	**Description**
A	Earthjustice to USEPA, Notice of Intent (May 17, 2022).
B	Excerpt of Hydrogeological Assessment Plan, Joliet Generating Station No. 29 (July 2010).
C	Excerpt of Hydrogeological Assessment Plan, Waukegan Generating Station (Feb. 2011).
	Group 2 (via separate transmission)
D	Paula Christian, *New Richmond residents worry about blowing dust clouds as cleanup of former Beckjord site begins*, WCPO 9 News (last updated May 5, 2021).
E	Letter from Phil Morris, Senior Environmental Director, IPRG, to Darin LeCrone, Manager, IEPA (May 19, 2021) (Attach. T to IPRG, Operating Permit Application for Edwards Power Plant Ash Pond (Oct. 25, 2021)).
F	Email from IEPA to Environmental Justice Distribution List (June 10, 2022).
G	IEPA, EJ Start, Screenshot of Pekin Area (July 28, 2022).
H	R3, Eligibility Map (July 28, 2022).

CERTIFICATE OF SERVICE

The undersigned, Jennifer Cassel, an attorney, certifies that I have served by email the Clerk and by email the individuals with email addresses named on the Service List provided on the Board's website, *available at* https://pcb.illinois.gov/Cases/GetCaseDetailsById?caseId=16975, a true and correct copy of the **ENVIRONMENTAL LAW & POLICY CENTER, LITTLE VILLAGE ENVIRONMENTAL JUSTICE ORGANIZATION, PRAIRIE RIVER NETWORK, AND SIERRA CLUB's RESPONSE COMMENTS ON ENVIRONMENTAL GROUPS' RECOMMENDED RULES**, before 5 p.m. Central Time on Aug. 2, 2022. The number of pages in the email transmission is 412 pages.

Dated: Aug. 2, 2022

Respectfully Submitted,

/s/ Jennifer Cassel_________________

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Exhibit A

May 17, 2022

BY REGISTERED MAIL

Michael Regan, Administrator
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Ave., NW
Washington, D.C. 20460

Merrick Garland, Attorney General
U.S. Department of Justice
950 Pennsylvania Ave., NW
Washington, D.C. 20530

RE: 60-Day Notice of Intent to Sue for Failure to Perform Nondiscretionary Duties under the Resource Conservation and Recovery Act

Dear Administrator Regan:

This letter is written on behalf of Clean Power Lake County, Environmental Integrity Project, Hoosier Environmental Council, Indiana State Conference and the Laporte County Branch of the National Association for the Advancement of Colored People, Sierra Club, and Statewide Organizing for Community eMpowerment to provide notice of their intent to sue the United States Environmental Protection Agency ("EPA") for failure to perform nondiscretionary duties under the Resource Conservation and Recovery Act ("RCRA"). 42 U.S.C. § 6901 *et seq.* The EPA failed to fulfill its duty under RCRA section 2002(b), 42 U.S.C. § 6912(b), to review and revise regulations that are inadequate to address widespread and serious risks to health and the environment caused by unsafe disposal of coal combustion residuals ("CCR" or "coal ash"). Specifically, the EPA failed to review section 257.50(d), which exempts all coal ash landfills from protective requirements if these landfills ceased receiving waste prior to October 19, 2015. 40 C.F.R. § 257.50(d).

RCRA commands the EPA to review and revise, as necessary, each regulation not less frequently than every three years. 42 U.S.C. § 6912(b).[1] On April 17, 2015, the EPA exercised its authority under RCRA to promulgate the Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule ("CCR Rule"). 80 Fed. Reg. 21,302. The CCR Rule amended Subpart D of 40 C.F.R. to include "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," 40 C.F.R. §§ 257.50 through 257.107. While the CCR Rule applies to a number of CCR surface impoundments and landfills, it exempts all CCR landfills that ceased accepting coal ash prior to

[1] The statute provides: "Each regulation promulgated under this chapter *shall* be reviewed and, where necessary, revised *not less frequently than every three years*." 42 U.S.C. § 6912(b) (emphasis added).

October 19, 2015 (hereinafter referred to as "inactive CCR landfills"). 40 C.F.R. § 257.50(d).[2] EPA has not reviewed this exemption since its promulgation in April 2015, more than seven years ago.

The EPA's blanket exemption of inactive coal ash landfills allows dangerous and leaking toxic dumps to escape critical monitoring, inspection, closure, and cleanup requirements. Data reveal that inactive CCR landfills located throughout the U.S. pose an unabated and perpetual threat to human health and the environment by the leaking of toxic heavy metals. As explained in detail below, the EPA's failure to perform its nondiscretionary duty to review and revise this regulation is overdue and causing irreparable harm to the nation's water resources. Because of this exemption, and the EPA's failure to review and revise it, the EPA fails to establish a regulatory scheme that meets RCRA's protectiveness standard to prevent the reasonable probability of adverse effects on health or the environment from disposal of solid waste. 42 U.S.C. § 6944(a).

I. THE PARTIES

Clean Power Lake County ("CPLC") is a community-driven coalition based in Lake County, Illinois that is committed to local action to secure environmental, economic, and racial justice. CPLC's mission is to ensure clean air, clean water, and healthy soil for every Lake County community member and to achieve the self-determination of those disproportionately impacted by environmental pollution. It is supported by several partners, including environmental, faith, and public health organizations.

Environmental Integrity Project ("EIP") is a nonpartisan, nonprofit organization founded in 2002 by former EPA enforcement attorneys to advocate for more effective enforcement of environmental laws. EIP's three objectives are: to provide objective analysis of how the failure to enforce or implement environmental laws increases pollution and affects the public's health; to hold federal and state agencies, as well as individual corporations, accountable for failing to enforce or comply with environmental laws; and to help local communities in key states obtain the protection of environmental laws. EIP advocates for laws to protect public health and the environment from air and water pollution from coal-fired power plants and other large sources of pollution.

Hoosier Environmental Council ("HEC") is Indiana's largest environmental policy nonprofit organization, with more than 1,400 members statewide. HEC's mission is to tackle our environmental challenges and help make Indiana a healthier, better place to live, and do business. Since its founding in 1983, HEC has become Indiana's leading educator and advocate on environmental issues and policies, and a leading advocate for cleaning up toxic coal ash in the state.

The Indiana State Conference and the Laporte County Branch are state and local units of the National Association for the Advancement of Colored People ("NAACP"), which is a national nonprofit organization founded in 1909 with more than 2,200 units and 2 million

[2] Section 257.50(d) states in its entirety: "(d) This subpart does not apply to CCR landfills that have ceased receiving CCR prior to October 19, 2015."

members across the nation. The NAACP's mission is to achieve equity, political rights, and social inclusion by advancing policies and practices that expand human and civil rights, eliminate discrimination, and accelerate the well-being, education, and economic security of Black people and all persons of color. The Indiana State Conference of the NAACP provides leadership for local branches, youth councils, and college chapters in the State of Indiana. The Laporte County Branch of the NAACP is comprised of members residing in Laporte County, Indiana.

Sierra Club, founded in 1892, is the nation's oldest grassroots environmental organization with its national headquarters in Oakland, California. Sierra Club is a nonprofit membership organization incorporated in California with more than 840,000 members in all 50 states and in the District of Columbia. Sierra Club's purpose is to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; and to educate and enlist humanity to protect and restore the quality of the natural and human environments. Sierra Club's Beyond Coal campaign is a major effort to replace dirty coal with clean energy by mobilizing members in local communities to advocate for the retirement of old and outdated coal plants and to prevent new coal plants from being built. As part of this campaign, Sierra Club has prioritized efforts to ensure that coal-fired power plants safely dispose of their coal ash in compliance with RCRA and other environmental laws, including through communications, organizing, and litigation.

Founded in 1972 in the coal fields of East Tennessee, Statewide Organizing for Community eMpowerment ("SOCM") is a democratically run, membership-based organization that uses civic involvement, leadership development, and collective action to empower everyday Tennesseans to have a greater voice in determining their own future. With over 1,700 members statewide, SOCM has led many local and regional efforts to challenge harmful coal mining permits, advocate for proper mine site reclamation, and support federal just transition legislation through local-based advocacy campaigns and meetings with legislators.

II. BACKGROUND

A. Statutory Background

The EPA regulates the disposal of most solid wastes that are not classified as hazardous under subtitle D of RCRA. In subtitle D, Congress directed the EPA to promulgate regulations defining when a solid waste disposal facility is deemed to be a "sanitary landfill" as opposed to a prohibited "open dump." 42 U.S.C. § 6944(a). Section 4004(a) of RCRA provides a protectiveness standard that EPA's subtitle D regulatory criteria for sanitary landfills must meet. Namely, at a minimum, the EPA's criteria can classify units as sanitary landfills and not open dumps, "only if there is no reasonable probability of adverse effects on health or the environment from disposal of solid waste . . . ." *Id.*

The regulations promulgated by the EPA to ensure that a facility qualifies as a sanitary landfill take the form of "minimum criteria." *See Id.* §6907(a)(3). If a waste unit fails to comply with the minimum criteria established by the EPA for sanitary landfills, the unit is deemed to be an "open dump," which is prohibited under the statute. *Id.* §§6944, 6903(14). A facility operating an open dump (i.e., a facility out of compliance with EPA's criteria) must be "closed or upgraded" and is subject to citizen suits for "open dumping." *Id.* §6945.

B. The EPA's Regulation Of CCR Under RCRA

CCR is the solid waste generated by the combustion of coal. 80 Fed. Reg. at 21,303. Utilities primarily dispose of their coal ash in landfills as dry waste, or by slurrying the waste mixed with water into surface impoundments or "ponds." *Id*. For decades, the EPA studied the coal ash disposal problem and struggled over how to address its scale, complexity, and gravity. *Util. Solid Waste Activities Grp. v. PAEPA*, 901 F.3d 414, 420 (D.C. Cir. 2018) (hereinafter "*USWAG v. EPA*"). It wasn't until public and congressional pressure reached a crescendo following the 2008 disaster at the Tennessee Valley Authority ("TVA") Kingston Fossil Plant that the agency publicly committed to regulate CCR. *Id.* at 423. The catastrophic breach of the Kingston ash pond, the largest spill of toxic waste in U.S. history, released more than one billion gallons of coal ash slurry, destroying dozens of homes, and contributing to the illness and deaths of scores of cleanup workers.[3] 80 Fed. Reg. at 21,313. The TVA spill was followed in February 2014 by another disastrous breach of a coal ash impoundment at Duke Energy's Dan River Generating Station, which released 0.5 million cubic yards of water and fly ash and polluted 70 miles of river in North Carolina and Virginia.[4] *Id*. at 21,327.

Despite these disasters and the EPA Administrator's commitment in January 2009 to regulate coal ash, the EPA still had to be sued in 2012 by ten citizen groups and an Indian tribe to compel it to regulate this toxic waste.[5] *See Appalachian Voices v. McCarthy*, 989 F. Supp. 2d 30, 56 (D.D.C. 2013). In 2013, a federal court directed the EPA to devise a schedule to comply with its obligation to regulate CCR under RCRA. *Id.* Even though coal ash is one of the largest industrial waste streams generated by U.S. industry, the EPA promulgated the first rule regulating the waste nearly 40 years after RCRA's enactment, on April 17, 2015. 80 Fed. Reg. at 21,302.

In its final rule, the EPA acknowledged that CCR contains many toxic contaminants associated with serious health and environmental effects including arsenic, cadmium, chromium, lead, mercury, selenium, and thallium. *Id*. at 21,311. The EPA further noted that the risks to humans associated with exposure to coal ash contaminants include "cancer in the skin, liver, bladder, and lungs," as well as non-cancer risks such as "neurological and psychiatric effects," "cardiovascular effects," "damage to blood vessels," and "anemia." *Id*. at 21,451. The EPA also acknowledged that when improperly managed, CCR (and the contaminants in it) leak into

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[3] Joel K. Bourne Jr., *Coal's other dark side: Toxic ash that can poison water and people*, Nat'l Geographic (Feb. 19, 2019), https://www.nationalgeographic.com/environment/article/coal-other-dark-side-toxic-ash. *See also*, Austyn Gaffney, *'They deserve to be heard': Sick and dying coal ash cleanup workers fight for their lives*, The Guardian (Aug 17, 2020), https://www.theguardian.com/us-news/2020/aug/17/coal-spill-workers-sick-dying-tva.
[4] EPA, *Case Summary: Duke Energy Agrees to $3 Million Cleanup for Coal Ash Release in the Dan River*, https://www.epa.gov/enforcement/case-summary-duke-energy-agrees-3-million-cleanup-coal-ash-release-dan-river? (last accessed May 13, 2022).
[5] Earthjustice filed the suit on behalf of Appalachian Voices, Chesapeake Climate Action Network, Environmental Integrity Project, Kentuckians For The Commonwealth, Montana Environmental Information Center, Moapa Band of Paiutes, Prairie Rivers Network, Physicians for Social Responsibility, Southern Alliance for Clean Energy, Sierra Club, and Western North Carolina Alliance.

groundwater, blow into the air as dust, and are released to surface waters and land through structural failures of landfills and impoundments. *Id*. at 21,449, 21,456-57.

To address these threats, the EPA attempted for the first time to regulate the disposal and handling of CCR under subtitle D in its CCR Rule. *Id.* at 21,302. For a limited universe of CCR landfills and surface impoundments, the CCR Rule established nationally applicable minimum criteria, including location restrictions; liner design criteria; structural integrity requirements; operating criteria; groundwater monitoring and corrective action; closure and post-closure requirements; and recordkeeping and notification requirements. 40 C.F.R. §257.60-64, 70-74, 80-84, 90-98, 100-07. Failure to comply with these criteria results in the unit being deemed an "open dump" and, therefore, potentially subject to closure. *Id.* §257.1(a); 80 Fed. Reg. at 21,468.

Soon after promulgation, however, it was clear that the rule's coverage was inadequate to protect health and the environment. The EPA expanded the rule in 2016, pursuant to a Petition for Review filed by Earthjustice in 2015,[6] to apply protective safeguards to "inactive surface impoundments." These are defined as CCR impoundments at operating plants that did not accept CCR on or after October 14, 2015 and still contain both CCR and liquids on or after that date. 80 Fed. Reg. at 21,470. Additionally, on August 21, 2018, the Court of Appeals for the District of Columbia ruled that the EPA must expand the CCR Rule to address inactive CCR impoundments that are located at shuttered power plants, known as "legacy ponds." *USWAG v. EPA*, 901 F.3d at 423, 449. The court found the EPA had exempted these legacy impoundments from the rule even though they pose at least the same risks of adverse effects as all other inactive impoundments. *Id.* at 434.

Approximately 738 landfills and surface impoundments in 43 states and Puerto Rico are currently regulated under the CCR Rule. These coal ash disposal sites are often massive. On average, landfills span more than 120 acres and are more than 40 feet deep, and surface impoundments are on average more than 50 acres in size with a depth of 20 feet. 80 Fed. Reg. at 21,303. The EPA has not yet regulated legacy ponds. Doing so will subject approximately 140 additional waste ponds to regulatory protections. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Legacy CCR Surface Impoundments,85 Fed. Reg. 65,015, 65,018 (Oct. 14, 2020).

C. The Evidence Of Harm To Human Health And The Environment From CCR Impoundments And Landfills

The EPA's violation of the three-year statutory deadline for revision of regulations pertaining to coal ash places hundreds of communities at great risk. Our nation's coal-fired power plants burn more than half a billion tons of coal every year, producing more than 100 million tons of coal ash annually, in the form of fly ash, bottom ash, and boiler slag. 80 Fed. Reg.at 21,303. By weight, the amount of chemicals in coal ash surpasses that created by pulp and paper mills, petroleum refiners, and textile mills combined. Because burning concentrates coal's

[6] Earthjustice filed the Petition for Review pursuant to RCRA 7006(a)(1) on behalf of Clean Water Action, Environmental Integrity Project, Hoosier Environmental Council, PennEnvironment, Prairie Rivers Network, Sierra Club, Tennessee Clean Water Network, and Waterkeeper Alliance. Petition for Review, Water Action v. EPA, No. 15-1228 (D.C. Cir July 16, 2015).

impurities, coal ash contains substantial quantities of carcinogens, neurotoxins, and poisons—including arsenic, cadmium, cobalt, lead, mercury, radium, selenium, and thallium. *Id.* at 21,311, 21,404. When coal ash comes in contact with water, these contaminants readily leach into it. For much of the last century, power companies dumped coal ash into unlined landfills and waste ponds, where the lack of a barrier between the coal ash and groundwater caused leaks and contamination of underground water supplies. *See id*. at 21,319. Groundwater polluted by coal ash made its way not only into underground water supplies but also nearby surface waters. *Id.* at 21,325. In addition, the open dumping of coal ash often created hazardous air pollution, as wind easily disperses friable coal ash particles into the air. *Id*. at 21,386. Coal ash pollution is an environmental justice issue because coal ash dumpsites disproportionately threaten low-income communities and communities of color. *Id.* at 21,467.

Among other safeguards, the CCR Rule established groundwater monitoring requirements for existing CCR landfills (those that accepted ash after October 19, 2015) and existing and inactive CCR surface impoundments. 40 C.F.R. § 257.90-95. The rule required the owner/operators of such CCR landfills and impoundments to monitor the groundwater for toxic contaminants near these disposal units and to make the groundwater monitoring data available to the public starting in March 2018. *Id*. § 257.90. The public posting of these data has allowed the EPA and the nation to finally understand that the enduring legacy of decades of unregulated coal ash dumping includes severe and extensive groundwater pollution.

EIP and Earthjustice, in collaboration with other environmental organizations, obtained and analyzed all the groundwater monitoring data that power companies posted on their websites in 2018.[7] The data cover 265 coal plants and offsite coal ash disposal areas, including over 550 individual coal ash ponds and landfills that are monitored by over 4,600 groundwater monitoring wells. This represents roughly three-quarters of the coal-fired power plants across the United States. The remainder of coal plants did not post groundwater data in 2018 either because they closed their ash dumps before the CCR Rule took effect in 2015, or because they were eligible for an extension or exemption. The environmental organizations analyzed these data because the EPA failed to do so, and in fact, the EPA has still not reviewed and analyzed the data generated by its own rule.

After comparing groundwater monitoring data to health-based EPA standards and advisories, the EIP and Earthjustice analysis confirmed that groundwater beneath virtually all coal plants is contaminated:

- Ninety-one percent of coal plants have unsafe levels of one or more coal ash constituents in groundwater, even after setting aside contamination that may be naturally occurring or coming from other sources.
- The groundwater at most coal plants (fifty-two percent) has unsafe levels of arsenic, which is known to cause multiple types of cancer. Arsenic is also a neurotoxin and, much like lead, can impair the brains of developing children.
- Most coal plants (sixty percent) have unsafe levels of lithium, a chemical associated with multiple health risks, including neurological damage.

[7] EIP & Earthjustice, Coal's Poisonous Legacy: Groundwater Contaminated by Coal Ash Across the U.S. (Mar. 2, 2019, rev. July 11, 2019), https://earthjustice.org/sites/default/files/files/national-coal-ash-report-7.11.19.pdf.

- The majority of coal plants have unsafe levels of at least four toxic constituents of coal ash.[8]

The contamination documented by the utility industry's groundwater monitoring data in 2018 is just the tip of the iceberg. Because the CCR Rule exempted inactive CCR landfills from all requirements of the rule, including groundwater monitoring, no data were available for these units. The EIP/Earthjustice study reveals that this is a dangerous omission, as groundwater contamination exceeding federal health standards was found at seventy-six percent of the regulated CCR landfills.[9] Regulated landfills are newer and more likely to be lined than the older landfills the EPA exempted from the CCR Rule. Thus, the exempted landfills are likely to be releasing even higher levels of toxic contaminants.

The EPA's exemption of inactive landfills under the CCR Rule creates additional risks to health and the environment. The rule allows regulated contaminated sites to avoid any corrective action to address coal ash contamination if the owner can claim that the source of the contaminants is an inactive CCR landfill, even if the owner created that landfill, and it is on the plant site. Thus, not only does the rule exempt inactive CCR landfills from monitoring and cleanup requirements, it also can be used to release otherwise regulated dumps from monitoring of toxic metals and groundwater cleanup if they claim that an inactive CCR landfill caused the contamination. The impact of the exemption is thus far broader than excluding certain sources—the rule's provisions work together to excuse owners from cleaning up some of the largest and dirtiest sites, as discussed in more detail in Section IV.A., *infra*.

Consequently, there are numerous sites where coal ash contamination is not monitored, assessed, and remediated because the CCR Rule fails to address, in any manner, landfills that ceased operation prior to 2015. Regulations addressing these landfills would prevent exposure to deadly coal ash constituents, protect drinking water sources and aquatic ecosystems, and lead to much needed cleanups nationwide. The EPA's failure to review and revise the dangerous exemption for inactive CCR landfills is resulting in widespread, but undetected, contamination of groundwater and surface water, and preventing the cleanup of groundwater at sites where contamination exceeds federal health-based standards.

The review and revision of the CCR Rule's inactive CCR landfill exemption is clearly warranted by the deeply concerning data, and it is years overdue. The EPA has neither completed a formal review nor revised the regulation exempting inactive CCR landfills since the rule's promulgation in 2015. Yet the EPA formally determined as far back as 2000 that RCRA regulations are required for the protection of human health and the environment from the disposal of coal ash. *See* Notice of Regulatory Determination on Wastes from the Combustion of Fossil Fuels, 65 Fed. Reg. 32,214 (May 22, 2000). Had the EPA performed its mandatory duty to review the CCR landfill exemption by 2018, within three years after its promulgation, and revised the CCR Rule to be consistent with RCRA's protectiveness standard, 42 U.S.C. § 6944(a), basic safeguards would be in place for inactive landfills that would keep coal ash toxins out of our drinking water, lakes, and streams and require remediation at the scores of sites already known to be contaminated at dangerous levels.

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[8] *Id.* at 4.
[9] *Id.* at 16.

III. DUTY OF THE ADMINISTRATOR TO REVIEW AND REVISE REGULATIONS UNDER RCRA

To ensure protection of health and the environment, RCRA section 2002(b) imposes a nondiscretionary duty on the EPA Administrator to review and revise each regulation promulgated pursuant to the statute. *Appalachian Voices*, 989 F. Supp. 2d at 54. Specifically, section 2002(b) provides: "Each regulation promulgated under this chapter shall be reviewed and, where necessary, revised not less frequently than every three years." 42 U.S.C. § 6912(b). The EPA's duty requires the completion of a review and a determination by the Agency as to whether a revision is needed in compliance with the periodic statutory deadlines. *See Env't Def. Fund v. Thomas*, 870 F.2d 892, 900 (2d Cir. 1989). In accordance with RCRA section 2002(b), such review and revision must occur no less frequently than every three years.

IV. RCRA REQUIRES THE ELIMINATION OF THE INACTIVE CCR LANDFILL EXEMPTION TO ENSURE NO REASONABLE PROBABLITY OF ADVERSE EFFECTS ON HEALTH AND THE ENVIRONMENT

The EPA must review and revise its regulation exempting inactive CCR landfills under RCRA subtitle D to meet the RCRA protectiveness standard. *See* 42 U.S.C. § 6944(a). The failure to regulate inactive CCR landfills leaves communities near coal ash disposal sites unprotected and guarantees that environmental damage and threats to health will continue unabated.

A. Inactive CCR Landfills Are Currently Causing Groundwater Pollution Above Federal Health Standards And Such Pollution Is Unmonitored, Unabated And Results In A Reasonable Probability Of Adverse Effects On Health And The Environment

Most coal-fired power plants have one or more on-site CCR impoundments and/or landfills that are not covered by the CCR Rule.[10] These are typically old ash ponds, dredge cells, or landfills that were filled to capacity and then left in place. Very few of these old disposal units have secure, maintained final cover systems that comply with the requirements set out in the CCR Rule for closed landfills and impoundments. *See* 40 C.F.R. § 257.102(d). In some cases, the owners continued to stack dry fly ash over the abandoned disposal areas. In addition, most of these inactive landfills lack adequate liners underneath the ash to prevent the seepage of coal ash contaminants. Overall, we estimate that there are hundreds of such units across the country, causing or contributing to groundwater contamination to the same degree as the federally regulated disposal units.[11]

[10] *See* EPA, Questionnaire for the Steam Electric Power Generating Effluent Guidelines, https://www.epa.gov/sites/default/files/2015-06/documents/steam-electric_questionnaire_052010.pdf (last accessed May 12, 2022); EPA, Steam Electric Power Industry Technical Questionnaire – Response Database (Access) (accdb), https://www.epa.gov/eg/steam-electric-power-generating-effluent-guidelines-questionnaire (last accessed May 12, 2022).

[11] EPA, *supra* note 10.

Two large coal fleets, for which we have significant historical documentation, illustrate the problem – eleven TVA coal plants and four Midwest Generation coal plants in Illinois. At these fifteen coal plants there are seventy-three active or inactive coal ash disposal areas. The name and status of each disposal area are described in the table, attached as Appendix A. The historic coal ash disposal sites at these coal plants are exhaustively detailed in the EIP report TVA's Toxic Legacy: Groundwater Contaminated by Tennessee Valley Authority Coal Ash (Nov. 1, 2013), attached as Appendix B, and in the Sierra Club's brief for its enforcement action before the Illinois Pollution Control Board, Citizens Groups' Post-Hearing Brief, *Sierra Club v. Midwest Generation, LLC*, PCB No. 2013-015, (July 20, 2018), attached as Appendix C.

The majority of coal ash disposal units at the fifteen plants are not federally "regulated" CCR units.[12] The seventy-three coal ash disposal units at the fifteen plants fall into the following categories:

- Thirty-five regulated CCR surface impoundments and landfills, including:
    - Twenty-seven regulated CCR surface impoundments
    - Eight regulated CCR landfills
- Thirty-eight unregulated CCR surface impoundments and landfills, including:
    - Twenty-five unregulated CCR surface impoundments
    - Thirteen unregulated CCR landfills

In short, *roughly half* of the disposed coal ash at these fifteen plants is not currently covered by the CCR Rule. This means that any corrective action taken pursuant to the CCR Rule at these sites will only partially address the source of contamination and will not fully restore groundwater quality.

The failure of the rule to address all known sources of contamination has serious consequences as ninety-one percent of regulated sites' groundwater is now unsafe for human consumption.[13] The polluted groundwater is also draining into nearby rivers and streams, presenting a long-term environmental threat. For example, TVA's Bull Run Fossil Plant hosts two unregulated CCR landfills that have been leaching arsenic, boron, cobalt, manganese, and molybdenum into the groundwater for decades, resulting in groundwater that exceeds health standards for these toxins by many times.[14] Between 2008 and 2013, average concentrations in groundwater monitoring wells at Bull Run exceeded health standards[15] by 2.75 times for arsenic, up to 8.1 times for cobalt, up to 32 times for manganese, and up to 15 times for molybdenum.[16] Yet the CCR rule exempts these landfills and TVA has admitted no duty under the rule to clean up the groundwater.

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[12] "Regulated" CCR units are the CCR disposal units listed by TVA or NRG (Midwest Generation's parent company) on their CCR Rule compliance websites. *See* TVA, CCR Rule Compliance Data and Information, https://www.tva.com/Environment/Environmental-Stewardship/Coal-Combustion-Residuals (last accessed May 12, 2022); NRG, CCR Rule Compliance Data and Information, https://www.nrg.com/legal/coal-combustion-residuals.html (last accessed May 12, 2022).
[13] EIP & Earthjustice, *supra* note 7, at 4.
[14] *See* Appendix B, Table ES-2 at 9.
[15] 40 C.F.R. § 257.95(h).
[16] Appendix B, Table ES-2 at 9.

Regulated coal ash units that appear to be contaminating groundwater frequently escape cleanup by blaming the contamination on another source, and that other source is often an older, unregulated coal ash disposal unit, or coal ash fill. This avoidance of cleanup responsibility takes a few different forms. First, the owners may explicitly attribute contamination to an unregulated source in an alternative source determination ("ASD") following detection of Appendix IV contaminants above groundwater protections standards at the plant site. *See* 40 C.F.R. § 257.95(g)(3)(ii). Numerous owners use ASDs to avoid corrective action requirements and even monitoring requirements. This is the case at the Four Corners Power Plant in Fruitland, New Mexico, where historic coal ash disposal near the regulated unit is blamed for groundwater contamination.[17] Second, owners may attribute the contamination to something less specific, like "pre-existing contamination," "other sources," or "naturally occurring contamination," even though the details of the site clearly indicate contamination from historic coal ash disposal.[18] Third, the site in question may never get to the point of producing an ASD, because the adjacent source of contamination affects the well(s) designated as upgradient of the regulated disposal unit. In cases like these, where both the upgradient and downgradient wells are contaminated, owners are less likely to compute statistically significant increases ("SSIs"). If statistical analysis fails to generate SSIs, then there is no requirement that the owner identify other sources of contamination.

B. The Large Number Of Inactive CCR Landfills Poses A Significant Threat To Health And The Environment

We know that the number of inactive CCR landfills exempted from the CCR Rule is substantial. According to the publicly accessible websites maintained pursuant to the CCR Rule, approximately 229 CCR landfills are currently regulated by the rule.[19] Information describing many older and exempted inactive CCR landfills is contained in a database assembled by EPA in 2010. In 2010, the EPA sent questionnaires to about 700 fossil- and nuclear-fueled steam electric power plants (a subset of the nation's approximately 1,200 facilities) to support its proposed rule

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[17] *See* Arizona Pub. Serv., Annual Groundwater Monitoring and Corrective Action Report for 2019, prepared by Wood Environment & Infrastructure Solutions, Inc. (Jan. 31, 2020), https://www.aps.com/-/media/APS/APSCOM-PDFs/Utility/CCR-Documents/Four-Corners/Facility-Wide/FC_GW_AnRpt_021_20200131.ashx?la=en. Arizona Public Service's ASD states that numerous contaminant concentration exceedances of CCR contaminants present at their Combined Water Treatment Pond ("CWTP") reflect historic CCR disposal beneath the unit. Specifically, the ASD states that groundwater contamination downgradient of the regulated CCR pond is from a twenty foot layer of CCR disposed beneath the unit. *Id.* at 3 of Appendix A. Historic CCR disposal is likely reflected in the exceptionally high concentrations of sulfate and total dissolved solids detected in both downgradient and "background" wells.

[18] *See* TVA, 2020 Annual Groundwater Monitoring and Corrective Action Report, Bull Run Fossil Plant Dray Fly Ash Stack Lateral Expansion CCR Unit (Jan. 29, 2021), https://www.tva.com/docs/default-source/ccr/brf/landfill---dry-fly-ash-stack-lateral-expansion/groundwater-monitoring/annual-groundwater-report/257-90(e)_annual-groundwater-monitoring-report_brf_dry-fly-ash-lateral-expansion-2020.pdf?sfvrsn=8070bc0a_2. TVA's ASD for Bull Run's expanded landfill, dated April 13, 2018, identifies the source of the CCR contamination in the groundwater as "pre-existing groundwater conditions" and does not attribute it to the new landfill expansion. *Id.* at 39-40. As explained in Appendix B, historic groundwater contamination was caused by the original landfill to which the expansion was added. As a result of TVA's 2018 ASD, TVA does not have to conduct assessment monitoring despite the ongoing presence of high levels of Appendix III constituents. Further the groundwater contamination will never trigger corrective action, despite being caused by CCR.

[19] *See* EPA, List of Publicly Accessible Internet Sites Hosting Compliance Data and Information Required by the Disposal of Coal Combustion Residuals Rule, https://www.epa.gov/coalash/list-publicly-accessible-internet-sites-hosting-compliance-data-and-information-required (last accessed May 12, 2022).

amending the effluent limitation guidelines for the Steam Electric Power Generating category.[20] Each facility reported their retired, active, and planned landfills that store fly ash, bottom ash, boiler slag, or flue gas desulfurization sludge. Pursuant to this 2010 Information Collection Request, utilities reported a total of 470 CCR landfills that they described as "active" (273), "retired" (108), "planned" (66) and "unknown" (23).[21]

We compared the landfills identified in the 2010 database to the 229 currently regulated CCR landfills to determine which of the 470 landfills are currently regulated. Of the 470 landfills, our analysis resulted in an estimate of 285 inactive and thus unregulated CCR landfills.[22] Of these 285 inactive CCR landfills, 88 landfills exist at facilities that retired prior to the CCR Rule and thus do not have any regulated CCR units, 56 landfills exist at facilities that have a currently regulated CCR surface impoundment, but no regulated landfills, and 141 landfills exist at facilities that have at least one currently regulated CCR landfill.

Based on landfills that reported volume information, we estimated the total volume of CCR in these unregulated landfills to be more than half a billion cubic yards.[23] The exemption of close to 300 older CCR landfills is particularly concerning as industry admitted in their responses to the 2010 questionnaire that sixty-six percent of the then-retired CCR landfills and thirty-four percent of the then-active CCR landfills were unlined.[24] Furthermore, almost all of the landfills that reported "liners" in the 2010 database have clay, soil, or pozzolanic material liners that do not meet the requirements of the CCR Rule.[25] These unregulated and unlined, or inadequately lined, inactive landfills pose a substantial threat to groundwater, surface water, and human health.

This estimate does not reflect the complete universe of inactive CCR landfills, such as landfills at plants that retired before EPA's 2010 survey and large volumes of CCR disposed in areas that do not fit the survey's definition of a landfill. Because there is very poor documentation of unregulated coal ash fill sites, such as areas where ash was used as "structural fill," it is impossible to estimate the number of these disposal areas. Still, our conservative quantitative estimate of the threat posed by inactive CCR landfills that are likely leaching toxic metals into groundwater demonstrates an urgent need to require monitoring, closure, and corrective action for these sites under RCRA and the CCR Rule.

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[20] EPA, *supra* note 10.
[21] Appendix D; EPA, *supra* note 10.
[22] Of the 470 landfills, a maximum of 229 could possibly be regulated under the CCR rule (leaving a minimum of 241 unregulated). Our estimate of 285 is larger than this minimum because some of the 229 regulated landfills were not reported in the 2010 survey. Our estimate of 285 inactive landfills cannot be exact for several reasons. First, some facilities have combined or split up landfills between 2010 and current day. Second, the Earthjustice analysis assumes overlap, which may render our calculation an underestimate. For example, if a given facility reports four landfills in 2010 and has two currently regulated landfills, we assume both of those regulated landfills are included in the four 2010 landfills when data are unavailable to confirm this.
[23] Of the 285 inactive CCR landfills, twenty percent reported volume information. The volume associated with that twenty percent is approximately 112 million cubic yards. Extrapolating the analysis yields an estimate of over half a billion yards. *See* EPA, *supra* note 10.
[24] *Id.*
[25] *Id.*

C. Section 257.50(d) Must Be Revised Because It Fails To Prohibit Open Dumping From Inactive CCR Landfills And Fails To Protect Health and the Environment.

One of the primary goals of RCRA is "requiring the conversion of existing open dumps to facilities which do not pose a danger to the environment or to health." 42 U.S.C. § 6902(a)(3). RCRA defines an "open dump" as any facility or site where solid waste is disposed of that is not a sanitary landfill that meets the criteria promulgated under section 4004. *Id.* § 6903(14). As described above, the regulatory criteria for classifying coal ash landfills as sanitary landfills excludes inactive CCR landfills. *See* 40 C.F.R. § 257.50(d). Yet these are facilities where solid waste is disposed of and which continue to dispose of solid waste by the leaking of CCR constituents into groundwater and surface water. These landfills, however, completely fall through a gap in the EPA's regulations. The only RCRA regulations that apply to inactive CCR landfills are the outdated subtitle D criteria, Criteria for Classification of Solid Waste Disposal Facilities and Practices, published by the EPA in 1979, which fail to require even baseline safeguards, such as groundwater monitoring, corrective action, closure, and post-closure care. 40 C.F.R. Subpart A. The EPA has yet to establish adequate minimum criteria for inactive CCR landfills despite their documented widespread damage. In the absence of such criteria, inactive CCR landfills present a "reasonable probability of adverse effects on health and the environment from disposal of solid waste" at such facilities. 42 U.S.C. § 6944(a).

V. THE CITIZEN SUIT PROVISION OF RCRA

Section 7002(a)(2) of RCRA authorizes citizen suits "against the Administrator where there is alleged a failure of the Administrator to perform any act or duty under this Act which is not discretionary with the Administrator." *Id*. § 6972(a)(2). Citizens must provide notice to the Administrator at least sixty days before commencing a citizen suit under section 7002(a)(2). *Id*. § 6972(c).

VI. EPA MUST REMEDY THESE LEGAL VIOLATIONS BY COMPLETING REGULATORY REVIEW AND REVISION AS SOON AS POSSIBLE

The EPA has violated RCRA's express, mandatory requirement to review and, if necessary, revise its regulations every three years. The EPA must now remedy this legal violation by completing such a review and making the regulatory revisions that are plainly necessary to meet the RCRA protectiveness standard in light of the wealth of data before the Agency. As the courts have made clear, citizens can compel timely action when agencies fail to comply with periodic requirements to review and revise regulations. *See, e.g., Appalachian Voices*, 989 F. Supp. 2d at 55 ("[T]he Court finds that § 2002(b) creates a non-discretionary duty that may be enforced pursuant to the RCRA's citizen suit provision." (citation omitted)); *Am. Lung Ass 'n v. Browner,* 884 F. Supp. 345, 347-48 (D. Ariz. 1994) (construing parallel provisions under section 109 of the Clean Air Act); *Env't Def. Fund,* 870 F.2d at 900 (same).[26] As explained by the D.C. District Court:

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[26] Section 109(d) states: "Not later than December 31, 1980, and at five-year intervals thereafter, the Administrator shall complete a thorough review of the criteria published under section 7408 of this title and the national ambient

> By its plain terms, the statute charges the EPA with the ongoing obligation to review and, if necessary, revise the regulations promulgated under the RCRA every three years. The language is unambiguous in its command and contains no limitation ending the EPA's obligation to undertake such reviews and revisions at least every three years. The interpretation of § 2002(b) as imposing a continuing obligation on the EPA to review and revise its regulations is consistent with the Act's emphasis on the ongoing development of improved solid waste disposal methods.

Appalachian Voices, 989 F. Supp. 2d at 45. Here, "the EPA has not merely missed a deadline, it has nullified the congressional scheme for a fixed interval review and revision process." *Am. Lung Ass'n*, 884 F. Supp. at 348*; see also Nat. Res. Def. Council v. EPA*, 902 F.2d 962, 986 (D.C. Cir. 1990) (finding that the Agency's "preliminary action in the direction of revising a standard" in an Advanced Notice of Proposed Rulemaking did not constitute the mandated, timely formal Agency decision required under section 109(d) of the Clean Air Act).

CONCLUSION

The EPA has failed to perform its nondiscretionary duty mandated by section 2002(b) of RCRA, 42 U.S.C. § 6912(b) by failing to conduct its mandatory three-year review of the inactive CCR landfill exemption established in 2015. 40 C.F.R. § 257.50(d). EPA must conduct that review posthaste and revise the CCR Rule to eliminate the exemption and provide RCRA-required safeguards for the disposal of coal ash that has too long escaped effective regulation. The EPA can delay no further in the face of data that reveal severe, widespread, and persistent contamination of groundwater and rivers. Across the U.S., impacted groundwater is unsafe for human consumption and polluted groundwater is draining into rivers and streams, presenting long-term environmental threats from bioaccumulative and toxic metals. The impact of further delay is to render aquifers indefinitely unavailable for future use and aquatic environments permanently impaired.

We intend to file suit in federal court to compel the EPA to fulfill its mandatory duty to review 40 C.F.R. § 257.50(d) as required by RCRA.

If you have any questions or wish to discuss this matter, please do not hesitate to contact Lisa Evans, Senior Counsel, 781-631-4119, levans@earthjustice.org.

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air quality standards promulgated under this section and shall make such revision in such criteria and standards and promulgate such new standards as may be appropriate in accordance with section 7408 of this title . . . ." 42 U.S.C. § 7409(d)(1).

Respectfully,

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Appendix A

Appendix A: Table of CCR Landfills and Surface Impoundments at TVA and Midwest Generation Plants

Owner	Plant Name	CCR Disposal Area	Status of Unit Per 2015 CCR Rule
Midwest Generation	Joliet 29	Ash Landfill (1)	Unregulated Landfill
Midwest Generation	Joliet 29	Ash Landfill (2)	Unregulated Landfill
Midwest Generation	Joliet 29	Ash Pond 2	Regulated Surface Impoundment
Midwest Generation	Powerton	Ash Surge Basin	Regulated Surface Impoundment
Midwest Generation	Powerton	Bypass Basin	Regulated Surface Impoundment
Midwest Generation	Powerton	Former Ash Basin	Regulated Surface Impoundment
Midwest Generation	Waukegan	East Ash Pond	Regulated Surface Impoundment
Midwest Generation	Waukegan	Former Slag/Fly Ash Storage Area	Unregulated Former CCR Surface Impoundment
Midwest Generation	Waukegan	West Ash Pond	Regulated Surface Impoundment
Midwest Generation	Will County	Ash Pond 1N	Unregulated Former CCR Surface Impoundment
Midwest Generation	Will County	Ash Pond 1S	Unregulated Former CCR Surface Impoundment
Midwest Generation	Will County	South Ash Pond 2	Regulated Surface Impoundment
Midwest Generation	Will County	South Ash Pond 3	Regulated Surface Impoundment
TVA	Allen	East Ash Disposal Ares	Regulated Surface Impoundment
TVA	Allen	West Ash Disposal Area	Unregulated Former CCR Surface Impoundment
TVA	Bull Run	Ash Area 1A	Unregulated Former CCR Surface Impoundment
TVA	Bull Run	Bottom Ash Area 1	Unregulated Former CCR Surface Impoundment
TVA	Bull Run	Dry Fly Ash Stack (original footprint)	Unregulated Landfill
TVA	Bull Run	Dry Fly Ash Stack Lateral Expansion	Regulated Landfill

TVA	Bull Run	East/West Dredge Cell	Unregulated Landfill
TVA	Bull Run	Fly Ash Stilling Pond 2C and Sluice Channel	Regulated Surface Impoundment
TVA	Bull Run	Gypsum Area 2A	Unregulated Former CCR Surface Impoundment
TVA	Bull Run	Main Ash Pond	Regulated Surface Impoundment
TVA	Colbert	Ash Disposal Area 4	Regulated Surface Impoundment
TVA	Colbert	Ash Pond 1	Unregulated Former CCR Surface Impoundment
TVA	Colbert	Ash Pond 5	Unregulated Former CCR Surface Impoundment
TVA	Colbert	Dry Ash Landfill	Unregulated Landfill
TVA	Colbert	Stilling Pond	Unregulated Former CCR Surface Impoundment
TVA	Cumberland	Bottom Ash Pond	Regulated Surface Impoundment
TVA	Cumberland	Dry Ash Stack	Regulated Landfill
TVA	Cumberland	Gypsum Storage Area	Regulated Landfill
TVA	Cumberland	Stilling Pond	Regulated Surface Impoundment
TVA	Gallatin	Additional Ash Pond Area (north of regulated units)	Unregulated Former CCR Surface Impoundment
TVA	Gallatin	Ash Pond A	Regulated Surface Impoundment
TVA	Gallatin	Ash Pond E	Regulated Surface Impoundment
TVA	Gallatin	Bottom Ash Pond	Regulated Surface Impoundment
TVA	Gallatin	Middle Pond A	Regulated Surface Impoundment
TVA	Gallatin	North Rail Loop Landfill	Regulated Landfill
TVA	Gallatin	Original Ash Pond	Unregulated Former CCR Surface Impoundment
TVA	John Sevier	Ash Disposal Area J	Unregulated Former CCR Surface Impoundment
TVA	John Sevier	Bottom Ash Pond	Regulated Surface Impoundment
TVA	John Sevier	Dry Fly Ash Disposal Area	Unregulated Former CCR Surface Impoundment
TVA	John Sevier	Sediment Pond	Unregulated Former CCR Surface Impoundment

TVA	Johnsonville	Active Ash Pond 2	Regulated Surface Impoundment
TVA	Johnsonville	Ash Disposal Area 1	Unregulated Former CCR Surface Impoundment
TVA	Johnsonville	DuPont Road Dredge Cell	Unregulated Landfill
TVA	Johnsonville	South Rail Loop	Unregulated Landfill
TVA	Kingston	Former Ash Disposal Area	Unregulated Landfill
TVA	Kingston	Parts of Former Ash Processing Area	Unregulated Landfill
TVA	Kingston	Peninsula Disposal Area	Regulated Landfill
TVA	Kingston	Sluice Trench and Area East of Sluice Trench	Regulated CCR Surface Impoundment
TVA	Kingston	Stilling Pond	Regulated CCR Surface Impoundment
TVA	Paradise	East Dredge Cell	Unregulated Landfill
TVA	Paradise	Gypsum Disposal Area (including Stilling Ponds)	Regulated CCR Surface Impoundment
TVA	Paradise	Jacob’s Creek Ash Pond	Unregulated Former CCR Surface Impoundment
TVA	Paradise	New CCR Landfill	Regulated Landfill
TVA	Paradise	Peabody Ash Pond	Regulated CCR Surface Impoundment
TVA	Paradise	Slag Mountain	Unregulated Landfill
TVA	Paradise	Slag Mountain Ash Ponds	Unregulated Former CCR Surface Impoundment
TVA	Paradise	Slag Ponds 2A and 2B	Regulated CCR Surface Impoundment
TVA	Paradise	Slag Stilling Pond 2C	Regulated CCR Surface Impoundment
TVA	Paradise	West Dredge Cell	Unregulated Former CCR Surface Impoundment
TVA	Shawnee	Ash Pond 2	Regulated CCR Surface Impoundment
TVA	Shawnee	Consolidated Waste Dry Stack	Regulated Landfill
TVA	Shawnee	New CCR landfill	Regulated Landfill
TVA	Widows Creek	Abandoned Ash Disposal Area	Unregulated Former CCR Surface Impoundment
TVA	Widows Creek	Ash Pond A Stacking Area	Unregulated Landfill
TVA	Widows Creek	Gypsum Stack	Unregulated Landfill

TVA	Widows Creek	Gypsum Stilling Pond	Unregulated Former CCR Surface Impoundment
TVA	Widows Creek	Main Ash Pond A	Unregulated Former CCR Surface Impoundment
TVA	Widows Creek	Old Scrubber Sludge Pond	Unregulated Former CCR Surface Impoundment
TVA	Widows Creek	Red Water Pond	Unregulated Former CCR Surface Impoundment
TVA	Widows Creek	Upper and Lower Stilling Ponds	Unregulated Former CCR Surface Impoundment

Appendix B

TVA's Toxic Legacy:

Groundwater Contaminated by Tennessee Valley Authority Coal Ash

November 2013

About the Environmental Integrity Project

The Environmental Integrity Project (EIP) is a nonpartisan, nonprofit organization dedicated to the enforcement of the nation's anti-pollution laws and to the prevention of political interference with those laws. EIP provides objective analysis of how the failure to enforce or implement environmental laws increases pollution and harms public health, and helps local communities obtain the protection of environmental laws.

Data Limitations

EIP based its analysis of groundwater quality on publicly available data retrieved from the Tennessee Valley Authority through Freedom of Information Act Requests. The amount of information available, and the date of the most recent information available, varies by site. The range of dates for which we had information on file is described in each site-specific section of the report. EIP is committed to ensuring that the data we present are as accurate as possible. We will correct any errors that are verifiable.

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Executive Summary

The billion-gallon spill at the Tennessee Valley Authority's (TVA's) Kingston plant in 2008 reminded us that unregulated and poorly maintained coal ash ponds are an invitation to disaster. Although less visible, contamination below the surface of TVA's power plants may be the more serious, long-lasting legacy from decades of mismanagement. Based on a review of documents obtained through Freedom of Information Act requests, this report shows that TVA's ponds and landfills have contaminated groundwater under and around all eleven of the utility's fleet of coal-fired power plants.

The impacted groundwater is now unsafe for human consumption. The polluted groundwater is also draining into nearby rivers and streams, presenting a long-term environmental threat. The evidence of contamination is substantial, but it understates the damage due to gaps in data collection and because TVA stopped monitoring at some sites after initial results indicated high levels of contamination. No cleanup plans are in place at these sites, as state oversight is minimal and EPA has yet to set federal standards to guide the monitoring and cleanup of groundwater at coal ash sites. TVA needs a comprehensive, system-wide plan to strengthen its groundwater monitoring network and remediate the toxic legacy that coal ash disposal has created.

CONTAMINATION: WIDESPREAD AND PERSISTENT

Table ES-1 highlights the pollutants that exceed health-based guidelines in wells likely to be affected by coal ash, and peak levels measured over the past five years. Some of the spikes are sky-high – peak concentrations of arsenic in one TVA monitoring well were nearly eight times above the Safe Drinking Water Act standard, while manganese concentrations in another were 700 times above the health advisory for lifetime exposure. Table ES-1 also shows that the contamination is widespread. Arsenic has exceeded the federal drinking water standard in 17 downgradient wells. Boron, cobalt and sulfate have each exceeded health-based guidelines in 30 or more downgradient TVA wells, while manganese has exceeded its guideline in 56 wells.

The contamination is also persistent. Table ES-2 summarizes a subset of wells where *average* concentrations of several coal ash pollutants exceeded federal health-based over the past five years. Table ES-2 highlights the following pollutants:

> **Arsenic** has been linked to cancers of the skin, bladder, kidneys and other organs. Average concentrations exceeded the Safe Drinking Water Act Maximum Contaminant Level (MCL) of 10 micrograms per liter at five TVA plants: Allen, Bull Run, Colbert,

Cumberland Paradise, and John Sevier. Three wells at the **Colbert** plant in Alabama had average arsenic concentrations of 48-69 ug/L, roughly five times the federal MCL. Wells at the **Allen** and **Bull Run** plants in Tennessee were roughly three times the MCL.

Boron may harm developing fetuses or contribute to testicular atrophy in male children, which is why EPA's Health Advisory recommends a daily limit of no more than 3.0 milligrams per liter of drinking water for young children. Average boron concentrations have exceeded EPA's recommended limit in thirty-two monitoring wells at nine TVA plants. Average concentrations exceeded 10 mg/L, more than three times the health advisory, in one or more wells at the **Bull Run**, **Cumberland**, and **John Sevier** plants in Tennessee, the **Paradise** and **Shawnee** plants in Kentucky, and the **Widows Creek** plant in Alabama.

Cobalt is associated with blood disease (polycythemia), heart disease, neurological symptoms, and reproductive toxicity. The health-based screening level for cobalt, 4.7 micrograms per liter, is based on studies showing polycythemia and reduced iodine uptake in humans. Average cobalt concentrations in 25 downgradient wells at 9 TVA plants exceed this level.

Manganese at high doses can cause neurological, developmental, and musculo-skeletal impairments. EPA's Health Advisory recommends limiting lifetime exposure to no more than 0.3 milligrams per liter of drinking water. Fifty wells at ten of TVA's eleven plants have average concentrations above this level. Manganese levels averaged more than 100 times the health advisory in one or more wells at the **Kingston** plant in Tennessee, the **Shawnee** and **Paradise** plants in Kentucky, and the **Widows Creek** plant in Alabama.

Molybdenum has been linked to gout (painful inflammation of the joints). EPA Health Advisories are design to limit lifetime exposure to 40 micrograms per liter, but six TVA sites report average molybdenum concentrations at least twice that level. One well at the **Shawnee** site in Kentucky averaged 556 micrograms, or nearly 14 times the limit, while a single sample taken from a well at Tennessee's **John Sevier** plant showed molybdenum at 2,200 micrograms (no further samples were taken after that).

Sulfate concentrations above 500 mg/L in drinking water can cause diarrhea, and the EPA established a drinking water advisory at this level to protect infants, who are more sensitive to water loss caused by diarrhea. Average sulfate concentrations exceed this level in 27 downgradient wells at 8 TVA plants.

Much of the contamination is slowly moving toward local rivers. Although this reduces the immediate threat to local residents who drink groundwater, it is a small comfort; in these cases the aquifers are rendered indefinitely unavailable for future residential use while local aquatic environments are forced to absorb an additional burden of bioaccumulative and toxic metals.

DON'T ASK, DON'T TELL: MONITORING GAPS, MONITORING STOPPED

While TVA has an extensive network of monitoring wells at some of its plants, it does not regularly collect data for some of the most important pollutants, including those most indicative of coal ash pollution. For reasons unclear, TVA also chose to stop monitoring many contaminated wells, including ones measured under a voluntary program promoted by the industry trade association after the Kingston spill. Table ES-3 summarizes instances in which TVA has reported evidence of contamination and either stopped measuring coal ash indicators or stopped monitoring wells altogether. For example:

- TVA has stopped monitoring many contaminated wells. Wells P2 and P3 at the **Allen** plant in Tennessee showed unsafe levels of arsenic and manganese in 2008, but have not been monitored since then. Another example is well 21 at the **Gallatin** plant in Tennessee, which showed consistently unsafe concentrations of cadmium, cobalt, manganese, mercury, and sulfate when TVA stopped sampling it in 2011. TVA collected one round of sampling data from new impoundment wells at the **Paradise** plant in Kentucky in 2011, and despite finding unsafe concentrations of arsenic, boron, cobalt, manganese, and other pollutants, stopped monitoring seven of these wells. Paradise well 10-9, at the site's bottom ash ponds, had boron at five times the Child Health Advisory, cobalt at 80 times the Regional Screening Level, and manganese at 200 times the Lifetime Health Advisory when TVA stopped monitoring this well.

- In the wells that TVA continues to monitor, it routinely fails to measure pollutants known to be associated with coal ash. For example, TVA stopped measuring boron, chloride, manganese, molybdenum, strontium, sulfate, and TDS in the voluntary monitoring wells at most of its plants after one round of sampling in 2011. TVA also frequently omits these pollutants from the wells that are monitored pursuant to state requirements. For example, TVA did not measure these pollutants at the **Bull Run** plant in 2011 or 2012. This is troubling for two reasons: Not only are these pollutants associated with coal ash leachate, they have also been found at high concentrations in downgradient TVA wells. Voluntary wells at **Allen** (TN), **Johnsonville** (TN), **Paradise** (KY), and **Widows Creek** (AL) all had high concentrations of boron and other pollutants when TVA stopped measuring these pollutants.

- TVA is not monitoring all coal ash disposal areas. This is particularly true of abandoned ash areas, including the abandoned ash pond at the **Allen** plant, the east/west dredge cell at the **Bull Run** plant, and the abandoned "Area A" at the **Johnsonville** plant (all in Tennessee).

TVA WARNED OF RISKS AT SOME SITES

Many of TVA's ash disposal units are built over "karst" bedrock, which is characterized by dissolved fractures and cavities. TVA has long known that building on this kind of terrain creates the risk of sinkholes, which allow leachate mixed with solid waste to drain, unfiltered and unattenuated, into local groundwater and surface water. For example, before building Ash Pond 4 at the Colbert plant in Alabama, TVA knew that "[s]udden collapse of a small portion of the soil layer overlying the cavernous limestone could occur." As predicted, the pond bottom collapsed in 1984 and the pond had to be abandoned; this was one of several sinkholes at the Colbert site over the past 30 years.

Karst has also created problems at Gallatin, where TVA built the active ash pond complex over more than 100 known sinkholes, and at Kingston, where TVA recently built a new gypsum disposal facility over an area with known sinkholes, allowing gypsum slurry to drain into the Clinch River just a few years after the massive dredge cell collapse at the same plant. It was irresponsible for TVA to dispose of ash on karst when it knew of the risk involved, and it is particularly irresponsible to continue the practice after the risk has been repeatedly realized.

STATE ACTION: TOO LITTLE, TOO LATE

TVA has frequently abandoned old ash ponds with little or no oversight from the states. For example, Tennessee still considers the abandoned ash pond at the Allen Fossil Plant to be exempt from solid waste laws because it has a Clean Water Act permit – despite the fact that it has been inactive for over 20 years. As a result, TVA does not monitor the groundwater around the abandoned pond and the public has no way of knowing whether the area poses a threat to local water resources. The abandoned ash pond at the Gallatin plant, as described in this report, is leaching dangerously high concentrations of many pollutants into groundwater immediately connected to the Cumberland River.

RECOMMENDATIONS

TVA is currently in the process of phasing out its ash ponds and replacing them with landfills. This is a step in the right direction. Unfortunately, the process is not scheduled to be complete until 2021, and there is no guarantee that it will be completed on schedule, if at all. More importantly, the contamination caused by existing ponds and landfills has proven to be chronic and persistent; without clean closure of these disposal areas, the threat to local aquifers and ecosystems will continue long into the future. Finally, the data show that so-called “dry landfills” have also leaked into groundwater, which means that tighter standards are needed for any new landfills.

In order to minimize ongoing degradation of groundwater aquifers, and to facilitate remediation, TVA should implement a fleet-wide groundwater protection plan. As part of that plan, TVA should:

1) Resume monitoring contaminated wells, including wells P2 and P3 at the Allen plant, wells around the Colbert coal yard drainage basin, well 93-2 at Cumberland, well 21 at Gallatin, wells around Area 1 at Johnsonville, and all ash pond wells at Paradise and Widows Creek. TVA should also continue to monitor wells B6 and B8 at Johnsonville.
2) Monitor the right contaminants. Coal ash indicators including boron, chloride, manganese, sulfate, and TDS should be measured routinely and in every well.
3) Contain the problem. TVA should complete a full characterization of the ongoing impacts from coal ash disposal, including discharges to sensitive aquatic ecosystems, and immediately limit the contamination plumes.
4) Develop a fleet-wide cleanup plan with opportunities for public review and comment. Every contaminated aquifer beneath TVA ash ponds and landfills should be returned to background condition in a reasonable amount of time.

There are also steps that TVA can take outside of a groundwater protection plan. As it begins the process of moving beyond wet ash disposal, TVA must close its ash ponds in a way that protects groundwater and surface water, and must make the closure process transparent and enforceable through proper solid waste permitting. And for many reason, coal ash contamination among them, TVA should accelerate its planned transition away from coal and toward cleaner forms of energy.

Last but not least, in order to ensure that TVA and other utilities bring their coal ash disposal practices into the modern age, EPA must finalize its coal ash disposal regulations, and in those regulations must require rigorous closure and post-closure requirements, clean-up requirements, and groundwater protections.

Table ES-1. Summary of pollutants and wells with maximum concentrations above health-based guidelines between 2008 and 2013.[1]

Pollutant	Health-based guideline[2]	Number of down-gradient TVA wells exceeding guideline	Maximum concentration
Aluminum	16 mg/L	4	125 mg/L
Antimony	6 ug/L	5	59 ug/L
Arsenic	10 ug/L	17	135 ug/L
Beryllium	4 ug/L	2	25 ug/L
Boron	3 mg/L	35	38 mg/L
Cadmium	5 ug/L	4	8 ug/L
Cobalt	4.7 ug/L	35	370 ug/L
Lead	15 ug/L	2	160 ug/L
Lithium	31 ug/L	4	200 ug/L
Manganese	0.3 mg/L	56	220 mg/L
Mercury	2 ug/L	1	3 ug/L
Molybdenum	40 ug/L	19	2,200 ug/L
Nickel	100 ug/L	6	250 ug/L
Selenium	50 ug/L	2	412 ug/L
Strontium	9.3 mg/L	1	10 mg/L
Sulfate	500 mg/L	31	6,300 mg/L
Vanadium	63 ug/L	2	200 ug/L

[1] For the purposes of this table, wells were not counted if boron was consistently below 1 mg/L and sulfate was consistently below 150 mg/L, and pollutants were not counted as exceedances if the mean concentration for that well was below the mean concentration for the relevant upgradient well (see section 13 for more detail). A full presentation of this analysis is shown in Table 13-3 of this report.

[2] See Table 1-1 in the Introduction for a detailed explanation of these values.

Table ES-2. Summary of groundwater wells in which 2008-2013 average concentrations of selected pollutants exceeded health-based guidelines.[3] Table shows mean or range of means for each well or set of wells.

Pollutant		**Arsenic** (ug/L)	**Boron** (mg/L)	**Cobalt** (ug/L)	**Manga-nese** (ug/L)	**Molybd-enum** (ug/L)	**Sulfate** (mg/L)
Health-based guideline		10	3	4.7	0.3	40	500
Allen	# wells	1					
	Mean(s)	28.4					
Bull Run	# wells	1	2	2	2	2	4
	Mean(s)	27.5	3.6 - 15.3	10.3 - 49.1	6.7 - 9.7	76 - 605	745 - 1786
Colbert	# wells	3	3	1	4	7	
	Mean(s)	47.8 - 68.8	3.3 - 4.4	10.0	0.4 - 1.2	45 - 160	
Cumberland	# wells	1	4	4	6	1	2
	Mean(s)	11.6	5.6 - 34.9	5.1 - 140	1.2 - 16.5	469	776 - 1313
Gallatin	# wells		4	4	5		5
	Mean(s)		3.5 - 5.7	14.7 - 197	0.4 - 20.2		893 - 4088
John Sevier	# wells		2		3	1	3
	Mean(s)		5.0 - 13.3		2.6 - 4.1	2200	835 - 1337
Johnsonville	# wells		5	4	6		3
	Mean(s)		3.5 - 9.9	16.0 - 52.3	1.1 - 20.0		780 - 1028
Kingston	# wells			2	5		1
	Mean(s)			7.2 - 95.9	1.0 - 176		2967
Paradise	# wells	1	4	5	6		4
	Mean(s)	18.0	3.2 - 24	5.9 - 370	1.4 - 61.0		590 - 1900
Shawnee	# wells		7	2	8	1	2
	Mean(s)		5.0 - 19.8	11.1 - 35.2	0.9 - 66.4	559	1061 - 1230
Widows Creek	# wells		1	1	5		3
	Mean(s)		13.0	20.4	1.2 - 32.0		550 - 1100

[3] This analysis was limited to the pollutants shown (other pollutants, not shown, also exceeded health-based guidelines), was limited to wells in which half or more of available sample results exceeded health-based guidelines, and was limited to wells likely to be affected by coal ash (see 'restricted analysis' description in the text of the report). A full presentation of this analysis is shown in Table 13-4 of this report.

Table ES-3 (page 1 of 2): Wells and pollutants dropped from monitoring network despite evidence of contamination.

Site	Wells	Groundwater quality issues	Monitoring gaps
Allen	P2 and P3	Unsafe levels of arsenic and manganese in 2004-2008.	Not monitored since 2008
Bull Run	Wells 10-51 and 10-52	Arsenic 22-31 ug/L in well 10-52 during 2011-2013; manganese exceeded LHA in both wells in 2011	Coal ash indicators not measured since first round of sampling in 2011
	Well S	Insufficient data	This well was installed in 2011, but coal ash indicators were never measured
Colbert	Wells around coal yard drainage basin	Very high aluminum, cadmium, manganese (up to 99 mg/L) and sulfate in the 1980s-1990s (see Colbert chapter)	Abandoned in 1999
Cumberland	Well 93-2	High arsenic, boron (up to 38 mg/L), cobalt, manganese (3-5 mg/L), molybdenum, and sulfate during 2009-2011.	TVA “replaced” this well with a new well, 93-2R, screened in a different geologic layer (see Cumberland chapter)
	Wells 10-1 and 10-2	High cobalt (up to 150 ug/L) and manganese (up to 17 mg/L).	Coal ash indicators not measured since 2011.
Gallatin	Well 21	Very high cobalt (up to 330 ug/L) and manganese (up to 18 mg/L); unsafe levels of cadmium, mercury, nickel, strontium and sulfate	Not monitored since 2011. This well may be affected by sources of pollution other than coal ash (see Gallatin chapter)
	Wells 19R, 20, and 26	Very high cobalt downgradient of abandoned ash pond	TDEC suspended cobalt monitoring and reporting requirements in 2011
John Sevier	Wells 10-36 and 10-37	Unsafe levels of manganese; no molybdenum data	Coal ash indicators not measured since first round of sampling in 2011

Table ES-3 (page 2 of 2): Wells and pollutants dropped from monitoring network despite evidence of contaminations.

Site	Wells	Groundwater quality issues	Monitoring gaps
Johnsonville	Six wells around Area 1	Very high concentrations of many pollutants in the 1990s (see Johnsonville chapter)	Not monitored since 1994
	Areas 2 & 3 (ash island)	High boron (up to 6.3 mg/L) and manganese (up to 20 mg/L) in 2011, unsafe levels of other pollutants	Coal ash indicators not measured since first round of sampling in 2011
	Wells B6 and B8	Very high boron (up to 12 mg/L), cobalt, manganese, and sulfate (see Johnsonville chapter)	TDEC and TVA agreed to stop monitoring these wells[4]
Paradise	Wells 10-1 and 10-2 (scrubber sludge pond)	Very high boron (11-24 mg/L); unsafe levels of cobalt, manganese, and sulfate	Coal ash indicators not measured since first round of sampling in 2011
	Wells 10-3 through 10-9 (ash ponds)	Very high cobalt (370 ug/L) and manganese (61 mg/L) in well 10-9, high arsenic, boron, cobalt and other pollutants in other wells	All seven wells were sampled once, in June 2011, but not since then
Widows Creek	Wells 10-48 through 10-52	Unsafe levels of boron, manganese, and sulfate	Coal ash indicators not measured since first sample date in 2011; wells 10-48 through 10-52 not sampled at all since 2011

[4] TVA and TDEC agreed to abandon contaminated wells B6 and B8 in 2012 on the grounds that these wells may be showing the effect of the natural shale bedrock. Since then, a new upgradient shale-screened well has been installed and shows much lower naturally occurring concentrations. It is not clear whether TVA and TDEC are still planning to abandon these wells (see Johnsonville chapter).

Table of Contents

1 Introduction

The Tennessee Valley Authority (TVA) operates eleven coal plants in Alabama, Kentucky, and Tennessee. These plants create a range of environmental impacts, including greenhouse gas emissions, local air pollution, water pollution, and in some cases physical destruction of homes, infrastructure, and ecosystems, as happened with the collapse of the coal ash dredge cell at TVA's Kingston plant. The Environmental Integrity Project and other groups have written about TVA's general environmental impacts several times.[5] This report will focus more narrowly on recent groundwater monitoring data from the TVA coal plants. The data discussed in this report clearly show that the groundwater around TVA's ash disposal areas is unsafe to drink. This does not always mean that there are legal violations, however. In many cases existing state regulations do not address the most prevalent pollutants, like boron and manganese. Where pollutants do exceed regulatory thresholds, state regulations typically provide for extended monitoring, allowing the contamination to continue unabated. In many cases, TVA and the states simply fail to measure the pollutants that they should expect to be present, avoiding the problem altogether. This report will therefore emphasize gaps in the monitoring networks and groundwater quality database, and identify ways in which known groundwater contamination has failed to trigger regulatory responses.

1.1 Background

Some of the source material, technical concepts, and terminology used in this report are described here for ease of reading:

- **Units of measurement**. The concentration of a chemical in water is usually described as the mass of that chemical per volume of water; units are typically either milligrams per liter (mg/L) or micrograms per liter (µg/L). One mg/L is equal to 1,000 ug/L. Chemicals that exist at relatively high concentrations, like chlorides, are easier to report in units of mg/L. Chemicals found at lower concentrations, like arsenic, are easier to report using units of ug/L. Alternatively, some people report concentrations as the mass of a chemical per mass of water, usually in units of "parts per million" (ppm) or "parts per billion" (ppb). Since a liter of fresh water weighs 1 kg, one ppm is equal to one mg/L, and one ppb is equal to one ug/L.
- **Aquifers and wells**. Aquifers are permeable layers of soil or bedrock that contain groundwater. In many cases the TVA plants have two or more discreet aquifers beneath

[5] *See, e.g.*, EIP, OUTSIDE THE LAW: RESTORING ACCOUNTABILITY TO THE TENNESSEE VALLEY AUTHORITY (Dec. 2009); EIP and Earthjustice, OUT OF CONTROL: MOUNTING DAMAGES FROM COAL ASH WASTE SITES (Feb. 24, 2010); EIP, Earthjustice, and the Sierra Club, IN HARM'S WAY: LACK OF FEDERAL COAL ASH REGULATIONS ENDANGERS AMERICANS AND THEIR ENVIRONMENT (Aug. 26, 2010); EIP, RISKY BUSINESS: COAL ASH THREATENS AMERICA'S GROUNDWATER RESOURCES AT 19 MORE SITES (Dec. 12, 2011).

them, either in artificial fill, in alluvial deposits, or in the bedrock. Wells are often drilled through one or more aquifers, but the open part of the well, or the "screen," can be restricted to a specific depth. A well "screened" in a given aquifer is expected to be drawing water from that aquifer.

- **Background or upgradient wells**. Most groundwater analyses compare wells that may be contaminated to wells from the same aquifer that are expected to be unaffected by coal ash. These wells are often described as "background" wells. In some cases, wells are selected based on the assumed direction of groundwater flow: Wells may be downgradient (picture downstream or downhill) of an ash disposal area, and impacted or threatened by contamination, or they may be upgradient, and theoretically drawing from groundwater that has not yet encountered the disposal area. However, some wells described as upgradient based on location can be affected by coal ash contamination because of the mounding of the water table beneath the disposal areas. These wells should not be considered background wells.
- **Groundwater mounding**. When water from permeable ash disposal areas percolates into the underlying soil, it can affect groundwater flow by creating a "mound," or local elevation, in the water table.[6] In these situations, the groundwater will often exhibit radial flow, meaning that the groundwater moves away from the disposal areas in all directions. We know that mounding is occurring at some areas (Ash Pond 4 at Colbert, for example), and it may be occurring at others areas. Where a groundwater mound exists, a well that appears to be located upgradient, especially if it is immediately adjacent to a disposal area, may in fact be contaminated by the coal ash disposal area.
- **Karst geology**. Many of the TVA plants are located over soluble limestone bedrock. When this kind of bedrock becomes weathered by water, leaving dissolved spaces throughout the solid matrix, it is known as "karst." The U.S. Geological Survey describes karst as "extremely vulnerable to contamination" due to "springs, caves, [and] sinkholes."[7] The consequences of sinkhole formation can be serious. For example, as described in this report, a 2010 sinkhole in the gypsum disposal area at the Kingston Fossil Plant allowed gypsum waste with high concentrations of selenium (measured at up to 412 ug/L in groundwater wells) to drain into the already-fragile Clinch River.[8] This was one of eleven known "dropouts" in the Kingston gypsum disposal area.[9]

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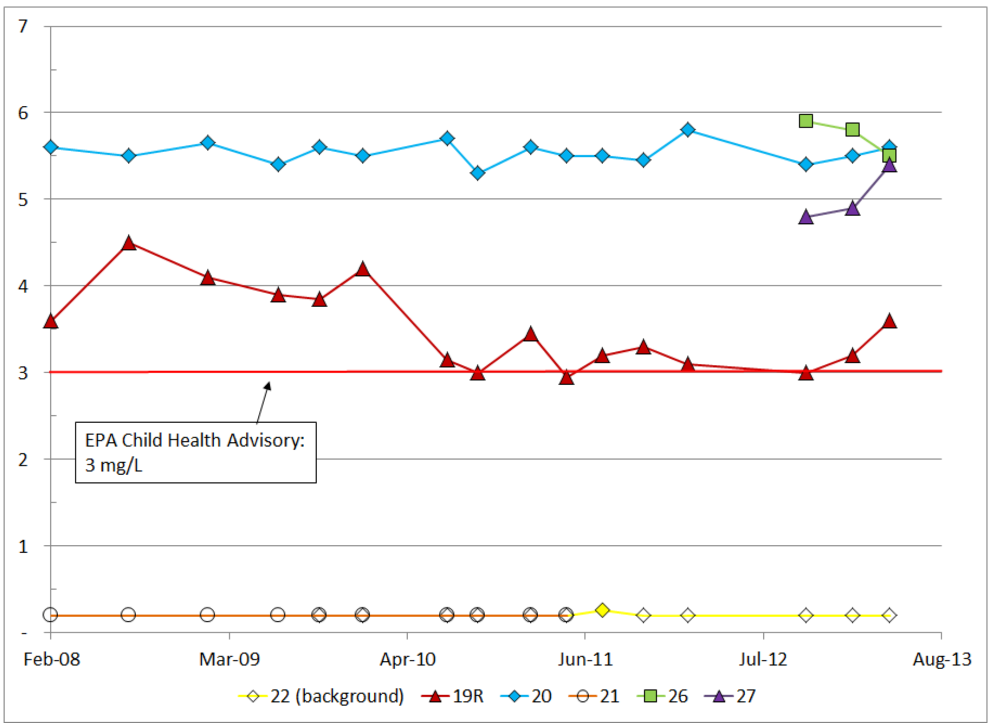
[6] *See, e.g.*, TVA, *Gallatin Fossil Plant Ash Impoundment Groundwater Monitoring Report* (Jan. 2013) ("The true flows from the facility would be expected to radiate out laterally from each side of the ash pond, since impounded waters would likely mound up over ambient water levels.").
[7] U.S. Geological Survey, What is Karst?, http://water.usgs.gov/ogw/karst/pages/whatiskarst.
[8] *See, e.g.*, TVA, *Kingston Fossil Plant – Gyspum Disposal Area – Groundwater Quality Assessment Plan* (May 6, 2011).
[9] *Id*.

- **Coal ash indicators**. The U.S. EPA's proposed regulation for disposal of coal ash sets out pollutants that might serve as early indicators of coal ash pollution during detection monitoring. These include boron, chloride, sulfate, and Total Dissolved Solids (TDS).[10] The proposed EPA rule also includes a larger list of pollutants to be monitored in "assessment monitoring" once the early indicators show a problem. The assessment monitoring list includes most of the metals discussed in this report (e.g., arsenic, manganese, and selenium).[11] Like EPA, TVA has also recognized that aluminum, arsenic, boron, manganese, strontium, sulfate, and TDS are useful coal ash indicators.[12] These pollutants, and in particular boron, manganese, and sulfate, are regularly elevated relative to upgradient or background wells at TVA plants, and frequently much higher than health-based advisories. Figures 1-1 – 1-3 below depict a typical set of data, in this case for the abandoned ash pond at the Gallatin plant.

Figure 1-1: Boron concentrations (mg/L) in wells around the abandoned ash pond at the Gallatin Fossil Plant. Hollow data points are nondetects.



[10] *See* U.S. EPA co-proposed Subtitle D coal ash regulations, 75 Fed. Reg. 35128, 35253 (June 21, 2010).

[11] *Id*. The full list includes aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chloride, chromium, copper, fluoride, iron, lead, manganese, mercury, molybdenum, pH, selenium, sulfate, thallium, and TDS.

[12] *See, e.g.*, TVA, *Colbert Fossil Plant Groundwater Assessment*, 51 (Oct. 1994) (stating that "pH, sulfate, and TDS are considered to be indicators of coal ash leachate in groundwater" and that aluminum, manganese and iron can be associated with ash leachate); id. at 52 (stating that boron, molybdenum, and strontium are often considered to be indicators of ash leachate); TVA, *Groundwater Monitoring Report – Allen Fossil Plant*, at 2 (Aug. 22, 2008) (identifying arsenic, boron, and sulfate as "ash leachate indicators").

Figure 1-2: Manganese concentrations (mg/L) in wells around the abandoned ash pond at the Gallatin Fossil Plant. Hollow data points are nondetects.

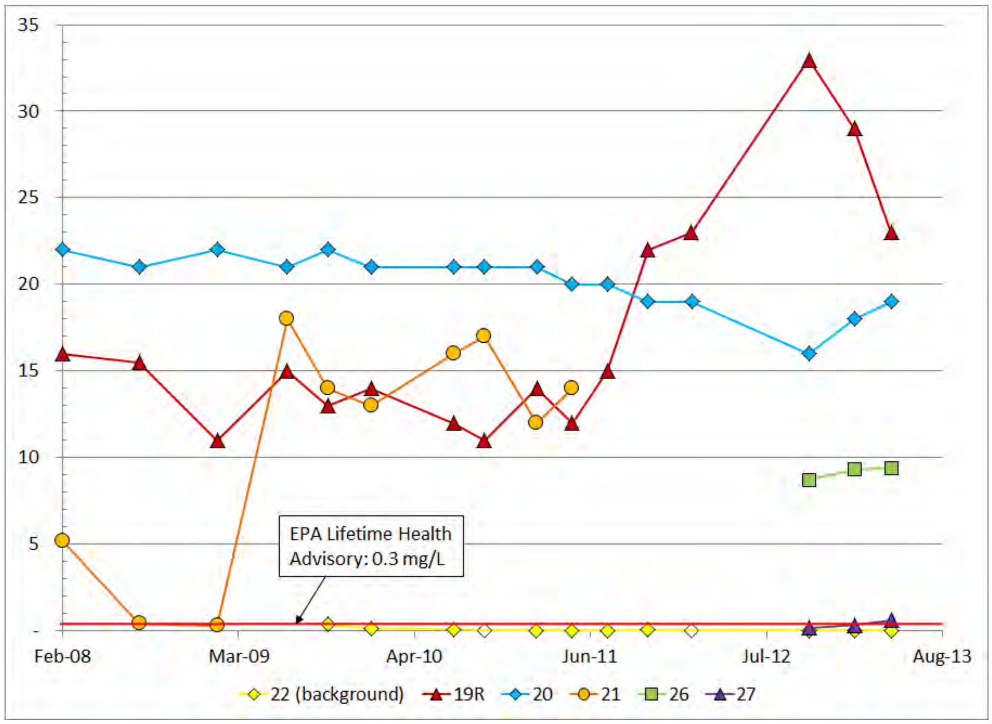
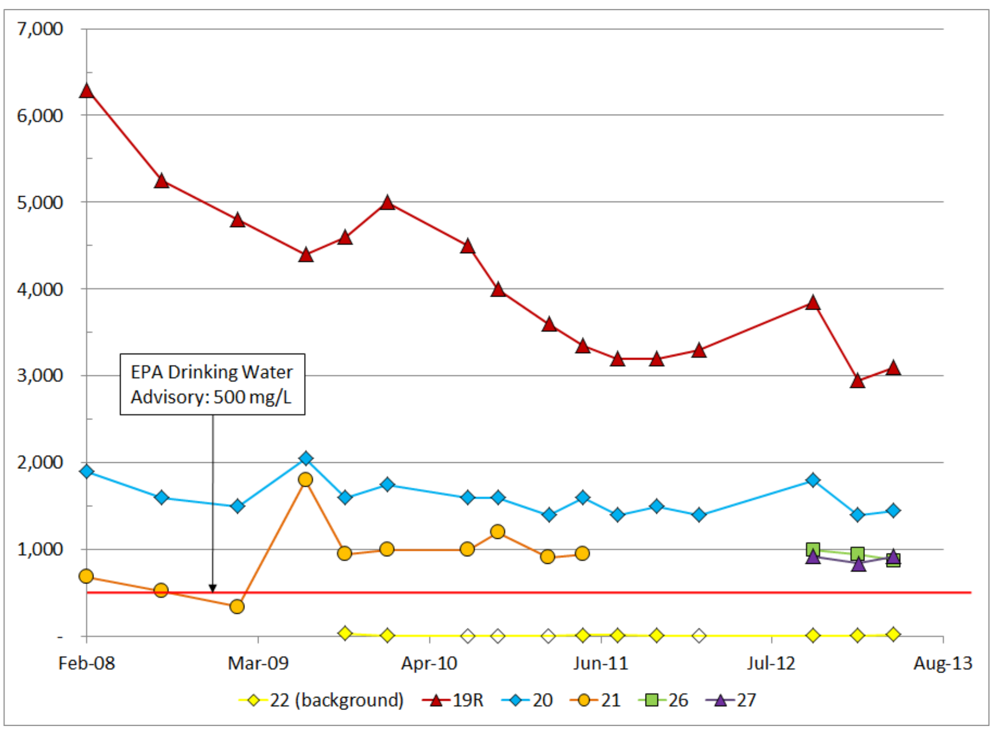


Figure 1-3: Sulfate concentrations (mg/L) in wells around the abandoned ash pond at the Gallatin Fossil Plant. Hollow data points are nondetects.



- **Groundwater standards**. State and federal agencies use a variety of standards to evaluate groundwater quality data. Some are health-based, while others are based on statistical assessments of historical data from a site:
  - Maximum Contaminant Levels (MCLs) are federal, legally enforceable limits on pollutants in public water supplies.[13] These are the criteria most commonly used by state agencies to evaluate groundwater quality. There are at least two problems with using MCLs. First, the U.S. EPA has not derived MCLs for several of the pollutants associated with coal ash, including boron, cobalt, and manganese. Second, MCLs are not purely health-based. Instead they are set as close to health-based goals as feasible after considering treatment technology and cost.[14] The MCL for arsenic, for example (10 ug/L), was set at a level deemed to be feasible for water treatment facilities.[15] A purely health-based value would be much lower.[16]
  - Secondary MCLs (SMCLs). The U.S. EPA has derived SMCLs for a short list of pollutants, including sulfate and manganese, based on aesthetic endpoints like odor, taste, or color. These pollutants may also have other, health-based standards.
  - Health Advisories (DWAs, LHAs, and CHAs). The U.S. EPA also publishes unenforceable recommendations for drinking water quality in the form of Health Advisories.[17] These are set at levels that are not expected to cause adverse non-cancer health effects generally (Drinking Water Advisories), in adults exposed over a lifetime (Lifetime Health Advisories), or in children exposed for 1-10 days (Child Health Advisories).
  - Regional Screening Levels (RSLs). Regional Screening Levels are purely health-based guidelines jointly published by three EPA regions to assist in the investigation of potential superfund sites.[18] These numbers are updated more often than MCLs and Health Advisories. RSLs cover a range of exposure routes; this report uses the RSLs for tapwater.

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[13] *See* U.S. EPA, National Primary Drinking Water Regulations, http://www.epa.gov/safewater/consumer/pdf/mcl.pdf.
[14] *Id*.
[15] U.S. EPA, National Primary Drinking Water Regulations; Arsenic and Clarifications to Compliance and New Source Contaminants Monitoring, 66 FR 6976.
[16] Since arsenic is a carcinogen, the Maximum Contaminant Level Goal is zero. The Regional Screening Level for arsenic, which assumes some level of acceptable risk, is 0.045 ug/L.
[17] *See* U.S. EPA, 2012 Edition of the Drinking Water Standards and Health Advisories (Apr. 2012), http://water.epa.gov/action/advisories/drinking/upload/dwstandards2012.pdf.
[18] *See* U.S. EPA, Regional Screening Tables User's Guide (May 2013), http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm.

- Upper Prediction Limits (UPLs). States sometimes establish site-specific groundwater standards based on a statistical analysis of local groundwater data. In this way states can establish a 'normal' range of groundwater chemistry, making it possible to identify any changes over time, regardless of the health implications. If a state is interested in analyzing how groundwater quality in each well changes over time, it will use historical data from each well to set the UPL, often at the 95th percentile of the data from a 2-year period. These are known as **intrawell UPLs**. If a state is instead interested in whether groundwater in some wells differs from normal groundwater quality for a site, it will derive the UPL from data for a reference, unaffected well; these are known as **interwell UPLs**.

1.2 Methods

Sources of information. We chose to focus on recent groundwater data in order to characterize ongoing groundwater quality issues. The exact range of dates varies by site due to differences in data availability, but this report generally focuses on the past four years (2009-present). The data in the report were drawn from several sources.

- The largest source of data is the reports that TVA submits to the three state agencies overseeing TVA's coal plants: The Alabama Department of Environmental Management (ADEM), the Kentucky Department for Environmental Protection (KDEP), and the Tennessee Department of Environmental Conservation (TDEC). EIP requested these reports, and the laboratory data that they were based on, from TVA through Freedom of Information Act (FOIA) requests. We assume that TVA is not generating more data than it provided.
- A second source of data is TVA's voluntary monitoring around its ash impoundments. TVA began collecting these data in 2011 as part of a voluntary agreement through an industry association known as the Utility Solid Waste Activities Group (USWAG); [19] these data are described in our report as "USWAG data." TVA uses some wells for both state-required reporting and USWAG voluntary monitoring, but in most cases the USWAG wells were installed exclusively for the voluntary program. The USWAG wells are generally sampled for a smaller subset of pollutants than the state-required wells. EIP obtained these data from TVA through FOIA requests.
- EIP also consulted a series of detailed geotechnical investigations conducted for TVA by Stantec Consulting Services in 2009 and 2010; these reports included helpful surveys of

[19] TVA Office of the Inspector General, *Inspection Report: TVA's Groundwater Monitoring at Coal Combustion Products Disposal Areas*, 12-13 (June 21, 2011).

historical ash management practices at each site and identified some ongoing issues with seepage and structural stability.

- Finally, although this report is focused on current groundwater quality issues, we referred to historical documents for each site to help us identify legacy contamination that is no longer being monitored.

Pollutants discussed in this report. TVA measures different sets of pollutants at every coal plant. We chose to present these data in a uniform way using an inclusive list of pollutants. The list (and format) shown in Table 1 is used throughout the report. This is not, however, an exhaustive list. For example, some wells have been monitored for parameters like chemical oxygen demand, iron, magnesium, and pH. The pollutants discussed in this report include those that were most often measured at most of the TVA plants. As described above, several of these, including boron, manganese, and sulfate, serve as useful indicators of coal ash contamination. Our list also includes lithium; although this is only actively measured at Colbert, TVA has identified it as another possible coal ash leachate indicator.[20]

Each of these pollutants is associated with multiple health and environmental impacts. The human health effects have been most thoroughly researched, and are summarized in Table 1-1. More detailed information on each pollutant can be found in the Environmental Protection Agency's Integrated Risk Information System (IRIS),[21] support documents for Provisional Peer-Reviewed Toxicity Values,[22] and other support documents,[23] and in Toxicological Profiles published by the Agency for Toxic Substances and Disease Registry (ATSDR).[24]

Comparison values used in this report. Choosing a set of benchmark values for evaluating groundwater data is a difficult process. Each candidate set of criteria answers a different question. MCLs generally indicate whether groundwater is safe to drink. More precisely, MCLs indicate whether groundwater meets standards set for municipal drinking water, and only for certain chemicals. Drinking water advisories and RSLs also indicate whether groundwater is safe to drink, and they cover most of the chemicals associated with coal ash, but they are not widely used as groundwater protection standards. Interwell UPLs indicate whether groundwater in a downgradient well is significantly different from background groundwater for a site. Intrawell UPLs indicate whether groundwater quality in a well has changed over time. The state agencies overseeing TVA operations have used a combination of the above, and not in a very coherent or helpful way (see discussion section of this report).

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[20] *See* TVA, *An Evaluation of the Impacts of the Gallatin Fly Ash Pond to Groundwater Resources*, 13 (Aug. 1989) (naming lithium and boron as good coal ash leachate indicators).
[21] http://www.epa.gov/IRIS/.
[22] http://hhpprtv.ornl.gov/quickview/pprtv_papers.php.
[23] http://water.epa.gov/drink/standards/hascience.cfm.
[24] http://www.atsdr.cdc.gov/toxprofiles/index.asp.

Although the question of whether downgradient groundwater quality is different from background is significant, we chose not to emphasize site-specific statistical analyses for three reasons: First, we wanted a uniform set of criteria against which to compare all eleven TVA plants; second, TVA only compiles statistics for some pollutants at some plants, rarely including key coal ash indicators; finally, not every designated background or upgradient well is necessarily representative of background conditions, especially in locations where groundwater mounding has caused radial flow away from ash disposal areas.

This report therefore uses health-based criteria as benchmarks. We began by identifying MCLs, the most widely-used, peer-reviewed values available. For pollutants without MCLs, we next turned to EPA's health-based advisories. These were available for boron, manganese, molybdenum, nickel, silver, sulfate, and zinc. For pollutants without MCLs or drinking water advisories, including aluminum, cobalt, lithium, strontium, and vanadium, we used RSLs. Finally, for the remaining pollutants (chloride and TDS) we used Secondary MCLs. The full set of health-based criteria used in this report is shown in Table 1-1.

There a few caveats regarding this list:

- First, the list is not purely health-based. As described above, some of the MCLs are set at levels that may be unsafe to drink. Moreover, the cumulative effect of multiple pollutants, including carcinogens and neurotoxins, is not captured by chemical-by-chemical analyses. So it would be incorrect to say that groundwater below all of the criteria is 'safe.' On the other hand, it is clear that groundwater exceeding any of the criteria, other than those for chloride and TDS, is <u>un</u>safe.
- Second, water below the criteria may still be unusable, as judged against U.S. EPA Secondary MCLs. The SMCLs for aluminum, copper, fluoride, manganese, and sulfate, based on aesthetic effects like taste, odor, and color, are all lower than the health-based criteria used in our report. Some of the groundwater near the TVA sites may therefore taste or smell bad, or stain sinks and clothing, without being flagged in this report as exceeding any criteria.
- Finally, despite the fact that much of the contaminated groundwater under TVA's coal plants ends up in local rivers and streams, there are no readily useful criteria against which to evaluate this risk.[25] This may be the single largest unaddressed issue in the knowledge base regarding TVA's groundwater impacts.

[25] Although there are ecological criteria for surface water, including U.S. Department of Energy Preliminary Remediation Goals for Ecological Endpoints (Aug. 1997), the fate and transport of pollutants through groundwater to surface water must be modeled before these criteria can be applied. TVA has not, to our knowledge, done this.

1.3 Structure of the report

The remainder of the report includes eleven sections describing each of the eleven coal plants. Each section includes a brief description of the plant and its ash disposal history, a description of the groundwater monitoring network, a discussion of monitoring results from recent years, and a summary of data gaps and, where applicable, instances where available data indicate that the states have failed to address a known problem. Each section also includes a map of the disposal areas and wells. We did not find comprehensive maps for any of the eleven sites, so we generated our own maps using multiple sources of information. The locations of disposal areas and wells are roughly accurate, but not precise.

Finally, each section includes a summary of the groundwater data in tabular form following the format shown in Table 1-1 below. Data reported as "<x" are consistently below detection at the given detection limit. Where multiple detection limits have been reported, the highest detection limit is shown. Ranges reflect minimum and maximum concentrations over given periods of time. A highlighted row indicates that a pollutant exceeded its criterion one or more of the sampling dates. Chloride and TDS, with criteria that are not health-based, are not highlighted when they exceed their respective criteria. Data are presented as a range of values for each pollutant, and rows are highlighted where pollutants exceeds their respective health-based criteria.[26]

The report concludes with a discussion of the overall state of groundwater, and groundwater monitoring, at the eleven TVA sites.

[26] Since the chloride and TDS criteria are not health-based, these rows are never highlighted.

Table 1-1: Pollutants and health-based[27] criteria used in this report

Chemical	Principal Health Effects[28]	Criterion value	Criterion type
Aluminum	Neurotoxicity	16,000 ug/L	Regional Screening Level
Antimony	Reduced lifespan	6 ug/L	MCL
Arsenic	Cancer	10 ug/L	MCL
Barium	Kidney toxicity	2,000 ug/L	MCL
Beryllium	Intestinal toxicity	4 ug/L	MCL
Boron	Developmental and testicular toxicity	3,000 ug/L	Child Health Advisory
Cadmium	Kidney disease	5 ug/L	MCL
Chloride		250 mg/L	Secondary MCL
Chromium	Blood disease / cancer[29]	100 ug/L	MCL
Cobalt	Blood disease	4.7 ug/L	Regional Screening Level
Copper	Gastrointestinal symptoms	1,300 ug/L	Action Level[30]
Fluoride	Adverse changes in bones and teeth	4,000 ug/L	MCL
Lead	Neurotoxicity; Probable carcinogen	15 ug/L	Action Level[30]
Lithium	Various and uncertain	31 ug/L	Regional Screening Level
Manganese	Neurotoxicity	300 ug/L	Lifetime Health Advisory
Mercury	Neurotoxicity	2 ug/L	MCL
Molybdenum	Gout-like symptoms	40 ug/L	Lifetime Health Advisory
Nickel	Reduced body weight	100 ug/L	Lifetime Health Advisory
Nitrate	Blue baby syndrome	10,000 ug/L	MCL
Selenium	Hair and nail loss	50 ug/L	MCL
Silver	Skin discoloration	100 ug/L	Lifetime Health Advisory
Strontium	Bone toxicity	9,300 ug/L	Regional Screening Level
Sulfate	Diarrhea	500 mg/L	Drinking Water Advisory
TDS		500 mg/L	Secondary MCL
Thallium	Neurotoxicity and hair loss	2 ug/L	MCL
Vanadium	Various and uncertain	63 ug/L	Regional Screening Level
Zinc	Changes in blood chemistry	2,000 ug/L	Lifetime Health Advisory

[27] The Secondary MCLs for chloride and TDS are not health-based, but are instead based on aesthetic effects. These are both indicators of coal ash pollution, however, and are therefore tabulated with the other pollutants.
[28] The effects listed here are those used to establish chronic oral exposure guidelines and advisories.
[29] *See* California EPA, Public Health Goal for Hexavalent Chromium in Drinking Water (July 2011), http://www.oehha.ca.gov/water/phg/pdf/Cr6PHG072911.pdf.
[30] U.S. EPA "Action Levels" for copper and lead are enforceable primary drinking water regulations similar to, and published with, MCLs. *See* National Primary Drinking Water Regulations, Subpart I – Control of Lead and Copper, 40 CFR § 141.80 *et seq*.

1.4 Acronyms

ADEM	Alabama Department of Environmental Management
ATSDR	Agency for Toxic Substances and Disease Registry
CHA	Child Health Advisory
DWA	Drinking Water Advisory
EIP	Environmental Integrity Project
EPA	U.S. Environmental Protection Agency
FGD	Flue Gas Desulfurization
FOIA	Freedom of Information Act
GWPS	Groundwater Protection Standard
IRIS	Integrated Risk Information System
KDEP	Kentucky Department for Environmental Protection
LHA	Lifetime Health Advisory
MCL	Maximum Contaminant Level
OIG	TVA Office of the Inspector General
RGA	Regional Groundwater Aquifer; an aquifer beneath the Shawnee Fossil Plant
RSL	Regional Screening Level
SMCL	Secondary Maximum Contaminant Level
TDEC	Tennessee Department of Environment & Conservation
TDS	Total Dissolved Solids
TVA	Tennessee Valley Authority
UCD	Upper Consolidated Deposits; an aquifer beneath the Shawnee Fossil Plant
UPL	Upper Prediction Limit
USWAG	Utility Solid Waste Activities Group

2 Allen Fossil Plant

Background

The Allen Fossil Plant is located on the south shore of Lake McKellar outside of Memphis, TN. TVA has been operating Allen's three coal units since the 1950s. The original ash pond, located west of the site, was deactivated and pumped dry in 1992.[31] A chemical treatment pond was built inside the northeast corner of the abandoned ash pond.[32] The active ash pond was commissioned in 1967 and expanded in 1978.[33] The plant and the ash ponds rest on a mix of alluvial deposits, both naturally occurring and artificially in-filled.[34]

Monitoring

Figure 2-1 shows the approximate locations of the groundwater wells discussed below. Until 2010, the well network at Allen consisted of wells P1 through P5, which surround the main plant and the active ash pond. These wells were historically monitored every two years on a voluntary basis. The 2010 USWAG voluntary monitoring plan added well P6, located between the center of the active ash pond and Lake McKellar, and otherwise continued to monitor existing wells P1, P4, and P5. TVA apparently stopped monitoring wells P2 and P3 in 2008. The current monitoring program consists of voluntary monitoring of wells P1, P4, P5, and P6.

According to TVA's groundwater monitoring reports there is a strong "communication" between the alluvial aquifer beneath Allen and the adjacent Lake McKellar,[35] and "[t]he predominant flow of groundwater is towards Lake McKellar."[36] However, lake levels sometimes rise above the local groundwater table and reverse the direction of flow. The groundwater levels measured for the February 2008 sample collection, for example, showed groundwater movement away from the lake.[37]

Aside from the notable shortage of groundwater data, discussed further below under "data gaps," the biggest problem at Allen is the arsenic and other coal ash contaminants leaching into Lake McKellar. Unsafe concentrations of arsenic have been detected in three wells along the lake shore. Wells P2 and P3 are located at the northwest and northeast corners of the main

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[31] Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment – Coal Combustion Product Impoundments and Disposal Facilities – Appendix B, Allen Fossil Plant, West Ash Pond* page 1 (June 24, 2009).
[32] *Id*. at 3.
[33] *Id*. at Appendix B, Allen Fossil Plant, East Ash Pond and Dredge Cell, page 1.
[34] *Id*. at Appendix B, Phase 1 Plant Summary, page 2.
[35] TVA, *Groundwater Monitoring Report – Allen Fossil Plant – February 2008* (Aug. 22, 2008) ("Groundwater levels measured at Allen fluctuate with changes in McKellar Lake levels, driven by changes in Mississippi River elevation, which suggest a strong communication between groundwater under the site and nearby surface water.")
[36] *Id*.
[37] *Id*. at 5.

plant (see Fig. 2-1). The data we have on file, collected in 2004, 2006, and 2008, show concentrations above and below the current MCL of 10 ug/L. TVA has recognized this as an ongoing historical problem and attributed it to the abandoned ash pond:

> Since 1988, groundwater sampling results at all Allen wells have produced detectable and consistent levels of arsenic, with well P2 typically being above the new MCL [10 ug/L]. Two of the last five bi-annual sampling events have shown P3 with arsenic levels at or above the MCL . . . The source of arsenic is potentially due to ash leachate from the inactive West Ash Pond. Elevated levels of ash leachate analytes boron and sulfate detected in adjacent well P2 indicate probable ash impoundment releases and migration. Concentrations of arsenic, boron, and sulfate are historically higher than the background (well P1) data. Significantly higher levels of these ash leachate indicators and total dissolved solids were measured from 1988 to 2000, indicating an active period of contaminant transmission.[38]

Well P6 was installed in 2010 and sampled seven times between February 2011 and February 2013. Arsenic concentrations in this well have been consistently higher than the MCL of 10 ug/L, fluctuating between 15 and 43 ug/L. Boron, TVA recognizes as an indicator of coal ash leachate,[39] has also been present at elevated and unsafe levels in this well.

Data Gaps

1. Infrequent and discontinued sampling. Prior to 2010, wells were only monitored biannually and on a voluntary basis. Wells P2 and P3, which showed elevated and unsafe levels of arsenic, have not been monitored since 2008.

2. Inadequate well network. Groundwater mounding is suspected at both the inactive and the active ash ponds, and as noted above, general groundwater flows at Allen sometimes reverse and flow away from the river. In other words, groundwater flows are dynamic and inconsistent. The existing well network is not capable of characterizing this situation, a fact that TVA acknowledged in its 2008 groundwater report: "The ash ponds and other impoundments likely produce radial groundwater flow away from their impoundments that cannot be adequately characterized with the existing well network."[40]

A more egregious problem is the fact that the abandoned ash pond is effectively unmonitored (see Fig. 2-1), with all wells situated east of the pond and no wells closer

[38] TVA, *Groundwater Monitoring Report – Allen Fossil Plant – February 2008*, at 2 (Aug. 22, 2008).
[39] *Id*.
[40] *Id*. at 5.

than 200 meters (the USWAG plan calls for wells within 150 meters of every pond[41]). Although TVA admitted that it needs at least one new well downgradient of the inactive ash pond,[42] it has not yet installed such a well.

Failure to regulate

Groundwater monitoring at Allen is strictly voluntary, which in practice means that TVA has no obligation to report exceedances to TDEC. As the OIG report observed,

> Elevated levels of boron and sulfate indicated probable ash impoundment releases and migration. Concentrations of arsenic, boron, and sulfate in that well have been historically higher than the background data. According to TVA personnel, these levels have not been reported to TDEC because the testing was not required.[43]

TDEC has flatly failed to regulate Allen's abandoned ash pond, even when it knew about the "active period of contaminant transmission" during the 1990s.[44] According to Tennessee law, ash ponds are regulated by the Water Division as long as they are actively treating waste, but must be regulated as landfills when they become inactive.[45] Landfill regulations include significant groundwater monitoring and a process that leads to corrective action when contamination reaches certain levels.[46] Allen's inactive ash pond was pumped dry in 1992, so these regulations should have been applied over twenty years ago. Proper regulation would have provided a full picture of the contamination leaching from the pond, and perhaps corrective action. Instead we have a very small amount of information from one barely relevant well; what we know may only be the tip of the iceberg. Although environmental

[41] *See, e.g.*, URS, *TVA Gallatin Fossil Plant – Preliminary Ash Pond Closure Plan (Revision 0) – Prepared for TVA*, Appendix B page 4 (Sep. 25, 2012).
[42] *Id*. at 7 ("With coming [USWAG] voluntary surveillance measures, Allen Fossil Plant will likely be subject to required monitoring of groundwater surrounding the two onsite ash impoundments. This will likely necessitate installation of two additional wells, including . . . a new downgradient well for the inactive West Ash Pond.
[43] TVA Office of the Inspector General, *Inspection Report: TVA's Groundwater Monitoring at Coal Combustion Products Disposal Areas*, 7 (June 21, 2011) (emphasis added).
[44] TVA, *Groundwater Monitoring Report – Allen Fossil Plant – February 2008*, at 2 (Aug. 22, 2008).
[45] *See* Tenn. Code. Ann. § 68-211-106; Letter from Paul Sloan, TDEC Deputy Commissioner, to Josh Galperin, Southern Alliance for Clean Energy, and Kimberly Wilson, Environmental Integrity Project, 3 (Sept. 7, 2010) ("As previously indicated, TDEC regulates solid waste disposal units under solid waste rules found at 1200-01-07 and wastewater treatment units under NPDES permitting rules found at 1200-04-05. The Division of Solid Waste is the lead agency for solid waste disposal units containing CCW. That would include impoundments formerly used for wastewater treatment that contain CCW and no longer provide treatment or discharge process wastewater") (emphasis added); Letter from Robert J. Martineau, Jr.,TDEC Commissioner, to Joshua Galperin, Southern Alliance for Clean Energy (Apr. 23, 2012) ("Industrial and municipal wastewater treatment plants, such as TVA ash ponds, are not subject to solid waste permitting process…When the ash pond is converted from a wastewater treatment unit to a solid waste management unit, oversight will be transferred to Solid Waste Management.")
[46] *See* Tenn. Comp. Rules & Regs. 1200-01-07-.04(7).

groups asked TDEC to regulate the abandoned ash pond in 2012,[47] they were told that the current Clean Water Act permit for the plant exempted it from any landfill requirements, a statement that is plainly inconsistent with the law.[48]

[47] *See* Letter from Angela Garrone, Southern Alliance for Clean Energy, *et al.*, to Robert J. Martineau Jr., TDEC Commissioner (Sep. 10, 2012).
[48] *See id*; Letter from Pat Flood, Director of TDEC Division of Solid Waste Management, to Angela Garrone, Southern Alliance for Clean Energy (Dec. 6, 2012).

Figure 2-1: Groundwater wells at Allen Fossil Plant (approximate locations)

Table 2-1: Allen Fossil Plant, Well P1. Sampled 8 times between March 2004 and February 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<200	Limited data since 2008
Antimony	6	<3	
Arsenic	10	1.0 – 2.1	
Barium	2,000	450 – 600	
Beryllium	4	<2	
Boron	3,000	<200	Limited data since 2008
Cadmium	5	<0.5	
Chloride	250 mg/L	1.4 – 2.3 mg/L	Limited data since 2008
Chromium	100	<0.5 – 2.2	
Cobalt	4.7	<1	No data since 8/2011
Copper	1,300	<10	No data since 8/2011
Fluoride	4,000	180 – 300	
Lead	15	<1	
Lithium	31		No data
Manganese	300	590 – 780	Limited data since 2008
Mercury	2	<0.2	
Molybdenum	40	<20	Limited data since 2008
Nickel	100	<1 – 2.9	
Nitrate	10,000	<100	
Selenium	50	<1	
Silver	100	<10	
Strontium	9,300	471 – 620	Limited data since 2008
Sulfate	500 mg/L	5 – 43 mg/L	Limited data since 2008
TDS	500 mg/L	480 – 600 mg/L	Limited data since 2008
Thallium	2	<2	
Vanadium	63	<10	No data since 8/2011
Zinc	2,000	<10 – 23	No data since 8/2011

Table 2-2: Allen Fossil Plant, Well P2. Sampled 3 times between March 2004 and February 2008. **No data since 2008**.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<200	
Antimony	6	<3	
Arsenic	10	8.1 – 14	
Barium	2,000	160-320	
Beryllium	4	<2	
Boron	3,000	<200 – 500	
Cadmium	5	<0.5	
Chloride	250 mg/L	17 – 25 mg/L	
Chromium	100	<0.1 – 1.0	
Cobalt	4.7	<1	
Copper	1,300	<10	
Fluoride	4,000	180 – 220	
Lead	15	<1	
Lithium	31		No data
Manganese	300	560 – 930	
Mercury	2	<0.2	
Molybdenum	40	<20	
Nickel	100	<1 – 1.7	
Nitrate	10,000	<10 – 110	
Selenium	50	<1	
Silver	100	<10	
Strontium	9,300	240 -460	
Sulfate	500 mg/L	52 – 85 mg/L	
TDS	500 mg/L	340 – 620 mg/L	
Thallium	2	<2	
Vanadium	63	<10	
Zinc	2,000	<10	

Table 2-3: Allen Fossil Plant, Well P3. Sampled 3 times between March 2004 and February 2008. **No data since 2008.**

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<50 – 120	
Antimony	6	<3	
Arsenic	10	3.6 – 13	
Barium	2,000	190 – 500	
Beryllium	4	<2	
Boron	3,000	<200	
Cadmium	5	<0.5	
Chloride	250 mg/L	14 – 19 mg/L	
Chromium	100	<1	
Cobalt	4.7	<1	
Copper	1,300	<10	
Fluoride	4,000	110 – 190	
Lead	15	<1	
Lithium	31		No data
Manganese	300	370 – 1,400	
Mercury	2	<0.2	
Molybdenum	40	<20	
Nickel	100	<1 – 1.5	
Nitrate	10,000	<100	
Selenium	50	<1	
Silver	100	<10	
Strontium	9,300	<100	
Sulfate	500 mg/L	42 – 66 mg/L	
TDS	500 mg/L	245 – 450 mg/L	
Thallium	2	<2	
Vanadium	63	<10	
Zinc	2,000	<10	

Table 2-4: Allen Fossil Plant, Well P4. Sampled 8 times between March 2004 and February 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<200	Limited data since 2008
Antimony	6	<3	
Arsenic	10	1.8 – 5.7	
Barium	2,000	51 – 195	
Beryllium	4	<2	
Boron	3,000	<200 – 300	Limited data since 2008
Cadmium	5	<0.5	
Chloride	250 mg/L	8.6 – 61 mg/L	Limited data since 2008
Chromium	100	<1 – 4.2	
Cobalt	4.7	<1	No data since 8/2011
Copper	1,300	<10	No data since 8/2011
Fluoride	4,000	110 – 390	
Lead	15	<1	
Lithium	31		No data
Manganese	300	610 – 880	Limited data since 2008
Mercury	2	<0.2	
Molybdenum	40	<20	Limited data since 2008
Nickel	100	<1 – 4.1	
Nitrate	10,000	<10 – 260	
Selenium	50	<1	
Silver	100	<10	
Strontium	9,300	90 -160	Limited data since 2008
Sulfate	500 mg/L	28 – 58 mg/L	Limited data since 2008
TDS	500 mg/L	160 – 300 mg/L	Limited data since 2008
Thallium	2	<2	
Vanadium	63	<10	No data since 8/2011
Zinc	2,000	<10	No data since 8/2011

Table 2-5: Allen Fossil Plant, Well P5. Sampled 8 times between March 2004 and February 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<200	Limited data since 2008
Antimony	6	<3	
Arsenic	10	2.7 – 4.5	
Barium	2,000	255 – 2,400[49]	
Beryllium	4	<2	
Boron	3,000	220 – 300	Limited data since 2008
Cadmium	5	<0.5	
Chloride	250 mg/L	15 – 23 mg/L	Limited data since 2008
Chromium	100	<1 – 8.9	
Cobalt	4.7	<1	No data since 8/2011
Copper	1,300	<10	No data since 8/2011
Fluoride	4,000	150 – 200	
Lead	15	<1	
Lithium	31		No data
Manganese	300	470 – 710	Limited data since 2008
Mercury	2	<0.2	
Molybdenum	40	<20	Limited data since 2008
Nickel	100	<1 – 9.9	
Nitrate	10,000	<100	
Selenium	50	<1	
Silver	100	<10	
Strontium	9,300	150 – 260	Limited data since 2008
Sulfate	500 mg/L	23 – 51 ug/L	Limited data since 2008
TDS	500 mg/L	200 – 305 mg/L	Limited data since 2008
Thallium	2	<2	
Vanadium	63	<10	No data since 8/2011
Zinc	2,000	<10 – 13	No data since 8/2011

Table 2-6: Allen Fossil Plant, Well P6. Sampled 6 times between February 2011 and February 2013.[50]

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 190	Limited data
Antimony	6	<1	
Arsenic	10	15 – 43	
Barium	2,000	220 – 490	
Beryllium	4	<2	
Boron	3,000	500 – 2,100	
Cadmium	5	<0.5	
Chloride	250 mg/L	13 – 14 mg/L	
Chromium	100	<1 – 4.4	
Cobalt	4.7	<1	
Copper	1,300	<1 – 1.1	
Fluoride	4,000	<100 – 330	
Lead	15	<1	
Lithium	31		No data
Manganese	300	580 – 870	
Mercury	2	<0.2	
Molybdenum	40	3.8 – 4.0	Limited data
Nickel	100	1.3 – 4.4	
Nitrate	10,000	<100 – 180	
Selenium	50	<1	
Silver	100	<0.5	
Strontium	9,300	270 – 620	Limited data
Sulfate	500 mg/L	44 – 89 mg/L	
TDS	500 mg/L	270 – 510 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	<10 – 24	

[49] Although TVA reported a barium concentration of 2,400 mg/L in well P5 in February 2013, above the MCL of 2,000 mg/L, there are several reasons to suspect laboratory error. First, this is the only instance, at least in the data that we have on file, that barium in a TVA well has exceeded the MCL. Second, historical data for well P5 never exceeded 500 mg/L. Finally, data for the other pollutants measured in well P5 were consistent with historical data for that well.

[50] Arsenic was measured 7 times: 2/2011, 4/2011, 8/2011, 11/2011, 1/2012, 8/2012, and 2/2013.

3 Bull Run Fossil Plant

Background

The Bull Run Fossil Plant is located at the confluence of the Clinch River and Bull Run Creek outside of Oak Ridge, TN. TVA has been operating a single large unit at Bull Run since 1967. The original complex of ponds along the Clinch River has changed significantly over time. The area now known as Bottom Ash Area 1 was originally a fly ash pond; TVA filled it with bottom ash in 1985, and has been stacking bottom ash in the area since then.[51] Area 2A, Ash Pond 2, and the Stilling Pond were originally one large ash pond that TVA started using in 1971.[52] The stilling pond was separated from the rest of the pond in 1976. Area 2A was separated from the rest of the pond in 1981. TVA disposed of wet fly ash in Area 2A until 1989, then disposed of dry bottom ash there until 2004, and ultimately converted it to a gypsum disposal area in 2006-2008. Ash Pond 2 is now used as a fly ash settling pond, and also receives discharges from the coal yard runoff and metal cleaning ponds and overflow from the gypsum area (2A). The Dry Fly Ash Stack (landfill) has been in operation since 1982[53]. TVA used the East/West Dredge Cell for dredged fly ash disposal from 1981 to 1995; it is currently inactive.[54]

Monitoring

There are currently 12 wells monitoring groundwater at Bull Run. Four wells surround the Dry Fly Ash Landfill, five wells monitor the gypsum and ash landfills along the Clinch River, and three wells, installed in 2010 as part of the USWAG voluntary monitoring plan, are located along the edges of the ash ponds (see figure 3-6). Well 45R, a downgradient well at the Dry Fly Ash Landfill, replaced well 45 in 2009. Note that the upgradient well at the Dry Fly Ash Landfill is well “I” (eye), while the upgradient well at the gypsum/ash landfill is well “1.” Our files include groundwater data from 2008-2012.

Wells around the Dry Fly Ash Landfill show a clear pattern of ash-related contamination. Since 2008, boron concentrations in downgradient well 45R have been much higher than the concentrations in upgradient well I (consistently <200 ug/L), higher than the Child Health Advisory of 300 ug/L (see Fig. 3-1), and increasing. The same pattern is evident with molybdenum (Fig. 3-2). Manganese and sulfate concentrations in wells 45 and 45R have also been higher than background and higher than upgradient concentrations. Despite the clear

[51] Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Tennessee*, *Appendix C, Bull Run Fossil Plant*, Bottom Ash Disposal Area, page 1 (June 24, 2009).
[52] *Id*. at Fly Ash pond Area 2, page 1.
[53] *Id*. at Dry Flay Ash Stack, page 1.
[54] *Id*. at East/West Dredge Cell, page 1.

evidence of a problem, and despite the fact that boron and molybdenum concentrations were getting progressively worse in well 45R, all four of these pollutants were dropped from monitoring in 2010. TVA measured these pollutants again in May 2013, and results show that the levels of boron and molybdenum continue to increase.

Wells downgradient of the gypsum and ash landfills along the river (wells 47 – 50) also show evidence of contamination, including unsafe concentrations of cobalt, manganese, molybdenum, and sulfate. All wells have consistently shown unsafe levels of manganese. Manganese concentrations in upgradient well 1, however, are even higher than those in downgradient wells, suggesting a natural or man-made source other than the landfills. Cobalt concentrations in downgradient well 48 (see Fig. 3-3) were high enough to warrant an investigation by TVA in 2009. That investigation came to the unsatisfying conclusion that "ash and or gypsum leachate may not be the source or only source of cobalt in well 48."[55] In fact, it is quite likely that the ash landfill is the cause of the problem – downgradient wells have higher cobalt concentrations than the upgradient well, and the concentrations of cobalt in ash samples (mean of 64 mg/kg) were much higher than concentrations in soil samples (means of 9.0 – 12.7 mg/kg).[56] Although cobalt concentrations in wells 47 and 48 have declined since 2008, they remain unsafe.

Well 49 shows clear evidence of increasing contamination. TVA omitted manganese, strontium, sulfate, and TDS from monitoring in 2010-2012, but results from 2013 confirm they have all been increasing with a consistent pattern: Figure 3-4 plots the increase of each pollutant relative to its concentration in February 2008, and it shows that all of these pollutants have been increasing in parallel. Cobalt, which has been consistently monitored over this period, fits the same pattern. Other pollutants have not been increasing but nevertheless reflect ongoing contamination: Boron concentrations have been stable at concentrations (1.8 – 2.3 mg/L) much higher than background (<0.2 mg/L). Molybdenum concentrations in well 49 have been declining over this period, from 700 to 410 ug/L, but remain 10 times higher than the Lifetime Health Advisory of 40 ug/L.

Groundwater around the ash ponds has only recently been monitored, and not always for the full range of pollutants. The limited data show arsenic above the MCL in well 52 in addition to manganese concentrations slightly above the lifetime health advisory in wells 51 and 52.

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[55] TVA, *Bull Run Fossil Plant Gypsum/Coal-Ash Landfill Cobalt Investigation Report* (Oct. 2, 2009).
[56] *Id*. Cobalt concentrations from gypsum samples were nondetect (<0.5 mg/kg), suggesting that the ash, and not the gypsum, is the source of the cobalt.

Figure 3-1: Boron concentrations (ug/L) in wells around the Bull Run Fossil Plant Dry Fly Ash Landfill (hollow data points are nondetect at <200 ug/L).

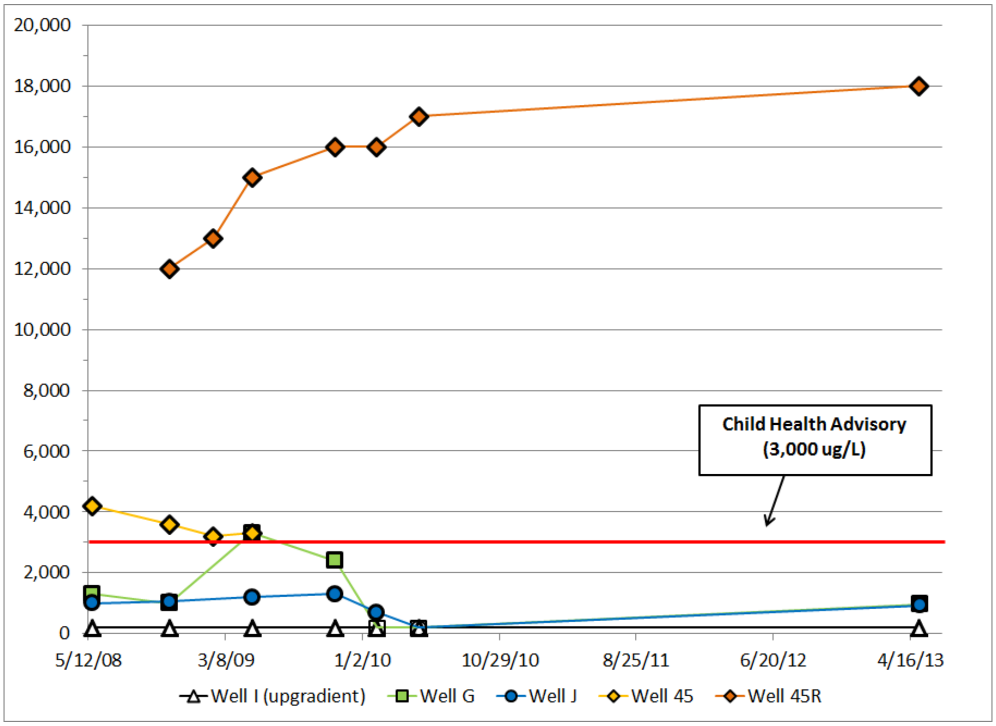


Figure 3-2: Molybdenum concentrations (ug/L) in wells around the Bull Run Fossil Plant Dry Fly Ash Landfill (hollow data points are nondetect at <2 or <5 ug/L).

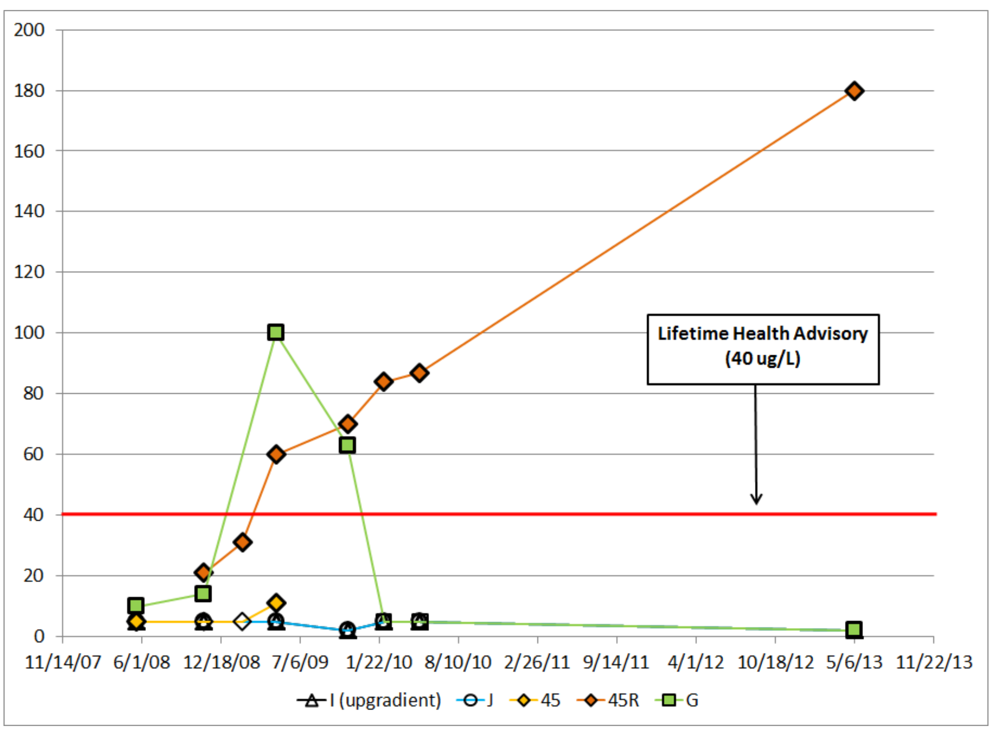


Figure 3-3: Cobalt concentrations (ug/L) in wells around the Bull Run Fossil Plant Gypsum and Fly Ash Landfill (hollow data points are nondetect at <1 or <10 ug/L).

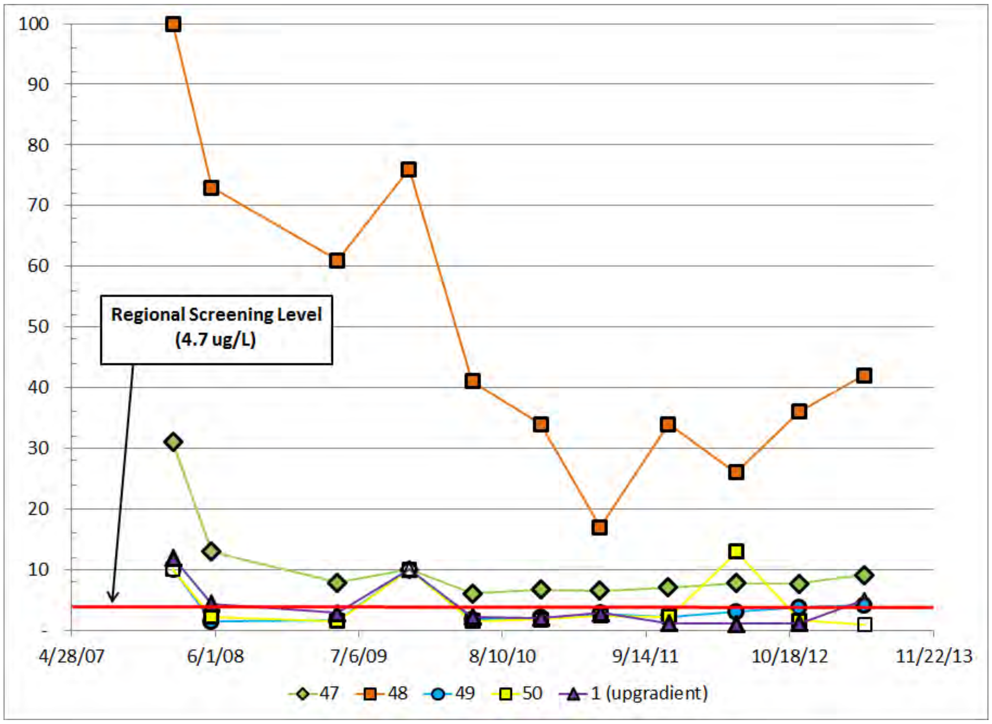
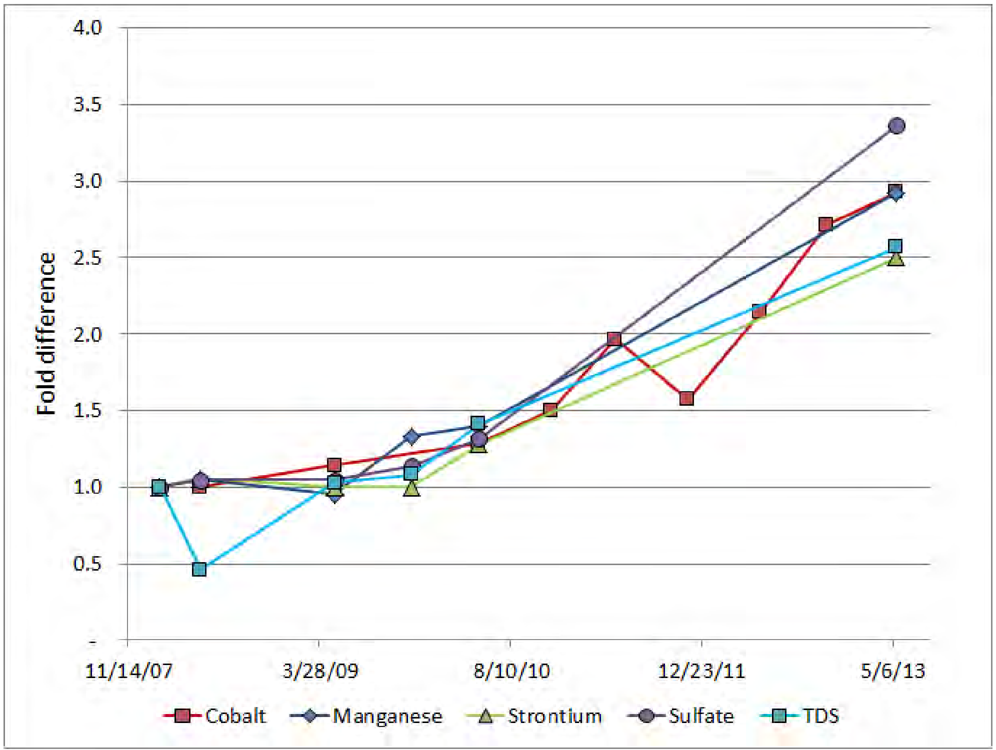


Figure 3-4: Increase of selected pollutants in Well 49. The Y axis reflects the ratio of the concentration of each pollutant on various dates to the same pollutant's concentration in February 2008. The figure shows that all of these pollutants roughly tripled in concentration between 2008 and 2013.



Data Gaps

1. Discontinued monitoring of coal ash indicators. TVA's groundwater reports suggest that TVA and TDEC deliberately dropped most coal ash indicators from monitoring in recent years.[57] Aluminum, boron, chloride, manganese, molybdenum, strontium, sulfate, and TDS were all dropped from site-wide monitoring after May 2010, aside from one initial round of sampling at two of the three ash pond wells in May 2011. TVA measured these pollutants again in 2013, but only in some wells. This lack of monitoring is troubling for two reasons; not only are these pollutants associated with coal ash leachate,[58] they are also found at high concentrations in downgradient wells at Bull Run, and in the case of boron and molybdenum in well 45R, have been steadily increasing.

2. Unmonitored areas. The East/West Dredge Cell is unmonitored. We do not have historical data for this area on file, and there is no way of knowing the extent of any contamination.

3. Shifting groundwater protection standards. Although not strictly a data gap, the inconsistent selection of Groundwater Protection Standards (GWPSs) for cobalt obscures the contamination at the gypsum landfill. Table 3-1, below, lists the various GWPSs that have been applied to the two Bull Run landfill areas along with the Upper Prediction Intervals (UPLs) used as the upper bound on assumed background concentrations. GWPSs have ranged from 4.7 to 55, they have been alternately health-based (Regional Screening Levels) and background-based (UPLs), and they have rarely been consistent between landfills. Moreover, they have not always been applied – TVA stopped comparing cobalt to any standards in 2011. This shifting benchmark means that cobalt, which has consistently exceeded the health-based Regional Screening Level in well 48, is not routinely flagged as an issue in the groundwater reports. TDEC has the authority to require TVA to apply a strict groundwater protection standard, and it has occasionally done so. It should, in the future, routinely require TVA to demonstrate compliance with the cobalt Regional Screening Level of 4.7 ug/L.

[57] It may be the case that TVA is measuring more than they report; our conclusions are based on what was provided to us in public record requests.

[58] *See, e.g.*, U.S. EPA co-proposed Subtitle D coal ash regulations, which would have made boron, chloride, sulfate, and TDS, among others, "detection monitoring" parameters, and would have included aluminum, boron, chloride, manganese, molybdenum, sulfate, and TDS among the "assessment monitoring" parameters. 75 Fed. Reg. 35128, 35253 (June 21, 2010). *See also* TVA, *Groundwater Monitoring Report – Allen Fossil Plant – February 2008*, at 2 (Aug. 22, 2008) (identifying boron and sulfate as "ash leachate analytes."

Table 3-1: Regional Screening Levels (RSLs), Upper Prediction Limits (UPLs), and Groundwater Protection Standards (GWPSs) for cobalt at the two Bull Run landfills over time. Empty cells reflect groundwater reports that failed to identify RSLs, UPLs, or GWPSs.

Date	RSL	Dry fly ash landfill		Gypsum area 2A	
		UPL (ug/L)	**GWPS** (ug/L)	**UPL** (ug/L)	**GWPS** (ug/L)
Feb. 2008	-	*No report on file*		-	-
May 2008	-	22[59]	-	-	-
Nov. 2008	-	22	-	*No report on file*	
May 2009	-	22	-	37[60]	37
Nov. 2009	11	22	-	35	35
Feb. 2010	11	22	22	*No report on file*	
May 2010	11	22	22	55	55
Nov. 2010	11	10[61]	11	53	53
May 2011	11	10	11	28.5	11[62]
Nov. 2011	4.7	10	4.7	44.7	-
May 2012	-	-	-	-	-
Nov. 2012	-	10	-	*No report on file*	
May 2013	-	10	-	38.4	-

Failure to regulate

As described above, TVA and TDEC have routinely omitted coal ash indicators from groundwater monitoring, and have stopped comparing cobalt to any kind of regulatory standard. These could not have been arbitrary decisions. Boron, cobalt, manganese, molybdenum, and sulfate had all been observed at unsafe concentrations in one or more on-site wells. Rather than dealing with known contamination, however, TVA and TDEC chose to ignore the problem for two years and leave the source of the problem in place.

[59] Although this report generally used intrawell UPLs, TVA describes the cobalt UPL of 22 ug/L as the "assumed UPL equal to 90th percentile of TVA valley-wide groundwater measurements." TVA, *Bull Run Fossil Plant Dry Fly Ash Disposal Facility Groundwater Monitoring Report – May 2008*, 3 (June 25, 2008).

[60] Calculated on an interwell basis; this value represents the upper confidence limit on data from background well 1 between August 2006 and the date of each report.

[61] Based on data from background well I, June 2000 – date of report.

[62] Set at the RSL level "at the request of TDEC regulator over the site." TVA, *Bull Run Fossil Plant Gypsum/Coal Ash Landfill Groundwater Assessment Monitoring Report – May 2011*, 3 (June 24, 2011).

Figure 3-6: Groundwater wells at Bull Run Fossil Plant (approximate locations)

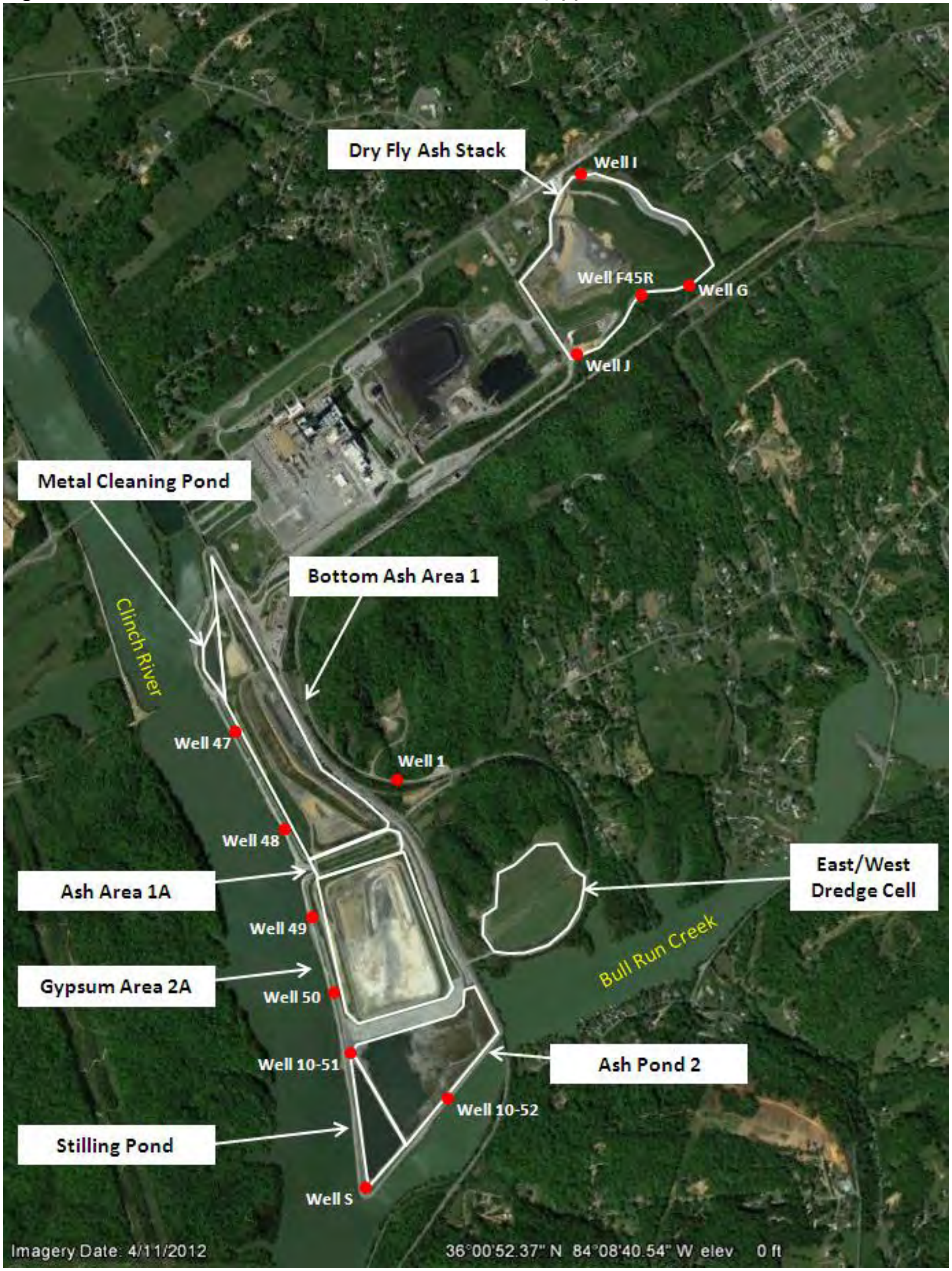


Table 3-2: Bull Run Fossil Plant, Well 10-51. Sampled 5 times between May 2011 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	2,000	No data since 5/2011
Antimony	6	<1	
Arsenic	10	<5	
Barium	2,000	69 – 81	
Beryllium	4	<1	
Boron	3,000	<200	No data since 5/2011
Cadmium	5	<0.5	
Chloride	250 mg/L	3.3 mg/L	No data since 5/2011
Chromium	100	<2 – 4.4	
Cobalt	4.7	<1 – 1.5	No data since 5/2012
Copper	1,300	<2 – 2.4	No data since 5/2012
Fluoride	4,000	<100	No data prior to 5/2012
Lead	15	<1 – 1.6	
Lithium	31		No data
Manganese	300	400	No data since 5/2011
Mercury	2	<0.2	
Molybdenum	40	9	No data since 5/2011
Nickel	100	1.9 – 6.0	
Nitrate	10,000	<100	
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300	110	No data since 5/2011
Sulfate	500 mg/L	11 mg/L	No data since 5/2011
TDS	500 mg/L	310 mg/L	No data since 5/2011
Thallium	2	<1	
Vanadium	63	<2 – 4.4	No data since 11/2011
Zinc	2,000	<10 – 10	No data since 11/2011

Table 3-3: Bull Run Fossil Plant, Well 10-52. Sampled 5 times between May 2011 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	750	No data since 5/2011
Antimony	6	<1	
Arsenic	10	22 – 31	
Barium	2,000	27 –510	
Beryllium	4	<1 – 1.8	
Boron	3,000	<200	No data since 5/2011
Cadmium	5	<0.5	
Chloride	250 mg/L	5 mg/L	No data since 5/2011
Chromium	100	<2 – 3.5	
Cobalt	4.7	1.6 – 2.8	No data since 5/2012
Copper	1,300	<2	No data since 5/2012
Fluoride	4,000	170	No data prior to 5/2012
Lead	15	<1 – 1.6	
Lithium	31		No data
Manganese	300	360	No data since 5/2011
Mercury	2	<0.2	
Molybdenum	40	9	No data since 5/2011
Nickel	100	1.7 – 4.2	
Nitrate	10,000	<100	
Selenium	50	<1 – 4.2	
Silver	100	<1 – 5.3	
Strontium	9,300	280	No data since 5/2011
Sulfate	500 mg/L	<5 mg/L	No data since 5/2011
TDS	500 mg/L	395 mg/L	No data since 5/2011
Thallium	2	<1	
Vanadium	63	2.2 – 2.5	No data since 11/2011
Zinc	2,000	<10 – 19	No data since 11/2011

Table 3-4: Bull Run Fossil Plant, Well S. Sampled 4 times between November 2011 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	<5	
Barium	2,000	49 – 59	
Beryllium	4	<1	
Boron	3,000		No data
Cadmium	5	<0.5 – 0.6	
Chloride	250 mg/L		No data
Chromium	100	<2	
Cobalt	4.7	1.1	No data since 5/2012
Copper	1,300	<2	No data since 5/2012
Fluoride	4,000	<100	No data prior to 5/2012
Lead	15	<1	
Lithium	31		No data
Manganese	300		No data
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	3.1 – 4.5	
Nitrate	10,000	<100	No data prior to 5/2012
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300		No data
Sulfate	500 mg/L		No data
TDS	500 mg/L		No data
Thallium	2	<1	
Vanadium	63	<2	No data since 11/2011
Zinc	2,000	<10 – 19	No data since 11/2011

Table 3-5: Bull Run Fossil Plant, Gypsum/Bottom Ash landfills, Well BRF-1. Sampled 11 times between February 2008 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 3,800 (decreasing)	No data 5/2010-11/2012
Antimony	6	<1	
Arsenic	10	1.8 – 5.0	
Barium	2,000	<2 – 1,867[63]	
Beryllium	4	<2	
Boron	3,000	<200	No data 5/2010-11/2012
Cadmium	5	<0.5	
Chloride	250 mg/L	3.2 – 4.8 mg/L	No data 5/2010-11/2012
Chromium	100	<10	
Cobalt	4.7	1.1 – 12 (decreasing)	No data 5/2010-11/2012
Copper	1,300	<10	No data 5/2010-11/2012
Fluoride	4,000	<100 – 240	
Lead	15	<5	
Lithium	31		No data
Manganese	300	19,000 – 22,000	No data 5/2010-11/2012
Mercury	2	<0.2	
Molybdenum	40	<10	No data 5/2010-11/2012
Nickel	100	<5	
Nitrate	10,000	<100	
Selenium	50	<5	
Silver	100	<1 – 10	
Strontium	9,300	190 – 210	No data 5/2010-11/2012
Sulfate	500 mg/L	<5 – 15	No data 5/2010-11/2012
TDS	500 mg/L	220 – 260	No data 5/2010-11/2012
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 83	

[63] TVA reported barium concentrations of <0.002 mg/L in November 2010 and November 2011. These may have been typographical errors; aside from these two nondetects, data have ranged from 1.4 mg/L to 1.9 mg/L.

Table 3-6: Bull Run Fossil Plant, Gypsum/Bottom Ash landfills, Well BRF-47. Sampled 11 times between February 2008 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	280 – 3,700 (decreasing)	No data 5/2010-11/2012
Antimony	6	<1	
Arsenic	10	1.7 – 6.1	
Barium	2,000	23 – 48	
Beryllium	4	<2	
Boron	3,000	1,750 – 2,600	No data 5/2010-11/2012
Cadmium	5	<0.5	
Chloride	250 mg/L	3 – 12 mg/L	No data 5/2010-11/2012
Chromium	100	<10	
Cobalt	4.7	6 – 31	
Copper	1,300	<2 – 5	
Fluoride	4,000	<100 – 270	No data 5/2010-11/2012
Lead	15	<5	
Lithium	31		No data
Manganese	300	3,400 – 6,300 (decreasing)	No data 5/2010-11/2012
Mercury	2	<0.2	
Molybdenum	40	22 – 50	No data 5/2010-11/2012
Nickel	100	3 – 16	
Nitrate	10,000	<100	No data 5/2010-11/2012
Selenium	50	<1 – 1.8	
Silver	100	<1 – 10	
Strontium	9,300	2.3 – 3.5	No data 5/2010-11/2012
Sulfate	500 mg/L	580 – 1,000 mg/L, decreasing	No data 5/2010-11/2012
TDS	500 mg/L	1,000 – 1,500 mg/L	No data 5/2010-11/2012
Thallium	2	<5	
Vanadium	63	<10	
Zinc	2,000	52 – 120	

Table 3-7: Bull Run Fossil Plant, Gypsum/Bottom Ash landfills, Well BRF-48. Sampled 11 times between February 2008 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	900 – 10,000	No data 5/2010-11/2012
Antimony	6	<1	
Arsenic	10	<1 – 2.9	
Barium	2,000	27 – 71	
Beryllium	4	<2	
Boron	3,000	1,200 – 2,100	No data 5/2010-11/2012
Cadmium	5	<0.5 – 1.1	
Chloride	250 mg/L	2.0 – 3.8 mg/L	No data 5/2010-11/2012
Chromium	100	<2 – 11	
Cobalt	4.7	17 – 100	
Copper	1,300	<2 – 7.4	
Fluoride	4,000	100 – 230	No data 5/2010-11/2012
Lead	15	<1 – 5.5	
Lithium	31		No data
Manganese	300	9,200 – 18,000	No data 5/2010-11/2012
Mercury	2	<0.2	
Molybdenum	40	<5 – 6	No data 5/2010-11/2012
Nickel	100	17 – 43	
Nitrate	10,000	<100	No data 5/2010-11/2012
Selenium	50	<1 – 1.6	
Silver	100	<10	
Strontium	9,300	3.2 – 6.3	No data 5/2010-11/2012
Sulfate	500 mg/L	1,400 – 1,800 mg/L	No data 5/2010-11/2012
TDS	500 mg/L	2,000 – 2,600 mg/L	No data 5/2010-11/2012
Thallium	2	<1 – 1	
Vanadium	63	<2 – 18	
Zinc	2,000	<10 – 55	

Table 3-8: Bull Run Fossil Plant, Gypsum/Bottom Ash landfills, Well BRF-49. Sampled 11 times between February 2008 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	110 – 400	No data 5/2010-11/2012
Antimony	6	<1	
Arsenic	10	1.4 – 6.1	
Barium	2,000	38 – 74	
Beryllium	4	<2	
Boron	3,000	1,800 – 2,300	No data 5/2010-11/2012
Cadmium	5	<0.5 – 2.0	
Chloride	250 mg/L	1.6 – 38 mg/L	No data 5/2010-11/2012
Chromium	100	<10	
Cobalt	4.7	<10 (increasing)[64]	
Copper	1,300	<2	
Fluoride	4,000	1,200 – 1,600	No data 5/2010-11/2012
Lead	15	<5	
Lithium	31		No data
Manganese	300	3,000 – 9,200	No data 5/2010-11/2012
Mercury	2	<0.2	
Molybdenum	40	410 – 700	No data 5/2010-11/2012
Nickel	100	1.2 – 20	
Nitrate	10,000	<100	No data 5/2010-11/2012
Selenium	50	<1	
Silver	100	<10	
Strontium	9,300	1.8 – 4.5	No data 5/2010-11/2012
Sulfate	500 mg/L	220 – 740 mg/L	No data 5/2010-11/2012
TDS	500 mg/L	250 – 1,400 mg/L	No data 5/2010-11/2012
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 13	

Table 3-9: Bull Run Fossil Plant, Gypsum/Bottom Ash landfills, Well BRF-50. Sampled 11 times between February 2008 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 2,800 (decreasing)	No data 5/2010-11/2012
Antimony	6	<1	
Arsenic	10	2.4 – 4.4	
Barium	2,000	<2 – 360	
Beryllium	4	<2	
Boron	3,000	<200	No data 5/2010-11/2012
Cadmium	5	<0.5	
Chloride	250 mg/L	2.3 – 5.3 mg/L	No data 5/2010-11/2012
Chromium	100	<10	
Cobalt	4.7	<1 – 13	
Copper	1,300	<2	
Fluoride	4,000	<100 – 170	No data 5/2010-11/2012
Lead	15	<5	
Lithium	31		No data
Manganese	300	2,700 – 4,700	No data 5/2010-11/2012
Mercury	2	<0.2	
Molybdenum	40	<2 – 6	No data 5/2010-11/2012
Nickel	100	1.3 – 6.8	
Nitrate	10,000	<100	No data 5/2010-11/2012
Selenium	50	<1 – 9.9	
Silver	100	<10	
Strontium	9,300	170 – 350	No data 5/2010-11/2012
Sulfate	500 mg/L	21 – 35 mg/L	No data 5/2010-11/2012
TDS	500 mg/L	310 – 640 mg/L	No data 5/2010-11/2012
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<30	

[64] Cobalt was reported as nondetect at <10 ug/L in two sampling events in 2008 and 2009. Positive detections show an increasing trend, from 1.4 ug/L in May 2008 to 4.1 ug/L in May 2013.

Table 3-10: Bull Run Fossil Plant, Dry Ash Disposal Facility, Well 45. Sampled 4 times between May 2008 and May 2009, then replaced by Well 45R (next page).

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 130	
Antimony	6	<1	
Arsenic	10	3.4 – 5.6	
Barium	2,000	43 – 62 (decreasing)	
Beryllium	4	<2	
Boron	3,000	3,200 – 4,200	
Cadmium	5	<0.5	
Chloride	250 mg/L	5.3 – 6.9 mg/L	
Chromium	100	<1 – 4.6	
Cobalt	4.7	2.0 -2.4	
Copper	1,300	<1 – 3.4	
Fluoride	4,000	<100 - 150	
Lead	15	<1	
Lithium	31		No data
Manganese	300	9,400 – 10,000	
Mercury	2	<0.2	
Molybdenum	40	<5 – 11	
Nickel	100	9.3 – 12.0 (decreasing)	
Nitrate	10,000	<100	
Selenium	50	<1 – 9.8	
Silver	100	<0.5	
Strontium	9,300	450 – 520	
Sulfate	500 mg/L	420 – 910 mg/L	
TDS	500 mg/L	1,600 – 1,700 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 13	

Table 3-11: Bull Run Fossil Plant, Dry Ash Disposal Facility, Well 45R. Sampled 12 times between November 2008 and May 2013. This well replaced Well 45 (previous page).

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 3,100 (decreasing)	No data 5/2010-11/2012
Antimony	6	<1	
Arsenic	10	4.1 – 8.9	
Barium	2,000	31 – 110	
Beryllium	4	<10[65]	
Boron	3,000	12,000 – 18,000 (increasing)	No data 5/2010-11/2012
Cadmium	5	<0.5	
Chloride	250 mg/L	8.2 – 22 mg/L	
Chromium	100	<10	
Cobalt	4.7	<10[66]	
Copper	1,300	<2 – 13	
Fluoride	4,000	<100 – 160	No data since 5/2010
Lead	15	<1 – 2.7	
Lithium	31		No data
Manganese	300	5,300 – 7,800	No data 5/2010-11/2012
Mercury	2	<0.2	
Molybdenum	40	21 – 180 (increasing)	No data 5/2010-11/2012
Nickel	100	1 – 17	
Nitrate	10,000	<100	No data 5/2010-11/2012
Selenium	50	<1 – 29	
Silver	100	<10	
Strontium	9,300	1,900 – 3,600 (increasing)	No data 5/2010-11/2012
Sulfate	500 mg/L	800 – 2,200 mg/L	No data 5/2010-11/2012
TDS	500 mg/L	2,600 – 3,500 mg/L	No data 5/2010-11/2012
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 19	

[65] Of the ten measurements on file, five were reported with a detection limit of 5 ug/L, and one with a detection limit of 10 ug/L. Since these are higher than the MCL for beryllium (4 ug/L), they are not sufficient to demonstrate the absence of an exceedance. On the other hand, beryllium has consistently been below detection, and half of the measurements that we have on file used detection limits of 1 or 2 ug/L.

[66] One of the ten measurements on file for this well reported that cobalt was undetected with a detection limit of 10 ug/L, which is not adequate to detect concentrations above the Regional Screening Level (RSL) of 4.7 ug/L. The nine remaining measurements were below the RSL, however, with an average of 2.3 ug/L, and so there is little evidence that cobalt levels in this well are unsafe.

Table 3-12: Bull Run Fossil Plant, Dry Ash Disposal Facility, Well G. Sampled 12 times between May 2008 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	No data 5/2010-11/2012
Antimony	6	<1	
Arsenic	10	<1 – 1.0	
Barium	2,000	29 – 65	
Beryllium	4	<5[67]	
Boron	3,000	<200 – 3,300	No data 5/2010-11/2012
Cadmium	5	<0.5	
Chloride	250 mg/L	7.4 – 9.4 mg/L	
Chromium	100	<10	
Cobalt	4.7	<10[68]	
Copper	1,300	<1 – 2.4	
Fluoride	4,000	<100 – 140	No data since 5/2010
Lead	15	<1	
Lithium	31		No data
Manganese	300	5 – 140	No data 5/2010-11/2012
Mercury	2	<0.2	
Molybdenum	40	<2 – 100	No data 5/2010-11/2012
Nickel	100	1.4 – 47	
Nitrate	10,000	<100 – 100	No data 5/2010-11/2012
Selenium	50	<1 – 3.7	
Silver	100	<10	
Strontium	9,300	0.17 – 0.48	No data 5/2010-11/2012
Sulfate	500 mg/L	51 – 520 mg/L	No data 5/2010-11/2012
TDS	500 mg/L	275 – 1,000 mg/L	No data 5/2010-11/2012
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 12	

[67] Of the ten measurements on file, three were reported with a detection limit of 5 ug/L. Since this is higher than the MCL for beryllium (4 ug/L), it is not sufficient to demonstrate the absence of an exceedance. On the other hand, beryllium has consistently been undetected, and seven of the ten measurements had detection limits of 3 ug/L or less.

[68] One of the ten measurements on file for this well indicated that cobalt was undetected with a detection limit of 10 ug/L, which is not adequate to detect concentrations above the Regional Screening Level (RSL) of 4.7 ug/L. The nine remaining measurements were undetected at <1 ug/L, and so there is no evidence that cobalt levels in this well are unsafe.

Table 3-13: Bull Run Fossil Plant, Dry Ash Disposal Facility, Well I. Sampled 12 times between May 2008 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	165 – 2,500	No data 5/2010-11/2012
Antimony	6	<1	
Arsenic	10	<1	
Barium	2,000	59 – 69	
Beryllium	4	<5[69]	
Boron	3,000	<200	No data 5/2010-11/2012
Cadmium	5	<0.5	
Chloride	250 mg/L	12 – 21 mg/L (increasing)	
Chromium	100	<10	
Cobalt	4.7	<10[70]	
Copper	1,300	<2	
Fluoride	4,000	<100 – 120	No data since 5/2010
Lead	15	<1	
Lithium	31		No data
Manganese	300	<10 – 27	No data 5/2010-11/2012
Mercury	2	<0.2	
Molybdenum	40	<5	No data 5/2010-11/2012
Nickel	100	1.1 – 2.5	
Nitrate	10,000	<100 – 380	No data 5/2010-11/2012
Selenium	50	<1 – 1.2	
Silver	100	<10	
Strontium	9,300	0.17 – 0.20	No data 5/2010-11/2012
Sulfate	500 mg/L	<5 mg/L	No data 5/2010-11/2012
TDS	500 mg/L	280 – 325 mg/L	No data 5/2010-11/2012
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 36	

[69] Of the ten measurements on file, three were reported with a detection limit of 5 ug/L. Since this is higher than the MCL for beryllium (4 ug/L), it is not sufficient to demonstrate the absence of an exceedance. On the other hand, beryllium has consistently been undetected, and seven of the ten measurements had detection limits of 2 ug/L or less.

[70] One of the ten measurements on file for this well indicated that cobalt was undetected with a detection limit of 10 ug/L, which is not adequate to detect concentrations above the Regional Screening Level (RSL) of 4.7 ug/L. The nine remaining measurements were undetected at <1 ug/L, and so there is no evidence that cobalt levels in this well are unsafe.

Table 3-14: Bull Run Fossil Plant, Dry Ash Disposal Facility, Well J. Sampled 12 times between May 2008 and May 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 810	No data 5/2010-11/2012
Antimony	6	<1	
Arsenic	10	<1	
Barium	2,000	49 – 120	
Beryllium	4	<5[71]	
Boron	3,000	<200 – 1,300	No data 5/2010-11/2012
Cadmium	5	<0.5	
Chloride	250 mg/L	3.8 – 17 mg/L	
Chromium	100	<10	
Cobalt	4.7	<10[72]	
Copper	1,300	<2	
Fluoride	4,000	<100 – 130	No data since 5/2010
Lead	15	<5	
Lithium	31		No data
Manganese	300	<2 – 140	No data 5/2010-11/2012
Mercury	2	<0.2	
Molybdenum	40	<5	No data 5/2010-11/2012
Nickel	100	1.8 – 5.5	
Nitrate	10,000	<100	No data 5/2010-11/2012
Selenium	50	<1 – 8	
Silver	100	<10	
Strontium	9,300	0.36 – 0.51	No data 5/2010-11/2012
Sulfate	500 mg/L	290 – 440 mg/L	No data 5/2010-11/2012
TDS	500 mg/L	320 – 870 mg/L	No data 5/2010-11/2012
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 12.5	

[71] Of the ten measurements on file, three were reported with a detection limit of 5 ug/L. Since this is higher than the MCL for beryllium (4 ug/L), it is not sufficient to demonstrate the absence of an exceedance. On the other hand, beryllium has consistently been undetected, and seven of the ten measurements had detection limits of 2 ug/L or less.

[72] One of the ten measurements on file for this well indicated that cobalt was undetected with a detection limit of 10 ug/L, which is not adequate to detect concentrations above the Regional Screening Level (RSL) of 4.7 ug/L. The nine remaining measurements were undetected at <1 ug/L, and so there is no evidence that cobalt levels in this well are unsafe.

4 Colbert Fossil Plant

Background

The Colbert Fossil Plant is located outside of Muscle Shoals, Alabama on the Tennessee River. A small tributary, Cane Creek, runs northwest through the site before mixing with Colbert's cooling water discharge and eventually emptying into the river. TVA has been operating four units at the site since the 1950s, and added a fifth unit in the early 1960s. The original ash pond, Ash Pond 1, was located at the far northwest corner of the site. TVA stopped sluicing ash to the pond in 1975, but may have dry-stacked ash in the area during the 1980s.[73] Ash Pond 4 was built in 1972, and then raised by 20 feet in 1984. Ash Pond 5 was built in 1984; sinkholes formed shortly after TVA started filling the pond, so TVA abandoned the northwest part of the area and used the southeast part to dispose of ash dredged from Ash Pond 4. In 1990, TVA started dry-stacking ash in the southeast part of Ash Pond 5, which is now known as the Dry Fly Ash Landfill. The Metal Cleaning Pond was built in the early 1980s and used until 2007.[74] A chemical treatment pond just north of the Metal Cleaning Pond was closed in 1993.[75]

Colbert sits atop karst bedrock characterized by dissolved cavities. As described in one groundwater monitoring report, "[e]vidence of karst terrain is abundant with numerous sinkholes across the site and several caves along the river bluff."[76] This kind of terrain presents an ongoing risk that the coal ash disposal areas (or other areas) will suffer local collapses. TVA has long known about this risk: A 1982 memorandum regarding the future Ash Pond 5 noted that "[s]udden collapse of a small portion of the soil layer overlying the cavernous limestone could occur," but that it was "impossible to predict when or where they might occur."[77] Consultants recognized that Colbert posed a "moderate risk to water resources" as early as 1987.[78]

As predicted, Colbert has experienced a series of sinkhole-related accidents over the years:

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[73] Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Alabama*, *Appendix B – Colbert Fossil Plant* (June 24, 2009).
[74] TVA, *Pond Assessment Environmental Information: A Summary of Findings*, at 1 (Aug. 14, 2009); TVA, *Colbert Fossil Plant Groundwater Monitoring Report – October 2008*, at 8 (Jan. 20, 2009).
[75] TVA, *Colbert Fossil Plant Groundwater Assessment*, at 4 (Oct. 1994).
[76] TVA, *Colbert Fossil Plant Groundwater Monitoring Report – October 2008*, at 4 (Jan. 20, 2009).
[77] TVA, Memorandum from M. N. Sprouse to H. S. Fox*, Colbert Steam Plant – Additional Ash Disposal Area No. 5 – Engineering Report* (Dec. 21, 1982); *see also* TVA, *Geology of the Colbert Steam Plant*, at 10 (Nov. 1951) ("[T]he major structural features are the small faults and joints, with the solution accompanying these features being of more than passing interest.").
[78] TVA, *Colbert Fossil Plant Groundwater Assessment*, at 1 (Oct. 1994).

- In October of 1984, as mentioned above, a "sinkhole complex" caused the new Ash Pond 5 to drain at a rate of 1 foot per hour;[79] this was part of a series of sinkholes in this area between 1983 and 1985.[80]
- TVA lined the coal yard drainage basin with clay in 1988 after "water level measurements in the [basin] indicated subsurface leakage."[81]
- In December of 1991, a meter-wide sinkhole caused the chemical treatment pond to lose 2 million liters of water.[82]
- In February of 2012, a sinkhole caused process water from the coal unloading area to drain into the river, causing a 150-foot plume.[83]

The Colbert ash disposal areas have also contaminated local groundwater: Monitoring during the 1980s and 1990s revealed that "[g]roundwater in both the bedrock and soil [was] impacted near the metal cleaning pond, coal yard drainage basin, and Ash Ponds 4 and 5."[84] A 1994 report suggested that there were three general areas or types of contamination: First, wells downgradient of the metal cleaning pond and Ash Pond 4 showed evidence of contamination that TVA attributed to multiple sources, including high levels of solids, boron, and molybdenum attributed to Ash Pond 4, and high pH and sulfate attributed to the chemical treatment pond.[85] Second, groundwater near the coal yard and coal yard drainage basin showed evidence of contamination from those sources, including low pH, high sulfate and dissolved solids, and "excessive levels of several heavy metals and cadmium."[86] Most of the wells around the coal yard drainage basin were abandoned in the late 1990s (see "data gaps" below). Finally, there was some evidence, though not as strong, of contamination from Ash Pond 5.[87] More recent data are discussed below.

Overview of recent monitoring

The groundwater quality database for Colbert is better than for most TVA sites, with data going back to 1982, over twenty actively monitored wells (Fig. 4-1), and a complete set of monitored parameters (4-2 to 4-26). Monitoring was originally required under both solid waste and NPDES permits. Alabama exempted coal ash from landfill regulations between 1982 and

[79] TVA, *Colbert Steam Plant – Ash Pond 5 Engineering Report*, at 1 – 4 (Apr. 1985).
[80] Letter from TVA to ADEM, *Response to Groundwater Incident Number GW 93-6-4 and Notice of Violation (NOV)* (Oct. 6, 1993).
[81] TVA, *Colbert Fossil Plant Groundwater Assessment*, at 1 (Oct. 1994).
[82] *Id*. at 4.
[83] Letter from TVA to ADEM, *Tennessee Valley Authority (TVA) – Colbert Fossil Plant (COF) – NPDES Permit No. AL0003867 – Sinkhole Development* (Feb. 6, 2012).
[84] TVA, *Colbert Fossil Plant Groundwater Assessment*, at iii (Oct. 1994).
[85] *Id*. at 66.
[86] *Id*. at 66 – 70.
[87] *Id*. at 68 – 70.

2011,[88] but the Alabama Department of Environmental Management (ADEM) continued to require monitoring pursuant to a 1993 Notice of Violation.[89]

In general, the same issues identified in the 1994 report (see preceding section) continue today.

- Wells MC1, MC4, MC5A, and MC5C are all west and downgradient of Ash Pond 4 and the metal cleaning pond, and they show consistently high levels of antimony, arsenic, boron, and molybdenum. Although the metal cleaning pond may have been partly responsible for the contamination, and was closed by TVA, the ash pond is likely to be the major cause. The groundwater flow in this area is to the west and southwest, away from the river and toward the boundary of TVA's property, raising concerns about offsite drinking water impacts.

- Wells 17A, 17B, 31A, and 30B are downgradient of Ash Pond 4 to the east and north. TVA recently noted that "[i]ron and manganese levels exceed historical range of background levels, and therefore likely indicate coal ash contamination at these wells."[90]

- Wells downgradient of Area 5, an area known to be susceptible to karst-related sinkholes, also show evidence of ash-related contamination.[91]

Ash Pond 4 is scheduled for final closure in 2020. The problems related to seeps and leaching are likely to continue in the meantime; whether the site continues to present a threat to groundwater after closure will depend on how TVA chooses to close the pond.

Data Gaps

- The monitoring well network at Colbert, which now consists of 25 wells, in the past included 41 or more wells.[92] Some of these were offsite private wells that were abandoned when the owners connected to public water supplies.[93] In 1999, ADEM approved the abandonment of five wells surrounding the coal yard drainage basin after TVA argued that the wells were redundant or were producing results that were

[88] *See* 2011 Alabama Laws Act 2011-258 (H.B. 50); Ala. Code §§ 22-27-2 and 22-27-3.
[89] TVA, *Colbert Fossil Plant Groundwater Update – 1999*, at 9 (Oct. 1999).
[90] TVA, *Colbert Fossil Plant Groundwater Monitoring Report – April 2012*, at 8 (July 5, 2012).
[91] *See, e.g., id*. at 8 – 9.
[92] *See* TVA, *Colbert Fossil Plant Groundwater Update – 1999*, at 2 (Oct. 1999) (describing 37 on-site wells and 4 off-site wells).
[93] *See, e.g.*, Letter from TVA to ADEM, *Groundwater Assessment Update Report – Groundwater Incident 93-6-4* (Jan. 19, 2000). The two private wells approved for abandonment in this letter were offsite; one to the far northeast, and one just south of the Dry Fly Ash Landfill.

"unremarkable/statistically insignificant."[94] In fact, as shown in Table 4-1, some of these wells showed clear evidence of contamination from the drainage basin including low pH, high sulfate and TDS, and high levels of some metals. These wells should not have been abandoned. Wells MC2 and MC3, which were located immediately south of the metal cleaning pond and showed high levels of antimony, arsenic, boron, and molybdenum, were abandoned in 2003 and replaced with wells MC5A and MC5B.[95] From what we have on file it is not clear why these wells were abandoned.

Table 4-1: Evidence of contamination from three wells around the coal yard drainage basin, all abandoned after 1999 (mean and range of data over stated period).[96]

Pollutant	**Threshold** (see Table 1-1)	**Well CA14** (6/17/1986-9/14/1993)	**Well CA18A** (6/18/1986-2/25/1997)	**Well CA24A** (9/27/1989-9/26/1991)
pH	6.5-8.5 (SMCL)	4.9 (4.1-5.7)	6.0 (5.4-6.4)	6.5 (6.1-6.9)
Sulfate (mg/L)	500 (DWA)	1,291 (130-1,900)	1,078 (580-1,900)	322 (160-610)
TDS (mg/L)	500 (SMCL)	2,087 (1,400-3,000)	1,751 (930-2,400)	694 (390-1,100)
Aluminum (mg/L)	16.0 (RSL)	19.8 (2.4-56.0)	0.36 (0.1-3.4)	10.1 (0.1-47.0)
Cadmium (ug/L)	5.0 (MCL)	46.8 (0.1-101)	5.4 (0.2-46)	2.3 (0.8-5.7)
Manganese (mg/L)	0.3 (LHA)	63.4 (27-99.4)	21.9 (0.0-34.0)	13.7 (8.7-22.0)

- Wells CA9R and CA29BR have not been monitored for key non-metal pollutants, including sulfate and chloride, since spring 2010.
- Many pollutants were not measured in any wells in April 2013 (see 4-2 to 4-26 below). It is not clear whether TVA intends to measure these pollutants less frequently or to stop measuring them altogether. For the most part, these were pollutants that have never been found at high concentrations at the plant. Cobalt, however, has been found at unsafe levels in several wells, and is a pollutant of concern in the coal ash context.[97] TVA should continue to monitor cobalt on a regular basis.

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[94] Letter from TVA to ADEM, *Groundwater Assessment Update Report – Groundwater Incident 93-6-4*, Enclosure A: Groundwater Well Summary (Mar. 6, 1998); Letter from ADEM to TVA, *Re: Groundwater Incident GW-93-4* (Mar. 9, 1999).

[95] Letter from TVA to ADEM, *Groundwater Assessment Monitoring Report* (Jan. 8, 2004).

[96] TVA, *Colbert Fossil Plant Groundwater Update – 1999*, at A13-A27 (Oct. 1999).

[97] *See, e.g.*, U.S. EPA, 75 Fed. Reg. 35128, 35145 (June 21, 2010) (identifying cobalt as one of the two "constituents with the highest estimated risks for surface impoundments.").

Figure 4-1: Groundwater wells at Colbert Fossil Plant (approximate locations)

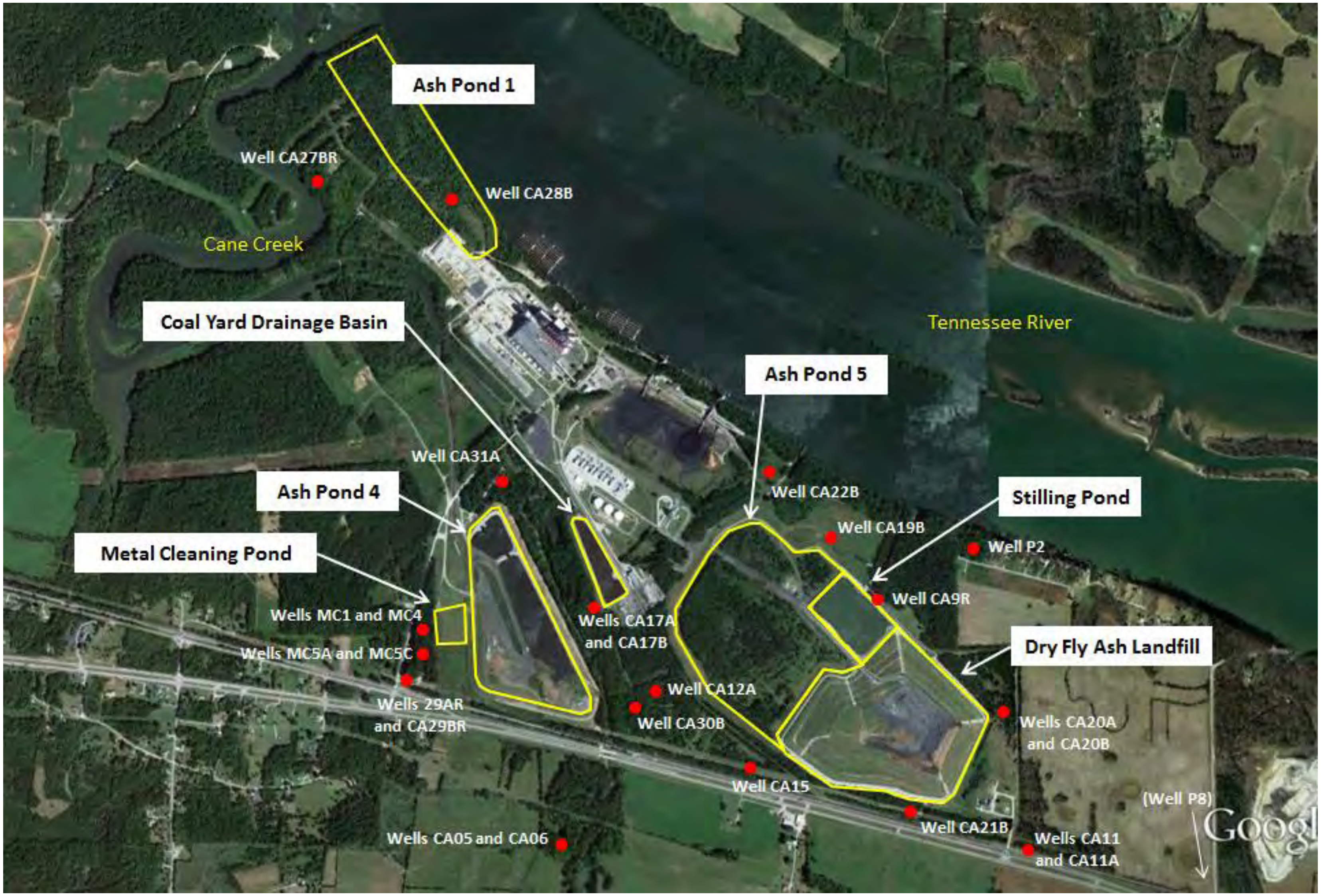


Table 4-2: Colbert Fossil Plant, Well CA19B. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 170	
Antimony	6	<1	
Arsenic	10	<1 – 3.3	
Barium	2,000	25 – 33	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200 – 240	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	14 – 20 mg/L	No data in 4/2013
Chromium	100	<2 – 9.8	
Cobalt	4.7	<1 – 7.2[98]	No data in 4/2013
Copper	1,300	<2	
Fluoride	4,000	<100 – 160	No data in 4/2013
Lead	15	<1	
Lithium	31	<15	
Manganese	300	<10 – 61	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<5 – 18	
Nickel	100	3.0 – 9.0	No data in 4/2013
Nitrate	10,000	1,200 – 1,700	
Selenium	50	<1 – 2.3	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	290 – 360	
Sulfate	500 mg/L	190 – 240 mg/L	
TDS	500 mg/L	610 – 720 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	<10 – 19	

Table 4-3: Colbert Fossil Plant, Well CA11. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 830	
Antimony	6	<1 – 1	
Arsenic	10	<1 – 3.3	
Barium	2,000	16 – 21	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	1.2 – 2.5	No data in 4/2013
Chromium	100	2.3 – 19.0	
Cobalt	4.7	<1 – 6.5	No data in 4/2013
Copper	1,300	<2	
Fluoride	4,000	<100 – 130	No data in 4/2013
Lead	15	3.3 – 6.6	
Lithium	31	<15	
Manganese	300	<10 – 62	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 13	
Nickel	100	4.4 – 32.0	No data in 4/2013
Nitrate	10,000	360 – 600	
Selenium	50	<1	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	140 – 200	
Sulfate	500 mg/L	<5 mg/L	
TDS	500 mg/L	290 – 390 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	<10 – 31	

[98] The only positive cobalt reading was in October 2011; all other measurements were nondetect (<1 ug/L).

Table 4-4: Colbert Fossil Plant, Well CA12A. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 1,900	
Antimony	6	<1 – 5.5	
Arsenic	10	<1 – 1.9	
Barium	2,000	32 – 56	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	1.4 – 3.6 mg/L	No data in 4/2013
Chromium	100	<2 – 6.6	
Cobalt	4.7	<1	No data in 4/2013
Copper	1,300	<2 – 3.9	
Fluoride	4,000	120 – 1,200	No data in 4/2013
Lead	15	3 – 160	
Lithium	31	<15	
Manganese	300	<10 – 32	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 15	
Nickel	100	2.7 – 23.0	No data in 4/2013
Nitrate	10,000	<100 – 390	
Selenium	50	<1	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	160 – 260	
Sulfate	500 mg/L	7.4 – 8.9 mg/L	
TDS	500 mg/L	190 – 280 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	<10 – 66	

Table 4-5: Colbert Fossil Plant, Well CA16. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	
Antimony	6	<1	
Arsenic	10	<1 – 1.6	
Barium	2,000	22 – 37	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200 – 1,200	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	4.4 – 7.6 mg/L	No data in 4/2013
Chromium	100	<2 – 4.7	
Cobalt	4.7	<1	No data in 4/2013
Copper	1,300	<2	
Fluoride	4,000	<100	No data in 4/2013
Lead	15	<1	
Lithium	31	<15 – 19	
Manganese	300	<10	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 16	
Nickel	100	<1 – 5.6	No data in 4/2013
Nitrate	10,000	1,700 – 2,700	
Selenium	50	<1 – 3.2	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	120 – 200	
Sulfate	500 mg/L	11 – 120 mg/L	
TDS	500 mg/L	310 – 500 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	<10 – 10	

Table 4-6: Colbert Fossil Plant, Well CA17A. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 7,000	
Antimony	6	<1	
Arsenic	10	<1 – 3.4	
Barium	2,000	28 – 73	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	2.7 – 4.7 mg/L	No data in 4/2013
Chromium	100	<2 – 21	
Cobalt	4.7	<1 – 1.3	No data in 4/2013
Copper	1,300	<2 – 7.2	
Fluoride	4,000	<100	No data in 4/2013
Lead	15	<1 – 5.7	
Lithium	31	<15	
Manganese	300	<10 – 180	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 6	
Nickel	100	1.3 – 8.9	No data in 4/2013
Nitrate	10,000	<100 – 840	
Selenium	50	<1 – 1.4	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	29 – 97	
Sulfate	500 mg/L	9.1 – 14.0 mg/L	
TDS	500 mg/L	60 – 120 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2 – 18	
Zinc	2,000	<10 – 56	

Table 4-7: Colbert Fossil Plant, Well CA17B. Sampled 5 times between April 2011 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	
Antimony	6	<1	
Arsenic	10	1.0 – 9.2	
Barium	2,000	18 – 25	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	4.8 – 15 mg/L	No data in 4/2013
Chromium	100	<2 – 4.6	
Cobalt	4.7	6.1 – 19.0	No data in 4/2013
Copper	1,300	<2 – 2.7	
Fluoride	4,000	<100 – 290	No data in 4/2013
Lead	15	<1 – 6.2	
Lithium	31	<15 – 20	
Manganese	300	660 – 1,700	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 72	
Nickel	100	12 -24	No data in 4/2013
Nitrate	10,000	<100	
Selenium	50	<1 – 1.0	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	180 – 840	
Sulfate	500 mg/L	150 – 1,000 mg/L	
TDS	500 mg/L	500 – 1,800 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	12 – 48	

Table 4-8: Colbert Fossil Plant, Well CA20A. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 40,000	
Antimony	6	<1	
Arsenic	10	<1 – 13	
Barium	2,000	25 – 110	No data in 4/2013
Beryllium	4	<2 – 3.6	No data in 4/2013
Boron	3,000	<200 – 440	
Cadmium	5	<0.5 – 0.76	No data in 4/2013
Chloride	250 mg/L	1.2 – 2.5 mg/L	No data in 4/2013
Chromium	100	<2 – 19	
Cobalt	4.7	<1 – 4.2	No data in 4/2013
Copper	1,300	<2 – 12	
Fluoride	4,000	<100	No data in 4/2013
Lead	15	<1 – 8.9	
Lithium	31	<15 – 32[99]	
Manganese	300	<10 – 420	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 14	
Nickel	100	3.1 – 36	No data in 4/2013
Nitrate	10,000	2,300 – 4,200	
Selenium	50	<1 – 2.0	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	89 – 140	
Sulfate	500 mg/L	11 – 20 mg/L	
TDS	500 mg/L	250 – 340 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2 – 28	
Zinc	2,000	<10 – 230	

[99] Lithium was measured at 32 ug/L in October 2010; all other measurements have been nondetect (<15 ug/L).

Table 4-9: Colbert Fossil Plant, Well CA20B. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	
Antimony	6	<1 – 1.6	
Arsenic	10	<1 – 3.3	
Barium	2,000	32 – 37	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	1.6 – 1.9 mg/L	No data in 4/2013
Chromium	100	3.1 – 5.2	
Cobalt	4.7	<1 – 4.2	No data in 4/2013
Copper	1,300	<2	
Fluoride	4,000	<100 – 100	No data in 4/2013
Lead	15	<1	
Lithium	31	<15	
Manganese	300	<10	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<150[100]	
Nickel	100	3.2 – 8.4	No data in 4/2013
Nitrate	10,000	1,000 – 2,800	
Selenium	50	<1 – 6.2	No data in 4/2013
Silver	100	<1 – 1.3	No data in 4/2013
Strontium	9,300	170 – 190	
Sulfate	500 mg/L	16 – 18 mg/L	
TDS	500 mg/L	370 – 390 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	<10 – 12	

[100] One of the five readings since April 2010 was reported as nondetect at <150 ug/L. This detection limit is inadequate to detect exceedances of the Lifetime Health Advisory for molybdenum (40 ug/L). In this case, however, the four earlier readings were all nondetect at <5 ug/L, the October 2012 reading was 8.2 ug/L, and the April 2013 reading was <2 ug/L, all well below the Lifetime Health Advisory.

Table 4-10: Colbert Fossil Plant, Well CA21B. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 4,800	
Antimony	6	<1	
Arsenic	10	<1 – 19	
Barium	2,000	27 – 55	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200 – 9,300	
Cadmium	5	<0.5 – 4.4	No data in 4/2013
Chloride	250 mg/L	3.3 – 9.6 mg/L	No data in 4/2013
Chromium	100	2.2 – 27	
Cobalt	4.7	<1 – 13	No data in 4/2013
Copper	1,300	<2 – 12	
Fluoride	4,000	<100	No data in 4/2013
Lead	15	<1 – 15	
Lithium	31	<15 – 200	
Manganese	300	<10 – 82	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	7 – 180	
Nickel	100	1.8 – 43	No data in 4/2013
Nitrate	10,000	<100 – 1,700	
Selenium	50	<1 – 4.3	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	200 – 430	
Sulfate	500 mg/L	62 – 360	
TDS	500 mg/L	400 – 820	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2 – 26	
Zinc	2,000	<10 – 240	

Table 4-11: Colbert Fossil Plant, Well CA22B. Sampled 7 times between April 2010 and April.[101]

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 29,000 (see note)	
Antimony	6	<1	
Arsenic	10	<1 – 1.5	
Barium	2,000	50 – 52	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200 – 7,300 (see note)	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	2.4 – 13 mg/L	No data in 4/2013
Chromium	100	<2 – 9.3	
Cobalt	4.7	<1 – 10 (see note)	No data in 4/2013
Copper	1,300	<2	
Fluoride	4,000	<100 – 130	No data in 4/2013
Lead	15	<1 – 1.8	
Lithium	31	<15 – 160 (see note)	
Manganese	300	<10 – 1,700 (see note)	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 88 (see note)	
Nickel	100	3.3 – 11	No data in 4/2013
Nitrate	10,000	<100	
Selenium	50	<1	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	250 – 390	
Sulfate	500 mg/L	87 – 420 mg/L	
TDS	500 mg/L	400 – 430 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	<10 – 16	

[101] Sampling results in October 2011 were noticeably different than other dates in that aluminum, boron, cobalt, lithium, manganese, and molybdenum all exceeded their respective thresholds on this date only; all other dates, including 2012 sampling, showed results for these contaminants that were well below their respective thresholds.

Table 4-12: Colbert Fossil Plant, Well CA27BR. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 830	
Antimony	6	<2 – 24	
Arsenic	10	<1 – 3.0	
Barium	2,000	22 – 47	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	1.2 – 1.4 mg/L	No data in 4/2013
Chromium	100	<2 – 9.4	
Cobalt	4.7	<1	No data in 4/2013
Copper	1,300	<2 – 8.6	
Fluoride	4,000	270 – 3,000	No data in 4/2013
Lead	15	<1 – 5.6	
Lithium	31	<15	
Manganese	300	<10 – 33	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 6	
Nickel	100	3.1 – 13	No data in 4/2013
Nitrate	10,000	<100	
Selenium	50	<1	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	160 – 190	
Sulfate	500 mg/L	<5 – 6.1 mg/L	
TDS	500 mg/L	150 – 180 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2 – 3.1	
Zinc	2,000	<10 – 33	

Table 4-13: Colbert Fossil Plant, Well CA28B. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 220	
Antimony	6	<1 – 1.3	
Arsenic	10	<1 – 4.8	
Barium	2,000	130 – 160	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	16 – 17 mg/L	No data in 4/2013
Chromium	100	<2	
Cobalt	4.7	<1	No data in 4/2013
Copper	1,300	<2 – 3.4	
Fluoride	4,000	<100 – 160	No data in 4/2013
Lead	15	<1 – 3	
Lithium	31	<15	
Manganese	300	540 – 680	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 13	
Nickel	100	<1 – 4.7	No data in 4/2013
Nitrate	10,000	<100 – 110	
Selenium	50	<1	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	180 – 260	
Sulfate	500 mg/L	<5 mg/L	
TDS	500 mg/L	360 – 380 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	<10 – 20	

Table 4-14. Colbert Fossil Plant, Well CA29AR. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 2,200 (decreasing)	
Antimony	6	<1	
Arsenic	10	<1 – 4.6	
Barium	2,000	30 – 40	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	1,200 – 2,000	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	19 – 33 mg/L	No data in 4/2013
Chromium	100	<2 – 8.2	
Cobalt	4.7	<1 – 3.2	No data in 4/2013
Copper	1,300	<2	
Fluoride	4,000	<100 – 110	No data in 4/2013
Lead	15	<1 – 1.5	
Lithium	31	<15	
Manganese	300	200 – 700	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	32 – 67	
Nickel	100	1.4 – 6.4	No data in 4/2013
Nitrate	10,000	<100 – 300	
Selenium	50	<1	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	88 – 110	
Sulfate	500 mg/L	36 – 80 mg/L	
TDS	500 mg/L	190 – 250 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2 – 5.8	
Zinc	2,000	<10 – 15	

Table 4.15. Colbert Fossil Plant, Well CA29BR. Sampled 6 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 1,100 (decreasing)	
Antimony	6	<1 – 1.1	
Arsenic	10	<1 – 12	
Barium	2,000	68 – 78	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	690 – 1,100	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	14 mg/L	No data since 4/2010
Chromium	100	<2	
Cobalt	4.7	<1 – 1.8	No data in 4/2013
Copper	1,300	<2 – 36	
Fluoride	4,000	160	No data since 4/2010
Lead	15	<1 – 2.7	
Lithium	31	<15 – 15	
Manganese	300	10 – 200	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	48 – 65	
Nickel	100	3.2 – 6.8	No data in 4/2013
Nitrate	10,000	<100 – 120	No data since 10/2011
Selenium	50	<1 – 2.9	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	250 – 340	
Sulfate	500 mg/L	36 mg/L	No data since 4/2010
TDS	500 mg/L	250 mg/L	No data since 4/2010
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	15 – 93	

Table 4-16: Colbert Fossil Plant, Well CA30B. Sampled 4 times between April 2011 and October 2012.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 200	
Antimony	6	<1	
Arsenic	10	<1 – 2.9	
Barium	2,000	42 – 96	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	2.5 – 4.2 mg/L	No data in 4/2013
Chromium	100	<2 – 280	
Cobalt	4.7	1.2 – 11.0	No data in 4/2013
Copper	1,300	<2 – 7.8	
Fluoride	4,000	<100 – 140	No data in 4/2013
Lead	15	<1	
Lithium	31	<15	
Manganese	300	810 – 1,700	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 47	
Nickel	100	10 – 220	No data in 4/2013
Nitrate	10,000	<100 – 140	
Selenium	50	<1	No data in 4/2013
Silver	100	<1 – 15	No data in 4/2013
Strontium	9,300	94 – 480	
Sulfate	500 mg/L	69 – 540 mg/L (decreasing)	
TDS	500 mg/L	17.3 – 530 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2 – 7.5	
Zinc	2,000	<10 – 12	

Table 4-17: Colbert Fossil Plant, Well CA31A. Sampled 5 times between April 2011 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	100 – 180	
Antimony	6	<1	
Arsenic	10	<1 – 6.9	
Barium	2,000	46 – 95	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	590 – 910	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	25 – 39 mg/L	No data in 4/2013
Chromium	100	<2	
Cobalt	4.7	<1	No data in 4/2013
Copper	1,300	<2 – 12	
Fluoride	4,000	<100	No data in 4/2013
Lead	15	<1	
Lithium	31	<15	
Manganese	300	110 – 650	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	21 – 51	
Nickel	100	1.4 – 3.0	No data in 4/2013
Nitrate	10,000	<100 – 200	
Selenium	50	<1 – 1.2	No data in 4/2013
Silver	100	<1 – 14	No data in 4/2013
Strontium	9,300	140 – 220	
Sulfate	500 mg/L	44 – 92 mg/L	
TDS	500 mg/L	290 – 370 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2 – 4.2	
Zinc	2,000	<10 – 28	

Table 4-18: Colbert Fossil Plant, Well CA5. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	180 – 8,000	
Antimony	6	<1	
Arsenic	10	<1 – 8.1	
Barium	2,000	36 – 160	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200	
Cadmium	5	<0.5 – 1.3	No data in 4/2013
Chloride	250 mg/L	1.6 – 2.4 mg/L	No data in 4/2013
Chromium	100	<2 – 18	
Cobalt	4.7	<5[102]	No data in 4/2013
Copper	1,300	<2 – 160	
Fluoride	4,000	<100 – 130	No data in 4/2013
Lead	15	<1 – 100[103]	
Lithium	31	<15	
Manganese	300	12 – 340	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 5.5	
Nickel	100	6 – 99	No data in 4/2013
Nitrate	10,000	<100	
Selenium	50	<1 – 2	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	44 – 260	
Sulfate	500 mg/L	<5 – 8.5 mg/L	
TDS	500 mg/L	47 – 200 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2 – 13	
Zinc	2,000	<10 – 170	

Table 4-19: Colbert Fossil Plant, Well CA6. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 800	
Antimony	6	<1	
Arsenic	10	<1 – 3	
Barium	2,000	340 – 390	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	480 – 650	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	13 – 15 mg/L	No data in 4/2013
Chromium	100	<2 – 4.7	
Cobalt	4.7	<1	No data in 4/2013
Copper	1,300	<2	
Fluoride	4,000	240 – 2,600	No data in 4/2013
Lead	15	<1	
Lithium	31	57 – 71	
Manganese	300	<10 – 19	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 6.2	
Nickel	100	<1 – 4	No data in 4/2013
Nitrate	10,000	<100	
Selenium	50	<1	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	3,400 – 3,800	
Sulfate	500 mg/L	5.2 – 31 mg/L	
TDS	500 mg/L	<10 – 340 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	<10 – 19	

[102] Cobalt has consistently been below the level of detection at this well. The detection limit was 5 ug/L on one sampling date (10/20/2010), but cobalt was reported as <1 ug/L on all other sample dates.
[103] Lead was reportedly found at 100 ug/L on 10/20/2010. All other measurements have been below the Action Level of 15 ug/L.

Table 4-20: Colbert Fossil Plant, Well CA9R. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 200	
Antimony	6	1.9 – 59 (increasing)	
Arsenic	10	<1 – 4.6	
Barium	2,000	47 – 62	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	2,000 – 2,800	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	3.6 mg/L	No data since 4/2010
Chromium	100	<2	
Cobalt	4.7	<1	No data in 4/2013
Copper	1,300	<2 – 46	
Fluoride	4,000	1,100	No data since 4/2010
Lead	15	<1 – 1.2	
Lithium	31	18 – 53	
Manganese	300	<10 – 48	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	18 – 57	
Nickel	100	2.7 – 7.3	No data in 4/2013
Nitrate	10,000	<100	No data 10/2010-10/2012
Selenium	50	<1 – 8.8	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	550 – 670	
Sulfate	500 mg/L	110 – 130 mg/L	No data 10/2010-10/2012
TDS	500 mg/L	370 – 390 mg/L	Rarely measured[104]
Thallium	2	<1	No data in 4/2013
Vanadium	63	3.4 – 6.3	
Zinc	2,000	<10 – 24	

Table 4-21: Colbert Fossil Plant, Well MC1. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	1,300 – 1,600	
Antimony	6	12 – 15	
Arsenic	10	62 – 76[105]	
Barium	2,000	12 – 14	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	3,100 – 3,700	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	42 – 53 mg/L	No data in 4/2013
Chromium	100	<2	
Cobalt	4.7	<1	No data in 4/2013
Copper	1,300	<2	
Fluoride	4,000	<100 – 120	No data in 4/2013
Lead	15	<1	
Lithium	31	<15 – 35	
Manganese	300	<10 – 13	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	150 – 180	
Nickel	100	<1.4 – 3.9	No data in 4/2013
Nitrate	10,000	<100	
Selenium	50	<1	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	230 – 260	
Sulfate	500 mg/L	110 – 160 mg/L	
TDS	500 mg/L	280 – 320 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	50 – 69	
Zinc	2,000	<10	

[104] TVA measured TDS in well CA94 in April 2010 and April 2012, but not in the 5 other monitoring events represented by this table.

[105] The April 2012 report lists the arsenic result for this well as <1 ug/L. This is so unlikely to be true that I did not include the result in the table.

Table 4-22: Colbert Fossil Plant, Well MC4. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	500 – 955	
Antimony	6	5.1 – 11	
Arsenic	10	38 – 65[106]	
Barium	2,000	9.2 – 15	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	3,100 – 3,600	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	41 – 52 mg/L	No data in 4/2013
Chromium	100	<2	
Cobalt	4.7	<1	No data in 4/2013
Copper	1,300	<2	
Fluoride	4,000	<100 – 110	No data in 4/2013
Lead	15	<1	
Lithium	31	<15 – 26	
Manganese	300	<10 – 15	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	140 – 180	
Nickel	100	<1 – 4.4	No data in 4/2013
Nitrate	10,000	<100 – 350	
Selenium	50	<1	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	210 – 240	
Sulfate	500 mg/L	100 – 120 mg/L	
TDS	500 mg/L	280 – 300 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	4.9 – 19.5	
Zinc	2,000	<10	

106 The April 2012 report lists the arsenic result for this well as <1 ug/L. This is so unlikely to be true that I did not include the result in the table.

Table 4-23: Colbert Fossil Plant, Well MC5A. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	450 – 5,500 (decreasing)	
Antimony	6	6.5 – 11	
Arsenic	10	15 – 72[107]	
Barium	2,000	14 – 43	
Beryllium	4	<2	
Boron	3,000	1,800 – 3,500	
Cadmium	5	<0.5	
Chloride	250 mg/L	32 – 52 mg/L	
Chromium	100	<2 – 11	
Cobalt	4.7	<1 – 2.2	
Copper	1,300	<2 – 2.4	
Fluoride	4,000	<100 – 115	
Lead	15	<1 – 2.3	
Lithium	31	<15 – 30	
Manganese	300	30 – 310	
Mercury	2	<0.2	
Molybdenum	40	70 – 170	
Nickel	100	2.4 – 9.0	
Nitrate	10,000	<100 – 110	
Selenium	50	<1 – 1.6	
Silver	100	<1	
Strontium	9,300	190 – 260	
Sulfate	500 mg/L	60 – 120 mg/L	
TDS	500 mg/L	240 – 300 mg/L	
Thallium	2	<1	
Vanadium	63	14 – 120	
Zinc	2,000	<10 – 19	

107 The April 2012 report lists the arsenic result for this well as <1 ug/L. This is so unlikely to be true that I did not include the result in the table.

Table 4-24: Colbert Fossil Plant, Well MC5C. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 160	
Antimony	6	<1	
Arsenic	10	<1 – 1.7	
Barium	2,000	140 – 150	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	1,100 – 1,300	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	20 – 23 mg/L	No data in 4/2013
Chromium	100	<2 – 10	
Cobalt	4.7	<1 – 1.9	No data in 4/2013
Copper	1,300	<2 – 2.1	
Fluoride	4,000	<100 – 1,900	No data in 4/2013
Lead	15	<1	
Lithium	31	<15 – 84	
Manganese	300	19 – 110	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	38 – 54	
Nickel	100	<2 – 15	No data in 4/2013
Nitrate	10,000	<100	
Selenium	50	<1	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	1,200 – 1,500	
Sulfate	500 mg/L	51 – 62 mg/L	
TDS	500 mg/L	220 – 250 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	<10 – 19	

Table 4-25: Colbert Fossil Plant, Well P2. Sampled 7 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	1,300 – 14,000	
Antimony	6	<1	
Arsenic	10	<1 – 8.0	
Barium	2,000	34 – 69	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	340 – 930	
Cadmium	5	<0.5	No data in 4/2013
Chloride	250 mg/L	14 – 57 mg/L	No data in 4/2013
Chromium	100	2.6 – 21	
Cobalt	4.7	<1 – 2.2	No data in 4/2013
Copper	1,300	<2 – 48	
Fluoride	4,000	120 – 200	No data in 4/2013
Lead	15	1.3 – 6.3	
Lithium	31	<15 – 25	
Manganese	300	31 – 220	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 11	
Nickel	100	13 – 26	No data in 4/2013
Nitrate	10,000	240 – 610	
Selenium	50	<1 – 2.9	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	130 – 255	
Sulfate	500 mg/L	31 – 74 mg/L	
TDS	500 mg/L	350 – 440 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	2.6 – 20	
Zinc	2,000	38 – 350	

Table 4-26: Colbert Fossil Plant, Well P8. Sampled 6 times between April 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	
Antimony	6	<1	
Arsenic	10	<1 – 3.7	
Barium	2,000	30 – 47	No data in 4/2013
Beryllium	4	<2	No data in 4/2013
Boron	3,000	<200	
Cadmium	5	<0.5 – 0.75	No data in 4/2013
Chloride	250 mg/L	2.6 – 6.0 mg/L	No data in 4/2013
Chromium	100	<2	
Cobalt	4.7	<1	No data in 4/2013
Copper	1,300	<2 – 7.7	
Fluoride	4,000	140 – 420	No data in 4/2013
Lead	15	<1 – 18	
Lithium	31	<15 – 23	
Manganese	300	<10 – 14	
Mercury	2	<0.2	No data in 4/2013
Molybdenum	40	<2 – 8.4	
Nickel	100	3.5 – 7.0	No data in 4/2013
Nitrate	10,000	<100 – 530	
Selenium	50	<1 – 5.0	No data in 4/2013
Silver	100	<1	No data in 4/2013
Strontium	9,300	110 – 230	
Sulfate	500 mg/L	6.7 – 9.3 mg/L	
TDS	500 mg/L	220 – 260 mg/L	No data in 4/2013
Thallium	2	<1	No data in 4/2013
Vanadium	63	<2	
Zinc	2,000	140 – 2,700	

5 Cumberland Fossil Plant

Background

The Cumberland Fossil Plant is located on the Cumberland River near Nashville, TN. TVA has been operating two coal units at the site since the early 1970s. Cumberland's ash disposal area was originally one large ash pond. TVA installed sulfur dioxide scrubbers in 1994, and in 1995-1996 separated the area into the current configuration: The ash pond receives wet-sluiced bottom ash, which is dredged and stacked in the dry fly ash disposal area, and fly ash is dry-handled and stacked in the dry fly ash disposal area. Gypsum is wet-sluiced to the gypsum disposal area or directly routed to a neighboring gypsum processing plant. The dry fly ash and gypsum disposal areas are therefore built over an unknown amount of sluiced bottom and fly ash that was left in the original ash pond.[108] TVA has had ongoing problems with seepage along the west perimeter dike, along the bank of Wells Creek.[109] Groundwater under the site is in contact with ash and, in some places, gypsum.[110]

Overview of monitoring

TVA currently monitors and reports on groundwater quality in six downgradient wells. TVA also monitors two surface water locations, including one spring, and uses them as upgradient reference points. The tables below also include well 93-2, which TVA removed from monitoring in 2011.

Monitoring shows that coal ash has affected groundwater quality across the site, as shown in tables 5-2 to 5-10. Table 5-1, below, summarizes results for four coal ash indicator pollutants. Wells 93-2 and 93-2R, in particular, show that very high concentrations of these pollutants are migrating from the ash disposal area to Wells Creek.

[108] *See* Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Tennessee*, Cumberland Fossil Plant Dry Ash Stack, 2 (June 24, 2009) ("It is unknown how much sluiced ash is beneath the [dry ash] stack.").
[109] *Id*. at 5; Stantec Consulting Services, Inc., *Dry Fly Ash Stack and Gypsum Disposal Complex*, at 8 – 10 (June, 2010) (identifying seepage studies from 2005 and 2008), *id*. at 29 (describing seepage in 1973 – 1974), and *id*. at Appendix A (identifying historical documents, some of which concern seepage over the 1973 – 2005 period).
[110] *See, e.g.*, *id*. at 44, Appendix B, and Appendix C.

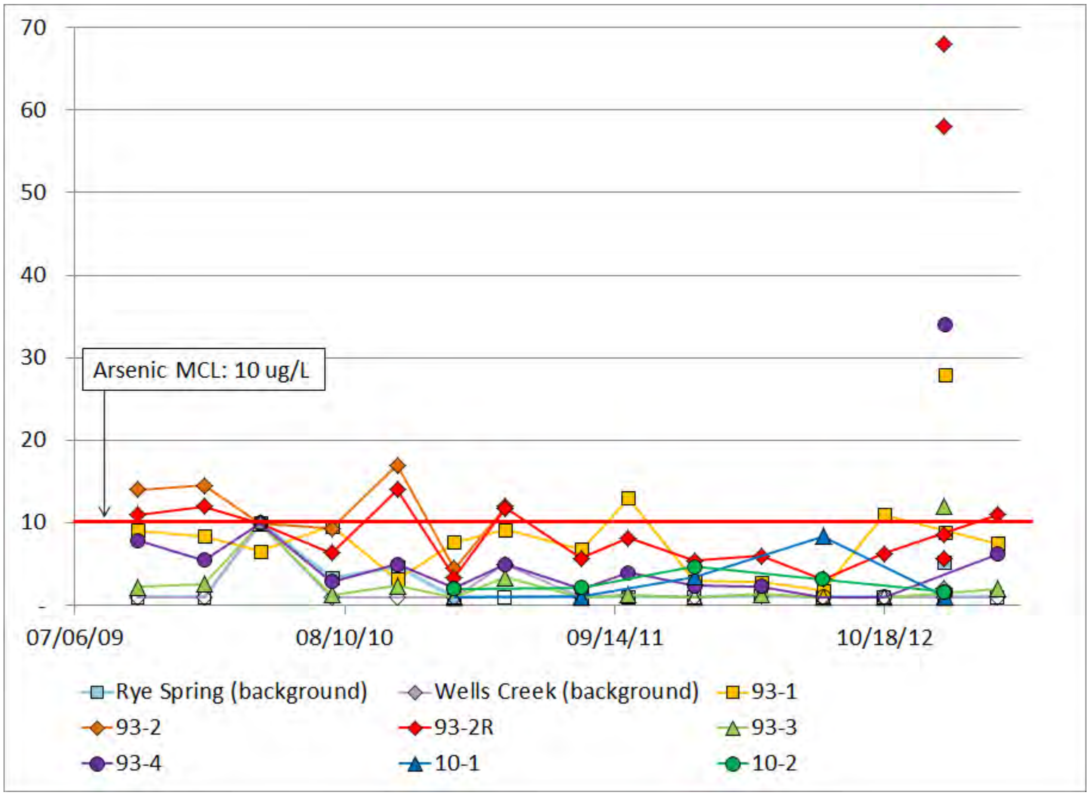
Table 5-1: Mean concentrations of selected coal ash indicators in Cumberland monitoring network, October 2009-April 2013. All units mg/L.

Well or sampling point	Boron	Chloride	Manganese	Sulfate
Upgradient				
Rye Spring	0.3	9	0.2	54
Wells Creek	0.2	6	0.02	7
Downgradient				
93-1	0.6	417	9.3	192
93-2	34.9	1,386	3.8	1,957
93-2R	14.0	1,158	13.5	1,313
93-3	6.0	47	1.2	189
93-4	5.6	390	0.2	840
10-1	0.2	17	4.2	70
10-2	0.2	51	16.5	111

TVA is not required to report boron, chloride, manganese, or sulfate results to TDEC for compliance monitoring purposes, and TDEC does not apply Groundwater Protection Standards (GWPSs) for these pollutants at Cumberland. However, high concentrations of selenium in well 93-2 led TDEC to place Cumberland in assessment monitoring in early 2009.[111] Since that time, TVA has reported intermittent exceedances of Tennessee GWPSs for arsenic, selenium, and vanadium. TVA found unusually high arsenic levels in January 2013. In response, they had the wells retested; the second round of results was lower, and TVA reported these lower results to TDEC. Figure 5-1 below includes both original and retest results for each well for that date. It does appear that initial results from January 2013 were erroneous.

[111] *See* TVA, *Cumberland Fossil Plant Dry Ash and Gypsum Disposal Areas Groundwater Assessment Monitoring Report – April 2009*, at 1 (May 20, 2009). TDEC regulations require quarterly assessment monitoring whenever semi-annual detection monitoring shows a significant increase in any detection monitoring pollutants. Tenn. Comp. R. & Regs. 0400-11-01-.04(7)6.

Figure 5-1: Arsenic in Cumberland wells. Hollow data points were undetected at the detection limit shown. Lines do not intersect January 2013 data, some of which may have been in error.



TVA also discovered very high concentrations of cobalt in USWAG well 10-2, at 130-150 ug/L, observing that "[t]he value of cobalt at well 10-2 is exceptionally high, higher than any in the fleet."[112] TVA's response to this dramatic problem was to dismiss it and then ignore it. TVA claimed that they had "no MCL or UPL in place that this value is exceeding,"[113] flatly ignoring the use of RSLs or Preliminary Remediation Goals for cobalt at Bull Run, Gallatin, and John Sevier. TVA stopped measuring cobalt in this well after 2011.

Data Gaps

TVA stopped reporting results from well 93-2 in 2011 despite the fact that it was showing unsafe concentrations of several pollutants. TVA describes well 93-2R, which was installed in the same location sometime prior to 2008, as a replacement well. This is misleading, however, because the two wells are screened in different strata: Well 93-2 was screened in a layer of gravel roughly parallel to neighboring Wells Creek, while well 93-2R, the deepest onsite well, is

[112] TVA, *Cumberland Fossil Plant USWAG Groundwater Monitoring Report – July 2011*. In fact, higher concentrations of cobalt have been seen at the Gallatin and Paradise plants.
[113] *Id*.

screened roughly 5 meters deeper, in bedrock.[114] As might be expected, the water quality in the two wells is not the same: Well 93-2 shows higher concentrations of boron, chloride, molybdenum, selenium, strontium, and sulfate, while well 93-2R shows higher concentrations of aluminum, barium, cadmium, and manganese. Because these wells provide evidence for different kinds of contamination in different groundwater strata, TDEC should require TVA to continue monitoring both wells.

Wells 10-1 and 10-2 are being monitored as part of TVA's voluntary impoundment monitoring program. In 2011, TVA stopped reporting results from these wells for key coal ash indicators including boron, chloride, cobalt, manganese, molybdenum, and sulfate. Without these data, TVA, TDEC, and the public do not have a clear sense of how the Cumberland ash pond is affecting local groundwater; TVA should continue to measure and report a full suite of pollutants at all wells.

Finally, TVA maintains very few wells at Cumberland and may not be able to adequately characterize the site. For example, the western edge of the site, and the western edge of the ash pond in particular, is effectively unmonitored. TVA should install additional wells at Cumberland to create a more comprehensive database.

Failure to Regulate

Despite the evidence of contamination described above, including reported exceedances of state GWPSs and unsafe concentrations of other pollutants for which TDEC has not established GWPSs, TDEC has not required TVA to remediate the site. TVA's Office of the Inspector General made the following observation about Cumberland (and Gallatin):

> TDEC's Guidance states that Phase III assessment requires the development of a Groundwater Quality Assessment Plan, which should be submitted no later than 45 days after a constituent exceeds the groundwater protection standard. Also, an assessment of corrective measures is to be initiated within 90 days. The policy also states that TDEC will issue a Notice of Violation at the time the assessment is initiated. However, TDEC personnel noted that the above policy has room for discretion and that it would be impossible to meet the 45- and 90-day requirements. <u>TDEC personnel also noted that they were not required to</u>

[114] Groundwater well screen depths are provided in Appendix A to each groundwater monitoring report. Well 93-2 is screened at a depth of 10.6-13.6 meters; well 93-2R is screened at a depth of 19-22 meters. Although we were not able to review well development logs for these wells, soil boring B-21, located a short distance away from these monitoring wells, shows bedrock at a depth of roughly 14 meters. Stantec Consulting Services, Inc., *Report of Geotechnical Exploration, Dry Fly Ash Stack and Gypsum Disposal Complex, Cumberland Fossil Plant, Appendix B* (June, 2010).

> issue a Notice of Violation and chose not to as long as TVA was cooperative and working toward making a quality plan.[115]

There is no evidence that the problems at Cumberland will improve without TDEC intervention. Instead of turning a blind eye to an obvious source of contamination, TDEC and TVA should jointly investigate the possibility of removing the ash from Cumberland's waste disposal area and transferring it to a dry, lined, monitored disposal site.

[115] TVA Office of the Inspector General, *TVA's Groundwater Monitoring at Coal Combustion Products Disposal Areas*, at 7 (June 21, 2011) (emphasis added).

Figure 5-2: Groundwater wells at Cumberland Run Fossil Plant (approximate locations)

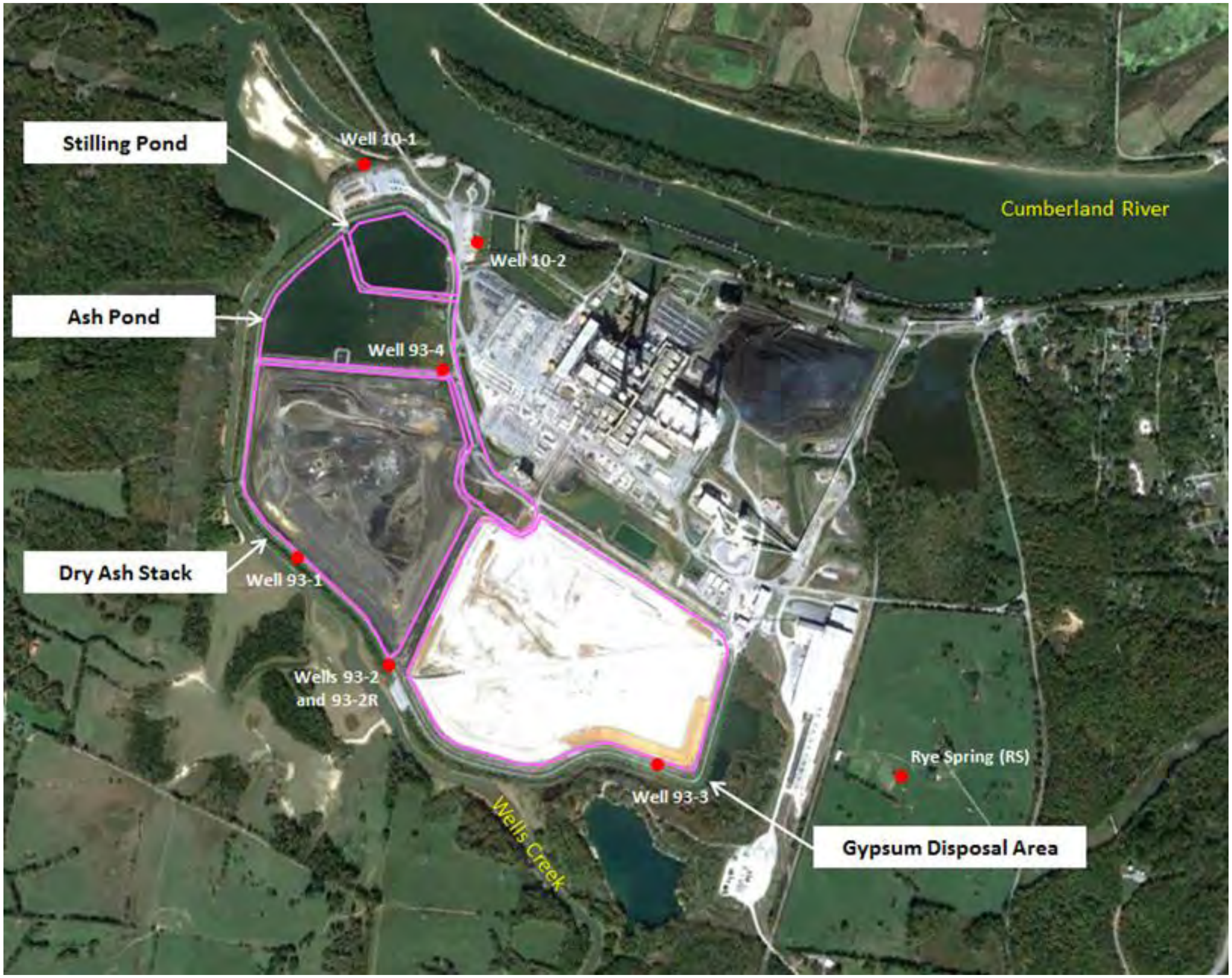


Table 5-2: Cumberland Fossil Plant, Well 10-1. Sampled 5 times between January 2011 and January 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	120 – 350	No data since 7/2011
Antimony	6	<1	
Arsenic	10	<1 – 8.4	
Barium	2,000	55 – 69	
Beryllium	4	<2	
Boron	3,000	<200	No data since 7/2011
Cadmium	5	<0.5 – 1.5	
Chloride	250 mg/L	17 mg/L	No data since 7/2011
Chromium	100	<2 – 2.5	
Cobalt	4.7	6.4 – 7.4	No data since 7/2011
Copper	1,300	<2	No data since 7/2011
Fluoride	4,000	260 – 360	No data since 1/2012
Lead	15	<1	
Lithium	31		No data
Manganese	300	4,000 – 4,300	No data since 7/2011
Mercury	2	<0.2	
Molybdenum	40	<0.5 – 5.7	No data since 7/2011
Nickel	100	6 – 30	
Nitrate	10,000	<100	
Selenium	50	<1 – 1.3	
Silver	100	<1 – 1.5	
Strontium	9,300	120 – 130	No data since 7/2011
Sulfate	500 mg/L	69 – 70 mg/L	No data since 7/2011
TDS	500 mg/L	290 – 330 mg/L	No data since 7/2011
Thallium	2	<1	
Vanadium	63	<2	No data since 7/2011
Zinc	2,000	<10 – 10	No data since 7/2011

Table 5-3: Cumberland Fossil Plant, Well 10-2. Sampled 5 times between January 2011 and January 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	No data since 7/2011
Antimony	6	<1	
Arsenic	10	1.7 – 4.7	
Barium	2,000	69 – 80	
Beryllium	4	<2	
Boron	3,000	<200 – 210	No data since 7/2011
Cadmium	5	<0.5	
Chloride	250 mg/L	49 – 52 mg/L	No data since 7/2011
Chromium	100	<2 – 2.3	
Cobalt	4.7	130 – 150	No data since 7/2011
Copper	1,300	<2	No data since 7/2011
Fluoride	4,000	<100	No data since 1/2012
Lead	15	<1	
Lithium	31		No data
Manganese	300	16,000 – 17,000	No data since 7/2011
Mercury	2	<0.2	
Molybdenum	40	<5	No data since 7/2011
Nickel	100	11 – 18	
Nitrate	10,000	<100 – 140	
Selenium	50	<1 – 1	
Silver	100	<1	
Strontium	9,300	220	No data since 7/2011
Sulfate	500 mg/L	110 – 111 mg/L	No data since 7/2011
TDS	500 mg/L	290 – 320 mg/L	No data since 7/2011
Thallium	2	<1	
Vanadium	63	<2	No data since 7/2011
Zinc	2,000	20 – 24	No data since 7/2011

Table 5-4: Cumberland Fossil Plant, Well 93-1. Sampled 15 times between October 2010 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 600	Not always measured[116]
Antimony	6	<1 – 3.5	
Arsenic	10	1.8 – 28[117]	
Barium	2,000	170 – 330	
Beryllium	4	<2	
Boron	3,000	480 – 1,100	See note
Cadmium	5	<0.5 – 2.0	
Chloride	250 mg/L	250 – 540 mg/L	See note
Chromium	100	<2 – 16	
Cobalt	4.7	1.0 – 10.0	
Copper	1,300	<2 – 18	
Fluoride	4,000	<100 – 190	
Lead	15	<1 – 1.6	
Lithium	31		No data
Manganese	300	1,000 – 32,000	See note
Mercury	2	<0.2	
Molybdenum	40	<5 – 21	See note
Nickel	100	2.1 – 28	
Nitrate	10,000	<100	See note
Selenium	50	<5	
Silver	100	<1 – 3.3	
Strontium	9,300	1,000 – 3,000	See note
Sulfate	500 mg/L	120 – 250 mg/L	See note
TDS	500 mg/L	1,200 – 2,000 mg/L	See note
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 27	

Table 5-5: Cumberland Fossil Plant, Well 93-2. Sampled 7 times between October 2009 and April 2011.[118]

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 - 200	
Antimony	6	<1 – 2.3	
Arsenic	10	4.5 – 17	
Barium	2,000	27 – 41	
Beryllium	4	<2	
Boron	3,000	33,500 – 38,000	
Cadmium	5	<2.5	
Chloride	250 mg/L	1,300 – 1,500 mg/L	
Chromium	100	<10	
Cobalt	4.7	3.4 – 9.4	
Copper	1,300	<10	
Fluoride	4,000	440 – 800	
Lead	15	<1	
Lithium	31		No data
Manganese	300	2,700 – 4,900	
Mercury	2	<1	
Molybdenum	40	420 – 540	
Nickel	100	<1 – 63	
Nitrate	10,000	550 – 1,600	
Selenium	50	13 – 49.5	
Silver	100	<1	
Strontium	9,300	3,000 – 3,400	
Sulfate	500 mg/L	1,800 – 2,100 mg/L	
TDS	500 mg/L	4,850 – 6,600 mg/L	
Thallium	2	<1	
Vanadium	63	<10 – 18	
Zinc	2,000	<50	

[116] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were not measured in April 2012, July 2012, or January 2013.

[117] TVA measured arsenic at 28 ug/L in January 2013, then retested and obtained a result of 8.8 ug/L. See text for further details.

[118] This well was abandoned in 2011. TVA continues to monitor a replacement well located nearby (Well 93-2R).

Table 5-6: Cumberland Fossil Plant, Well 93-2R. Sampled 15 times between October 2009 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	120 – 700	Not always measured[119]
Antimony	6	<1	
Arsenic	10	3.2 – 68[120]	
Barium	2,000	46 – 63	
Beryllium	4	<2	
Boron	3,000	12,000 – 16,000	See note
Cadmium	5	1.2 – 3.6	
Chloride	250 mg/L	1,100 – 1,200 mg/L	See note
Chromium	100	<2 – 16	
Cobalt	4.7	1.1 – 9.0	
Copper	1,300	<10	
Fluoride	4,000	<100 – 240	
Lead	15	<1	
Lithium	31		No data
Manganese	300	11,000 – 18,000	See note
Mercury	2	<1	
Molybdenum	40	<5 – 13	See note
Nickel	100	<1 – 74	
Nitrate	10,000	<0.1	See note
Selenium	50	<1 – 15.5	
Silver	100	<1 – 1.1	
Strontium	9,300	1,300 – 1,500	See note
Sulfate	500 mg/L	1,250 – 1,400 mg/L	See note
TDS	500 mg/L	2,800 – 5,100 mg/L	See note
Thallium	2	<2	
Vanadium	63	<10	
Zinc	2,000	<50	

[119] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were not measured in April 2012, July 2012, or January 2013.

[120] When TVA measured high arsenic in January 2013 (58 ug/L and 68 ug/L in duplicate samples), they retested the well, again in duplicate, and measured 8.6 and 5.7 ug/L. See text for further details.

Table 5-7: Cumberland Fossil Plant, Well 93-3. Sampled 15 times between October 2009 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 7,600	Not always measured[121]
Antimony	6	<1 – 1.9	
Arsenic	10	<1 – 12[122]	
Barium	2,000	140 – 180	
Beryllium	4	<2	
Boron	3,000	5,700 – 6,500	See note
Cadmium	5	<0.5	
Chloride	250 mg/L	37 – 62 mg/L	See note
Chromium	100	<2 – 14	
Cobalt	4.7	<1 – 4.4	
Copper	1,300	<2 – 4.9	
Fluoride	4,000	320 – 510	
Lead	15	<1 – 4.2	
Lithium	31		No data
Manganese	300	930 – 1,600	See note
Mercury	2	<1	
Molybdenum	40	24 – 36	See note
Nickel	100	<1 – 20	
Nitrate	10,000	<0.1 – 0.6	See note
Selenium	50	<1 – 3.0	
Silver	100	<1	
Strontium	9,300	820 – 970	See note
Sulfate	500 mg/L	160 – 210	See note
TDS	500 mg/L	770 – 1,700	See note
Thallium	2	<1	
Vanadium	63	<2 – 20	
Zinc	2,000	<10 – 25	

[121] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were not measured in April 2012, July 2012, or January 2013.

[122] TVA measured arsenic at 12 ug/L in January 2013, then retested and obtained a result of <1 ug/L. See text for further details.

Table 5-8: Cumberland Fossil Plant, Well 93-4. Sampled 13 times between October 2009 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	200 – 1,200	Not always measured[123]
Antimony	6	<1 – 2	
Arsenic	10	<1 – 34[124]	
Barium	2,000	77 – 110	
Beryllium	4	<2	
Boron	3,000	3,800 – 8,100	See note
Cadmium	5	<0.5 – 3.2	
Chloride	250 mg/L	220 – 470 mg/L	See note
Chromium	100	<2 – 3.7	
Cobalt	4.7	<1 – 1.9	
Copper	1,300	<2 – 12	
Fluoride	4,000	<100 – 230	
Lead	15	<1 – 1.1	
Lithium	31		No data
Manganese	300	31 – 510	See note
Mercury	2	<0.2	
Molybdenum	40	<5 – 10	See note
Nickel	100	<1 – 39	
Nitrate	10,000	<0.1	See note
Selenium	50	<1 – 5.7[125]	
Silver	100	<1	
Strontium	9,300	1,200 – 1,600	See note
Sulfate	500 mg/L	390 – 1,100 mg/L	See note
TDS	500 mg/L	1,700 – 2,900 mg/L	See note
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 38	

Table 5-9: Cumberland Fossil Plant, Rye Spring.[126] Sampled 15 times between October 2009 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 38,000	Not always measured[127]
Antimony	6	<1	
Arsenic	10	<10	
Barium	2,000	31 – 300	
Beryllium	4	<2	
Boron	3,000	<200 – 970	See note
Cadmium	5	<0.5	
Chloride	250 mg/L	6.5 – 15 mg/L	See note
Chromium	100	<2 – 24	
Cobalt	4.7	<1 – 10	
Copper	1,300	<2 – 24	
Fluoride	4,000	190 – 360	
Lead	15	<1 – 23	
Lithium	31		No data
Manganese	300	17 – 710	See note
Mercury	2	<0.2	
Molybdenum	40	<5 – 6	See note
Nickel	100	<1 – 25	
Nitrate	10,000	2,800 – 8,900	See note
Selenium	50	<1 – 4	
Silver	100	<1	
Strontium	9,300	360 – 570	See note
Sulfate	500 mg/L	48 – 68 mg/L	See note
TDS	500 mg/L	360 – 1,400 mg/L	See note
Thallium	2	<2	
Vanadium	63	<2 – 26	
Zinc	2,000	<10 – 120	

[123] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were not measured in April 2012, July 2012, or January 2013.

[124] TVA measured arsenic at 34 ug/L in January 2013, then retested and obtained a result of 1.7 ug/L. See text for further details.

[125] TVA has been using two labs to test for selenium, one with higher results (shown here) and one that typically reports <1 ug/L.

[126] Rye Spring and Wells Creek surface water sampling locations are included here because TVA uses them as upgradient comparisons for Cumberland groundwater.

[127] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were not measured in April 2012, July 2012, or January 2013.

Table 5-10: Cumberland Fossil Plant, Wells Creek.[128] Sampled 13 times between October 2009 and October 2012.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	Not always measured[129]
Antimony	6	<1	
Arsenic	10	<10	
Barium	2,000	26 – 38	
Beryllium	4	<2	
Boron	3,000	<200	See note
Cadmium	5	<0.5	
Chloride	250 mg/L	4.7 – 6.15 mg/L	See note
Chromium	100	<2	
Cobalt	4.7	<1	
Copper	1,300	<2 – 24	
Fluoride	4,000	<100	
Lead	15	<1	
Lithium	31		No data
Manganese	300	<10 – 20	See note
Mercury	2	<0.2	
Molybdenum	40	<5	See note
Nickel	100	<1 – 4	
Nitrate	10,000	350 – 720	See note
Selenium	50	<1 – 4	
Silver	100	<1 – 5.05	
Strontium	9,300	120 – 180	See note
Sulfate	500 mg/L	5.6 – 7.9 mg/L	See note
TDS	500 mg/L	160 – 2,530 mg/L	See note
Thallium	2	<2	
Vanadium	63	<10	
Zinc	2,000	<10	

[128] Rye Spring and Wells Creek surface water sampling locations are included here because TVA uses them as upgradient comparisons for Cumberland groundwater.
[129] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were not measured in April 2012, July 2012, or January 2013.

6 Gallatin Fossil Plant

Background

The Gallatin Fossil Plant is located on the Cumberland River in Gallatin, TN. TVA has been operating four coal units at the site since the 1950s. The original ash pond was located immediately west of the site; TVA abandoned this pond in 1970 when it built the existing ash pond complex to the north of the site. Within the active ash pond complex, the active fly ash pond receives 185,000 dry tons of fly ash each year, and the bottom ash pond receives roughly 45,000 dry tons of bottom ash.

In its Phase I engineering assessment for Gallatin, Stantec Consulting Services observed that "karst bedrock and sinkhole activity is present plant-wide and is a concern." [130] In response to the identified karst-related risk, Stantec recommended that TVA "install[] lining systems beneath all ponds or convert[] to dry disposal operation."[131] The risk of sinkholes is not a merely conjectural concern; many sinkholes have formed at Gallatin in the past: From 1970-1978, all of the water put into the currently active ash pond complex drained through sinkholes – up to 111 of them – and the pond never reached the level of the permitted outfall.[132] Although TVA filled enough sinkholes to bring the pond up to the level of the outfall, it is not clear how many sinkholes were left unrepaired, or how much ash pond leachate has drained through existing or new sinkholes since then.[133] More recently, sinkholes were identified during the 2006 expansion of the fly ash pond, and another sinkhole was discovered in 2010.[134] Sinkholes can affect groundwater, and groundwater monitoring just north of Gallatin's active ash pond in the late 1980s found evidence that leachate from the ash ponds had affected a cluster of wells, including residential wells, causing elevated concentrations of boron, manganese, and other pollutants.[135]

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[130] Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Tennessee, Appendix E – Gallatin Fossil Plant*, Bottom Ash Pond A pages 5-6 of 6, Fly Ash Pond E page 6, Stilling Ponds B, C and D pages 5-6 (June 24, 2009).
[131] *Id*.
[132] *See* TVA memorandum, *Gallatin Steam Plant – Ash Disposal Pond – Leakage Problems* (Jan. 25, 1979); *see also* TVA, *Magnitude of Ash Disposal Pond Leakage Problem – Gallatin Steam Plant* (Apr. 1977).
[133] *See* TVA, *Magnitude of Ash Disposal Pond Leakage Problem – Gallatin Steam Plant*, 3 (Apr. 1977) ("If the present leaks from the pond were plugged and the water level in the pond rose to the elevation of the outfall weir, one or more of another 52 sinkholes could begin to leak. In addition, sink holes which are not presently leaking could begin to leak because of increased hydrostatic pressure. . . . [P]lugging the presently leaking sinkholes would give no assurance that other sinkholes would not begin to leak.").
[134] Stantec Consulting Services, Inc., *Report of Geotechnical Exploration and Slope Stability Evaluation: Ash Pond / Stilling Pond Complex, Gallatin Fossil Plant* 8 (May 27, 2010).
[135] TVA, *An Evaluation of the Impacts of the Gallatin Fly Ash Pond to Groundwater Resources* (Aug. 1989).

It is clear that status quo waste disposal operations at Gallatin will continue to be accompanied by the risk of sinkholes and groundwater contamination. New operations, including the possible construction of a Flue Gas Desulfurization (FGD) waste disposal facility, will increase this risk.

Monitoring

Figure 6-2 shows the approximate locations of the groundwater wells discussed in this report. The oldest wells are those along the edge of the abandoned ash pond, wells 19-R and 20, and well 21, which is between the plant's coal pile and the cooling water discharge channel. Well 21 is upgradient of the abandoned ash pond and the other two wells, so it was originally used as a background well. When it became apparent that well 21 was contaminated (see below), TVA installed a new background well, well 22, on the other side of the discharge channel.[136] In 2010, as part of the USWAG voluntary monitoring plan, TVA installed wells 23, 24, and 25 to the west and north of the ash pond complex. TVA also started monitoring well 17, a pre-existing well located on the southwest corner of the ash pond complex, as part of the USWAG program.[137] Wells 26 and 27, which are bedrock wells located near wells 19R and 20, were installed in 2012.[138]

All of the groundwater beneath the Gallatin plant ultimately discharges to the river, either directly, as in the case of groundwater monitored by wells adjacent to the river, or through underlying bedrock.[139]

The data that we have on file cover the period February 2008 through April 2013, and they reveal three distinct areas of concern.

First, the abandoned ash pond is leaching pollutants into the local groundwater and surface water (see Figs. 1-1 to 1-3 in the Introduction). Wells 19-R and 20 have both shown unsafe concentrations of boron, cobalt, manganese, and sulfate in recent years. One of these two wells, 19-R, has also shown unsafe concentrations of aluminum, beryllium, cadmium, and

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[136] Well 22 was installed in 2009 (*see* TVA, *Gallatin Fossil Plant Abandoned Ash Disposal Area Groundwater Assessment Monitoring Report – October 2009*, Dec. 4 2009), but was not approved for use as a background well until 2011 (*see* TVA, *Gallatin Fossil Plant Abandoned Ash Disposal Area Groundwater Assessment Monitoring Report – April 2011*, June 7, 2011).

[137] It is not clear when well 17 was installed or how often it was sampled between installation and the beginning of the USWAG monitoring program, but TVA's ash pond closure plan for Gallatin describes well 17 as "existing" when wells 23, 24 and 25 were installed. URS, *TVA Gallatin Fossil Plant – Preliminary Ash Pond Closure Plan (Revision 0) – Prepared for TVA*, Appendix B page 4 (Sep. 25, 2012).

[138] *See* TVA, *Gallatin Fossil Plant Abandoned Ash Disposal Area Groundwater Assessment Monitoring Report – July 2012*, 1 (Sep. 6, 2012).

[139] URS, *supra* note 137, at Appendix B page 3 ("A raised area of groundwater in and around the Ash Pond Complex causes flow to generally radiate outward until it either discharges to the adjacent river or reaches the underlying bedrock. . . [B]edrock groundwater eventually discharges to the river.").

nickel. Vanadium concentrations in well 19-R have historically been higher than in other on-site wells, but below the current EPA Regional Screening Level used to define exceedances in this report.[140] Wells 26 and 27, deeper wells near wells 19-R and 20, have only recently been installed and sampled, but have also shown unsafe levels of boron, cobalt, manganese, and sulfate. Arsenic in several wells exceeded the MCL of 10 ug/L in 2013. Since arsenic had not been elevated in earlier monitoring, TVA had samples from each well retested by additional labs. All downgradient wells exceeded the MCL at least once in 2013. Taken together, 2013 results have ranged from <1 to 140 ug/L in well 19R, from 1.1 to 79 ug/L in well 20, from <1 to 22 ug/L in well 26, and from <1 to 15 ug/L in well 27. Since groundwater flow in this area is toward the river, and since the strip of land between the inactive ash pond and the river is very narrow, the practical reality is that these pollutants are leaching directly into the river.

Cobalt concentrations in certain wells have been extremely high in recent monitoring (see Fig. 6-1 below), and this is consistent with historical trends. Three wells, 19-R, 20, and 21, routinely show concentrations greater than 100 ug/L, more than 20 times higher than the RSL of 4.7 ug/L; well 26 also exceeds the RSL. In 2011, TVA asked TDEC to consider the high cobalt to be naturally occurring based on the following evidence. First, soil cobalt concentrations around well 21 were much higher than cobalt concentrations in coal ash produced onsite. Second, groundwater concentrations were historically higher upgradient of the ash pond than downgradient. Finally, well drilling had revealed manganese "nodules," which may have suggested a natural source of cobalt (manganese and iron deposits).[141] On the other hand, there is good evidence that the cobalt may be related to coal ash or other TVA operations: First, concentrations in background well 22 have been consistently lower than the RSL of 4.7 ug/L, and have been undetected at <1 ug/L since 2011. Second, recent monitoring shows cobalt concentrations in downgradient well 19R that are as high as they ever were in well 21. Despite the mixed evidence and the dangerously high cobalt concentrations, TDEC accepted the idea that cobalt was naturally occurring in 2003,[142] and stopped requiring cobalt monitoring and reporting in 2011.[143]

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[140] Between April 2009 and October 2011, TVA groundwater reports compared vanadium concentrations to the Regional Screening Level, which at the time was 5 ug/L, and identified well 19-R as exceeding that standard.
[141] Letter from Gordon G. Park, TVA, to Alfred Majors, Tennessee Division of Solid Waste Management, re: Evaluation of Naturally-Occurring Cobalt (Dec. 19, 2001).
[142] Letter from Al Majors and Alan D. Spear, Tennessee Division of Solid Waste Management, to Gordon G. Park, TVA, re: Natural Background Cobalt in Soils and Water (Feb. 10, 2003).
[143] *See, e.g.*, TVA, *Gallatin Fossil Plant Abandoned Ash Disposal Area Groundwater Assessment Monitoring Report – April 2011*, 2 (June 7, 2011) ("Naturally-occurring cobalt, associated [with] concretionary mineral deposits in the alluvial sediments in the AADA vicinity, has been shown to be a likely source of elevated cobalt concentrations observed in GAF-19R, GAF-20, and in former background well GAF-21 (12/19/2001 letter from G.G. Park to A. Majors of TDEC).").

Well 21, which was once used an upgradient background well and has since been dropped from monitoring, had unsafe concentrations of cadmium, cobalt, manganese, mercury, strontium and sulfate. In 2011, TVA acknowledged that well 21 was contaminated.[144] This well is upgradient of the abandoned ash pond and has a different contamination profile than wells 19-R and 20, so the contamination may be from another source.

Well 17, which was installed or reactivated in 2010, is at the southwest corner of the active ash pond complex. This well has had high concentrations of cobalt and manganese since 2010.

Data gaps

1. Suspended cobalt monitoring. Cobalt has long been a problem at Gallatin. TVA has argued that the cobalt is naturally occurring. Even if the cobalt is naturally occurring, it is an environmental risk that TDEC should be keeping track of. Instead, however, TDEC suspended cobalt monitoring and reporting requirements in 2011.[145] Although TVA continues to collect cobalt data, it no longer includes these results in the main body their groundwater reports.

2. Suspended monitoring of well 21. Well 21 is clearly contaminated, with unsafe concentrations of cadmium, cobalt, manganese, mercury, strontium, and sulfate. According to Tennessee's Assessment Monitoring regulations, the high concentrations of cadmium and mercury, and perhaps cobalt, should have triggered corrective action.[146] Instead of requiring TVA to address the problem, however, TDEC allowed it to suspend monitoring.[147]

3. Incomplete well network. The USWAG well network around the ash pond complex is incomplete, with two wells at the northwest corner, one well at the southwest corner, but no wells in the center of the western edge of the complex, and no wells south, east, or north of the complex (aside from upgradient well 25 to the north). As explained in the 2012 ash pond closure plan,

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[144] *See* TVA, *Gallatin Fossil Plant Abandoned Ash Disposal Area Groundwater Assessment Monitoring Report – February 2011*, 4 (Mar. 11, 2011) ("GAF-21 is now believed to be contaminated.").

[145] See TVA, *Gallatin Fossil Plant Abandoned Ash Disposal Area Groundwater Assessment Monitoring Report – October 2011*, 2 (Mar. 11, 2011) ("TDEC recently suspended requirements to monitor and report cobalt data from the AADA site (personal communication, A.D. Spear to R.L. Hooper, 11/21/2011)."). TVA has continued to include cobalt in its lab analyses but is no longer listing cobalt results in its groundwater reports.

[146] *See* Tenn. Comp. Rules & Regs. 1200-01-07-.04(7); URS, *supra* note 137 at Appendix B page 14; TVA Office of the Inspector General (OIG), *TVA's Groundwater Monitoring at Coal Combustion Products Disposal Areas*, at 7 (June 21, 2011).

[147] Well 21 results were left out of groundwater reports beginning in January 2010, but the well was still sampled and results were available in lab analyses appended to the groundwater reports. In the July 2011 groundwater report, TVA stated that well 21 would only be used for groundwater level measurements, and would no longer be sampled. TVA, *Gallatin Fossil Plant Abandoned Ash Disposal Area Groundwater Assessment Monitoring Report – July 2011*, 4 (Aug. 30, 2011)

> Originally, all three downgradient wells were intended to be placed between the Ash Pond Complex and the Cumberland River; due to safety concerns of drilling too close to high power transmission lines, one of the downgradient wells was moved to the northern edge of the Ash Pond Complex. As a result, two wells were installed near the northwestern corner of the facility, with one (GAF-23) installed into overburden and the other (GAF-24) installed into the Carters Limestone, both being screened in the first water encountered at those locations.[148]

This is unlikely to be sufficient. TVA identified an area of leachate migration to the north in 1989, and at the time had four wells in that area in addition to residential wells.[149] TVA is currently monitoring just one well in that area (Well 25). Migration to the west, and particularly to the east, is also unlikely to be identified by the existing wells. There should be wells in these areas because, as TVA has observed, "[t]he true flows from the [ash pond complex] would be expected to radiate out laterally from each side of the ash pond, since impounded waters would likely mound up over ambient water levels."[150]

Failure to regulate

Because of the known on-site contamination, TDEC placed Gallatin in phase III assessment monitoring in 2009.[151] Documented exceedances of groundwater protection standards since that time should, according to Tennessee law, require corrective action.[152] Specifically, TDEC should have required TVA to remediate the leaking abandoned ash pond and to identify and remediate the source of the contamination in Well 21. But so far TDEC has failed to impose any corrective action requirements at all.[153] As described above, TDEC's only real response to the problem has been to allow TVA to discontinue monitoring at well 21 and to discontinue cobalt monitoring. Instead of dealing with the problem, TDEC has chosen to ignore the problem and allow the site to bleed mercury, cobalt, and other pollutants into the Cumberland River indefinitely.

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[148] URS, *supra* note 137, at Appendix B page 4.
[149] TVA, *An Evaluation of the Impacts of the Gallatin Fly Ash Pond to Groundwater Resources* (Aug. 1989).
[150] TVA, *Gallatin Fossil Plant Ash Impoundment Groundwater Monitoring Report, July 2011*.
[151] TVA Office of the Inspector General, *TVA's Groundwater Monitoring at Coal Combustion Products Disposal Areas*, 7 (June 21, 2011).
[152] *See* Tenn. Comp. Rules & Regs. 1200-01-07-.04(7); URS, *supra* note 137 at Appendix B page 14; TVA OIG, *supra* note 146 at 7.
[153] TVA OIG, *supra* note 146 at 7 ("TDEC personnel also noted that they were not required to issue a Notice of Violation and chose not to as long as TVA was cooperative and working toward making a quality plan.").

Figure 6-1: Cobalt (ug/L) in wells near the Abandoned Ash Pond, February 2008 through April 2013. Hollow data points were undetected at the detection limit shown.

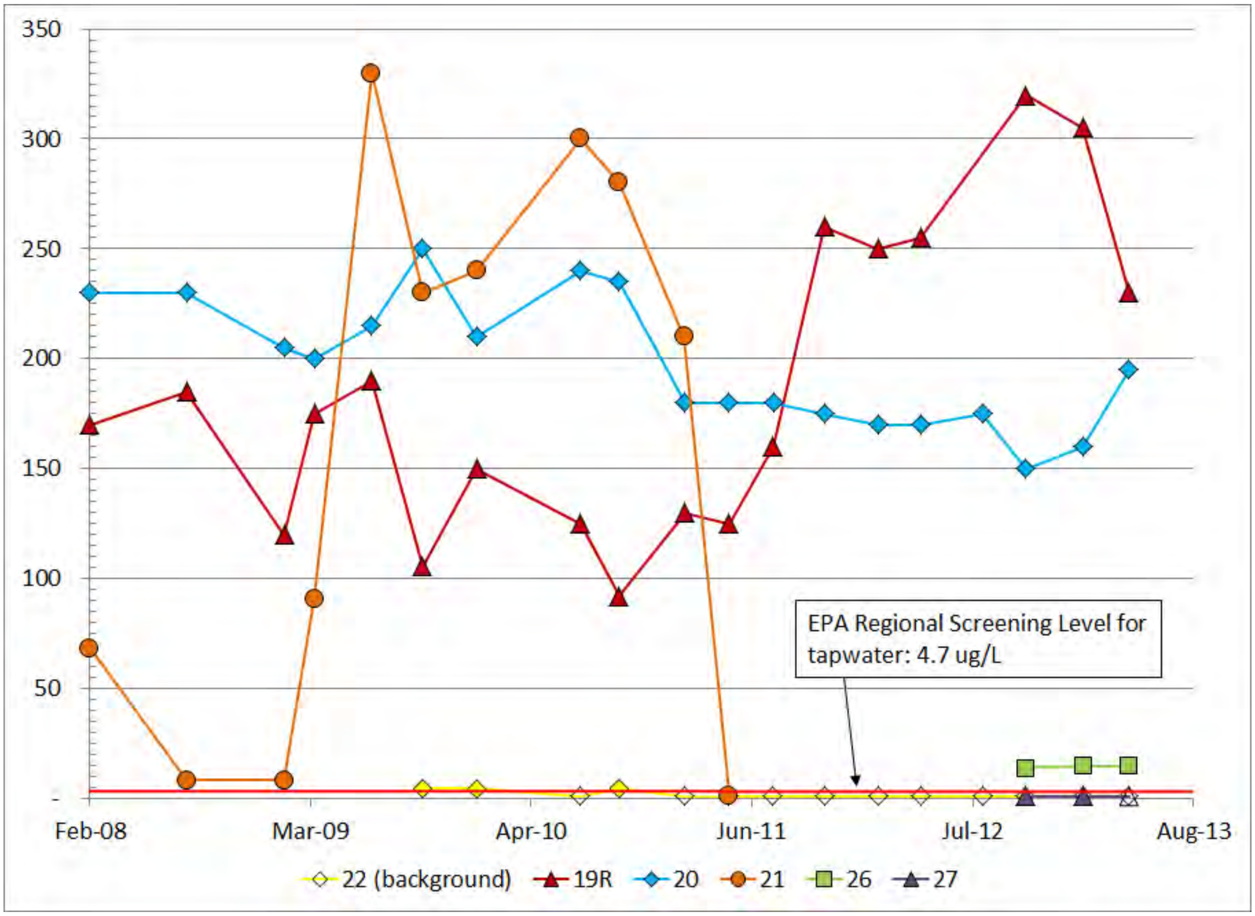

Figure 6-2: Groundwater wells at Gallatin Fossil Plant (approximate locations)

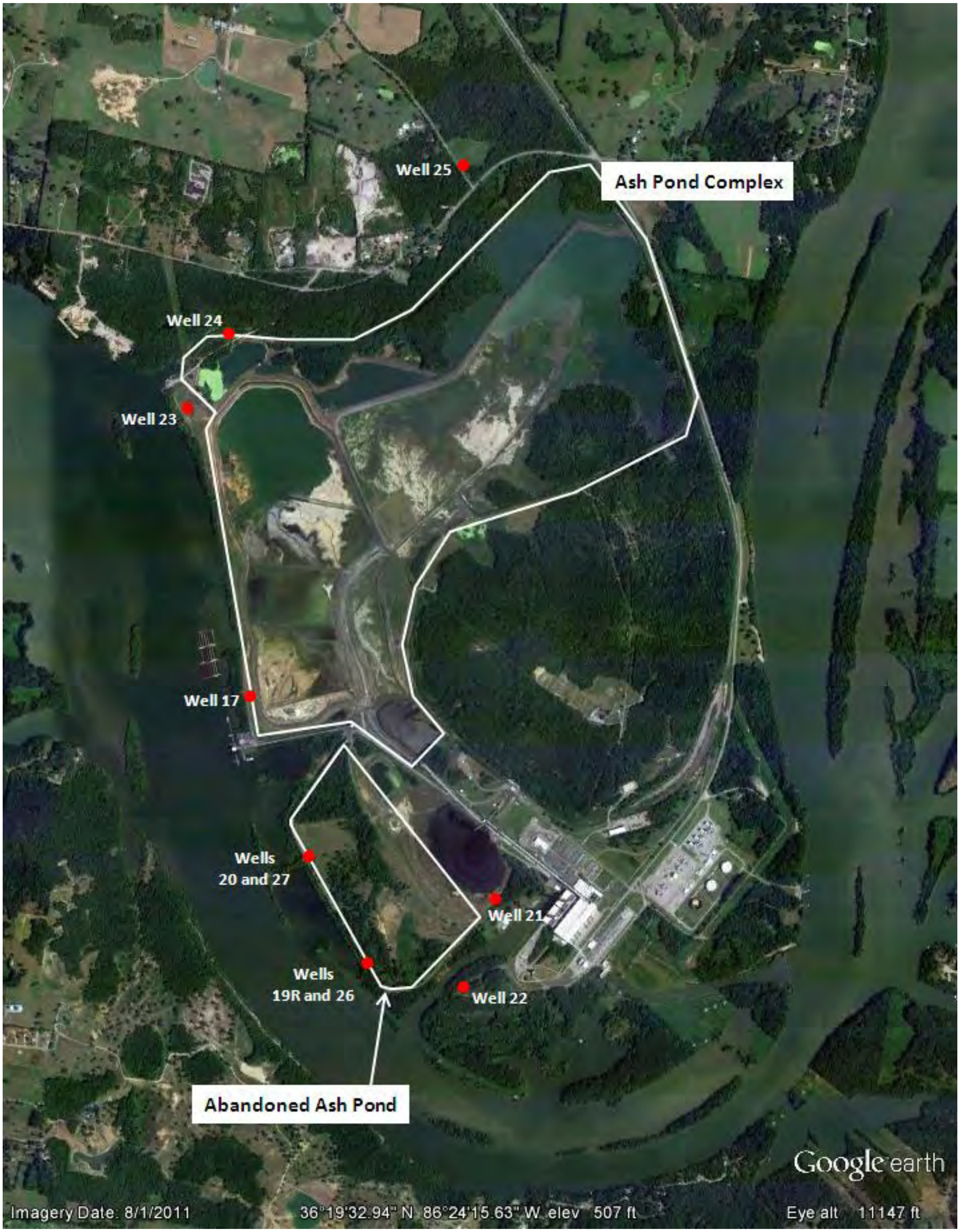

Table 6-1: Gallatin Fossil Plant, Well 17. Sampled 4 times between February 2011 and January 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 640	No data since 1/2012
Antimony	6	<1	
Arsenic	10	<1 – 2.0	
Barium	2,000	36 – 100	
Beryllium	4	<2	
Boron	3,000	1,200 – 2,100	
Cadmium	5	<0.5 – 0.64	
Chloride	250 mg/L	10 – 11 mg/L	No data since 1/2012
Chromium	100	<2 – 6.3	
Cobalt	4.7	3.0 – 7.8	No data since 1/2012
Copper	1,300	<2 – 6.2	No data since 1/2012
Fluoride	4,000	990 – 1,000	
Lead	15	<1 – 2.2	
Lithium	31		No data
Manganese	300	260 – 1,500	No data since 1/2012
Mercury	2	<0.2	
Molybdenum	40	7.0 – 7.9	No data since 1/2012
Nickel	100	5.1 – 27.0	
Nitrate	10,000	<100	
Selenium	50	<1 – 1.3	
Silver	100	<1	
Strontium	9,300	0.62 – 0.65	No data since 1/2012
Sulfate	500 mg/L	230 – 240	No data since 1/2012
TDS	500 mg/L	620 – 630	No data since 1/2012
Thallium	2	<1	
Vanadium	63	<2 - 2.4	No data since 1/2012
Zinc	2,000	<10 – 42	No data since 1/2012

Table 6-2: Gallatin Fossil Plant, Well 19-R. Sampled 19 times between February 2008 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	69,000 – 125,000	
Antimony	6	<1	
Arsenic	10	<1 – 135[154]	
Barium	2,000	<5 – 110	
Beryllium	4	11 – 24.5	
Boron	3,000	2,950 – 4,500	
Cadmium	5	2.65 – 7.9	
Chloride	250 mg/L	2.1 – 7.4 mg/L	
Chromium	100	<40	
Cobalt	4.7	92 – 320[155]	
Copper	1,300	<2 – 51	
Fluoride	4,000	<100 – 755	
Lead	15	<1 – 7.5	
Lithium	31		No data
Manganese	300	11,000 – 33,000	
Mercury	2	<0.2	
Molybdenum	40	<50[156]	
Nickel	100	120 – 250	
Nitrate	10,000		No data
Selenium	50	<1 – 18.8	
Silver	100	<0.5 – 16.7	
Strontium	9,300	1,150 – 1,500	
Sulfate	500 mg/L	2,950 – 6,300 mg/L	
TDS	500 mg/L	3,750 – 6,700 mg/L	
Thallium	2	<1	
Vanadium	63	<2 – 66	
Zinc	2,000	495 – 1,000[157]	

[154] This well started showing arsenic levels above the MCL in 2013 (see report text).

[155] Cobalt in this well was reported as <1 ug/L in July 2012, but that result is presumed to be inaccurate given that cobalt results immediately before and after July 2012 were over 200 ug/L.

[156] There have been no positive detections of molybdenum above 40 ug/L, and results are generally nondetect at <5 or <25 ug/L.

[157] Zinc in this well was reported as 30 ug/L in July 2012. This is likely to be inaccurate given that all other values, before and after July 2012, have been above 400 ug/L.

Table 6-3: Gallatin Fossil Plant, Well 20. Sampled 19 times between February 2008 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 1,600	
Antimony	6	<1	
Arsenic	10	<1 – 78[158]	
Barium	2,000	12 – 30	
Beryllium	4	<2	
Boron	3,000	5,300 – 5,800	
Cadmium	5	<0.5 – 0.97	
Chloride	250 mg/L	2.8 – 5.4 mg/L	
Chromium	100	<1 – 3.3	
Cobalt	4.7	150 – 250	
Copper	1,300	<10	
Fluoride	4,000	<100 – 230	
Lead	15	<1	
Lithium	31		No data
Manganese	300	16,000 – 22,000	
Mercury	2	<0.2	
Molybdenum	40	<5 – 23	
Nickel	100	33 – 63	
Nitrate	10,000		No data
Selenium	50	<1 – 1.6	
Silver	100	<1	
Strontium	9,300	1,200 – 1,400	
Sulfate	500 mg/L	1,400 – 2,050 mg/L	
TDS	500 mg/L	1,900 – 2,300 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<50	

Table 6-4: Gallatin Fossil Plant, Well 21. Sampled 11 times between February 2008 and April 2011. No data since April 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	510 – 10,000	
Antimony	6	<1	
Arsenic	10	<1 – 2.2	
Barium	2,000	21 – 200	
Beryllium	4	<1 – 3.0	
Boron	3,000	<200	
Cadmium	5	<0.5 – 5.8	
Chloride	250 mg/L	59 – 100 mg/L	
Chromium	100	2.1 – 27	
Cobalt	4.7	1.3 – 330	
Copper	1,300	3.2 – 7.7	
Fluoride	4,000	<100 – 1,900	
Lead	15	<1 – 2.1	
Lithium	31		No data
Manganese	300	300 – 18,000	
Mercury	2	<0.2 – 3	
Molybdenum	40	<5 – 8.3	
Nickel	100	13 – 110	
Nitrate	10,000		No data
Selenium	50	<1 – 10	
Silver	100	<0.5 – 20	
Strontium	9,300	<10 – 10,000	
Sulfate	500 mg/L	340 – 1,800 mg/L	
TDS	500 mg/L	960 – 1,900 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	13 – 280	

[158] This well started showing arsenic levels above the MCL in 2013 (see report text).

Table 6-5: Gallatin Fossil Plant, Well 22. Sampled 14 times between October 2009 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	100 – 6,000	
Antimony	6	<1	
Arsenic	10	<1 – 3.4	
Barium	2,000	9.5 – 73	
Beryllium	4	<5	
Boron	3,000	<200 – 260	
Cadmium	5	<0.5 – 0.52	
Chloride	250 mg/L	<1 – 2.3 mg/L	
Chromium	100	<1 – 43	
Cobalt	4.7	<1 – 4.6	
Copper	1,300	<2 – 8.5	
Fluoride	4,000	<100 – 180	
Lead	15	<1 – 5.8	
Lithium	31		No data
Manganese	300	<10 – 370	
Mercury	2	<0.2	
Molybdenum	40	<5 – 11	
Nickel	100	<1 – 39	
Nitrate	10,000		No data
Selenium	50	<1 – 5	
Silver	100	<1	
Strontium	9,300	57 – 140	
Sulfate	500 mg/L	<5 – 32 mg/L	
TDS	500 mg/L	<10 – 320	
Thallium	2	<1	
Vanadium	63	<2 – 14	
Zinc	2,000	<10 – 39	

Table 6-6: Gallatin Fossil Plant, Well 23. Sampled 5 times between January 2011 and January 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	810 – 1,300	No data since 1/2012
Antimony	6	<1	
Arsenic	10	<1 – 1.1	
Barium	2,000	55 – 68	
Beryllium	4	<2	
Boron	3,000	290 – 410	No data since 1/2012
Cadmium	5	<0.5	
Chloride	250 mg/L	5.8 – 6.8 mg/L	No data since 1/2012
Chromium	100	<2	
Cobalt	4.7	<1 – 2.2	No data since 1/2012
Copper	1,300	<2	No data since 1/2012
Fluoride	4,000	<100	
Lead	15	<1	
Lithium	31		No data
Manganese	300	35 – 300	No data since 1/2012
Mercury	2	<0.2	
Molybdenum	40	<5 – 9.1	No data since 1/2012
Nickel	100	<1 – 8.2	
Nitrate	10,000	0.66 – 0.67	No data prior to 7/2012
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300	220 – 260	No data since 1/2012
Sulfate	500 mg/L	250 – 260 mg/L	No data since 1/2012
TDS	500 mg/L	640 – 740 mg/L	
Thallium	2	<1	
Vanadium	63	<2 – 2.3	No data since 1/2012
Zinc	2,000	<10 – 11	No data since 1/2012

Table 6-7: Gallatin Fossil Plant, Well 24. Sampled 5 times between February 2011 and January 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 200	No data since 1/2012
Antimony	6	<1	
Arsenic	10	<1 – 1.3	
Barium	2,000	23 – 34	
Beryllium	4	<2	
Boron	3,000	<200	No data since 1/2012
Cadmium	5	<0.5	
Chloride	250 mg/L	1.0 – 1.2 mg/L	No data since 1/2012
Chromium	100	<2	
Cobalt	4.7	<1	No data since 1/2012
Copper	1,300	<2	No data since 1/2012
Fluoride	4,000	<100	
Lead	15	<1	
Lithium	31		No data
Manganese	300	32 – 68	No data since 1/2012
Mercury	2	<0.2	
Molybdenum	40	<5 – 11	No data since 1/2012
Nickel	100	1.2 – 8.7	
Nitrate	10,000	<0.1	No data prior to 7/2012
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300	210 – 230	No data since 1/2012
Sulfate	500 mg/L	230 – 240 mg/L	No data since 1/2012
TDS	500 mg/L	710 – 760 mg/L	
Thallium	2	<1	
Vanadium	63	<2	No data since 1/2012
Zinc	2,000	<10	No data since 1/2012

Table 6-8: Gallatin Fossil Plant, Well 25. Sampled 5 times between January 2011 and January 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 280	No data since 1/2012
Antimony	6	<1 – 1.2	
Arsenic	10	<1 – 1.9	
Barium	2,000	86 – 100	
Beryllium	4	<2	
Boron	3,000	<200	No data since 1/2012
Cadmium	5	<0.5	
Chloride	250 mg/L	42 – 66 mg/L	No data since 1/2012
Chromium	100	<2	
Cobalt	4.7	<1 – 2.5	No data since 1/2012
Copper	1,300	<2	No data since 1/2012
Fluoride	4,000	<100 – 120	
Lead	15	<1	
Lithium	31		No data
Manganese	300	140 – 210	No data since 1/2012
Mercury	2	<0.2	
Molybdenum	40	5.1 – 7.2	No data since 1/2012
Nickel	100	<1 – 2.6	
Nitrate	10,000	<0.1	No data prior to 7/2012
Selenium	50	<1 – 1.7	
Silver	100	<1	
Strontium	9,300	260 – 270	No data since 1/2012
Sulfate	500 mg/L	32 – 46 mg/L	No data since 1/2012
TDS	500 mg/L	420 – 440 mg/L	
Thallium	2	<1	
Vanadium	63	<2	No data since 1/2012
Zinc	2,000	<10	No data since 1/2012

Table 6-9: Gallatin Fossil Plant, Well 26. Sampled 4 times between July 2012 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	330 – 740	
Antimony	6	<1	
Arsenic	10	1.5 – 22	
Barium	2,000	<2 – 51	
Beryllium	4	<2	
Boron	3,000	5,500 – 5,900	
Cadmium	5	<0.5	
Chloride	250 mg/L	3.6 – 8.9 mg/L	
Chromium	100	<1 – 4.4	
Cobalt	4.7	14 - 15	
Copper	1,300	<2	
Fluoride	4,000	<100 – 200	
Lead	15	<1	
Lithium	31		No data
Manganese	300	8,700 – 9,400	
Mercury	2	<0.2	
Molybdenum	40	7 – 14	
Nickel	100	<1 – 18	
Nitrate	10,000		No data
Selenium	50	<1 – 2	
Silver	100	<1	
Strontium	9,300	99 – 1,100	
Sulfate	500 mg/L	880 – 1,000 mg/L	October 2012 only
TDS	500 mg/L	1,500 – 1,600 mg/L	October 2012 only
Thallium	2	<1	
Vanadium	63	<2 – 2	
Zinc	2,000	<10	

Table 6-10: Gallatin Fossil Plant, Well 27. Sampled 4 times between July 2012 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 180	
Antimony	6	<1	
Arsenic	10	<1 – 15	
Barium	2,000	52 – 100	
Beryllium	4	<2	
Boron	3,000	4,800 – 5,400	
Cadmium	5	<0.5 – 2.4	
Chloride	250 mg/L	4.2 – 4.6 mg/L	
Chromium	100	<2	
Cobalt	4.7	<1 – 1.1	
Copper	1,300	1.5 – 5.5	
Fluoride	4,000	160 – 400	
Lead	15	<1	
Lithium	31		No data
Manganese	300	170 – 600	
Mercury	2	<0.2	
Molybdenum	40	<5 – 19	
Nickel	100	9 – 13	
Nitrate	10,000		No data
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300	1,200 – 1,300	
Sulfate	500 mg/L	840 – 920 mg/L	
TDS	500 mg/L	1,400 – 1,600 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	<10 – 14	

7 John Sevier Fossil Plant

Background

John Sevier Fossil Plant includes four coal units on the Holston River near Rogersville, TN. The plant went online in 1955, and TVA idled the coal units in 2012. TVA originally disposed of the ash from John Sevier in a series of ponds located along the Holston River, in the area now covered by the dry fly ash disposal area and the sediment pond. In 1979, TVA started using Area 2 as a bottom ash pond and started disposing of dry fly ash on top of the fly ash and bottom ash in the old ash ponds. Ash Disposal Area J had a shorter lifespan - TVA started using Area J as a fly ash settling pond in 1982, converted to dry stacking in 1988, and closed the area in 1999.

John Sevier does not appear to have the same karst bedrock as many of the TVA plants, and therefore has less natural vulnerability to sinkholes and related groundwater contamination. Other, anthropogenic sources of vulnerability do exist, however, including the fact that the dikes around the original ash ponds, now the dry fly ash disposal area, were poorly built. After a section of the northern dike collapsed in 1973, TVA observed that:

> A large percent of ash was used as material to raise the dikes. DED had recommended that ash not be used in dike building at John Sevier since the ash there is not suitable for this purpose because a significant portion is not stable when wet and it erodes easily.[159]

The dikes were also too steep to be structurally sound; the same memo went on to observe that "the entire dike system at John Sevier has the same inadequacies."[160] As a result of this poor construction, John Sevier has had a history of dike failures, sloughing, and seepage.[161]

Monitoring

TVA currently monitors eight wells at John Sevier, mainly around the dry fly ash disposal area. Wells along the north dike of the dry fly ash disposal area show unsafe concentrations of boron, manganese, and sulfate, and in some cases cobalt (wells W28 and W30). Well W31 also showed very high concentrations of molybdenum in April 2008, but molybdenum has not been

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[159] TVA*, John Sevier Steam Plant – Inspection of Ash Disposal Pond Dikes*, memo to file from R. J. Bowman, Principal Civil Engineer (June 8, 1973) (reproduced in Stantec Consulting Services Inc., *Report of Geotechnical Exploration – John Sevier Fossil Plant*, Appendix A – historical documents, Feb. 8, 2010).

[160] *Id*.

[161] *See generally* Stantec Consulting Services Inc., *Report of Phase 1 Facility Assessment, Tennessee, Appendix F – John Sevier Fossil Plant*, Dry Fly Ash Area pages 2 – 6 and Sediment Pond West page 2; Parsons Energy and Chemicals Group Inc., *Fly Ash Pond Dike Slope Stability Evaluation – Phase One Report* (Dec. 9, 1999).

measured since then (see Data Gaps section below). When compared to upgradient background water quality, all of the wells around the dry fly ash disposal area have shown significantly elevated concentrations of boron, sulfate, and many other contaminants in recent years.[162] Although results for well W31 suggest cadmium contamination, TVA tested water from that well at three different labs in 2011, and only one of the three has reported such high concentrations.[163] TVA suggested that the high readings at one lab were caused by interference from elevated molybdenum levels.[164] This explanation seems plausible, but it raises another issue – if there is elevated molybdenum in this well, then TVA should be regularly measuring and reporting molybdenum concentrations.

Monitoring around the bottom ash disposal pond, Area 2, has been recent and limited; concentrations of most pollutants were below health-based thresholds. Manganese, which was only measured in April 2011, was higher than the Lifetime Health Advisory and higher than upgradient concentrations.

Data gaps

There are gaps at each of John Sevier's three ash disposal areas:

- There are no groundwater wells upgradient or downgradient of ash disposal Area J, so we have no information about the extent to which that abandoned ash pond is leaching pollutants into groundwater and the Holston River.
- The bottom ash disposal area (Area 2) is currently monitored with one upgradient well (W1) and two downgradient wells (10-36 and 10-37). The downgradient wells, however, were only recently installed. Moreover, TVA does not regularly monitor these wells for many pollutants of concern, including boron, chloride, manganese, and sulfate. TVA once monitored an additional well south of Area 2 and west of well W1; it is not clear why this well was removed.[165]
- The dry fly ash disposal area is the best-monitored of the three areas. However, it has a history of dike failures, sloughing, and seeping along the north dike. The 1973 dike failure occurred in the area between wells W30 and W31 (see Figure 7-1 below), and

[162] For example, the April 2012 groundwater report noted that there were exceedances (significant departures from upgradient water quality) for the following analytes in the following downgradient wells: Alkalinity (all wells), aluminum (W31 and W32), ammonia (W29), boron (all wells), fluoride (W30 and W31), manganese (W28- W30), pH (all wells), sodium (W28-W31), specific conductivity (all wells), strontium (wells W28-W31), and sulfate (all wells). TVA, *John Sevier Fossil Plant Dry Fly Ash Landfill Groundwater Assessment Monitoring Report – April 2012*, 6 (May 28, 2012).
[163] TVA, *John Sevier Fossil Plant Dry Fly Ash Landfill Groundwater Assessment Monitoring Report – April 2011*, 7-9 (June 15, 2011).
[164] *Id*.
[165] Meeting Minutes, John Sevier Fossil Plant Ash Disposal – Tennessee Solid Waste Permit (Mar. 3, 1987) (showing two wells south of Area 2 – W1 and W2).

> both of these wells show clear evidence of contamination. The distance between these two wells is roughly 0.4 miles. An additional well in this area would provide important information about the rate of leaching in parts of the dike that have a history of weakness and instability.

As a site-wide matter, molybdenum is essentially unmonitored at John Sevier. The only data that we have on file for wells W1 – W32 are from a single round of results in April 2008; molybdenum has apparently not been measured at all in wells 10-36 and 10-37. Yet there are several reasons why molybdenum should be a pollutant of concern at John Sevier: First, according to a U.S. EPA risk assessment, molybdenum is a coal ash pollutant that may pose a health risk near coal ash impoundments and landfills.[166] Second, molybdenum is elevated in groundwater at other TVA coal plants. Third, molybdenum concentrations in well W31 have been as high as 2,200 ug/L, over 50 times higher than the concentration that is safe to drink. Finally, molybdenum has been blamed for causing artificially high cadmium results in the same well (see Monitoring section above). TDEC clearly should require TVA to regularly measure molybdenum concentrations across the site.

Failure to regulate

Recent data show clear evidence of coal ash leachate migrating from the dry fly ash disposal area to the Holston River via the local groundwater. Specifically, concentrations of boron, manganese, strontium, sulfate and other pollutants are much higher than background in wells along the thin strip of land between the disposal area and the river. The source of the contamination is likely to be the ash that was sluiced to the ponds beneath the current dry disposal area and left in place, though the dry fly ash stacks may be contributing as well. As far as we know, TDEC is not requiring TVA to do anything about this legacy waste issue, and has decided to allow the problem to persist indefinitely.

[166] *See, e.g.*, U.S. EPA, Draft *Human and Ecological Risk Assessment of Coal Combustion Wastes*, 2-4 (Apr. 2010) (listing molybdenum as a coal ash constituent of potential concern); id. at ES-6 – ES-7 (showing significant 90th percentile risks for molybdenum through the groundwater-to-drinking water pathway for landfills and surface impoundments); U.S. EPA co-proposed Subtitle D coal ash regulations, 75 Fed. Reg. 35128, 35253 (June 21, 2010) (listing molybdenum as an assessment monitoring constituent).

Figure 7-1: Groundwater wells at John Sevier Fossil Plant (approximate locations).

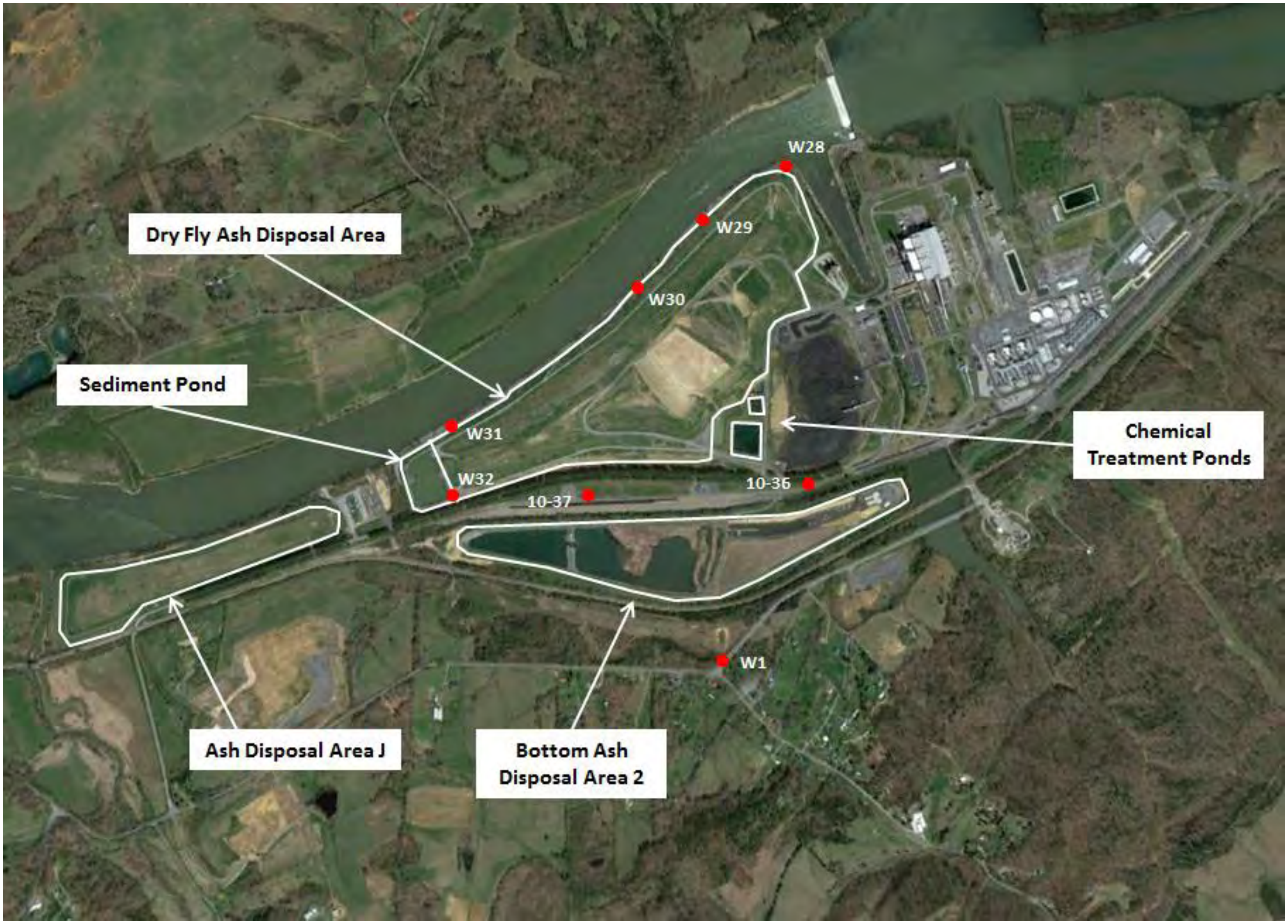

Table 7-1: John Sevier Fossil Plant, Well W1. Sampled 11 times between April 2008 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 140	
Antimony	6	<1	
Arsenic	10	<1	
Barium	2,000	190 – 230	
Beryllium	4	<2	
Boron	3,000	<0.2	
Cadmium	5	<0.5	
Chloride	250 mg/L	8.9 – 11.0 mg/L	
Chromium	100	<1 – 4	
Cobalt	4.7	<1	
Copper	1,300	<2	
Fluoride	4,000	<100 – 100	
Lead	15	<1	
Lithium	31		No data
Manganese	300	<10 – 39	
Mercury	2	<0.2	
Molybdenum	40	<5	No data since 4/2008
Nickel	100	<1 – 3.3	
Nitrate	10,000	<100 – 530	
Selenium	50	<1 – 1.4	
Silver	100	<1	
Strontium	9,300	590 – 800	
Sulfate	500 mg/L	24.5 – 27.0 mg/L	
TDS	500 mg/L	260 – 320 mg/L	No data 4/2012 or 4/2013
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 95.5	

Table 7-2: John Sevier Fossil Plant, Well W28. Sampled 11 times between April 2008 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 3,100	
Antimony	6	<1	
Arsenic	10	<1 – 2.3	
Barium	2,000	16 – 53	
Beryllium	4	<2	
Boron	3,000	2,600 – 3,100	
Cadmium	5	<0.5	
Chloride	250 mg/L	12 – 14 mg/L	
Chromium	100	<1 – 7.6	
Cobalt	4.7	<1 – 6.4	
Copper	1,300	<1 – 3.3	
Fluoride	4,000	<100 – 120	
Lead	15	<1 – 2.4	
Lithium	31		No data
Manganese	300	960 – 4,000	
Mercury	2	<0.2	
Molybdenum	40	<5	No data since 4/2008
Nickel	100	5.1 – 21.0	
Nitrate	10,000	<100 – 280	
Selenium	50	<1 – 2.1	
Silver	100	<1	
Strontium	9,300	870 – 1,000	
Sulfate	500 mg/L	750 – 890 mg/L	
TDS	500 mg/L	1,400 – 1,600 mg/L	No data 4/2012 or 4/2013
Thallium	2	<1	
Vanadium	63	<2 – 10	
Zinc	2,000	<10 – 18	

Table 7-3: John Sevier Fossil Plant, Well W29. Sampled 11 times between April 2008 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 760	
Antimony	6	<1	
Arsenic	10	<1	
Barium	2,000	15 – 32	
Beryllium	4	<2	
Boron	3,000	850 – 1,800	
Cadmium	5	<0.5	
Chloride	250 mg/L	3.2 – 9.5 mg/L	
Chromium	100	<1 – 4.3	
Cobalt	4.7	<1 – 2.4	
Copper	1,300	<1 – 2	
Fluoride	4,000	100 – 220	
Lead	15	<1	
Lithium	31		No data
Manganese	300	1,040 – 8,300	
Mercury	2	<0.2	
Molybdenum	40	<5	No data since 4/2008
Nickel	100	2.4 – 7.6	
Nitrate	10,000	<100 – 3,200	
Selenium	50	<1 – 4	
Silver	100	<1	
Strontium	9,300	640 – 1,200	
Sulfate	500 mg/L	150 – 390	
TDS	500 mg/L	640 – 860	No data 4/2012 or 4/2013
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 21	

Table 7-4: John Sevier Fossil Plant, Well W30. Sampled 11 times between April 2008 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 110	
Antimony	6	<1	
Arsenic	10	<1 – 7.3	
Barium	2,000	16 – 27	
Beryllium	4	<2	
Boron	3,000	4,100 – 5,650	
Cadmium	5	<0.5	
Chloride	250 mg/L	15 – 18 mg/L	
Chromium	100	<1 – 2.9	
Cobalt	4.7	1.2 – 5.0	
Copper	1,300	<1 – 3.1	
Fluoride	4,000	310 – 420	
Lead	15	<1	
Lithium	31		No data
Manganese	300	1,200 – 3,800	
Mercury	2	<0.2	
Molybdenum	40	<5	No data since 4/2008
Nickel	100	7.2 – 33.0	
Nitrate	10,000	<100 – 100	
Selenium	50	<1 – 2.1	
Silver	100	<1	
Strontium	9,300	3,200 – 5,050	
Sulfate	500 mg/L	960 – 1,100 mg/L	
TDS	500 mg/L	1,750 – 2,000 mg/L	No data 4/2012 or 4/2013
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10	

Table 7-5: John Sevier Fossil Plant, Well W31. Sampled 11 times between April 2008 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 880	
Antimony	6	<1	
Arsenic	10	<1 – 2.2	
Barium	2,000	23.5 – 46	
Beryllium	4	<1	
Boron	3,000	9,000 – 18,000	
Cadmium	5	<0.5 – 8.2	
Chloride	250 mg/L	8.1 – 14 mg/L	
Chromium	100	<1 – 2.7	
Cobalt	4.7	<1	
Copper	1,300	<1 – 9.7	
Fluoride	4,000	170 – 380	
Lead	15	<1 – 1.25	
Lithium	31		No data
Manganese	300	<50	
Mercury	2	<0.2	
Molybdenum	40	2,200	No data since 4/2008
Nickel	100	6.8 – 19.0	
Nitrate	10,000	<100 – 3,000	
Selenium	50	<1 – 4.1	
Silver	100	<1	
Strontium	9,300	3,000 – 6,300	
Sulfate	500 mg/L	860 – 1,800 mg/L	
TDS	500 mg/L	1,600 – 2,800 mg/L	No data 4/2012 or 4/2013
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 16	

Table 7-6: John Sevier Fossil Plant, Well W32. Sampled 11 times between April 2008 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 1,000	
Antimony	6	<1	
Arsenic	10	<1 – 1.1	
Barium	2,000	52 – 65	
Beryllium	4	<2	
Boron	3,000	<200 – 440	
Cadmium	5	<0.5	
Chloride	250 mg/L	9.7 – 12.0 mg/L	
Chromium	100	<1 – 2.7	
Cobalt	4.7	<1	
Copper	1,300	<2	
Fluoride	4,000	<100 – 120	
Lead	15	<1	
Lithium	31		No data
Manganese	300	4 – 12	
Mercury	2	<0.2	
Molybdenum	40	<5	No data since 4/2008
Nickel	100	1.8 – 5.7	
Nitrate	10,000	<100 – 960	
Selenium	50	<1 – 1	
Silver	100	<1	
Strontium	9,300	260 – 340	
Sulfate	500 mg/L	47 – 54	
TDS	500 mg/L	370 – 460	No data 4/2012 or 4/2013
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 15	

Table 7-7: John Sevier Fossil Plant, Well 10-36. Sampled 5 times between April 2011 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	No data since 4/2011
Antimony	6	<1	
Arsenic	10	1.3 – 2.5	
Barium	2,000	47 – 60	
Beryllium	4	<1	
Boron	3,000	<200	No data since 4/2011
Cadmium	5	<0.5	
Chloride	250 mg/L	9.75 mg/L	No data since 4/2011
Chromium	100	<2	
Cobalt	4.7	3.30 – 3.35	No data since 10/2011
Copper	1,300	<2	No data since 10/2011
Fluoride	4,000	<100 – 120	
Lead	15	<1	
Lithium	31		No data
Manganese	300	1,850	No data since 4/2011
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	3.3 – 7.55	
Nitrate	10,000	<100	
Selenium	50	<1 – 2.3	
Silver	100	<1	
Strontium	9,300	850	No data since 4/2011
Sulfate	500 mg/L	120 mg/L	No data since 4/2011
TDS	500 mg/L	625 mg/L	No data since 4/2011
Thallium	2	<1	
Vanadium	63	<2	No data since 10/2011
Zinc	2,000	<10	No data since 10/2011

Table 7-8: John Sevier Fossil Plant, Well 10-37. Sampled 5 times between April 2011 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	No data since 4/2011
Antimony	6	<1	
Arsenic	10	<1 – 3.7	
Barium	2,000	33.5 – 59	
Beryllium	4	<1	
Boron	3,000	<200	No data since 4/2011
Cadmium	5	<0.5	
Chloride	250 mg/L	7.7 mg/L	No data since 4/2011
Chromium	100	<2	
Cobalt	4.7	<1	No data since 10/2011
Copper	1,300	<2	No data since 10/2011
Fluoride	4,000	<100 – 150	
Lead	15	<1	
Lithium	31		No data
Manganese	300	750	No data since 4/2011
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	<1 – 2.4	
Nitrate	10,000	<100 – 340	
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300	210	No data since 4/2011
Sulfate	500 mg/L	65 mg/L	No data since 4/2011
TDS	500 mg/L	350 mg/L	No data since 4/2011
Thallium	2	<1	
Vanadium	63	<2	No data since 10/2011
Zinc	2,000	<10	No data since 10/2011

8 Johnsonville Fossil Plant

Background

The 10-unit Johnsonville plant, on the Tennessee River in New Johnsonville TN, is TVA's oldest coal plant. Construction began in 1949 and the first unit went online in 1951.[167] TVA idled four units in 2012. The plant will permanently close between 2015 and 2017.

The ash disposal facilities at Johnsonville are shown in Figure 8-1. The original ash disposal pond for the plant was in Area 1. DuPont, which operates a titanium dioxide facility north of the coal plant and east of Area 1, has used and controlled the northern part of Area 1 since the early 1970s.[168] TVA closed the ash disposal areas in the southern half of Area 1 in 1975-1976. The area is presumably unlined, and although it was covered with soil upon closure, erosion "throughout the majority" of the exterior slopes of the area has since exposed the ash.[169] The western dike along the Tennessee River has also experienced significant seepage.

TVA built Areas 2 & 3 on an artificial island in the late 1960s, and raised the dikes twice during the 1970s.[170] Fly ash from the ponds on the island is now being dredged and transported to a private landfill across the river.[171] Groundwater within the Area 2 & 3 dikes drains into the Tennessee River.[172] TVA plans to close this area between 2015 and 2017 by removing most of the ash,[173] grading the dikes and remaining ash, and installing either a geosynthetic or compacted soil cap.[174]

The South Railroad Loop Area was built in the early 1980s, and originally included two dredge cells, a dry disposal area, and stilling ponds. Ash was dry-stacked over the dredge cells to a maximum height of 70-80 feet before the area was closed in 2000. Geotechnical engineering

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[167] TVA, Johnsonville Fossil Plant, http://www.tva.com/sites/johnsonville.htm.
[168] Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Tennessee, Appendix G: Johnsonville Fossil Plant*, North Abandoned Ash Disposal Area 1, pages 1-2 (June 24, 2009).
[169] *Id*. at 4.
[170] *Id*. at Active Ash Disposal Areas 2 & 3, 1-2.
[171] The private landfill has had its own groundwater quality problems. *See* EIP and Earthjustice, OUT OF CONTROL, *supra* note 5 at 102-105.
[172] *See, e.g.*, TVA, *Johnsonville Fossil Plant Ash Impoundment Groundwater Monitoring Report – September 2011* (showing groundwater "flowing out radially, including north towards the Kentucky Reservoir / Tennessee River.").
[173] The closure plan calls for removing 5 million cubic yards of ash. TVA estimated that this would be all of the ash on the island and all of the ash that will be sluiced to the island between 2009 and plant closure. TVA, *Active Ash Pond Preliminary Closure Plan*, 2 (May 24, 2011). However, the closure plan also describes grading and capping of the remaining ash, suggesting that not all ash will be removed. *Id*. at 6. TVA has estimated the total storage capacity of "Area 2" to be 4.36 million cubic yards. Letter from Anda Ray, TVA, to Richard Kinch, U.S. EPA, responding to EPA's request for information (Mar. 25, 2009). It is not clear whether this volume represents all of the ash on the island, or only the ash within the footprint of what TVA defines as Area 2.
[174] TVA, *Active Ash Pond Preliminary Closure Plan*, 6 (May 24, 2011).

consultants noted ongoing erosion around the area, due in part to the "erosive nature of the materials used to construct the disposal area and final cover."[175] The extent to which TVA lined the site prior to using it as an ash disposal area is unclear.[176]

TVA constructed the DuPont Road Dredge Cell in the late 1980s or early 1990s. Ash was dry stacked in the area from the late 1990s through the early 2000s, when the area was closed. Although TVA built the cell with a clay liner, they did not install a cap to prevent water from percolating through the ash, instead opting for an "evapotranspiration plan" that consisted of trees planted along the crest of the area. Although the liner appears to have worked, the evapotranspiration plan has not, and so the area has filled with water, creating a "bathtub effect" and seepage that "appears to have completely surrounded the cell."[177]

Monitoring

Figure 8-1 shows the approximate locations of the groundwater wells discussed in this report.

Area 1. EIP has not received any recent data from the original ash pond area (Area 1), but we do have data from 1990-1994 for six wells numbered C1 through C6. EIP obtained these data from TVA through a Freedom of Information Act request in 2010.[178] Unfortunately, the data came in the form of a spreadsheet, without details about how the wells were installed, what kind of material they were screened in, or precisely where the wells were located.[179] The spreadsheet included results for aluminum, arsenic, boron, cadmium, chromium, iron, lead, manganese, molybdenum, sulfate, and TDS. As shown in Tables 8-1 through 8-6, concentrations of all pollutants were very high, frequently more than an order of magnitude greater than the health-based thresholds used in this paper. This area is known to be deteriorating (see Background section above), and has apparently caused severe groundwater contamination,[180] yet neither TVA nor TDEC appear to have conducted any groundwater monitoring since 1994, much less remediate the source of the contamination.

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[175] Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Tennessee, Appendix G: Johnsonville Fossil Plant*, South Railroad Loop Ash Disposal Area 4 page 6 (June 24, 2009).
[176] See *id*., Photos, Concerns/Photo Log, page a (photograph caption describing "erosion exposing liner along toe of eastern stack area.").
[177] *Id*., Dredge Pond East of Gas Turbines Area 5, pages 2-6.
[178] TVA, Groundwater monitoring data for the active ash disposal area and abandoned ash disposal area (Area A) in response to April 28, 2010 Freedom of Information Act Request (2010).
[179] Two unrelated maps indicate that they were in the southern part of Area 1, which is consistent with the fact that DuPont controls all of Area 1 north of the TVA property line. Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Tennessee, Appendix G: Johnsonville Fossil Plant*, North Abandoned Ash Disposal Area 1, pages 1-2 (June 24, 2009).
[180] Even if these six wells were screened directly in saturated ash, the primitive state of ash disposal in the 1950s-1970s suggests a high likelihood of groundwater contamination beyond the footprint of the abandoned ash pond.

Areas 2 & 3. EIP has two sets of data from the ash disposal island, Areas 2 &3. The first set of data, from 1986-1997, was obtained in the same 2010 FOIA request described above, and comes with the same limitations. The exact locations of these wells, in particular, remain uncertain. The results from these wells are shown in Tables 8-7 through 8-9. The data show very high concentrations of the measured pollutants, again frequently more than an order of magnitude greater than "safe" concentrations. We are not aware of any groundwater data collected by TVA between 1997 and 2011. In 2011, as part of the USWAG voluntary monitoring program, TVA installed 3 new wells around the perimeter of the island in 2010, shown in Figure 8-1 as 10-AP1 through 10-AP3. These wells show much lower concentrations of some metals, like arsenic and cadmium, but continue to show clear evidence of coal ash contamination, including high concentrations of boron, cobalt, manganese, and sulfate (see Tables 8-10 through 8-12). Well 10-AP1, for example, showed 6.3 mg/L of boron, 11-21 ug/L of cobalt, and 3.5 mg/L of manganese in 2011, all much higher than background and higher than health-based guidelines.[181] Despite the clearly elevated concentrations of these three pollutants, TVA stopped measuring them in 2012.

South Rail Loop area. There are currently six wells around the South Rail Loop Area. Three wells are screened in alluvial soils: B9 (upgradient), B6R, and B8R. The other three wells are screened in a deeper geologic layer of Chattanooga Shale: B30 (upgradient), B6, and B8. Wells B6R, B8R, and B30 are new or recently reactivated wells, as described below.

Until recently, TVA maintained three wells around the South Rail Loop Area: Wells B6, B8, and upgradient well B9. Wells B6 and B8 consistently showed evidence of contamination, including high concentrations of boron, manganese, sulfate, and in the case of well B8, cobalt. Limited data from the 1992-1993 suggest that the same pattern was evident 20 years ago.[182] TVA speculated that the contamination might have been naturally occurring since Chattanooga Shale can release the same pollutants typically associated with coal ash.[183] TVA could not conduct a proper upgradient-downgradient analysis at the time because the upgradient well, B9, was screened in alluvial soils. In March 2013, in order to build the database for a better analysis, TVA started monitoring well B30, which is upgradient of the South Rail Loop area and also screened in the Chattanooga shale.[184] Although TVA has only measured this well once, there are clear differences between well B30 and wells B6 and B8. Boron, in particular, is below detection at <0.2 mg/L in well B30, but above the Child Health Advisory in wells B6 (1.3-6.5

[181] Background well B9 has had maximum boron, cobalt, and manganese concentrations of 0.33 mg/L, 1 ug/L, and 0.06 mg/L, respectively, since 2006.
[182] *See* TVA, *Rail Loop Disposal Area – Revised Closure Plan – Appendix F: Background Groundwater Monitoring Report* (Feb. 2, 1998).
[183] Letter from Cynthia M. Anderson, TVA, to Alan Spear, TDEC (Nov. 15, 2012).
[184] TVA, *Johnsonville Fossil Plant South Rail Loop Ash Disposal Area Groundwater Monitoring Report- March 2013*, 1, 4 (May 15, 2013).

mg/L) and B8 (9.2-10.5 mg/L). Similar differences between wells B30 and B8 can be seen for cobalt (5.1 ug/L in well B30, 47-65 ug/L in well B8), manganese (1.0 mg/L in well B30, 2.5-2.9 mg/L in well B8), and sulfate (13 mg/L in well B30, 120-1,200 mg/L in well B8). These results suggest that the contamination in wells B6 and B8 is not naturally occurring, and is instead due to the coal ash in the South Rail Loop area.

In 2012, on the grounds that contamination in wells B6 and B8 might have been naturally occurring (and before results from well B30 were collected), TVA and TDEC agreed to replace these wells with new wells screened in alluvial soils above the shale layer.[185] The new wells, B6R and B8R, were installed in December 2012 and first monitored in March 2013. The initial results suggest that the groundwater in the alluvial soil, like the groundwater in the Chattanooga shale, has been contaminated by the ash in the South Rail Loop area. Boron in wells B6R and B8R was 7.2 and 1.0 mg/L, respectively. Upgradient well B9, by comparison, ranges between <0.2 and 0.3 mg/L. Manganese in wells B6R and B8R was 1.5 and 1.1 mg/L, much higher than the 0.003-0.06 mg/L seen in well B9.

To summarize, the ash in the South Rail Loop area has contaminated groundwater in the alluvial soil and in the Chattanooga Shale beneath it; this groundwater is now unsafe to drink, with high concentrations of boron, cobalt, manganese, and sulfate.

DuPont Road Dredge Cell. The closed DuPont Road Dredge Cell, as described above, has a clay liner that may be effectively preventing leachate from seeping into local groundwater. The four wells around that area show little evidence of contamination.

Data gaps

1. The groundwater around the southern part of abandoned ash disposal Area 1 has apparently not been monitored over the past twenty years (since 1994). As described above, TVA measured extremely high levels of groundwater contamination here in the early 1990s. TVA and TDEC should resume monitoring this area and, if the groundwater contamination has persisted, remediate the area.

2. Although TVA found clear evidence of groundwater contamination around Areas 2 & 3 in the early 1990s with no discernible downward trend, it suspended monitoring between 1994/1997 (depending on the well) and 2011. When TVA resumed monitoring, this time at different wells, concentrations of some pollutants (for example, aluminum, arsenic and cadmium) were dramatically lower. Concentrations of boron, on the other hand, were roughly consistent with historical data. TVA and TDEC should investigate whether these changes are an

[185] Letter from Cynthia M. Anderson, TVA, to Alan Spear, TDEC (May 17, 2012).

artifact of where the wells are installed or screened, or whether they represent changes that can be generalized to the perimeter of the island.

3. TVA resumed monitoring groundwater around Areas 2 & 3 in 2011 as part of its USWAG voluntary monitoring plan. However, TVA only conducted one or two rounds of monitoring for many pollutants, including key coal ash indicators. Specifically, aluminum, boron, chloride, manganese, molybdenum, strontium, sulfate, and TDS were measured in the first round of sampling, but not measured during the next four sampling events. Cobalt, copper, vanadium, and zinc were measured twice in 2011 but not at all in 2012 or 2013. All of these pollutants should be routinely measured. The failure to routinely measure boron, cobalt, and manganese when initial sampling showed elevated and unsafe concentrations is particularly irresponsible. Manganese, for example, was more than ten times the Lifetime Health Advisory in all three wells when TVA stopped measuring it.

4. Finally, TVA and TDEC agreed to abandon contaminated wells B6 and B8 on the grounds that these wells may be showing the effect of the natural shale bedrock. However, as described above, the new upgradient shale-screened well, well B30, shows much lower concentrations of boron, manganese, and sulfate than the downgradient wells, suggesting that the contamination in wells B6 and B8 is not in fact naturally occurring. TVA and TDEC should not abandon these wells, but should instead begin corrective action planning to remediate the contamination.

Figure 8-1: Groundwater wells at Johnsonville Fossil Plant (approximate locations). Orange wells are no longer monitored and their locations are only roughly known.

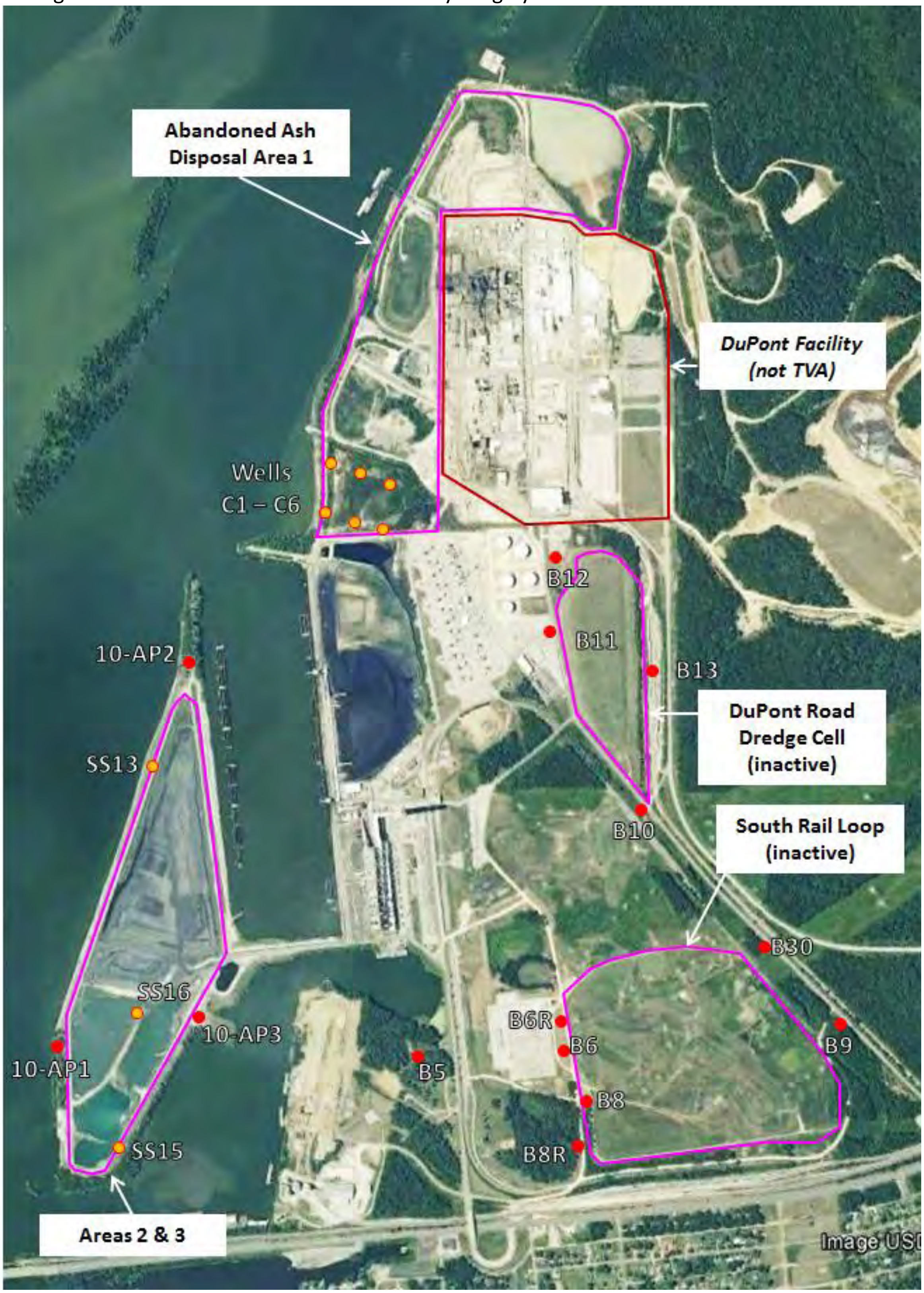

Table 8-1: Johnsonville Fossil Plant, Well C1. Sampled 14 times, March 1990 - September 1994.

Chemical	Threshold	Data
Aluminum	16,000	1,200 – 49,000
Arsenic	10	130 – 390
Boron	3,000	7,900 – 48,000
Cadmium	5	<0.1 – 37
Chromium	100	<1 – 49
Lead	15	<1 – 38
Manganese	300	1,900 – 6,700
Molybdenum	40	<20 – 320
Sulfate	500 mg/L	160 – 2,000 mg/L
TDS	500 mg/L	2,000 – 3,300 mg/L

Table 8-2: Johnsonville Fossil Plant, Well C2. Sampled 14 times, March 1990 - September 1994.

Chemical	Threshold	Data
Aluminum	16,000	1,400 – 28,000
Arsenic	10	35 – 110
Boron	3,000	6,300 – 18,000
Cadmium	5	0.2 – 20
Chromium	100	1 – 47
Lead	15	<1 – 43
Manganese	300	<5 – 410
Molybdenum	40	<20 – 350
Sulfate	500 mg/L	43 – 1,500 mg/L
TDS	500 mg/L	1,600 – 2,400 mg/L

Table 8-3: Johnsonville Fossil Plant, Well C3. Sampled 12 times, March 1990 - September 1994.

Chemical	Threshold	Data
Aluminum	16,000	370 – 42,000
Arsenic	10	37 – 160
Boron	3,000	8,000 – 24,000
Cadmium	5	0.1 – 18
Chromium	100	<1 – 68
Lead	15	<1 – 53
Manganese	300	<5 – 720
Molybdenum	40	140 – 320
Sulfate	500 mg/L	240 – 950 mg/L
TDS	500 mg/L	550 – 1,900 mg/L

Table 8-4: Johnsonville Fossil Plant, Well C4. Sampled 12 times, March 1990 - September 1994.

Chemical	Threshold	Data
Aluminum	16,000	1,800 – 270,000
Arsenic	10	6 – 61
Boron	3,000	1,800 – 5,700
Cadmium	5	0.2 – 35
Chromium	100	1 – 230
Lead	15	2 – 200
Manganese	300	3,800 – 8,900
Molybdenum	40	<20 – 160
Sulfate	500 mg/L	60 – 250 mg/L
TDS	500 mg/L	<10 – 310 mg/L

Table 8-5: Johnsonville Fossil Plant, Well C5. Sampled 12 times, March 1990 - September 1994.

Chemical	Threshold	Data
Aluminum	16,000	2,000 – 470,000
Arsenic	10	32 – 300
Boron	3,000	3,500 – 18,000
Cadmium	5	0.2 – 240
Chromium	100	1 – 620
Lead	15	5 – 240
Manganese	300	38 – 10,000
Molybdenum	40	<20 – 420
Sulfate	500 mg/L	77 – 600 mg/L
TDS	500 mg/L	300 – 920 mg/L

Table 8-6: Johnsonville Fossil Plant, Well C6. Sampled 15 times, March 1990 - September 1994.

Chemical	Threshold	Data
Aluminum	16,000	5,700 – 340,000
Arsenic	10	12 – 570
Boron	3,000	3,300 – 17,000
Cadmium	5	0.3 – 31
Chromium	100	7 – 520
Lead	15	11 – 390
Manganese	300	240 – 6,800
Molybdenum	40	<20 – 310
Sulfate	500 mg/L	47 – 1,400
TDS	500 mg/L	210 – 1,200

Table 8-7: Johnsonville Fossil Plant, Well SS13. Sampled 14 times, April 1986 - September 1994.

Chemical	Threshold	Data
Aluminum	16,000	38 – 130,000
Arsenic	10	3 – 65
Boron	3,000	<500 – 16,000
Cadmium	5	0.4 – 86
Chromium	100	2 – 110
Lead	15	2 – 120
Manganese	300	410 – 9,000
Molybdenum	40	<20 – 130
Sulfate	500 mg/L	<1 – 1,400
TDS	500 mg/L	80 – 310

Table 8-8: Johnsonville Fossil Plant, Well SS15. Sampled 18 times, April 1986 - September 1997.

Chemical	Threshold	Data
Aluminum	16,000	1,300 – 46,000
Arsenic	10	<1 – 10
Boron	3,000	1,900 – 4,200
Cadmium	5	0.8 – 25
Chromium	100	<1 – 48
Lead	15	<1 – 32
Manganese	300	3,110 – 14,000
Molybdenum	40	<20
Sulfate	500 mg/L	88 – 220
TDS	500 mg/L	230 – 400

Table 8-9: Johnsonville Fossil Plant, Well SS16. Sampled 15 times, April 1986 - September 1994.

Chemical	Threshold	Data
Aluminum	16,000	130 – 1,100,000
Arsenic	10	6 – 520
Boron	3,000	2,100 – 8,400
Cadmium	5	0.5 – 260
Chromium	100	<1 – 160
Lead	15	<1 – 100
Manganese	300	4,100 – 16,000
Molybdenum	40	150 – 1,200
Sulfate	500 mg/L	140 – 1,500
TDS	500 mg/L	1,200 – 2,300

Table 8-10: Johnsonville Fossil Plant, Well 10-AP1. Sampled 5 times between March 2011 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	420	No data since 3/2011
Antimony	6	<1	
Arsenic	10	2.4 – 4.8	
Barium	2,000	35 – 44	
Beryllium	4	<2	
Boron	3,000	6,300	No data since 3/2011
Cadmium	5	<0.5	
Chloride	250 mg/L	21 mg/L	No data since 3/2011
Chromium	100	<2	
Cobalt	4.7	11 – 21	No data since 9/2011
Copper	1,300	<2	No data since 9/2011
Fluoride	4,000	130 – 180	
Lead	15	<1	
Lithium	31		No data
Manganese	300	3,500	No data since 3/2011
Mercury	2	<0.2	
Molybdenum	40	<5	No data since 3/2011
Nickel	100	29 – 36	
Nitrate	10,000	<100	No data prior to 9/2012
Selenium	50	<1 – 2.8	
Silver	100	<1	
Strontium	9,300	360	No data since 3/2011
Sulfate	500 mg/L	300 mg/L	No data since 3/2011
TDS	500 mg/L	1,200 mg/L	No data since 3/2011
Thallium	2	<1	
Vanadium	63	<10	No data since 9/2011
Zinc	2,000	15 – 21	No data since 9/2011

Table 8-11: Johnsonville Fossil Plant, Well 10-AP2. Sampled 5 times between March 2011 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	230	No data since 3/2011
Antimony	6	<1	
Arsenic	10	1.8 – 4.9	
Barium	2,000	31 – 71	
Beryllium	4	<2	
Boron	3,000	<200	No data since 3/2011
Cadmium	5	<0.5 – 2.8	
Chloride	250 mg/L	23 mg/L	No data since 3/2011
Chromium	100	<2 – 14	
Cobalt	4.7	34 – 58	No data since 9/2011
Copper	1,300	<2	No data since 9/2011
Fluoride	4,000	120 – 170	
Lead	15	<1	
Lithium	31		No data
Manganese	300	13,000	No data since 3/2011
Mercury	2	<0.2	
Molybdenum	40	<5	No data since 3/2011
Nickel	100	35 – 52	
Nitrate	10,000	<100	No data prior to 9/2012
Selenium	50	<1 – 1	
Silver	100	<1	
Strontium	9,300	280	No data since 3/2011
Sulfate	500 mg/L	820 mg/L	No data since 3/2011
TDS	500 mg/L	810 mg/L	No data since 3/2011
Thallium	2	<1	
Vanadium	63	<10	No data since 9/2011
Zinc	2,000	16 – 18	No data since 9/2011

Table 8-12: Johnsonville Fossil Plant, Well 10-AP3. Sampled 5 times between March 2011 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	1,300	No data since 3/2011
Antimony	6	<1	
Arsenic	10	<1 – 1.6	
Barium	2,000	20 – 26	
Beryllium	4	<2	
Boron	3,000	5,300	No data since 3/2011
Cadmium	5	3.7 – 5.8	
Chloride	250 mg/L	36 mg/L	No data since 3/2011
Chromium	100	<2	
Cobalt	4.7	47 – 55	No data since 9/2011
Copper	1,300	<2 – 3	No data since 9/2011
Fluoride	4,000	<100	
Lead	15	<1	
Lithium	31		No data
Manganese	300	20,000	No data since 3/2011
Mercury	2	<0.2	
Molybdenum	40	<5	No data since 3/2011
Nickel	100	84 – 120[186]	
Nitrate	10,000	<100	No data prior to 9/2012
Selenium	50	<1 – 1.2	
Silver	100	<1	
Strontium	9,300	630	No data since 3/2011
Sulfate	500 mg/L	780 mg/L	No data since 3/2011
TDS	500 mg/L	560 mg/L	No data since 3/2011
Thallium	2	<1	
Vanadium	63	<10	No data since 9/2011
Zinc	2,000	68 – 75	No data since 9/2011

[186] Nickel was measured 7 times over this period.

Table 8-13: Johnsonville Fossil Plant, Well B5. Sampled 9 times between March 2009 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	360 – 2,000	
Antimony	6	<1	
Arsenic	10	<1 – 3.4	
Barium	2,000	<5 – 20	
Beryllium	4	<2	
Boron	3,000	<200	
Cadmium	5	0.6 – 1.6	
Chloride	250 mg/L	32 – 36 mg/L	
Chromium	100	<2 – 2.9	
Cobalt	4.7	<10[187]	
Copper	1,300	7.4 – 13	
Fluoride	4,000	310 – 560	
Lead	15	<1 – 3	
Lithium	31		No data
Manganese	300	53 - 87	
Mercury	2	0.22 – 0.66	
Molybdenum	40	<5	
Nickel	100	61 – 76	
Nitrate	10,000	560	No data prior to 3/2013
Selenium	50	<1 – 6.1	
Silver	100	<1	
Strontium	9,300	<10 – 23	
Sulfate	500 mg/L	66 – 72 mg/L	
TDS	500 mg/L	180 – 200 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	160 – 220	

[187] Cobalt in this well has historically been reported as "<10 ug/L." Results for September 2012 and March 2013 were <1 and 1 ug/L.

Table 8-14: Johnsonville Fossil Plant, Well B6. Sampled 9 times between March 2009 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 135	
Antimony	6	<1	
Arsenic	10	1.1 – 3	
Barium	2,000	6.9 – 21	
Beryllium	4	<2	
Boron	3,000	1,300 – 6,500	
Cadmium	5	<0.5	
Chloride	250 mg/L	2.5 – 17 mg/L	
Chromium	100	<2	
Cobalt	4.7	<10[188]	
Copper	1,300	<2	
Fluoride	4,000	<100 – 150	
Lead	15	<1	
Lithium	31		No data
Manganese	300	150 – 390	
Mercury	2	<0.2	
Molybdenum	40	3 – 7	
Nickel	100	4.6 – 10	
Nitrate	10,000	520	No data prior to 3/2013
Selenium	50	<1 – 3.6	
Silver	100	<1	
Strontium	9,300	80 – 300	
Sulfate	500 mg/L	120 – 310 mg/L	
TDS	500 mg/L	205 – 560 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	12 – 24	

Table 8-15: Johnsonville Fossil Plant, Well B8. Sampled 9 times between March 2009 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	780 – 2,900	
Antimony	6	<1	
Arsenic	10	<1 – 2.8	
Barium	2,000	22 – 40	
Beryllium	4	<10	
Boron	3,000	9,200 – 10,500	
Cadmium	5	<0.5 – 1	
Chloride	250 mg/L	6.8 – 10 mg/L	
Chromium	100	<2 – 12	
Cobalt	4.7	47 – 65	
Copper	1,300	<2 – 4.9	
Fluoride	4,000	140 – 445	
Lead	15	<1 – 2.2	
Lithium	31		No data
Manganese	300	2,500 – 2,850	
Mercury	2	<0.2 – 1.4	
Molybdenum	40	<2 – 11	
Nickel	100	18.5 – 34	
Nitrate	10,000	<100	No data prior to 3/2013
Selenium	50	<1 – 6	
Silver	100	<1	
Strontium	9,300	950 – 1,200	
Sulfate	500 mg/L	120 – 1,200 mg/L	
TDS	500 mg/L	1,400 – 1,800 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 55	

[188] Cobalt in this well has historically been reported as "<10 ug/L." Results for September 2012 and March 2013 were <1 and 2.3ug/L.

Table 8-16: Johnsonville Fossil Plant, Well B9. Sampled 9 times between March 2009 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 5,100	
Antimony	6	<1	
Arsenic	10	<1 – 1	
Barium	2,000	6.8 – 53	
Beryllium	4	<2	
Boron	3,000	<200 – 330	
Cadmium	5	<0.5	
Chloride	250 mg/L	3.1 – 4.7	
Chromium	100	<2 – 12	
Cobalt	4.7	<10[189]	
Copper	1,300	<2 – 4	
Fluoride	4,000	<100	
Lead	15	<1 – 1.5	
Lithium	31		No data
Manganese	300	3 – 62	
Mercury	2	<0.2	
Molybdenum	40	<5	
Nickel	100	<1 – 7.7	
Nitrate	10,000	<100	No data prior to 9/2012
Selenium	50	<1 – 1.4	
Silver	100	<1	
Strontium	9,300	<10 – 21	
Sulfate	500 mg/L	<5	
TDS	500 mg/L	38 – 90	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 15	

Table 8-17: Johnsonville Fossil Plant, Well B10. Sampled 9 times between March 2009 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	100 – 1,500	
Antimony	6	<1	
Arsenic	10	<1 – 1	
Barium	2,000	9 – 19	
Beryllium	4	<2	
Boron	3,000	<200	
Cadmium	5	<0.5	
Chloride	250 mg/L	11 – 18 mg/L	
Chromium	100	<2 – 4.6	
Cobalt	4.7	<10[190]	
Copper	1,300	<2	
Fluoride	4,000	<100 – 100	
Lead	15	<1	
Lithium	31		No data
Manganese	300	6 – 15	
Mercury	2	<0.2	
Molybdenum	40	<5	
Nickel	100	2.7 – 6.1	
Nitrate	10,000	180	No data prior to 3/2013
Selenium	50	<1 – 1.3	
Silver	100	<1	
Strontium	9,300	<10 – 12	
Sulfate	500 mg/L	<5 – 5.6 mg/L	
TDS	500 mg/L	46 – 93 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<10 – 12	

[189] Cobalt in this well has historically been reported as "<10 ug/L." Results for September 2012 and March 2013 were both <1 ug/L.

[190] Cobalt in this well has historically been reported as "<10 ug/L." Results for September 2012 and March 2013 were <1 and 1.1 ug/L.

Table 8-18: Johnsonville Fossil Plant, Well B11. Sampled 9 times between March 2009 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 3,500	
Antimony	6	<1	
Arsenic	10	<1 – 1.5	
Barium	2,000	255 – 530	
Beryllium	4	<2	
Boron	3,000	270 – 540	
Cadmium	5	<0.5 – 0.7	
Chloride	250 mg/L	230 – 400 mg/L	
Chromium	100	<2 – 9.7	
Cobalt	4.7	<10[191]	
Copper	1,300	<2 – 2.4	
Fluoride	4,000	<100	
Lead	15	<1 – 3	
Lithium	31		No data
Manganese	300	380 – 780	
Mercury	2	<0.2	
Molybdenum	40	<5	
Nickel	100	7 – 14	
Nitrate	10,000	660	No data prior to 3/2013
Selenium	50	<1 – 2.7	
Silver	100	<1	
Strontium	9,300	195 – 330	
Sulfate	500 mg/L	20 – 34 mg/L	
TDS	500 mg/L	470 – 870 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	13 – 39	

Table 8-19: Johnsonville Fossil Plant, Well B12. Sampled 9 times between March 2009 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 590	
Antimony	6	<1	
Arsenic	10	<1 – 1.4	
Barium	2,000	360 – 750	
Beryllium	4	<2	
Boron	3,000	<200	
Cadmium	5	<0.5 – 0.9	
Chloride	250 mg/L	660 – 1,200 mg/L	
Chromium	100	<2 – 2.8	
Cobalt	4.7	<10[192]	
Copper	1,300	<2	
Fluoride	4,000	<100	
Lead	15	<1 – 3	
Lithium	31	No data	No data
Manganese	300	1,000 – 2,200	
Mercury	2	<0.2	
Molybdenum	40	<5	
Nickel	100	11 – 23	
Nitrate	10,000	1,600	No data prior to 3/2013
Selenium	50	1.3 – 4.9	
Silver	100	<1	
Strontium	9,300	320 – 620	
Sulfate	500 mg/L	20 – 28 mg/L	
TDS	500 mg/L	1,100 – 2,200 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	16 – 51	

[191] Cobalt in this well has historically been reported as "<10 ug/L." Results for September 2012 and March 2013 were <1 and 1.3 ug/L.

[192] Cobalt in this well has historically been reported as "<10 ug/L." Results for September 2012 and March 2013 were 1 and 1.9 ug/L.

Table 8-20: Johnsonville Fossil Plant, Well B13. Sampled 9 times between March 2009 and March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	280 – 2,600	
Antimony	6	<1	
Arsenic	10	<1 – 1.5	
Barium	2,000	780 – 1,000	
Beryllium	4	<2	
Boron	3,000	<200	
Cadmium	5	1.1 – 2	
Chloride	250 mg/L	820 – 1,200 mg/L	
Chromium	100	<2 – 5.7	
Cobalt	4.7	<10[193]	
Copper	1,300	<2 – 2.3	
Fluoride	4,000	<100 – 120	
Lead	15	<1 – 1.9	
Lithium	31	No data	No data
Manganese	300	135 – 460	
Mercury	2	<0.2 – 0.3	
Molybdenum	40	<2 – 11	
Nickel	100	23 – 43	
Nitrate	10,000	500	No data prior to 3/2013
Selenium	50	1.9 – 6.0	
Silver	100	<1	
Strontium	9,300	660 – 1,100	
Sulfate	500 mg/L	<5 – 37 mg/L	
TDS	500 mg/L	1,800 – 2,800 mg/L	
Thallium	2	<1	
Vanadium	63	4 – 11	
Zinc	2,000	36 – 75	

Table 8-21: Johnsonville Fossil Plant, Well B6R. First sampled in March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	160	
Antimony	6	<1	
Arsenic	10	<1	
Barium	2,000	28	
Beryllium	4	<1	
Boron	3,000	7,200	
Cadmium	5	<0.5	
Chloride	250 mg/L	18 mg/L	
Chromium	100	<2	
Cobalt	4.7	<1	
Copper	1,300	<2	
Fluoride	4,000	<100	
Lead	15	<1	
Lithium	31		No data
Manganese	300	1,500	
Mercury	2	<0.2	
Molybdenum	40	<2	
Nickel	100	18	
Nitrate	10,000	490	
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300	370	
Sulfate	500 mg/L	340 mg/L	
TDS	500 mg/L	540 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	26	

[193] Cobalt in this well has historically been reported as "<10 ug/L." Results for September 2012 and March 2013 were 2.6 and 6.0 ug/L.

Table 8-22: Johnsonville Fossil Plant, Well B8R. First sampled in March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	
Antimony	6	<1	
Arsenic	10	<1	
Barium	2,000	25	
Beryllium	4	<1	
Boron	3,000	990	
Cadmium	5	<0.5	
Chloride	250 mg/L	10 mg/L	
Chromium	100	<2	
Cobalt	4.7	2.4	
Copper	1,300	<2	
Fluoride	4,000	<100	
Lead	15	<1	
Lithium	31		No data
Manganese	300	1,100	
Mercury	2	<0.2	
Molybdenum	40	<2	
Nickel	100	12	
Nitrate	10,000	240	
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300	140	
Sulfate	500 mg/L	87 mg/L	
TDS	500 mg/L	160 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	19	

Table 8-23: Johnsonville Fossil Plant, Well B30. First sampled in March 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	
Antimony	6	<1	
Arsenic	10	2.9	
Barium	2,000	7.5	
Beryllium	4	<1	
Boron	3,000	<200	
Cadmium	5	<0.5	
Chloride	250 mg/L	4.8 mg/L	
Chromium	100	3.4	
Cobalt	4.7	5.1	
Copper	1,300	<2	
Fluoride	4,000	480	
Lead	15	<1	
Lithium	31		No data
Manganese	300	960	
Mercury	2	<0.2	
Molybdenum	40	6	
Nickel	100	5.9	
Nitrate	10,000	<100	
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300	11	
Sulfate	500 mg/L	13 mg/L	
TDS	500 mg/L	74 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	<10	

9 Kingston Fossil Plant

Background

The Kingston fossil plant is located outside of Kingston, TN, at the confluence of the Clinch and Emory Rivers. The nine coal units at Kingston were built in the 1950s; at the time it was the largest coal plant in the world.[194] Kingston is notorious as the site of the largest coal ash spill in U.S. history:[195] On December 22, 2008, the ash dredge cell at the Kingston plant collapsed, spilling 5.4 million cubic yards of ash into local waterways and over 300 acres of land.[196] Although much could be, and has been, said about the engineering and regulatory failures that led to the spill, this report is focused on groundwater. For more information on the spill, see EPA, TDEC, and TVA websites with archived data and reports.[197]

Current ash disposal areas are shown in Figure 9-3. Prior to the ash spill, TVA was disposing of ash in a complex that included, from northwest to southeast in Figure 9-2, a dredge cell, a settling pond, and a stilling pond. TVA has used this area for ash disposal since 1958.[198] Since the spill, TVA has switched to dry ash disposal at Kingston, but continues to use the reconstructed ash complex area, including the original stilling pond. The Ash Processing Area was built in 2009 as a place to dewater and temporarily store ash dredged from the Emory and Clinch Rivers during cleanup and recovery from the spill. This area was built over an abandoned section of the ash disposal area, including 7.4 – 16.2 meters of ash fill, and an abandoned metal cleaning pond.[199]

TVA built the gypsum disposal area (variously described as a pond[200] and a landfill[201]) to store the waste from Kingston's sulfur dioxide scrubber. Initial construction took place between

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[194] TVA, Kingston Fossil Plant, http://www.tva.gov/sites/kingston.htm
[195] *See, e.g.*, New York Times, Tennessee Ash Flood Larger than Initial Estimate (Dec. 26, 2008).
[196] *See, e.g.*, U.S. EPA, In the Matter of TVA Kingston Fossil Fuel Plant Release Site, Administrative Order and Agreement on Consent (May 11, 2009).
[197] U.S. EPA, TVA Kingston Fossil Fuel Plant Release Site: http://www.epakingstontva.com/default.aspx, TDEC, Ash Slide at TVA Kingston Fossil Plant: http://www.tn.gov/environment/kingston/archive/, TVA, Kingston Recovery: http://www.tva.gov/kingston/index.htm,
[198] *See* U.S. EPA, *supra* note 196.
[199] *See, e.g.*, TVA, *Kingston Fossil Plant Ash Processing area Groundwater Monitoring Report – June 2009* (Aug. 24, 2009).
[200] *See, e.g.*, letter from Anda Ray, TVA, to Paul Sloan, TDEC, transmitting corrective action plan for the "Gypsum Disposal Pond" (Mar. 4, 2011).
[201] *See, e.g.*, TVA, *Kingston Fossil Plant Gypsum Landfill Groundwater Monitoring Report – March 2008* (May 23, 2008).

2008 and 2010.[202] Although 10 sinkholes were discovered and repaired during that time,[203] the facility was constructed with only a clay liner. Gypsum was first sluiced to the area in June 2010.[204] In December 2010, TVA discovered that liquid was draining through a sinkhole near the southern edge of the disposal area, causing dramatically elevated selenium concentrations in underlying groundwater (see Monitoring section below), and ultimately discharging to the Clinch River.[205] TVA dewatered the area in January 2011. During investigation and repair work, TVA discovered additional sinkholes.[206] The clay liner was ultimately removed and replaced, and covered with a high-density polyethylene liner.[207]

Monitoring

Figure 9-3 shows the approximate locations of the groundwater wells discussed in this report. Four wells have been lost since 2008, and four wells have been added. Two wells, 4B and 16A, were destroyed in the 2008 ash spill; TVA installed well AD-1, and resumed monitoring existing well 22, to replace the two destroyed wells. TVA also installed wells AD-2 and AD-3 in 2009 to monitor the ash processing area. Wells 6A and 13B were destroyed during routine operations in 2009. Well 6AR was installed in 2009 to replace well 6A.

Wells around the ash disposal area show unsafe levels of manganese. Well 6A had manganese concentrations hundreds of times higher than the Lifetime Health Advisory before it was destroyed in 2009. Boron, sulfate, and TDS concentrations in this well, although below their respective health-based thresholds, were all elevated relative to other ash disposal area wells, suggesting that the manganese is at least partly attributable to the coal ash. Well 6AR has also shown very high manganese concentrations, in addition to very high concentrations of cobalt and statistically elevated concentrations of beryllium, cadmium, and nickel.[208] TVA has conceded that this contamination may be due, at least in part, to coal ash:

[202] TVA, *Gypsum Disposal Facility Groundwater Quality Assessment Plan*, 2 (May 6, 2011).
[203] *See* Geosyntec, *Dye Trace Investigation Report – Flue Gas Desulfurization (FGD) Disposal Facility – Kingston Fossil Plant*, 7 (July 19, 2011).
[204] *See* TVA, *Kingston Fossil Plant Gypsum Disposal Facility Groundwater Monitoring Report – June 2010* (July 29, 2010).
[205] *See, e.g.*, Geosyntec, *supra* note 203, at 7 ("The drop-out occurred beneath the pond water surface and a vortex indicated drainage into the feature. On December 15, 2010 diffuse discharge, allegedly associated with the drop-out, was observed on the northern bank of the Clinch River.").
[206] *See* TVA, *Kingston Fossil Plant Gypsum Disposal Facility Groundwater Assessment Monitoring Report – June 2011 Sampling* (Aug. 16, 2011).
[207] *See* TVA, *Kingston Fossil Plant Gypsum Disposal Facility Groundwater Assessment Monitoring Report – March 2012 Sampling* (May 8, 2012).
[208] *See* Groundwater disposal reports for the Ash Disposal Area from June 2010 – December 2012.

> Concentrations of metals in well 6AR have been slightly elevated since the first sampling event in September 2009, which could be due to naturally-occurring metals associated with the alluvial deposits surrounding the well screen, as indicated by metallic staining and nodules on the lithological boring log of this well. Bottom ash, which was not present in the lithological boring log of this well, is present at a number of neighboring borings and could be a source for these elevated constituents.[209]

Groundwater near the ash processing area is also contaminated with coal ash pollutants. Boron concentrations in downgradient wells AD-2 and AD-3 have consistently been higher than in upgradient well AD-1, and although TVA rarely measures boron, the limited available data show that it is increasing.[210] In well AD-2, boron, cobalt, manganese, and sulfate concentrations have all increased by at least two-fold since 2009. Cobalt and manganese concentrations in this well are now 2-6 times higher than health-based guidelines.

The gypsum disposal area, as described above, experienced a sinkhole shortly after it was put into service in 2010. This event affected wells G4B, G5A, G5B, and G6B, causing selenium concentrations as high as 412 ug/L. Selenium levels have declined following TVA's remediation and repair work, but still remain elevated above background concentrations, and, in well G5B, above the MCL (see Figure 9-1 below).

Data gaps

- The well network at Kingston is insufficient, with no wells along the northern perimeter of the ash disposal area.
- More generally, TVA and TDEC have failed to assess concentrations of coal ash indicators like boron, chloride, manganese, and sulfate with the same level of scrutiny applied to other pollutants. These coal ash indicators are measured infrequently, as reflected in the groundwater data summary tables below. In well AD-2, for example, these pollutants have been measured less than a third of the time. The limited data that TVA does collect is not reported in the main body of the groundwater monitoring reports, is not compared to any groundwater protection standards, and is not statistically analyzed for upgradient-downgradient patterns or temporal trends. Without proper reporting and analysis, TDEC and the public are deprived of the most informative evidence about the extent to which Kingston's ash disposal areas are contaminating groundwater.

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[209] TVA, *Kingston Fossil Plant Ash Disposal Area Groundwater Compliance Report – June 2011* (Aug. 22, 2011).
[210] Boron in wells AD-1 and AD-2 was between 350 and 450 ug/L in early 2010, and was measured at 1,360 ug/L (AD-2) and 1,865 ug/L (AD-3) in September 2012.

Figure 9-1: Selenium concentrations in gypsum disposal area wells G4B, G5A, G5B, and G6B (ug/L). Selenium in wells G1B, G3A, and G3B (not shown) has consistently been below 2 ug/L.

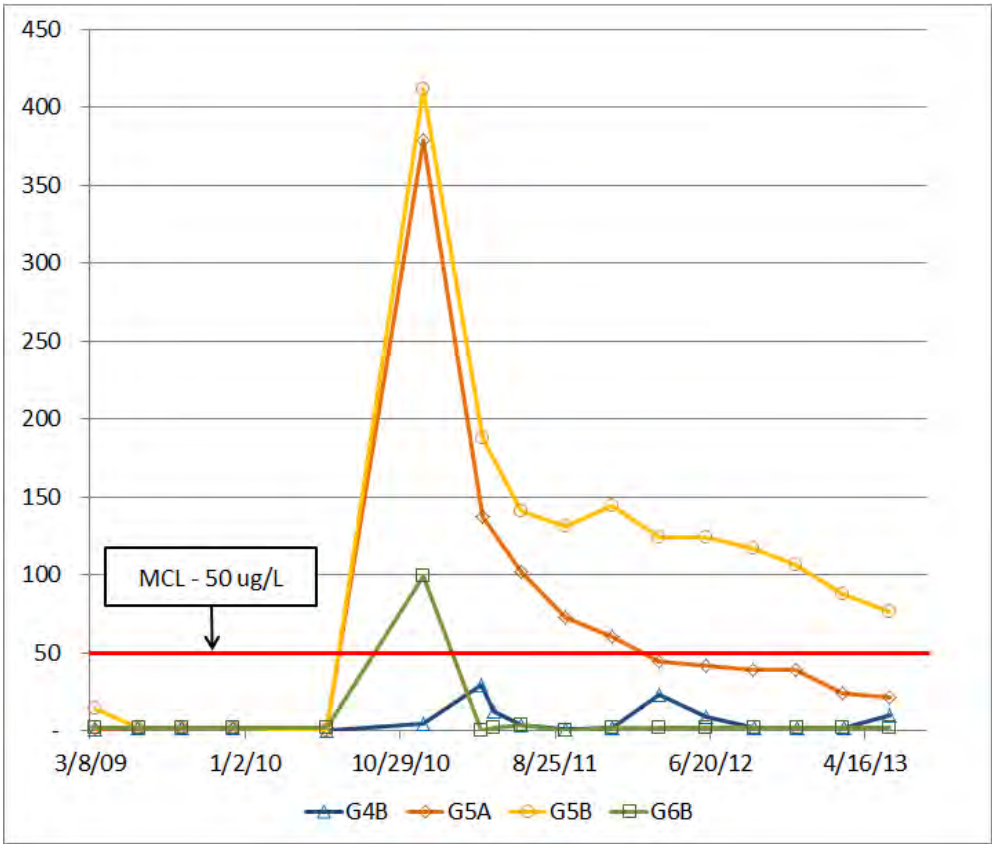

Figure 9-2: Kingston Fossil Plant in September 2007 (top), and in April 2013 (bottom). The ash spill occurred in December 2008. Note changes in the perimeter of ash disposal area, conversion of the ash pond to dry stacking, and construction of the gypsum disposal area on the southern peninsula**.**

Figure 9-3: Former (orange) and current (red) groundwater wells at Kingston Fossil Plant (approximate locations).

Table 9-1: Kingston Fossil Plant, Well AD-1. Based on 20 measurements between June 2009 and March 2013.[211]

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 2,430	(see note[212])
Antimony	6	<2	
Arsenic	10	<2	
Barium	2,000	44 – 102	
Beryllium	4	<2	
Boron	3,000	116 – 137	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	1.2 – 1.7 mg/L	(see note)
Chromium	100	0.4 – 4.4	
Cobalt	4.7	<2	
Copper	1,300	<0.3 – 15	
Fluoride	4,000	<100 – 429	
Lead	15	<2	
Lithium	31		No data
Manganese	300	28 – 176	(see note)
Mercury	2	<0.2	
Molybdenum	40	<5	(see note)
Nickel	100	<5	
Nitrate	10,000	<100	(see note)
Selenium	50	<2	
Silver	100	<2	
Strontium	9,300	90 – 201	(see note)
Sulfate	500 mg/L	19 – 29 mg/L	(see note)
TDS	500 mg/L	212 – 318 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<1 – 5	
Zinc	2,000	<50	

Table 9-2: Kingston Fossil Plant, Well AD-2. Based on 14 measurements between January 2010 and March 2013.[213]

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 123	(see note[214])
Antimony	6	<2	
Arsenic	10	1.0 – 5.1	
Barium	2,000	25 – 49	
Beryllium	4	<2	
Boron	3,000	358 – 1,360	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	8.0 – 10.2 mg/L	(see note)
Chromium	100	<2	
Cobalt	4.7	4.7 – 11.2	
Copper	1,300	<5	
Fluoride	4,000	<100 – 140	
Lead	15	<2	
Lithium	31	No data	
Manganese	300	739 – 1,670	(see note)
Mercury	2	<0.2	
Molybdenum	40	0.6 – 5.2	(see note)
Nickel	100	2.0 – 4.4	
Nitrate	10,000	<100	(see note)
Selenium	50	<2	
Silver	100	<2	
Strontium	9,300	346 – 957	(see note)
Sulfate	500 mg/L	97 – 269 mg/L	(see note)
TDS	500 mg/L	28 – 498 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<4	
Zinc	2,000	<50	

[211] EIP does not have all groundwater reports for this period on file; this table does not reflect data from March 2011.

[212] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 12 of the 20 sampling events represented here (no data from April-December 2010, September 2011-June 2012, or since September 2012).

[213] EIP does not have all groundwater reports for this period on file; this table does not reflect data from October 2010-August 2011, or from June 2012.

[214] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 10 of the 14 sampling events represented here (no data from April 2010-March 2012 or since September 2012).

Table 9-3: Kingston Fossil Plant, Well AD-3. Based on 17 measurements between January 2010 and March 2013.[215]

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	54 – 102	(see note[216])
Antimony	6	<2	
Arsenic	10	<2	
Barium	2,000	24 – 58	
Beryllium	4	<2	
Boron	3,000	363 – 1,865	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	5.3 – 8.4 mg/L	(see note)
Chromium	100	<2	
Cobalt	4.7	2.6 – 8.3	
Copper	1,300	<5	
Fluoride	4,000	<100 – 426	
Lead	15	<2	
Lithium	31	No data	
Manganese	300	5,130 – 13,750	(see note)
Mercury	2	<0.2	
Molybdenum	40	0.4 – 0.6	(see note)
Nickel	100	<5	
Nitrate	10,000	<100	(see note)
Selenium	50	<2	
Silver	100	<2	
Strontium	9,300	636 – 746	(see note)
Sulfate	500 mg/L	204 – 552 mg/L	(see note)
TDS	500 mg/L	509 – 1,215 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<4	
Zinc	2,000	<50	

Table 9-4: Kingston Fossil Plant, Well 4B. Based on 2 measurements in June and December 2008. This well was destroyed in the December 2008 ash spill.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 160	
Antimony	6	<1	
Arsenic	10	<1 – 1.7	
Barium	2,000	30 – 35	
Beryllium	4	<1	
Boron	3,000	<200	
Cadmium	5	0.5 – 0.8	
Chloride	250 mg/L	2.8 – 5.7 mg/L	
Chromium	100	<1 – 4	
Cobalt	4.7	1.7 – 2.8	
Copper	1,300	4 – 19	
Fluoride	4,000	170 – 280	
Lead	15	<1 – 1.3	
Lithium	31	No data	
Manganese	300	1,100 – 1,800	
Mercury	2	<0.2	
Molybdenum	40	<5	
Nickel	100	14 – 18	
Nitrate	10,000	<100	
Selenium	50	1.0 – 1.2	
Silver	100	<0.5	
Strontium	9,300	250 – 460	
Sulfate	500 mg/L	240 – 500 mg/L	
TDS	500 mg/L	520 – 980 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	18 – 24	

[215] EIP does not have all groundwater reports for this period on file; this table does not reflect data from March 2011.

[216] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 12 of the 17 sampling events represented here (no data from April 2010-December 2010, September 2011-June 2012, or since September 2012).

Table 9-5: Kingston Fossil Plant, Well 6A. Based on 3 measurements from June 2008 to June 2009. This well was destroyed in August 2009 during routine operations.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<1,000	
Antimony	6	<2	
Arsenic	10	6.3 – 6.5[217]	
Barium	2,000	<100 – 210	
Beryllium	4	<2	
Boron	3,000	711 – 1,900	
Cadmium	5	<1	
Chloride	250 mg/L	6.1 – 8.0	
Chromium	100	<20	
Cobalt	4.7	<20[218]	
Copper	1,300	<50	
Fluoride	4,000	<100 – 230	
Lead	15	<2	
Lithium	31	No data	
Manganese	300	130,000 – 220,000	
Mercury	2	<0.2	
Molybdenum	40	<25[219]	
Nickel	100	<50	
Nitrate	10,000	<100[220]	
Selenium	50	<20	
Silver	100	<20	
Strontium	9,300	681 – 700	
Sulfate	500 mg/L	2,500 – 3,500 mg/L	
TDS	500 mg/L	4,600 – 5,280 mg/L	
Thallium	2	<2	
Vanadium	63	<50	
Zinc	2,000	<500	

Table 9-6: Kingston Fossil Plant, Well 6AR. Based on 9 measurements from September 2009 to December 2012.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	198 – 204	(see note[221])
Antimony	6	<2	
Arsenic	10	<2	
Barium	2,000	22 – 43	
Beryllium	4	<2	
Boron	3,000	588 – 664	(see note)
Cadmium	5	1.0 – 2.5	
Chloride	250 mg/L	4.0 – 10.1 mg/L	(see note)
Chromium	100	<2	
Cobalt	4.7	84 – 111	
Copper	1,300	<5	
Fluoride	4,000	<500	
Lead	15	<2	
Lithium	31	No data	
Manganese	300	27,600 – 35,800	(see note)
Mercury	2	<0.2	
Molybdenum	40	<5	(see note)
Nickel	100	35 – 45	
Nitrate	10,000	<100	(see note)
Selenium	50	<10	
Silver	100	<2	
Strontium	9,300	119 – 128	(see note)
Sulfate	500 mg/L	19 – 229 mg/L	(see note)
TDS	500 mg/L	319 – 376 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<4	
Zinc	2,000	<50	

[217] One of the three measurements was reported as <20 ug/L.

[218] The three reported values for this period were 1.7 ug/L, <20 ug/L, and <2 ug/L.

[219] One of the three measurements was reported as <50 ug/L.

[220] One the three measurements was reported as <50 mg/L.

[221] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 5 of the 9 sampling events represented here (no data from June-December 2010 or since June 2011).

Table 9-7: Kingston Fossil Plant, Well 13B. Based on 5 measurements from June 2008 to December 2009, when the well was destroyed during routine operations.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100	
Antimony	6	<2	
Arsenic	10	0.7 – 3.2	
Barium	2,000	356 – 485	
Beryllium	4	<2	
Boron	3,000	<200	
Cadmium	5	<2	
Chloride	250 mg/L	2.5 – 9.7 mg/L	
Chromium	100	<2	
Cobalt	4.7	<2	
Copper	1,300	<5	
Fluoride	4,000	100 – 230	
Lead	15	<2	
Lithium	31	No data	
Manganese	300	80 – 182	
Mercury	2	<0.2	
Molybdenum	40	<5	
Nickel	100	<5	
Nitrate	10,000	<100	
Selenium	50	<2	
Silver	100	<2	
Strontium	9,300	340 – 451	
Sulfate	500 mg/L	<5 – 46 mg/L	
TDS	500 mg/L	240 – 300 mg/L	
Thallium	2	<2	
Vanadium	63	<10	
Zinc	2,000	11 – 686	

Table 9-8: Kingston Fossil Plant, Well 16A. Based on 2 measurements in June and December 2008. This well was destroyed in the December 2008 ash spill.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	280 – 2,100	
Antimony	6	<1	
Arsenic	10	1.4	
Barium	2,000	51 – 64	
Beryllium	4	<1	
Boron	3,000	<200	
Cadmium	5	<0.5 – 0.6	
Chloride	250 mg/L	<1 – 2.3 mg/L	
Chromium	100	1.5 – 5.6	
Cobalt	4.7	<1 -1.6	
Copper	1,300	1.3 – 2.8	
Fluoride	4,000	300 – 420	
Lead	15	<1 – 2	
Lithium	31	No data	
Manganese	300	1,200 – 1,300	
Mercury	2	<0.2	
Molybdenum	40	<5	
Nickel	100	2.2 – 6.0	
Nitrate	10,000	<0.1	
Selenium	50	<1	
Silver	100	<0.5	
Strontium	9,300	275 – 280	
Sulfate	500 mg/L	27 – 28 mg/L	
TDS	500 mg/L	160 – 200 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	12 – 35	

Table 9-9: Kingston Fossil Plant, Well 22. Based on 10 measurements in June 2009 and December 2012.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 362	(see note[222])
Antimony	6	<2	
Arsenic	10	<2	
Barium	2,000	21 – 36	
Beryllium	4	<2	
Boron	3,000	665 – 1,140	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	7.0 – 11.8 mg/L	(see note)
Chromium	100	<2	
Cobalt	4.7	<0.3 – 2.2	
Copper	1,300	<5	
Fluoride	4,000	<100	
Lead	15	<2	
Lithium	31	No data	
Manganese	300	1,830 – 2,320	(see note)
Mercury	2	<0.2	
Molybdenum	40	<5	(see note)
Nickel	100	<5	
Nitrate	10,000	<100	(see note)
Selenium	50	<2	
Silver	100	<2	
Strontium	9,300	408 – 502	(see note)
Sulfate	500 mg/L	78 – 102 mg/L	(see note)
TDS	500 mg/L	183 – 209 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<4	
Zinc	2,000	<50	

Table 9-10: Kingston Fossil Plant, Well G1B. Based on 16 measurements between March 2009 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 1,420	(see note[223])
Antimony	6	<2	
Arsenic	10	<2	
Barium	2,000	54 – 475	
Beryllium	4	<2	
Boron	3,000	<200	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	1.2 – 1.9 mg/L	(see note)
Chromium	100	0.7 – 5.4	
Cobalt	4.7	<2	
Copper	1,300	<5	
Fluoride	4,000	<100	
Lead	15	<0.3 – 6.1	
Lithium	31		No data
Manganese	300	<5 – 178	(see note)
Mercury	2	<0.2	
Molybdenum	40	<5	(see note)
Nickel	100	<0.3 – 5.7	
Nitrate	10,000	111 – 582	(see note)
Selenium	50	<0.33 – 2.3	
Silver	100	<2	
Strontium	9,300	<50	(see note)
Sulfate	500 mg/L	1.1 – 7.6 mg/L	(see note)
TDS	500 mg/L	184 – 252 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<1 – 8.8	
Zinc	2,000	<50	

[222] Aluminum, boron, chloride, manganese, molybdenum, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 5 of the 10 sampling events represented here (no data from June-December 2010 or since June 2011).

[223] Aluminum, boron, manganese, and molybdenum were omitted from monitoring in 5 of the 15 sampling events represented here (no data from June-December 2010, September-December 2011, or March 2013); chloride, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 8 of the 15 sampling events (no data from June-December 2010, June 2011-September 2012, or March 2013).

Table 9-11: Kingston Fossil Plant, Well G3A. Based on 17 measurements between March 2009 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 1,720	(see note[224])
Antimony	6	<2	
Arsenic	10	<0.3 – 3.0	
Barium	2,000	18 – 36	
Beryllium	4	<2	
Boron	3,000	<200	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	2.8 – 4.3 mg/L	(see note)
Chromium	100	0.6 – 4.8	
Cobalt	4.7	<2	
Copper	1,300	<5	
Fluoride	4,000	<100 – 120	
Lead	15	<0.3 – 5.8	
Lithium	31		No data
Manganese	300	7 – 203	(see note)
Mercury	2	<0.2	
Molybdenum	40	<5	(see note)
Nickel	100	<5	
Nitrate	10,000	615 – 908	(see note)
Selenium	50	<2	
Silver	100	<2	
Strontium	9,300	<50	(see note)
Sulfate	500 mg/L	13.6 – 29 mg/L	(see note)
TDS	500 mg/L	170 – 229 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<1 – 5.9	
Zinc	2,000	<50	

Table 9-12: Kingston Fossil Plant, Well G3B. Based on 17 measurements between March 2009 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 776	(see note[225])
Antimony	6	<2	
Arsenic	10	0.4 – 2.1	
Barium	2,000	13 – 22	
Beryllium	4	<2	
Boron	3,000	<200	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	2.5 – 3.4 mg/L	(see note)
Chromium	100	<0.3 – 9.8	
Cobalt	4.7	<2	
Copper	1,300	<5	
Fluoride	4,000	<100 – 244	
Lead	15	0.5 – 5.1	
Lithium	31		No data
Manganese	300	<5 – 252	(see note)
Mercury	2	<0.2	
Molybdenum	40	2.8 – 5.4	(see note)
Nickel	100	0.5 – 6.7	
Nitrate	10,000	<100 – 520	(see note)
Selenium	50	<2	
Silver	100	<2	
Strontium	9,300	52 – 94	(see note)
Sulfate	500 mg/L	48 – 65 mg/L	(see note)
TDS	500 mg/L	229 – 296 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<1 – 4.1	
Zinc	2,000	<50	

[224] Aluminum, boron, manganese, and molybdenum were omitted from monitoring in 5 of the 16 sampling events represented here (no data from June-December 2010, September-December 2011, or March 2013); chloride, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 9 of the 16 sampling events (no data from June 2010-April 2011, September 2011-September 2012, or March 2013).

[225] Aluminum, boron, manganese, and molybdenum were omitted from monitoring in 5 of the 16 sampling events represented here (no data from June-December 2010, September-December 2011, or March 2013); chloride, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 9 of the 16 sampling events (no data from June 2010-April 2011, September 2011-September 2012, or March 2013).

Table 9-13: Kingston Fossil Plant, Well G4B. Based on 17 measurements between March 2009 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	27 – 715	(see note[226])
Antimony	6	<2	
Arsenic	10	0.6 – 6.5	
Barium	2,000	24 – 42	
Beryllium	4	<2	
Boron	3,000	<200	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	2 – 42 mg/L	(see note)
Chromium	100	<0.3 – 5.0	
Cobalt	4.7	0.3 – 2.6	
Copper	1,300	0.5 – 6.7	
Fluoride	4,000	<100 – 338	
Lead	15	<0.3 – 2.6	
Lithium	31		No data
Manganese	300	4 – 31	(see note)
Mercury	2	<0.2	
Molybdenum	40	7 – 26	(see note)
Nickel	100	2.3 – 5.5	
Nitrate	10,000	<100 – 212	(see note)
Selenium	50	<0.3 – 29.3	
Silver	100	<2	
Strontium	9,300	55 – 105	(see note)
Sulfate	500 mg/L	33.4 – 75.8 mg/L	(see note)
TDS	500 mg/L	296 – 604 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	0.8 – 4.3	
Zinc	2,000	<50	

Table 9-14: Kingston Fossil Plant, Well G5A. Based on 16 measurements between March 2009 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 193	(see note[227])
Antimony	6	<2	
Arsenic	10	<2	
Barium	2,000	12.5 – 148.5	
Beryllium	4	<2	
Boron	3,000	<12.5 – 1,410	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	2.7 – 172 mg/L	(see note)
Chromium	100	<0.3 – 4.0	
Cobalt	4.7	<2	
Copper	1,300	<0.3 – 11	
Fluoride	4,000	<100 – 614	
Lead	15	<2	
Lithium	31		No data
Manganese	300	1 – 11	(see note)
Mercury	2	<0.2	
Molybdenum	40	<5	(see note)
Nickel	100	<5	
Nitrate	10,000	1,020 – 1,930	(see note)
Selenium	50	<0.3 – 379	
Silver	100	<2	
Strontium	9,300	31 – 965	(see note)
Sulfate	500 mg/L	3.5 – 246 mg/L	(see note)
TDS	500 mg/L	151 – 841 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<4	
Zinc	2,000	<50	

[226] Aluminum, boron, manganese, and molybdenum were omitted from monitoring in 5 of the 16 sampling events represented here (no data from June-December 2010, September-December 2011, or March 2013); chloride, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 9 of the 16 sampling events (no data from June 2010-April 2011, September 2011-September 2012, or March 2013).

[227] Aluminum, boron, manganese, and molybdenum were omitted from monitoring in 5 of the 16 sampling events represented here (no data from June-December 2010, September-December 2011, or March 2013); chloride, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 8 of the 16 sampling events (no data from June-December 2010, September 2011-September 2012, or March 2013).

Table 9-15: Kingston Fossil Plant, Well G5B. Based on 16 measurements between March 2009 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	<100 – 4,500	(see note[228])
Antimony	6	<2	
Arsenic	10	0.8 – 3.8	
Barium	2,000	14 – 183	
Beryllium	4	<2	
Boron	3,000	<12.5 – 1,550	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	2.8 – 249 mg/L	(see note)
Chromium	100	<0.3 – 9.8	
Cobalt	4.7	<2	
Copper	1,300	<5	
Fluoride	4,000	<100 – 840	
Lead	15	<2 – 13.5	
Lithium	31	No data	No data
Manganese	300	11 – 263	(see note)
Mercury	2	<0.1 – 0.2	
Molybdenum	40	2 – 13	(see note)
Nickel	100	0.9 – 7.3	
Nitrate	10,000	171 – 1,700	(see note)
Selenium	50	<0.3 – 412	
Silver	100	<2	
Strontium	9,300	48 – 1,330	(see note)
Sulfate	500 mg/L	6.8 – 378 mg/L	(see note)
TDS	500 mg/L	195 – 1,090 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<4	
Zinc	2,000	<50	

Table 9-16: Kingston Fossil Plant, Well G6B. Based on 17 measurements between March 2009 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000	84 – 104	(see note[229])
Antimony	6	<2	
Arsenic	10	<2	
Barium	2,000	8.1 – 24.6	
Beryllium	4	<2	
Boron	3,000	<200	(see note)
Cadmium	5	<1	
Chloride	250 mg/L	3.1 – 6.6 mg/L	(see note)
Chromium	100	<0.3 – 3.8	
Cobalt	4.7	<2	
Copper	1,300	<5	
Fluoride	4,000	<100	
Lead	15	<2	
Lithium	31	No data	No data
Manganese	300	3 – 22	(see note)
Mercury	2	<0.2	
Molybdenum	40	<5	(see note)
Nickel	100	<5	
Nitrate	10,000	<100 – 345	(see note)
Selenium	50	<0.3 – 99.3	
Silver	100	<2	
Strontium	9,300	<50	(see note)
Sulfate	500 mg/L	3.5 – 12.7 mg/L	(see note)
TDS	500 mg/L	200 – 334 mg/L	(see note)
Thallium	2	<2	
Vanadium	63	<1 – 4.1	
Zinc	2,000	<50	

[228] Aluminum, boron, manganese, and molybdenum were omitted from monitoring in 5 of the 16 sampling events represented here (no data from June-December 2010, September-December 2011, or March 2013); chloride, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 8 of the 16 sampling events (no data from June-December 2010, September 2011-September 2012, or March 2013).

[229] Aluminum, boron, manganese, and molybdenum were omitted from monitoring in 5 of the 16 sampling events represented here (no data from June-December 2010, September-December 2011, or March 2013); chloride, nitrate, strontium, sulfate, and TDS were omitted from monitoring in 9 of the 16 sampling events (no data from June 2010-April 2011, September 2011-September 2012, or March 2013).

10 Paradise Fossil Plant

Background

The Paradise Fossil Plant includes three coal units on the Green River outside of Drakesboro, KY. TVA built the plant between 1959 and 1970. The land around and beneath the site is heavily disturbed by coal mining and reclamation, and coal ash disposal areas have been built over mine spoil.[230]

The original ash disposal areas for Paradise were located close to the plant, under the current coal pile, coal yard drainage basin, and parking lot.[231] These areas were filled and graded by 1967.[232] TVA built the slag (bottom ash) ponds, including Slag Ponds 2A and 2B and the Slag Stilling Pond, in 1967-1970.[233] Stantec noted that this area may be underlain by both mine spoils and fly ash.[234] TVA built Jacob's Creek Ash and Stilling Ponds around 1971, and built the Peabody Ash and Stilling Ponds in 1997.[235]

At some point prior to 1980,[236] TVA began stacking bottom ash in the "Slag Mountain" area. The area is no longer used for disposal, but the ash is being actively reclaimed for commercial use and the area still includes two storm water retention ponds.[237] The dikes around the ponds have experienced erosion and partial structural failures.[238] The pond dikes also show significant

[230] *See, e.g.*, Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Kentucky, Appendix B: Paradise Fossil Plant,* Scrubber Sludge Complex - Gypsum Stack page 11 ("It appears that most or all of the Scrubber Sludge Complex was constructed on top of thick mine spoil deposits which are difficult to characterize."). Stantec made the same observation about each of the eleven ash or gypsum disposal areas at Paradise. Stantec subsequently confirmed the presence of mine spoil beneath the gypsum area and the active ash pond in its Phase II assessment. Stantec Consulting Services, Inc., *Report of Geotechnical Exploration – Peabody Ash Pond, Paradise Fossil Plant* (Feb. 9, 2010); Letter from Stantec Consulting Services, Inc. to TVA reporting on geotechnical exploration of the south slope of the west pond of the scrubber sludge complex (Apr. 19, 2010).

[231] *See* Stantec Consulting Services, Inc., *Report of Geotechnical Exploration – Peabody Ash Pond, Paradise Fossil Plant – Appendix A, Historic Documents*, Reference No. 2: Draft Peabody Ash Pond Expansion 1998, page 1 (Feb. 9, 2010).

[232] *Id*.

[233] Letter from Anda Ray, TVA, to Richard Kinch, U.S. EPA, responding to a U.S. EPA request for information (Mar. 25, 2009).

[234] Stantec Phase 1 Assessment, *supra* note 230, at Slag Stilling Pond page 6.

[235] TVA letter, *supra* note 233; Stantec, Peabody Ash Pond Report, *supra* note 230, at iv.

[236] Stantec reports having access to inspection reports from 1980-2008, and states that slag was stacked in the Slag Mountain area "during early years of the plant operation." Stantec Phase 1 Assessment, *supra* note 230, at Slag Mountain pages 1-2.

[237] *Id*. at Slag Mountain page 1, Slag Mountain Pond 1, and Slag Mountain Pond 2.

[238] *Id*. at Slag Mountain Pond 1 page 1 ("a 75 foot long by 4 foot section of the south dike slide into the edge of Jacob's Creek in the early 1990'2") and Slag Mountain Pond 2 page 4 (describing a slide 40 feet long and 22 feet high).

seepage around their perimeters, including one red water seep flowing at a rate of five gallons per minute,[239] and another seepage-affected area that nearly swallowed a Stantec engineer:

> A thick cover of leaves makes it difficult to identify the location and extent of wet areas, but while searching below the toe, a Stantec engineer stepped into a seepage ponded area and his leg sank approximately 16 inches into the ground (very saturated and disturbed).[240]

TVA installed sulfur dioxide scrubbers at Paradise in the early 1980s, and built the scrubber sludge complex around 1986.[241] TVA has sluiced both gypsum and fly ash into the areas.[242] In addition to erosion, sloughing, and one structural "blow out" in 2008, Stantec has observed "uncontrolled seepage saturating the slopes on all sides of this facility."[243]

TVA built the East and West Dredge Cells in 1991 as a place to stack fly ash dredged from the Jacob's Creek Pond, but apparently only dredged to the East Cell, and only during 1992-1994. The West Cell functions as a storm water control pond.[244]

Monitoring

The limited available data show that TVA is adding contamination to an already-contaminated area. The groundwater aquifers around the Paradise plant were originally disturbed by strip mining.[245] By 1989 local groundwater was no longer "considered usable as a water source."[246] TVA operates an asbestos landfill on the property just north of the Scrubber Sludge Complex,[247] and the two disposal areas share two groundwater monitoring wells.[248] The groundwater flow in the area is now affected by the TVA ash ponds.[249] There are therefore several complications in any attempt to isolate the effect of TVA's ash disposal areas on local groundwater quality:

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[239] *Id*. at Slag Mountain Pond 1 page 5.
[240] *Id*. at Slag Mountain Pond 2 page 4.
[241] TVA letter, *supra* note 233.
[242] Stantec Phase I Assessment, *supra* note 230, at Scrubber Sludge Complex Gypsum Stack page 9.
[243] *Id*. at Scrubber Sludge Complex Gypsum Stack pages 1-6.
[244] *Id*. at East and West Dredge Cells.
[245] TVA, *Draft Environmental Assessment – Development of Dredged Ash Disposal Area*, 10 (Mar. 1, 1989) ("The only significant water-bearing units within the Pennsylvanian Age regional aquifer are the Lisman Formation and the deeply buried Caseyville Formation. Coal-stripping operations have removed the Lisman formation in most of the upland areas. Where sandstone units of the Lisman Formation exits they receive direct infiltration and are susceptible to contamination from the surface.").
[246] *Id*. at 16.
[247] *See, e.g.*, Kentucky Department for Environmental Protection, Fact Sheet for Residual Landfill Permit # 089-00012 (Sep. 1996).
[248] Wells 94-42 and 97-45, both used as upgradient wells for the Scrubber Sludge Complex (or FGD Pond), are also upgradient wells for the asbestos landfill. *See, e.g.*, TVA, Groundwater and Surface Water Monitoring Sample Data Reporting Form – Residual Landfill – 2nd Quarter 2010 (2012).
[249] *See* TVA 1989, *supra* note 245, at 16. *See also id*. at 24, noting that ash placed in the area now occupied by the Peabody Ash Pond would be in direct contact with groundwater.

First, there are very few data points (see Data Gaps, below). Second, the limited data are likely to reflect a mixture of impacts from historical strip mining, ongoing ash disposal, and other waste disposal. Finally, the ash ponds may be influencing local groundwater in ways that make site-wide flow patterns difficult to characterize. With these considerations in mind, there are a few observations that can be made about each disposal area.

Wells 10-1 and 10-2, at the eastern edge of the Scrubber Sludge Complex, show clear evidence of coal ash contamination, with very high concentrations of boron, manganese, and sulfate, in addition to high concentrations of cobalt.

Wells around the Jacob's Creek and Peabody Ash Ponds have only been sampled once, but all four showed unsafe concentrations of one or more pollutants, including manganese in all four wells and cobalt in three of the four wells. Well 10-6 stands out as having much higher concentrations of cobalt and manganese than the other three wells: Cobalt in well 10-6 was measured at 130 ug/l, while wells 10-3 through 10-5 had concentrations of 1.4 – 27 ug/L. Similarly, manganese in well 10-6 was measured at 28 mg/L, roughly 100 times higher than EPA's health advisory of 0.3 mg/L. Manganese in wells 10-3 through 10-5 was measured at 1.4 – 3.8 mg/L. Well 10-6 also stands out as having much higher boron concentrations than the other three wells, providing further evidence of ash contamination.

Wells along the Slag Ponds, measured once in 2011, also show evidence of contamination. Well 10-8 had unsafe concentrations of arsenic, cobalt, and manganese, although the cobalt and manganese concentrations were less than those seen in upgradient well 10-7. Well 10-9 had higher concentrations of cobalt and manganese than the upgradient well (both were orders of magnitude higher than health-based thresholds) and also had an extremely high concentration of boron, which was not detected in the upgradient well.

Data Gaps

Groundwater at Paradise is effectively unmonitored. Although TVA has sampled a series of wells one or more times, it rarely monitors wells on a routine basis, and when it does sample a well it typically omits pollutants associated with coal ash.

- As far as we know, TVA sampled the wells around the ash ponds just once, in June 2011. After finding evidence of coal ash contamination in several of these wells, especially wells 10-6 (at the Peabody Ash Pond) and 10-9 (at the Slag Ponds), TVA stopped sampling these wells, effectively ignoring the problem.
- TVA has been sampling wells around the Scrubber Sludge Complex semi-annually since 2011, but only for a very limited set of pollutants. Most pollutants, including key coal ash indicators like boron, manganese, and sulfate, were measured once (in wells 10-1

and 10-2) or not at all (in wells 94-35A, 94-42, and 97-45). Again, TVA appears to be avoiding evidence of coal ash contamination.

- Other areas of the site simply have no wells around them, most notably the area east of the site known as Slag Mountain, including the two storm water ponds in that area, but also including the East and West Dredge Cells.

Figure 10-1: Groundwater wells at Paradise Fossil Plant (approximate locations)

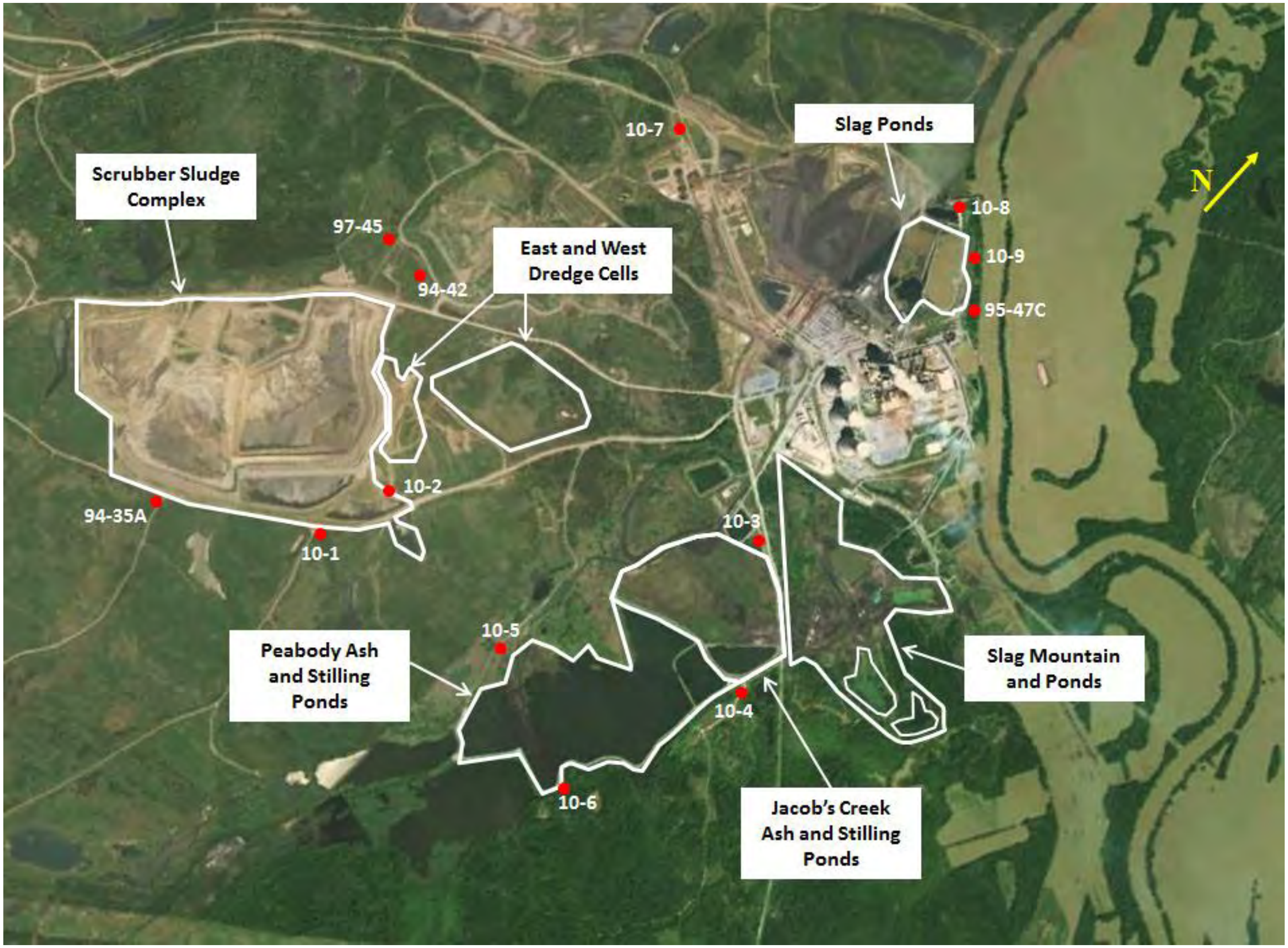

Table 10-1: Paradise Fossil Plant, Well 94-35A. Sampled 5 times between June 2011 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6		No data
Arsenic	10	4.1 – 8.4	
Barium	2,000		No data
Beryllium	4		No data
Boron	3,000		No data
Cadmium	5	<0.5	
Chloride	250 mg/L	410 mg/L	No data since 6/2011
Chromium	100		No data
Cobalt	4.7		No data
Copper	1,300	8.7	No data since 6/2011
Fluoride	4,000		No data
Lead	15	<1 – 1.7	
Lithium	31		No data
Manganese	300		No data
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	23	No data since 6/2011
Nitrate	10,000		No data
Selenium	50	5.8 – 17	
Silver	100		No data
Strontium	9,300		No data
Sulfate	500 mg/L	1,800 mg/L	No data since 6/2011
TDS	500 mg/L	3,700 mg/L	No data since 6/2011
Thallium	2		No data
Vanadium	63		No data
Zinc	2,000		No data

Table 10-2: Paradise Fossil Plant, Well 94-42. Sampled 5 times between June 2011 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6		No data
Arsenic	10	1.0 – 3.5	
Barium	2,000		No data
Beryllium	4		No data
Boron	3,000		No data
Cadmium	5	<0.5 – 0.5	
Chloride	250 mg/L	9.6 mg/L	No data since 6/2011
Chromium	100		No data
Cobalt	4.7		No data
Copper	1,300		No data
Fluoride	4,000		No data
Lead	15	<1	
Lithium	31		No data
Manganese	300		No data
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100		No data
Nitrate	10,000		No data
Selenium	50	<1	
Silver	100		No data
Strontium	9,300		No data
Sulfate	500 mg/L		No data
TDS	500 mg/L	4,900 mg/L	No data since 6/2011
Thallium	2		No data
Vanadium	63		No data
Zinc	2,000		No data

Table 10-3: Paradise Fossil Plant, Well 94-47C. Sampled once, in June 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6		No data
Arsenic	10	<1	
Barium	2,000		No data
Beryllium	4		No data
Boron	3,000		No data
Cadmium	5	<0.5	
Chloride	250 mg/L	17 mg/L	
Chromium	100		No data
Cobalt	4.7		No data
Copper	1,300	2.6	
Fluoride	4,000		No data
Lead	15	<1	
Lithium	31		No data
Manganese	300		No data
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	63	
Nitrate	10,000		No data
Selenium	50	<1	
Silver	100		No data
Strontium	9,300		No data
Sulfate	500 mg/L	460 mg/L	
TDS	500 mg/L	910 mg/L	
Thallium	2		No data
Vanadium	63		No data
Zinc	2,000		No data

Table 10-4: Paradise Fossil Plant, Well 97-45. Sampled 5 times between June 2011 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6		No data
Arsenic	10	<1	
Barium	2,000		No data
Beryllium	4		No data
Boron	3,000		No data
Cadmium	5	<0.5 – 0.5	
Chloride	250 mg/L	3.3 mg/L	No data since 6/2011
Chromium	100		No data
Cobalt	4.7		No data
Copper	1,300		No data
Fluoride	4,000		No data
Lead	15	<1	
Lithium	31		No data
Manganese	300		No data
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	7.9	No data since 6/2011
Nitrate	10,000		No data
Selenium	50	<1 – 1.2	
Silver	100		No data
Strontium	9,300		No data
Sulfate	500 mg/L	1,600 mg/L	No data since 6/2011
TDS	500 mg/L	3,200 mg/L	No data since 6/2011
Thallium	2		No data
Vanadium	63		No data
Zinc	2,000		No data

Table 10-6: Paradise Fossil Plant, Well 10-1. Sampled 5 times between June 2011 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	No data since 6/2011
Arsenic	10	1.9 – 4.4	
Barium	2,000	22	No data since 6/2011
Beryllium	4	<1	No data since 6/2011
Boron	3,000	10,500	No data since 6/2011
Cadmium	5	<0.5	
Chloride	250 mg/L	340 mg/L	No data since 6/2011
Chromium	100	5.5	No data since 6/2011
Cobalt	4.7	8.1	No data since 6/2011
Copper	1,300	14.1	No data since 6/2011
Fluoride	4,000	480	No data since 6/2011
Lead	15	<5	
Lithium	31		No data
Manganese	300	2,700	No data since 6/2011
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	16.5	No data since 6/2011
Nitrate	10,000	<100	No data since 6/2011
Selenium	50	5 – 11	
Silver	100	<1	No data since 6/2011
Strontium	9,300		No data
Sulfate	500 mg/L	1,900 mg/L	No data since 6/2011
TDS	500 mg/L	3,750 mg/L	No data since 6/2011
Thallium	2	<1	No data since 6/2011
Vanadium	63	<2	No data since 6/2011
Zinc	2,000	12	No data since 6/2011

Table 10-7: Paradise Fossil Plant, Well 10-2. Sampled 5 times between June 2011 and June 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	No data since 6/2011
Arsenic	10	2.0 – 6.1	
Barium	2,000	16	No data since 6/2011
Beryllium	4	<1	No data since 6/2011
Boron	3,000	24,000	No data since 6/2011
Cadmium	5	<0.5	
Chloride	250 mg/L	410 mg/L	No data since 6/2011
Chromium	100	<2	No data since 6/2011
Cobalt	4.7	5.9	No data since 6/2011
Copper	1,300	7.2	No data since 6/2011
Fluoride	4,000	1,200	No data since 6/2011
Lead	15	<1 -1.8	
Lithium	31		No data
Manganese	300	2,600	No data since 6/2011
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	17	No data since 6/2011
Nitrate	10,000	<100	No data since 6/2011
Selenium	50	7.4	
Silver	100	<1	No data since 6/2011
Strontium	9,300		No data
Sulfate	500 mg/L	1,800 mg/L	No data since 6/2011
TDS	500 mg/L	3,400 mg/L	No data since 6/2011
Thallium	2	1.2	No data since 6/2011
Vanadium	63	<2	No data since 6/2011
Zinc	2,000	19	No data since 6/2011

Table 10-8: Paradise Fossil Plant, Well 10-3. Sampled once, in June 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	<1	
Barium	2,000	16	
Beryllium	4	M1	
Boron	3,000	420	
Cadmium	5	0.7	
Chloride	250 mg/L	15 mg/L	
Chromium	100	2.6	
Cobalt	4.7	27	
Copper	1,300	6.8	
Fluoride	4,000	350	
Lead	15	1.7	
Lithium	31		No data
Manganese	300	3,800	
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	43	
Nitrate	10,000	<100	
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300		No data
Sulfate	500 mg/L	1,400 mg/L	
TDS	500 mg/L	2,100 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	22	

Table 10-9: Paradise Fossil Plant, Well 10-4. Sampled once, in June 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	8.0	
Barium	2,000	64	
Beryllium	4	<1	
Boron	3,000	270	
Cadmium	5	<0.5	
Chloride	250 mg/L	9.8 mg/L	
Chromium	100	14	
Cobalt	4.7	1.4	
Copper	1,300	2	
Fluoride	4,000	615	
Lead	15	2.1	
Lithium	31		No data
Manganese	300	1,400	
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	9.4	
Nitrate	10,000	<0.1	
Selenium	50	1.3	
Silver	100	<1	
Strontium	9,300		No data
Sulfate	500 mg/L	98 mg/L	
TDS	500 mg/L	580 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	<10	

Table 10-10: Paradise Fossil Plant, Well 10-5. Sampled once, in June 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	<1	
Barium	2,000	17	
Beryllium	4	<1	
Boron	3,000	530	
Cadmium	5	<0.5	
Chloride	250 mg/L	36 mg/L	
Chromium	100	23	
Cobalt	4.7	13	
Copper	1,300	8.2	
Fluoride	4,000	170	
Lead	15	1	
Lithium	31		No data
Manganese	300	3,000	
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	30	
Nitrate	10,000	<100	
Selenium	50	1.5	
Silver	100	1	
Strontium	9,300		No data
Sulfate	500 mg/L	1,900 mg/L	
TDS	500 mg/L	3,400 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	10	

Table 10-11: Paradise Fossil Plant, Well 10-6. Sampled once, in June 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	<5	
Barium	2,000	46	
Beryllium	4	<1	
Boron	3,000	3,200	
Cadmium	5	<0.5	
Chloride	250 mg/L	94 mg/L	
Chromium	100	12	
Cobalt	4.7	130	
Copper	1,300	<10	
Fluoride	4,000	290	
Lead	15	1.2	
Lithium	31		No data
Manganese	300	28,000	
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	29	
Nitrate	10,000	<100	
Selenium	50	7.8	
Silver	100	21	
Strontium	9,300		No data
Sulfate	500 mg/L	590 mg/L	
TDS	500 mg/L	1,100 mg/L	
Thallium	2	<1	
Vanadium	63	<10	
Zinc	2,000	<50	

Table 10-12: Paradise Fossil Plant, Well 10-7. Sampled once, in June 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	2.7	
Barium	2,000	170	
Beryllium	4	<1	
Boron	3,000	<200	
Cadmium	5	<0.5	
Chloride	250 mg/L	45 mg/L	
Chromium	100	<2	
Cobalt	4.7	135	
Copper	1,300	<2	
Fluoride	4,000	160	
Lead	15	1.4	
Lithium	31		No data
Manganese	300	48,500	
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	21.5	
Nitrate	10,000	<100	
Selenium	50	<1	
Silver	100	<1	
Strontium	9,300		No data
Sulfate	500 mg/L	190 mg/L	
TDS	500 mg/L	580 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	<10	

Table 10-13: Paradise Fossil Plant, Well 10-8. Sampled once, in June 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	18	
Barium	2,000	300	
Beryllium	4	<1	
Boron	3,000	<200	
Cadmium	5	<0.5	
Chloride	250 mg/L	19 mg/L	
Chromium	100	3.6	
Cobalt	4.7	26	
Copper	1,300	<2	
Fluoride	4,000	160	
Lead	15	1.5	
Lithium	31		No data
Manganese	300	19,000	
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	18	
Nitrate	10,000	<100	
Selenium	50	2.7	
Silver	100	2.5	
Strontium	9,300		No data
Sulfate	500 mg/L	210 mg/L	
TDS	500 mg/L	920 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	13	

Table 10-14: Paradise Fossil Plant, Well 10-9. Sampled once, in June 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	1.2	
Barium	2,000	12	
Beryllium	4	3.9	
Boron	3,000	15,000	
Cadmium	5	4.5	
Chloride	250 mg/L	14 mg/L	
Chromium	100	10	
Cobalt	4.7	370	
Copper	1,300	7.9	
Fluoride	4,000	190	
Lead	15	2.4	
Lithium	31		No data
Manganese	300	61,000	
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	200	
Nitrate	10,000	<100	
Selenium	50	5	
Silver	100	<1	
Strontium	9,300		No data
Sulfate	500 mg/L	280 mg/L	
TDS	500 mg/L	1,600 mg/L	
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	340	

11 Shawnee Fossil Plant

Background

The Shawnee Fossil Plant is located on the Ohio River in West Paducah, KY. TVA has been operating 10 coal units at the site since the mid-1950s. The original ash pond was located under the current Dry Stack (see figure 11-1). TVA stopped using the pond for wet disposal in 1971, and started stacking dry fly ash in the area in 1984.[250] TVA started operating Ash Pond 2 in 1971; it is currently used to store wet bottom ash.[251] The Inactive Dredge cell was used briefly between 1983 and 1984/1985.[252] Little Bayou Creek runs along the southern edge of the ash disposal area before emptying into the Ohio River.

Monitoring

Figure 11-1 shows the approximate locations of the groundwater wells discussed in this report.

Four wells (D-8A, D-11, D-19, and D-27) have been in place since the late 1987-1988. The other ten wells were installed in 2007. Unlike other TVA plants, the monitoring wells at Shawnee are screened in three distinct aquifers under the plant: the alluvial aquifer, the Upper Continental Deposits (UCD), and the Regional Groundwater Aquifer (RGA). Tables 11-4 through 11-17, which summarize groundwater quality data at Shawnee, are grouped according to these three aquifers.

TVA did not begin performing site-wide upgradient-downgradient statistical analyses until 2010, after it had eight quarters of quarterly monitoring data from the new wells. After statistically analyzing the limited available data, TVA observed that the majority of wells in the UCD and RGA aquifers showed “statistical exceptions” for boron, pH, sulfate, and other parameters; it was clear that these were the result of coal ash contamination: “The prevalence of elevated levels of boron, sulfate, and TDS compared to background suggests that local groundwater might be affected by coal combustion byproduct leachate.”[253]

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[250] *See* Stantec Consulting Services, Inc., *Report of Geotechnical Exploration and Slope Stability Evaluation – Ash Pond 1 & 2 and Consolidated Waste Dry Stack – Shawnee Fossil Plant*, 5 (July 14, 2010).
[251] *See* Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment , Kentucky, Appendix C, Shawnee Fossil Plant,* Active Ash Pond No. 2 page 1 and Consolidated Waste Dry Stack page 1 (June 24, 2009).
[252] *Id*. at Inactive Dredge Cell page 1.
[253] TVA, *Groundwater and Surface Water Sample Data Reporting Form, Shawnee Fossil Plant*, 2nd Quarter 2010, at 5 and 7 (Aug. 2010).

From 2010 forward, TVA performed "assessment monitoring" according to Kentucky landfill regulations,[254] significantly increasing the number of monitored pollutants. The initial round of monitoring showed very high concentrations of several metals in well D-75A. This may have been, as TVA argued,[255] an artifact of sampling error, because subsequent results have been much lower (see Tables 11-1 and 11-9):

Table 11-1: Results for select metals showing anomalous 2010 results in well D-75A (ug/L).

	Sep. 2010	**June 2011**	**March 2012**	**June 2012**	**Nov. 2012**
Aluminum	*100,000*	<100	<100	<100	<100
Arsenic	*22*	3.6	<20	<10	<1
Barium	*1,300*	56	55	58	59
Beryllium	*5.8*	<1	<20	<1	<1
Chromium	*150*	<2	<40	<20	<2
Cobalt	*74*	1.3	<20	<10	<1
Lead	*120*	<1	<20	<1	<1
Nickel	*120*	1.2	<20	5.7	2.8
Vanadium	*200*	<2	<40	<4	<2

Setting the September 2010 results for well D-75A aside, the remaining available data show clear evidence of ash contamination in all three aquifers. Three alluvial wells along the Ohio River show high concentrations of boron and manganese; well D-30A also has high levels of cobalt, and well D-74A has high levels of molybdenum. The two downgradient UCD aquifer wells show consistently high boron, manganese, and sulfate; well D-76A has also had high levels of cobalt and molybdenum. All downgradient RGA aquifer wells show high levels of manganese, and three (D-74B, D-30B, and D-75B) have high levels of boron. Well D-75B also exceeded the health-based threshold for cobalt in recent monitoring.

The manganese results are particularly troubling, for four reasons: First, EPA has identified manganese as a coal ash pollutant.[256] Second, there is a clear difference in concentration between upgradient and downgradient wells, indicating that the coal ash disposal areas are responsible. Table 11-2 summarizes the manganese data for the site. Third, with concentrations orders of magnitude above the EPA Lifetime Health Advisory for manganese, the affected groundwater is hazardous to human health. It may also be hazardous to aquatic life as it leaches in Little Bayou Creek and the Ohio River: EPA has noted that "biota with

[254] The Kentucky Division of Waste Management formally informed TVA that Shawnee had been placed in assessment monitoring in February, 2011, but TVA began the process earlier than that, conducting the first round of assessment monitoring in September, 2010. See TVA, *Groundwater and Surface Water Sample Data Reporting Form, Shawnee Fossil Plant*, 2nd Quarter 2011, at 12 (June 2011); TVA, *Groundwater and Surface Water Sample Data Reporting Form, Shawnee Fossil Plant*, 3rd Quarter 2010, at Attachment B (Nov. 2010); 401 KAR 45:160.
[255] TVA, *Groundwater and Surface Water Sample Data Reporting Form, Shawnee Fossil Plant*, 3rd Quarter 2010 (Nov. 2010).
[256] U.S. EPA, *Steam Electric Power Generating Point Source Category: Final Detailed Study Report*, 6-3 (Oct. 2009).

elevated levels [of manganese] have exhibited sublethal effects including metabolic changes and abnormalities of the liver and kidneys."[257] Finally, because Kentucky does not have an MCL for manganese, TVA has not identified or analyzed these exceedances.

Table 11-2: Manganese concentrations in Shawnee monitoring wells, 2010-2012; upgradient data are in blue, downgradient data are in black.[258]

Aquifer	Well	Mean (ug/L)	Range (ug/L)	N
Alluvium	*D-77 (upgradient)*	*358*	*60 – 640*	*5*
	D-11	340	110 – 640	4
	D-33A	893	800 – 950	4
	D-30A	7,920	5,300 – 10,000	5
	D-74A	894	740 – 1,200	5
UCD	*D-19 (upgradient)*	*26*	*<10 – 40*	*5*
	D-75A	66,400	64,000 – 69,000	5
	D-76A	5,480	4,700 – 5,900	5
Upper RGA	*D-27 (upgradient)*	*6*	*3 – 12*	*5*
	D-8A	2,000	1,900 – 2,100	5
	D-11B	5,325	4,800 – 5,400	4
	D-30B	4,600	3,100 – 5,300	5
	D-74B	1,480	1,000 – 1,800	5
	D-75B	5,450	4,550 – 6,700	5

A similar pattern can be observed for boron, as shown in Table 11-3. Boron is also one of the few parameters measured in surface water near TVA. In the results for the two sampling events that we have on file, boron was below detection (<200 ug/L) at all surface water sampling points other than the point on Little Bayou Creek immediately downstream of the ash disposal area, where it was measured at 710-860 ug/L. [259]

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[257] *Id*. Although TVA monitors surface water along Little Bayou Creek, it does not measure manganese. TVA, *Groundwater and Surface Water Sample Data Reporting Form, Shawnee Fossil Plant*, 1st half 2012 (July 31, 2012).
[258] TVA only began measuring manganese in groundwater in late 2010.
[259] TVA, *Groundwater and Surface Water Sample Data Reporting Form, Shawnee Fossil Plant*, 1st half 2012 (July 31, 2012).

Table 11-3: Boron concentrations in Shawnee monitoring wells, 2008-2012; upgradient data are in blue, downgradient data are in black.

Aquifer	Well	Mean (ug/L)	Range (ug/L)	N
Alluvium	*D-77 (upgradient)*	*240*	*<50 – 410*	*13*
	D-11	200	<200 – 220	9
	D-33A	2,510	2,300 – 2,600	9
	D-30A	5,020	990 – 12,000	10
	D-74A	7,560	4,700 – 10,000	10
UCD	*D-19 (upgradient)*	*<200*	*<200*	*13*
	D-75A	7,430	6,800 – 8,200	10
	D-76A	19,800	15,000 – 24,000	10
Upper RGA	*D-27 (upgradient)*	*<200*	*<200*	*13*
	D-8A	217	<200 – 280	10
	D-11B	2,522	2,100 – 2,800	9
	D-30B	4,290	500 – 6,600	10
	D-74B	9,020	6,300 – 11,000	10
	D-75B	5,875	5,000 – 6,700	10

Data gaps

1. Lack of historical data. Ten of the fourteen wells in the Shawnee monitoring network were installed in 2007, and through 2010 TVA was generally monitoring for a short list of parameters that included boron, chloride, copper, fluoride, molybdenum, sulfate, TDS, and vanadium. In addition, flooding in 2011-2012 made some wells inaccessible.[260] As a result, although we have 12 sampling events on file from 2008-2012, any given pollutant-well combination may have been sampled only 2 or 3 times.

[260] TVA, *Groundwater and Surface Water Sample Data Reporting Form, Shawnee Fossil Plant*, 2nd half of 2011 (May 8, 2012).

Figure 11-1: Groundwater wells at Shawnee Fossil Plant (approximate locations)

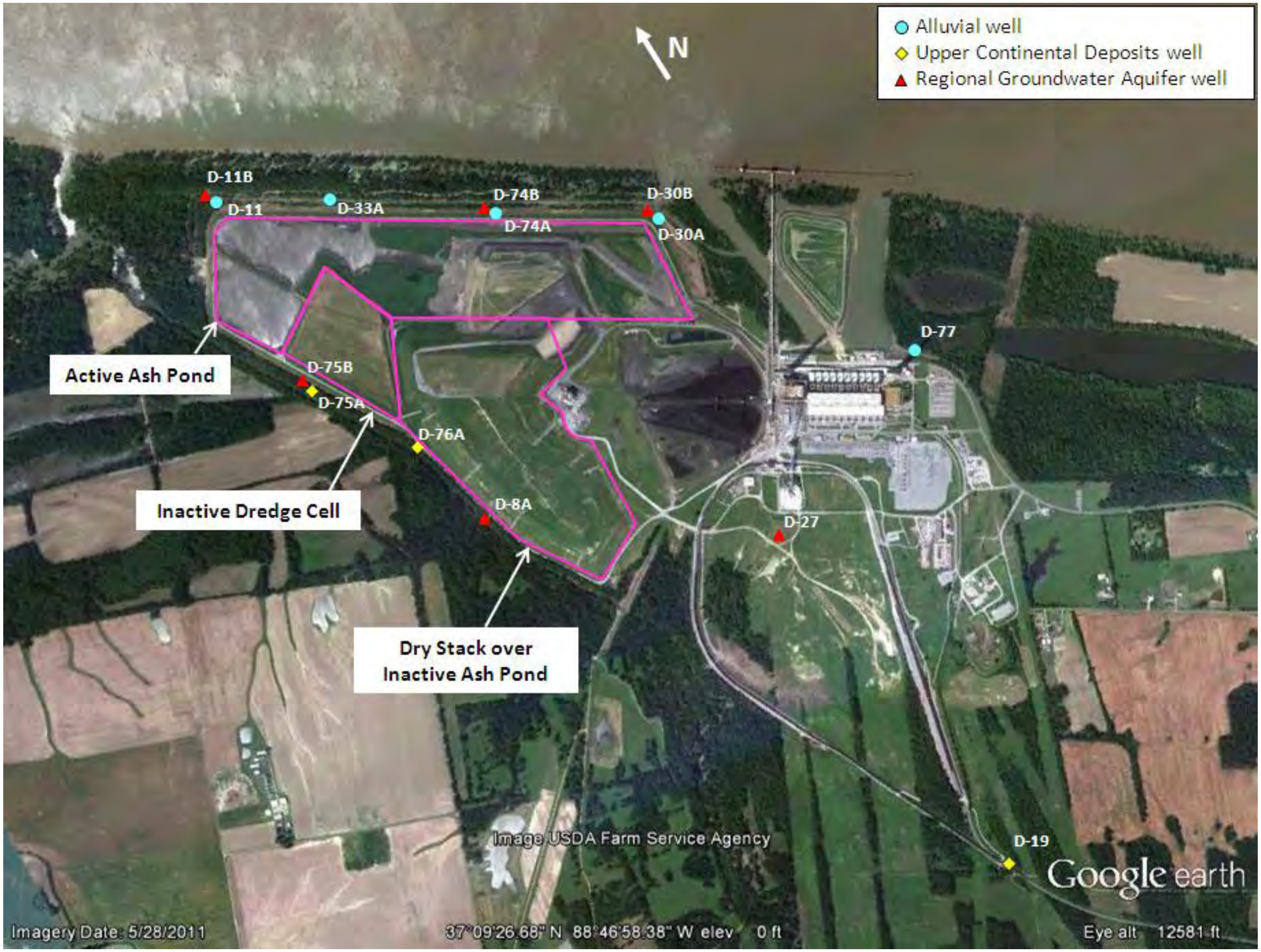

Table 11-4: Shawnee Fossil Plant, alluvial well D-11. Sampled 9 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[261]
Aluminum	16,000	200 – 4,000	4 results
Antimony	6	<1	2 results
Arsenic	10	<1 – 3	4 results
Barium	2,000	78 – 140	4 results
Beryllium	4	<1	4 results
Boron	3,000	<200 – 220	
Cadmium	5	<0.5 – 0.8	4 results
Chloride	250 mg/L	14 – 24 mg/L	
Chromium	100	<2 – 16	4 results
Cobalt	4.7	<1 – 6.3	4 results
Copper	1,300	<2 – 8.2	
Fluoride	4,000	<100 – 150	
Lead	15	<1 – 4.6	4 results
Lithium	31		No data
Manganese	300	110 – 640	4 results
Mercury	2	<0.2	4 results
Molybdenum	40	<5	
Nickel	100	9.6 – 29	4 results
Nitrate	10,000		No data
Selenium	50	<1	4 results
Silver	100	<1	2 results
Strontium	9,300	53 – 71	4 results
Sulfate	500 mg/L	34 – 40 mg/L	
TDS	500 mg/L	100 – 150 mg/L	
Thallium	2	<1	4 results
Vanadium	63	<2 – 15	
Zinc	2,000	<10 – 64	4 results

[261] Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

Table 11-5: Shawnee Fossil Plant, alluvial well D-33A. Sampled 9 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[262]
Aluminum	16,000	<100	4 results
Antimony	6	<1	2 results
Arsenic	10	4.5 – 5.8	4 results
Barium	2,000	45 – 63	4 results
Beryllium	4	<1	4 results
Boron	3,000	2,300 – 2,600	
Cadmium	5	<0.5	4 results
Chloride	250 mg/L	15 – 21 mg/L	
Chromium	100	<2	4 results
Cobalt	4.7	<1 – 1.7	4 results
Copper	1,300	<2	
Fluoride	4,000	110 – 250	
Lead	15	<1	4 results
Lithium	31		No data
Manganese	300	800 – 950	4 results
Mercury	2	<0.2	4 results
Molybdenum	40	<5	
Nickel	100	<1 – 2.2	4 results
Nitrate	10,000		No data
Selenium	50	<1	4 results
Silver	100	<1	2 results
Strontium	9,300	51 – 59	4 results
Sulfate	500 mg/L	54 – 69 mg/L	
TDS	500 mg/L	140 – 180 mg/L	
Thallium	2	<1	4 results
Vanadium	63	<10	
Zinc	2,000	<10	4 results

[262] Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

Table 11-6: Shawnee Fossil Plant, alluvial well D-74A. Sampled 10 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[263]
Aluminum	16,000	<100 – 280	5 results
Antimony	6	<1	2 results
Arsenic	10	<10	5 results
Barium	2,000	<20 – 33	5 results
Beryllium	4	<10[264]	5 results
Boron	3,000	4,700 – 10,000	
Cadmium	5	<5	5 results
Chloride	250 mg/L	9.8 – 21 mg/L	
Chromium	100	<20	5 results
Cobalt	4.7	<10[265]	5 results
Copper	1,300	<20	
Fluoride	4,000	<100 – 390	
Lead	15	<10	5 results
Lithium	31		No data
Manganese	300	740 – 1,200	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	270 – 720	
Nickel	100	<10	5 results
Nitrate	10,000		No data
Selenium	50	<10	5 results
Silver	100	<1	2 results
Strontium	9,300	180 – 310	5 results
Sulfate	500 mg/L	67 – 320 mg/L	
TDS	500 mg/L	140 – 600 mg/L	
Thallium	2	<10[266]	5 results
Vanadium	63	<20	
Zinc	2,000	<100	5 results

263 Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

264 Although one of the four beryllium results was reported as <10 ug/L (March 2012), results before and after this date were reported as <1 ug/L, and a beryllium exceedance is unlikely.

265 One result was reported as <10 ug/L (March 2012); other results have been in the range of 2.6 – 3.2 ug/L.

266 Although one of the four thallium results was reported as <10 ug/L (March 2012), results before and after this date were reported as <1 ug/L, and an exceedance is unlikely.

Table 11-7: Shawnee Fossil Plant, alluvial well D-30A. Sampled 10 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[267]
Aluminum	16,000	<100 – 120	5 results
Antimony	6	<1	2 results
Arsenic	10	<5	5 results
Barium	2,000	23 – 110	5 results
Beryllium	4	<5[268]	5 results
Boron	3,000	990 – 12,000	
Cadmium	5	<2.5	5 results
Chloride	250 mg/L	25 – 46 mg/L	
Chromium	100	<10	5 results
Cobalt	4.7	8.6 – 16	5 results
Copper	1,300	<10	
Fluoride	4,000	<100 – 400	
Lead	15	<5	5 results
Lithium	31		No data
Manganese	300	5,300 – 10,000	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	<10	
Nickel	100	5.8 – 14	5 results
Nitrate	10,000		No data
Selenium	50	<5	5 results
Silver	100	<1	2 results
Strontium	9,300	180 – 450	5 results
Sulfate	500 mg/L	92 – 500 mg/L	
TDS	500 mg/L	180 – 600 mg/L	
Thallium	2	<5[269]	5 results
Vanadium	63	<10	
Zinc	2,000	<50	5 results

267 Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

268 The March 2012 result was reported as <5 ug/L, but all results from before and after that date have been <1 ug/L, so an exceedance is unlikely.

269 Although one of the four thallium results was reported as <5 ug/L (March 2012), results before and after this date were reported as <1 ug/L, and an exceedance is unlikely.

Table 11-8: Shawnee Fossil Plant, alluvial well D-77. Sampled 13 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[270]
Aluminum	16,000	<100 – 2,300	5 results
Antimony	6	<1	2 results
Arsenic	10	<1 – 13	7 results
Barium	2,000	<2 – 420	5 results
Beryllium	4	<1	5 results
Boron	3,000	<200 – 410	
Cadmium	5	<0.5	7 results
Chloride	250 mg/L	36 – 130 mg/L	
Chromium	100	<2 – 77	5 results
Cobalt	4.7	<1 – 12	5 results
Copper	1,300	<1 – 6.5	
Fluoride	4,000	<100 – 220	
Lead	15	<1 – 3.8	7 results
Lithium	31		No data
Manganese	300	60 – 640	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	<2 – 9.9	
Nickel	100	4.2 – 53	7 results
Nitrate[271]	10,000	1.3 – 2.9	3 results
Selenium	50	1.8 – 4.4	7 results
Silver	100	<1	2 results
Strontium	9,300	95 – 130	6 results
Sulfate	500 mg/L	40 – 120 mg/L	
TDS	500 mg/L	220 – 560 mg/L	
Thallium	2	<1	5 results
Vanadium	63	<2 – 10	
Zinc	2,000	<10 – 72	7 results

Table 11-9: Shawnee Fossil Plant, UCD well D-75A. Sampled 10 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[272]
Aluminum	16,000	<100 – 100,000	5 results
Antimony	6	<1	2 results
Arsenic	10	<1 – 22	5 results
Barium	2,000	55 – 1,300	5 results
Beryllium	4	<20[273]	5 results
Boron	3,000	6,800 – 8,200	
Cadmium	5	<10[274]	5 results
Chloride	250 mg/L	6.5 – 12 mg/L	
Chromium	100	<2 – 150	5 results
Cobalt	4.7	<1 – 74	5 results
Copper	1,300	<2 – 100	
Fluoride	4,000	110 – 320	
Lead	15	<1 – 120	5 results
Lithium	31		No data
Manganese	300	64,000 – 69,000	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	<40	
Nickel	100	<20 – 120	5 results
Nitrate	10,000		No data
Selenium	50	<20	5 results
Silver	100	<1 – 1.2	2 results
Strontium	9,300	670 – 760	5 results
Sulfate	500 mg/L	920 – 1,200 mg/L	
TDS	500 mg/L	1,500 – 1,800 mg/L	
Thallium	2	<20[275]	5 results
Vanadium	63	<2 – 200	
Zinc	2,000	<10 – 380	5 results

[270] Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.
[271] These results are not for nitrate alone, but for nitrate+nitrite (as N).

[272] Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.
[273] Data were reported as 5.8, <1, <20, and <1 ug/L for sampling dates in September 2010, June 2011, March 2012, and June 2012, respectively.
[274] Although the March 2012 result was reported as <10 ug/L, results before and after that date have been between <0.5 and 0.9 ug/L, so an exceedance is unlikely.
[275] Although the March 2012 result was reported as <20 ug/L, results before and after that date have been between <1 and 1.4 ug/L, so an exceedance is unlikely.

Table 11-10: Shawnee Fossil Plant, UCD well D-76A. Sampled 10 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[276]
Aluminum	16,000	790 – 2,900	5 results
Antimony	6	<1	2 results
Arsenic	10	<1 – 1.5	5 results
Barium	2,000	<2 – 21	5 results
Beryllium	4	<1 – 1.8	5 results
Boron	3,000	15,000 – 24,000	
Cadmium	5	<0.5 – 0.8	5 results
Chloride	250 mg/L	2.1 – 4.2 mg/L	
Chromium	100	<2	5 results
Cobalt	4.7	<1 – 57	5 results
Copper	1,300	<2 – 2.7	
Fluoride	4,000	170 – 390	
Lead	15	<1 – 2.7	5 results
Lithium	31		No data
Manganese	300	4,700 – 5,900	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	<2 – 170	
Nickel	100	<1 – 38	5 results
Nitrate	10,000		No data
Selenium	50	<1 – 2.6	5 results
Silver	100	<1	2 results
Strontium	9,300	770 – 840	5 results
Sulfate	500 mg/L	1,100 – 1,500 mg/L	
TDS	500 mg/L	440 – 2,000 mg/L	
Thallium	2	<1	5 results
Vanadium	63	<2 – 11	
Zinc	2,000	<10 – 87	5 results

Table 11-11: Shawnee Fossil Plant, UCD well D-19. Sampled 13 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[277]
Aluminum	16,000	420 – 3,100	5 results
Antimony	6	<1	2 results
Arsenic	10	<1 – 1.0	7 results
Barium	2,000	33 – 55	5 results
Beryllium	4	<1	5 results
Boron	3,000	<200	
Cadmium	5	<0.5	7 results
Chloride	250 mg/L	19 – 25 mg/L	
Chromium	100	<2 – 58	5 results
Cobalt	4.7	<1 – 20	5 results
Copper	1,300	<5	
Fluoride	4,000	<100 – 160	12 results
Lead	15	<1 – 1.7	7 results
Lithium	31		No data
Manganese	300	<10 – 40	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	<2 – 7.3	
Nickel	100	1 – 44	7 results
Nitrate	10,000	2.0 – 2.1	3 results
Selenium	50	3.2 – 5.25	7 results
Silver	100	<1	2 results
Strontium	9,300	44 – 55	6 results
Sulfate	500 mg/L	110 – 150 mg/L	
TDS	500 mg/L	300 – 410 mg/L	
Thallium	2	<1	5 results
Vanadium	63	<10	
Zinc	2,000	<10 – 26	7 results

276 Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

277 Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

Table 11-12: Shawnee Fossil Plant, RGA well D-11B. Sampled 9 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[278]
Aluminum	16,000	<100 – 710	4 results
Antimony	6	<1	2 results
Arsenic	10	<1	4 results
Barium	2,000	42 – 68	4 results
Beryllium	4	<1	4 results
Boron	3,000	2,100 – 2,800	
Cadmium	5	<0.5 – 0.6	4 results
Chloride	250 mg/L	14 – 18 mg/L	
Chromium	100	<2 – 2.7	4 results
Cobalt	4.7	1.1 – 1.9	4 results
Copper	1,300	<2	
Fluoride	4,000	<100 – 150	
Lead	15	<1	4 results
Lithium	31		No data
Manganese	300	4,800 – 5,900	4 results
Mercury	2	<0.2	4 results
Molybdenum	40	<5	
Nickel	100	56 – 59	4 results
Nitrate	10,000		No data
Selenium	50	<1	4 results
Silver	100	<1	2 results
Strontium	9,300	130 – 140	4 results
Sulfate	500 mg/L	230 – 280 mg/L	
TDS	500 mg/L	420 – 550 mg/L	
Thallium	2	<1	4 results
Vanadium	63	<10	
Zinc	2,000	13 – 18	4 results

278 Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

Table 11-13: Shawnee Fossil Plant, RGA well D-75B. Sampled 10 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[279]
Aluminum	16,000	<100 – 170	5 results
Antimony	6	<1	2 results
Arsenic	10	<1 – 1.1	5 results
Barium	2,000	21 – 51	5 results
Beryllium	4	<1	5 results
Boron	3,000	5,000 – 6,700	
Cadmium	5	<0.5 – 0.51	5 results
Chloride	250 mg/L	8.9 – 12 mg/L	
Chromium	100	<2 – 6.5	5 results
Cobalt	4.7	2.3 – 5.8	5 results
Copper	1,300	<1 – 3.9	
Fluoride	4,000	<100 – 120	9 results
Lead	15	<1	5 results
Lithium	31		No data
Manganese	300	4,550 – 6,700	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	<2 – 5.7	
Nickel	100	8.8 – 18	5 results
Nitrate	10,000		No data
Selenium	50	<1 – 3.4	5 results
Silver	100	<1	2 results
Strontium	9,300	510 – 670	5 results
Sulfate	500 mg/L	380 – 500 mg/L	
TDS	500 mg/L	740 – 920 mg/L	
Thallium	2	<1	5 results
Vanadium	63	<10	
Zinc	2,000	<10	5 results

279 Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

Table 11-14: Shawnee Fossil Plant, RGA well D-74B. Sampled 10 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[280]
Aluminum	16,000	<100 – 180	5 results
Antimony	6	<1	2 results
Arsenic	10	<1 – 1	5 results
Barium	2,000	21 – 32	5 results
Beryllium	4	<1	5 results
Boron	3,000	6,300 – 11,000	
Cadmium	5	<0.5 – 0.59	5 results
Chloride	250 mg/L	9.4 – 25 mg/L	
Chromium	100	<2	5 results
Cobalt	4.7	<1	5 results
Copper	1,300	<1 – 5.5	
Fluoride	4,000	<100 – 250	
Lead	15	<1	5 results
Lithium	31		No data
Manganese	300	1,000 – 1,800	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	<2 – 5.7	
Nickel	100	12 – 19	5 results
Nitrate	10,000		No data
Selenium	50	1.6 – 24	5 results
Silver	100	<1	2 results
Strontium	9,300	160 – 240	5 results
Sulfate	500 mg/L	160 – 340 mg/L	
TDS	500 mg/L	230 – 600 mg/L	
Thallium	2	<1	5 results
Vanadium	63	<10	
Zinc	2,000	<10	5 results

Table 11-15: Shawnee Fossil Plant, RGA well D-30B. Sampled 10 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[281]
Aluminum	16,000	<100 – 1,200	5 results
Antimony	6	<1	2 results
Arsenic	10	<1	5 results
Barium	2,000	52 – 65	5 results
Beryllium	4	<1	5 results
Boron	3,000	500 – 6,600	
Cadmium	5	<0.5	5 results
Chloride	250 mg/L	15 – 25 mg/L	
Chromium	100	<2	5 results
Cobalt	4.7	2.8 – 3.5	5 results
Copper	1,300	<1 – 4.2	
Fluoride	4,000	<100 – 190	
Lead	15	<1	5 results
Lithium	31		No data
Manganese	300	3,100 – 5,300	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	<5	
Nickel	100	4.0 – 6.5	5 results
Nitrate	10,000		No data
Selenium	50	<1	5 results
Silver	100	<1	2 results
Strontium	9,300	170 – 240	5 results
Sulfate	500 mg/L	57 – 410 mg/L	
TDS	500 mg/L	220 – 550 mg/L	
Thallium	2	<1	5 results
Vanadium	63	<10	
Zinc	2,000	<10	5 results

280 Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

281 Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

Table 11-16: Shawnee Fossil Plant, RGA well D-8A. Sampled 10 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[282]
Aluminum	16,000	<100	5 results
Antimony	6	<1	2 results
Arsenic	10	<1 – 1.2	5 results
Barium	2,000	84 – 110	5 results
Beryllium	4	<1	5 results
Boron	3,000	<200 – 270	
Cadmium	5	<0.5 – 0.5	5 results
Chloride	250 mg/L	27 – 34 mg/L	
Chromium	100	<2	5 results
Cobalt	4.7	1.6 – 4.1	5 results
Copper	1,300	<2 – 3.5	
Fluoride	4,000	<100 – 120	
Lead	15	<1	5 results
Lithium	31		No data
Manganese	300	1,900 – 2,100	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	<5	
Nickel	100	1.4 – 4.6	5 results
Nitrate	10,000		No data
Selenium	50	<1	5 results
Silver	100	<1	2 results
Strontium	9,300	69 – 80	5 results
Sulfate	500 mg/L	11 – 15 mg/L	
TDS	500 mg/L	130 – 170 mg/L	
Thallium	2	<1	5 results
Vanadium	63	<10	
Zinc	2,000	<10 – 11	5 results

[282] Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

Table 11-17: Shawnee Fossil Plant, RGA well D-27. Sampled 13 times between August 2008 and November 2012.

Chemical	Threshold	Data	Data gaps[283]
Aluminum	16,000	55 – 225	5 results
Antimony	6	<0.25	2 results
Arsenic	10	<2.5	6 results
Barium	2,000	170 – 195	5 results
Beryllium	4	<1	5 results
Boron	3,000	<50	
Cadmium	5	<0.5	6 results
Chloride	250 mg/L	29 – 35 mg/L	
Chromium	100	<2.5	5 results
Cobalt	4.7	<2	5 results
Copper	1,300	<5	
Fluoride	4,000	<100 – 233	12 results
Lead	15	<2.5	6 results
Lithium	31		No data
Manganese	300	3 – 12	5 results
Mercury	2	<0.2	5 results
Molybdenum	40	<5	
Nickel	100	<2.5	6 results
Nitrate	10,000	1.4	2 results
Selenium	50	<2.5	6 results
Silver	100	<5	2 results
Strontium	9,300	103 – 129	6 results
Sulfate	500 mg/L	35 – 46.7 mg/L	
TDS	500 mg/L	220 – 304 mg/L	
Thallium	2	<0.25	5 results
Vanadium	63	<10	
Zinc	2,000	<2.5 – 57	6 results

[283] Most parameters were not measured in every sampling event at every well; this column provides the number of results for each parameter measured less often than every sampling event.

12 Widows Creek Fossil Plant

Background

The Widows Creek Fossil Plant is located on the Tennessee River in Stevenson, AL. Widows Creek itself is a partially rechanneled stream that flows through the site. TVA built Units 1 through 6 in the 1950s. Two more units, Units 7 and 8, came online in 1964. As part of a recent compliance agreement with EPA, TVA has agreed to retire units 1-6 between 2013 and 2015, and all six units are currently idle.[284]

The original ash pond was located immediately north of the plant; it was abandoned in 1969. Fly ash and bottom ash have been wet sluiced and stacked in the Main Ash Pond A area since then. Gypsum from the plant's sulfur dioxide scrubbers was disposed of in the Old Scrubber Sludge Pond until 1986. In 1986 the Old Scrubber Sludge Pond was converted to a dredge cell, and has since been dewatered. TVA started using the current Gypsum Stack in 1986. The Gypsum Stack was expanded to its current footprint in the 1990s. Smaller ponds on the site include copper and iron ponds, now closed, stilling ponds associated with both the Main Ash Pond and the Gypsum Stack, and a red water pond north of the Main Ash Pond.

Widows Creek has had a series of large and small structural issues over its lifetime, including erosion and sloughing along the southern perimeter of the bottom ash stack within Ash Pond A, seepage around Main Ash Pond A and the Old Scrubber Sludge Pond, and a large spill of gypsum from the active Gypsum Stack into the stilling pond and Widows Creek in January of 2009.[285]

Monitoring

Although this report is generally focused on recent groundwater quality data, Widows Creek has been monitored less than any other TVA plant, and so we will also discuss an earlier report for this plant.

TVA assessed the potential groundwater impacts of its gypsum stack expansion in 1990.[286] The report is useful in several ways. First, it describes the site's geologic vulnerability, noting that "Widows Creek Fossil Plant is situated on karst terrain," and that "[a]s in all karst terrains,

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[284] U.S. EPA, Federal Facilities Compliance Agreement, Docket No. CAA-04-2010-1760, ¶¶ 73, 89 (Apr. 2011).
[285] *See* Stantec Consulting Services, Inc., *Report of Phase 1 Facility Assessment, Alabama , Appendix C: Widows Creek Fossil Plant* (June 24, 2009); Stantec Consulting Services, Inc., *Report of Phase 2 Geotechnical Exploration – Ash Pond Complex – Widows Creek Fossil Plant* (Feb. 4, 2010).
[286] TVA, *Widows Creek Fossil Plant – Assessment of Potential Effects on Groundwater of the Phase II FGD Pond* (Dec. 1990).

solution activity along faults, bedding planes, joints and fractures produces enlarged openings and effective routes for groundwater movement."[287] The report later makes this observation:

> It is important to realize that a potential exists for piping of liner material into the karst subsurface drainage system. This type of undermining activity can result in a sudden collapse of the remaining liner material and pirating of the contents of overlying ponds or basins. TVA has experienced several such problems at their facilities located in karst terrains.[288]

TVA also noted that leachate from the gypsum stack expansion would migrate to the Widows Creek stream and increase the concentration of some pollutants including iron, manganese, and sulfate.[289]

Second, the report depicts the then-existing groundwater monitoring well network, and it appears to have included over 30 wells.[290] We do not know if any of these wells have been maintained or monitored since 1990, but as described below, recent groundwater monitoring reports only include 7 wells. It therefore appears that the monitoring network has been substantially abandoned.

Finally, the 1990 report includes a discussion of groundwater quality. TVA presented data from five upgradient wells, from 1984-1989, that generally showed low concentrations of coal ash constituents: Boron never exceeded 200 ug/L, for example, and sulfate never exceeded 500 mg/L. One well immediately north of the as-yet unbuilt gypsum stack expansion, well W15, showed high concentrations of manganese, sulfate, and iron that may have been naturally occurring.[291] TVA also discussed well W14, located immediately northwest of the plant (near where well 10-48 is located in Figure 12-1): "A high TDS level and a predominance of sulfate indicates increasing likelihood that a well has been affected by ash waste. Therefore, well W14 would appear to be affected by the ash waste disposal area."[292]

We do not know the extent to which TVA monitored groundwater between 1990 and 2008. Our information requests for 2008-2011 suggest that no monitoring occurred during that period.

[287] *Id*. at ii and 6.
[288] *Id*. at 9.
[289] *Id*. at ii.
[290] *Id*. at 6 – 7.
[291] *Id*. at 13, 26 – 28.
[292] *Id*. at 13.

TVA began monitoring wells W10, 31, and 10-48 through 10-52 in March 2011.[293] Figure 12-1 shows the approximate locations of these seven wells. Although data since then are spotty (see data gaps section below), there have been exceedances of health-based guidelines for at least boron (well 10-52), cobalt (well 31), manganese (wells 10-48 through 10-52), and sulfate (well 10-50).

Data gaps

Based on TVA's responses to our information requests, it appears that the groundwater quality database for Widows Creek is very poor, with an insufficient number of wells, inadequate monitoring frequency, an inadequate set of monitored pollutants, and an inconsistent pattern of monitoring. It is very difficult to say anything meaningful about groundwater quality or the impact of coal ash at the site based on the data that TVA have been collecting.

1. <u>Discontinued monitoring at some wells</u>. Wells 10-48, 10-49, and 10-50 were sampled in March and October of 2011, but not since then.

2. <u>Discontinued monitoring of coal ash indicators</u>. Boron, chloride, manganese, and TDS, all of which are associated with coal ash, were measured in each of the new wells (10-48 through 10-52) in March 2011, but not since then. TVA did not measure these pollutants in wells W10 or 31 at all. Similarly, TVA measured sulfate, another coal ash indicator, only once in wells 10-48 through 10-50.

3. <u>Some pollutants are not being monitored at all</u>. TVA is not measuring aluminum, molybdenum, or strontium in any wells, and is not measuring boron, chloride, manganese, or TDS in wells W10 and 31.

4. <u>Incomplete well network</u>. The existing network of wells is clearly less informative than the 30+ wells that TVA maintained in the 1980s (see above), and many possible groundwater migration pathways are not covered (e.g., north, west, or south of the Abandoned Ash Disposal Area, east of Main Ash Pond A and the Dredge Cell, or north and east of the Gypsum Stack).

[293] TVA, *Widows Creek Fossil plant Ash Impoundment Groundwater Monitoring Report*, March 2011. Wells 10-48 through 10-52 were installed in 2010. We presume that wells W10 and 31 are older wells.

Figure 12-1: Groundwater wells at Widows Creek Fossil Plant (approximate locations)

Table 21-1: Widows Creek Fossil Plant, Well W-10. Sampled 5 times between March 2011 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	<1	
Barium	2,000	9.2 – 12.0	
Beryllium	4	<1	
Boron	3,000		No data
Cadmium	5	<0.5	
Chloride	250 mg/L		No data
Chromium	100	<2	
Cobalt	4.7	<1	No data since 10/2011
Copper	1,300	6.4 – 7.8	No data since 10/2011
Fluoride	4,000	<100	
Lead	15	<1	
Lithium	31		No data
Manganese	300		No data
Mercury	2	<0.2	
Molybdenum	40		No data
Nickel	100	<1 – 1.2	
Nitrate	10,000	0.16 – 0.17	
Selenium	50	<1	
Silver	100	<1	No data since 10/2011
Strontium	9,300		No data
Sulfate	500 mg/L	<5 mg/L	
TDS	500 mg/L		No data
Thallium	2	<1	
Vanadium	63	<2	No data since 10/2011
Zinc	2,000	<10 – 10	No data since 10/2011

Table 12-2: Widows Creek Fossil Plant, Well 31. Sampled 5 times between March 2011 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	<1 – 3.1	
Barium	2,000	39 – 57	
Beryllium	4	<1	
Boron	3,000		No data
Cadmium	5	<0.5	
Chloride	250 mg/L		No data
Chromium	100	<2	
Cobalt	4.7	2.7 – 38	No data since 10/2011
Copper	1,300	6.4 – 7.8	No data since 10/2011
Fluoride	4,000	<100 – 360	
Lead	15	<1	
Lithium	31		No data
Manganese	300		No data
Mercury	2	<2	
Molybdenum	40		No data
Nickel	100	<1 – 6.2	
Nitrate	10,000	<0.1 – 0.13	
Selenium	50	<1 – 14	
Silver	100	<1	No data since 10/2011
Strontium	9,300		No data
Sulfate	500 mg/L	45 – 270 mg/L	
TDS	500 mg/L		No data
Thallium	2	<1	
Vanadium	63	<2	No data since 10/2011
Zinc	2,000	<10	No data since 10/2011

Table 12-3: Widows Creek Fossil Plant, Well 10-48. Sampled in March and October 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	<1	
Barium	2,000	30 – 35	
Beryllium	4	<1	
Boron	3,000	2,950	3/2011 only
Cadmium	5	<0.5	
Chloride	250 mg/L	19 mg/L	3/2011 only
Chromium	100	<2	
Cobalt	4.7	<1	
Copper	1,300	<2	
Fluoride	4,000	<100	
Lead	15	<1	
Lithium	31		No data
Manganese	300	1,400	3/2011 only
Mercury	2	<2	
Molybdenum	40		No data
Nickel	100	3.8 – 6.2	
Nitrate	10,000	<0.1	3/2011 only
Selenium	50	<1 – 3.6	
Silver	100	<1	
Strontium	9,300		No data
Sulfate	500 mg/L	550 mg/L	3/2011 only
TDS	500 mg/L	990 mg/L	3/2011 only
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	<10	

Table 12-4: Widows Creek Fossil Plant, Well 10-49. Sampled in March and October 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	2.7 – 5.1	
Barium	2,000	<2 – 340	
Beryllium	4	<1	
Boron	3,000	200	3/2011 only
Cadmium	5	<0.5	
Chloride	250 mg/L	23 mg/L	3/2011 only
Chromium	100	<2	
Cobalt	4.7	3.3 – 4.3	
Copper	1,300	<2	
Fluoride	4,000	160 – 240	
Lead	15	<1	
Lithium	31		No data
Manganese	300	32,000	3/2011 only
Mercury	2	1.1	
Molybdenum	40		No data
Nickel	100	4.2 – 10.0	
Nitrate	10,000	0.45	3/2011 only
Selenium	50	<1	
Silver	100	<1 – 4.3	
Strontium	9,300		No data
Sulfate	500 mg/L	310 mg/L	3/2011 only
TDS	500 mg/L	1,100 mg/L	3/2011 only
Thallium	2	<1	
Vanadium	63	<2	
Zinc	2,000	<10 – 14	

Table 12-5: Widows Creek Fossil Plant, Well 10-50. Sampled in March and October 2011.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	2.7 – 4.4	
Barium	2,000	150 – 170	
Beryllium	4	<1	
Boron	3,000	2,400	3/2011 only
Cadmium	5	<0.5	
Chloride	250 mg/L	290 mg/L	3/2011 only
Chromium	100	<2	
Cobalt	4.7	1.6 – 3.5	
Copper	1,300	<2	
Fluoride	4,000	<100 – 115	
Lead	15	<1	
Lithium	31		No data
Manganese	300	1,500	3/2011 only
Mercury	2	<2	
Molybdenum	40		No data
Nickel	100	5.8 – 7.6	
Nitrate	10,000	0.49	3/2011 only
Selenium	50	2.9 – 6.4	
Silver	100	<1	
Strontium	9,300		No data
Sulfate	500 mg/L	740 mg/L	3/2011 only
TDS	500 mg/L	1,100 mg/L	3/2011 only
Thallium	2	<1	
Vanadium	63	2.3 – 3.4	
Zinc	2,000	<10	

Table 12-6: Widows Creek Fossil Plant, Well 10-51. Sampled 5 times between March 2011 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	2.2 – 4.3	
Barium	2,000	41 – 55	
Beryllium	4	<1	
Boron	3,000	240	No data since 3/2011
Cadmium	5	<0.5	
Chloride	250 mg/L	43 mg/L	No data since 3/2011
Chromium	100	<2	
Cobalt	4.7	<1	No data since 10/2011
Copper	1,300	<2	No data since 10/2011
Fluoride	4,000	<100	
Lead	15	<1	
Lithium	31		No data
Manganese	300	1,200	No data since 3/2011
Mercury	2	<2	
Molybdenum	40		No data
Nickel	100	1.6 – 5.4	
Nitrate	10,000	<0.1	
Selenium	50	<1 – 2.5	
Silver	100	<1	No data since 10/2011
Strontium	9,300		No data
Sulfate	500 mg/L	170 – 260 mg/L	
TDS	500 mg/L	685 mg/L	No data since 10/2011
Thallium	2	<1	
Vanadium	63	<2	No data since 10/2011
Zinc	2,000	<10	No data since 10/2011

Table 12-7: Widows Creek Fossil Plant, Well 10-52. Sampled 5 times between March 2011 and April 2013.

Chemical	Threshold	Data	Data gaps
Aluminum	16,000		No data
Antimony	6	<1	
Arsenic	10	1.5 – 4.6	
Barium	2,000	34 – 47	
Beryllium	4	<1	
Boron	3,000	13,000	No data since 3/2011
Cadmium	5	<0.5	
Chloride	250 mg/L	370 mg/L	No data since 3/2011
Chromium	100	<2	
Cobalt	4.7	1.3 – 1.4	No data since 10/2011
Copper	1,300	<2	No data since 10/2011
Fluoride	4,000	230 – 300	
Lead	15	<1 – 1.1	
Lithium	31		No data
Manganese	300	1,600	No data since 3/2011
Mercury	2	<2	
Molybdenum	40		No data
Nickel	100	9.4 – 17.5	
Nitrate	10,000	<0.1	
Selenium	50	5.4 – 20	
Silver	100	<1	No data since 10/2011
Strontium	9,300		No data
Sulfate	500 mg/L	1,100 mg/L	
TDS	500 mg/L	2,700 mg/L	No data since 10/2011
Thallium	2	<1	
Vanadium	63	<2	No data since 10/2011
Zinc	2,000	<10	No data since 10/2011

13 Discussion

It is clear that TVA's coal ash disposal areas have contaminated groundwater to the point that it is unsafe to drink and may also threaten aquatic ecosystems. And yet the TVA states have not required TVA to clean up the pollution. There are several reasons for this. First, the groundwater quality database for the TVA sites is spotty, with poor characterization of certain time periods, certain locations, and certain pollutants. Second, the most compelling evidence of contamination involves pollutants that the states are not actively regulating (see "unmeasured coal ash pollutants" below). Since the states are not regulating these pollutants, TVA rarely measures them, and almost never analyzes them statistically or compares them to any kind of groundwater protection standard. Finally, in cases where states have opportunities to hold TVA accountable, they almost always give TVA a pass.

13.1 Evidence of contamination

In general, groundwater beneath and around the TVA coal ash disposal areas shows clear signs of coal ash contamination, including elevated and unsafe concentrations of boron, sulfate, and other coal ash indicators. Table 13-2 summarizes the extent of pollution in the TVA fleet as a whole, comparing all downgradient wells to all upgradient wells. The table shows that concentrations of coal ash indicators are higher downgradient than upgradient, and frequently much higher than health-based guidelines. Boron, cobalt, manganese, and sulfate are each present at unsafe levels in 30 or more downgradient TVA wells. Twenty-seven wells (24% of all downgradient wells) have sulfate concentrations greater than 500 mg/L, manganese concentrations greater than 0.3 mg/L <u>and</u> boron concentrations greater than 1 mg/L (typical background concentrations of boron are <0.2 mg/L). This contamination exists, to varying degrees, at every TVA coal plant.

MCL exceedances. TVA has violated MCLs for many pollutants across its fleet:

- Antimony, with an MCL of 6 ug/L, has been routinely found at 5-15 ug/L downgradient of Colbert Ash Pond 4, and has increased to a concentration of 59 ug/L downgradient of the Colbert ash landfill stilling pond.
- Arsenic exceeds the MCL of 10 ug/L at various sites, including Allen, Bull Run, Colbert, Cumberland, Paradise, and Shawnee. Concentrations downgradient of Colbert Ash Pond 4 have been as high as 76 ug/L.
- Well 19R at Gallatin's abandoned ash disposal area has had beryllium concentrations of 11-25 ug/L in recent years, 3-5 times higher than the MCL of 4 ug/L.
- Cadmium has exceeded its MCL at Gallatin and John Sevier.

- Colbert, Cumberland, and Shawnee have had problems with lead occasionally exceeding its MCL.
- Mercury was above its MCL in Gallatin well 21, and increasing, when that well was abandoned in 2011. Mercury has also exceeded its MCL at the Johnsonville South Rail Loop area.
- Selenium concentrations of over 400 ug/L were caused by a sinkhole at the Kingston gypsum disposal area; this is eight times higher than the selenium MCL of 50 ug/L.

Coal ash indicator pollutants. The serious contamination at the TVA plants often involves pollutants without MCLs. These pollutants are nonetheless toxic, and frequently present at concentrations much higher than health-based guidelines. TVA has argued that certain pollutants are naturally occurring (see Bull Run and Gallatin sections of this report). However, the pollutants in downgradient groundwater regularly exceed naturally occurring concentrations. Downgradient groundwater also tends to mirror pure coal ash leachate. As an illustration, Table 13-1 below compares the groundwater from three points at the John Sevier site – a well upgradient of the fly ash landfill, a downgradient well, and a sample from the fly ash landfill leachate collection system. It is clear that the groundwater in the downgradient well is very similar to the pure leachate, with elevated levels of arsenic, boron, cobalt and manganese, strontium, and sulfate.

Four of these pollutants – boron, cobalt, manganese, and sulfate – are elevated well above safe concentrations in groundwater throughout the TVA fleet:

Boron. Boron has proven to be toxic to the developing fetus and the male reproductive system in animal studies.[294] The EPA developed drinking water guidelines to protect against low birth weight and testicular toxicity; these include the Child Health Advisory of 3 mg/L.[295] While boron in upgradient wells is almost always below detection, and never exceeds 1 mg/L,[296] boron exceeded the Child Health Advisory in 36 downgradient wells at 10 TVA coal plants. Concentrations range as high as 38 mg/L (at the Cumberland plant); this is more than ten times the Child Health Advisory, and 200 times higher than the typical background concentration (<0.2 mg/L). TVA has clearly caused dangerously unsafe boron contamination throughout its fleet.

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[294] *See, e.g.*, U.S. EPA, Toxicological Review of Boron and Compounds (June 2004); Agency for Toxic Substances and Disease Registry , Toxicological Profile for Boron (November 2010).
[295] *See* U.S. EPA, Drinking Water Health Advisory for Boron (May 2008).
[296] Out of 177 upgradient boron measurements on file, 148 were below detection (less than 0.2 mg/L), and the maximum detected value was 0.97 mg/L.

Table 13-1. John Sevier Fossil Plant Leachate Collection System, sampled 10 times between April 2008 and April 2013, compared to up- and downgradient groundwater wells.

Chemical	Upgradient well W1	Downgradient well W-30	Leachate Collection System
Aluminum	<100 – 140	<100 – 110	<100 – 200
Antimony	<1	<1	<1
Arsenic	<1	**<1 – 7**	**<1 – 44**
Barium	190 – 230	16 – 27	20 – 74
Beryllium	<2	<2	<1
Boron	<0.2	**4,100 – 5,650**	**3,400 – 5,300**
Cadmium	<0.5	<0.5	<0.5
Chloride	9 – 11 mg/L	15 – 18 mg/L	8 – 15 mg/L
Chromium	<1 – 4	<1 – 3	<1 – 2
Cobalt	<1	**1 – 5**	**<1 – 10**
Copper	<2	<1 – 3	<1 – 3
Fluoride	<100 – 100	310 – 420	<100 – 300
Lead	<1	<1	<1
Manganese	<10 – 39	**1,200 – 3,800**	**230 – 4,800**
Mercury	<0.2	<0.2	<0.2
Molybdenum	<5	<5	No data
Nickel	<1 – 3	7 – 33	5 – 16
Nitrate	<100 – 530	<100 – 100	300 – 1,100
Selenium	<1 – 1	<1 – 2	<1 – 2
Silver	<1	<1	<1
Strontium	590 – 800	**3,200 – 5,050**	**3,100 – 8,300**
Sulfate	25 – 27 mg/L	**960 – 1,100 mg/L**	**550 – 950 mg/L**
TDS	260 – 320 mg/L	1,750 – 2,000 mg/L	No data
Thallium	<1	<1	<1
Vanadium	<10	<10	<10
Zinc	<10 – 96	<10	<10 – 220

Cobalt. Cobalt is associated with heart disease, blood disease (polycythemia), neurological symptoms, and other endpoints.[297] The U.S. EPA, when assessing the risks of coal ash disposal to groundwater, identified cobalt as one of the two "constituents with the highest estimated risks for surface impoundments," the other being arsenic.[298] Even before looking at the data, then, there is a clear reason to be concerned about cobalt. And, in fact, cobalt concentrations at every TVA plant but Allen have exceeded the Regional Screening Level, often by ten times or

[297] *See, e.g.*, ATSDR, Toxicological Profile for Cobalt (Apr. 2004). The most sensitive endpoint for intermediate oral exposure was polycythemia, which has been observed in humans.
[298] U.S. EPA co-proposed Subtitle D coal ash regulations, 75 Fed. Reg. 35128, 35145 (stating that cobalt's estimated Hazard Quotient was as high as 500 for unlined surface impoundments).

more. Concentrations at Bull Run, Cumberland, Gallatin, Kingston, and Paradise have exceeded 100 ug/L. TVA often observes that cobalt is naturally occurring (see Bull Run and Gallatin sections of this report), but cobalt in upgradient TVA wells rarely exceeds the Regional Screening Level, and is usually below detection.[299] Taken together, the evidence strongly suggests that TVA's coal ash disposal operations are contaminating groundwater with unsafe levels of cobalt.

Manganese. The EPA identified manganese as a pollutant associated with coal ash in its coal ash disposal rule.[300] The Lifetime Health Advisory for manganese is 0.3 mg/L.[301] Manganese concentrations exceed this concentration at every TVA coal plant, typically by very large margins. Concentrations greater than 30 mg/L – more than 100 times higher than the health advisory – have been recorded at Cumberland, Gallatin, Kingston, Paradise, Shawnee, and Widows Creek. Although manganese is an essential element at low doses, it has been associated with neurological toxicity at higher doses. For example, increased neurological symptoms were observed in communities exposed to concentrations of 1.6 – 2.3 mg/L.[302] Manganese exceeds this range in 40 downgradient wells at 9 of the TVA coal plants. Infants may be uniquely susceptible due to higher uptake and retention of manganese, and due to higher manganese concentrations in infant formula.[303]

Sulfate. Sulfate concentrations above 500 mg/L in drinking water can cause diarrhea, and the EPA established a drinking water advisory at this level.[304] Natural concentrations of sulfate are usually below 500 mg/L. Of the 176 upgradient TVA well measurements that we have on file, 158 were below 100 mg/L, and only 3 exceeded the Drinking Water Advisory. In downgradient wells, on the other hand, sulfate concentrations range as high as 6,300 mg/L (at the Gallatin plant), more than ten times the Drinking Water Advisory. In total, 32 downgradient wells at 10 of the TVA coal plants have exceeded the Drinking Water Advisory for sulfate.

Restricted analysis. We also made a more conservative assessment of the data by filtering out groundwater results that potentially reflected natural contamination, or man-made sources other than coal ash. We began by eliminating all downgradient wells that had boron concentrations less than 1 mg/L and sulfate concentrations less than 150 mg/L. One mg/L is

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[299] Our database includes 189 cobalt measurements in upgradient wells. Of these, 153 were below detection, 24 were detected at concentrations less than 4.7 ug/L, and only 11 exceeded 4.7 ug/L.
[300] *See, e.g.*, U.S. EPA co-proposed Subtitle D coal ash regulations, which would list manganese as an "assessment monitoring" parameter, 75 Fed. Reg. 35128, 35253 (June 21, 2010).
[301] Concentrations greater than 0.05 mg/L are unusable as sources of domestic water because they exceed the EPA Secondary MCL.
[302] *See, e.g.*, U.S. EPA, Integrated Risk Information System, Manganese (1996), available at http://www.epa.gov/iris/subst/0373.htm.
[303] *Id*.
[304] *See* U.S. EPA, Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Sulfate (Feb. 2003).

the maximum boron value seen in upgradient TVA wells. The maximum sulfate concentration in upgradient TVA wells (aside from three potentially contaminated upgradient wells at the Paradise plant)[305] was 150 mg/L. This eliminated 23 downgradient wells. In the remaining 87 wells, we identified all pollutants that exceeded their respective health-based guidelines one or more times during the past five years (2008-2013). We did not count exceedances that appeared to be outliers (e.g., one high value for a pollutant that is usually below detection in a particular well), and we did not count exceedances for pollutants where the mean concentration in the downgradient well was lower than the mean concentration in the relevant upgradient well. We did not apply the same upgradient-downgradient filter to wells around the Paradise scrubber sludge disposal area or fly ash ponds, because the upgradient wells at these locations were immediately adjacent to disposal areas and had sulfate concentrations greater than 1,000 mg/L, suggesting that they were contaminated.[305] The results of the restricted analysis are shown in Table 13-3 and summarized in Table ES-1. The main conclusions of the broader analysis conclusions remain unchanged in the restricted analysis – there is evidence of coal ash contamination in groundwater at all 11 TVA coal plants; boron, cobalt, manganese, and sulfate each exceed health-based guidelines in more than 30 downgradient wells; and downgradient contamination frequently exceeds health-based guidelines by orders of magnitude.

Persistent pollutants. Finally, we isolated a subset of the wells identified in our restricted analysis that had persistent problems – these wells showed *average* concentrations of selected pollutants above health-based guidelines in the data that we had on file for the 2008-2013 period. We excluded pollutants that did not exceed health-based guidelines in at least half of available samples, and as described above, excluded pollutants that were higher in upgradient wells. We also limited our scope to six pollutants – arsenic, boron, cobalt, manganese, and molybdenum. The results of this analysis are shown in Table 13-4.

13.2 Data gaps

Unmonitored ash disposal legacy sites. Many of TVA's closed coal ash disposal areas are unmonitored. These include the abandoned ash pond at Allen, the east and west dredge cells at Bull Run, the Area J ash pond at John Sevier, Area 1 at Johnsonville, and the "Slag Mountain" area and the east and west dredge cells at Paradise.

[305] Three nominally upgradient wells at the Paradise plant show sulfate concentrations greater than 1,000 mg/L. Well 94-35A is immediately adjacent to the scrubber sludge disposal area, well 97-45 is immediately adjacent to an asbestos landfill, and well 10-5 is immediately adjacent to an ash pond. Since these three wells are potentially contaminated by ash or other sources, we did not treat them as upgradient for purposes of establishing a background sulfate screening threshold.

Abandonment of contaminated wells. In several instances TVA has stopped monitoring individual wells despite (or perhaps in response to) evidence of contamination. These abandoned wells include:

- Wells P2 and P3 at Allen, which showed arsenic and manganese contamination before TVA stopped monitoring them in 2008;
- well 93-2 at Cumberland, which showed high concentrations of arsenic, boron, cobalt, manganese, molybdenum, selenium, and sulfate when it was 'replaced' with a well screened in a different geological layer;
- wells around the coal yard drainage basin at Colbert, which showed high concentrations of aluminum, cadmium, manganese, and sulfate when they were abandoned in 1999;
- wells MC2 and MC3 near Ash Pond 4 at Colbert, abandoned in 2003 despite high concentrations of antimony, arsenic, boron, and molybdenum;
- well 21 at Gallatin, which showed high concentrations of cobalt, manganese, mercury and other pollutants when it was abandoned in 2011;
- wells B6 and B8 at Johnsonville's South Rail Loop disposal area, with high concentrations of boron (up to 12 mg/L), cobalt (up to 65 ug/L), and manganese (up to 2.9 mg/L), now approved for 'replacement;'
- voluntary USWAG monitoring wells around the Fly Ash and Bottom Ash Ponds at Paradise, not monitored since 2011.

Unmeasured coal ash pollutants. It is impossible to require corrective action for pollutants that are never measured. The pollutants most likely to be elevated as a result of coal ash contamination include aluminum, boron, chloride, manganese, molybdenum, strontium, sulfate, and TDS.[306] These are the pollutants that should be measured most often, and yet they are the pollutants that TVA measures the least: TVA has generally failed to measure any of these pollutants in the USWAG ash impoundment wells in recent years, and measures them infrequently in other wells.

Clearly the monitoring program is focused on an inadequate set of monitoring parameters, and both TVA and the states appear to be at fault. TVA is responsible for what it chooses to monitor in its voluntary monitoring program, and it has chosen to avoid coal ash indicator pollutants. When it comes to monitoring required by the states, the states are equally to blame. Solid waste regulations in the TVA states do not require monitoring for these

[306] *See, e.g.*, U.S. EPA co-proposed Subtitle D coal ash regulations, which would have made boron, chloride, sulfate, and TDS, among others, as "detection monitoring" parameters, and would have included aluminum, boron, chloride, manganese, molybdenum, sulfate, and TDS among the "assessment monitoring" parameters. 75 Fed. Reg. 35128, 35253 (June 21, 2010).

pollutants.[307] They do, however, give state agencies the ability to establish alternative monitoring and reporting requirements.[308] TDEC has established these alternative requirements at some plants for some pollutants. But TDEC and the other state agencies have largely failed to require monitoring for coal ash pollutants at coal ash sites. In other words, when given the choice between properly regulating these sources of pollution and choosing to bury their heads in the sand, the state agencies have chosen to bury their heads in the sand.

13.3 Analytical gaps

Poor use of groundwater protection standards. Selection of comparison values in reports is important; if done incorrectly, trends in groundwater quality will be missed. The most glaring omission in this regard is the fact that many pollutants, including boron, manganese, sulfate, and other coal ash pollutants, are almost never analyzed for upgradient/downgradient trends or changes over time. This is despite TVA's observation that boron and sulfate, in particular, are "ash leachate indicators."[309] The failure to assess spatial and temporal trends for coal ash pollutants at coal ash sites is willful ignorance.

When TVA does conduct statistical analyses, they often do so in a way that hides ongoing contamination. The use of intrawell Upper Prediction Limits (UPLs) is a case in point. An intrawell UPL is the high end of the historical range of a pollutant's concentration in the well being evaluated. Since each round of sampling is compared to historical data for the same well, an exceedance will only appear if the concentration in that well increases over time. If the historical baseline period already showed contamination, then this approach will not identify ongoing problems.

Consider, for example, boron in well W31 at the John Sevier plant, one of the only plants where boron is analyzed. The data that we have on file for this well show boron concentrations ranging from 9,000 to 18,000 ug/L, three to six times higher than the Child Health Advisory (3,000 ug/L) and orders of magnitude higher than boron concentrations in upgradient well W1 (consistently less than 200 ug/L). Yet groundwater monitoring reports for 2008-2009 did not show any boron exceedances for this well. This is because it was already contaminated in 2003-2004, the time period from which TVA and TDEC derived the UPL (19,000 ug/L).

We should note that this practice appears to be changing at many plants. To return to boron at John Sevier, TVA and TDEC started comparing downgradient wells to background

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[307] Ala. Admin. Code R. 335-13-4 Appendix I; 401 Ky. Admin. Regs. 45:160; Tenn. Comp. R. & Regs. 0400-11-01-.04(7).

[308] Ala. Admin. Code R. 335-13-4-.27(3)(a)(4); 401 Ky. Admin. Regs. 45:160 Section 8(2)(c); Tenn. Comp. R. & Regs. 0400-11-01-.04(7)(a)1.(ii).

[309] *See, e.g.*, TVA, Groundwater Monitoring Report – Allen Fossil Plant, at 2 (Aug. 22, 2008).

concentrations from an upgradient well in 2010. Not surprisingly, they found boron exceedances in Well W31 and three other wells, in addition to exceendances of interwell UPLs for manganese, strontium, and sulfate (see John Sevier Chapter).

Another standard practice in TVA groundwater reporting has been to use a combination of health-based and statistical criteria (MCLs and UPLs), using the higher of the two for each pollutant.[310] This is not legally improper – Tennessee regulations, for example, prescribe this approach.[311] However, it is an approach that favors the polluter to the detriment of public health. If the UPL is higher than the MCL, groundwater can reach unsafe levels without being an 'exceedance.' In the case of the April 2009 groundwater report for Gallatin, for example, the groundwater protection standard for mercury was set at the UPL of 2.87 ug/L, which was higher than the MCL of 2 ug/L. The UPL was calculated using contaminated well 21 as a 'background' well. In cases like these, groundwater can exceed the MCL without exceeding the groundwater protection standard or triggering a regulatory response.

In the opposite case, which is more common, the MCL exceeds the UPL. This also hides a problem, however. If coal ash contaminates groundwater to the extent that downgradient wells show higher concentrations of some pollutants than upgradient wells, but none of these pollutants exceed their respective MCLs, then TVA will not report any exceedances, and the state will not be alerted to evidence of contamination.

In short, there are two scenarios – unsafe groundwater that is not significantly different from background conditions, and contaminated groundwater that is not yet 'unsafe' – that escape regulatory action. A better, more protective approach would be to use the <u>lower</u> of the MCL and the UPL for each pollutant as the groundwater protection standard. This would flag groundwater that either exceeds health-based criteria or shows evidence of changes that might be the result of contamination. Unfortunately, switching to this approach would require changes to the laws governing waste disposal in the TVA states.

Environmental impacts to surface water. The groundwater contamination at TVA's coal plants is not just a problem for groundwater quality – much of the contaminated groundwater flows into adjacent rivers and streams creating potential risks to aquatic life. This risk is often ignored by state agencies, who assume that the receiving waters dilute any contamination below dangerous levels. However, we are not aware of any monitoring or modeling that can show either a significant risk or the absence of a significant risk, a situation that TVA commented on over 30 years ago in an internal memorandum about the John Sevier plant:

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[310] Among many other examples, see TVA, *Gallatin Fossil Plant Abandoned Ash Disposal Area, Groundwater Assessment Monitoring Report – April 2009* (May 19, 2009), or TVA, *John Sevier Fossil Plant Dry Fly Ash Landfill, Groundwater Assessment Monitoring Report – April 2010* (June 27, 2010).

[311] Tenn. Comp. R. & Regs. 1200-01-07-.04(7)(a)(1)(i).

> Although the potential for significant ground-water contamination is low, the question of whether there is any threat to the quality of the Holston River via groundwater contaminant transport has not been resolved. Furthermore, the broader question of the cumulative effect of the numerous ash disposal areas sited immediately adjacent to the Tennessee River and its tributaries should also be addressed.[312]

This may be the single biggest gap in the body of knowledge about environmental impacts of ash disposal at TVA plants.

Although there is no available modeling that would demonstrate the risk (or absence of risk) to aquatic ecosystems, simple back-of-the-envelope calculations sufficiently demonstrate the problem. To begin with, the Department of Energy has published surface water screening values for most of the coal ash pollutants in the form of “preliminary remediation goals.”[313] These are frequently many orders of magnitude lower than the concentrations present in groundwater at TVA sites. The goal for boron, for example, is 0.0016 mg/L. Although we cannot directly evaluate groundwater by this standard, because we know it will be diluted by river water, we can calculate how much dilution would be required to achieve a safe concentration. Groundwater along the banks of the Holston River at the John Sevier plant, for example, generally exceeds 3 mg/L, and has reached 18 mg/L in some wells. This means that the groundwater entering the river will present a risk to aquatic life even if it is diluted 1,000-fold. The same can be said about boron at other sites. The same can be also be said about other pollutants: The preliminary remediation goal for aluminum is 0.087 mg/L; concentrations in Gallatin well 19R, adjacent to the Cumberland River, hover around 100 mg/L, more than 1,000 times higher than the surface water goal. And as with human health risks, the cumulative ecological impact of multiple pollutants must be considered. One study of the toxicity of aluminum to fish, for example, found that the presence of low concentrations of zinc and copper enhanced aluminum’s toxicity.[314]

TVA’s ash disposal clearly poses a potential threat to aquatic ecosystems. Future groundwater quality oversight should include attempts to model the loads of coal ash pollution entering surface water through hydrologically connected groundwater, and prevent chronic loadings of ecologically toxic pollutants.

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[312] TVA, Memorandum from Roger P. Betson, Water Systems Development Branch, to C. Paul Jones, Civil Engineering Branch, re: John Sevier Steam Plant – Proposed Fly Ash Disposal Area – Potential for Ground Water Degradation (Apr. 21, 1981).
[313] U.S. Department of Energy, Preliminary Remediation Goals for Ecological Endpoints (Aug. 1997).
[314] R. W. Gensemer & R.C. Playle, The Bioavailability and Toxicity of Aluminum in Aquatic Environments, 29 CRITICAL REVIEWS IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY 315, 409 (1999).

Table 13-2 (page 1 of 3). Statistical summary of selected pollutants in wells throughout the TVA coal fleet, 2008-2013. Highlighted pollutants exceeded their respective health-based criteria in 20 or more downgradient samples.

		Downgradient wells (N = 110)			**Upgradient wells** (N = 26)		
Pollutant	Health-based criterion	Wells exceeding criterion (% of wells)[315]	Mean[316] concentration	Maximum concentration	Wells exceeding criterion (% of wells)[317]	Mean concentration	Maximum concentration
Aluminum	16 mg/L	4 (4%)	1.9 mg/L	125 mg/L	1 (5%)	1.0 mg/L	38 mg/L
Antimony	6 ug/L	5 (5%)	1.5 ug/L	59 ug/L	0	1.0 ug/L	1 ug/L
Arsenic	10 ug/L	18 (17%)	4.7 ug/L	135 ug/L	1 (4%)	1.8 ug/L	13 ug/L
Barium	2 mg/L	1 (1%)	0.08 mg/L	2.4 mg/L	0	0.20 mg/L	1.9 mg/L
Beryllium	4 ug/L	2 (2%)	1.7 ug/L	24.5 ug/L	0	1.5 ug/L	0.4 ug/L
Boron	3 mg/L	36 (34%)	3.2 mg/L	38 mg/L	0	0.2 mg/L	1 mg/L
Cadmium	5 ug/L	4 (4%)	0.8 ug/L	8.2 ug/L	0	0.6 ug/L	2 ug/L
Chloride	250 mg/L	10 (9%)	71.3 mg/L	1,500 mg/L	2 (8%)	69.4 mg/L	1,200 mg/L
Chromium	100 ug/L	2 (2%)	4.3 ug/L	280 ug/L	0	5.2 ug/L	77 ug/L
Cobalt	4.7 ug/L	40 (36%)	17.2 ug/L	370 ug/L	8 (36%)	9.2 ug/L	135 ug/L
Copper	1.3 mg/L	0	0.004 mg/L	0.1 mg/L	0	0.004 mg/L	0.2 mg/L
Fluoride	4 mg/L	0	0.3 mg/L	3.0 mg/L	0	0.2 mg/L	2.6 mg/L

[315] The denominator in each percentage in this column is the number of downgradient wells in which a pollutant was measured. This is often less than the total number of downgradient wells.
[316] The value shown in this column is the mean of well-specific means.
[317] The denominator in each percentage in this column is the number of upgradient wells in which a pollutant was measured. This is often less than the total number of upgradient wells.

Table 13-2 (page 2 of 3). Statistical summary of selected pollutants in wells throughout the TVA coal fleet, 2008-2013. Highlighted pollutants exceeded their respective health-based criteria in 20 or more downgradient samples.

		Downgradient wells (N = 110)			**Upgradient wells** (N = 26)		
Pollutant	Health-based criterion	Wells exceeding criterion (% of wells)[318]	Mean[319] concentration	Maximum concentration	Wells exceeding criterion (% of wells)[320]	Mean concentration	Maximum concentration
Lead	15 ug/L	2 (2%)	1.9 ug/L	160 ug/L	3 (12%)	2.2 ug/L	100 ug/L
Lithium[321]	31 ug/L	6 (29%)	23.4 ug/L	200 ug/L	1 (25%)	27.6 ug/L	71 ug/L
Manganese	0.3 mg/L	78 (73%)	6.5 mg/L	220 mg/L	10 (48%)	3.6 mg/L	49 mg/L
Mercury	2 ug/L	1 (1%)	0.3 ug/L	3 ug/L	0	0.2 ug/L	0.3 ug/L
Molybdenum	40 ug/L	22 (23%)	56.4 ug/L	2,200 ug/L	0	4.7 ug/L	13 ug/L
Nickel	100 ug/L	6 (5%)	17 ug/L	250 ug/L	0	9.3 ug/L	99 ug/L
Nitrate	10 mg/L	0	0.5 mg/L	4.2 mg/L	0	0.7 mg/L	8.9 mg/L
Selenium	50 ug/L	3 (3%)	4.0 ug/L	412 ug/L	0	1.9 ug/L	17 ug/L
Silver	100 ug/L	0	1.4 ug/L	21 ug/L	0	1.2 ug/L	10 ug/L
Strontium	9.3 mg/L	1 (1%)	0.7 mg/L	10 mg/L	0	0.4 mg/L	3.8 mg/L

[318] The denominator in each percentage in this column is the number of downgradient wells in which a pollutant was measured. This is often less than the total number of downgradient wells.
[319] The value shown in this column is the mean of well-specific means.
[320] The denominator in each percentage in this column is the number of upgradient wells in which a pollutant was measured. This is often less than the total number of upgradient wells.
[321] Since lithium is only measured at the Colbert plant, this row only reflects the 21 downgradient and 4 upgradient wells at Colbert.

Table 13-2 (page 3 of 3). Statistical summary of selected pollutants in wells throughout the TVA coal fleet, 2008-2013. Highlighted pollutants exceeded their respective health-based criteria in 20 or more downgradient samples.

		Downgradient wells (N = 110)			**Upgradient wells** (N = 26)		
Pollutant	Health-based criterion	Wells exceeding criterion (% of wells)[322]	Mean[323] concentration	Maximum concentration	Wells exceeding criterion (% of wells)[324]	Mean concentration	Maximum concentration
Sulfate	500 mg/L	33 (30%)	440 mg/L	6,300 mg/L	3 (13%)	248 mg/L	1,900 ug/L
Thallium	2 ug/L	0	1.0 ug/L	1.4 ug/L	0	1.1 ug/L	0.4 ug/L
TDS	500 mg/L	67 (61%)	973 mg/L	6,700 mg/L	10 (42%)	960 mg/L	5,000 mg/L
Vanadium	63 ug/L	4 (4%)	6.3 ug/L	200 ug/L	0	4.5 ug/L	26 ug/L
Zinc	2 mg/L	0	0.04 mg/L	1.0 mg/L	1 (4%)	0.06 mg/L	2.7 mg/L

[322] The denominator in each percentage in this column is the number of downgradient wells in which a pollutant was measured. This is often less than the total number of downgradient wells.
[323] The value shown in this column is the mean of well-specific means.
[324] The denominator in each percentage in this column is the number of upgradient wells in which a pollutant was measured. This is often less than the total number of upgradient wells.

Table 13-3 (page 1 of 4). Pollutants exceeding health-based guidelines between 2008 and 2013 in wells likely to be affected by coal ash (see 'restricted analysis' description above).

Plant / well	Pollutants exceeding health-based guidelines (maximum concentration)
Allen Fossil Plant	
Well P6	Arsenic (43 ug/L), Manganese (0.87 mg/L)
Bull Run Fossil Plant	
Well 45	Boron (4.2 mg/L), Manganese (10 mg/L), Sulfate (910 mg/L)
Well 45R	Boron (18 mg/L), Manganese (7.8 mg/L), Molybdenum (180 ug/L), Sulfate (2,200 mg/L)
Well G	Boron (3.3 mg/L), Molybdenum (100 ug/L), Sulfate (520 mg/L)
Well 47	Cobalt (31 ug/L), Molybdenum (50 ug/L), Sulfate (1,000 mg/L)
Well 48	Cobalt (100 ug/L), Sulfate (1,800 mg/L)
Well 49	Molybdenum (700 ug/L)
Well 10-52	Arsenic (31 ug/L), Manganese (0.355 mg/L)
Colbert Fossil Plant	
Well 19B	Cobalt (7.2 ug/L)
Well CA12A	Lead (160 ug/L)
Well CA17B	Cobalt (19 ug/L), Manganese (1.7 mg/L), Molybdenum (72 ug/L), Sulfate (1,000 mg/L)
Well CA20A	Aluminum (40 mg/L), Arsenic (13 ug/L), Manganese (0.42 mg/L)
Well CA21B	Arsenic (19 ug/L), Boron (9.3 mg/L), Cobalt (13 ug/L), Lithium (200 ug/L), Molybdenum (180 ug/L)
Well CA22B	Aluminum (29 mg/L), Boron (7.3 mg/L), Cobalt (10 ug/L), Lithium (160 ug/L) Molybdenum (88 ug/L)
Well CA27BR	Antimony (24 ug/L)
Well CA28B	Manganese (0.68 mg/L)
Well CA29AR	Manganese (0.7 mg/L), Molybdenum (67 ug/L)
Well CA29BR	Arsenic (12 ug/L), Molybdenum (65 ug/L)
Well CA30B	Chromium (280 ug/L), Cobalt (11 ug/L), Manganese (1.7 mg/L), Molybdenum (47 ug/L), Nickel (220 ug/L), Sulfate (540 mg/L)
Well CA31A	Manganese (0.65 mg/L), Molybdenum (51 ug/L)
Well CA9R	Antimony (59 ug/L), Lithium (53 ug/L), Molybdenum (57 ug/L)
Well MC1	Antimony (15 ug/L), Arsenic (76 ug/L), Boron (3.7 mg/L), Molybdenum (180 ug/L)
Well MC4	Antimony (11 ug/L), Arsenic (65 ug/L), Boron (3.6 mg/L), Molybdenum (180 ug/L)
Well MC5A	Antimony (11 ug/L), Arsenic (72 ug/L), Boron (3.5 mg/L), Manganese (0.310 mg/L), Molybdenum (170 ug/L), Vanadium (120 ug/L)
Well MC5C	Lithium (84 ug/L), Molybdenum (54 ug/L)

Table 13-3 (page 2 of 4). Pollutants exceeding health-based guidelines between 2008 and 2013 in wells likely to be affected by coal ash (see 'restricted analysis' description above).

Plant / well	Pollutants exceeding health-based guidelines (maximum concentration)
Cumberland Fossil Plant	
Well 10-1	Cobalt (7.4 ug/L), Manganese (4.3 mg/L)
Well 10-2	Cobalt (150 ug/L), Manganese (17 mg/L)
Well 93-1	Arsenic (18.4 ug/L), Cobalt (10 ug/L), Manganese (32 mg/L)
Well 93-2	Arsenic (17 ug/L), Boron (38 mg/L), Cobalt (9.4 ug/L), Manganese (4.9 mg/L), Molybdenum (540 ug/L), Sulfate (2,100 mg/L)
Well 93-2R	Arsenic (35.1 ug/L), Boron (16 mg/L), Cobalt (9 ug/L), Manganese (18 mg/L), Sulfate (1,400 mg/L)
Well 93-3	Boron (6.5 mg/L), Manganese (1.6 mg/L)
Well 93-4	Arsenic (17.9 ug/L), Boron (8.1 mg/L), Manganese (0.51 mg/L), Sulfate (1,100 mg/L)
Gallatin Fossil Plant	
Well 17	Cobalt (7.8 ug/L), Manganese (1.5 mg/L)
Well 19R	Aluminum (125 mg/L), Arsenic (135 ug/L), Beryllium (24.5 ug/L), Boron (4.5 mg/L), Cadmium (6.8 ug/L), Cobalt (320 ug/L), Manganese (33 mg/L), Nickel (250 ug/L), Sulfate (6,300 mg/L)
Well 20	Boron (5.8 mg/L), Cobalt (250 ug/L), Manganese (22 mg/L), Sulfate (2,050 mg/L)
Well 21	Cadmium (5.8 ug/L), Cobalt (330 ug/L), Manganese (18 mg/L), Mercury (3 ug/L), Nickel (110 ug/L), Strontium (10 mg/L), Sulfate (1,800 mg/L)
Well 26	Arsenic (22 ug/L), Boron (5.9 mg/L), Cobalt (15 ug/L), Manganese (9.4 mg/L), Sulfate (1,000 mg/L)
Well 27	Arsenic (15 ug/L), Boron (5.4 mg/L), Manganese (0.6 mg/L), Sulfate (920 mg/L)
John Sevier	
Well W28	Boron (3.1 mg/L), Cobalt (6.4 ug/L), Manganese (4 mg/L), Sulfate (890 mg/L)
Well W29	Manganese (8.3 mg/L)
Well W30	Boron (5.65 mg/L), Cobalt (5 ug/L), Manganese (3.8 mg/L), Sulfate (1,100 mg/L)
Well W31	Boron (18 mg/L), Cadmium (8.2 ug/L), Molybdenum (2,200 ug/L), Sulfate (1,800 mg/L)

Table 13-3 (page 3 of 4). Pollutants exceeding health-based guidelines between 2008 and 2013 in wells likely to be affected by coal ash (see 'restricted analysis' description above).

Plant / well	Pollutants exceeding health-based guidelines (maximum concentration)
Johnsonville Fossil Plant	
Well B6	Boron (6.5 mg/L)
Well B8	Boron (10.5 mg/L), Cobalt (65 ug/L), Manganese (2.9 mg/L), Sulfate (1,400 mg/L)
Well B6R	Boron (7.2 mg/L), Manganese (1.5 mg/L)
Well AP1	Boron (6.3 mg/L), Cobalt (21 ug/L), Manganese (3.5 mg/L)
Well AP2	Cobalt (58 ug/L), Manganese (13 mg/L), Sulfate (820 mg/L)
Well AP3	Boron (5.3 mg/L), Cadmium (5.8 ug/L), Cobalt (55 ug/L), Manganese (20 mg/L), Nickel (120 ug/L), Sulfate (780 mg/L)
Kingston Fossil Plant	
Well 4B	Manganese (1.8 mg/L)
Well 22	Manganese (2.3 mg/L)
Well 6A	Manganese (220 mg/L), Sulfate (3,500 mg/L)
Well 6AR	Cobalt (111 ug/L), Manganese (35.8 mg/L)
Well AD-2	Cobalt (11.2 ug/L), Manganese (1.7 mg/L)
Well AD-3	Cobalt (8.3 ug/L), Manganese (13.8 mg/L), Sulfate (552 mg/L)
Well G5A	Selenium (379 ug/L)
Well G5B	Selenium (412 ug/L)
Paradise Fossil Plant	
Well 10-1	Boron (10.5 mg/L), Cobalt (8.1 ug/L), Manganese (2.7 mg/L), Sulfate (1,900 mg/L)
Well 10-2	Boron (24 mg/L), Cobalt (5.9 ug/L), Manganese (2.6 mg/L), Sulfate (1,800 mg/L)
Well 10-3	Cobalt (27 ug/L), Manganese (3.8 mg/L), Sulfate (1,900 mg/L)
Well 10-6	Boron (3.2 mg/L), Cobalt (130 ug/L), Manganese (28 mg/L), Sulfate (590 mg/L)
Well 10-8	Arsenic (18 ug/L)
Well 10-9	Boron (15 mg/L), Cobalt (370 ug/L), Manganese (61 mg/L), Nickel (200 ug/L)

Table 13-3 (page 4 of 4). Pollutants exceeding health-based guidelines between 2008 and 2013 in wells likely to be affected by coal ash (see 'restricted analysis' description above).

Plant / well	Pollutants exceeding health-based guidelines (maximum concentration)
Shawnee Fossil Plant	
Well D33A	Manganese (0.95 mg/L)
Well D74A	Boron (10 mg/L), Manganese (1.2 mg/L), Molybdenum (720 ug/L)
Well D30A	Boron (12 mg/L), Cobalt (16 ug/L), Manganese (10 mg/L)
Well D75B	Boron (6.7 mg/L), Cobalt (5.8 ug/L), Manganese (6.7 mg/L)
Well D11B	Manganese (5.9 mg/L)
Well D74B	Boron (11 mg/L), Manganese (1.8 mg/L)
Well D30B	Boron (6.6 mg/L), Manganese (5.3 mg/L)
Well D75A	Aluminum (100 mg/L), Arsenic (22 ug/L), Beryllium (5.8 ug/L), Boron (8.2 mg/L), Chromium (150 ug/L), Cobalt (74 ug/L), Lead (120 ug/L), Manganese (69 mg/L), Nickel (120 ug/L), Sulfate (1,200 mg/L), Vanadium (200 ug/L)
Widows Creek Fossil Plant	
Well 31	Cobalt (38 ug/L)
Well 10-48	Manganese (1.4 mg/L), Sulfate (550 mg/L)
Well 10-49	Manganese (32 mg/L)
Well 10-50	Manganese (1.5 mg/L), Sulfate (740 mg/L)
Well 10-51	Manganese (1.2 mg/L)
Well 10-52	Boron (13 mg/L), Manganese (1.6 mg/L), Sulfate (1,100 mg/L)

Table 13-4 (page 1 of 3). Groundwater wells in which average concentrations of selected pollutants exceeded health-based guidelines.[325] Each cell identifies a well, and, in parentheses, the mean of data on file for that well during the 2008-2013 period.

	Arsenic (ug/L)	Boron (mg/L)	Cobalt (ug/L)	Manganese (mg/L)	Molybdenum (ug/L)	Sulfate (mg/L)
Guideline	10	3	4.7	0.3	40	500
Allen	P6 (28.4)					
Bull Run	10-52 (27.5)	F45 (3.6) F45R (15.3)	47 (10.3) 48 (49.1)	F45 (9.7) F45R (6.7)	49 (605) F45R (76)	47 (778) 48 (1641) F45 (745) F45R (1786)
Colbert	MC1 (68.8) MC4 (48.7) MC5A (47.8)	CA21B (4.4) MC1 (3.3) MC4 (3.3)	CA17B (10.0)	CA17B (1.1) CA28B (0.6) CA29AR (0.4) CA30B (1.2)	CA21B (71) CA29AR (51) CA29BR (58) MC1 (159) MC4 (160) MC5A (142) MC5C (45)	
Cumberland	93-2 (11.6)	93-2 (34.9) 93-2R (14.0) 93-3 (6.0) 93-4 (5.6)	10-1 (6.9) 10-2 (140) 93-1 (5.1) 93-2 (6.9)	10-1 (4.2) 10-2 (16.5) 93-1 (9.3) 93-2 (3.8) 93-2R (13.5) 93-3 (1.2)	93-2 (469)	93-2R (1313) 93-4 (776)

325 This analysis was limited to the pollutants shown (other pollutants, not shown, also exceeded health-based guidelines), was limited to wells in which half or more of available sample results exceeded health-based guidelines, and was limited to wells likely to be affected by coal ash (see 'restricted analysis' description in the text of the report).

Table 13-4 (page 2 of 3). Groundwater wells in which 2008-2013 average concentrations of selected pollutants exceeded health-based guidelines.[326]

Plant	Arsenic (ug/L)	Boron (mg/L)	Cobalt (ug/L)	Manganese (mg/L)	Molybdenum (ug/L)	Sulfate (mg/L)
Guideline	10	3	4.7	0.3	40	500
Gallatin		19R (3.5) 20 (5.5) 26 (5.7) 27 (5.0)	19R (186) 20 (197) 21 (161) 26 (14.7)	19R (17.4) 20 (20.2) 21 (11.0) 26 (9.1) 27 (0.4)		19R (4088) 20 (1597) 21 (936) 26 (943) 27 (893)
John Sevier		W30 (5.0) W31 (13.3)		W28 (2.9) W29 (4.1) W30 (2.6)	W31 (2200)	W28 (835) W30 (1025) W31 (1337)
Johnsonville		10-AP1 (6.3) 10-AP3 (5.3) B6 (3.5) B6R (7.2) B8 (9.9)	10-AP1 (16.0) 10-AP2 (46.0) 10-AP3 (51.0) B8 (52.3)	10-AP1 (3.5) 10-AP2 (13.0) 10-AP3 (20.0) B6R (1.5) B8 (2.7) B8R (1.1)		10-AP2 (820) 10-AP3 (780) B8 (1028)
Kingston			6AR (95.9) AD2 (7.2)	22 (2.1) 6A (176) 6AR (30.9) AD2 (1.0) AD3 (7.3)		6A (2967)

[326] This analysis was limited to the pollutants shown (other pollutants, not shown, also exceeded health-based guidelines), was limited to wells in which half or more of available sample results exceeded health-based guidelines, and was limited to wells likely to be affected by coal ash (see 'restricted analysis' description in the text of the report).

Table 13-4 (page 3 of 3). Groundwater wells in which 2008-2013 average concentrations of selected pollutants exceeded health-based guidelines.[327]

Plant	Arsenic (ug/L)	Boron (mg/L)	Cobalt (ug/L)	Manganese (mg/L)	Molybdenum (ug/L)	Sulfate (mg/L)
Guideline	10	3	4.7	0.3	40	500
Paradise	10-8 (18.0)	10-1 (10.5) 10-2 (24.0) 10-6 (3.2) 10-9 (15.0)	10-1 (8.1) 10-2 (5.9) 10-3 (27.0) 10-6 (130) 10-9 (370)	10-1 (2.7) 10-2 (2.6) 10-3 (3.8) 10-4 (1.4) 10-6 (28.0) 10-9 (61.0)		10-1 (1900) 10-2 (1800) 10-3 (1400) 10-6 (590)
Shawnee		D30A (5.0) D30B (4.3) D74A (7.6) D74B (9.0) D75A (7.4) D75B (5.9) D76A (19.8)	D30A (11.1) D76A (35.2)	D11B (5.3) D30A (7.9) D30B (4.6) D33A (0.9) D74B (1.5) D75A (66.4) D75B (5.5) D76A (5.5)	D74A (559)	D75A (1061) D76A (1230)
Widows Creek		10-52 (13.0)	31 (20.4)	10-48 (1.4) 10-49 (32.0) 10-50 (1.5) 10-51 (1.2) 10-52 (1.6)		10-48 (550) 10-50 (740) 10-52 (1100)

[327] This analysis was limited to the pollutants shown (other pollutants, not shown, also exceeded health-based guidelines), was limited to wells in which half or more of available sample results exceeded health-based guidelines, and was limited to wells likely to be affected by coal ash (see ‘restricted analysis’ description in the text of the report).

Appendix C

Electronic Filing: Received, Clerk's Office 7/20/2018

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

In the Matter of:	)	
	)	
SIERRA CLUB, ENVIRONMENTAL LAW AND POLICY CENTER, PRAIRIE RIVERS NETWORK, and CITIZENS AGAINST RUINING THE ENVIRONMENT	)	
	)	**PCB No-2013-015**
Complainants,	)	**(Enforcement – Water)**
	)	
v.	)	
	)	
MIDWEST GENERATION, LLC,	)	
	)	
Respondents	)	

NOTICE OF FILING

TO: Don Brown, Assistant Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph Street, Suite 11-500
Chicago, IL 60601

Attached Service List

PLEASE TAKE NOTICE that I have filed today with the Illinois Pollution Control Board the attached **CITIZENS GROUP'S POST-HEARING BRIEF** in the above-captioned proceeding, copies of which are served on you along with this notice.

Respectfully submitted,

_/s/ Faith Bugel_________

Faith E. Bugel
1004 Mohawk
Wilmette, IL 60091
(312) 282-9119
fbugel@gmail.com

Dated: July 20, 2018

Attorney for Sierra Club

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

In the Matter of:	)	
	)	
SIERRA CLUB, ENVIRONMENTAL LAW AND POLICY CENTER, PRAIRIE RIVERS NETWORK, and CITIZENS AGAINST RUINING THE ENVIRONMENT	)	
	)	**PCB No-2013-015**
Complainants,	)	**(Enforcement – Water)**
	)	
v.	)	
	)	
MIDWEST GENERATION, LLC,	)	
	)	
Respondents	)	

CITIZENS GROUPS' OPENING POST-HEARING BRIEF

Complainants Sierra Club, Environmental Law and Policy Center, Prairie Rivers Network and Citizens Against Ruining the Environment (collectively, "Citizens Groups") respectfully submit this Opening Post-Hearing Brief for the Illinois Pollution Control Board's ("Board") consideration in this case.

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INTRODUCTION

Midwest Generation, LLC, ("MWG") controls four properties containing coal-fired power plants—known as the Joliet 29, Powerton, Waukegan, and Will County Electric Generating Stations (collectively, the four "MWG Plants")—where constituents of coal ash have contaminated groundwater, and continue to contaminate groundwater, in violation of Section 12(a) of the Illinois Environmental Protection Act ("Act").

Since 2010, groundwater monitoring reports from the MWG Plants have recorded coal ash constituents in excess of their respective Illinois Class I groundwater standards over 1,300 times. Boron and sulfate, the two leading indicators of coal ash contamination in groundwater, continue to routinely exceed background levels and Illinois Class I groundwater standards. MWG's sole expert in this case, John Seymour, conceded that some or all of this contamination is coming from onsite coal ash at all four MWG Plants. Mr. Seymour also conceded that the contamination at the Powerton, Waukegan and Will County plants is not improving.

At all of the MWG Plants coal ash can be found in onsite impoundments (or "ash ponds") and in ash landfills and other coal ash fill areas outside of the ash ponds. MWG has owned or operated the MWG Plants since 1999 and has long known about the coal ash both in and outside of the ash ponds. MWG has not exercised adequate control to prevent groundwater contamination from the coal ash landfills, coal ash fill areas, or coal ash ponds at any of the sites. As a result, the groundwater contamination continues unabated.

MWG's failure to exercise its control over the power plants and prevent coal ash from contaminating groundwater renders it liable under Section 12(a). Additionally, because violations of Section 12(a) trigger liability under Section 620.115 of the Act's implementing regulations, 35 Ill. Adm. Code 620.115, MWG is also liable for violations of Section 620.115.

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MWG is liable for violations of 35 Ill. Adm. Code 620.301(a) and 35 Ill. Adm. Code 620.405. On many occasions before the groundwater monitoring zone ("GMZ") at three of the plants became active, groundwater monitoring recorded exceedances of Illinois Class I groundwater standards. These groundwater quality standard exceedances trigger liability under Section 620.301(a) and 620.405. At Waukegan, where there is no GMZ, these exceedances continue to occur, triggering liability under Section 620.301(a) and 620.405.

Lastly, MWG's knowledge of and acquiescence to coal ash deposited at unlined repositories like the ash landfills and ash fill areas, and the subsequent water pollution caused by this coal ash, renders MWG liable for violations under Section 21(a) of the Act, which prohibits open dumping in Illinois.

SUMMARY OF THE LAW

I. BURDEN OF PROOF

In an enforcement proceeding, the burden of proof is by a preponderance of the evidence. *Rodney Nelson v. Kane County*, PCB 94-244, 1996 WL 419472, at *4 (IPCB July 18, 1996). A proposition is proved by a preponderance of the evidence when it is more probably true than not. *Id*. A complainant in an enforcement proceeding has the burden of proving violations of the Act by a preponderance of the evidence. *Id*. Once the complainant presents sufficient evidence to make a prima facie case, the burden shifts to the respondent to disprove the propositions. *Id*.

II. SECTION 12(A) OF THE ILLINOIS ENVIRONMENTAL PROTECTION ACT

Section 12(a) of the Illinois Environmental Protection Act ("Act") provides that no person shall "[c]ause or threaten or allow the discharge of any contaminants into the environment in any State so as to cause or tend to cause water pollution in Illinois." 415 ILCS 5/12. "Water"

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is defined in the Act as "all accumulations of water, surface and **underground**, natural, and artificial, public and private, or parts thereof, which are wholly or partially within, flow through, or border upon this State." 415 ILCS 5/3.550 (emphasis added). "Contaminant" is defined in the Act as "any solid, liquid, or gaseous matter, any odor, or any form of energy, from whatever source." 415 ILCS 5/3.165.

The Act defines "water pollution" as the:

> [D]ischarge of any contaminant into any waters of the State, as will or is likely to create a nuisance or render such waters harmful or detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate uses, or to livestock, wild animals, birds, fish, or other aquatic life.

415 ILCS 5/3.545.

Long-standing precedent confirms that the owner of the source of water pollution causes or allows the water pollution unless the owner (1) lacked the capability to control the source or (2) undertook extensive precautions to prevent vandalism or other intervening causes of the water pollution. *See, e.g.*, *People v. John Prior*, PCB 02-177, 2004 WL 1090239, at *18 (IPCB May 6, 2004); *Perkinson v. Ill. Pollution Control Bd*., 543 N.E.2d 901, 903-904 (Ill. App. 3d Dist. 1989); *Meadowlark Farms, Inc., v. Ill. Pollution Control Bd*, 308 N.E.2d 829, 836 (Ill. App. 5th Dist. 1974); *People v. A.J. Davinroy Contractors*, 618 N.E.2d 1282, 1286-87 (Ill. App. 5th Dist. 1993).

Parties who lease or operate the source of pollution exercise the capability to control a source of pollution. *See, e.g.*, *People v. State Oil Co*., PCB 97-103, 2003 WL 1785038, at *15, 24-25 (IPCB Mar. 20, 2003); *People v. Michel Grain*, PCB 96-143, 2002 WL 2012414, at *3-4 (IPCB Aug. 22, 2002) (denying lessee's motion to dismiss Section 12(a) complaint); *Allaert Rendering, Inc. v. Ill. Pollution Control Bd*., 414 N.E.2d 492, 494-95 (Ill. App. 3d Dist. 1980) (finding plant operator liable under Section 12(a)).

Even if they did not place the contaminants at issue in the ground or water, parties with control over a source of pollution are liable for water pollution in violation of Section 12(a). "[T]he current owner may be responsible for contamination even if the current owner did not actively dispose of the contamination." *People v. Inverse Investments, LLC*, PCB 11-79, 2012 WL 586821, at *9 (IPCB Feb. 16, 2012); *see also Michel Grain*, PCB 96-143, 2002 WL 2012414, at *3 ("a respondent with control over a site may be found in violation even if the respondent did not actively dispose of contaminants at the site"); *State Oil Co.*, PCB 97-103, 2003 WL 1785038, at *15 ("the fact that the Abrahams and Millstream did not initially cause the pollution at the site is immaterial with regard to their responsibilities and duties as owners and operators of the property."); *Meadowlark Farms*, 308 N.E.2d at 836-37 (finding owner of premises liable under Section 12(a) even though owner did not operate the source of pollution on their premise); *People v. John Prior*, PCB 97-111, 1997 WL 735036, at *6-7 (IPCB Nov. 20, 1997) (rejecting respondents' argument that it is not liable for water pollution because it was not an owner of the property during the time of the violations).

In *Meadowlark Farms*, the Section 12(a) violation was caused by material that had been discarded twenty to thirty years earlier and well before the new owner purchased the property. *Meadowlark Farms*, 308 N.E.2d at 831. The court upheld the IPCB's finding that the landowner's ownership of surface rights to the property that was the source of the water pollution provided the landowner with sufficient "capability of controlling the pollutional discharge." *Id.* at 836. The court upheld the IPCB's finding the landowner liable for violating section 12(a) of the Act. *Id.*at 837. *Meadowlark* "illustrates that the courts will find liability when a landowner currently has the capability of control over pollution, even when the landowner attributes the problem to someone else.” *People v. Lincoln*, 70 N.E.3d 661, 678 (Ill. App.4th Dist. 2016) (citing *Meadowlark*).

Even where a respondent has attempted to remedy contamination, if those efforts are not completely successful, the respondent can still be held liable:

> While respondent has certainly taken steps to remediate the groundwater situation, respondent's responsibility is evident and we can reach no other conclusion but to find respondent in violation of Section 12(a) of the Act.

Int’l Union v. Caterpillar, PCB 94-240, 1996 WL 454961, at *29 (IPCB Aug. 1, 1996).

Parties can be liable for “threaten[ing] a discharge which would tend to cause water pollution” when they “fail[] to properly monitor the groundwater.” *People v. ESG Watts*, PCB 96-233, 1998 WL 54022, at *13 (IPCB Feb. 5, 1998). In finding ESG Watts liable, the Board explained that:

> [B]y failing to install the monitoring equipment, monitor groundwater beneath the landfill and submit the monitoring reports as required, ESG Watts operated its landfill in a manner which constitutes a threat to waters, which [sic] in this case, groundwaters of the State. ESG Watts thereby violated Sections 12(a) and 21(d)(2) of the Act.

People v. ESG Watts, PCB 96-233, 1997 WL 114108, at *5 (IPCB Mar. 6, 1997).

Parties can be liable for creating a “water pollution hazard” or the “threat of pollution” even when there is no actual contamination:

> The fourth count alleged that Allaert deposited contaminants on land so as to create a water pollution hazard. As discussed above, it is not necessary to show actual pollution in order to show a threat of pollution. Therefore, the failure to allege actual pollution does not render this count insufficient.

Allaert, 414 N.E.2d at 495.

Parties with control over the premises or source of pollution cannot avoid liability unless that party has “exercise[d] control to prevent pollution.” *Meadowlark Farms*, 308 N.E.2d at 836.

Petitioner further argues that it has not caused, threatened or allowed the

> discharge of contaminants within the meaning of section 12(a) of the Act (Ill.Rev.Stats. 1971, ch. 111 1/2, s 1012(a)). Petitioner contends that its mere ownership of the surface estate from which the discharge originates is the only relationship to the transaction responsible for the discharge and that ***to expect the petitioner to exercise control to prevent pollution*** would be unreasonable. In conjunction, the petitioner states that its lack of knowledge that the discharge of contaminants was occurring is a defense to the complaint. We find these arguments without merit.

Id. (emphasis added).

The Board has made clear that water pollution exists when regulated contaminants are present in excess of either Class I or Class II groundwater quality standards. *See*, *e.g.*, *John Prior*, PCB 97-111, 1997 WL 735036, at *7 (finding respondent liable for exceeding groundwater quality standards and, subsequently, liable for violation of Section 12(a) of the Act); *Int'l Union*, PCB 94-240, 1996 WL 454961, at *28-29 (finding respondent exceeded groundwater quality standards and, subsequently, liable for violation of Section 12(a) of the Act).

Water pollution occurs even when a party is immune from violations of groundwater quality standards, as is the case when a GMZ is in effect. *See* 35 Ill. Adm. Code §§ 620.250(e), 740.530(d). The GMZ only provides immunity "from violating the Part 620 standards." *People v. Texaco*, PCB 02-03, 2003 WL 22761195, at *9 (Nov. 6, 2003). In *Texaco*, the Board rejected respondent Texaco's argument that a GMZ provides immunity from Section 12(a) violations. *Id*. Therefore, exceedances of groundwater quality standards constitute water pollution under Section 12(a) regardless of the existence of a GMZ.

Furthermore, as noted above, water pollution is present when a discharge of any contaminant into groundwater "will or is likely to… render such waters harmful or detrimental or injurious to public health, safety or welfare." 415 ILCS § 5/3.545. When the Board adopted the groundwater quality standards in 1991, it noted that the Class I: Potable Resource Groundwater quality standards were being set at levels "equal to the USEPA's Maximum Concentration

Levels," ("MCLs") which are health-based standards intended to be protective of human health. 42 USC § 300g-1(b)(4)(A)-(B). Class I standards were intended to fulfill "the principle that groundwaters that are naturally potable should be available for drinking water supply without treatment." *In Re: Groundwater Quality Standards: 35 Ill. Adm. Code 620,* PCB R89-014(B), Final Order at 18 (Nov. 7, 1991).

Therefore, regardless of whether the standards are in effect, contamination in excess of those standards leaves the affected groundwater "harmful or detrimental or injurious to public health, safety or welfare" under § 415 ILCS 5/3.545. When groundwater quality standards are set to prevent harm to public health, exceedances of those standards in a water body constitute water pollution, even if the polluter cannot be held liable under Part 620 because of a GMZ.

Other Board decisions similarly support the principle that contamination in excess of health-based standards constitutes water pollution. *See Int'l Union*, PCB 94-240, 1996 WL 454961, at *29 (finding that "exceedences [*sic*] of the Part 620 standards… constitutes degradation of one of the State's water resources and indicates the presence of water pollution caused by respondent"); *People v. CSX Transp., Inc.*, PCB 07-16, 2007 WL 2050813, at *16 (IPCB July 12, 2007) (finding § 12(a) violation based on exceedance of soil remediation objectives because "exposure above the remediation objective levels would be hazardous to human health").

Lastly, "[t]hat the discharges were accidental and not intentional, or that they occurred in spite of Petitioner's efforts to prevent them, is not a defense" to liability under Section 12(a) of the Act. *Freeman Coal Mining Corp., v. Ill. Pollution Control. Bd.,* 313 N.E.2d 616, 621 (Ill. App. 5th Dist. 1974). In *Freeman Coal*, the court concluded:

> As the court stated in Meadowlark, The Environmental Protection Act is Malum prohibitum, no proof of guilty knowledge or Mens rea is necessary to a finding of

> guilt. The facts of Petitioner's construction of a treatment facility and subsequent improvements thereto go to mitigation, not to the primary issue of liability.

Id.

In summary, Illinois law clearly creates liability on the part of owners and/or operators for causing or allowing groundwater pollution by failing to exercise control over the site and abate ongoing pollution. Part 620 Class I and Class II standards provide a useful measuring stick to evaluate contamination, and evidence of exceedances of those standards at a given site establishes that groundwater pollution exists at that site. Thus, if a party has allowed groundwater to exceed groundwater quality standards, it has caused or allowed water pollution and is liable under Section 12(a).

III. PART 620 OF THE BOARD'S REGULATIONS

The Board's Part 620 regulations prohibit violations of the Illinois Environmental Protection Act and prohibit exceedances of Class I groundwater quality standards. There are three relevant regulations at issue.

Section 620.115 provides that:

> No person shall cause, threaten or allow a violation of the Act, the IGPA or regulations adopted by the Board thereunder, including but not limited to this Part.

35 Ill. Adm. Code 620.115. Therefore, violations of Section 12(a) of the Act also trigger violations of Section 620.115.

Section 620.301(a), provides that:

> No person shall cause, threaten or allow the release of any contaminant to a resource groundwater such that:
>
> > (1) Treatment or additional treatment is necessary to continue an existing use or to assure a potential use of such groundwater; or
> > (2) An existing or potential use of such groundwater is precluded.

35 Ill. Adm. Code 620.301(a).

For purposes of Section 620.301(a), Class I groundwater is considered "resource groundwater" under Part 620. *See* 35 Ill. Adm. Code 620.201 (defining Class I groundwater as "Potable Resource Groundwater"). Therefore, exceedances of Class I groundwater quality standards constitute a violation of Section 620.301(a).

Lastly, Section 620.405 provides that:

> No person shall cause, threaten or allow the release of any contaminant to groundwater so as to cause a groundwater quality standard set forth in this Subpart to be exceeded.

35 Ill. Adm. Code 620.405.

A GMZ only provides a defense to liability for exceedances of Part 620 groundwater quality standards and, therefore, a defense to liability under Section 620.301(a) and 620.405. *See Texaco*, PCB 02-03, 2003 WL 22761195, at *8-9. Exceedances of groundwater quality standards trigger liability under Part 620 when those exceedances occur outside of an active GMZ (either geographically or temporally). If a facility never had a GMZ, then all exceedances of groundwater quality standards trigger liability under Part 620. If a facility has or had a GMZ, then all exceedances that took place before and/or after an active GMZ trigger liability under Section 620.301(a) and 620.405.

A GMZ, however, does not provide a defense to liability for violations of Section 620.115. Section 620.115 liability attaches to any violation of the Illinois Environmental Protection Act. "No person shall cause, threaten or allow a violation of the Act. . ." 35 Ill. Adm. Code 620.115; *see also* 35 Ill. Adm. Code 620.110 ("'Act' means the Environmental Protection Act [415 ILCS 5]"). Therefore, a violation of Section 12(a) of the Act would also trigger liability under Section 620.115 regardless of whether a GMZ exists.

IV. SECTION 21(A) OF THE ILLINOIS ENVIRONMENTAL PROTECTION ACT

Section 21(a) of the Act provides that "[n]o person shall cause or allow the *open dumping* of any waste." 415 ILCS 5/21(a). The Act defines "open dumping" as "the consolidation of refuse from one or more sources at a disposal site that does not fulfill the requirements of a sanitary landfill." 415 ILCS 5/3.305. "Refuse" is defined as "waste." 415 ILCS 5/3.385 (emphasis added). "Waste" is defined in relevant part as "any garbage… or other discarded material, including solid, liquid, semi-solid… material resulting from industrial, commercial… operations.…" 415 ILCS 5/3.535.

In other words, a party is liable under Section 21(a) when that party causes or allows the consolidation of discarded materials resulting from industrial or commercial operations and deposits them in a disposal site that does not fulfill the requirements of a sanitary landfill. Coal ash is "waste" under Section 21(a) because it is a discarded material resulting from an industrial operation—the burning of coal to generate electricity. 415 ILCS 5/3.535 and 3.385.[1]

As the Board explained earlier in the present case, "an area on which waste is deposited can be a 'disposal site' if the waste deposition is conducted in a manner that allows waste material to enter the environment, including groundwater." *Sierra Club et al v. Midwest Generation, LLC*, PCB 13-15, 2013 WL 5524474, at *26 (Oct. 3, 2013).[2]

The Act references federal law in order to define "sanitary landfills": "facilit[ies]

---

[1] The Illinois Environmental Protection Act specifically identifies coal ash as "coal combustion waste." 415 ILCS 5/3.140 (defining "coal combustion waste" as "any fly ash, bottom ash, slag, or flue gas or fluid bed boiler desulfurization by-products generated as a result of the combustion of: (1) coal, or (2) coal in combination with…other fossil fuel…."). Although the Act excludes "coal combustion byproducts" ("CCB") from its definition of "waste," 415 ILCS 5/3.535, none of the coal ash deposited outside of the coal ash ponds at Waukegan, Powerton, and Will County meets the definition of CCB. CCB only includes coal combustion waste that is recycled and used beneficially. *See* 415 ILCS 5/3.135.

[2] Under the Act, a "waste disposal site" is a "site on which solid waste is disposed," 415 ILCS 5/3.540, and "disposal" means "the discharge, deposit, injection, dumping, spilling, leaking or placing of any waste or hazardous waste into or on any land or water or into any well so that such waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, *including ground waters*." 415 ILCS 5/3.185 (emphasis added).

permitted by the Agency for the disposal of waste on land meeting the requirements of the Resource Conservation and Recovery Act [42 USCA § 6901 et seq.] and regulations thereunder….” 415 ILCS 5/3.445. The Resource Conservation and Recovery Act (“RCRA”)’s implementing regulations, in turn, set forth specific criteria to distinguish between sanitary landfills and prohibited open dumps.

The Board has previously held in this case that “an exceedance of the MCLs at one or more power plants may be evidence tending to show a violation of Section 21(a) of the Act.” *Sierra Club*, PCB 13-15, 2013 WL 5524474, at *25. During the period in which the violations alleged in the Second Amended Complaint took place, the applicable regulations were those set forth at 40 CFR Part 257, Subpart A. Under 40 CFR § 257.1(a)(1), “[f]acilities[3] failing to satisfy any of the criteria in §§ 257.1 through 257.4 or §§ 257.5 through 257.30 or §§ 257.50 through 257.107 are considered [prohibited] open dumps.”[4] The criteria in section 257.3-4, which relate to groundwater, provide that “contaminat[ion of] an underground drinking water source” means exceeding one of the MCLs set forth in 40 CFR pt. 257 Appendix I.[5]

Federal law now includes more detailed regulations for some coal ash impoundments in 40 CFR pt. 257, often described as the “coal ash rule” or “CCR rule.” 40 CFR 257.50-257.107. While not binding on the Board, EPA’s expectations for proper handling of coal ash bear mention. In particular, EPA requires that new and existing coal ash impoundments, and new coal ash landfills, be located at least five feet above “the upper limit of the uppermost aquifer,” 40

[3] Under 40 CFR § 257.2, “facility” means “all contiguous land and structures, other appurtenances, and improvements on the land used for the disposal of solid waste.”

[4] RCRA’s regulations provide that sanitary landfills cannot: (1) “contaminate an underground drinking water source” (2) “beyond the solid waste boundary or beyond an alternative compliance boundary.” 40 C.F.R. § 257.3-4(a). Under RCRA, “solid waste boundary” means “the outermost perimeter of the solid waste (projected in the horizontal plane) as it would exist at completion of the disposal activity.” 40 C.F.R. § 257.3-4(c)(5).

[5] The exceedance must occur in either an actual drinking water source or in an aquifer with less than 10,000 mg/L total dissolved solids. 40 CFR § 257.3-4(c)(2). Groundwater qualifies as an “underground drinking water” if it contains less than 10,000 mg/L of total dissolved solids (“TDS”). 40 CFR § 257.3-4(d)(4).

CFR 257.60(a), and requires, for existing impoundments, liners "consisting of a minimum of two feet of compacted soil with a hydraulic conductivity of no more than 1 x 10-7 cm/sec," or something with an equivalent hydraulic conductivity. 40 CFR 257.71(a).

As the Board explained in its Order denying MWG's Motion to Dismiss: "[t]o cause or allow open dumping, the alleged polluter must have the capability of control over the pollution or control of the premises where the pollution occurred." *Sierra Club*, PCB 13-15, 2013 WL 5524474, at *26 (Oct. 3, 2013)*; see also Lincoln*, 70 N.E.3d at 670 ("[K]nowledge, awareness, or intent are not elements of a violation of section 21(a) and (p) of the Act.").

As is the case under Section 12(a),[6] under Section 21(a) of the Act a party may be liable for violating the open dumping prohibitions even if they did not place the contaminating material at issue on the land or water. "A clear standard of landowner liability has also been stated by the Illinois Pollution Control Board in proceedings in which landowners attributed violations to others." *Lincoln*, 70 N.E.3d at 678; *see also State Oil Co.*, PCB 97-103, 2003 WL 1785038, at *19, (holding owners liable for open dumping when they "knew of the pollution and allowed it to persist" even though they did not place the leaking underground storage tank on the land); *Illinois EPA v. Rawe*, AC 92-5, 1992 WL 315780, *3-5 (IPCB Oct. 16, 1992) (holding son liable for allowing open dumping when, approximately 30 years earlier, his father placed abandoned cars on a site the son controlled and the son did not remove them); *Illinois EPA v. Coleman*, AC 04-46, 2004 WL 2578712, at *7 (IPCB Nov. 4, 2004) (holding current owner liable for open dumping by failing to remove gravel and barrel on site even though prior owner had placed those materials there).

Also like Section 12(a) of the Act, under Section 21(a) the Board looks to whether the alleged violator has taken precautions to prevent pollution. "[I]t is illegal to fail to remedy

[6] Section 21(a)'s standard is identical to "cause or allow" standard applicable to Section 12(a) of the Act.

pollution on one's land, even if someone else, even unknown others, created the problem." *Lincoln*, 70 N.E.3d at 678. Parties with control over the premises or source of pollution cannot avoid liability unless that party has taken "extensive precautions" to prevent vandalism or intervening causes of pollution. *See, e.g., Gonzalez v. Ill. Pollution Control Bd*, 960 N.E.2d 772, 779 (Ill. App. 1st Dist. 2011); *Perkinson*, 543 N.E.2d at 904.

When a party is aware of a source of contamination on its property but does not remove that source, the party has not taken sufficient precautions to prevent pollution. *Gonzalez*, 960 N.E.2d at 779 (Petitioners violated the Act when they "were aware of the preexisting fly-dumped waste at the time of the purchase but failed to remove it for over 14 months"). In *State Oil Co.*, the Board held a property owner liable because they failed to remove contaminated soil:

> The Anests allowed the waste to be consolidated on the Site when they failed to conduct any soil removal. Although the Anests tested the underground storage tanks and made repairs to one tank, the Anests did not address the removal of the waste from the Site.

State Oil Co., PCB 97-103, 2003 WL 1785038, at *19. Similarly, in *Rawe*, a violation of Section 21(a) was found based on the standard of "allowing" pollution. Specifically, the court held that "passive conduct amounts to acquiescence sufficient to find a violation." *Illinois EPA v. Rawe*, AC 92-5, 1992 WL 315780, at *4. In the Board's words, "Present inaction on the part of the landowner to remedy the disposal of waste that was previously placed on the site, constitutes 'allowing' litter in that the owner allows the illegal situation to continue." *Id.*

In summary, a party is liable under Section 21(a) when it causes or allows consolidation of coal ash in a disposal site that does not fulfill the requirements of a sanitary landfill.

SUMMARY OF FACTS APPLICABLE TO ALL OF THE MWG PLANTS

1. MWG Conducts Groundwater Monitoring at the MWG Plants

According to Maria Race, Director of Federal Environmental Programs at NRG Energy

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(parent company of MWG),[7] MWG installed groundwater monitoring wells at the MWG Plants at the request of Illinois EPA. Race Tr. Oct. 23, 44:12-45:1. To install groundwater monitoring wells, a boring is required and each boring is logged. Hr'g. Tr. Oct. 23, 76:3-14. Each boring log contains a record of what was found in the soil or rock while boring. Hr'g. Tr. Oct. 23, 81:15-20.

MWG has conducted sampling of the groundwater monitoring wells at all four MWG Plants since 2010, and those results are reported on a quarterly basis. Hr'g. Tr. Feb. 1, 86:2-8, 87:16-20. Initially, the groundwater monitoring was conducted by Patrick Engineering. Hr'g. Tr. Feb. 1, 85:19-85:23. Richard Gnat's company, KPRG, took over the groundwater monitoring at the MWG facilities in 2012. Hr'g. Tr. Feb. 1, 85:13-85:18. "CCA sampling" is the "sampling that's done on a quarterly basis in accordance with the compliance commitment agreement that was signed with IEPA." Hr'g. Tr. Oct. 25, 60:6-9. "CCR sampling" is the sampling done to comply with federal regulations concerning coal combustion byproducts. Hr'g. Tr. Oct. 25, 59:21-60:5.

2. MWG's Monitoring Revealed Groundwater Contamination Levels Consistently Above State Standards

Since 2010, concentrations of coal ash constituents[8] have exceeded Illinois Class I groundwater standards over 1,300 times at the MWG Plants. *See* **Appendix A.**

3. Coal Ash, Coal Cinders, and Slag are Byproducts of Coal Burning at the MWG Plants

According to Rebecca Maddox, former Environmental Specialist at MWG and NRG Energy,[9] "bottom ash" and "slag" are both by-products of coal combustion. Hr'g. Tr. Oct. 24, 179:2-5, 179:13-15. According to Fred Veenbaas, Environmental Specialist at MWG's

[7] Hr'g. Tr. Oct. 23, 30:1-9.

[8] Coal ash contains many chemicals. These include the "constituents" for which the U.S. EPA requires groundwater monitoring: antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chloride, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, selenium, sulfate, thallium, total dissolved solids, and radium. 40 C.F.R. Part 257, Appendices III and IV.

[9] Hr'g. Tr. Oct. 24, 174:3-8.

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Waukegan plant,[10] "slag" is a by-product from a cyclone boiler whereas "bottom ash" is from a pulverized coal boiler. Hr'g. Tr. Feb. 1, 7:17-20. According to Maria Race, Director of Federal Environmental Programs, bottom ash is a cinder-like material that is too heavy to go up the stacks, whereas fly ash is light enough that it does go up the stacks. Hr'g. Tr. Oct. 23, 193:20-21; Tr. Oct. 26, 31:3-30; *see also* Comp. Ex. 43. According to Christopher Lux, Engineering Manager for MWG at Waukegan,[11] bottom ash ends up in the tanks of the operating boilers and then is sluiced out to the ash ponds. Hr'g. Tr. Oct. 24, 38:20-23.

4. Coal Ash Placed in Unlined Areas Poses a Risk of Groundwater Contamination

Illinois EPA and MWG both acknowledge that there is risk associated with ash in unlined areas. Christopher Lux, Engineering Manager for MWG at Waukegan, acknowledges that the purpose of a liner is to separate the ash from the ground. Hr'g. Tr. Oct. 24, 39:6-9 ("Q. And what purpose does the liner in the west ash pond serve? A. I assume it's there to separate the bottom ash from the ground.") Maria Race, Director of Federal Environmental Programs, also acknowledged that there are risks associated with ash being placed, unlined, in the ground:

> Q. What was your understanding then as to whether there were any risks from coal ash placed in or on the ground?
>
> A. Well, my understanding was that we needed to use lined impoundments or lined areas for any coal ash, that coal ash wasn't going to just be placed on the ground.

Hr'g. Tr. Jan. 29, 208:2-8.

IEPA prohibits the use of unlined areas for placement of ash, acknowledging the risk of groundwater contamination from placing ash in unlined areas. Resp. Ex. 636 at MWG-13-

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[10] Hr'g. Tr. Oct. 23, 24:16-17.
[11] Hr'g. Tr. Oct. 24, 33:8-14.

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15_555 (Powerton CCA)[12] ("Midwest Generation shall not use any unlined areas for permanent or temporary ash storage or ash handling."). MWG also takes the view that liners prevent contamination: Q. "[D]id the existence of liners form any part of the reason why Midwest Gen's position was the ash ponds weren't the source of the impacts? A. Absolutely." Hr'g. Tr. Jan. 30, 29:12-16. The logical corollary is that there is nothing to prevent groundwater contamination when ash is stored in unlined areas.

The movement of water, including groundwater, through coal ash increases the risk of leaching and contamination. Hr'g. Tr. Oct. 26 Afternoon, 83:19-84:1. MWG's expert witness John Seymour argued that risks are higher from (unlined) active surface impoundments than dry, inactive landfills: "Ponds have a lot water and we call it a driving head or pressure…". Hr'g. Tr., Feb. 1, 225:14-15. "Q. So if I understand you correctly, it's sort of the weight or the pressure of the water that causes the head, is that right? A. Yes, a head is a pressure which is developed by the height of water and the weight of water." Hr'g. Tr. Feb. 1, 225:20-226:1. Like surface water, groundwater also creates hydraulic pressure: "Groundwater has a head. If it goes from high pressure to low pressure, that's a head…". Hr'g. Tr. Feb. 1, 226:4. In other words, when any water, including groundwater, comes into contact with ash fill, it will have a hydraulic head that creates the risk of groundwater contamination.

5. Boron and Sulfate Are Known Indicators of Coal Ash Pollution

Both parties agree that boron is a good indicator of coal ash. According to counsel for MWG, "boron is a primary indicator of potential coal ash impacts to groundwater..." Comp. Ex. 8B (Letter from Nijman Franzetti on behalf of MWG to Illinois EPA re: Violation Notice W-2012-0059, July 27, 2012); Hr'g.Tr. Oct. 23, 66:17-67:7; *see also* Comp. Ex. 10B (Letter from

[12] Whenever an exhibit has a Bates stamp, the citations will refer to the Bates number that appears at the bottom of the page in the exhibit.

Nijman Franzetti on behalf of MWG to Illinois EPA re: Violation Notice W-2012-0056, July 27, 2012); Tr. Oct. 23, 68:3-13. According to MWG's expert John Seymour, one reason that boron is a good indicator is that it is mobile in the environment.[13] Hr'g. Tr. Feb. 2, 258:1-4; *see also* Hr'g. Tr. Oct. 26 (afternoon), 55:20-23.

If boron is found with other coal ash indicators, it strengthens the conclusion that coal ash is the source of groundwater contamination. Hr'g. Tr. Feb. 2, 257:6-13; *see also* Hr'g. Tr. Oct. 26 (afternoon), 34:8-11. Boron and sulfate together are indicators of coal ash: "Boron and sulfate are constituents known to be associated with coal ash." Comp. Ex. 9B (Letter from Nijman Franzetti on behalf of MWG to Illinois EPA re: Violation Notice W-2012-0057, July 27, 2012); Tr. Oct. 23, 67:11-21; *see also* Comp. Ex. 11B (Letter from Nijman Franzetti on behalf of MWG to Illinois EPA re: Violation Notice W-2012-0058, July 27, 2012); Hr'g. Tr. Oct. 23, 69:1-3 ("[B]oron and sulfate levels . . . are two typical ash leachate indicators.").

Both the U.S. EPA and the Illinois EPA agree that boron and sulfate are good coal ash indicators. The U.S. EPA chose to use boron and sulfate as detection monitoring constituents in the 2015 coal ash rule (40 C.F.R. 257, Appendix III), noting that "[t]he high mobility of boron and sulfate explains the prevalence of these constituents in damage cases that are associated with groundwater impacts." 80 Fed. Reg. 21,456.

The Illinois EPA, in a Technical Support Document for a proposed coal ash regulation, stated that "in addition to calcium (Ca), some of the more soluble [inorganic chemical] contaminants that leach from coal ash are: B [boron], SO_4 [sulfate], and Mn [manganese]." Comp. Ex. 405 at Comp. 019069 (Technical Support Document: Coal Combustion Waste Impoundments at Electrical Coal Fired Power Plants). The Illinois EPA went on to observe that:

[13] When groundwater is impacted by waste, it is not the waste itself that is moving with the groundwater, but the constituents. According to MWG's expert John Seymour, some constituents can be adsorbed so they move more slowly; others move more freely. Tr. Feb. 2, 150:12-17.

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> Boron, sulfate, and manganese are the same contaminants that have been found in recent hydrogeologic assessments of groundwater in multiple confirmed sample results collected from down-gradient dedicated monitoring wells adjacent to surface impoundment units containing CCW [coal combustion waste] at power generating facilities in Illinois. These contaminants were found to be attributable to these surface impoundment units.

Ex. 405 at Comp. 019069 (Technical Support Document: Coal Combustion Waste Impoundments at Electrical Coal Fired Power Plants).

6. MWG's Groundwater Monitoring Shows Elevated Levels of Coal Ash Indicator Pollutants When Compared to Background Levels

Illinois EPA implements a statewide "ambient groundwater monitoring network." Comp. Ex. 405 at Comp. 19071. One of the purposes of this network is to "establish background of water quality within the principle aquifers." *Id.* at Comp. 19072. In 2013, Illinois EPA prepared a "Technical Support Document" that included summary statistics for boron, sulfate, and other pollutants in the statewide ambient monitoring network. The data were summarized with median values, 90th percentile values, and other statistics in diagrams known as "box plots;" medians were also presented in tabular form. *Id.* at 19071-75.

Complainants' expert compared the median concentrations of coal ash indicators in each well at the MWG Plants (other than Powerton) to statewide median background values. Comp. Ex. 401 at 8; *Id*. at Table 3; Hr'g. Tr. Oct. 26, 60:18-63:12; Comp. Ex. 411 at pdf p. *5, *42, and *59. At the January hearing, MWG suggested that a more appropriate comparison would be to the upper-bound, 90th percentile background estimates. Hr'g. Tr. Jan. 29, 31:22-36:16; Tr. Feb. 1, 104:2-106:6. According to MWG's expert, if onsite groundwater data are greater than the 90th percentile value from the Illinois EPA database, then "you're sure that it is above background." Seymour, Tr. Feb. 2, 32:1-33:6.

The Illinois EPA database contains summary statistics for two groups of aquifers—sand and gravel aquifers, and bedrock aquifers. Comp. Ex. 405 at Comp. 19075–76. According to

Complainants' expert, the groundwater at Joliet 29, Powerton, and Waukegan should be compared to the sand and gravel aquifer data, while the groundwater at Will County should be compared to the bedrock aquifer data. Hr'g. Tr. Oct. 26, 61:12-62:2. For sand and gravel aquifers, the 90th percentile boron value is approximately 0.7 mg/L. Comp. Ex. 405 at Comp. 19074; Hr'g. Tr. Feb. 1, 105:12-106:6. The 90th percentile sulfate value is approximately 175 mg/L. Comp. Ex. 405 at Comp. 19074. For bedrock aquifers, the 90th percentile boron and sulfate values are approximately 1.25 and 550 mg/L, respectively. *Id* at Comp. 19075.

Table 1, below, shows median and 90th percentile background values from the Illinois EPA ambient monitoring network. *Id*. at Comp. 19074-76.

Table 1: Illinois EPA ambient monitoring network background values for boron and sulfate. Comp. Ex. 405 at Comp. 19074-76.

	Boron, sand and gravel aquifer (mg/L)	**Sulfate, sand and gravel aquifer (mg/L)**
Median	0.12	54
90^{th} percentile	0.70	175
	Boron, shallow bedrock aquifer (mg/L)	**Sulfate, shallow bedrock aquifer (mg/L)**
Median	0.28	106
90^{th} percentile	1.25	550

As discussed in more detail in the site-specific sections below, groundwater data at all of the MWG Plants routinely exceeds median background values, and groundwater at Powerton, Waukegan and Will County routinely exceeds upper-bound, 90^{th} percentile background values.

7. There is Coal Ash Contamination in the Groundwater at all Four MWG Plants

It is uncontested that the groundwater at all the MWG Plants has been contaminated by coal ash. MWG's expert, John Seymour, made numerous statements during his testimony about

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the presence of coal ash constituents in groundwater. *See, e.g.*, Hr'g. Tr. Feb 2, 43:24-44:5, 46:10-46:13, 80:4-80:8, 137:1-7, 175:11-175:23, 303:14-15. Mr. Seymour conducted a "matching" analysis[14] in which he observed that boron and sulfate were detected in every groundwater monitoring well at each site. Resp. Ex. 904 at Table 5-5; Resp. Ex. 901 at slides 21, 36, 50, and 64.[15] Mr. Seymour also selected an additional indicator of coal ash contamination—barium—and again found it in every groundwater monitoring well at each site. *See* Resp. Ex. 904 at Table 5-5. Although Seymour originally claimed that his "matching" analysis did not find a match between bottom ash leachate and groundwater, this was only because some of the elements detected in groundwater were not, in his opinion, indicators of coal ash. *Id*. However, Mr. Seymour later testified that the presence of non-coal ash indicators in groundwater should not count against the possibility of coal ash contamination. Tr. Feb. 2, 237:6-238:4. This makes sense because contaminated groundwater may also contain, for example, naturally occurring iron. The presence of iron does not make the groundwater any less contaminated by coal ash.

If non-indicators of coal ash were left out of Seymour's matching exercise, as he conceded they should be, then Seymour would have found a 100 percent match between bottom ash leachate and groundwater at Waukegan. Hr'g. Tr. Feb. 2, 241:10-245:24. The same is true for the other three MWG Plants, where the only chemicals that do not "match" are the non-coal ash indicators found in groundwater. Resp. Ex. 901 at slides 21, 36, 50, and 64.[16]

In short, MWG's expert acknowledged that coal ash indicators, including boron and

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[14] MWG's expert John Seymour conducted two versions of his "matching" analysis. His primary analysis can be found in various places as a multi-page "Table 5-5." Resp. Ex. 903 at Table 5-5; Resp. Ex. 904 at Table 5-5; Resp. Ex. 901 at Table 5-5. His "backup" analysis can be found in Table 5-4. *See*, *e.g.*, Hr'g. Tr. Feb. 2, 18:17-19:16.

[15] The cited slides do not include page numbers, but each one has a title of the form "[Plant name] – Updated Table 5-5." In the document filed with the Board as "Additional Demonstrative Exhibits" on January 30, 2018, these slides can be found on pdf p. 46, 61, 75, and 89.

[16] The cited slides do not include page numbers, but each one has a title of the form "[Plant name] – Updated Table 5-5." In the document filed with the Board as "Additional Demonstrative Exhibits" on January 30, 2018, these slides can be found on pdf p. 46, 61, 75, and 89.

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sulfate, were detected in every groundwater monitoring well at the MWG Plants. Seymour's matching analysis, if done correctly, should have found a perfect match between onsite bottom ash leachate and groundwater contamination at all of the MWG Plants. This is consistent with Seymour's general observations that the groundwater at the MWG Plants contains coal ash constituents. In fact, as discussed in more detail below, the concentrations of coal ash indicators are quite high in many groundwater wells at the MWG Plants, particularly at Powerton, Waukegan, and Will County.

8. Illinois EPA Determined that the Groundwater Contamination at the MWG Plants Violated State Groundwater Standards

In 2012, Illinois EPA found groundwater violations at the MWG Plants. Attachment A to the 2012 violation notices contains the following statement for all four MWG Plants in the first paragraph: "A review of information available to the Illinois EPA indicate the following on-going violations of statutes, regulations or permits." *See, e.g.*, Comp. Ex. 1A, at MWG13-15_330; Comp. Ex. 2A at MWG13-15_335; Comp. Ex. 3A at MWG13-15_344; Comp. Ex. 4A at MWG13-15_350. Under the "Violation Description" in all four violations notices, there is the statement that "[o]perations at ash impoundments have resulted in violations of the Groundwater Quality Standards at monitoring well MW-[XX] for the following constituents. . . ." Comp. Ex. 1A, at MWG13-15_330; Comp. Ex. 2A at MWG13-15_335; Comp. Ex. 3A at MWG13-15_344; Comp. Ex. 4A at MWG13-15_350. After the sentence describing the violations is a list of individual groundwater monitoring wells at each facility at which violations were found and, for each monitoring well, a list of parameters (or constituents) for which there were exceedances, the sample value that exceeded the groundwater standard, the "GW" standard, and the date on which the sample was taken ("Collection Date"). Comp. Ex. 1A, at MWG13-15_330; Comp. Ex. 2A at MWG13-15_335; Comp. Ex. 3A at MWG13-15_344; Comp. Ex. 4A at MWG13-15_350.

Similarly, the 2012 Compliance Commitment Agreements ("CCAs") for all four MWG Plants contained a section entitled "Allegation of Violations" but also contained the following statement without the term "alleged":

> Pursuant to Violation Notice ("VN") [W-2012-number] issued on June 11, 2012, the Illinois EPA contends that Respondent has violated the following provisions of the Act and Illinois Pollution Control Board ("Board") Regulations:
>
> a) Operations at ash impoundments have resulted in violations of the Groundwater Quality Standards at monitoring wells MW [X through X]. Section 12 of the Act, 415 ILCS 5/12, 35 Ill. Adm. Code 620.115, 620.301, 620.401, 620.405, and 620.410.

Resp. Ex. 626 at MWG-13-15_572; Resp. Ex. 636 at MWG-13-15_553; Resp. Ex. 647 at MWG-13-15_566; Resp. Ex. 656 at MWG-13-15_560. The CCAs for all four MWG Plants were signed and agreed to by John Kennedy, Senior Vice President, of Generation for MWG.

9. MWG Entered Into CCAs with the Illinois EPA That Failed to Address All Possible Sources of Coal Ash Contamination

The CCAs entered into by MWG with IEPA, referenced above, were intended to set up a process to bring the MWG ash impoundments into compliance. *See* Resp. Ex. 626 (Joliet CCA); Resp. Ex. 636 (Powerton CCA); Resp. Ex. 647 (Waukegan CCA); Resp. Ex. 656 (Will County CCA). As part of that process, the CCAs for three of the four MWG Plants—Powerton, Joliet 29, and Will County—contained requirements for MWG to apply for and establish a GMZ. Resp. Ex. 626 at MWG-13-15_573; Resp. Ex. 636 at MWG-13-15_555; Resp. Ex. 656 at MWG-13-15_562. A GMZ designates an area within which Class I groundwater standards are no longer applicable. Hr'g. Tr. Feb. 1, 107:11-17. There was no GMZ established at the Waukegan Station and, therefore, the Class I Groundwater Quality Standards have continued to apply since the signing of the CCA.

Both the Violation Notices and the CCAs issued by Illinois EPA were explicitly limited to the violations caused by coal ash impoundments. "Operations ***at ash impoundments*** have resulted in violations of the Groundwater Quality Standards…" Resp. Ex. 626 at MWG-13-15_572; Resp. Ex. 636 at MWG-13-15_553; Resp. Ex. 647 at MWG-13-15_566; Resp. Ex. 656 at MWG-13-15_560. In terms of corrective action, three of the CCAs required relining of the coal ash impoundments. Resp. Ex. 626 at MWG-13-15_573; Resp. Ex. 636 at MWG-13-15_554; Resp. Ex. 656 at MWG-13-15_561. Other actions were limited to restricting which impoundments could be used for active ash handling and closure of impoundments. Resp. Ex. 636 at MWG-13-15_555 (prohibiting East Yard Runoff basin from being used as part of ash sluicing flow system); Resp. Ex. 626 at MWG-13-15_561 (requiring that ponds 1N and 1S be removed from service). None of the CCAs addressed coal ash outside of the coal ash impoundments. The CCAs do not provide for any sort of controls to prevent groundwater contamination by coal ash landfills or fill areas.

10. MWG Was on Notice as to the Presence of Historic Coal Ash at the Four Plants

In 1998, Commonwealth Edison, the previous owner/operator of the MWG Plants, hired a consultant to prepare Environmental Site Assessments ("ESAs") for the four plants as part of Commonwealth Edison's sale of the plants to MWG. Hr'g. Tr. Oct. 23, 99:14-100:17. For each site, the consultant prepared a "Phase I" ESA and a "Phase II" ESA. *See* Comp. Ex. 17D (Powerton Phase II ESA); Comp. Ex. 18D (Will County Phase II ESA); Comp. Ex. 19D (Waukegan Phase II ESA); Comp. Ex. 20D (Joliet Phase II ESA); Comp. Ex. 21 (Joliet Phase I ESA); Comp. Ex. 38 (Waukegan Phase I ESA).

MWG employees have long been aware of the contents of the ESAs and used the documents as important reference points. Hr'g. Tr. Oct. 23, 225:11-23. Maria Race, Director of

Federal Environmental Programs,[17] stated that she "looked at [an ESA] as a historic document that gave me some information that could be helpful at times of interest." Hr'g. Tr. Oct. 23, 103:10-12. Maria Race explained how she used the ESAs:

> [S]ometimes when I would look at the information, you know, something like these borings you could look at it and think, well, this is what they were finding the way that they were sampling, you know, in this area or if you looked at one of the maps in here you could gather information about where an old switch yard was or, you know, if the coal pile had always been in the same place and things like that. You would just look for information and I wasn't looking at it as the Gospel truth, but it would give me additional information when we were performing work.

Hr'g. Tr. Oct. 23, 103:15-104:2. Ms. Race also turned to ESAs to answer site-specific questions:

> [I]f someone asked me a question from a site, I might go back and take a peek and look and see did we ever have a well at this -- did they ever put a well in over here or did they ever monitor for anything over here.

Hr'g. Tr. Oct. 23, 226:19-23. Ms. Race also looked at the ESAs to get a sense of past activities at the properties. "I looked at these documents for their historic information." Tr. Oct. 23, 226:18-19. Ms. Race went on to testify that it was her view that after looking at the ESAs, MWG should "develop [its] own information." Hr'g. Tr. Jan. 29, 204:18-205:1.

Ms. Race was aware of both the site maps and the boring logs for the MWG Plants. She reviewed these parts of the ESAs[18] and it was these pages of the ESAs that indicated that there were ash landfills, ash storage areas, and ash fill outside of the ponds at all four sites.[19]

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[17] Maria Race, Director of Federal Environmental Programs at NRG Energy, the current owner of MWG, became Director of Federal Environmental Programs in September of 2015. Hr'g. Tr. Oct. 23, 32:20-22. Previously, Ms. Race was Director of Asset Management at MWG. Hr'g. Tr. Jan. 29, 160:11-16; Hr'g. Tr. Oct. 23, 31:24-32:2. Ms. Race's responsibilities when she started with MWG included taking on the position of the "[NPDES] permitting person, compliance person, and the landfill management person. . . ." Hr'g. Tr. Jan. 29, 159:20-22; Hr'g. Tr. Jan. 30, 267:22-268:2. These responsibilities entailed, among other things, "ensuring that we are in compliance with the regulations." Hr'g. Tr. Jan. 29, 160:1-4.

[18] Hr'g. Tr. Oct. 23, 100:3-24, 110:21-111:20, 112:15-113:9, 113:24-114:16, 121:16-122:18, 134:24-135:18, 136:19-137:12.

[19] Comp. Ex. 17D at MWG13-15_3297, 3298, 3299-3342 (Powerton ESA Phase II); Comp. Ex. 18D at MWG13-15_5739, 5742, 5746-63 (Will County ESA Phase II); Comp. Ex. 19D at MWG13-15_45814, 45820-45842 (Waukegan ESA Phase II); Comp. Ex. 20D at MWG13-15_23339 (Joliet ESA Phase II); Comp. Ex. 21 at MWG13-15_25149 (Joliet ESA Phase I); Comp. Ex. 38 at MWG13-15_12012 (Waukegan ESA Phase I).

ARGUMENT

As has been shown above, and will be shown in more detail below, the groundwater beneath the MWG Plants is being contaminated by coal ash. This is plainly evident by the fact that groundwater monitoring at the Powerton, Waukegan, and Will County plants shows routine exceedances of both background levels and groundwater quality standards for boron and sulfate (as well as other known constituents of coal ash). At the Joliet 29 plant, boron and sulfate levels routinely exceed background levels, and periodically exceed groundwater quality standards. Both parties agree that boron and sulfate are indicators of coal ash, and their presence at elevated concentrations establishes that coal ash is the source of the groundwater contamination.

MWG has known about the existence of unlined coal ash repositories like the ash landfills and ash fill areas at each of its power plants since it first purchased the plants in 1999. However, despite being on notice as to the presence of ash on its properties, MWG still has not exercised control to prevent groundwater contamination. As a result, the groundwater contamination at Powerton, Waukegan, and Will County is not improving—and the groundwater at Joliet continues to show periodic exceedances of state groundwater standards.

MWG's failure to exercise control over the power plants and prevent coal ash from contaminating groundwater renders it liable under Section 12(a). Furthermore, because violations of Section 12(a) trigger liability under Section 620.115 of the Act's implementing regulations, 35 Ill. Adm. Code 620.115, MWG is also liable for violations of Section 620.115.

MWG is additionally liable for violations of 35 Ill. Adm. Code 620.301(a) and 35 Ill. Adm. Code 620.405, for direct violation of Illinois Class I groundwater standards. On many occasions before the GMZs at three of the plants became active, groundwater monitoring recorded exceedances of the Class I standards. These groundwater quality standard exceedances trigger liability under Section 620.301(a) and 620.405. At Waukegan, where there is no GMZ, these exceedances continue to occur and trigger liability under Section 620.301(a) and 620.405.

Lastly, MWG's knowledge of and acquiescence to coal ash deposited at unlined repositories like the ash landfills and ash fill areas, and the subsequent water pollution caused by this coal ash, renders MWG liable for violations under Section 21(a) of the Act, which prohibits open dumping in Illinois.

I. JOLIET 29

MWG operates and leases the Joliet 29 Generating Station. Hr'g. Tr. Jan. 29, 178:22-179:3. The layout of the site is shown in **Appendix C**. Until 2013, MWG stored ash in three onsite ash ponds, Ponds 1, 2 and 3. Coal ash was removed from Pond 3 in 2013, and removed from Pond 1 in 2015. Hr'g Tr. Jan. 29, 191:22-192:2; 198:13-16. The Joliet 29 property also includes two large onsite coal ash landfills, one on the northeast portion of the property ("Northeast Ash Landfill") and one on the southwest portion of the property ("Southwest Ash Landfill").[20] Comp. Ex. 20D (Phase II ESAs for Joliet), MWG13-15_23339; Hr'g Tr. Oct. 25, 81:19-82:24.

A. The Groundwater at Joliet 29 is Contaminated with Coal Ash Constituents

Since monitoring began in 2010, the groundwater at Joliet 29 has exceeded Illinois Class I Groundwater Quality Standards for coal ash constituents 69 times, including 8 exceedances in 2016 and 4 exceedances in the first half of 2017. *See* **Appendix A**. Onsite concentrations of coal ash indicators boron and sulfate are higher than background values developed by Illinois EPA, and not naturally occurring. Specifically, as shown in Table 2 below, the median boron and

[20] In this Brief, Complainants refer to the areas where coal ash is stored and disposed in the ground at Joliet as "Ash Landfills" because that is how the two areas in the northeast and southwest portions of the property are identified in the Phase I and Phase II Environmental Site Assessments performed in 1998 shortly before the sale of the Joliet Station (among others) to MWG.

sulfate concentrations in all eleven groundwater monitoring wells are greater than the median background values. The median boron concentration in well MW-11 exceeds the upper-bound, 90th percentile background value;[21] the same is true for sulfate in well MW-9. According to MWG's expert, if onsite groundwater data are greater than the 90th percentile from the Illinois EPA database, then "you're sure that it is above background." Hr'g. Tr. Feb. 2, 32:17-33:6.

Table 2: Boron and sulfate data for the Joliet 29 site.[22] Highlighted (red) values are medians that exceed the 90th percentile value from Illinois EPA's statewide database for sand and gravel aquifers. Highlighted (light orange) values are medians that exceed the median value from Illinois EPA's statewide database.[23]

Monitoring Well	Boron median (mg/L)	Sulfate median (mg/L)
MW-1	0.25	81
MW-2	0.25	100
MW-3	0.37	120
MW-4	0.37	110
MW-5	0.57	170
MW-6	0.25	110
MW-7	0.23	120
MW-8	0.16	73
MW-9	0.34	1100
MW-10	0.43	110
MW-11	1.20	120
Background (Sand and Gravel Aquifer)		
Illinois EPA median	0.12	54
Illinois EPA 90th percentile	0.70	175

[21] *See* discussion of Illinois EPA background values. *Supra* "Summary of Facts Applicable to All of the MWG Plants" § 6.
[22] Source data was extracted from Respondent's Exhibit 809.
[23] Comp. Ex. 405 at 7.

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B. MWG Has Long Known About the Ash Disposal Areas at Joliet 29

Respondent MWG has been aware of the Northeast Ash Landfill since 1999 when it began operating the plant, and it has been aware of the Southwest Ash Landfill since approximately 2002-2003. Hr'g. Tr. Oct. 23, 116:24-117:6, 122:19-22, 225:11-23; Hr'g. Tr. Jan. 29, 179:1-2; 183:11-13; Comp. Ex. 20D at MWG13-15_23339; Comp. Ex. 21, at MWG13-15_25149. The Phase II Environmental Site Assessment, which was done at the time of the sale of the Joliet property to MWG (Hr'g. Tr. Jan. 29, 183:11-13), identified both landfills. Comp. Ex. 20D at MWG13-15_23339. Maria Race is currently the Director of Federal Environmental Programs (Hr'g Tr. Oct. 23, 30:1-6), and had been the "compliance person, and the landfill management person," (Hr'g. Tr. Jan. 29. 159:20-22) with "environmental compliance responsibilities,…at times [for] the ash ponds at the stations" at MWG. Hr'g. Tr. Jan. 29, 161:19-23. Ms. Race has known about both of these old ash disposal areas since approximately 2002-2003. Hr'g Tr. Oct. 23, 115:11-15, 116:24-117:6, 122:19-22, 225:11-23; Hr'g Tr. Jan. 29, 183:11-13, in part through her review of the Phase II ESA. Hr'g. Tr. Oct. 23, 114:5-10, 122:15, 123:20-21.[24] Ms. Race indicated in testimony that she was aware that the Phase II ESA identified the two ash landfills; when referring to the "Alleged Former Ash Placement Areas" in a MWG Demonstrative Exhibit,[25] Ms. Race stated, "[I]n the ENSR surveys[26] that were done at the time of the sale to Midwest Generation, those were the labels that were put on those two areas.". Hr'g. Tr. Jan. 29, 183:11-13; Comp. Ex. 20D at MWG13-15_23339.

Similarly, the Joliet Phase I ESA also identified both coal ash areas. Maria Race has reviewed this document and was familiar with it. Hr'g. Tr. Oct. 23, 122:15. She reviewed it for

[24] Race testified: "Q. Are you familiar with this document? A. Yes, I am. Q. And have you previously reviewed this document? A. Yes, I have.". Hr'g. Tr. Oct. 23, 114:5-10.
[25] Respondent, Midwest Generation, LLC's Additional Demonstrative Exhibits at 7 (Jan. 29, 2018) .
[26] Referring to the Phase I and II ESAs which were conducted by ENSR Consulting. Comp. Exs. 20D, 21.

the purpose of "see[ing] what a prior consultant's thoughts were on the site." Hr'g. Tr. Oct. 23, 122:15, 123:20-21. Just like the Joliet Phase II ESA, the Phase I ESA also identifies two "ash landfill[s]" in the same locations as the Phase II ESA. Comp. Ex. 21, MG13-15_25149. This Phase I ESA indicates that coal ash from the Joliet 29 and Joliet 9 stations was disposed in the landfills. *See, e.g.,* Comp. Ex. 21, MWG13-15_25150, 25153, 25160. Ms. Race indicated that she had reviewed the page of the Phase I that contains the statements that, "Coal ash was primarily disposed in a landfill on the eastern portion of the site. A second abandoned ash disposal landfill lies on the southwest portion of the site between the coal pile and the Caterpillar, Inc. site." Hr'g Tr. Jan. 31, 35:12-36:4 citing Comp. Ex. 21, 25150.[27] This Phase I goes so far as to say, in the portion of the section discussing "Onsite Contamination Potential" that, in reference to the abandoned ash disposal landfill at the east side of the property "It is unknown whether leachate from the ash has had an adverse impact on soil and/or groundwater quality." Comp. Ex. 21, 25150. Ms. Race indicated that she had previously reviewed the page containing this statement. Hr'g Tr. Jan. 31, 37:24-39:3.

Ms. Race was also aware of the Northeast Ash Landfill as a result of requirements contained in the NPDES permit for the Joliet Station. Hr'g. Tr. Oct. 23, 115:11-15.[28] "I know that there is an ash fill area in the northeastern section of the property that we maintain under our NPDES storm water permit or storm water plan under our NPDES permit." Hr'g. Tr. Oct. 23, 115:19-21. Ms. Race does not dispute her knowledge of ash being present at the Northeast Ash Landfill. "I know that for the northern area, the northeastern area, that there is ash placed

[27] The single ash landfill located at the far right of the site plan, Comp. Ex. 21 at MWG13-15_25149, can be described as being located at the eastern end of the property or the northeastern end since the property is oriented from the northeast to the southwest (and is wider than it is tall).

[28] Race testified: "I am familiar with an area where there is ash on the—which side of the property is this? It must be northeast side of the property because we have -- it's part of our NPDES storm water permit." Hr'g. Tr. Oct. 23, 115:11-15.

there…”. Hr’g. Tr. Jan. 29, 183:17-18.

MWG’s consultant, Richard Gnat of KPRG, was also aware of areas at Joliet where ash was landfilled: “Midwest Generation Joliet stations No. 29 include areas where ash and slag resultant from the combustion of coal were formerly placed on the ground surface.” Hr’g Tr. Oct. 25, 95:6-11. KPRG performed the necessary work to maintain that area under the NPDES permit. In doing this work, KPRG repeatedly confirmed the presence of coal ash in the area. Gnat carried out inspections at the Northeast Ash Landfill. Hr’g. Tr. Feb. 1, 193:3-11. Gnat also testified as to repairs made to the Northeast Ash Landfill. Hr’g. Tr. Feb. 1, 194:22-195:11. “KPRG identified five areas outside the fenced boundary of the Joliet No. 29 facility where either sheet wash erosion or rilling has exposed the underlying ash slag and may transport the material to the Des Plaines River.” Hr’g Tr. Oct. 25, 116:6-10.[29] Gnat testified that the erosion at the Northeast Ash Landfill at Joliet that was exposing the coal ash was being caused by surface water runoff. Hr’g. Tr. Feb. 1, 204:14-205:10. Mr. Gnat stated that MWG needed to ensure that Joliet’s Northeast Ash Landfill remained covered. Hr’g Tr. Jan. 30, 259:10-14. MWG did so by installing soil and vegetation to repair the exposed areas of the ash landfill. (Hr’g. Tr. Jan. 30, 259:15-17.)

C. Coal Ash at Joliet is Causing Groundwater Contamination

Historic ash at Joliet has caused some or all of the groundwater contamination. MWG’s expert witness John Seymour has confirmed that coal ash constituents have been found in the groundwater at Joliet: “Q. Now, we see that there have been – you just identified a few coal ash constituents in the past that have been detected in the monitoring wells. You would agree? A. Yes.” Hr’g Tr. Feb. 2, 43:24-44:5. Mr. Seymour acknowledged that the groundwater impacts

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[29] Outside the fenced boundary is still on MWG leased property. Hr’g. Tr. Oct. 25, 116:14-22. There is a fence surrounding the operational portion of the facility but the facility’s property extends beyond the fence line. Hr’g. Tr. Oct. 25, 116:14-22.

show “ash-related constituents” originating from the site. “It’s a power plant and so there’s ash-related constituents at the site. It’s just that we haven’t identified a specific source.” Hr’g Tr. Feb. 2, 46:10-46:13; *see also* Hr’g Tr. Feb. 2, 158:15-19.[30] Mr. Seymour also affirmed his deposition testimony that “[t]he power plant is over 50 years old and there are many historic uses at the site that may have caused the impacts that we’re seeing, and they have caused the impacts that we’re seeing, and they may be related to coal ash from historic uses.” Hr’g Tr. Feb. 2, 158:14-160:10.

MWG’s expert purported to “rule out” certain coal ash deposits on the basis of leach test results. Hr’g Tr. Feb. 2, 161-165; Id. at 160:21-161:1 (“Q: And specifically, the material that you can rule out is the material for which you have leach test data; is that right? A: Correct.”). Yet MWG has not performed leach tests on the ash from either onsite landfill. The single leach test done at Joliet 29 did not come from either the Northeast Ash Landfill or the Southwest Ash Landfill, but from another ash fill area northwest of the ash ponds. Hr’g Tr. Feb. 2, 161:8-14. MWG’s expert cannot, therefore, “rule out” either landfill on the basis of leach tests.

MWG tries to argue that the Northeast and Southwest Ash Landfills are not contaminating groundwater, but neither the evidence nor common sense support this position. Seymour has already identified historic uses and historic sources as the cause of the coal ash constituents in the groundwater at Joliet Station. Hr’g Tr. Feb. 2, 46:10-46:13, 159:22-160:14, 158:15-19. Without ever sampling, leach testing, or taking borings at the two onsite Ash Landfills. Hr’g. Tr. Jan. 30, 258:21-259:9, 260:12-24, or monitoring the groundwater closer to these Landfills. Hr’g. Tr. Oct. 23, 77:2-13; Hr’g. Tr. Feb. 2, 21:6-10, MWG cannot credibly claim that we know anywhere near enough about the Landfills to dismiss them as sources of contamination.

[30] “I don't understand the specific source, but it appears to be historic uses.” Hr’g Tr. Feb. 2, 158:15-19

MWG will not even admit that the Southwest ash landfill is a landfill or has ash in it,[31] but MWG's expert claims to know enough about the ash there to dismiss it as a source of the coal ash constituents impacting the groundwater. Neither MWG nor its expert know the contents of the Landfills—whether they contain fly ash, for example. MWG cannot claim on the one hand to have no information about the ash in these areas but then claim to know enough about these areas to dismiss them as sources. The Landfills are potential sources of contamination to which MWG has turned a blind eye.

D. MWG Failed to Exercise Control to Prevent Groundwater Contamination from Coal Ash at Joliet

MWG failed to exercise control of the sources of coal ash to prevent groundwater contamination at Joliet by failing to develop information about, monitor, leach test, cap, or line the two coal ash landfills at Joliet. Despite being on notice about the two coal ash landfills discussed above, and despite Ms. Race's insistence that MWG should develop its own information about issues covered in the ESAs Hr'g. Tr. Jan. 29, 205:1,[32] MWG did not develop additional information about the two ash landfills:

> Q. Did that information in this report[33] and the advice you got from others, did that influence Midwest Gen's decision about whether any further investigation of the former ash placement areas at Joliet 29 was necessary?
> A. Definitely.
> Q. And what conclusion did Midwest Gen reach?
> A. We concluded that we didn't need to do any further investigation or remediation in those areas.

Hr'g. Tr. Jan. 29, 207:5-13. Maria Race testified that "we don't know what is there except for what we have in our stormwater plan for NPDES." Hr'g. Tr. Jan. 30, 273:10-12.

MWG has failed to monitor the groundwater under and around the two coal ash landfills

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[31] Referring to the Southwest Ash Landfill, Race stated "I don't know that that's a landfill and I don't know that there is ash there . . . ." Hr'g. Tr. Jan. 30, 273:19-20.
[32] "We should develop our own information." Hr'g. Tr. Jan. 29, 205:1
[33] Referring to the Comp. Ex. 20D, Joliet Phase II ESA. Hr'g Tr. Jan. 29, 205:22-207:4.)

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at Joliet. MWG's expert John Seymour testified that at there is no groundwater monitoring at historic onsite ash areas. Hr'g. Tr. Feb. 2, 21:6-21:10. Maria Race testified that the groundwater monitoring wells at Joliet were installed outside of and around Joliet ash ponds 1, 2, and 3 and there is no groundwater monitoring around either coal ash landfill. Hr'g. Tr. Oct. 23, 77:2-13.[34]

With regard to the Northeast Ash Landfill, MWG has not taken any soil borings, conducted any leach tests, or estimated the volume of ash in that landfill. Hr'g. Tr. Jan. 30, 258:21-259:9. MWG has not investigated the area in any manner other than the visual inspections for erosion, rilling or other surficial exposure of the ash stored there. Hr'g Tr. Feb. 1, 198:9-28. Although MWG was aware that the Northeast Ash Landfill was covered with soil, it did not investigate the cover to determine if it was impermeable, Hr'g. Tr. Jan. 30, 259:18-24, 260:2-6, nor did it cap the Northeast Ash Landfill with an impermeable cap. Hr'g Tr. Feb.1, 193: 15-23. MWG also failed to determine whether the Northeast Ash Landfill was lined, and failed to install a liner. Hr'g. Tr. Jan. 30, 272:12-24.

MWG also failed to investigate the Southwest Ash Landfill - it failed to take borings, conduct leach tests, estimate the volume of ash in that area, or gather any other information. Hr'g. Tr. Jan. 30, 260:12-24. All of Maria Race's testimony on MWG's failure to investigate the Southwest ash area was confirmed by Richard Gnat.[35] MWG also failed to cap[36] or line the Southwest ash landfill at Joliet. Hr'g. Tr. Jan. 30, 273:13-274:11.

One action MWG has taken to try to control contamination issues at Joliet 29 has been to enter into a CCA concerning groundwater contamination, Resp. Ex. 626, at MWG13-15_572-74, but that plan has failed to prevent ongoing contamination because the CCA's required actions are

[34] *See also* testimony of Richard Gnat. Hr'g Tr. Oct. 25, 90:21-91:9.
[35] Hr'g Tr. Feb. 1, 196:16-197:2, 197:3-198:7.
[36] Capping a pond means that an impervious cover is placed over the top of the pond. Hr'g. Tr. Feb. 1, 8:10-9:2. This means that the pond is impervious to rainwater entering the pond from above. Hr'g. Tr. Feb. 1, 8:20-9:2.

limited to improvements at the site's active ash ponds. There is no mention anywhere in the agreement of the Northeast or Southwest ash landfills. *Id.* Thus, MWG's measures under the CCA fall far short of its obligation to exercise control to prevent groundwater contamination at Joliet.

E. MWG is Liable for the Contamination at Joliet

Since MWG's property is the source of contamination, MWG is liable. Parties who lease or operate the source of pollution exercise the capability to control a source of pollution. *See, e.g.*, *People of Illinois v. State Oil Co*., PCB 97-103, 2003 WL 1785038, at *24-25 (IPCB Mar. 20, 2003) (finding current owners and operators liable under Section 12(a)); *People v. Michel Grain*, PCB 96-143, 2002 WL 2012414, at *3-4 (IPCB Aug. 22, 2002) (denying lessee's motion to dismiss Section 12(a) complaint); *Allaert Rendering, Inc. v. Ill. Pollution Control Bd*., 414 N.E.2d 492, 494-95 (Ill. App. 3d Dist. 1980) (finding plant operator liable under Section 12(a)). The expert witnesses for both parties agree that coal ash from the Joliet site is the source of the groundwater pollution: Mr. Seymour says it is historic sources/uses from the site, Hr'g Tr. Feb. 2, 46:10-46:13, 159:22-160:10, 158:15-19, and Dr. Kunkel points to it being either the ponds or the landfills Hr'g Tr. Oct. 27, 189:15-19.

Parties with control over a source of pollution are liable for water pollution in violation of Section 12(a) even if they did not place the contaminants at issue in the ground or water. "[T]he current owner may be responsible for contamination even if the current owner did not actively dispose of the contamination." *People of Illinois v. Inverse Investments, LLC*, PCB 11-79, 2012 WL 586821, at *9 (IPCB Feb. 16, 2012); *see also Michel Grain*, PCB 96-143, 2002 WL 2012414, at *3; *Meadowlark Farms*, 308 N.E.2d at 836-37; *People v. Lincoln*, 70 N.E.3d 661, 678, 410 Ill.Dec. 534, 551. Even if MWG did not place the ash in the northeast or southwest ash landfills at Joliet, MWG owns the property where the coal as contamination is coming from. If it is from the ponds or the landfills, or even from some other coal ash source on the site, MWG is liable.

The expert witnesses for both parties agree that coal ash from the Joliet site is a source of the groundwater pollution. MWG's expert John Seymour says it is historic sources/uses from the site. Resp. Ex. 903 at 43; Hr'g. Tr. Feb. 2, 159:22-14. Complainants' expert James Kunkel agrees. Comp. Ex. 401 at 12.

Finally, MWG was aware of the coal ash landfills but did not exercise control to prevent coal ash from contaminating the groundwater. Parties with control over the premises or source of pollution cannot avoid liability unless that party has "exercise[d] control to prevent pollution." *See, e.g.*, *Meadowlark Farms, Inc. v. Illinois Pollution Control Bd.*, 17 Ill. App. 3d 851, 860, 308 N.E.2d 829, 836 (1974); *Perkinson*, 543 N.E.2d at 904. When pollution "ha[s] its source on [a party's] land and in a waste facility under [a party's] control," the Board will hold them liable and find a violation of the Act. *Perkinson v. Illinois Pollution Control Bd.*, 187 Ill. App. 3d 689, 694–95, 543 N.E.2d 901, 904 (1989). MWG was aware of both the Northeast and Southwest landfill but took no efforts to either get more information about the landfills (i.e., testing, monitoring) or to prevent contamination (i.e., place an impermeable cap on the landfills, remove the coal ash). The source of the pollution was on MWG's land and in a waste facility (either the ponds or the landfills) under MWG's control. That is sufficient for the Board to find a violation under the Act.

II. POWERTON

As at the other three sites, MWG has operated Powerton since 1999. (Hr'g. Tr. Jan. 30, 49:2-9). The layout of the site is shown in **Appendix D**. The Powerton site contains several active impoundments: the Ash Surge Basin, the Secondary Ash Settling Basin, the Metal

Cleaning Basin, and the Ash Bypass Basin. Hr'g. Tr. Jan. 30, 57:10-18. The site also contains a "Former Ash Basin" located northeast of the current ash ponds, which was previously the ash impoundment but now serves as an emergency overflow for the ash surge basin. Hr'g. Tr. Jan. 30, 61:16-22. In addition, there is coal ash fill throughout the site, as seen in borings for the groundwater monitoring wells and other soil borings (discussed in more detail below). Groundwater monitoring data show widespread and ongoing coal ash contamination.

Despite the persistent contamination, MWG has failed in the almost 20 years it has been operating the site to take sufficient steps to prevent or reduce that contamination. As a result of these failures, MWG has allowed the Powerton site to discharge contaminants into the environment so as to cause water pollution, in violation of 415 ILCS 5/12(a). MWG also has placed coal ash contaminants upon the land in a place and manner that created a water pollution hazard, in violation of 415 ILCS 5/12(d), both by allowing ash deposits to persevere throughout the site and by at least on one occasion storing ash cinders directly on the ground with no protections to prevent contaminants leaching out from that ash into the groundwater.

A. The Groundwater at Powerton is Contaminated with Coal Ash Constituents

The Powerton site has had a long history of groundwater contamination at levels exceeding the Illinois Class I Groundwater standards. Since monitoring began in 2010, groundwater has exceeded Illinois Class I Groundwater Quality Standards for coal ash constituents 406 times, including 81 exceedances in 2016 and 45 exceedances in the first half of 2017. *See* **Appendix A**. MWG's expert acknowledges that the contamination is not improving. Hr'g. Tr. Feb. 2, 77:8-15.

The Powerton site has one onsite, upgradient background well, well MW-16, which was added to the site's groundwater monitoring network on November 27 and 28, 2012. Comp. Ex. 23, MWG13-15_21747. Well MW-16 was added because the previously designated upgradient

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wells were discovered to be affected by coal ash. Comp. Ex. 255, MWG13-15_11235 ("IEPA requests that monitoring wells MW-1, MW-9 and MW-10 not be identified as 'upgradient' … they are not believed to be reliable up gradient monitoring points for historical ash related activities that may be impacting groundwater proximate to these wells"); *Id*. at MWG13-15_11236 ("Well MW-16 is considered an upgradient monitoring well, outside the area of groundwater impacts associated with historical ash-related handling activities."). Unlike nearly all of the other wells at the Powerton site, MW-16 was installed far from the ash impoundments, and the soil boring for the well showed no traces of coal ash. Comp. Ex. 23, MWG13-15_21750.

The concentrations of coal ash indicators boron and sulfate in downgradient wells are much higher than they are in upgradient well MW-16. See Table 3, below. Median boron concentrations exceed the upgradient median in every downgradient well, in some cases by an order of magnitude or more. The same is true for sulfate. Downgradient boron and sulfate concentrations are also much higher than the statewide background data developed by Illinois EPA. Specifically, median concentrations in downgradient Powerton wells exceed upper-bound 90th percentile background values from the Illinois EPA database in nine wells for boron, and in seven wells for sulfate. According to MWG's expert, if onsite groundwater data are greater than the 90th percentile, then "you're sure that it is above background." Hr'g. Tr. Feb. 2, 32:17-33:6.

Table 3: Boron and sulfate data for the Powerton site.[37] Highlighted (red) values are medians that exceed the 90th percentile value from Illinois EPA's statewide database for sand and gravel aquifers. Highlighted (light orange) values are medians that exceed the median value from Illinois EPA's statewide database.[38]

[37] Source data was extracted from Resp. Ex. 810.
[38] Comp. Ex. 405 at 7.

Monitoring Well	Boron median (mg/L)	Sulfate median (mg/L)
MW-1	0.31	57
MW-2	0.32	57
MW-3	0.32	65
MW-4	0.78	100
MW-5	0.72	170
MW-6	0.40	380
MW-7	0.38	49
MW-8	0.86	300
MW-9	2.60	130
MW-10	0.52	67
MW-11	1.40	420
MW-12	0.92	420
MW-13	3.20	1100
MW-14	1.90	880
MW-15	1.40	420
Background (Sand and Gravel Aquifer)		
MW-16	0.18	40
Illinois EPA median	0.12	54
Illinois EPA 90th percentile	0.70	175

B. MWG Has Long Known About the Ash Disposal Areas at Powerton

1. Ash Ponds

The potential sources of coal ash contamination at Powerton include coal ash stored in the onsite ash ponds, and coal ash that is buried in the ground across the property. Most of the currently active basins were originally constructed with a Poz-o-Pac liner on the bottom and a Hypalon liner on the sides, including the Ash Surge Basin, which is the primary ash basin at Powerton. Hr'g. Tr. Jan. 30, 58:8-11, 19-21, 59:10-16, 61:4-7; Hr'g. Tr. Jan. 31, 143:22-144:1.

The Bypass Basin and the Metal Cleaning Basin were relined with 60 mil HDPE in 2010. The Ash Surge Basin and the Secondary Ash Settling Basin were relined with HDPE in 2013. *Id.*, at 61:7-9, 101:1-3, 101:4-6; Stips 20-30.

MWG has had multiple issues with the active ash ponds at Powerton. Because the river levels periodically rise, multiple MWG employees have made reference to concerns that water has infiltrated some of the existing basins, and could push up liners, exposing them to damage during cleaning events. *See, e.g.*, Comp. Ex. 107 (discussing possibility of water infiltration damaging Secondary Ash Basin lining); Comp. Ex. 714 (mentioning “the water infiltration [the Secondary Ash Basin is] currently experiencing” and expressing concerns about a new liner being damaged during cleaning); Comp. Ex. 108 (confirming issues that actually arose during Secondary Ash Basin de-watering, and confirming that the Illinois River rose above the level of the bottom of the pond).

MWG staff also discussed needing to reline the Bypass Basin in 2012 based on damage to that liner. Comp. Ex. 716, MWG13-15_21335. And as a general practice, at multiple times MWG has had to repair rips and tears in the liners around the site, all of which may have contributed to groundwater contamination. *See, e.g.*, Hr’g. Tr. Jan. 31, 85:2-12 (describing “rips and tears” in the Ash Surge Basin), 195:7-15 (describing “rips and tears” around the Bypass Basin), 164:5-12 (describing “rips and tears” in the Secondary Basin), 181:14-17 (describing “rips and tears” in the East Yard Runoff Basin), 210:7-24 (describing four repairs of liners in the Metal Cleaning Basin and Bypass Basin since 2010).

The Powerton site also contains a “Former Ash Basin” located northeast of the current ash ponds, which, as Maria Race testified, was once “the ash impoundment” but now serves as an emergency overflow for the ash surge basin. Hr’g. Tr. Jan. 30, 61:16-22. Thus, although it is not used regularly, Ms. Race indicated that the Former Ash Basin is part of Powerton's permitted water flow management system. Hr'g. Tr. Jan 30, 142:14-18. Specifically, this basin has been used as an emergency overflow basin twice in the past three years: in 2015 and again at the end of 2017. Hr'g. Tr. Oct. 23, 164:18-21; Hr'g. Tr. Jan. 31, 158:23-160:3. MWG's employees and contractors have openly discussed the presence of ash layers up to 10 feet thick, starting at least in 2008 when Patrick Engineering completed several probes and found up to nine feet of coal ash located over a clay layer. Comp. Ex. 32*; see also* Comp. Ex. 31, MWG-13-15_14225-26 (email between Patrick Engineering and Maria Race discussing the "former ash pond at Powerton" and mentioning up to 10 feet thick of ash being located in that pond).[39] In fact, some of the borings from 2008 show ash up to 30 feet thick near the delineated area of the Former Ash Basin. Comp. Ex. 31, MWG-13-15_14247-49 (boring APB-1-08 showing cinders from 1 to 31 ft.); MWG-13-15_14247-48; MWG-113-15_14250-51 (boring APB-2-08 showing cinders from 1 to 23 ft.)

None of the ash ponds at Powerton meet EPA criteria for existing ash ponds. Specifically, none of the ponds have liners that meet the criteria found in 40 CFR 257.71(a), and some or all of the ponds are located less than five feet above the high water table. Hr'g. Tr. Feb. 2, 143:5-148:4 (none of the liners at the four MWG coal plants meet the liner criteria in the coal ash rule); *Id*. at 58:14-59:7 ("the average groundwater level is elevation 441.5" and "they had built it [the Secondary Ash Settling Basin], you know, at 440.").

2. Coal Ash Fill Areas

Perhaps the most likely source of onsite groundwater contamination is the coal ash buried outside of the ash ponds. MWG has been aware of these extensive ash deposits since it took over the site in 1999. The Phase II Environmental Site Assessment for Powerton, prepared by MWG's

[39] This exhibit also contains multiple pages of boring logs showing coal ash and/or cinders was spread across the site. *See* Comp. Ex. 31 at MWG-13-15_14229-30, 14232-35, 14238-39, 14241, 14243, 14245, 14247-48, 14250-51.

predecessor in ownership at the time of sale in 1998, included nine soil borings that showed "coal/slag," "slag/coal," or "slag" in fill that extends from the surface to as deep as sixteen feet below the surface. Comp. Ex. 17D, MWG13-15_3309-3324. Another five borings performed by MWG consultant KPRG in 2005 showed "bottom ash" and/or "slag" in fill that extends from the surface to as deep as fifteen feet below the surface. Comp. Ex. 201, MWG13-15_24300, 24306-24310. When MWG installed the groundwater monitoring well network in 2010, many of the soil borings for the wells showed thick layers of ash. Specifically, the borings for groundwater monitoring wells MW-5 through MW-9, MW-11, and MW-12 show "cinders," "black cinders," "black coal cinders," and/or "red coal cinders" in fill that extends from the surface to as much as 24.5 feet below the surface. Comp. Ex. 13C, MWG13-15_7102-7121; Ex. 30.5E, MWG13-15_40059-40062; Hr'g. Tr. Oct. 23, 77:20-86:1. Complainants' expert summarized these boring log results in his initial expert report. Comp. Ex, 401 at Table 6.

The coal ash fill at Powerton is frequently in contact with groundwater, which facilitates the leaching of coal ash constituents.[40] Groundwater elevations at Powerton generally fluctuate between 430 and 452 feet above mean sea level. Resp. Ex. 903, Table 4-3. Coal ash is buried at elevations as low as 443 feet. Comp. Ex. 13C, MWG13-15_7113. This means that up to nine feet of buried ash is at times saturated with groundwater. Comparisons of coal ash and groundwater elevations in individual wells provides more specific evidence of this fact. For example, in monitoring well MW-8, coal ash described as "black cinders," and also described as "saturated," is found down to an elevation of 444 feet. Comp. Ex. 13C, MWG13-15_7119. The same boring log shows the groundwater level on that date at an elevation of 448 feet, *Id.*, and MWG's expert shows that the groundwater in well MW-8 fluctuates between 446 and 449 feet. Resp. Ex, 903,

[40] When groundwater periodically rises into coal ash, it facilitates the movement of coal ash constituents into groundwater. Hr'g Tr. Oct. 26 Afternoon, 83:19-84:1.

Table 4-3. In other words, in the vicinity of monitoring well MW-8, between 2 and 5 feet of buried coal ash is saturated with groundwater at all times.

Finally, MWG employees are also aware of having stored coal ash cinders directly on the ground for at least a couple of months in an area just south of the Bypass Basin. Hr'g. Tr. Jan. 31, 184:20-185:21. During the time they were stored there, these ash cinders were not insulated from contact with the ground in any way, nor were they protected from the elements. *Id.*

3. Flooding at Powerton Exposed Groundwater to Coal Ash Contamination

MWG employees recall periodic flooding at Powerton. Hr'g. Tr. Oct. 23, 164:18-21; Hr'g. Tr. Jan. 31, 211:10-21. Maria Race recalled the specific water elevations during one large flooding event. Hr'g. Tr. Oct. 23, 164:18-21("I do remember that the river water rose up to probably, you know—it got up very high in elevation during the big flooding that happened and that was around 470 probably."). Water at an elevation of 470 feet would have been thirty feet above the bottom of the secondary ash settling basin. Comp. Ex. 33, MWG13-15_9728 (showing the bottom of the secondary ash settling basin at an elevation of 440 feet). MWG employee Mark Kelly recalled flooding leading to river water entering the Former Ash Basin.[41] Hr'g. Tr. Jan. 31, 211:10-21. Mr. Kelly in fact indicated that the former ash basin is part of the river's floodplain, such that water from the river comes directly into the former ash basin and then recedes. Hr'g. Tr. Jan. 31, 211:10-21. Christopher Lux, another MWG employee, also recalled flooding at Powerton. *See also* Hr'g Tr. Oct. 24, 95:24-96:3 ("It was my understanding that there was some high river levels near the Powerton station. So it was very possible it could have come from, you know, the river flooding."). Rising river levels may also cause groundwater

[41] "Well, it is -- it is -- that area is connected to the river. The river -- the river is just on the -- it's a floodplain for the river. So if the river in the spring, if it comes up high, the water will come up into that area and then when the water recedes it will go back. Q. So the water will come into that former ash basin and then does it drain back out to the river? Yes, it goes back out. Q. To the river? A. Yes." Hr'g. Tr. Jan. 31, 211:10-21.

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levels to rise. *See,* e.g., Hr'g Tr. Feb. 2, 10:18-11:12, 59:8-24; Comp. Ex 107, Hr'g Tr. Oct. 24, 94:9-11 and 93:7 ("If we do have to clean the basin periodically in the future, NRT expressed concern about the water infiltration we are currently experiencing."). Finally, MWG documents groundwater leaching into an ash basin on one occasion. Comp. Ex. 108, Hr'g. Tr. Oct. 24, 102:13-14 and 101:13 ("It appears the groundwater is leaching into the basin and under the existing liner.").

Flooding, both river water flooding the site and high groundwater levels, poses the risk of groundwater contamination from coal ash at Powerton. High groundwater levels result in groundwater going up into ash fill and back down, carrying ash constituents into the groundwater. Hr'g. Tr. Oct. 26 Afternoon, 83:19-84:1; Hr'g. Tr. Feb. 1, 225:2-226:12.[42] River water flooding and saturating ash fill could also carry ash constituents and contamination into the groundwater or the surface waters.

C. Coal Ash at Powerton is Causing Groundwater Contamination

The groundwater contamination at Powerton is being caused by coal ash, including the ash stored inactive ash ponds and/or the ash buried across the site. MWG's expert, John Seymour, acknowledged that the contamination at Powerton includes constituents of coal ash. Hr'g. Tr. Feb. 2, 80:4-80:8 (Q: "Now, we just saw from a couple of your slides that there are constituents of coal ash found in groundwater above Class I [standards] at Powerton, correct?" A: "Yes."). Mr. Seymour also acknowledged the presence of more than one coal ash indicator:

Q. Now, some of the inorganics we are talking about here are boron and sulfate; is that right?
A. Some of them are, yes, boron and – inorganic compounds – sulfate.
Q. And so when you use the phrase 'groundwater impact,' that included in some cases elevated boron and sulfate?
A. In the groundwater data, it had, in some cases, elevated boron and sulfate.

[42] *See* discussion of hydraulic head or water head above. *Supra* "Summary of Facts Applicable to All of the MWG Plants" § 4.

Hr'g Tr. Feb. 2, 139:9-19; see also *id*. at 257:6-13 (boron found with other coal ash indicators support conclusion of coal ash as source); Comp. Ex. 11B (("[B]oron and sulfate levels . . . are two typical ash leachate indicators.").

Mr. Seymour also affirmed what he stated in his report, when asked about the following quote:

> Q. So what it says here is, "Thus, it is my opinion that the recent groundwater impacts are not a result of the ash currently stored in the ponds at the sites, but instead are more likely than not a result of historical uses at the sites and the surrounding industrial companies and conditions."
> A. Yes. It is still my opinion.

Hr'g. Tr. Feb. 2, 142:5-142:24; Resp. Exhibit 903, at 43. The onsite historical uses causing coal ash contamination include historical deposits of coal ash, about which the record provides ample evidence (discussed above). Again, MWG's expert also indicated that coal ash constituents in the groundwater are not decreasing. "Overall, the groundwater concentrations are neither increasing nor decreasing. They're about the same." Hr'g. Tr. Feb. 2, 77:12-15. The specific sources of coal ash that have caused contamination in the past continue to cause contamination today.

IEPA also attributes specific groundwater impacts seen at the site at certain wells to "historical ash-related activities." The fact that the coal ash found outside of the ponds is impacting the groundwater at Powerton is seen in statements from the Illinois EPA. Ex. 255, MWG13-15_11235 ("IEPA requests that monitoring wells MW-1, MW-9 and MW-10 not be identified as 'upgradient' … they are not believed to be reliable up gradient monitoring points for historical ash related activities that may be impacting groundwater proximate to these wells."); *Id*. at MWG13-15_11236 ("Well MW-16 is considered an upgradient monitoring well, outside the area of groundwater impacts associated with historical ash-related handling activities.").

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While MWG's expert purported to "rule out" certain coal ash deposits at Powerton as the source of contamination based on leach test results, MWG has not performed leach tests on the ash buried in the ground outside of the impoundments. Hr'g. Tr. Feb. 2, 170:5-20. Material in the limestone basin was leach tested (Hr'g. Tr. Feb. 2, 170:17-20), and Mr. Seymour tried to suggest that the single leach test could somehow rule out other sources by "process of elimination:" "Answer: My point is that the ash that we sampled and analyzed and where we evaluated it, it doesn't appear to be contributing enough to cause what we're seeing. And so I'm concluding by process of elimination there's something else.". Hr'g. Tr. Feb. 2, 138:24-139:5. MWG has not "sampled and analyzed" any of the coal ash fill at the site, and Mr. Seymour cannot rule this fill out as a source of contamination.

D. MWG Failed to Exercise Control to Prevent Groundwater Contamination from Coal Ash at Powerton

MWG failed to exercise control of the sources of coal ash to prevent groundwater contamination at Powerton. MWG failed to conduct environmental sampling of, leach test, cap, or line the ash fill areas at Powerton. First, aside from the hydrogeological monitoring required by IEPA, MWG has not conducted environmental sampling of the Former Ash Basin. Hr'g. Tr. Oct. 23, 159:15-16. Complainants Exhibit 32 makes it clear that even though MWG's consultant was aware of the presence of ash in the Former Ash Basin, ("There is up to 9 feet of ash (black coarse to fine sand - maybe cinders) over medium stiff clay."), it did not intend to follow up with "environmental" testing. Hr'g. Tr. Oct. 23, 158:18-159:16. Jeffrey Schuh of Patrick Engineering explicitly stated, "We did not sample for any environmental reason, and I do not intend to." Comp. Ex. 32; Hr'g. Tr. Oct. 23, 158:18-24.

According to MWG employees, the Former Ash Basin is not capped, and neither Maria Race nor Mark Kelly think it is lined. Hr'g. Tr. Jan. 30, 61:20-24; Hr'g. Tr. Jan. 31, 176:8-15.

MWG also has not undertaken any efforts to remove the ash from the Former Ash Basin, despite having been on notice since taking over operation of the site in 1999 that it was there. Hr'g. Tr. Jan 30, 142:14-18 (stating that Former Ash Basin was part of permitted water flow management system). Instead MWG intends to merely move the ash from one area of the pond to another for when the company closes the pond in the future. Hr'g. Tr. Jan. 30, 102:19-103:11. Finally, the Former Ash Basin has water in it and has not been dewatered. Hr'g. Tr. Jan. 30, 103:5-11. This of course increases the risk of the hydraulic "head" in the pond driving contaminants into the groundwater. Hr'g. Tr. Feb. 1, 225:14-226:12.[43]

MWG has entered into a CCA concerning groundwater contamination at Powerton. Resp. Ex. 636, at MWG13-15_555. But this agreement has failed to prevent ongoing contamination, likely because the CCA did not include any corrective action to address the Former Ash Basin or the coal ash fill buried throughout the site. Instead, it focuses almost entirely on proposals to replace liners and improve operation of the currently active ash ponds. Predictably, the groundwater contamination at Powerton has not improved. Hr'g. Tr. Feb. 2, 77:8-15.

E. MWG is Liable for the Contamination at Powerton

As the previous sections demonstrate, MWG has "allow[ed] the discharge of [] contaminants" into the groundwater at the Powerton site in violation of section 12(a) of the Illinois Environmental Protection Act, because even if it did not place the ash there, it knew about the coal ash issue at Powerton for years and failed to act. MWG has known about onsite coal ash, including the Former Ash Basin and coal discovered in borings all over the site, since it purchased the plant in 1999. Hr'g. Tr. Jan 30, 142:14-18 (stating that Former Ash Basin was part of permitted water flow management system); Comp. Ex. 201, MWG13-15_24300, 24306-

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[43] *See* discussion of hydraulic head or water head above. *Supra* "Summary of Facts Applicable to All of the MWG Plants" § 4.

24310. Parties with control over a source of pollution are liable for water pollution in violation of Section 12(a) even if they did not place the contaminants at issue in the ground or water. *People of Illinois v. Inverse Investments, LLC*, PCB 11-79, 2012 WL 586821, at *9 (IPCB Feb. 16, 2012); *see also Michel Grain*, PCB 96-143, 2002 WL 2012414, at *3; *Meadowlark Farms,* 308 N.E.2d at 836-37; *People v. Lincoln,* 70 N.E.3d 661, 678, 410 Ill.Dec. 534, 551.

The expert witnesses for both parties agree that coal ash from the Powerton site is a source of the groundwater pollution. MWG's expert John Seymour says it is historic sources/uses from the site. Resp. Ex. 903 at 43; Hr'g. Tr. Feb. 2, 142:5-24. Complainants' expert James Kunkel agrees, and believes that ash stored in the ash ponds may also be a source. Comp. Ex. 401 at 18. IEPA also attributes specific groundwater impacts seen at the site at certain wells to "historical ash-related activities." Comp. Ex. 255, MWG13-15_11235.

MWG is liable for groundwater contamination caused by historical ash sources on its Powerton property. MWG, as operator and lessee of Powerton, has had "capability and control" over the site since 1999. *See, e.g., People of Illinois v. State Oil Co*., PCB 97-103, 2003 WL 1785038, at *24-25 (IPCB Mar. 20, 2003); *People v. Michel Grain*, PCB 96-143, 2002 WL 2012414, at *3-4 (IPCB Aug. 22, 2002); *Allaert Rendering, Inc. v. Ill. Pollution Control Bd*., 414 N.E.2d 492, 494-95 (Ill. App. 3d Dist. 1980). MWG has not exercised control to prevent pollution from the ash in the Former Ash Basin or scattered across the site. Parties with control over the premises or source of pollution cannot avoid liability unless that party has "exercise[d] control to prevent pollution." *See, e.g.,* *Meadowlark Farms, Inc. v. Illinois Pollution Control Bd.*, 17 Ill. App. 3d 851, 860, 308 N.E.2d 829, 836 (1974); *Perkinson*, 543 N.E.2d at 904; *Perkinson v. Illinois Pollution Control Bd.*, 187 Ill. App. 3d 689, 694–95, 543 N.E.2d 901, 904 (1989).

MWG also violated the open dumping prohibitions in section 21(a) of the Illinois

Environmental Protection Act by maintaining coal ash "disposal sites" that do not "fulfill the requirements of a sanitary landfill." 415 ILCS 5/21(a); 415 ILCS 5/3.305. Under Illinois law, sanitary landfills "must meet the requirements of the Resource Conservation and Recovery Act and regulations thereunder." 415 ILCS 5/3.445. The relevant regulations include a set of MCLs at 40 C.F.R. Part 257, Appendix I. The Board cannot enforce these federal regulations, but has held that "an exceedance of the MCLs at one or more power plants may be evidence tending to show a violation of Section 21(a) of the Act." Order of the Board at 25 (Oct. 3, 2013). As shown in **Appendix B**, the groundwater at Powerton has exceeded the relevant MCLs 62 times since 2010, and continues to exceed these MCLs in 2017. Again, is the case under Section 12(a),[44] under Section 21(a) of the Act a party may be liable for violating the open dumping prohibitions even if they did not place the contaminating material at issue on the land or water. *People v. Lincoln, Ltd.*, 70 N.E.3d 661, 678 (Ill. App. 1st 2016). *See also State Oil Co., PCB 97-103, 2003 WL 1785038, at *19*; *Illinois EPA v. Rawe*, AC 92-5, 1992 WL 315780, *3-5 (IPCB Oct. 16, 1992); *Illinois EPA v. Coleman*, AC 04-46, 2004 WL 2578712, at *7 (IPCB Nov. 4, 2004).

To summarize, coal ash at Powerton has contaminated groundwater, and continues to contaminate groundwater. The Former Ash Basin is one identifiable source of contamination, and onsite ash ponds may be an additional source. Onsite boring logs consistently show that coal ash is buried deep in the ground throughout the site. This coal ash fill represents a major legacy contamination issue that MWG has failed to address.

III. WAUKEGAN

MWG owns and operates the Waukegan Generating Station, which has two active coal ash impoundments known as the East and West Ponds, and has owned and operated the site since 1999. Hr'g. Tr. Jan. 30, 107:21-108:2, 110:22-111:1. The area immediately west of the two ash

[44] This standard is identical to "cause or allow" standard applicable to Section 12(a) of the Act.

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ponds is a coal ash storage area identified in drawings as the "Former Slag/Fly Ash Storage Area," (hereinafter "ash storage area"). Comp. Ex. 19D at MWG13-15_45814. The layout of the Waukegan site is shown in **Appendix E**. As described in more detail below, the groundwater at Waukegan is contaminated with coal ash constituents. MWG's expert concedes that at least some of the contamination is coming from onsite coal ash, and that the contamination is not improving over time. MWG's expert also concedes that the levels of coal ash indicators in groundwater increase as groundwater moves through the onsite ash storage area. The record shows that the ash storage area is a large, unlined coal ash landfill; that it is contaminating groundwater and has been since at least 2010; and that MWG has done nothing to investigate or remediate that area. Other onsite sources of coal ash may also be adding to the groundwater contamination.

A. The Groundwater at Waukegan is Contaminated with Coal Ash Constituents

Since monitoring began in 2010, groundwater has exceeded Illinois Class I Groundwater Quality Standards for coal ash constituents 396 times, including 87 exceedances in 2016, and 55 exceedances in the first half of 2017. *See* **Appendix A;** Comp. Exs. 267P, 268P, 269P, 270P, 271. Boron alone has exceeded Class I Groundwater Quality Standards 170 times since 2010, including 40 exceedances in 2016 and 21 exceedances in the first half of 2017. As MWG's expert concedes, groundwater contamination at Waukegan is not improving. Hr'g. Tr. Feb. 2, 96:9-19[45]; Resp. Ex. 901 at slides 54 and 55.[46]

Onsite concentrations of coal ash indicators boron and sulfate are not naturally occurring. The following table (Table 4) compares mean and median boron and sulfate values for each well at Waukegan to both median and upper-bound (90th percentile) background values from Illinois

[45] "[T]hey are neither increasing nor decreasing for the same reasons. You have about the same number of wells and parameters increasing as decreasing. So you can't make a -- it's not going up or down." Hr'g. Tr. Feb. 2, 96:15-19.
[46] Slides 54 and 55 can be found on pages 79 and 80 of the pdf document filed with the Board by MWG on Jan. 30, 2018.

EPA's statewide database.[47] The table demonstrates that most wells at Waukegan have boron and sulfate concentrations that are much higher than upper-bound background values. According to MWG's expert, we can be "sure that it is above background," (Hr'g. Tr. Feb. 2, 32:17-33:6), and onsite levels of boron and sulfate are therefore not naturally occurring.

Table 4: Boron and sulfate data for the Waukegan site.[48] Highlighted (red) values are medians that exceed the 90th percentile value from Illinois EPA's statewide database for sand and gravel aquifers. Highlighted (light orange) values are medians that exceed the median value from Illinois EPA's statewide database.[49]

Monitoring Well	**Boron median (mg/L)**	**Sulfate median (mg/L)**
MW-1	2.10	260
MW-2	2.50	220
MW-3	1.90	170
MW-4	2.10	210
MW-5	32.00	840
MW-6	2.80	190
MW-7	39.00	690
MW-8	24.00	420
MW-9	14.00	390
MW-10	1.05	140
MW-11	3.25	160
MW-12	1.95	190
MW-14	1.00	140
MW-15	5.10	250
Background (Sand and Gravel Aquifer)		
Illinois EPA median	0.12	54
Illinois EPA 90th percentile	0.70	175

[47] *See* discussion of Illinois EPA background values. *Supra* "Summary of Facts Applicable to All of the MWG Plants" § 6.
[48] Source data was extracted from Resp. Ex. 811.
[49] Comp. Ex. 405 at 7.

B. MWG Has Long Known About the Ash Disposal Areas (Lined and Unlined) at Waukegan

The Former Slag/Fly Ash Storage Area at Waukegan appears to be the primary onsite source of groundwater contamination. There is voluminous evidence indicating that the ash storage area continues to contain coal ash, and MWG has long known about the ash in this area.

The ash storage area was identified as early as 1998, in a Phase II Environmental Site Assessment that was produced by a consultant for the Waukegan Station's prior owner during the sale of the site to MWG. Comp. Ex. 19D at MWG13-15_45814; Hr'g. Tr. Oct. 23, 99:14-100:17. It was also identified in the Phase I Environmental Site Assessment that preceded the Phase II ESA. Comp. Ex. 38; Hr'g. Tr. Oct. 23, 137:1-138:1. MWG employees, including Maria Race (Director of Federal Environmental Programs), have long known about these documents and used them as a source of historic information. Hr'g. Tr. Oct. 23, 103:10-104:2, 112:15-113:7, 136:19-137:10, 225:11-23, 226:18-227.

Other MWG employees are also familiar with the ash storage area. MWG employee Frederick Veenbaas testified that he had seen photographs of ash in Former Slag/Fly Ash Storage Area. Hr'g. Tr. Feb. 1, 9:3-10:8. "I've seen pictures where ash is located there. They're from like the 1960s." Hr'g. Tr. Feb. 1, 10:7-8. "Again, from a historical basis, that area to the west of the west basin was used as a slag retention area.". Hr'g. Tr. Feb 1, 62:16-18. Mr. Veenbaas also testified that he was not aware of ash ever being removed from the area. Hr'g. Tr. Feb. 1, 10:9-18.

In 2011, MWG was made aware that MW-5 had been installed along the eastern side of the ash storage area and the boring for the well went through over 16 feet of "black coal cinders"[50] mixed with other material. Comp. Ex. 14C,[51] at MWG13-15_7166, 7175. Again,

[50] Coal "cinders" are coal ash. Hr'g. Tr. Oct. 23, 193:20-22; Hr'g. Tr. Jan. 31, 69:6-11, 92:6-10, 150:14-15.

Maria Race was aware that there was ash in the boring log for MW-5. "[A]t this point, which was several years ago now when I did my deposition, I remembered that there was shown to be ash in Monitoring Well 5. But as I sit here today, I do not remember that.". Hr'g. Tr. Jan. 30, 264:9-13.

In 2012, one of MWG's consultants, interpreting groundwater monitoring results, stated in an email to Maria Race that "[t]he elevated concentrations of compounds of interest in MW-5 appear to be the result of the well being installed in a former ash area." Comp. Ex. 16 at MWG13-15_14167; Hr'g. Tr. Oct. 23, 86:23-87:18. Ms. Race acknowledged that the initial groundwater results for MW-5 showed elevated "constituents" and that the results were consistent with her knowledge of the "old historic area":

> Q. What did the results of that first quarter groundwater sampling show?
> A. Well, the first round showed that Monitoring Well 5, which was the upgradient monitoring well from the ash impoundments, was higher in many constituents than the downgradient wells were.
> Q. Okay. Did that surprise you?
> A. Yeah.
> Q. All right. What --
> A. In a way but—let me continue—in a way it did not because I know this is an old historical area.

Hr'g. Tr. Jan. 30, 162:4-16.

In 2014, MWG learned that there was ash ("slag"[52]) buried along the northern and western edges of the ash storage area when its consultant drilled borings for groundwater monitoring wells MW-8 and MW-9. Comp. Ex. 203 at MWG13-15_45648-45649; Hr'g. Tr. Oct. 25, 53:5-54:17.

The name of the "Former Slag/Fly Ash Storage Area" indicates that it contains both slag

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[51] Comp. Ex. 14C is the Hydrogeological Assessment Report for Waukegan. Patrick Engineering prepared this assessment in cooperation with and on behalf of MWG in February 2011. Comp. Ex. 14C at MWG13-15_7148; Hr'g. Tr. Oct. 23, 69:21-75:12.

[52] "Slag" is a form of coal ash. Hr'g. Tr. Feb. 1, 7:17-8:6; Hr'g. Tr. Jan. 31, 150:16-20.

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and fly ash. Comp. Ex. 19D; Comp. Ex. 38.

MWG has failed to investigate the ash storage area at Waukegan and has failed to exercise control to prevent coal ash from contaminating the groundwater. Despite extensive evidence that the ash storage area contains ash and continues to contaminate groundwater, and despite MWG's contention that it should "develop [its] own information" about historic coal ash deposits (Hr'g. Tr. Jan 29, 204:18-205:3), MWG has done nothing to investigate or remediate the area. Hr'g. Tr. Jan. 30, 261:4-262:8; Hr'g. Tr. Feb. 2, 192:20-193:14.9. MWG has not, for example, extracted borings from the center of the area to determine how much ash is located there, or performed leach tests to determine what might be leaching out of the area. Hr'g. Tr. Jan. 30, 261:4-262:8. When asked whether MWG ever conducted leach tests for the ash buried in the ash storage area, Maria Race responded that "[w]e don't know that there is ash buried in that area. We haven't done investigation within this whole area to characterize it." *Id.* MWG's expert, John Seymour, stated that "[t]here's nothing – there's no borings or samples from that area.". Hr'g. Tr. Feb. 2, 192:20-193:14.

In terms of exercising control to prevent contamination or remediate the area, there no evidence that MWG took any action at all. MWG never installed a liner under the ash storage area, Hr'g. Tr. Oct. 23, 137:20-138:1,[53] and MWG employees are not aware of the area being lined by anyone else. Hr'g. Tr. Feb.1, 11:3-5.[54] MWG employees have no knowledge of an impermeable cap over the ash storage area. Hr'g. Tr. Jan. 30, 264:14-265:24; Hr'g. Tr. Feb. 1, 9:3-11:15. Finally, there is no evidence that MWG removed the ash from this area. Hr'g. Tr Feb 1, 10:16-18.

[53] "Q. And has Midwest Generation installed a liner under the former slag/fly ash storage area? A. No Midwest Generation has not installed a liner under a former slag/fly ash storage area." Hr'g. Tr. Oct. 23, 137:20-138:1.
[54] "Q. Have you seen any evidence that this area is lined? A. No." Hr'g. Tr. Feb. 1, 11:3-5.

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C. Coal Ash at Waukegan is Causing Groundwater Contamination

MWG's expert John Seymour concedes that at least some of the contamination is coming from onsite coal ash:

> Q. Is it your opinion that some of the contamination at Waukegan is coming from on-site historic uses of coal ash?
> A. Is that the same kind of statement in my deposition report, Mr. Russ? I think we're going over the same questions, is that correct?
> Q. Yes.
> A. I think that's a fair understanding if put in the proper context.

Hr'g. Tr. Feb. 2, 184:12-21. *See also id.* at 190:6-10. Seymour goes on to say that some of the boron contamination, specifically, is coming from onsite coal ash. Hr'g. Tr. Feb. 2, 192:6-10 ("Q. Do you still have the opinion that some of the boron in the monitor wells at Waukegan was coming from an on-site source? A. Yes, I believe so. I think that's clearly stated in my deposition.").

Based on the groundwater monitoring data, the most likely source of coal ash contamination is the Former Fly Ash/Slag Storage Area. Groundwater generally flows through the ash storage area from the west/northwest to the east/southeast. *See* the site map with groundwater flow contours in **Appendix E**; *see also* Resp. Ex. 901 at slide 49. The best indications of upgradient groundwater quality can therefore be found in wells MW-11 through MW-14 (located downgradient of the adjacent tannery site and upgradient of the ash storage area), and MW-6 (located immediately downgradient of the adjacent general boiler site and upgradient of the ash storage area). Groundwater monitoring wells MW-8 and MW-9 are located on the upgradient edge of the ash storage area, but are both screened in ash, which shows that they are in fact within the area, and likely affected by it, rather than upgradient of it. Comp. Ex. 203 at MWG13-15_45648-45649; Hr'g. Tr. Feb. 2, 196:1-4.

Table 4, above, shows that the groundwater migrating onto the site from the upgradient properties has between 1 and 4 mg/L of boron (in wells MW-11 through MW-14 and well MW-6). After crossing the former slag/fly ash storage area, boron concentrations increase more than tenfold, to 30-40 mg/L (in wells MW-5 and MW-7). A similar pattern can be seen in the sulfate data: Sulfate concentrations are roughly 100-200 mg/L upgradient of the ash storage area, but 700-800 mg/L in downgradient wells MW-5 and MW-7. In short, the data plainly show that something in the ash storage area is adding coal ash constituents to groundwater.

MWG's expert John Seymour admits that the groundwater contamination increases as groundwater flows through the Former Slag/Fly Ash Storage Area:

> Q. Do the concentrations of boron and sulfate increase moving from upgradient to downgradient across the former fly ash slag storage area; is that accurate?
> A. It is for this data series that's shown.

Hr'g. Tr. Feb. 2, 229:16-21. Mr. Seymour also concedes that MW 5 and MW 7 have the highest onsite concentrations of coal ash indicators boron and sulfate. Hr'g. Tr. Feb. 2, 219:1-5, 221:11-222:15.

The coal ash in the Former Slag/Fly Ash Storage Area is in direct contact with groundwater, facilitating the leaching and migration of coal ash contamination.[55] Groundwater elevations at Waukegan fluctuate between 579 and 585 feet above mean sea level. Resp. Ex. 903, Table 4-5. Soil borings for the groundwater monitoring wells around the edge of the Former Slag/Fly Ash Storage Area show ash as low as 582 feet above mean sea level. Comp. Ex. 203 at MWG13-15_45648-45649. The coal ash buried in the center of the ash storage area may be even deeper, but the available evidence shows the potential for at least three feet of overlap between buried coal ash and groundwater.

Other onsite sources of coal ash may also be contributing to the contamination. The two

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[55] *See* discussion of hydraulic head or water head above. *Supra* "Summary of Facts Applicable to All of the MWG Plants" § 4.

ash ponds at Waukegan were last relined in 2003 and 2004, well before this complaint was filed. Hr'g. Tr. Jan. 30, 111:18-22. The two ponds do not meet federal design criteria. Specifically, they are less than five feet above the underlying groundwater, and they do not have the type of liner that the U.S. EPA requires for new and existing coal ash ponds. Hr'g. Tr. Feb. 2, 84:22-85:4, 306:7-307:16 (the bottoms of the pond liners are 1-2 feet above average groundwater elevations); Id. at 143:5-148:4 (none of the liners at the four MWG coal plants meet the liner criteria in the coal ash rule). If these substandard ponds were leaking when Complainants filed their complaint, then they are almost certainly still leaking. In addition, the berms of the ash ponds were constructed, at least in part, with coal ash, and now contain ash to a depth of 10-20 feet; this can be seen in the soil borings for the groundwater monitoring wells east of the ponds. Comp. Ex. 14C at MWG13-15_7166-7174; Comp. Ex. 401 at Table 7. The coal ash in the berms of the ponds is likely leaching coal ash constituents into groundwater. Comp. Ex. 401 at 24-25; Hr'g. Tr. Oct. 27, 24:9-26:3.

All of the above-cited evidence shows that the "Former Slag/Fly ash Storage Area" is now a large, unlined (Hr'g. Tr. Oct. 23, 137:20-138:1) coal ash landfill that is actively contaminating groundwater with coal ash constituents, with the possibility of additional contamination coming from the ash ponds (including their berms). Given the weight of the evidence described above, the Board should conclude that the Former Slag/Fly Ash Storage Area contains coal ash, and that the Waukegan property, particularly the Former Slag/Fly Ash Storage Area, is actively contaminating the groundwater.

D. MWG Failed to Exercise Control to Prevent Groundwater Contamination from Coal Ash at Waukegan

MWG has entered into a CCA concerning groundwater contamination at Waukegan, but that plan notably fails to prescribe any corrective action that MWG might take to reduce or eliminate ongoing contamination. Resp. Ex. 649 at MWG13-15_50550 ("The CCA that IEPA approved for Waukegan, didn't include a corrective action (hence no GMZ) . . . .")[56] ; *see also* Resp. Ex. 647. Unlike the CCAs for the other facilities, the Waukegan CCA did not require the relining of any ponds. If the ponds were leaking before, they are almost certainly still leaking.

Both the Violation Notice and the CCA were explicitly limited to the violations caused by impoundments. The CCA does not, therefore, contain any conditions that could reduce contamination from the Former Slag/Fly Ash Storage Area. All told, nothing in the CCA requires any action by MWG to control the source of the coal ash constituents that are contaminating groundwater. Predictably, the groundwater contamination at Waukegan has not improved since the CCA was signed. Hr'g. Tr. Feb. 2, 96:9-19[57]; MWG Ex. 901 at slides 54 and 55.[58]

E. MWG is Liable for the Contamination at Waukegan

MWG's property is a source of contamination, and MWG is therefore liable for the contamination. Parties who lease or operate the source of pollution exercise the capability to control a source of pollution. *See, e.g., State Oil Co*., PCB 97-103, 2003 WL 1785038, at *24-25 (finding current owners and operators liable under Section 12(a)); *Michel Grain*, PCB No. 96-143, 2002 WL 2012414, at *3-4 (denying lessee's motion to dismiss Section 12(a) complaint); *Allaert Rendering*, 414 N.E.2d at 494-95 (finding plant operator liable under Section 12(a)).

The expert witnesses for both parties agree that coal ash from the Waukegan site is a source of the groundwater pollution. MWG's expert John Seymour concluded that at least some of the contamination is coming from onsite coal ash at Waukegan. Hr'g. Tr. Feb.2, 184:12-21; 192:6-10. Dr. Kunkel identifies the source of contamination as the ponds (including their berms)

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[56] IEPA never eliminated the ash storage area as a source of groundwater contamination at Waukegan. Resp. Ex. 649.

[57] "[T]hey are neither increasing nor decreasing for the same reasons. You have about the same number of wells and parameters increasing as decreasing. So you can't make a -- it's not going up or down." Hr'g. Tr. Feb. 2, 96:15-19.

[58] Slides 54 and 55 can be found on pages 79 and 80 of the pdf document filed with the Board by MWG on Jan. 30, 2018.

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and/or the ash storage areas. Comp. Ex. 401 at 3, 23-25; Hr'g. Tr. Oct. 27, 24:9-26:3, 189:15-19. And again, the contamination is not improving. Hr'g. Tr. Feb. 2, 96:9-19[59]; Ex. 901 at slides 54 and 55.[60] In the first half of 2017 alone, there were over fifty exceedances of Class I Groundwater Quality Standards for arsenic, boron, sulfate, and other coal ash constituents. *See* **Appendix A.** Regardless of the relative contributions of these two sources, it is clear that coal ash on the Waukegan property is causing groundwater contamination. MWG is responsible for that contamination.

Parties with control over a source of pollution, like MWG has over Waukegan, are liable for water pollution in violation of Section 12(a) even if they did not place the contaminants at issue in the ground or water. "[T]he current owner may be responsible for contamination even if the current owner did not actively dispose of the contamination." *Inverse Investments*, PCB 11-79, 2012 WL 586821, at *9; *see also Michel Grain*, PCB No. 96-143, 2002 WL 2012414, at *3; *Meadowlark Farms*, 308 N.E.2d at 836-37; *Lincoln*, 70 N.E.3d at 678. Even though Midwest Generation may not have placed ash in the Former Fly Ash/Slag Storage Area at Waukegan, MWG owns the property where the coal ash contamination is occurring.

Finally, MWG has long been aware of the Former Fly Ash/Slag Storage Area but has not exercised control to prevent coal ash from contaminating the groundwater. Parties with control over the premises or source of pollution cannot avoid liability unless that party has "exercise[d] control to prevent pollution." *See, e.g., Meadowlark Farms*, 308 N.E.2d at 851, 860, 308 N.E.2d 829, 836 (1974); *Perkinson*, 543 N.E.2d at 904. When pollution "ha[s] its source on [a party's] land and in a waste facility under [a party's] control," the PCB will hold them liable and find a

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[59] "[T]hey are neither increasing nor decreasing for the same reasons. You have about the same number of wells and parameters increasing as decreasing. So you can't make a -- it's not going up or down." Hr'g. Tr. Feb. 2, 96:15-19.
[60] Slides 54 and 55 can be found on pages *79 and *80 of the pdf document filed with the Board by MWG on Jan. 30, 2018.

violation of the Act. *Perkinson*, 543 N.E.2d at 901, 904 (1989). MWG was aware of the Former Slag/Fly Ash Storage Area but took no efforts to either get more information about the area (e.g., through testing or monitoring) or to remove the source of contamination or otherwise prevent contamination. The source of the pollution is on MWG's land and in a disposal area under MWG's control. That is sufficient for the PCB to find ongoing violations under the Act.

MWG also violated the open dumping prohibitions in section 21(a) of the Illinois Environmental Protection Act by maintaining a coal ash "disposal site" that did not "fulfill the requirements of a sanitary landfill." 415 ILCS 5/21(a); 415 ILCS 5/3.305. Under Illinois law, sanitary landfills "must meet the requirements of the Resource Conservation and Recovery Act and regulations thereunder." 415 ILCS 5/3.445. The relevant regulations include a set of MCLs at 40 C.F.R. Part 257, Appendix I. The Board cannot enforce these federal regulations, but has held that "an exceedance of the MCLs at one or more power plants may be evidence tending to show a violation of Section 21(a) of the Act." Order of the Board at 25 (Oct. 3, 2013). As shown in **Appendix B**, the groundwater at Waukegan has exceeded the relevant MCLs 106 times since 2010, and continues to exceed these MCLs in 2017. Again, as is the case under Section 12(a),[61] under Section 21(a) of the Act a party may be liable for violating the open dumping prohibitions even if they did not place the contaminating material at issue on the land or water. "A clear standard of landowner liability has also been stated by the Illinois Pollution Control Board in proceedings in which landowners attributed violations to others." *Lincoln*, 70 N.E.3d at 661, 678. *See also State Oil Co.*, PCB 97-103, 2003 WL 1785038, at *19; *Rawe*, AC 92-5, 1992 WL 315780, at *3-5; *Coleman*, AC 04-46, 2004 WL 2578712, at *7 (IPCB Nov. 4, 2004).

IV. WILL COUNTY

MWG has owned and operated the Will County Station since 1999. Hr'g. Tr. Jan. 30,

[61] This standard is identical to "cause or allow" standard applicable to Section 12(a) of the Act.

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187:4-9. The site has four ash ponds, two of which are actively being used. Hr'g. Tr. Jan. 30, 191:20-192:3. The layout of the Will County site is shown in **Appendix F**. Will County is located on a narrow peninsula, which means that any groundwater contamination detected at the site must be coming from onsite sources. Hr'g. Tr. Feb. 2, 172:5-20. As MWG's expert acknowledges, there are coal ash constituents in the groundwater at Will County, which means that there must be an onsite source of coal ash contamination. Hr'g. Tr. Feb. 2, 122:20-23, 175:11-23. The contamination is likely coming from two places—the four ash ponds, which are sitting in groundwater and two of which have not been relined since they were constructed in 1977, and up to twelve feet of coal ash buried along the eastern edge of the ash pond. Hr'g. Tr. Jan. 30, 191:20-23; Comp. Ex. 201 at MWG13-15_24282-24287;[62] Comp. Ex. 15C at MWG13-15_7251-7256.[63] MWG has known about the poor condition of the ash pond liners, and about the coal ash buried next to the ponds, since at least 2010, but has done virtually nothing to control the continuous release of contamination. Comp. Ex. 34 at MWG13-15_23614; Resp. Ex. 606 at MWG13-15_23647; Comp. Ex. 15C at MWG13-15_7251-7256. As a result, and as admitted by MWG's expert, the contamination has not improved over time. Hr'g. Tr. Feb. 2, 123:20-124:6.

A. The Groundwater at Will County is Contaminated with Coal Ash Constituents

Since monitoring began in 2010, groundwater at the Will County site has exceeded Illinois Class I Groundwater Quality Standards for coal ash constituents 443 times, including 70 exceedances in 2016 and 37 exceedances in the first half of 2017. *See* **Appendix A**. Again,

[62] These borings were located between ponds 1N and 1S (boring GT-2), east of pond 1S (boring WC-GT-3), and at the southwest corner of pond 2S (boring WC-GT-4). Comp. Ex. 201 at MWG13-15_24282-24287.

[63] Ex. 15C is the Hydrogeological Assessment Report for Will County. Patrick Engineering prepared this assessment in cooperation with and on behalf of MWG in February 2011. Comp. Ex. 15C at MWG13-15_7230; Hr'g. Tr. Oct. 23, 72:23-74:7.

MWG's expert acknowledges that the contamination is not improving. Hr'g. Tr. Feb. 2, 123:20-124:6; Resp. Ex. 901 at slides 70 and 72.[64]

Onsite concentrations of the coal ash indicators boron and sulfate are higher than background values developed by Illinois EPA, and not naturally occurring. Median boron concentrations exceed the upper-bound, 90th percentile background concentration in all wells.[65] *See* Table 5 below. According to MWG's expert, if onsite groundwater data are greater than the 90th percentile value from the Illinois EPA database, then "you're sure that it is above background." Hr'g. Tr. Feb. 2, 32:17-33:6. Onsite sulfate values are generally below the 90th percentile background value, but two to five times higher than the median background value. Sulfate concentrations in well MW-4 (which has the highest onsite boron levels) are roughly three times higher than the 90th percentile background value.

Table 5: Boron and sulfate data for the Will County site.[66] Highlighted (red) values are medians that exceed the 90th percentile value from Illinois EPA's statewide database for sand and gravel aquifers. Highlighted (light orange) values are medians that exceed the median value from Illinois EPA's statewide database.[67]

[64] Slides 70 and 71 can be found on pages 95 and 96 of the pdf document filed with the Board by MWG on Jan. 30, 2018.

[65] *See* discussion of Illinois EPA background values. *Supra* "Summary of Facts Applicable to All of the MWG Plants" § 6.

[66] Source data was extracted from Respondent's Exhibit 809.

[67] Comp. Ex. 405 at 7.

Monitoring Well	Boron median (mg/L)	Sulfate median (mg/L)
MW-1	1.60	270
MW-2	2.40	340
MW-3	3.20	390
MW-4	4.60	1500
MW-5	3.50	540
MW-6	2.90	360
MW-7	3.90	530
MW-8	2.30	450
MW-9	1.70	310
MW-10	2.80	300
Background (Bedrock Aquifer)		
Illinois EPA median	0.28	106
Illinois EPA 90th percentile	1.25	550

B. MWG Has Long Known About Likely Sources of Coal Ash Contamination at Will County

The contamination at Will County must be coming from onsite sources because the plant is located on a peninsula, with surface water on either side acting as a barrier against contamination from offsite. Hr'g. Tr. Feb. 2, 172:5-20. Given the high concentrations of coal ash indicators boron and sulfate, the contamination must be coming from, specifically, onsite coal ash. Hr'g. Tr. Feb. 2, 122:20-23, 175:11-23. Both the ash ponds and the coal ash fill located outside the ash ponds are likely contributing to the contamination.

The four ash ponds were lined with poz-o-pac[68] in 1977. Hr'g. Tr. Jan. 30, 191:20-23. In 2006, a consultant for MWG rated the condition of all four pond liners as "poor." Comp. Ex. 34 at MWG13-15_23614; Resp. Ex. 606 at MWG13-15_23647. Since then, the poz-o-pac liner in at

[68] "Poz-o-pac" is a cementitious material made of fly ash and other materials. Hr'g. Tr. Feb. 2, 148:6-12.

least one pond has cracked, allowing water to seep through. Comp. Ex. 303; Hr'g. Tr. Oct. 24, 214:5-215:12.[69] A core sample of poz-o-pac from the liner of one of the Will County ponds also contained hairline cracks. Comp. Ex. 286; Hr'g. Tr. Oct. 25, 221:6-223:2. [70] The two southernmost ponds (ponds 2S and 3S) have been relined with HDPE and other materials. Hr'g. Tr. Oct. 24, 192:5-194:23, 204:2-22. Yet MWG employees expressed concerns about how easy it would be for the new liners to be damaged during the dredging process (Comp. Ex. 306), and in at least one instance the new liner was "extremely damaged" and "completely torn up," with the torn section of liner buried under ash and not discovered for potentially "many months." Comp. Ex. 307.

The two northern ponds, ponds 1N and 1S, which still contain ash and are not capped, remain lined with nothing more than forty-year-old poz-o-pac. Hr'g. Tr. Oct. 23, 169:18-21, 170:1-19[71]; Hr'g. Tr. Oct. 24, 14:2-15:19. None of the four active ash ponds at Will County meet federal design criteria. Specifically, they are less than five feet above the underlying groundwater, and they do not have the type of liner that the U.S. EPA requires for new and existing coal ash ponds. Hr'g. Tr. Feb. 2, 309:21-310:19 (the bottoms of the pond liners are at least a foot below average groundwater elevations); Id. at 143:5-148:4 (none of the liners at the four MWG coal plants meet the liner criteria in the coal ash rule). Evidence indicates that groundwater has, in fact leaked through the poz-o-pac liners. Comp. Ex. 302; Hr'g. Tr. Oct. 24, 211:18-213:20, 213:1-6 ("Q. What was the purpose of this field change request? A. So the description of the change request is written as 'cut holes in liner to pump out groundwater.'

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[69] "Water is seeping through cracks in 2nd p-o-p layer." Comp. Ex. 303. MWG's expert testified about the conditions that would lead poz-o-pac to crack: Q: "And Poz-o-Pac liners can crack, right?" A. "The conditions that they would crack would have to, of course, be between the loading and weathering of those like freeze/thaw so they can crack." Hr'g. Tr. Feb. 2, 148:16-21.

[70] "It says, 'Additionally, the samples inspected for science [sic] of cracking and discoloration -- if cracking and discoloration. Hairline cracks were noted at the ends of the core,' yes." Hr'g. Tr. Oct. 25, 222:7-10.

[71] "Q. And they still have ash in them, correct? A. Yes, they do still have ash in them." Hr'g. Tr. Oct. 23, 170:8-10.

CAWS, C-A-W-S, will then patch the holes."). Since the bottoms of ponds 1N and 1S are sitting below the water table, cracks in the poz-o-pac liners would allow groundwater to leak into the ponds and ash constituents to leak out of the ponds into the groundwater.[72] Hr'g. Tr. Feb. 2, 149:15-18 ("[O]f course, if you have crack in a material, the water can flow through if you put the water head on top of it."). In short, all of the coal ash ponds at Will County, but particularly ponds 1N and 1S, are substandard and likely to be leaking coal ash constituents into the underlying groundwater.

MWG has also long been aware of coal ash fill in the ground surrounding the ash ponds, particularly along their eastern edge. In 2005, a consultant for MWG implemented a soil boring program around MWG's coal ash ponds. At Will County, three borings identified "bottom ash" and/or "slag" mixed with other materials, primarily in the top two feet of soil, but also as deep as nine feet beneath the surface. Comp. Ex. 201 at MWG13-15_24282-24287.[73] In 2010 and 2011, when MWG was installing groundwater monitoring wells, the borings for the wells showed a thick layer of coal ash buried along the eastern edge of the four ash ponds. Comp. Ex. 15C at MWG13-15_7251-7256.[74] Specifically, the soil borings for groundwater monitoring wells MW-1, MW-2, MW-3, MW-4, and MW-6 all show layers of fill, between five and twelve feet thick, containing "black coal cinders," "black coal ash," and/or "black ash." Comp. Ex. 15C at MWG13-15_7251-7256.[75]

[72] *See* discussion of hydraulic head or water head above. *Supra* "Summary of Facts Applicable to All of the MWG Plants" § 4.

[73] These borings were located between ponds 1N and 1S (boring GT-2), east of pond 1S (boring WC-GT-3), and at the southwest corner of pond 2S (boring WC-GT-4). Comp. Ex. 201 at MWG13-15_24282-24287.

[74] Comp. Ex. 15C is the Hydrogeological Assessment Report for Will County. Patrick Engineering prepared this assessment in cooperation with and on behalf of MWG in February 2011. Comp. Ex. 15C at MWG13-15_7230; Hr'g. Tr. Oct. 23, 72:23-74:7.

[75] Comp. Ex. 15C is the Hydrogeological Assessment Report for Will County. Patrick Engineering prepared this assessment in cooperation with and on behalf of MWG in February 2011. Comp. Ex. 15C at MWG13-15_7230; Hr'g. Tr. Oct. 23, 72:23-74:7.

The coal ash fill in this area is at least periodically saturated with groundwater, which increases the risk of contamination. Groundwater elevations at Will County fluctuate between 579 and 584 feet above mean sea level. MWG Ex. 903 at Table 4-7. Coal ash is buried at elevations as low as 578.6 feet. Comp. Ex. 15C at MWG13-15_7252. Monitoring well MW-2 provides a useful example. When the boring log for monitoring well MW-2 was made, coal ash was found down to 578.6 feet, and the groundwater elevation in that well was at 580.6 feet. *Id*. (showing a layer of fill that contains "black coal cinders" extending two feet beneath the groundwater level). This was an unusually low groundwater reading for this well, which generally has groundwater elevations between 582 and 584 feet. MWG Ex. 903 at Table 4-7. In other words, three to five feet of coal ash in the vicinity of monitoring well MW-2 is constantly saturated with groundwater.

C. Coal Ash at Will County is Causing Groundwater Contamination

MWG's expert John Seymour conceded that the contamination at Will County is characteristic of coal ash and that it is coming from onsite sources, but claims that "there's no specific source that could be identified." Hr'g. Tr. Feb 2, 122:20-23, 126:1-14; 172:22-176:12. One obvious culprit is the coal ash that surrounds groundwater monitoring wells MW-1 through MW-6. There is no evidence in the record that this area is capped or lined. Consequently, it is exposed to precipitation from above and to groundwater.

Mr. Seymour attempts to eliminate this ash as a potential source by assuming that it will have the same leachate characteristics as coal ash from an aboveground "CCR Placement Area." MWG Ex. 901 at slide 59; MWG Ex. 804, pdf p. 84. This argument has three fatal flaws. First, there is no reason to believe that the coal ash tested by MWG is representative of the coal ash buried along the edge of the ponds. The tested material was described as "bottom ash/slag," Comp. Ex. 284 at MWG13-15_49568, while the material found in the boring logs for the groundwater monitoring wells was described as "coal cinders," "coal ash," or simply "black ash." Comp. Ex. 15C at MWG13-15_7251-7256. The material in the boring logs may include, for example, fly ash. Second, the leach test used by MWG is not intended to simulate leaching in the field. Comp. Ex. 407, 4-5; Hr'g. Tr. Oct. 26, 46:24-48:13. Third, the leach test results, which detected boron and did not test for sulfate, are not inconsistent with the presence of boron and sulfate in groundwater. *See* Comp. Ex. 284.

The ponds are also a likely source of contamination. According to one of MWG's consultants, there is only one monitoring well upgradient of the ash ponds: Well MW-1. Comp Ex. 16 at MWG13-15_14171. As shown in Table 5 above, monitoring well MW-1 has lower boron and sulfate concentrations than any of the other wells. Basic principles of hydrology suggest that something between the upgradient well and the downgradient wells is adding coal ash indicators to the groundwater. For example, as groundwater moves from MW-1 toward MW-7, it travels beneath and potentially through[76] ash pond 1N, which contains coal ash, remains poorly lined, and may be leaking. By the time groundwater reaches monitoring well MW-7, the concentrations of boron and sulfate have doubled. The only thing between wells MW-1 and MW-7, and the only possible source of the increase in boron and sulfate, is the 1N ash pond.

D. MWG Failed to Exercise Control to Prevent Groundwater Contamination from Coal Ash at Will County

MWG failed to exercise control of the source of coal ash constituents to prevent groundwater contamination. Ash ponds 1N and 1S continue to have coal ash in them, the same ash that has been there since they were last dredged. Hr'g. Tr. Oct. 24, 14:21-24. These ponds were never relined and, therefore, have the same poz-o-pac liners that they were originally lined with in 1977. Hr'g. Tr. Jan. 30, 280:12-20; Hr'g. Tr. Oct. 24, 184:2-9, 188: 7-10, 188:13-17.

[76] See, e.g., Comp. Ex. 15C at MWG13-15_7249, showing a cross-section from MW-1 to MW-7 in which the groundwater level is higher than the bottom ash pond 1N.

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Ponds 1N and 1S are not capped. Hr'g. Tr. Oct. 23, 170:16-19; Hr'g. Tr. Oct. 24, 185:9-12, 188:18-19. The ponds are also open to precipitation. Hr'g. Tr. Oct. 24, 16:8-11. There is no evidence in the record that MWG has ever investigated or tested, much less taken steps to remove, the coal ash buried along the eastern edge of the ash ponds. Finally, the contents of One North and One South have not been completely dewatered and are allowed to sit in up to one foot of standing water. Resp. Ex. 656 at MWG-13-15_561. Due to MWG's lack of precautions, the coal ash in ash ponds 1N and 1S presents an ongoing threat to groundwater.

MWG has entered into a CCA with the Illinois EPA in a purported effort to try to control contamination issues at Will County. Resp. Ex. 656 at MWG13-15_560-562. But MWG's efforts under the CCA were limited to listed ash ponds at the site, and even those required actions were not sufficient to prevent ongoing contamination. Missing from the list of corrective actions under the CCA are any efforts to remove the coal ash from the eastern edge of the ash ponds. *Id.* Also missing is any requirement that MWG remove coal ash from ponds 1N and 1S. The terms of the CCA are therefore inadequate to control the ongoing contamination at Will County, and as a result, the groundwater contamination problem has not improved. Hr'g. Tr. Feb. 2, 123:20-124:6; Resp. Ex. 901 at slides 70 and 72.[77]

E. MWG is Liable for the Contamination at Will County

Ultimately, the answer to whether it is the coal ash ponds or the coal ash fill causing the contamination, or both, doesn't affect MWG's liability. If MWG's property is the source, then MWG is liable for the violations. Parties who lease or operate the source of pollution exercise the capability to control a source of pollution. *See, e.g.*, *State Oil Co.*, PCB 97-103, 2003 WL 1785038, at *24-25 (finding current owners and operators liable under Section 12(a)); *Michel*

[77] Slides 70 and 71 can be found on pages 95 and 96 of the pdf document filed with the Board by MWG on Jan. 30, 2018.

Grain, PCB 96-143, 2002 WL 2012414, at *3-4 (denying lessee's motion to dismiss Section 12(a) complaint); *Allaert Rendering*,414 N.E.2d at #492, 494-95 (finding plant operator liable under Section 12(a)).

The expert witnesses for both parties agree that coal ash from the Will County site is the source of the groundwater pollution. MWG's expert John Seymour concluded that the contamination is coming from onsite coal ash at Will County. Hr'g. Tr. Feb. 2, 122:19-23. Complainants' expert Dr. Kunkel points to it being either the ponds or ash fill. Hr'g. Tr. Oct. 27, 189:15-19.

Parties with control over a source of pollution, like MWG over Will County, are liable for water pollution in violation of Section 12(a) even if they did not place the contaminants at issue in the ground or water. "[T]he current owner may be responsible for contamination even if the current owner did not actively dispose of the contamination." *Inverse Investments*, PCB 11-79, 2012 WL 586821, at *9; *see also Michel Grain*, PCB 96-143, 2002 WL 2012414, at *3; *Meadowlark Farms*, 308 N.E.2d at 836-37; *Lincoln*, 70 N.E.3d 661, at 678. Even though MWG did not place the ash fill in the ground at Will County, MWG owns the property where the coal as contamination is coming from. If it is from the ponds or from ash fill or some other coal ash source on the site, MWG is liable.

Finally, MWG did not exercise control to prevent coal ash from contaminating the groundwater. Parties with control over the premises or source of pollution cannot avoid liability unless that party has "exercise[d] control to prevent pollution." *See, e.g., Meadowlark Farms,* 308 N.E.2d at 836; *Perkinson,* 543 N.E.2d at 904. When pollution "ha[s] its source on [a party's] land and in a waste facility under [a party's] control," the PCB will hold them liable and find a violation of the Act. *Perkinson*, 543 N.E.2d at, 904. MWG has known about onsite coal ash fill

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since as early as 2005, see Comp. Ex. 201, and gained additional knowledge of coal ash fill when it installed groundwater monitoring wells in 2010. Comp Ex. 15C. MWG has known about onsite groundwater contamination since at least 2010. *Id*. Despite this knowledge, MWG did not take efforts to control the contamination from Ponds 1N and 1S or the fill. The source of the pollution was on MWG's land and in disposal areas under MWG's control. That is sufficient for the PCB to find violations under the Act.

MWG also violated the open dumping prohibitions in section 21(a) of the Illinois Environmental Protection Act by maintaining a coal ash "disposal site" that did not "fulfill the requirements of a sanitary landfill." 415 ILCS 5/21(a); 415 ILCS 5/3.305. Under Illinois law, sanitary landfills "must meet the requirements of the Resource Conservation and Recovery Act and regulations thereunder." 415 ILCS 5/3.445. The relevant regulations include a set of MCLs at 40 C.F.R. Part 257, Appendix I. The Board cannot enforce these federal regulations, but has held that "an exceedance of the MCLs at one or more power plants may be evidence tending to show a violation of Section 21(a) of the Act." Order of the Board at 25 (Oct. 3, 2013).

As shown in **Appendix B**, the groundwater at Will County has exceeded the relevant MCLs 25 times since 2010, and continues to exceed these MCLs in 2017. Again, is the case under Section 12(a),[78] under Section 21(a) of the Act a party may be liable for violating the open dumping prohibitions even if they did not place the contaminating material at issue on the land or water. "A clear standard of landowner liability has also been stated by the Illinois Pollution Control Board in proceedings in which landowners attributed violations to others." *Lincoln,* 70 N.E.3d at 661, 678; s*ee also State Oil Co.,* PCB 97-103, 2003 WL 1785038, at *19; *Rawe,* AC 92-5, 1992 WL 315780, at *3-5; *Coleman,* AC 04-46, 2004 WL 2578712, at *7.

[78] This standard is identical to "cause or allow" standard applicable to Section 12(a) of the Act.

CONCLUSION

The evidence clearly shows that the groundwater at Joliet 29, Powerton, Waukegan, and Will County is contaminated with coal ash constituents, that coal ash at the four MWG Plants is the source of the contamination, and that MWG has done little to control the ongoing contamination. MWG has therefore violated Section 12(a) of the Act; 35 Ill. Adm. Code §§ 620.115, 620.301(a), 620.405; and Section 21(a) of the Act.

Dated: July 20, 2018

Respectfully submitted,

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TABLE OF APPENDICES

The data in Appendix A was extracted from Respondent's Exhibits 809-812. While these exhibits do not include all onsite groundwater monitoring data, they do include sufficient data to document the severity and persistence of contamination.

Appendix A only includes data for constituents of coal ash, as defined by the U.S. EPA in the coal ash rule's groundwater monitoring requirements. 40 C.F.R. Part 257, Appendices III ("constituents for detection monitoring") and IV ("constituents for assessment monitoring").

The data in Appendix B were extracted from Respondent's Exhibits 809-812 and only include data for constituents of coal ash as defined by the U.S. EPA in the coal ash rule's groundwater monitoring requirements. 40 C.F.R. Part 257, Appendices III ("constituents for detection monitoring") and IV ("constituents for assessment monitoring"). The data were compared to the "open dumping" MCLs found at 40 C.F.R. Part 257, Appendix I. See also 40 C.F.R. § 257.3-4(c)(2) (groundwater criteria for classification of solid waste disposal facilities and practices).

Exhibit 20D at MWG13-15_23339 and Exhibit 246M at MWG13-15_62325.

Exhibit 259O at MWG13-15_62221.

Exhibit 19D at MWG13-15_45814; Exhibit 267P at MWG13-15_43754), and Exhibit 411 at 38.

Exhibit 280Q at MWG13-15_58393.

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
1	2010	Joliet 29	MW-02	Antimony	12/6/2010	0.006	0.012
2	2010	Joliet 29	MW-09	Sulfate	12/6/2010	400	1600
3	2010	Joliet 29	MW-09	TDS	12/6/2010	1200	2600
4	2010	Powerton	MW-07	Arsenic	12/6/2010	0.01	0.026
5	2010	Powerton	MW-07	Lead	12/6/2010	0.0075	0.039
6	2010	Powerton	MW-09	Boron	12/16/2010	2	2.1
7	2010	Powerton	MW-13	Arsenic	12/15/2010	0.01	0.011
8	2010	Powerton	MW-13	Boron	12/15/2010	2	3.9
9	2010	Powerton	MW-13	Sulfate	12/15/2010	400	1400
10	2010	Powerton	MW-13	TDS	12/15/2010	1200	2600
11	2010	Powerton	MW-14	Arsenic	12/15/2010	0.01	0.024
12	2010	Powerton	MW-14	Sulfate	12/15/2010	400	960
13	2010	Powerton	MW-14	TDS	12/15/2010	1200	1800
14	2010	Waukegan	MW-01	Arsenic	10/25/2010	0.01	0.054
15	2010	Waukegan	MW-01	Boron	10/25/2010	2	2.6
16	2010	Waukegan	MW-02	Antimony	10/25/2010	0.006	0.015
17	2010	Waukegan	MW-02	Arsenic	10/25/2010	0.01	0.025
18	2010	Waukegan	MW-02	Boron	10/25/2010	2	2.2
19	2010	Waukegan	MW-05	Boron	10/25/2010	2	28
20	2010	Waukegan	MW-05	Sulfate	10/25/2010	400	920
21	2010	Waukegan	MW-05	TDS	10/25/2010	1200	1500
22	2010	Will	MW-01	Sulfate	12/13/2010	400	530
23	2010	Will	MW-02	Sulfate	12/13/2010	400	430
24	2010	Will	MW-03	Boron	12/13/2010	2	2.7
25	2010	Will	MW-04	Boron	12/13/2010	2	3.7
26	2010	Will	MW-04	Sulfate	12/13/2010	400	1500
27	2010	Will	MW-04	TDS	12/13/2010	1200	2500
28	2010	Will	MW-05	Boron	12/13/2010	2	2.6
29	2010	Will	MW-05	Sulfate	12/13/2010	400	580
30	2010	Will	MW-06	Boron	12/13/2010	2	2.7
31	2010	Will	MW-06	Sulfate	12/13/2010	400	500
32	2010	Will	MW-07	Boron	12/13/2010	2	4.7
33	2010	Will	MW-07	Sulfate	12/13/2010	400	610
34	2010	Will	MW-07	TDS	12/13/2010	1200	1300
35	2010	Will	MW-08	Sulfate	12/13/2010	400	440
36	2010	Will	MW-09	Boron	12/13/2010	2	2.2
37	2010	Will	MW-09	Sulfate	12/13/2010	400	410
38	2010	Will	MW-10	Boron	12/13/2010	2	2.1
39	2011	Joliet 29	MW-03	Antimony	9/14/2011	0.006	0.0065

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
40	2011	Joliet 29	MW-03	Antimony	12/7/2011	0.006	0.016
41	2011	Joliet 29	MW-04	Antimony	12/7/2011	0.006	0.0067
42	2011	Joliet 29	MW-09	Sulfate	3/23/2011	400	1100
43	2011	Joliet 29	MW-09	Sulfate	6/14/2011	400	580
44	2011	Joliet 29	MW-09	Sulfate	9/14/2011	400	750
45	2011	Joliet 29	MW-09	TDS	3/23/2011	1200	2400
46	2011	Joliet 29	MW-09	TDS	6/14/2011	1200	1500
47	2011	Joliet 29	MW-09	TDS	9/14/2011	1200	1700
48	2011	Joliet 29	MW-09	TDS	12/7/2011	1200	2400
49	2011	Joliet 29	MW-11	Boron	3/23/2011	2	2.6
50	2011	Joliet 29	MW-11	Boron	6/14/2011	2	2.2
51	2011	Powerton	MW-07	Arsenic	3/25/2011	0.01	0.085
52	2011	Powerton	MW-07	Arsenic	6/16/2011	0.01	0.12
53	2011	Powerton	MW-07	Arsenic	9/19/2011	0.01	0.18
54	2011	Powerton	MW-07	Arsenic	12/12/2011	0.01	0.23
55	2011	Powerton	MW-07	TDS	6/16/2011	1200	1300
56	2011	Powerton	MW-07	TDS	9/19/2011	1200	1300
57	2011	Powerton	MW-07	TDS	12/12/2011	1200	1300
58	2011	Powerton	MW-09	Boron	9/19/2011	2	2.5
59	2011	Powerton	MW-09	Boron	12/12/2011	2	2.7
60	2011	Powerton	MW-12	Arsenic	2/15/2011	0.01	0.013
61	2011	Powerton	MW-13	Arsenic	12/12/2011	0.01	0.023
62	2011	Powerton	MW-13	Boron	2/15/2011	2	3.1
63	2011	Powerton	MW-13	Boron	4/25/2011	2	2.6
64	2011	Powerton	MW-13	Boron	6/16/2011	2	3
65	2011	Powerton	MW-13	Boron	8/9/2011	2	2.7
66	2011	Powerton	MW-13	Boron	10/13/2011	2	3
67	2011	Powerton	MW-13	Boron	12/12/2011	2	4.1
68	2011	Powerton	MW-13	Sulfate	2/15/2011	400	770
69	2011	Powerton	MW-13	Sulfate	4/25/2011	400	580
70	2011	Powerton	MW-13	Sulfate	6/16/2011	400	540
71	2011	Powerton	MW-13	Sulfate	8/9/2011	400	440
72	2011	Powerton	MW-13	Sulfate	10/13/2011	400	660
73	2011	Powerton	MW-13	Sulfate	12/12/2011	400	1100
74	2011	Powerton	MW-13	TDS	2/15/2011	1200	1600
75	2011	Powerton	MW-13	TDS	4/25/2011	1200	1400
76	2011	Powerton	MW-13	TDS	6/16/2011	1200	1300
77	2011	Powerton	MW-13	TDS	10/13/2011	1200	1500
78	2011	Powerton	MW-13	TDS	12/12/2011	1200	2100

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
79	2011	Powerton	MW-14	Arsenic	2/15/2011	0.01	0.019
80	2011	Powerton	MW-14	Arsenic	10/13/2011	0.01	0.015
81	2011	Powerton	MW-14	Selenium	4/25/2011	0.05	0.065
82	2011	Powerton	MW-14	Sulfate	2/15/2011	400	820
83	2011	Powerton	MW-14	Sulfate	4/25/2011	400	770
84	2011	Powerton	MW-14	Sulfate	6/16/2011	400	810
85	2011	Powerton	MW-14	Sulfate	8/9/2011	400	940
86	2011	Powerton	MW-14	Sulfate	10/13/2011	400	850
87	2011	Powerton	MW-14	Sulfate	12/12/2011	400	880
88	2011	Powerton	MW-14	TDS	2/15/2011	1200	1700
89	2011	Powerton	MW-14	TDS	4/25/2011	1200	1800
90	2011	Powerton	MW-14	TDS	6/16/2011	1200	1900
91	2011	Powerton	MW-14	TDS	8/9/2011	1200	2000
92	2011	Powerton	MW-14	TDS	10/13/2011	1200	1800
93	2011	Powerton	MW-14	TDS	12/12/2011	1200	1800
94	2011	Powerton	MW-14	Thallium	4/25/2011	0.002	0.0035
95	2011	Powerton	MW-14	Thallium	6/16/2011	0.002	0.0039
96	2011	Powerton	MW-14	Thallium	8/9/2011	0.002	0.0027
97	2011	Powerton	MW-15	Arsenic	10/13/2011	0.01	0.011
98	2011	Powerton	MW-15	Sulfate	6/16/2011	400	650
99	2011	Powerton	MW-15	TDS	6/16/2011	1200	1600
100	2011	Waukegan	MW-01	Arsenic	3/24/2011	0.01	0.04
101	2011	Waukegan	MW-01	Arsenic	6/13/2011	0.01	0.17
102	2011	Waukegan	MW-01	Arsenic	9/13/2011	0.01	0.077
103	2011	Waukegan	MW-01	Arsenic	12/6/2011	0.01	0.057
104	2011	Waukegan	MW-01	Boron	6/13/2011	2	2.6
105	2011	Waukegan	MW-01	Boron	9/13/2011	2	2.5
106	2011	Waukegan	MW-01	Boron	12/6/2011	2	2.8
107	2011	Waukegan	MW-02	Arsenic	3/24/2011	0.01	0.016
108	2011	Waukegan	MW-02	Arsenic	6/13/2011	0.01	0.012
109	2011	Waukegan	MW-02	Boron	3/24/2011	2	2.2
110	2011	Waukegan	MW-03	Boron	3/24/2011	2	2.2
111	2011	Waukegan	MW-03	Boron	6/13/2011	2	2.3
112	2011	Waukegan	MW-04	Boron	3/24/2011	2	2.1
113	2011	Waukegan	MW-04	Boron	12/6/2011	2	2.1
114	2011	Waukegan	MW-05	Boron	3/24/2011	2	33
115	2011	Waukegan	MW-05	Boron	6/13/2011	2	12
116	2011	Waukegan	MW-05	Boron	9/13/2011	2	30
117	2011	Waukegan	MW-05	Boron	12/6/2011	2	37

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
118	2011	Waukegan	MW-05	Sulfate	3/24/2011	400	780
119	2011	Waukegan	MW-05	Sulfate	6/13/2011	400	1100
120	2011	Waukegan	MW-05	Sulfate	9/13/2011	400	810
121	2011	Waukegan	MW-05	Sulfate	12/6/2011	400	1100
122	2011	Waukegan	MW-05	TDS	3/24/2011	1200	1800
123	2011	Waukegan	MW-05	TDS	6/13/2011	1200	3300
124	2011	Waukegan	MW-05	TDS	9/13/2011	1200	2300
125	2011	Waukegan	MW-05	TDS	12/6/2011	1200	2300
126	2011	Will	MW-01	Antimony	12/8/2011	0.006	0.0063
127	2011	Will	MW-02	Antimony	9/15/2011	0.006	0.0073
128	2011	Will	MW-02	Antimony	12/8/2011	0.006	0.017
129	2011	Will	MW-02	Boron	6/15/2011	2	2.3
130	2011	Will	MW-02	Boron	9/15/2011	2	2.3
131	2011	Will	MW-03	Boron	3/28/2011	2	2.4
132	2011	Will	MW-03	Boron	6/15/2011	2	2.6
133	2011	Will	MW-03	Boron	9/15/2011	2	3.3
134	2011	Will	MW-03	Boron	12/8/2011	2	2.8
135	2011	Will	MW-04	Boron	3/28/2011	2	3.3
136	2011	Will	MW-04	Boron	6/15/2011	2	3.6
137	2011	Will	MW-04	Boron	9/15/2011	2	4.3
138	2011	Will	MW-04	Boron	12/8/2011	2	3
139	2011	Will	MW-04	Sulfate	3/28/2011	400	1500
140	2011	Will	MW-04	Sulfate	6/15/2011	400	1600
141	2011	Will	MW-04	Sulfate	9/15/2011	400	4800
142	2011	Will	MW-04	Sulfate	12/8/2011	400	1600
143	2011	Will	MW-04	TDS	3/28/2011	1200	2600
144	2011	Will	MW-04	TDS	6/15/2011	1200	2800
145	2011	Will	MW-04	TDS	9/15/2011	1200	6000
146	2011	Will	MW-04	TDS	12/8/2011	1200	3100
147	2011	Will	MW-05	Boron	3/28/2011	2	2.7
148	2011	Will	MW-05	Boron	6/15/2011	2	3.2
149	2011	Will	MW-05	Boron	9/15/2011	2	4
150	2011	Will	MW-05	Boron	12/8/2011	2	3.2
151	2011	Will	MW-05	Sulfate	3/28/2011	400	570
152	2011	Will	MW-05	Sulfate	6/15/2011	400	540
153	2011	Will	MW-05	Sulfate	9/15/2011	400	690
154	2011	Will	MW-05	Sulfate	12/8/2011	400	500
155	2011	Will	MW-05	TDS	3/28/2011	1200	1300
156	2011	Will	MW-05	TDS	6/15/2011	1200	1400

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
157	2011	Will	MW-05	TDS	9/15/2011	1200	1500
158	2011	Will	MW-06	Boron	3/28/2011	2	2.5
159	2011	Will	MW-06	Boron	6/15/2011	2	2.4
160	2011	Will	MW-06	Boron	9/15/2011	2	3
161	2011	Will	MW-06	Boron	12/8/2011	2	2.5
162	2011	Will	MW-06	Sulfate	3/28/2011	400	540
163	2011	Will	MW-06	Sulfate	6/15/2011	400	570
164	2011	Will	MW-06	Sulfate	9/15/2011	400	420
165	2011	Will	MW-06	Sulfate	12/8/2011	400	440
166	2011	Will	MW-07	Boron	3/28/2011	2	5
167	2011	Will	MW-07	Boron	6/15/2011	2	5.7
168	2011	Will	MW-07	Boron	9/15/2011	2	3.4
169	2011	Will	MW-07	Boron	12/8/2011	2	5
170	2011	Will	MW-07	Sulfate	3/28/2011	400	650
171	2011	Will	MW-07	Sulfate	6/15/2011	400	1000
172	2011	Will	MW-07	Sulfate	9/15/2011	400	710
173	2011	Will	MW-07	Sulfate	12/8/2011	400	710
174	2011	Will	MW-07	TDS	3/28/2011	1200	1500
175	2011	Will	MW-07	TDS	6/15/2011	1200	1600
176	2011	Will	MW-07	TDS	9/15/2011	1200	1400
177	2011	Will	MW-07	TDS	12/8/2011	1200	1300
178	2011	Will	MW-08	Arsenic	9/15/2011	0.01	0.014
179	2011	Will	MW-08	Arsenic	12/8/2011	0.01	0.012
180	2011	Will	MW-08	Boron	9/15/2011	2	2.3
181	2011	Will	MW-08	Sulfate	3/28/2011	400	440
182	2011	Will	MW-08	Sulfate	6/15/2011	400	420
183	2011	Will	MW-08	Sulfate	9/15/2011	400	600
184	2011	Will	MW-08	TDS	9/15/2011	1200	1300
185	2011	Will	MW-09	Sulfate	6/15/2011	400	410
186	2011	Will	MW-10	Boron	6/15/2011	2	2.2
187	2011	Will	MW-10	Boron	9/15/2011	2	2.8
188	2011	Will	MW-10	Boron	12/8/2011	2	2.5
189	2011	Will	MW-10	Sulfate	9/15/2011	400	420
190	2012	Joliet 29	MW-03	Antimony	3/15/2012	0.006	0.013
191	2012	Joliet 29	MW-09	Sulfate	3/15/2012	400	1600
192	2012	Joliet 29	MW-09	Sulfate	6/19/2012	400	1500
193	2012	Joliet 29	MW-09	Sulfate	9/19/2012	400	1600
194	2012	Joliet 29	MW-09	Sulfate	12/20/2012	400	1100
195	2012	Joliet 29	MW-09	TDS	3/15/2012	1200	2600

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
196	2012	Joliet 29	MW-09	TDS	6/19/2012	1200	2800
197	2012	Joliet 29	MW-09	TDS	9/19/2012	1200	2900
198	2012	Joliet 29	MW-09	TDS	12/20/2012	1200	2000
199	2012	Powerton	MW-06	Sulfate	6/25/2012	400	450
200	2012	Powerton	MW-06	Sulfate	12/12/2012	400	440
201	2012	Powerton	MW-06	TDS	6/25/2012	1200	1300
202	2012	Powerton	MW-07	Arsenic	3/19/2012	0.01	0.23
203	2012	Powerton	MW-07	Arsenic	6/25/2012	0.01	0.15
204	2012	Powerton	MW-07	Arsenic	9/18/2012	0.01	0.18
205	2012	Powerton	MW-07	Arsenic	12/12/2012	0.01	0.26
206	2012	Powerton	MW-07	TDS	3/19/2012	1200	1400
207	2012	Powerton	MW-07	TDS	6/25/2012	1200	1300
208	2012	Powerton	MW-07	TDS	9/18/2012	1200	1300
209	2012	Powerton	MW-08	Sulfate	6/25/2012	400	440
210	2012	Powerton	MW-09	Boron	3/19/2012	2	2.6
211	2012	Powerton	MW-09	Boron	6/25/2012	2	2.6
212	2012	Powerton	MW-09	Boron	9/18/2012	2	2.9
213	2012	Powerton	MW-09	Boron	12/12/2012	2	3.2
214	2012	Powerton	MW-11	Arsenic	12/12/2012	0.01	0.03
215	2012	Powerton	MW-11	Boron	3/19/2012	2	2.3
216	2012	Powerton	MW-11	Boron	9/18/2012	2	2.6
217	2012	Powerton	MW-12	Arsenic	6/25/2012	0.01	0.014
218	2012	Powerton	MW-12	Arsenic	9/18/2012	0.01	0.011
219	2012	Powerton	MW-12	Arsenic	12/12/2012	0.01	0.022
220	2012	Powerton	MW-12	Sulfate	6/25/2012	400	430
221	2012	Powerton	MW-13	Arsenic	4/10/2012	0.01	0.027
222	2012	Powerton	MW-13	Arsenic	12/14/2012	0.01	0.041
223	2012	Powerton	MW-13	Boron	4/10/2012	2	4
224	2012	Powerton	MW-13	Boron	12/14/2012	2	3.6
225	2012	Powerton	MW-13	Sulfate	4/10/2012	400	1100
226	2012	Powerton	MW-13	Sulfate	12/14/2012	400	1100
227	2012	Powerton	MW-13	TDS	4/10/2012	1200	2300
228	2012	Powerton	MW-13	TDS	12/14/2012	1200	1900
229	2012	Powerton	MW-14	Sulfate	4/10/2012	400	990
230	2012	Powerton	MW-14	Sulfate	12/14/2012	400	810
231	2012	Powerton	MW-14	TDS	4/10/2012	1200	2200
232	2012	Powerton	MW-14	TDS	12/14/2012	1200	1700
233	2012	Powerton	MW-14	Thallium	4/10/2012	0.002	0.0034
234	2012	Powerton	MW-14	Thallium	12/14/2012	0.002	0.0025

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
235	2012	Powerton	MW-15	Arsenic	12/14/2012	0.01	0.011
236	2012	Waukegan	MW-01	Arsenic	3/14/2012	0.01	0.078
237	2012	Waukegan	MW-01	Arsenic	6/18/2012	0.01	0.07
238	2012	Waukegan	MW-01	Arsenic	9/28/2012	0.01	0.07
239	2012	Waukegan	MW-01	Arsenic	12/19/2012	0.01	0.091
240	2012	Waukegan	MW-01	Boron	3/14/2012	2	2.5
241	2012	Waukegan	MW-02	Arsenic	6/18/2012	0.01	0.011
242	2012	Waukegan	MW-02	Arsenic	9/28/2012	0.01	0.011
243	2012	Waukegan	MW-02	Boron	6/18/2012	2	2.6
244	2012	Waukegan	MW-02	Boron	9/28/2012	2	2.1
245	2012	Waukegan	MW-04	Boron	3/14/2012	2	2.2
246	2012	Waukegan	MW-04	Boron	6/18/2012	2	2.5
247	2012	Waukegan	MW-04	Boron	9/28/2012	2	2.2
248	2012	Waukegan	MW-04	Boron	12/19/2012	2	2.5
249	2012	Waukegan	MW-05	Arsenic	9/28/2012	0.01	0.012
250	2012	Waukegan	MW-05	Arsenic	12/19/2012	0.01	0.011
251	2012	Waukegan	MW-05	Boron	3/14/2012	2	44
252	2012	Waukegan	MW-05	Boron	6/18/2012	2	47
253	2012	Waukegan	MW-05	Boron	9/28/2012	2	41
254	2012	Waukegan	MW-05	Boron	12/19/2012	2	27
255	2012	Waukegan	MW-05	Sulfate	3/14/2012	400	980
256	2012	Waukegan	MW-05	Sulfate	6/18/2012	400	800
257	2012	Waukegan	MW-05	Sulfate	9/28/2012	400	710
258	2012	Waukegan	MW-05	Sulfate	12/19/2012	400	550
259	2012	Waukegan	MW-05	TDS	3/14/2012	1200	2000
260	2012	Waukegan	MW-05	TDS	6/18/2012	1200	2000
261	2012	Waukegan	MW-05	TDS	9/28/2012	1200	1900
262	2012	Waukegan	MW-05	TDS	12/19/2012	1200	1800
263	2012	Waukegan	MW-07	Boron	12/19/2012	2	43
264	2012	Waukegan	MW-07	Sulfate	12/19/2012	400	630
265	2012	Waukegan	MW-07	TDS	12/19/2012	1200	1800
266	2012	Will	MW-01	Boron	6/20/2012	2	2.1
267	2012	Will	MW-01	Sulfate	3/16/2012	400	430
268	2012	Will	MW-02	Boron	9/24/2012	2	2.2
269	2012	Will	MW-03	Boron	3/16/2012	2	2.7
270	2012	Will	MW-03	Boron	6/20/2012	2	3.1
271	2012	Will	MW-03	Boron	9/24/2012	2	3.9
272	2012	Will	MW-03	Boron	12/18/2012	2	3.4
273	2012	Will	MW-03	Sulfate	6/20/2012	400	500

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
274	2012	Will	MW-03	Sulfate	9/24/2012	400	440
275	2012	Will	MW-03	Sulfate	12/18/2012	400	480
276	2012	Will	MW-03	TDS	6/20/2012	1200	1400
277	2012	Will	MW-04	Boron	3/16/2012	2	4
278	2012	Will	MW-04	Boron	6/20/2012	2	5.3
279	2012	Will	MW-04	Boron	9/24/2012	2	6.2
280	2012	Will	MW-04	Boron	12/18/2012	2	5.2
281	2012	Will	MW-04	Sulfate	3/16/2012	400	2000
282	2012	Will	MW-04	Sulfate	6/20/2012	400	2800
283	2012	Will	MW-04	Sulfate	9/24/2012	400	3200
284	2012	Will	MW-04	Sulfate	12/18/2012	400	2200
285	2012	Will	MW-04	TDS	3/16/2012	1200	3700
286	2012	Will	MW-04	TDS	6/20/2012	1200	4300
287	2012	Will	MW-04	TDS	9/24/2012	1200	4400
288	2012	Will	MW-04	TDS	12/18/2012	1200	4000
289	2012	Will	MW-05	Boron	3/16/2012	2	2.9
290	2012	Will	MW-05	Boron	6/20/2012	2	2.3
291	2012	Will	MW-05	Boron	9/24/2012	2	3.8
292	2012	Will	MW-05	Boron	12/18/2012	2	2.5
293	2012	Will	MW-05	Sulfate	6/20/2012	400	410
294	2012	Will	MW-05	Sulfate	9/24/2012	400	540
295	2012	Will	MW-06	Boron	3/16/2012	2	2.5
296	2012	Will	MW-06	Boron	6/20/2012	2	2.9
297	2012	Will	MW-06	Boron	9/24/2012	2	3
298	2012	Will	MW-06	Boron	12/18/2012	2	3
299	2012	Will	MW-06	Sulfate	6/20/2012	400	450
300	2012	Will	MW-06	Sulfate	9/24/2012	400	550
301	2012	Will	MW-07	Boron	3/16/2012	2	5.1
302	2012	Will	MW-07	Boron	6/20/2012	2	5.6
303	2012	Will	MW-07	Boron	9/24/2012	2	5.5
304	2012	Will	MW-07	Boron	12/18/2012	2	5.1
305	2012	Will	MW-07	Sulfate	3/16/2012	400	770
306	2012	Will	MW-07	Sulfate	6/20/2012	400	670
307	2012	Will	MW-07	Sulfate	9/24/2012	400	600
308	2012	Will	MW-07	Sulfate	12/18/2012	400	480
309	2012	Will	MW-07	TDS	3/16/2012	1200	1400
310	2012	Will	MW-07	TDS	6/20/2012	1200	1300
311	2012	Will	MW-08	Arsenic	6/20/2012	0.01	0.013
312	2012	Will	MW-08	Arsenic	9/24/2012	0.01	0.018

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
313	2012	Will	MW-08	Boron	9/24/2012	2	2.6
314	2012	Will	MW-08	Boron	12/18/2012	2	2.1
315	2012	Will	MW-08	Sulfate	9/24/2012	400	630
316	2012	Will	MW-10	Boron	3/16/2012	2	2.1
317	2012	Will	MW-10	Boron	6/20/2012	2	2.1
318	2012	Will	MW-10	Boron	9/24/2012	2	3.2
319	2012	Will	MW-10	Boron	12/18/2012	2	2.7
320	2013	Joliet 29	MW-03	TDS	5/22/2013	1200	1300
321	2013	Joliet 29	MW-04	Antimony	5/22/2013	0.006	0.012
322	2013	Joliet 29	MW-09	Sulfate	3/5/2013	400	700
323	2013	Joliet 29	MW-09	Sulfate	5/23/2013	400	1300
324	2013	Joliet 29	MW-09	Sulfate	7/22/2013	400	1000
325	2013	Joliet 29	MW-09	Sulfate	10/15/2013	400	680
326	2013	Joliet 29	MW-09	TDS	3/5/2013	1200	1700
327	2013	Joliet 29	MW-09	TDS	5/23/2013	1200	3000
328	2013	Joliet 29	MW-09	TDS	7/22/2013	1200	2300
329	2013	Joliet 29	MW-09	TDS	10/15/2013	1200	1700
330	2013	Powerton	MW-02	Antimony	5/29/2013	0.006	0.015
331	2013	Powerton	MW-02	Boron	10/21/2013	2	2.7
332	2013	Powerton	MW-06	Sulfate	5/29/2013	400	560
333	2013	Powerton	MW-06	Sulfate	7/31/2013	400	440
334	2013	Powerton	MW-06	TDS	5/29/2013	1200	1400
335	2013	Powerton	MW-07	Arsenic	2/27/2013	0.01	0.17
336	2013	Powerton	MW-07	Arsenic	5/31/2013	0.01	0.12
337	2013	Powerton	MW-07	Arsenic	7/31/2013	0.01	0.22
338	2013	Powerton	MW-07	Arsenic	10/23/2013	0.01	0.2
339	2013	Powerton	MW-07	TDS	7/31/2013	1200	1300
340	2013	Powerton	MW-08	Sulfate	5/30/2013	400	460
341	2013	Powerton	MW-08	TDS	5/30/2013	1200	1300
342	2013	Powerton	MW-08	TDS	7/31/2013	1200	1300
343	2013	Powerton	MW-08	TDS	10/23/2013	1200	1300
344	2013	Powerton	MW-09	Boron	2/27/2013	2	4.3
345	2013	Powerton	MW-09	Boron	5/30/2013	2	3.2
346	2013	Powerton	MW-09	Boron	7/30/2013	2	2.5
347	2013	Powerton	MW-10	Lead	5/29/2013	0.0075	0.012
348	2013	Powerton	MW-11	Arsenic	2/27/2013	0.01	0.045
349	2013	Powerton	MW-11	Arsenic	5/30/2013	0.01	0.028
350	2013	Powerton	MW-11	Arsenic	7/30/2013	0.01	0.038
351	2013	Powerton	MW-11	Arsenic	10/22/2013	0.01	0.038

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
352	2013	Powerton	MW-12	Arsenic	7/29/2013	0.01	0.016
353	2013	Powerton	MW-12	Arsenic	10/22/2013	0.01	0.018
354	2013	Powerton	MW-12	Boron	5/30/2013	2	3.7
355	2013	Powerton	MW-12	Sulfate	5/30/2013	400	410
356	2013	Powerton	MW-12	Sulfate	7/29/2013	400	420
357	2013	Powerton	MW-13	Arsenic	2/28/2013	0.01	0.029
358	2013	Powerton	MW-13	Arsenic	5/30/2013	0.01	0.031
359	2013	Powerton	MW-13	Arsenic	7/30/2013	0.01	0.029
360	2013	Powerton	MW-13	Arsenic	10/22/2013	0.01	0.024
361	2013	Powerton	MW-13	Boron	2/28/2013	2	4.2
362	2013	Powerton	MW-13	Boron	7/30/2013	2	3.8
363	2013	Powerton	MW-13	Boron	10/22/2013	2	3.5
364	2013	Powerton	MW-13	Sulfate	2/28/2013	400	730
365	2013	Powerton	MW-13	Sulfate	5/30/2013	400	880
366	2013	Powerton	MW-13	Sulfate	7/30/2013	400	1000
367	2013	Powerton	MW-13	Sulfate	10/22/2013	400	690
368	2013	Powerton	MW-13	TDS	2/28/2013	1200	1600
369	2013	Powerton	MW-13	TDS	5/30/2013	1200	2000
370	2013	Powerton	MW-13	TDS	7/30/2013	1200	2000
371	2013	Powerton	MW-13	TDS	10/22/2013	1200	1700
372	2013	Powerton	MW-14	Selenium	2/27/2013	0.05	0.15
373	2013	Powerton	MW-14	Sulfate	5/30/2013	400	800
374	2013	Powerton	MW-14	Sulfate	7/30/2013	400	900
375	2013	Powerton	MW-14	Sulfate	10/23/2013	400	840
376	2013	Powerton	MW-14	TDS	2/27/2013	1200	1300
377	2013	Powerton	MW-14	TDS	5/30/2013	1200	2000
378	2013	Powerton	MW-14	TDS	7/30/2013	1200	2100
379	2013	Powerton	MW-14	TDS	10/23/2013	1200	2100
380	2013	Powerton	MW-14	Thallium	2/27/2013	0.002	0.0043
381	2013	Powerton	MW-14	Thallium	5/30/2013	0.002	0.0025
382	2013	Powerton	MW-14	Thallium	7/30/2013	0.002	0.0043
383	2013	Powerton	MW-14	Thallium	10/23/2013	0.002	0.0022
384	2013	Powerton	MW-15	Sulfate	5/30/2013	400	570
385	2013	Powerton	MW-15	Sulfate	7/30/2013	400	460
386	2013	Powerton	MW-15	Sulfate	10/23/2013	400	420
387	2013	Powerton	MW-15	TDS	5/30/2013	1200	1700
388	2013	Powerton	MW-15	TDS	7/30/2013	1200	1400
389	2013	Powerton	MW-15	TDS	10/23/2013	1200	1400
390	2013	Waukegan	MW-01	Arsenic	3/7/2013	0.01	0.098

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	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
391	2013	Waukegan	MW-01	Arsenic	6/7/2013	0.01	0.036
392	2013	Waukegan	MW-01	Arsenic	7/25/2013	0.01	0.055
393	2013	Waukegan	MW-01	Arsenic	11/4/2013	0.01	0.046
394	2013	Waukegan	MW-01	Boron	3/7/2013	2	2.2
395	2013	Waukegan	MW-01	Boron	6/7/2013	2	2.2
396	2013	Waukegan	MW-01	Boron	7/25/2013	2	2.3
397	2013	Waukegan	MW-01	Boron	11/4/2013	2	3.1
398	2013	Waukegan	MW-01	Selenium	3/7/2013	0.05	0.056
399	2013	Waukegan	MW-02	Arsenic	3/7/2013	0.01	0.012
400	2013	Waukegan	MW-02	Boron	3/7/2013	2	2.2
401	2013	Waukegan	MW-02	Boron	7/25/2013	2	2.1
402	2013	Waukegan	MW-02	Boron	11/4/2013	2	2.2
403	2013	Waukegan	MW-03	Boron	6/7/2013	2	2.5
404	2013	Waukegan	MW-03	Selenium	6/7/2013	0.05	0.067
405	2013	Waukegan	MW-04	Boron	3/7/2013	2	2.4
406	2013	Waukegan	MW-04	Boron	6/6/2013	2	2.3
407	2013	Waukegan	MW-04	Boron	7/25/2013	2	2.5
408	2013	Waukegan	MW-04	Boron	11/4/2013	2	2.8
409	2013	Waukegan	MW-05	Arsenic	3/7/2013	0.01	0.012
410	2013	Waukegan	MW-05	Boron	3/7/2013	2	33
411	2013	Waukegan	MW-05	Boron	6/6/2013	2	12
412	2013	Waukegan	MW-05	Boron	7/25/2013	2	29
413	2013	Waukegan	MW-05	Boron	11/5/2013	2	32
414	2013	Waukegan	MW-05	Sulfate	3/7/2013	400	650
415	2013	Waukegan	MW-05	Sulfate	6/6/2013	400	1200
416	2013	Waukegan	MW-05	Sulfate	7/25/2013	400	890
417	2013	Waukegan	MW-05	Sulfate	11/5/2013	400	870
418	2013	Waukegan	MW-05	TDS	3/7/2013	1200	1600
419	2013	Waukegan	MW-05	TDS	6/6/2013	1200	3500
420	2013	Waukegan	MW-05	TDS	7/25/2013	1200	2000
421	2013	Waukegan	MW-05	TDS	11/5/2013	1200	1600
422	2013	Waukegan	MW-06	Boron	3/7/2013	2	2.8
423	2013	Waukegan	MW-06	Boron	6/6/2013	2	6.7
424	2013	Waukegan	MW-06	Boron	7/25/2013	2	4.3
425	2013	Waukegan	MW-06	Boron	11/5/2013	2	2.4
426	2013	Waukegan	MW-07	Arsenic	3/7/2013	0.01	0.012
427	2013	Waukegan	MW-07	Arsenic	7/25/2013	0.01	0.011
428	2013	Waukegan	MW-07	Arsenic	11/4/2013	0.01	0.012
429	2013	Waukegan	MW-07	Boron	3/7/2013	2	49

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
430	2013	Waukegan	MW-07	Boron	6/6/2013	2	42
431	2013	Waukegan	MW-07	Boron	7/25/2013	2	44
432	2013	Waukegan	MW-07	Boron	11/4/2013	2	45
433	2013	Waukegan	MW-07	Sulfate	3/7/2013	400	710
434	2013	Waukegan	MW-07	Sulfate	6/6/2013	400	650
435	2013	Waukegan	MW-07	Sulfate	7/25/2013	400	860
436	2013	Waukegan	MW-07	Sulfate	11/4/2013	400	770
437	2013	Waukegan	MW-07	TDS	3/7/2013	1200	1800
438	2013	Waukegan	MW-07	TDS	6/6/2013	1200	1800
439	2013	Waukegan	MW-07	TDS	7/25/2013	1200	1800
440	2013	Waukegan	MW-07	TDS	11/4/2013	1200	1800
441	2013	Will	MW-01	Boron	5/23/2013	2	2.4
442	2013	Will	MW-01	Boron	8/14/2013	2	2.3
443	2013	Will	MW-01	Boron	10/29/2013	2	2.6
444	2013	Will	MW-01	Sulfate	5/23/2013	400	460
445	2013	Will	MW-01	Sulfate	8/14/2013	400	540
446	2013	Will	MW-01	Sulfate	10/29/2013	400	430
447	2013	Will	MW-01	TDS	8/14/2013	1200	1300
448	2013	Will	MW-01	TDS	10/29/2013	1200	1300
449	2013	Will	MW-02	Boron	8/14/2013	2	2.2
450	2013	Will	MW-02	Boron	10/28/2013	2	2.4
451	2013	Will	MW-03	Boron	3/5/2013	2	3.2
452	2013	Will	MW-03	Boron	5/22/2013	2	3.7
453	2013	Will	MW-03	Boron	8/14/2013	2	3.6
454	2013	Will	MW-03	Boron	10/28/2013	2	3.5
455	2013	Will	MW-03	Sulfate	5/22/2013	400	610
456	2013	Will	MW-03	Sulfate	8/14/2013	400	530
457	2013	Will	MW-03	Sulfate	10/28/2013	400	540
458	2013	Will	MW-04	Boron	3/5/2013	2	4.5
459	2013	Will	MW-04	Boron	5/22/2013	2	3.8
460	2013	Will	MW-04	Boron	8/14/2013	2	5.1
461	2013	Will	MW-04	Boron	10/28/2013	2	5.6
462	2013	Will	MW-04	Sulfate	3/5/2013	400	2000
463	2013	Will	MW-04	Sulfate	5/22/2013	400	1500
464	2013	Will	MW-04	Sulfate	8/14/2013	400	2200
465	2013	Will	MW-04	Sulfate	10/28/2013	400	1300
466	2013	Will	MW-04	TDS	3/5/2013	1200	3600
467	2013	Will	MW-04	TDS	5/22/2013	1200	2900
468	2013	Will	MW-04	TDS	8/14/2013	1200	3500

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
469	2013	Will	MW-04	TDS	10/28/2013	1200	2400
470	2013	Will	MW-05	Boron	3/5/2013	2	2.6
471	2013	Will	MW-05	Boron	6/5/2013	2	3.6
472	2013	Will	MW-05	Boron	8/14/2013	2	3.5
473	2013	Will	MW-05	Boron	10/28/2013	2	4.1
474	2013	Will	MW-05	Selenium	10/28/2013	0.05	0.17
475	2013	Will	MW-05	Sulfate	6/5/2013	400	650
476	2013	Will	MW-05	Sulfate	8/14/2013	400	500
477	2013	Will	MW-05	Sulfate	10/28/2013	400	560
478	2013	Will	MW-05	TDS	6/5/2013	1200	1600
479	2013	Will	MW-05	TDS	10/28/2013	1200	1300
480	2013	Will	MW-06	Boron	3/5/2013	2	2.7
481	2013	Will	MW-06	Boron	5/22/2013	2	2.8
482	2013	Will	MW-06	Boron	8/14/2013	2	2.9
483	2013	Will	MW-06	Boron	10/28/2013	2	3.7
484	2013	Will	MW-07	Boron	3/5/2013	2	4.3
485	2013	Will	MW-07	Boron	5/22/2013	2	2.6
486	2013	Will	MW-07	Boron	8/15/2013	2	3.5
487	2013	Will	MW-07	Boron	10/29/2013	2	3
488	2013	Will	MW-07	Sulfate	8/15/2013	400	460
489	2013	Will	MW-07	Sulfate	10/29/2013	400	530
490	2013	Will	MW-08	Arsenic	8/15/2013	0.01	0.016
491	2013	Will	MW-08	Boron	8/15/2013	2	2.4
492	2013	Will	MW-08	Boron	10/28/2013	2	3.2
493	2013	Will	MW-08	Sulfate	8/15/2013	400	440
494	2013	Will	MW-08	Sulfate	10/28/2013	400	650
495	2013	Will	MW-08	TDS	10/28/2013	1200	1600
496	2013	Will	MW-09	Boron	10/29/2013	2	2.2
497	2013	Will	MW-10	Arsenic	10/28/2013	0.01	0.012
498	2013	Will	MW-10	Boron	3/5/2013	2	2.7
499	2013	Will	MW-10	Boron	5/22/2013	2	2.7
500	2013	Will	MW-10	Boron	8/15/2013	2	2.3
501	2013	Will	MW-10	Boron	10/28/2013	2	3.8
502	2014	Joliet 29	MW-08	Sulfate	5/1/2014	400	460
503	2014	Joliet 29	MW-08	TDS	5/1/2014	1200	2100
504	2014	Joliet 29	MW-09	Sulfate	2/17/2014	400	560
505	2014	Joliet 29	MW-09	Sulfate	5/1/2014	400	560
506	2014	Joliet 29	MW-09	Sulfate	8/18/2014	400	880
507	2014	Joliet 29	MW-09	Sulfate	10/23/2014	400	960

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	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
508	2014	Joliet 29	MW-09	TDS	2/17/2014	1200	1600
509	2014	Joliet 29	MW-09	TDS	5/1/2014	1200	1700
510	2014	Joliet 29	MW-09	TDS	8/18/2014	1200	2100
511	2014	Joliet 29	MW-09	TDS	10/23/2014	1200	1700
512	2014	Powerton	MW-06	Arsenic	5/29/2014	0.01	0.2
513	2014	Powerton	MW-06	Sulfate	3/6/2014	400	410
514	2014	Powerton	MW-06	Sulfate	5/29/2014	400	530
515	2014	Powerton	MW-06	TDS	5/29/2014	1200	1400
516	2014	Powerton	MW-06	TDS	8/27/2014	1200	1300
517	2014	Powerton	MW-07	Arsenic	3/5/2014	0.01	0.15
518	2014	Powerton	MW-07	Arsenic	8/27/2014	0.01	0.19
519	2014	Powerton	MW-07	Arsenic	10/29/2014	0.01	0.31
520	2014	Powerton	MW-07	TDS	8/27/2014	1200	1300
521	2014	Powerton	MW-07	TDS	10/29/2014	1200	1300
522	2014	Powerton	MW-08	TDS	5/28/2014	1200	1400
523	2014	Powerton	MW-08	TDS	8/27/2014	1200	1400
524	2014	Powerton	MW-09	Boron	5/29/2014	2	2.5
525	2014	Powerton	MW-09	Boron	8/26/2014	2	2.4
526	2014	Powerton	MW-10	Boron	3/6/2014	2	2.1
527	2014	Powerton	MW-10	Boron	5/30/2014	2	3.2
528	2014	Powerton	MW-11	Arsenic	3/4/2014	0.01	0.057
529	2014	Powerton	MW-11	Arsenic	5/29/2014	0.01	0.036
530	2014	Powerton	MW-11	Arsenic	8/26/2014	0.01	0.068
531	2014	Powerton	MW-11	Arsenic	10/28/2014	0.01	0.045
532	2014	Powerton	MW-12	Sulfate	3/4/2014	400	530
533	2014	Powerton	MW-12	Sulfate	5/29/2014	400	560
534	2014	Powerton	MW-12	Sulfate	10/28/2014	400	420
535	2014	Powerton	MW-12	TDS	3/4/2014	1200	1400
536	2014	Powerton	MW-12	TDS	5/29/2014	1200	1300
537	2014	Powerton	MW-13	Arsenic	3/4/2014	0.01	0.028
538	2014	Powerton	MW-13	Arsenic	5/28/2014	0.01	0.024
539	2014	Powerton	MW-13	Arsenic	8/27/2014	0.01	0.031
540	2014	Powerton	MW-13	Arsenic	10/29/2014	0.01	0.028
541	2014	Powerton	MW-13	Boron	3/4/2014	2	2.9
542	2014	Powerton	MW-13	Boron	5/28/2014	2	3.5
543	2014	Powerton	MW-13	Boron	8/27/2014	2	3
544	2014	Powerton	MW-13	Boron	10/29/2014	2	2.2
545	2014	Powerton	MW-13	Sulfate	3/4/2014	400	660
546	2014	Powerton	MW-13	Sulfate	5/28/2014	400	630

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	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
547	2014	Powerton	MW-13	Sulfate	8/27/2014	400	740
548	2014	Powerton	MW-13	Sulfate	10/29/2014	400	1400
549	2014	Powerton	MW-13	TDS	3/4/2014	1200	1900
550	2014	Powerton	MW-13	TDS	5/28/2014	1200	2100
551	2014	Powerton	MW-13	TDS	8/27/2014	1200	2300
552	2014	Powerton	MW-13	TDS	10/29/2014	1200	2200
553	2014	Powerton	MW-14	Boron	10/29/2014	2	2.2
554	2014	Powerton	MW-14	Sulfate	3/4/2014	400	680
555	2014	Powerton	MW-14	Sulfate	5/28/2014	400	720
556	2014	Powerton	MW-14	Sulfate	8/28/2014	400	1100
557	2014	Powerton	MW-14	Sulfate	10/29/2014	400	1300
558	2014	Powerton	MW-14	TDS	3/4/2014	1200	1900
559	2014	Powerton	MW-14	TDS	5/28/2014	1200	1700
560	2014	Powerton	MW-14	TDS	8/28/2014	1200	2400
561	2014	Powerton	MW-14	TDS	10/29/2014	1200	2200
562	2014	Powerton	MW-14	Thallium	3/4/2014	0.002	0.0023
563	2014	Powerton	MW-14	Thallium	5/28/2014	0.002	0.0026
564	2014	Powerton	MW-14	Thallium	8/28/2014	0.002	0.0023
565	2014	Powerton	MW-15	Sulfate	8/27/2014	400	620
566	2014	Powerton	MW-15	Sulfate	10/28/2014	400	660
567	2014	Powerton	MW-15	TDS	3/6/2014	1200	1300
568	2014	Powerton	MW-15	TDS	5/28/2014	1200	1300
569	2014	Powerton	MW-15	TDS	8/27/2014	1200	1800
570	2014	Powerton	MW-15	TDS	10/28/2014	1200	1600
571	2014	Waukegan	MW-01	Arsenic	3/10/2014	0.01	0.031
572	2014	Waukegan	MW-01	Arsenic	5/16/2014	0.01	0.036
573	2014	Waukegan	MW-01	Arsenic	8/21/2014	0.01	0.019
574	2014	Waukegan	MW-01	Arsenic	11/6/2014	0.01	0.21
575	2014	Waukegan	MW-01	Boron	11/6/2014	2	2.2
576	2014	Waukegan	MW-02	Boron	3/10/2014	2	2.8
577	2014	Waukegan	MW-02	Boron	5/15/2014	2	2.6
578	2014	Waukegan	MW-02	Boron	8/21/2014	2	3
579	2014	Waukegan	MW-02	Boron	11/6/2014	2	3
580	2014	Waukegan	MW-03	Boron	8/21/2014	2	2.3
581	2014	Waukegan	MW-03	Boron	11/6/2014	2	2.3
582	2014	Waukegan	MW-04	Boron	3/11/2014	2	3
583	2014	Waukegan	MW-04	Boron	5/16/2014	2	2.7
584	2014	Waukegan	MW-05	Boron	3/11/2014	2	31
585	2014	Waukegan	MW-05	Boron	5/16/2014	2	36

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
586	2014	Waukegan	MW-05	Boron	8/21/2014	2	35
587	2014	Waukegan	MW-05	Boron	11/5/2014	2	36
588	2014	Waukegan	MW-05	Sulfate	3/11/2014	400	640
589	2014	Waukegan	MW-05	Sulfate	5/16/2014	400	630
590	2014	Waukegan	MW-05	Sulfate	8/21/2014	400	640
591	2014	Waukegan	MW-05	Sulfate	11/5/2014	400	840
592	2014	Waukegan	MW-05	TDS	3/11/2014	1200	1400
593	2014	Waukegan	MW-05	TDS	5/16/2014	1200	1500
594	2014	Waukegan	MW-05	TDS	8/21/2014	1200	1600
595	2014	Waukegan	MW-05	TDS	11/5/2014	1200	1500
596	2014	Waukegan	MW-06	Boron	5/15/2014	2	2.2
597	2014	Waukegan	MW-06	Boron	8/21/2014	2	2.9
598	2014	Waukegan	MW-06	Boron	11/5/2014	2	3.7
599	2014	Waukegan	MW-07	Arsenic	8/21/2014	0.01	0.011
600	2014	Waukegan	MW-07	Boron	3/10/2014	2	39
601	2014	Waukegan	MW-07	Boron	5/15/2014	2	27
602	2014	Waukegan	MW-07	Boron	8/21/2014	2	40
603	2014	Waukegan	MW-07	Boron	11/5/2014	2	41
604	2014	Waukegan	MW-07	Sulfate	3/10/2014	400	540
605	2014	Waukegan	MW-07	Sulfate	8/21/2014	400	690
606	2014	Waukegan	MW-07	Sulfate	11/5/2014	400	880
607	2014	Waukegan	MW-07	TDS	3/10/2014	1200	1600
608	2014	Waukegan	MW-07	TDS	5/15/2014	1200	1300
609	2014	Waukegan	MW-07	TDS	8/21/2014	1200	1600
610	2014	Waukegan	MW-07	TDS	11/5/2014	1200	1500
611	2014	Waukegan	MW-08	Boron	5/15/2014	2	19
612	2014	Waukegan	MW-08	Boron	8/22/2014	2	24
613	2014	Waukegan	MW-08	Boron	11/5/2014	2	28
614	2014	Waukegan	MW-08	Sulfate	11/5/2014	400	500
615	2014	Waukegan	MW-09	Boron	5/15/2014	2	16
616	2014	Waukegan	MW-09	Boron	8/22/2014	2	6.3
617	2014	Waukegan	MW-09	Boron	11/5/2014	2	13
618	2014	Waukegan	MW-09	Sulfate	11/5/2014	400	430
619	2014	Waukegan	MW-09	TDS	5/15/2014	1200	1600
620	2014	Waukegan	MW-09	TDS	8/22/2014	1200	1300
621	2014	Waukegan	MW-09	TDS	11/5/2014	1200	1400
622	2014	Waukegan	MW-10	Arsenic	8/22/2014	0.01	0.75
623	2014	Waukegan	MW-10	Arsenic	11/6/2014	0.01	0.4
624	2014	Waukegan	MW-11	Arsenic	8/22/2014	0.01	1.3

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
625	2014	Waukegan	MW-11	Arsenic	11/6/2014	0.01	1
626	2014	Waukegan	MW-11	Boron	8/22/2014	2	5.1
627	2014	Waukegan	MW-11	Boron	11/6/2014	2	3.5
628	2014	Waukegan	MW-14	Arsenic	8/22/2014	0.01	0.13
629	2014	Waukegan	MW-14	Arsenic	11/6/2014	0.01	0.049
630	2014	Waukegan	MW-14	TDS	8/22/2014	1200	1300
631	2014	Waukegan	MW-15	Arsenic	11/5/2014	0.01	0.012
632	2014	Waukegan	MW-15	Boron	8/22/2014	2	3.7
633	2014	Waukegan	MW-15	Boron	11/5/2014	2	5.1
634	2014	Will	MW-01	Boron	2/20/2014	2	2.4
635	2014	Will	MW-01	Boron	5/20/2014	2	2.5
636	2014	Will	MW-01	TDS	2/20/2014	1200	1300
637	2014	Will	MW-02	Arsenic	10/20/2014	0.01	0.013
638	2014	Will	MW-02	Boron	2/20/2014	2	2.4
639	2014	Will	MW-02	Boron	5/20/2014	2	2.8
640	2014	Will	MW-02	Boron	8/13/2014	2	3
641	2014	Will	MW-02	Boron	10/20/2014	2	3.6
642	2014	Will	MW-02	Sulfate	10/20/2014	400	510
643	2014	Will	MW-03	Boron	2/13/2014	2	3.2
644	2014	Will	MW-03	Boron	5/21/2014	2	3.3
645	2014	Will	MW-03	Boron	8/12/2014	2	3.5
646	2014	Will	MW-03	Boron	10/20/2014	2	3.6
647	2014	Will	MW-03	Sulfate	2/13/2014	400	560
648	2014	Will	MW-03	Sulfate	5/21/2014	400	560
649	2014	Will	MW-03	Sulfate	8/12/2014	400	570
650	2014	Will	MW-03	Sulfate	10/20/2014	400	570
651	2014	Will	MW-04	Boron	2/13/2014	2	4.6
652	2014	Will	MW-04	Boron	5/21/2014	2	4.2
653	2014	Will	MW-04	Boron	8/13/2014	2	4.8
654	2014	Will	MW-04	Boron	10/20/2014	2	4.5
655	2014	Will	MW-04	Sulfate	2/13/2014	400	1400
656	2014	Will	MW-04	Sulfate	5/21/2014	400	1100
657	2014	Will	MW-04	Sulfate	8/13/2014	400	1200
658	2014	Will	MW-04	Sulfate	10/20/2014	400	1600
659	2014	Will	MW-04	TDS	2/13/2014	1200	2800
660	2014	Will	MW-04	TDS	5/21/2014	1200	2500
661	2014	Will	MW-04	TDS	8/13/2014	1200	2200
662	2014	Will	MW-04	TDS	10/20/2014	1200	2600
663	2014	Will	MW-05	Boron	2/13/2014	2	2.7

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
664	2014	Will	MW-05	Boron	5/21/2014	2	2.9
665	2014	Will	MW-05	Boron	8/12/2014	2	2.7
666	2014	Will	MW-05	Boron	10/20/2014	2	4.7
667	2014	Will	MW-05	Sulfate	2/13/2014	400	690
668	2014	Will	MW-05	Sulfate	5/21/2014	400	1700
669	2014	Will	MW-05	Sulfate	8/12/2014	400	610
670	2014	Will	MW-05	Sulfate	10/20/2014	400	840
671	2014	Will	MW-05	TDS	2/13/2014	1200	1400
672	2014	Will	MW-05	TDS	5/21/2014	1200	1600
673	2014	Will	MW-05	TDS	8/12/2014	1200	1400
674	2014	Will	MW-05	TDS	10/20/2014	1200	2100
675	2014	Will	MW-06	Boron	2/13/2014	2	3
676	2014	Will	MW-06	Boron	5/20/2014	2	2.9
677	2014	Will	MW-06	Boron	8/12/2014	2	2.8
678	2014	Will	MW-06	Boron	10/20/2014	2	3.4
679	2014	Will	MW-06	Sulfate	10/20/2014	400	420
680	2014	Will	MW-07	Boron	2/20/2014	2	4
681	2014	Will	MW-07	Boron	5/20/2014	2	4.8
682	2014	Will	MW-07	Boron	8/12/2014	2	3.9
683	2014	Will	MW-07	Boron	10/21/2014	2	5.1
684	2014	Will	MW-07	Sulfate	5/20/2014	400	540
685	2014	Will	MW-07	Sulfate	8/12/2014	400	570
686	2014	Will	MW-07	Sulfate	10/21/2014	400	680
687	2014	Will	MW-07	TDS	2/20/2014	1200	1300
688	2014	Will	MW-07	TDS	5/20/2014	1200	1300
689	2014	Will	MW-07	TDS	8/12/2014	1200	1300
690	2014	Will	MW-07	TDS	10/21/2014	1200	1500
691	2014	Will	MW-08	Arsenic	8/12/2014	0.01	0.014
692	2014	Will	MW-08	Boron	5/20/2014	2	2.5
693	2014	Will	MW-08	Boron	8/12/2014	2	2.4
694	2014	Will	MW-08	Boron	10/21/2014	2	2.8
695	2014	Will	MW-08	Sulfate	5/20/2014	400	450
696	2014	Will	MW-08	Sulfate	8/12/2014	400	430
697	2014	Will	MW-08	Sulfate	10/21/2014	400	730
698	2014	Will	MW-08	TDS	2/20/2014	1200	1300
699	2014	Will	MW-08	TDS	5/20/2014	1200	1400
700	2014	Will	MW-08	TDS	10/21/2014	1200	1500
701	2014	Will	MW-09	Sulfate	10/21/2014	400	430
702	2014	Will	MW-10	Boron	2/20/2014	2	2.5

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
703	2014	Will	MW-10	Boron	5/20/2014	2	2.2
704	2014	Will	MW-10	Boron	8/13/2014	2	2.1
705	2014	Will	MW-10	Boron	10/20/2014	2	3.3
706	2015	Joliet 29	MW-08	Sulfate	2/10/2015	400	600
707	2015	Joliet 29	MW-08	TDS	2/10/2015	1200	2000
708	2015	Joliet 29	MW-09	Sulfate	2/10/2015	400	820
709	2015	Joliet 29	MW-09	Sulfate	5/27/2015	400	1100
710	2015	Joliet 29	MW-09	Sulfate	8/4/2015	400	1900
711	2015	Joliet 29	MW-09	Sulfate	10/27/2015	400	1100
712	2015	Joliet 29	MW-09	TDS	2/10/2015	1200	2400
713	2015	Joliet 29	MW-09	TDS	5/27/2015	1200	3100
714	2015	Joliet 29	MW-09	TDS	8/4/2015	1200	3900
715	2015	Joliet 29	MW-09	TDS	10/27/2015	1200	2600
716	2015	Joliet 29	MW-11	Cadmium	2/11/2015	0.005	0.0077
717	2015	Joliet 29	MW-11	Lead	2/11/2015	0.0075	0.023
718	2015	Joliet 29	MW-11	TDS	2/11/2015	1200	1300
719	2015	Powerton	MW-06	Sulfate	11/17/2015	400	490
720	2015	Powerton	MW-06	TDS	5/11/2015	1200	1300
721	2015	Powerton	MW-06	TDS	8/18/2015	1200	1400
722	2015	Powerton	MW-07	Arsenic	2/23/2015	0.01	0.18
723	2015	Powerton	MW-07	Arsenic	5/11/2015	0.01	0.18
724	2015	Powerton	MW-07	Arsenic	8/18/2015	0.01	0.23
725	2015	Powerton	MW-07	Arsenic	11/16/2015	0.01	0.13
726	2015	Powerton	MW-07	TDS	8/18/2015	1200	1300
727	2015	Powerton	MW-08	Sulfate	11/18/2015	400	530
728	2015	Powerton	MW-09	Boron	2/24/2015	2	3
729	2015	Powerton	MW-09	Boron	5/12/2015	2	3.2
730	2015	Powerton	MW-09	Boron	8/19/2015	2	3.3
731	2015	Powerton	MW-09	Boron	11/18/2015	2	2.2
732	2015	Powerton	MW-11	Arsenic	2/24/2015	0.01	0.022
733	2015	Powerton	MW-11	Arsenic	5/12/2015	0.01	0.052
734	2015	Powerton	MW-11	Arsenic	8/19/2015	0.01	0.027
735	2015	Powerton	MW-11	Arsenic	11/19/2015	0.01	0.015
736	2015	Powerton	MW-12	Sulfate	2/24/2015	400	450
737	2015	Powerton	MW-12	Sulfate	5/12/2015	400	530
738	2015	Powerton	MW-12	Sulfate	11/19/2015	400	750
739	2015	Powerton	MW-12	TDS	2/24/2015	1200	1300
740	2015	Powerton	MW-12	TDS	5/12/2015	1200	1400
741	2015	Powerton	MW-12	TDS	8/19/2015	1200	1300

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
742	2015	Powerton	MW-12	TDS	11/19/2015	1200	1400
743	2015	Powerton	MW-13	Arsenic	2/26/2015	0.01	0.028
744	2015	Powerton	MW-13	Arsenic	5/13/2015	0.01	0.033
745	2015	Powerton	MW-13	Arsenic	8/19/2015	0.01	0.03
746	2015	Powerton	MW-13	Arsenic	11/19/2015	0.01	0.027
747	2015	Powerton	MW-13	Boron	2/26/2015	2	3.5
748	2015	Powerton	MW-13	Boron	5/13/2015	2	3.8
749	2015	Powerton	MW-13	Boron	8/19/2015	2	3.6
750	2015	Powerton	MW-13	Boron	11/19/2015	2	3.2
751	2015	Powerton	MW-13	Sulfate	2/26/2015	400	1000
752	2015	Powerton	MW-13	Sulfate	5/13/2015	400	1100
753	2015	Powerton	MW-13	Sulfate	8/19/2015	400	1300
754	2015	Powerton	MW-13	Sulfate	11/19/2015	400	1700
755	2015	Powerton	MW-13	TDS	2/26/2015	1200	2300
756	2015	Powerton	MW-13	TDS	5/13/2015	1200	2600
757	2015	Powerton	MW-13	TDS	8/19/2015	1200	2500
758	2015	Powerton	MW-13	TDS	11/19/2015	1200	2400
759	2015	Powerton	MW-14	Boron	2/26/2015	2	2.2
760	2015	Powerton	MW-14	Boron	11/18/2015	2	2.5
761	2015	Powerton	MW-14	Sulfate	2/26/2015	400	850
762	2015	Powerton	MW-14	Sulfate	5/13/2015	400	1200
763	2015	Powerton	MW-14	Sulfate	8/19/2015	400	1000
764	2015	Powerton	MW-14	Sulfate	11/18/2015	400	1200
765	2015	Powerton	MW-14	TDS	2/26/2015	1200	2200
766	2015	Powerton	MW-14	TDS	5/13/2015	1200	2700
767	2015	Powerton	MW-14	TDS	8/19/2015	1200	2400
768	2015	Powerton	MW-14	TDS	11/18/2015	1200	2300
769	2015	Powerton	MW-14	Thallium	5/13/2015	0.002	0.0044
770	2015	Powerton	MW-14	Thallium	8/19/2015	0.002	0.0065
771	2015	Powerton	MW-14	Thallium	11/18/2015	0.002	0.0033
772	2015	Powerton	MW-15	Selenium	2/26/2015	0.05	0.068
773	2015	Powerton	MW-15	Selenium	5/14/2015	0.05	0.051
774	2015	Powerton	MW-15	Sulfate	2/26/2015	400	460
775	2015	Powerton	MW-15	Sulfate	5/14/2015	400	930
776	2015	Powerton	MW-15	Sulfate	8/19/2015	400	640
777	2015	Powerton	MW-15	Sulfate	11/18/2015	400	1500
778	2015	Powerton	MW-15	TDS	2/26/2015	1200	1400
779	2015	Powerton	MW-15	TDS	5/14/2015	1200	2500
780	2015	Powerton	MW-15	TDS	8/19/2015	1200	1900

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
781	2015	Powerton	MW-15	TDS	11/18/2015	1200	2400
782	2015	Powerton	MW-17	Sulfate	11/19/2015	400	850
783	2015	Powerton	MW-17	TDS	11/19/2015	1200	1800
784	2015	Waukegan	MW-01	Arsenic	2/17/2015	0.01	0.05
785	2015	Waukegan	MW-01	Arsenic	4/21/2015	0.01	0.056
786	2015	Waukegan	MW-01	Arsenic	8/12/2015	0.01	0.034
787	2015	Waukegan	MW-01	Arsenic	11/2/2015	0.01	0.073
788	2015	Waukegan	MW-02	Arsenic	8/12/2015	0.01	0.042
789	2015	Waukegan	MW-02	Arsenic	11/2/2015	0.01	0.015
790	2015	Waukegan	MW-02	Boron	2/17/2015	2	3.2
791	2015	Waukegan	MW-02	Boron	4/21/2015	2	2.9
792	2015	Waukegan	MW-02	Boron	8/12/2015	2	2.5
793	2015	Waukegan	MW-02	Boron	11/2/2015	2	2.5
794	2015	Waukegan	MW-05	Arsenic	4/20/2015	0.01	0.017
795	2015	Waukegan	MW-05	Boron	2/17/2015	2	32
796	2015	Waukegan	MW-05	Boron	4/20/2015	2	24
797	2015	Waukegan	MW-05	Boron	8/13/2015	2	11
798	2015	Waukegan	MW-05	Boron	11/3/2015	2	12
799	2015	Waukegan	MW-05	Sulfate	2/17/2015	400	660
800	2015	Waukegan	MW-05	Sulfate	4/20/2015	400	700
801	2015	Waukegan	MW-05	Sulfate	8/13/2015	400	1200
802	2015	Waukegan	MW-05	Sulfate	11/3/2015	400	910
803	2015	Waukegan	MW-05	TDS	2/17/2015	1200	1700
804	2015	Waukegan	MW-05	TDS	4/20/2015	1200	2200
805	2015	Waukegan	MW-05	TDS	8/13/2015	1200	3500
806	2015	Waukegan	MW-05	TDS	11/3/2015	1200	2700
807	2015	Waukegan	MW-06	Boron	2/18/2015	2	3.5
808	2015	Waukegan	MW-07	Arsenic	2/17/2015	0.01	0.011
809	2015	Waukegan	MW-07	Arsenic	4/20/2015	0.01	0.014
810	2015	Waukegan	MW-07	Arsenic	11/3/2015	0.01	0.011
811	2015	Waukegan	MW-07	Boron	2/17/2015	2	37
812	2015	Waukegan	MW-07	Boron	4/20/2015	2	37
813	2015	Waukegan	MW-07	Boron	8/12/2015	2	32
814	2015	Waukegan	MW-07	Boron	11/3/2015	2	26
815	2015	Waukegan	MW-07	Sulfate	2/17/2015	400	710
816	2015	Waukegan	MW-07	Sulfate	4/20/2015	400	470
817	2015	Waukegan	MW-07	Sulfate	8/12/2015	400	760
818	2015	Waukegan	MW-07	Sulfate	11/3/2015	400	770
819	2015	Waukegan	MW-07	TDS	2/17/2015	1200	1600

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
820	2015	Waukegan	MW-07	TDS	4/20/2015	1200	1400
821	2015	Waukegan	MW-07	TDS	8/12/2015	1200	1700
822	2015	Waukegan	MW-07	TDS	11/3/2015	1200	1500
823	2015	Waukegan	MW-08	Boron	2/18/2015	2	24
824	2015	Waukegan	MW-08	Boron	4/21/2015	2	23
825	2015	Waukegan	MW-08	Boron	8/12/2015	2	22
826	2015	Waukegan	MW-08	Boron	11/4/2015	2	22
827	2015	Waukegan	MW-08	Sulfate	2/18/2015	400	420
828	2015	Waukegan	MW-08	Sulfate	11/4/2015	400	470
829	2015	Waukegan	MW-08	TDS	8/12/2015	1200	1300
830	2015	Waukegan	MW-09	Boron	2/18/2015	2	7.5
831	2015	Waukegan	MW-09	Boron	4/21/2015	2	20
832	2015	Waukegan	MW-09	Boron	8/13/2015	2	15
833	2015	Waukegan	MW-09	Boron	11/4/2015	2	12
834	2015	Waukegan	MW-09	Sulfate	8/13/2015	400	450
835	2015	Waukegan	MW-09	TDS	2/18/2015	1200	1300
836	2015	Waukegan	MW-09	TDS	4/21/2015	1200	1400
837	2015	Waukegan	MW-09	TDS	8/13/2015	1200	2200
838	2015	Waukegan	MW-09	TDS	11/4/2015	1200	1600
839	2015	Waukegan	MW-10	Arsenic	2/18/2015	0.01	0.12
840	2015	Waukegan	MW-10	Arsenic	4/20/2015	0.01	0.74
841	2015	Waukegan	MW-10	Arsenic	11/4/2015	0.01	0.63
842	2015	Waukegan	MW-11	Arsenic	2/18/2015	0.01	0.96
843	2015	Waukegan	MW-11	Arsenic	4/20/2015	0.01	0.79
844	2015	Waukegan	MW-11	Arsenic	8/11/2015	0.01	0.81
845	2015	Waukegan	MW-11	Arsenic	11/5/2015	0.01	0.82
846	2015	Waukegan	MW-11	Boron	2/18/2015	2	2.8
847	2015	Waukegan	MW-11	Boron	4/20/2015	2	2.5
848	2015	Waukegan	MW-11	Boron	8/11/2015	2	5
849	2015	Waukegan	MW-11	Boron	11/5/2015	2	4.4
850	2015	Waukegan	MW-12	Arsenic	4/20/2015	0.01	0.012
851	2015	Waukegan	MW-12	Arsenic	8/11/2015	0.01	0.46
852	2015	Waukegan	MW-12	Boron	4/20/2015	2	10
853	2015	Waukegan	MW-12	TDS	2/18/2015	1200	1400
854	2015	Waukegan	MW-14	Arsenic	4/20/2015	0.01	0.05
855	2015	Waukegan	MW-14	Arsenic	8/11/2015	0.01	0.32
856	2015	Waukegan	MW-14	Arsenic	11/5/2015	0.01	0.23
857	2015	Waukegan	MW-15	Arsenic	8/11/2015	0.01	0.32
858	2015	Waukegan	MW-15	Boron	4/20/2015	2	4.8

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
859	2015	Waukegan	MW-15	Boron	11/3/2015	2	6.8
860	2015	Will	MW-02	Arsenic	7/28/2015	0.01	0.013
861	2015	Will	MW-02	Arsenic	11/10/2015	0.01	0.018
862	2015	Will	MW-02	Boron	2/4/2015	2	3.8
863	2015	Will	MW-02	Boron	5/1/2015	2	3.8
864	2015	Will	MW-02	Boron	7/28/2015	2	4
865	2015	Will	MW-02	Boron	11/10/2015	2	4.4
866	2015	Will	MW-02	Sulfate	5/1/2015	400	460
867	2015	Will	MW-02	Sulfate	7/28/2015	400	610
868	2015	Will	MW-02	Sulfate	11/10/2015	400	600
869	2015	Will	MW-02	TDS	7/28/2015	1200	1300
870	2015	Will	MW-03	Boron	2/4/2015	2	2.9
871	2015	Will	MW-03	Boron	5/1/2015	2	2.9
872	2015	Will	MW-03	Boron	7/28/2015	2	4.1
873	2015	Will	MW-03	Boron	11/10/2015	2	3
874	2015	Will	MW-03	Sulfate	7/28/2015	400	520
875	2015	Will	MW-04	Boron	2/4/2015	2	3.9
876	2015	Will	MW-04	Boron	5/1/2015	2	4
877	2015	Will	MW-04	Boron	7/28/2015	2	5.4
878	2015	Will	MW-04	Boron	11/11/2015	2	5
879	2015	Will	MW-04	Sulfate	2/4/2015	400	1100
880	2015	Will	MW-04	Sulfate	5/1/2015	400	860
881	2015	Will	MW-04	Sulfate	7/28/2015	400	1600
882	2015	Will	MW-04	Sulfate	11/11/2015	400	870
883	2015	Will	MW-04	TDS	2/4/2015	1200	2600
884	2015	Will	MW-04	TDS	5/1/2015	1200	2300
885	2015	Will	MW-04	TDS	7/28/2015	1200	3200
886	2015	Will	MW-04	TDS	11/11/2015	1200	1900
887	2015	Will	MW-05	Boron	2/3/2015	2	2.4
888	2015	Will	MW-05	Boron	5/1/2015	2	3.7
889	2015	Will	MW-05	Boron	7/28/2015	2	5.3
890	2015	Will	MW-05	Boron	11/11/2015	2	5.9
891	2015	Will	MW-05	Sulfate	2/3/2015	400	430
892	2015	Will	MW-05	Sulfate	5/1/2015	400	480
893	2015	Will	MW-05	Sulfate	7/28/2015	400	770
894	2015	Will	MW-05	Sulfate	11/11/2015	400	780
895	2015	Will	MW-05	TDS	5/1/2015	1200	1600
896	2015	Will	MW-05	TDS	7/28/2015	1200	2000
897	2015	Will	MW-05	TDS	11/11/2015	1200	1900

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
898	2015	Will	MW-06	Boron	2/3/2015	2	3.2
899	2015	Will	MW-06	Boron	4/30/2015	2	3
900	2015	Will	MW-06	Boron	7/28/2015	2	3.6
901	2015	Will	MW-06	Boron	11/10/2015	2	3.4
902	2015	Will	MW-07	Boron	2/3/2015	2	3
903	2015	Will	MW-07	Boron	4/30/2015	2	3.3
904	2015	Will	MW-07	Boron	7/27/2015	2	3.1
905	2015	Will	MW-07	Boron	11/9/2015	2	2.9
906	2015	Will	MW-07	Sulfate	4/30/2015	400	440
907	2015	Will	MW-07	Sulfate	7/27/2015	400	420
908	2015	Will	MW-07	Sulfate	11/9/2015	400	420
909	2015	Will	MW-08	Boron	2/3/2015	2	2.3
910	2015	Will	MW-08	Boron	4/30/2015	2	2.3
911	2015	Will	MW-08	Boron	7/27/2015	2	2.8
912	2015	Will	MW-08	Boron	11/9/2015	2	4
913	2015	Will	MW-08	Sulfate	2/3/2015	400	530
914	2015	Will	MW-08	Sulfate	4/30/2015	400	520
915	2015	Will	MW-08	Sulfate	7/27/2015	400	650
916	2015	Will	MW-08	Sulfate	11/9/2015	400	800
917	2015	Will	MW-08	TDS	2/3/2015	1200	1400
918	2015	Will	MW-08	TDS	4/30/2015	1200	1400
919	2015	Will	MW-08	TDS	11/9/2015	1200	1600
920	2015	Will	MW-09	Boron	11/11/2015	2	2.1
921	2015	Will	MW-10	Arsenic	2/3/2015	0.01	0.012
922	2015	Will	MW-10	Arsenic	4/30/2015	0.01	0.014
923	2015	Will	MW-10	Arsenic	11/10/2015	0.01	0.017
924	2015	Will	MW-10	Boron	2/3/2015	2	3.3
925	2015	Will	MW-10	Boron	4/30/2015	2	3.6
926	2015	Will	MW-10	Boron	7/27/2015	2	3.1
927	2015	Will	MW-10	Boron	11/10/2015	2	4.4
928	2016	Joliet 29	MW-09	Sulfate	2/9/2016	400	3600
929	2016	Joliet 29	MW-09	Sulfate	5/11/2016	400	12000
930	2016	Joliet 29	MW-09	Sulfate	8/30/2016	400	8100
931	2016	Joliet 29	MW-09	Sulfate	11/1/2016	400	3600
932	2016	Joliet 29	MW-09	TDS	2/9/2016	1200	4700
933	2016	Joliet 29	MW-09	TDS	5/11/2016	1200	19000
934	2016	Joliet 29	MW-09	TDS	8/30/2016	1200	15000
935	2016	Joliet 29	MW-09	TDS	11/1/2016	1200	6100
936	2016	Powerton	MW-06	Sulfate	5/17/2016	400	500

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
937	2016	Powerton	MW-06	Sulfate	11/16/2016	400	470
938	2016	Powerton	MW-06	TDS	5/17/2016	1200	1400
939	2016	Powerton	MW-07	Arsenic	2/24/2016	0.01	0.21
940	2016	Powerton	MW-07	Arsenic	5/18/2016	0.01	0.13
941	2016	Powerton	MW-07	Arsenic	8/19/2016	0.01	0.14
942	2016	Powerton	MW-07	Arsenic	11/16/2016	0.01	0.18
943	2016	Powerton	MW-07	TDS	2/24/2016	1200	1300
944	2016	Powerton	MW-07	TDS	8/19/2016	1200	1400
945	2016	Powerton	MW-08	TDS	8/17/2016	1200	1400
946	2016	Powerton	MW-08	TDS	11/15/2016	1200	1300
947	2016	Powerton	MW-09	Boron	2/25/2016	2	2.3
948	2016	Powerton	MW-09	Boron	8/17/2016	2	2.7
949	2016	Powerton	MW-09	Boron	11/17/2016	2	3.8
950	2016	Powerton	MW-11	Arsenic	5/20/2016	0.01	0.011
951	2016	Powerton	MW-11	Arsenic	8/17/2016	0.01	0.015
952	2016	Powerton	MW-12	Arsenic	11/18/2016	0.01	0.013
953	2016	Powerton	MW-12	Sulfate	2/26/2016	400	580
954	2016	Powerton	MW-12	Sulfate	5/20/2016	400	570
955	2016	Powerton	MW-12	Sulfate	8/18/2016	400	600
956	2016	Powerton	MW-12	TDS	2/26/2016	1200	1300
957	2016	Powerton	MW-12	TDS	5/20/2016	1200	1300
958	2016	Powerton	MW-12	TDS	8/18/2016	1200	1700
959	2016	Powerton	MW-12	TDS	11/18/2016	1200	1300
960	2016	Powerton	MW-13	Arsenic	2/24/2016	0.01	0.027
961	2016	Powerton	MW-13	Arsenic	5/19/2016	0.01	0.033
962	2016	Powerton	MW-13	Arsenic	8/18/2016	0.01	0.027
963	2016	Powerton	MW-13	Arsenic	11/17/2016	0.01	0.028
964	2016	Powerton	MW-13	Boron	2/24/2016	2	3.7
965	2016	Powerton	MW-13	Boron	5/19/2016	2	2.9
966	2016	Powerton	MW-13	Boron	8/18/2016	2	3
967	2016	Powerton	MW-13	Boron	11/17/2016	2	3.7
968	2016	Powerton	MW-13	Sulfate	2/24/2016	400	1300
969	2016	Powerton	MW-13	Sulfate	5/19/2016	400	1200
970	2016	Powerton	MW-13	Sulfate	8/18/2016	400	1500
971	2016	Powerton	MW-13	Sulfate	11/17/2016	400	1700
972	2016	Powerton	MW-13	TDS	2/24/2016	1200	2600
973	2016	Powerton	MW-13	TDS	5/19/2016	1200	2800
974	2016	Powerton	MW-13	TDS	8/18/2016	1200	3300
975	2016	Powerton	MW-13	TDS	11/17/2016	1200	3400

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
976	2016	Powerton	MW-14	Boron	2/24/2016	2	2.3
977	2016	Powerton	MW-14	Boron	5/19/2016	2	2.2
978	2016	Powerton	MW-14	Sulfate	2/24/2016	400	730
979	2016	Powerton	MW-14	Sulfate	5/19/2016	400	650
980	2016	Powerton	MW-14	Sulfate	8/18/2016	400	1000
981	2016	Powerton	MW-14	Sulfate	11/17/2016	400	1200
982	2016	Powerton	MW-14	TDS	2/24/2016	1200	1800
983	2016	Powerton	MW-14	TDS	5/19/2016	1200	1800
984	2016	Powerton	MW-14	TDS	8/18/2016	1200	2300
985	2016	Powerton	MW-14	TDS	11/17/2016	1200	2900
986	2016	Powerton	MW-14	Thallium	2/24/2016	0.002	0.0043
987	2016	Powerton	MW-14	Thallium	5/19/2016	0.002	0.0028
988	2016	Powerton	MW-14	Thallium	8/18/2016	0.002	0.0041
989	2016	Powerton	MW-14	Thallium	11/17/2016	0.002	0.0048
990	2016	Powerton	MW-15	Boron	2/25/2016	2	2.4
991	2016	Powerton	MW-15	Sulfate	2/25/2016	400	670
992	2016	Powerton	MW-15	Sulfate	5/19/2016	400	1100
993	2016	Powerton	MW-15	Sulfate	8/18/2016	400	620
994	2016	Powerton	MW-15	Sulfate	11/17/2016	400	570
995	2016	Powerton	MW-15	TDS	2/25/2016	1200	1600
996	2016	Powerton	MW-15	TDS	5/19/2016	1200	2800
997	2016	Powerton	MW-15	TDS	8/18/2016	1200	1900
998	2016	Powerton	MW-15	TDS	11/17/2016	1200	1900
999	2016	Powerton	MW-17	Arsenic	2/22/2016	0.01	0.021
1000	2016	Powerton	MW-17	Arsenic	5/18/2016	0.01	0.32
1001	2016	Powerton	MW-17	Arsenic	8/17/2016	0.01	0.34
1002	2016	Powerton	MW-17	Arsenic	11/14/2016	0.01	0.19
1003	2016	Powerton	MW-17	Sulfate	2/22/2016	400	960
1004	2016	Powerton	MW-17	Sulfate	5/18/2016	400	700
1005	2016	Powerton	MW-17	Sulfate	8/17/2016	400	860
1006	2016	Powerton	MW-17	Sulfate	11/14/2016	400	560
1007	2016	Powerton	MW-17	TDS	2/22/2016	1200	2100
1008	2016	Powerton	MW-17	TDS	5/18/2016	1200	1800
1009	2016	Powerton	MW-17	TDS	8/17/2016	1200	2100
1010	2016	Powerton	MW-17	TDS	11/14/2016	1200	2000
1011	2016	Powerton	MW-17	Thallium	5/18/2016	0.002	0.0028
1012	2016	Powerton	MW-17	Thallium	8/17/2016	0.002	0.0031
1013	2016	Powerton	MW-17	Thallium	11/14/2016	0.002	0.0021
1014	2016	Powerton	MW-18	TDS	8/17/2016	1200	1300

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
1015	2016	Powerton	MW-18	TDS	11/18/2016	1200	1300
1016	2016	Powerton	MW-19	Boron	11/18/2016	2	3.8
1017	2016	Waukegan	MW-01	Arsenic	3/1/2016	0.01	0.12
1018	2016	Waukegan	MW-01	Arsenic	5/4/2016	0.01	0.11
1019	2016	Waukegan	MW-01	Arsenic	8/23/2016	0.01	0.12
1020	2016	Waukegan	MW-01	Arsenic	12/5/2016	0.01	0.15
1021	2016	Waukegan	MW-01	Boron	5/4/2016	2	2.1
1022	2016	Waukegan	MW-01	Boron	8/23/2016	2	2.1
1023	2016	Waukegan	MW-02	Arsenic	12/5/2016	0.01	0.015
1024	2016	Waukegan	MW-02	Boron	3/1/2016	2	3.6
1025	2016	Waukegan	MW-02	Boron	5/4/2016	2	3.3
1026	2016	Waukegan	MW-02	Boron	8/23/2016	2	3
1027	2016	Waukegan	MW-02	Boron	12/5/2016	2	3
1028	2016	Waukegan	MW-03	Boron	3/1/2016	2	2.7
1029	2016	Waukegan	MW-03	Boron	5/4/2016	2	2.4
1030	2016	Waukegan	MW-03	Boron	12/5/2016	2	2.7
1031	2016	Waukegan	MW-04	Boron	12/5/2016	2	2.9
1032	2016	Waukegan	MW-05	Arsenic	12/7/2016	0.01	0.013
1033	2016	Waukegan	MW-05	Boron	3/2/2016	2	14
1034	2016	Waukegan	MW-05	Boron	5/2/2016	2	23
1035	2016	Waukegan	MW-05	Boron	8/24/2016	2	43
1036	2016	Waukegan	MW-05	Boron	12/7/2016	2	49
1037	2016	Waukegan	MW-05	Sulfate	3/2/2016	400	1200
1038	2016	Waukegan	MW-05	Sulfate	5/2/2016	400	1000
1039	2016	Waukegan	MW-05	Sulfate	8/24/2016	400	1100
1040	2016	Waukegan	MW-05	Sulfate	12/7/2016	400	610
1041	2016	Waukegan	MW-05	TDS	3/2/2016	1200	2800
1042	2016	Waukegan	MW-05	TDS	5/2/2016	1200	2400
1043	2016	Waukegan	MW-05	TDS	8/24/2016	1200	2200
1044	2016	Waukegan	MW-05	TDS	12/7/2016	1200	2000
1045	2016	Waukegan	MW-06	Boron	2/29/2016	2	2.8
1046	2016	Waukegan	MW-06	Boron	5/3/2016	2	10
1047	2016	Waukegan	MW-06	Boron	12/6/2016	2	5.8
1048	2016	Waukegan	MW-07	Boron	2/29/2016	2	22
1049	2016	Waukegan	MW-07	Boron	5/2/2016	2	24
1050	2016	Waukegan	MW-07	Boron	8/24/2016	2	26
1051	2016	Waukegan	MW-07	Boron	12/7/2016	2	33
1052	2016	Waukegan	MW-07	Sulfate	2/29/2016	400	580
1053	2016	Waukegan	MW-07	Sulfate	5/2/2016	400	610

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
1054	2016	Waukegan	MW-07	Sulfate	8/24/2016	400	620
1055	2016	Waukegan	MW-07	Sulfate	12/7/2016	400	510
1056	2016	Waukegan	MW-07	TDS	2/29/2016	1200	1300
1057	2016	Waukegan	MW-07	TDS	5/2/2016	1200	1500
1058	2016	Waukegan	MW-07	TDS	8/24/2016	1200	1500
1059	2016	Waukegan	MW-07	TDS	12/7/2016	1200	1800
1060	2016	Waukegan	MW-08	Boron	2/29/2016	2	27
1061	2016	Waukegan	MW-08	Boron	5/3/2016	2	26
1062	2016	Waukegan	MW-08	Boron	8/25/2016	2	24
1063	2016	Waukegan	MW-08	Boron	12/6/2016	2	30
1064	2016	Waukegan	MW-08	Sulfate	2/29/2016	400	480
1065	2016	Waukegan	MW-08	Sulfate	5/3/2016	400	530
1066	2016	Waukegan	MW-08	Sulfate	8/25/2016	400	450
1067	2016	Waukegan	MW-08	TDS	2/29/2016	1200	1300
1068	2016	Waukegan	MW-08	TDS	5/3/2016	1200	1300
1069	2016	Waukegan	MW-08	TDS	8/25/2016	1200	1300
1070	2016	Waukegan	MW-08	TDS	12/6/2016	1200	1300
1071	2016	Waukegan	MW-09	Boron	3/2/2016	2	29
1072	2016	Waukegan	MW-09	Boron	5/3/2016	2	31
1073	2016	Waukegan	MW-09	Boron	8/25/2016	2	3.9
1074	2016	Waukegan	MW-09	Boron	12/8/2016	2	13
1075	2016	Waukegan	MW-09	Sulfate	3/2/2016	400	920
1076	2016	Waukegan	MW-09	Sulfate	5/3/2016	400	780
1077	2016	Waukegan	MW-09	TDS	3/2/2016	1200	3000
1078	2016	Waukegan	MW-09	TDS	5/3/2016	1200	2600
1079	2016	Waukegan	MW-09	TDS	12/8/2016	1200	1400
1080	2016	Waukegan	MW-10	Arsenic	3/2/2016	0.01	0.58
1081	2016	Waukegan	MW-10	Arsenic	5/3/2016	0.01	0.46
1082	2016	Waukegan	MW-10	Arsenic	8/26/2016	0.01	0.35
1083	2016	Waukegan	MW-10	Arsenic	12/6/2016	0.01	0.42
1084	2016	Waukegan	MW-11	Arsenic	3/2/2016	0.01	0.55
1085	2016	Waukegan	MW-11	Arsenic	5/5/2016	0.01	0.48
1086	2016	Waukegan	MW-11	Arsenic	8/26/2016	0.01	0.89
1087	2016	Waukegan	MW-11	Arsenic	12/7/2016	0.01	0.87
1088	2016	Waukegan	MW-11	Boron	3/2/2016	2	3.8
1089	2016	Waukegan	MW-11	Boron	5/5/2016	2	5.2
1090	2016	Waukegan	MW-11	Boron	8/26/2016	2	3
1091	2016	Waukegan	MW-11	Boron	12/7/2016	2	3
1092	2016	Waukegan	MW-12	Boron	2/29/2016	2	8.4

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
1093	2016	Waukegan	MW-12	Boron	5/4/2016	2	18
1094	2016	Waukegan	MW-12	Boron	8/25/2016	2	4.9
1095	2016	Waukegan	MW-14	Arsenic	3/2/2016	0.01	0.061
1096	2016	Waukegan	MW-14	Arsenic	5/5/2016	0.01	0.2
1097	2016	Waukegan	MW-14	Arsenic	8/25/2016	0.01	0.71
1098	2016	Waukegan	MW-14	Arsenic	12/7/2016	0.01	0.13
1099	2016	Waukegan	MW-15	Boron	2/29/2016	2	12
1100	2016	Waukegan	MW-15	Boron	5/3/2016	2	10
1101	2016	Waukegan	MW-15	Boron	8/23/2016	2	8
1102	2016	Waukegan	MW-15	Boron	12/6/2016	2	2.6
1103	2016	Waukegan	MW-16	Arsenic	12/5/2016	0.01	0.036
1104	2016	Will	MW-02	Arsenic	8/11/2016	0.01	0.018
1105	2016	Will	MW-02	Arsenic	10/27/2016	0.01	0.017
1106	2016	Will	MW-02	Boron	2/17/2016	2	4.3
1107	2016	Will	MW-02	Boron	5/25/2016	2	3.9
1108	2016	Will	MW-02	Boron	8/11/2016	2	4.1
1109	2016	Will	MW-02	Boron	10/27/2016	2	4.9
1110	2016	Will	MW-02	Sulfate	2/17/2016	400	710
1111	2016	Will	MW-02	Sulfate	5/25/2016	400	650
1112	2016	Will	MW-02	Sulfate	8/11/2016	400	510
1113	2016	Will	MW-02	Sulfate	10/27/2016	400	670
1114	2016	Will	MW-02	TDS	2/17/2016	1200	1300
1115	2016	Will	MW-02	TDS	5/25/2016	1200	1300
1116	2016	Will	MW-02	TDS	8/11/2016	1200	1500
1117	2016	Will	MW-02	TDS	10/27/2016	1200	1500
1118	2016	Will	MW-03	Boron	2/17/2016	2	3
1119	2016	Will	MW-03	Boron	5/25/2016	2	2.9
1120	2016	Will	MW-03	Boron	8/11/2016	2	3.1
1121	2016	Will	MW-03	Boron	10/27/2016	2	3.3
1122	2016	Will	MW-04	Boron	2/17/2016	2	4.9
1123	2016	Will	MW-04	Boron	5/25/2016	2	4.3
1124	2016	Will	MW-04	Boron	8/11/2016	2	4.8
1125	2016	Will	MW-04	Boron	10/27/2016	2	6.1
1126	2016	Will	MW-04	Sulfate	2/17/2016	400	1800
1127	2016	Will	MW-04	Sulfate	5/25/2016	400	1300
1128	2016	Will	MW-04	Sulfate	8/11/2016	400	880
1129	2016	Will	MW-04	Sulfate	10/27/2016	400	1400
1130	2016	Will	MW-04	TDS	2/17/2016	1200	3200
1131	2016	Will	MW-04	TDS	5/25/2016	1200	2700

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
1132	2016	Will	MW-04	TDS	8/11/2016	1200	2200
1133	2016	Will	MW-04	TDS	10/27/2016	1200	2800
1134	2016	Will	MW-05	Boron	2/18/2016	2	4.1
1135	2016	Will	MW-05	Boron	5/26/2016	2	3.7
1136	2016	Will	MW-05	Boron	8/10/2016	2	4.1
1137	2016	Will	MW-05	Boron	10/26/2016	2	3.9
1138	2016	Will	MW-05	Sulfate	2/18/2016	400	730
1139	2016	Will	MW-05	Sulfate	5/26/2016	400	600
1140	2016	Will	MW-05	Sulfate	8/10/2016	400	530
1141	2016	Will	MW-05	TDS	2/18/2016	1200	1700
1142	2016	Will	MW-05	TDS	5/26/2016	1200	1500
1143	2016	Will	MW-06	Boron	2/18/2016	2	2.4
1144	2016	Will	MW-06	Boron	5/26/2016	2	2.9
1145	2016	Will	MW-06	Boron	8/11/2016	2	3.6
1146	2016	Will	MW-06	Boron	10/26/2016	2	3.9
1147	2016	Will	MW-07	Boron	2/17/2016	2	3.8
1148	2016	Will	MW-07	Boron	5/24/2016	2	2.9
1149	2016	Will	MW-07	Boron	8/9/2016	2	2.8
1150	2016	Will	MW-07	Boron	10/25/2016	2	3.2
1151	2016	Will	MW-07	Sulfate	2/17/2016	400	700
1152	2016	Will	MW-07	Sulfate	5/24/2016	400	530
1153	2016	Will	MW-07	Sulfate	10/25/2016	400	510
1154	2016	Will	MW-07	TDS	2/17/2016	1200	1300
1155	2016	Will	MW-08	Boron	2/16/2016	2	2.8
1156	2016	Will	MW-08	Boron	5/24/2016	2	2.3
1157	2016	Will	MW-08	Boron	8/9/2016	2	2.6
1158	2016	Will	MW-08	Boron	10/25/2016	2	4.1
1159	2016	Will	MW-08	Sulfate	2/16/2016	400	750
1160	2016	Will	MW-08	Sulfate	5/24/2016	400	580
1161	2016	Will	MW-08	Sulfate	8/9/2016	400	520
1162	2016	Will	MW-08	Sulfate	10/25/2016	400	680
1163	2016	Will	MW-08	TDS	2/16/2016	1200	1600
1164	2016	Will	MW-08	TDS	5/24/2016	1200	1400
1165	2016	Will	MW-08	TDS	8/9/2016	1200	1300
1166	2016	Will	MW-08	TDS	10/25/2016	1200	1700
1167	2016	Will	MW-09	Boron	10/25/2016	2	2.6
1168	2016	Will	MW-10	Arsenic	8/10/2016	0.01	0.011
1169	2016	Will	MW-10	Arsenic	10/26/2016	0.01	0.025
1170	2016	Will	MW-10	Boron	2/16/2016	2	3.6

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
1171	2016	Will	MW-10	Boron	5/25/2016	2	3.8
1172	2016	Will	MW-10	Boron	8/10/2016	2	3.7
1173	2016	Will	MW-10	Boron	10/26/2016	2	3.5
1174	2017	Joliet 29	MW-09	Sulfate	2/8/2017	400	1200
1175	2017	Joliet 29	MW-09	Sulfate	4/25/2017	400	4700
1176	2017	Joliet 29	MW-09	TDS	2/8/2017	1200	2800
1177	2017	Joliet 29	MW-09	TDS	4/25/2017	1200	6500
1178	2017	Powerton	MW-06	Sulfate	5/2/2017	400	420
1179	2017	Powerton	MW-07	Arsenic	2/16/2017	0.01	0.19
1180	2017	Powerton	MW-07	Arsenic	5/2/2017	0.01	0.12
1181	2017	Powerton	MW-08	TDS	2/16/2017	1200	1400
1182	2017	Powerton	MW-08	TDS	5/2/2017	1200	1300
1183	2017	Powerton	MW-09	Boron	2/15/2017	2	3
1184	2017	Powerton	MW-09	Boron	5/3/2017	2	3.4
1185	2017	Powerton	MW-11	Sulfate	5/3/2017	400	410
1186	2017	Powerton	MW-11	TDS	5/3/2017	1200	1300
1187	2017	Powerton	MW-12	Sulfate	2/16/2017	400	550
1188	2017	Powerton	MW-12	Sulfate	5/3/2017	400	450
1189	2017	Powerton	MW-13	Arsenic	2/17/2017	0.01	0.024
1190	2017	Powerton	MW-13	Arsenic	5/4/2017	0.01	0.028
1191	2017	Powerton	MW-13	Boron	2/17/2017	2	3
1192	2017	Powerton	MW-13	Boron	5/4/2017	2	3
1193	2017	Powerton	MW-13	Sulfate	2/17/2017	400	1700
1194	2017	Powerton	MW-13	Sulfate	5/4/2017	400	1800
1195	2017	Powerton	MW-13	TDS	2/17/2017	1200	3500
1196	2017	Powerton	MW-13	TDS	5/4/2017	1200	3500
1197	2017	Powerton	MW-14	Boron	2/17/2017	2	2.3
1198	2017	Powerton	MW-14	Boron	5/4/2017	2	2.5
1199	2017	Powerton	MW-14	Sulfate	2/17/2017	400	1500
1200	2017	Powerton	MW-14	Sulfate	5/4/2017	400	1700
1201	2017	Powerton	MW-14	TDS	2/17/2017	1200	3200
1202	2017	Powerton	MW-14	TDS	5/4/2017	1200	3600
1203	2017	Powerton	MW-14	Thallium	5/4/2017	0.002	0.0028
1204	2017	Powerton	MW-15	Sulfate	2/17/2017	400	610
1205	2017	Powerton	MW-15	Sulfate	5/4/2017	400	480
1206	2017	Powerton	MW-15	TDS	2/17/2017	1200	1700
1207	2017	Powerton	MW-15	TDS	5/4/2017	1200	1500
1208	2017	Powerton	MW-17	Arsenic	2/13/2017	0.01	0.35
1209	2017	Powerton	MW-17	Arsenic	5/4/2017	0.01	0.24

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
1210	2017	Powerton	MW-17	Arsenic	6/22/2017	0.01	0.41
1211	2017	Powerton	MW-17	Sulfate	2/13/2017	400	770
1212	2017	Powerton	MW-17	Sulfate	5/4/2017	400	720
1213	2017	Powerton	MW-17	Sulfate	6/22/2017	400	580
1214	2017	Powerton	MW-17	TDS	2/13/2017	1200	1600
1215	2017	Powerton	MW-17	TDS	5/4/2017	1200	1500
1216	2017	Powerton	MW-17	TDS	6/22/2017	1200	1600
1217	2017	Powerton	MW-17	Thallium	2/13/2017	0.002	0.0025
1218	2017	Powerton	MW-17	Thallium	5/4/2017	0.002	0.0065
1219	2017	Powerton	MW-17	Thallium	6/22/2017	0.002	0.0022
1220	2017	Powerton	MW-19	Boron	2/15/2017	2	4.7
1221	2017	Powerton	MW-19	Boron	5/5/2017	2	3.3
1222	2017	Powerton	MW-19	Boron	6/21/2017	2	2.3
1223	2017	Waukegan	MW-01	Arsenic	2/21/2017	0.01	0.14
1224	2017	Waukegan	MW-01	Arsenic	5/15/2017	0.01	0.11
1225	2017	Waukegan	MW-01	Boron	2/21/2017	2	2.1
1226	2017	Waukegan	MW-01	Boron	5/15/2017	2	2.3
1227	2017	Waukegan	MW-02	Arsenic	2/21/2017	0.01	0.026
1228	2017	Waukegan	MW-02	Arsenic	5/15/2017	0.01	0.016
1229	2017	Waukegan	MW-02	Boron	2/21/2017	2	2.9
1230	2017	Waukegan	MW-02	Boron	5/15/2017	2	3.4
1231	2017	Waukegan	MW-03	Arsenic	2/21/2017	0.01	0.016
1232	2017	Waukegan	MW-03	Boron	2/21/2017	2	2.1
1233	2017	Waukegan	MW-03	Boron	5/16/2017	2	3.5
1234	2017	Waukegan	MW-04	Arsenic	2/22/2017	0.01	0.018
1235	2017	Waukegan	MW-04	Boron	2/22/2017	2	2.4
1236	2017	Waukegan	MW-04	Boron	5/16/2017	2	2.6
1237	2017	Waukegan	MW-05	Arsenic	2/22/2017	0.01	0.04
1238	2017	Waukegan	MW-05	Boron	2/22/2017	2	42
1239	2017	Waukegan	MW-05	Boron	5/15/2017	2	7.7
1240	2017	Waukegan	MW-05	Sulfate	2/22/2017	400	700
1241	2017	Waukegan	MW-05	Sulfate	5/15/2017	400	1100
1242	2017	Waukegan	MW-05	TDS	2/22/2017	1200	1700
1243	2017	Waukegan	MW-05	TDS	5/15/2017	1200	2600
1244	2017	Waukegan	MW-06	Boron	2/22/2017	2	8.9
1245	2017	Waukegan	MW-07	Boron	2/22/2017	2	49
1246	2017	Waukegan	MW-07	Boron	5/16/2017	2	50
1247	2017	Waukegan	MW-07	Sulfate	2/22/2017	400	880
1248	2017	Waukegan	MW-07	Sulfate	5/16/2017	400	690

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
1249	2017	Waukegan	MW-07	TDS	2/22/2017	1200	1900
1250	2017	Waukegan	MW-07	TDS	5/16/2017	1200	1800
1251	2017	Waukegan	MW-08	Boron	2/23/2017	2	32
1252	2017	Waukegan	MW-08	Boron	5/17/2017	2	21
1253	2017	Waukegan	MW-08	Cadmium	2/23/2017	0.005	0.0055
1254	2017	Waukegan	MW-08	Sulfate	2/23/2017	400	540
1255	2017	Waukegan	MW-09	Boron	2/23/2017	2	14
1256	2017	Waukegan	MW-09	Boron	5/16/2017	2	25
1257	2017	Waukegan	MW-09	Sulfate	2/23/2017	400	410
1258	2017	Waukegan	MW-10	Arsenic	2/23/2017	0.01	0.67
1259	2017	Waukegan	MW-10	Arsenic	5/17/2017	0.01	0.49
1260	2017	Waukegan	MW-11	Arsenic	2/24/2017	0.01	0.57
1261	2017	Waukegan	MW-11	Arsenic	5/18/2017	0.01	0.59
1262	2017	Waukegan	MW-11	Boron	2/24/2017	2	2.3
1263	2017	Waukegan	MW-12	Arsenic	2/22/2017	0.01	0.02
1264	2017	Waukegan	MW-12	Arsenic	5/17/2017	0.01	0.055
1265	2017	Waukegan	MW-12	Boron	5/17/2017	2	16
1266	2017	Waukegan	MW-14	Antimony	2/23/2017	0.006	0.021
1267	2017	Waukegan	MW-14	Arsenic	2/23/2017	0.01	25
1268	2017	Waukegan	MW-14	Arsenic	5/18/2017	0.01	0.66
1269	2017	Waukegan	MW-14	Chromium	2/23/2017	0.1	10
1270	2017	Waukegan	MW-14	Chromium	5/18/2017	0.1	0.2
1271	2017	Waukegan	MW-15	Arsenic	2/22/2017	0.01	0.04
1272	2017	Waukegan	MW-15	Arsenic	5/17/2017	0.01	0.031
1273	2017	Waukegan	MW-15	Boron	2/22/2017	2	4.2
1274	2017	Waukegan	MW-15	Boron	5/17/2017	2	5.8
1275	2017	Waukegan	MW-16	Arsenic	2/24/2017	0.01	0.027
1276	2017	Waukegan	MW-16	Arsenic	5/16/2017	0.01	0.043
1277	2017	Waukegan	MW-16	Thallium	5/16/2017	0.002	0.0021
1278	2017	Will	MW-02	Boron	2/2/2017	2	4.3
1279	2017	Will	MW-02	Boron	5/10/2017	2	3.6
1280	2017	Will	MW-02	Sulfate	2/2/2017	400	590
1281	2017	Will	MW-02	Sulfate	5/10/2017	400	470
1282	2017	Will	MW-02	TDS	2/2/2017	1200	1400
1283	2017	Will	MW-02	TDS	5/10/2017	1200	1300
1284	2017	Will	MW-03	Boron	2/1/2017	2	3
1285	2017	Will	MW-03	Boron	5/11/2017	2	4.1
1286	2017	Will	MW-03	Sulfate	5/11/2017	400	510
1287	2017	Will	MW-04	Boron	2/1/2017	2	5

	Year	Site	Well	Pollutant	Date	Standard (mg/L)	Concentration (mg/L)
1288	2017	Will	MW-04	Boron	5/11/2017	2	5
1289	2017	Will	MW-04	Sulfate	2/1/2017	400	1200
1290	2017	Will	MW-04	Sulfate	5/11/2017	400	1300
1291	2017	Will	MW-04	TDS	2/1/2017	1200	2700
1292	2017	Will	MW-04	TDS	5/11/2017	1200	2800
1293	2017	Will	MW-05	Boron	2/1/2017	2	4.2
1294	2017	Will	MW-05	Boron	5/11/2017	2	3.5
1295	2017	Will	MW-05	Sulfate	2/1/2017	400	500
1296	2017	Will	MW-05	Sulfate	5/11/2017	400	470
1297	2017	Will	MW-05	TDS	2/1/2017	1200	1600
1298	2017	Will	MW-06	Arsenic	5/11/2017	0.01	0.011
1299	2017	Will	MW-06	Boron	2/1/2017	2	2.9
1300	2017	Will	MW-06	Boron	5/11/2017	2	3
1301	2017	Will	MW-07	Boron	1/31/2017	2	3.7
1302	2017	Will	MW-07	Boron	5/9/2017	2	4.3
1303	2017	Will	MW-07	Sulfate	1/31/2017	400	500
1304	2017	Will	MW-07	Sulfate	5/9/2017	400	540
1305	2017	Will	MW-07	TDS	1/31/2017	1200	1500
1306	2017	Will	MW-07	TDS	5/9/2017	1200	1500
1307	2017	Will	MW-08	Boron	1/31/2017	2	2.5
1308	2017	Will	MW-08	Sulfate	1/31/2017	400	450
1309	2017	Will	MW-08	TDS	1/31/2017	1200	1500
1310	2017	Will	MW-10	Arsenic	2/2/2017	0.01	0.013
1311	2017	Will	MW-10	Boron	2/2/2017	2	3.2
1312	2017	Will	MW-10	Boron	5/10/2017	2	3
1313	2017	Will	MW-11	Arsenic	2/1/2017	0.01	0.011
1314	2017	Will	MW-11	Arsenic	5/10/2017	0.01	0.014

	Year	Site	Well	Pollutant	Date	Appendix I MCL (mg/L)	Concentration (mg/L)
1	2010	Waukegan	MW-01	Arsenic	10/25/2010	0.05	0.054
2	2010	Waukegan	MW-02	Selenium	10/25/2010	0.01	0.026
3	2010	Waukegan	MW-01	Selenium	10/25/2010	0.01	0.031
4	2010	Will	MW-05	Selenium	12/13/2010	0.01	0.017
5	2011	Powerton	MW-07	Arsenic	3/25/2011	0.05	0.085
6	2011	Powerton	MW-07	Arsenic	6/16/2011	0.05	0.12
7	2011	Powerton	MW-07	Arsenic	9/19/2011	0.05	0.18
8	2011	Powerton	MW-07	Arsenic	12/12/2011	0.05	0.23
9	2011	Powerton	MW-15	Selenium	4/25/2011	0.01	0.017
10	2011	Powerton	MW-14	Selenium	4/25/2011	0.01	0.065
11	2011	Waukegan	MW-01	Arsenic	6/13/2011	0.05	0.17
12	2011	Waukegan	MW-01	Arsenic	9/13/2011	0.05	0.077
13	2011	Waukegan	MW-01	Arsenic	12/6/2011	0.05	0.057
14	2011	Waukegan	MW-03	Selenium	3/24/2011	0.01	0.016
15	2011	Waukegan	MW-01	Selenium	3/24/2011	0.01	0.03
16	2011	Waukegan	MW-01	Selenium	6/13/2011	0.01	0.016
17	2011	Waukegan	MW-04	Selenium	6/13/2011	0.01	0.022
18	2011	Waukegan	MW-02	Selenium	6/13/2011	0.01	0.028
19	2011	Waukegan	MW-03	Selenium	6/13/2011	0.01	0.03
20	2011	Waukegan	MW-03	Selenium	9/13/2011	0.01	0.012
21	2011	Waukegan	MW-02	Selenium	9/13/2011	0.01	0.022
22	2011	Waukegan	MW-04	Selenium	9/13/2011	0.01	0.025
23	2011	Waukegan	MW-01	Selenium	9/13/2011	0.01	0.039
24	2011	Waukegan	MW-03	Selenium	12/6/2011	0.01	0.011
25	2011	Waukegan	MW-04	Selenium	12/6/2011	0.01	0.015
26	2011	Waukegan	MW-01	Selenium	12/6/2011	0.01	0.032
27	2011	Will	MW-05	Selenium	3/28/2011	0.01	0.014
28	2011	Will	MW-05	Selenium	6/15/2011	0.01	0.016
29	2011	Will	MW-06	Selenium	9/15/2011	0.01	0.011
30	2012	Powerton	MW-07	Arsenic	3/19/2012	0.05	0.23
31	2012	Powerton	MW-07	Arsenic	6/25/2012	0.05	0.15
32	2012	Powerton	MW-07	Arsenic	9/18/2012	0.05	0.18
33	2012	Powerton	MW-07	Arsenic	12/12/2012	0.05	0.26
34	2012	Powerton	MW-14	Selenium	4/10/2012	0.01	0.022
35	2012	Powerton	MW-15	Selenium	4/10/2012	0.01	0.025
36	2012	Waukegan	MW-01	Arsenic	3/14/2012	0.05	0.078
37	2012	Waukegan	MW-01	Arsenic	6/18/2012	0.05	0.07
38	2012	Waukegan	MW-01	Arsenic	9/28/2012	0.05	0.07
39	2012	Waukegan	MW-01	Arsenic	12/19/2012	0.05	0.091
40	2012	Waukegan	MW-01	Selenium	3/14/2012	0.01	0.037

	Year	Site	Well	Pollutant	Date	Appendix I MCL (mg/L)	Concentration (mg/L)
41	2012	Waukegan	MW-01	Selenium	6/18/2012	0.01	0.013
42	2012	Waukegan	MW-03	Selenium	6/18/2012	0.01	0.017
43	2012	Will	MW-06	Selenium	9/24/2012	0.01	0.014
44	2012	Will	MW-05	Selenium	9/24/2012	0.01	0.017
45	2013	Joliet 29	MW-06	Selenium	3/5/2013	0.01	0.013
46	2013	Joliet 29	MW-03	Selenium	5/22/2013	0.01	0.022
47	2013	Joliet 29	MW-05	Selenium	6/5/2013	0.01	0.025
48	2013	Joliet 29	MW-03	Selenium	7/22/2013	0.01	0.012
49	2013	Joliet 29	MW-05	Selenium	7/23/2013	0.01	0.016
50	2013	Powerton	MW-07	Arsenic	2/27/2013	0.05	0.17
51	2013	Powerton	MW-07	Arsenic	5/31/2013	0.05	0.12
52	2013	Powerton	MW-07	Arsenic	7/31/2013	0.05	0.22
53	2013	Powerton	MW-07	Arsenic	10/23/2013	0.05	0.2
54	2013	Powerton	MW-04	Selenium	2/27/2013	0.01	0.013
55	2013	Powerton	MW-09	Selenium	2/27/2013	0.01	0.015
56	2013	Powerton	MW-14	Selenium	2/27/2013	0.01	0.15
57	2013	Powerton	MW-09	Selenium	5/30/2013	0.01	0.016
58	2013	Powerton	MW-09	Selenium	7/30/2013	0.01	0.014
59	2013	Powerton	MW-15	Selenium	10/23/2013	0.01	0.013
60	2013	Waukegan	MW-01	Arsenic	3/7/2013	0.05	0.098
61	2013	Waukegan	MW-01	Arsenic	7/25/2013	0.05	0.055
62	2013	Waukegan	MW-03	Selenium	3/7/2013	0.01	0.011
63	2013	Waukegan	MW-01	Selenium	3/7/2013	0.01	0.056
64	2013	Waukegan	MW-04	Selenium	6/6/2013	0.01	0.028
65	2013	Waukegan	MW-01	Selenium	6/7/2013	0.01	0.043
66	2013	Waukegan	MW-03	Selenium	6/7/2013	0.01	0.067
67	2013	Waukegan	MW-02	Selenium	7/25/2013	0.01	0.015
68	2013	Waukegan	MW-01	Selenium	7/25/2013	0.01	0.031
69	2013	Waukegan	MW-04	Selenium	7/25/2013	0.01	0.05
70	2013	Waukegan	MW-04	Selenium	11/4/2013	0.01	0.011
71	2013	Waukegan	MW-01	Selenium	11/4/2013	0.01	0.013
72	2013	Will	MW-04	Selenium	3/5/2013	0.01	0.015
73	2013	Will	MW-05	Selenium	6/5/2013	0.01	0.026
74	2013	Will	MW-08	Selenium	10/28/2013	0.01	0.015
75	2013	Will	MW-05	Selenium	10/28/2013	0.01	0.17
76	2014	Joliet 29	MW-05	Selenium	8/19/2014	0.01	0.017
77	2014	Powerton	MW-11	Arsenic	3/4/2014	0.05	0.057
78	2014	Powerton	MW-07	Arsenic	3/5/2014	0.05	0.15
79	2014	Powerton	MW-06	Arsenic	5/29/2014	0.05	0.2
80	2014	Powerton	MW-11	Arsenic	8/26/2014	0.05	0.068

	Year	Site	Well	Pollutant	Date	Appendix I MCL (mg/L)	Concentration (mg/L)
81	2014	Powerton	MW-07	Arsenic	8/27/2014	0.05	0.19
82	2014	Powerton	MW-07	Arsenic	10/29/2014	0.05	0.31
83	2014	Powerton	MW-14	Selenium	3/4/2014	0.01	0.02
84	2014	Powerton	MW-14	Selenium	5/28/2014	0.01	0.014
85	2014	Powerton	MW-15	Selenium	5/28/2014	0.01	0.033
86	2014	Waukegan	MW-10	Arsenic	8/22/2014	0.05	0.75
87	2014	Waukegan	MW-11	Arsenic	8/22/2014	0.05	1.3
88	2014	Waukegan	MW-14	Arsenic	8/22/2014	0.05	0.13
89	2014	Waukegan	MW-01	Arsenic	11/6/2014	0.05	0.21
90	2014	Waukegan	MW-10	Arsenic	11/6/2014	0.05	0.4
91	2014	Waukegan	MW-11	Arsenic	11/6/2014	0.05	1
92	2014	Waukegan	MW-06	Selenium	3/10/2014	0.01	0.014
93	2014	Waukegan	MW-09	Selenium	5/15/2014	0.01	0.014
94	2014	Waukegan	MW-08	Selenium	5/15/2014	0.01	0.016
95	2014	Waukegan	MW-09	Selenium	8/22/2014	0.01	0.011
96	2014	Waukegan	MW-08	Selenium	11/5/2014	0.01	0.012
97	2014	Waukegan	MW-01	Selenium	11/6/2014	0.01	0.035
98	2014	Will	MW-05	Selenium	2/13/2014	0.01	0.024
99	2014	Will	MW-05	Selenium	5/21/2014	0.01	0.013
100	2015	Joliet 29	MW-05	Selenium	2/11/2015	0.01	0.014
101	2015	Joliet 29	MW-05	Selenium	5/27/2015	0.01	0.025
102	2015	Joliet 29	MW-05	Selenium	8/4/2015	0.01	0.013
103	2015	Powerton	MW-07	Arsenic	2/23/2015	0.05	0.18
104	2015	Powerton	MW-07	Arsenic	5/11/2015	0.05	0.18
105	2015	Powerton	MW-11	Arsenic	5/12/2015	0.05	0.052
106	2015	Powerton	MW-07	Arsenic	8/18/2015	0.05	0.23
107	2015	Powerton	MW-07	Arsenic	11/16/2015	0.05	0.13
108	2015	Powerton	MW-14	Selenium	2/26/2015	0.01	0.023
109	2015	Powerton	MW-15	Selenium	2/26/2015	0.01	0.068
110	2015	Powerton	MW-09	Selenium	5/12/2015	0.01	0.014
111	2015	Powerton	MW-13	Selenium	5/13/2015	0.01	0.012
112	2015	Powerton	MW-14	Selenium	5/13/2015	0.01	0.042
113	2015	Powerton	MW-15	Selenium	5/14/2015	0.01	0.051
114	2015	Powerton	MW-15	Selenium	8/19/2015	0.01	0.013
115	2015	Waukegan	MW-10	Arsenic	2/18/2015	0.05	0.12
116	2015	Waukegan	MW-11	Arsenic	2/18/2015	0.05	0.96
117	2015	Waukegan	MW-10	Arsenic	4/20/2015	0.05	0.74
118	2015	Waukegan	MW-11	Arsenic	4/20/2015	0.05	0.79
119	2015	Waukegan	MW-01	Arsenic	4/21/2015	0.05	0.056
120	2015	Waukegan	MW-11	Arsenic	8/11/2015	0.05	0.81

	Year	Site	Well	Pollutant	Date	Appendix I MCL (mg/L)	Concentration (mg/L)
121	2015	Waukegan	MW-12	Arsenic	8/11/2015	0.05	0.46
122	2015	Waukegan	MW-14	Arsenic	8/11/2015	0.05	0.32
123	2015	Waukegan	MW-15	Arsenic	8/11/2015	0.05	0.32
124	2015	Waukegan	MW-01	Arsenic	11/2/2015	0.05	0.073
125	2015	Waukegan	MW-10	Arsenic	11/4/2015	0.05	0.63
126	2015	Waukegan	MW-11	Arsenic	11/5/2015	0.05	0.82
127	2015	Waukegan	MW-14	Arsenic	11/5/2015	0.05	0.23
128	2015	Waukegan	MW-09	Selenium	4/21/2015	0.01	0.018
129	2015	Waukegan	MW-01	Selenium	8/12/2015	0.01	0.017
130	2015	Waukegan	MW-09	Selenium	8/13/2015	0.01	0.011
131	2015	Waukegan	MW-05	Selenium	8/13/2015	0.01	0.024
132	2015	Waukegan	MW-03	Selenium	11/2/2015	0.01	0.013
133	2015	Waukegan	MW-05	Selenium	11/3/2015	0.01	0.014
134	2015	Will	MW-04	Selenium	5/1/2015	0.01	0.02
135	2015	Will	MW-05	Selenium	5/1/2015	0.01	0.02
136	2015	Will	MW-05	Selenium	7/28/2015	0.01	0.021
137	2015	Will	MW-07	Selenium	11/9/2015	0.01	0.012
138	2015	Will	MW-05	Selenium	11/11/2015	0.01	0.035
139	2016	Joliet 29	MW-05	Selenium	5/10/2016	0.01	0.018
140	2016	Joliet 29	MW-01	Selenium	5/11/2016	0.01	0.021
141	2016	Joliet 29	MW-05	Selenium	8/31/2016	0.01	0.019
142	2016	Powerton	MW-07	Arsenic	2/24/2016	0.05	0.21
143	2016	Powerton	MW-07	Arsenic	5/18/2016	0.05	0.13
144	2016	Powerton	MW-17	Arsenic	5/18/2016	0.05	0.32
145	2016	Powerton	MW-17	Arsenic	8/17/2016	0.05	0.34
146	2016	Powerton	MW-07	Arsenic	8/19/2016	0.05	0.14
147	2016	Powerton	MW-17	Arsenic	11/14/2016	0.05	0.19
148	2016	Powerton	MW-07	Arsenic	11/16/2016	0.05	0.18
149	2016	Powerton	MW-15	Selenium	2/25/2016	0.01	0.042
150	2016	Powerton	MW-13	Selenium	5/19/2016	0.01	0.011
151	2016	Powerton	MW-15	Selenium	5/19/2016	0.01	0.015
152	2016	Powerton	MW-14	Selenium	8/18/2016	0.01	0.023
153	2016	Powerton	MW-15	Selenium	11/17/2016	0.01	0.017
154	2016	Waukegan	MW-01	Arsenic	3/1/2016	0.05	0.12
155	2016	Waukegan	MW-10	Arsenic	3/2/2016	0.05	0.58
156	2016	Waukegan	MW-11	Arsenic	3/2/2016	0.05	0.55
157	2016	Waukegan	MW-14	Arsenic	3/2/2016	0.05	0.061
158	2016	Waukegan	MW-10	Arsenic	5/3/2016	0.05	0.46
159	2016	Waukegan	MW-01	Arsenic	5/4/2016	0.05	0.11
160	2016	Waukegan	MW-11	Arsenic	5/5/2016	0.05	0.48

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	Year	Site	Well	Pollutant	Date	Appendix I MCL (mg/L)	Concentration (mg/L)
161	2016	Waukegan	MW-14	Arsenic	5/5/2016	0.05	0.2
162	2016	Waukegan	MW-01	Arsenic	8/23/2016	0.05	0.12
163	2016	Waukegan	MW-14	Arsenic	8/25/2016	0.05	0.71
164	2016	Waukegan	MW-10	Arsenic	8/26/2016	0.05	0.35
165	2016	Waukegan	MW-11	Arsenic	8/26/2016	0.05	0.89
166	2016	Waukegan	MW-01	Arsenic	12/5/2016	0.05	0.15
167	2016	Waukegan	MW-10	Arsenic	12/6/2016	0.05	0.42
168	2016	Waukegan	MW-11	Arsenic	12/7/2016	0.05	0.87
169	2016	Waukegan	MW-14	Arsenic	12/7/2016	0.05	0.13
170	2016	Waukegan	MW-09	Selenium	5/3/2016	0.01	0.024
171	2016	Waukegan	MW-01	Selenium	5/4/2016	0.01	0.013
172	2016	Waukegan	MW-01	Selenium	8/23/2016	0.01	0.014
173	2016	Waukegan	MW-09	Selenium	8/25/2016	0.01	0.017
174	2016	Waukegan	MW-04	Selenium	12/5/2016	0.01	0.023
175	2016	Waukegan	MW-09	Selenium	12/8/2016	0.01	0.032
176	2016	Will	MW-05	Selenium	2/18/2016	0.01	0.017
177	2016	Will	MW-04	Selenium	5/25/2016	0.01	0.012
178	2016	Will	MW-05	Selenium	5/26/2016	0.01	0.027
179	2016	Will	MW-05	Selenium	8/10/2016	0.01	0.012
180	2017	Joliet 29	MW-05	Selenium	4/26/2017	0.01	0.014
181	2017	Powerton	MW-17	Arsenic	2/13/2017	0.05	0.35
182	2017	Powerton	MW-07	Arsenic	2/16/2017	0.05	0.19
183	2017	Powerton	MW-07	Arsenic	5/2/2017	0.05	0.12
184	2017	Powerton	MW-17	Arsenic	5/4/2017	0.05	0.24
185	2017	Powerton	MW-17	Arsenic	6/22/2017	0.05	0.41
186	2017	Powerton	MW-09	Selenium	5/3/2017	0.01	0.011
187	2017	Powerton	MW-13	Selenium	5/4/2017	0.01	0.019
188	2017	Waukegan	MW-01	Arsenic	2/21/2017	0.05	0.14
189	2017	Waukegan	MW-10	Arsenic	2/23/2017	0.05	0.67
190	2017	Waukegan	MW-14	Arsenic	2/23/2017	0.05	25
191	2017	Waukegan	MW-11	Arsenic	2/24/2017	0.05	0.57
192	2017	Waukegan	MW-01	Arsenic	5/15/2017	0.05	0.11
193	2017	Waukegan	MW-10	Arsenic	5/17/2017	0.05	0.49
194	2017	Waukegan	MW-12	Arsenic	5/17/2017	0.05	0.055
195	2017	Waukegan	MW-11	Arsenic	5/18/2017	0.05	0.59
196	2017	Waukegan	MW-14	Arsenic	5/18/2017	0.05	0.66
197	2017	Waukegan	MW-14	Selenium	2/23/2017	0.01	0.017
198	2017	Waukegan	MW-09	Selenium	2/23/2017	0.01	0.018
199	2017	Waukegan	MW-08	Selenium	2/23/2017	0.01	0.031
200	2017	Waukegan	MW-02	Selenium	5/15/2017	0.01	0.022

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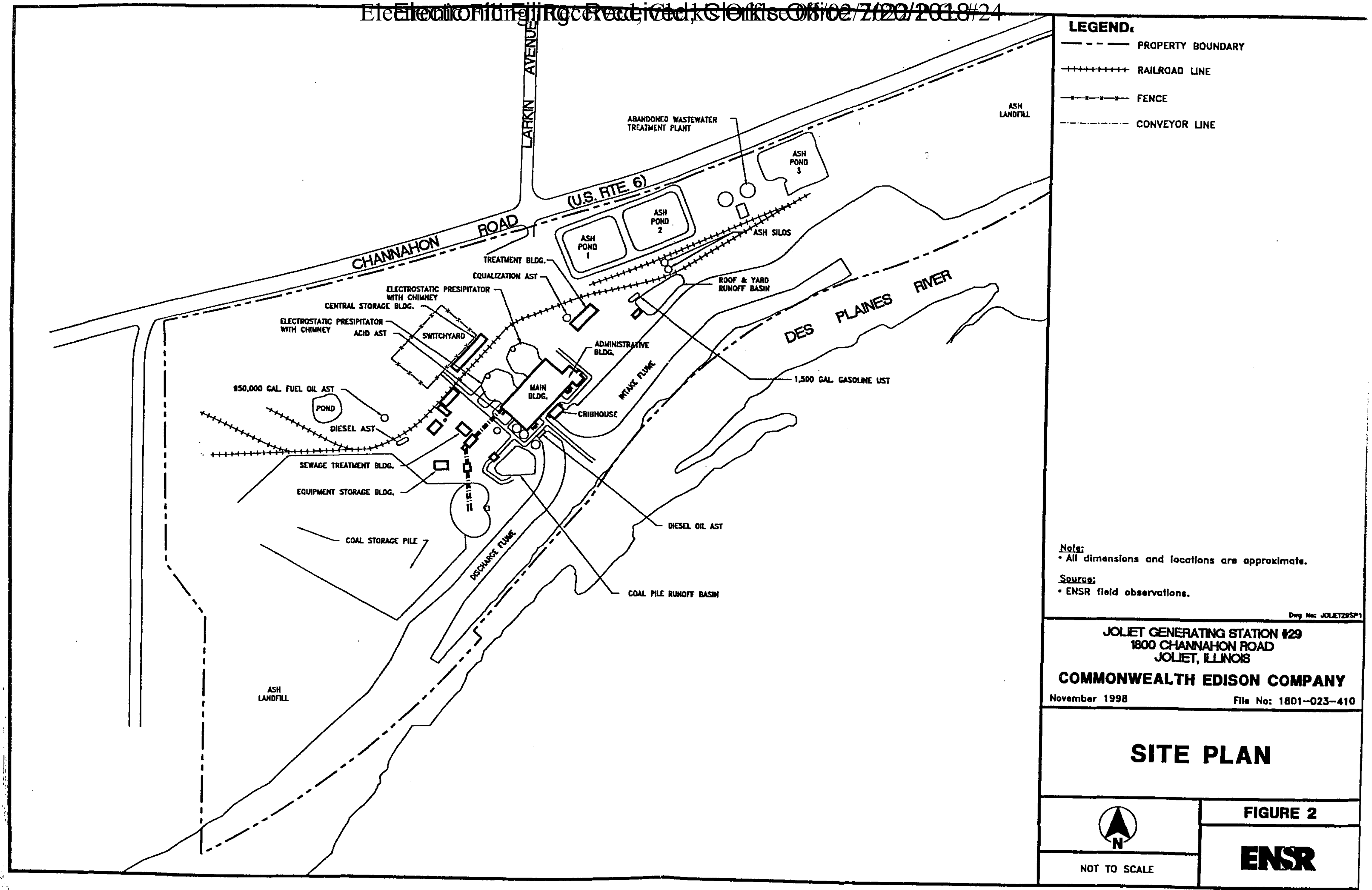
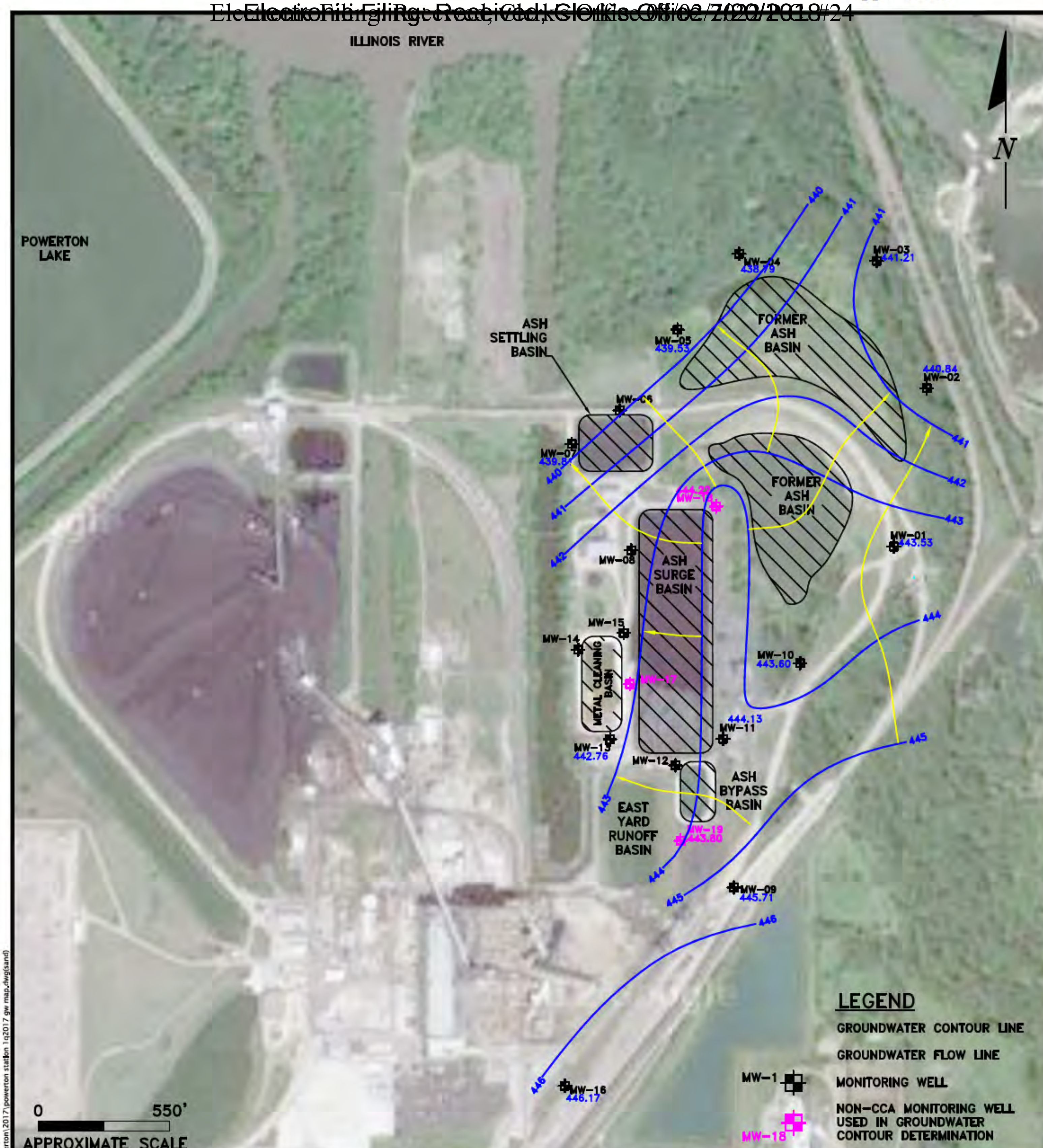
	Year	Site	Well	Pollutant	Date	Appendix I MCL (mg/L)	Concentration (mg/L)
201	2017	Waukegan	MW-16	Selenium	5/16/2017	0.01	0.016
202	2017	Waukegan	MW-04	Selenium	5/16/2017	0.01	0.021
203	2017	Will	MW-08	Selenium	1/31/2017	0.01	0.012
204	2017	Will	MW-04	Selenium	2/1/2017	0.01	0.011
205	2017	Will	MW-05	Selenium	2/1/2017	0.01	0.027
206	2017	Will	MW-12	Selenium	5/10/2017	0.01	0.017


LEGEND:
PROPERTY BOUNDARY
RAILROAD LINE
FENCE
CONVEYOR LINE
LARKIN AVENUE
CHANNAHON ROAD
(U.S. RTE. 6)
ABANDONED WASTEWATER TREATMENT PLANT
ASH LANDFILL
ASH POND 1
ASH POND 2
ASH POND 3
ASH SILOS
TREATMENT BLDG.
EQUALIZATION AST
ROOF & YARD RUNOFF BASIN
ELECTROSTATIC PRESIPITATOR WITH CHIMNEY
CENTRAL STORAGE BLDG.
ELECTROSTATIC PRESIPITATOR WITH CHIMNEY
ACID AST
SWITCHYARD
ADMINISTRATIVE BLDG.
DES PLAINES RIVER
1,500 GAL. GASOLINE UST
850,000 GAL. FUEL OIL AST
POND
MAIN BLDG.
INTAKE FLUME
CRIBHOUSE
DIESEL AST
SEWAGE TREATMENT BLDG.
EQUIPMENT STORAGE BLDG.
DIESEL OIL AST
COAL STORAGE PILE
DISCHARGE FLUME
COAL PILE RUNOFF BASIN
ASH LANDFILL
Note:
• All dimensions and locations are approximate.
Source:
• ENSR field observations.
Dwg No: JOLIET29SP1
JOLIET GENERATING STATION #29
1800 CHANNAHON ROAD
JOLIET, ILLINOIS
COMMONWEALTH EDISON COMPANY
November 1998
File No: 1801-023-410
SITE PLAN
FIGURE 2
N
NOT TO SCALE
ENSR


NOTE:
BACKGROUND MAP RETRIEVED FROM GOOGLE MAPS 2013
FORMER WASTEWATER TREATMENT FACILITY
DES PLAINES RIVER
INTAKE CHANNEL
ASH POND 3
ASH POND 2
ASH POND 1
MW-01
MW-02
MW-03
MW-04
MW-05
MW-06
MW-07
MW-08
MW-09
MW-10
MW-11
0
250'
APPROXIMATE SCALE
N
ENVIRONMENTAL CONSULTATION & REMEDIATION
KPRG
KPRG and Associates, Inc.
14665 West Lisbon Road, Suite 2B Brookfield, Wisconsin 53005 Telephone 262-781-0475 Facsimile 262-781-0478
414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593
SITE MAP
JOLIET #29 GENERATING STATION
JOLIET, ILLINOIS
Scale: 1" = 250'
Date: January 23, 2015
KPRG Project No. 12313.0
FIGURE 1



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414 Plaza Drive, Suite 106 Westmont, Illinois 60559 Telephone 630-325-1300 Facsimile 630-325-1593

GROUNDWATER CONTOUR MAP FOR GRAVELLY SAND UNIT 02/2017

POWERTON STATION
PEKIN, ILLINOIS

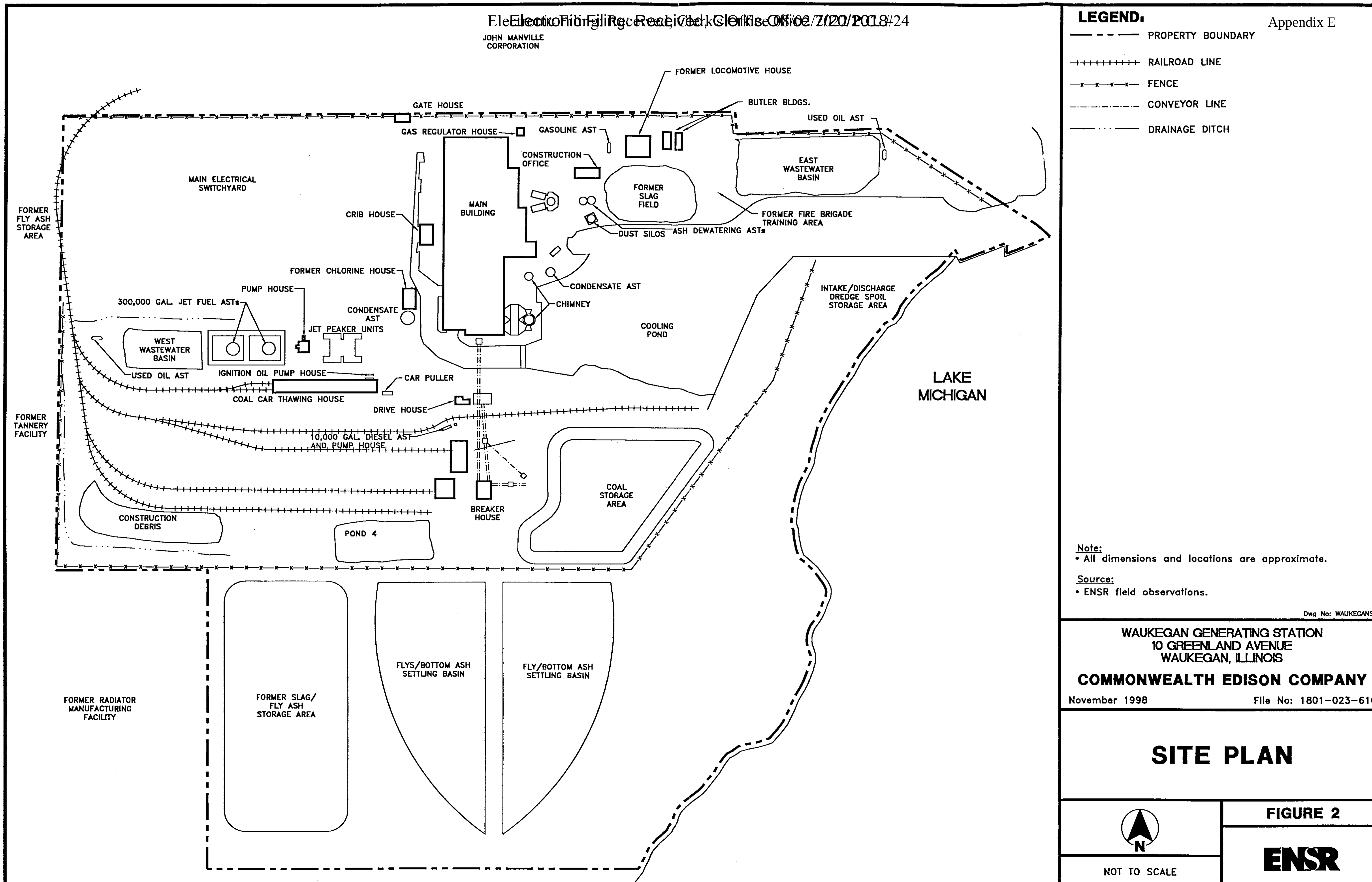
Scale: 1" = 550'

Date: April 11, 2017

KPRG Project No. 12313.1

FIGURE 3

W:\projects\midwest generation\12313\figures\powerton\2017\powerton station 1q2017 gw map.dwg(sand)


JOHN MANVILLE CORPORATION
LEGEND:
PROPERTY BOUNDARY
RAILROAD LINE
FENCE
CONVEYOR LINE
DRAINAGE DITCH
FORMER LOCOMOTIVE HOUSE
BUTLER BLDGS.
USED OIL AST
GATE HOUSE
GAS REGULATOR HOUSE
GASOLINE AST
CONSTRUCTION OFFICE
EAST WASTEWATER BASIN
FORMER SLAG FIELD
FORMER FIRE BRIGADE TRAINING AREA
MAIN ELECTRICAL SWITCHYARD
MAIN BUILDING
CRIB HOUSE
FORMER FLY ASH STORAGE AREA
DUST SILOS
ASH DEWATERING ASTs
FORMER CHLORINE HOUSE
CONDENSATE AST
CHIMNEY
PUMP HOUSE
300,000 GAL. JET FUEL ASTs
CONDENSATE AST
JET PEAKER UNITS
COOLING POND
INTAKE/DISCHARGE DREDGE SPOIL STORAGE AREA
WEST WASTEWATER BASIN
USED OIL AST
IGNITION OIL PUMP HOUSE
CAR PULLER
COAL CAR THAWING HOUSE
DRIVE HOUSE
LAKE MICHIGAN
FORMER TANNERY FACILITY
10,000 GAL. DIESEL AST AND PUMP HOUSE
COAL STORAGE AREA
BREAKER HOUSE
CONSTRUCTION DEBRIS
POND 4
Note:
• All dimensions and locations are approximate.
Source:
• ENSR field observations.
Dwg No: WAUKEGANSP1
WAUKEGAN GENERATING STATION
10 GREENLAND AVENUE
WAUKEGAN, ILLINOIS
COMMONWEALTH EDISON COMPANY
November 1998
File No: 1801-023-610
FLYS/BOTTOM ASH SETTLING BASIN
FLY/BOTTOM ASH SETTLING BASIN
FORMER SLAG/ FLY ASH STORAGE AREA
FORMER RADIATOR MANUFACTURING FACILITY
SITE PLAN
FIGURE 2
N
NOT TO SCALE
ENSR

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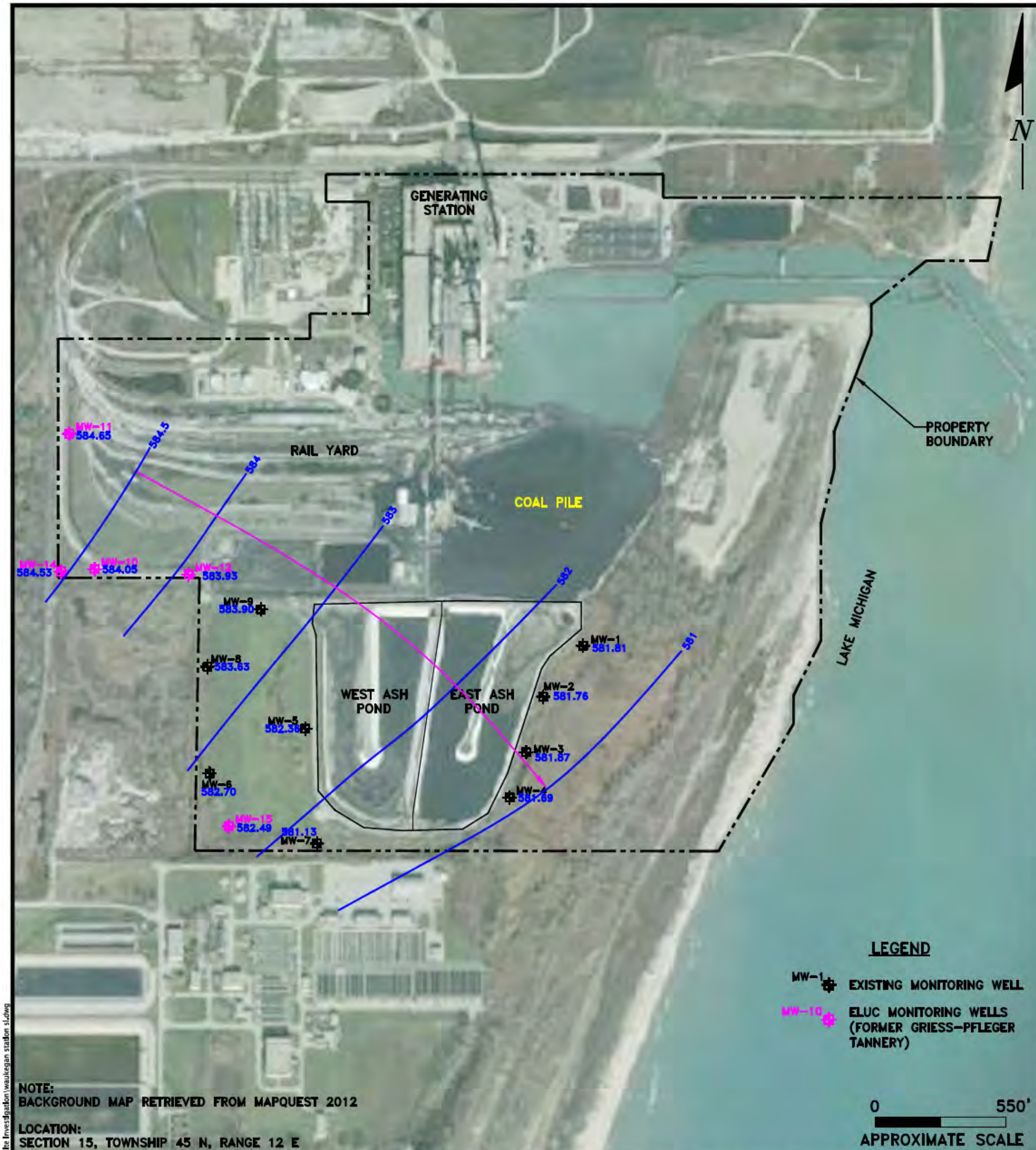

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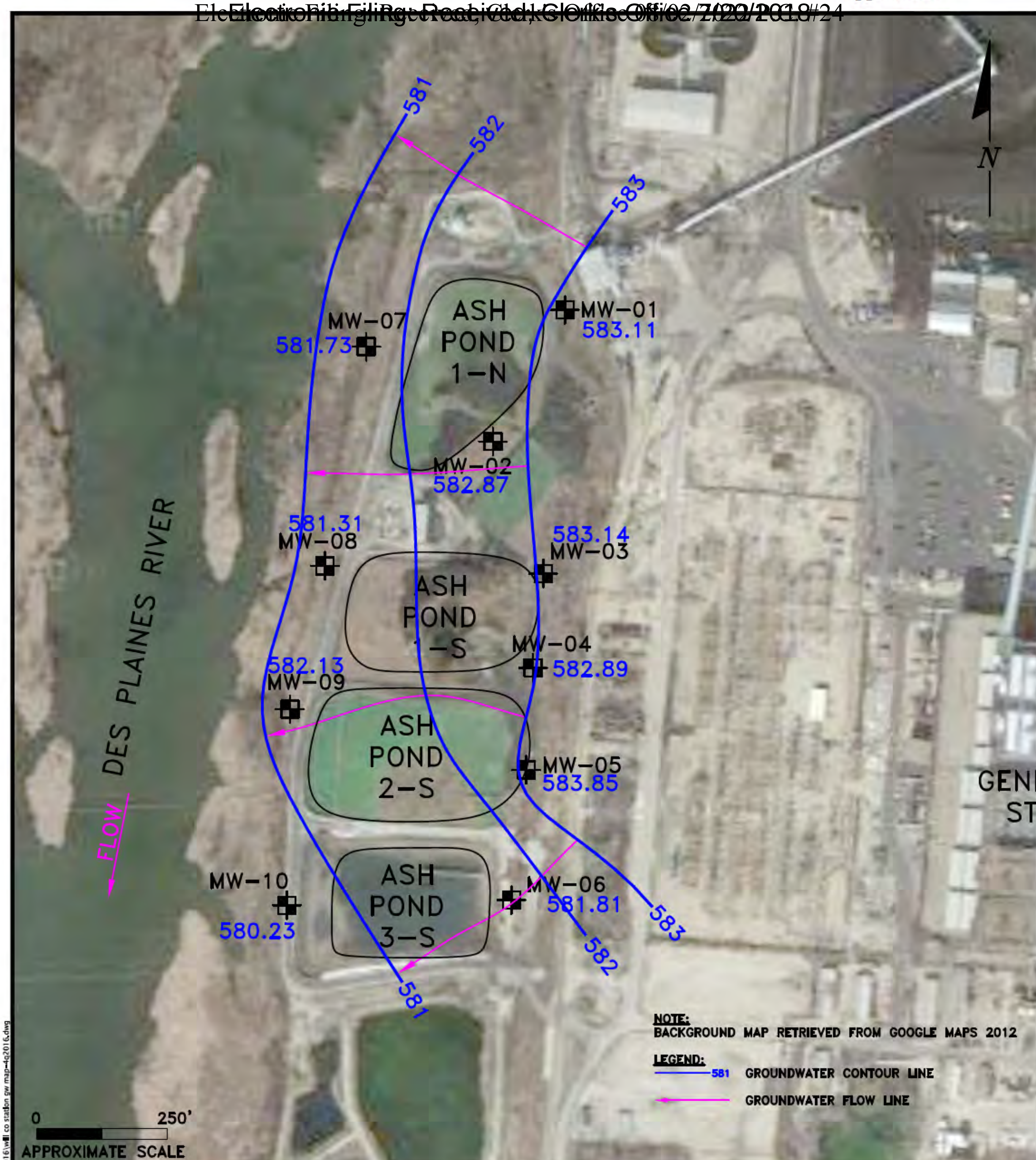
GROUNDWATER CONTOURS MAP AUGUST 2014	
WAUKEGAN STATION WAUKEGAN, ILLINOIS	
Scale: 1" = 550'	Date: October 14, 2014
KPRG Project No. 20013	FIGURE X

W:\c\projects\midwest generation\waukegan station\site investigation\waukegan station sl.dwg

Waukegan


Waukegan Generation Station
MW-11
Former Ash / Slag Storage Area
MW-10
MW-12
MW-9
MW-14
MW-1
MW-8
MW-2
East and West Ash Ponds
MW-5
MW-6
MW-3
Former Griess-Pfleger Tannery Site
MW-4
MW-15
MW-7
MW-16
LEGEND:
MWG/NRG Quarterly Report Wells
Griess-Pfleger ELUC Wells
Former General Boiler Property
Waukegan Wastewater Treatment Plant
Image USDA Farm Service Agency
2452 ft



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GROUNDWATER CONTOUR MAP 11/2016

WILL COUNTY STATION
ROMEOVILLE, ILLINOIS

Scale: 1" = 250' | Date: December 19, 2016

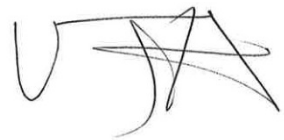
KPRG Project No. 12313.3 | FIGURE 2

W:\projects\midwest generation\12313\will county\2016\will co station gw map-4q2016.dwg

CERTIFICATE OF SERVICE

I hereby certify that the foregoing **CITIZENS GROUP'S POST-HEARING BRIEF** was served electronically to all parties of record listed below on July 20, 2018.

Respectfully submitted,



____

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Bradley P. Halloran,
Hearing Officer
Illinois Pollution Control Board 100
West Randolph St., Suite 11-500
Chicago, IL 60601

Appendix D

Plant	City	State	ID	Status	Desig	Lined	Is Leachate Collected?	Distance from Nearest Surface	Year Initially Brought Online Or	Inactive
A. B. Brown Station	Mount Vernon	IN	LANDFILL-1	Active/Inactive/Open Landfills	FGD Lanfill	Yes	Yes	7000	1979	No
AEP Tanners Creek Plant	Lawrenceburg	IN	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	Yes	Yes	300	2009	No
AER- Coffeen Power Station	Coffeen	IL	LANDFILL-1	Active/Inactive/Open Landfills	Landfill	Yes	Yes	1850	2010	Yes
AES - Somerset	Barker	NY	LANDFILL-A	Planned Landfills	SWDA 3	Yes	Yes	2902	2025	NA
AES - Somerset	Barker	NY	LANDFILL-1	Active/Inactive/Open Landfills	SWDA 2	Yes	Yes	4375	2008	No
AES - Somerset	Barker	NY	RET-LANDFILL-1	Retired/Closed Landfills	SWDA 1	Yes	Yes	1689	1984	NA
AES Cayuga LLC	Lansing	NY	LANDFILL-1	Active/Inactive/Open Landfills	Ash Site Landfill	Yes	Yes	4000	1978	No
AES Greenidge LLC	Dresden	NY	LANDFILL-1	Active/Inactive/Open Landfills	AES Lockwood	Yes	Yes	300	1979	No
Albright Power Station	Albright	WV	RET-LANDFILL-1	Retired/Closed Landfills	Closed CCB Landfill	No	Yes	50	1952	NA
Albright Power Station	Albright	WV	LANDFILL-1	Active/Inactive/Open Landfills	Active CCB Landfill	No	Yes	600	1978	No
Allen S King Generating Plant	Bayport	MN	LANDFILL-1	Active/Inactive/Open Landfills	AS King Ash Disposal Facility	Yes	Yes	50	1976	No
Allen Steam Plant	Memphis	TN	LANDFILL-A	Planned Landfills	ALF/SHF Regional Landfill	Yes	Yes	-111	2015	NA
Allen Steam Station	Belmont	NC	LANDFILL-1	Active/Inactive/Open Landfills	Ash/Gypsum Landfill	Yes	Yes	249	2009	No
Alma	Alma	WI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
Alma	Alma	WI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
Alma	Alma	WI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
AmerenUE Sioux Power Plant	West Alton	MO	LANDFILL-A	Planned Landfills	Gypsum Stack	Yes	No	900	2010	NA
AmerenUE Sioux Power Plant	West Alton	MO	LANDFILL-B	Planned Landfills	Dry Utility Waste Landfill	Yes	No	1800	2013	NA
Antelope Valley Station	Beulah	ND	LANDFILL-2	Active/Inactive/Open Landfills	SP-160	Yes	No	16045	1996	No
Antelope Valley Station	Beulah	ND	LANDFILL-1	Active/Inactive/Open Landfills	SP-025	Yes	No	13203	1984	Yes
Armstrong Power Station	Adrian	PA	LANDFILL-1	Active/Inactive/Open Landfills	Active Ash Site	Yes	Yes	900	2007	No
Armstrong Power Station	Adrian	PA	RET-LANDFILL-1	Retired/Closed Landfills	Closed Ash Site	No	Yes	600	1958	NA
Associated Electric Cooperative, Inc, Thomas Hill Energy Center	Clifton Hill	MO	LANDFILL-1	Active/Inactive/Open Landfills	MO-717502	No	No	1100	1982	No
Austin Northeast Power Station	Austin	MN	RET-LANDFILL-1	Retired/Closed Landfills	Coal Ash Monofill	No	No	50	1971	NA
Baldwin Energy Complex	Baldwin	IL	LANDFILL-A	Planned Landfills	DFGD Landfill	Yes	Yes	300	2013	NA
Bay Front Steam Plant	Ashland	WI	RET-LANDFILL-1	Retired/Closed Landfills	Deer Creek	No	No	7920	1978	NA
Bay Front Steam Plant	Ashland	WI	LANDFILL-1	Active/Inactive/Open Landfills	Woodfield	Yes	Yes	8750	1994	Yes
Belews Creek Steam Station	Belews Creek	NC	LANDFILL-1	Active/Inactive/Open Landfills	Craig Road Ash Landfill	Yes	Yes	429	2008	No
Belews Creek Steam Station	Belews Creek	NC	RET-LANDFILL-1	Retired/Closed Landfills	Closed Pine Hall Road Landfill	No	No	2295	1985	NA
Belews Creek Steam Station	Belews Creek	NC	LANDFILL-2	Active/Inactive/Open Landfills	FGD Residual Landfill	Yes	Yes	539	2008	No
Belle River Power Plant	China Township	MI	LANDFILL-1	Active/Inactive/Open Landfills	Range Road	Yes	Yes	500	1951	No
Big Brown Steam Electric Station	Fairfield	TX	RET-LANDFILL-1	Retired/Closed Landfills	Ash Disposal Area 1	Yes	No	1225	1971	NA
Big Brown Steam Electric Station	Fairfield	TX	RET-LANDFILL-3	Retired/Closed Landfills	Class 3 bottom ash landfill Area B	No	No	3300	1994	NA
Big Brown Steam Electric Station	Fairfield	TX	RET-LANDFILL-2	Retired/Closed Landfills	Class 3 bottom ash landfill Area A	No	No	2450	1998	NA
Big Brown Steam Electric Station	Fairfield	TX	LANDFILL-1	Active/Inactive/Open Landfills	Ash Disposal Area 2	Yes	No	700	1989	No
Big Cajun 2	New Roads	LA	LANDFILL-1	Active/Inactive/Open Landfills	Fly Ash	Yes	No	7600	1980	No
Big Sandy	Louisa	KY	LANDFILL-A	Planned Landfills	Burke Branch	Yes	Yes	700	2015	NA
Big Stone	Big Stone City	SD	LANDFILL-1	Active/Inactive/Open Landfills	Ash Disposal Site	No	No	2880	1975	No
Black Dog Generating Plant	Burnsville	MN	RET-LANDFILL-1	Retired/Closed Landfills	Ash Storage Area	No	No	65	1955	NA
Boardman	Boardman	OR	LANDFILL-1	Active/Inactive/Open Landfills	Ash Pit	Yes	No	64000	1980	No
Bonanza Power Plant	Vernal	UT	LANDFILL-2	Active/Inactive/Open Landfills	Bottom Ash	No	No	47000	2007	No
Bonanza Power Plant	Vernal	UT	LANDFILL-1	Active/Inactive/Open Landfills	Fly ash/Scrubber sludge	No	No	52800	1985	No
Boswell Energy Center	Cohasset	MN	LANDFILL-2	Active/Inactive/Open Landfills	Industrial Solid Waste Landfill	Yes	No	950	1973	No
Boswell Energy Center	Cohasset	MN	LANDFILL-1	Active/Inactive/Open Landfills	SE Units 1,2 and 3 Dry Fly Ash Landfill	Yes	No	5000	2009	Yes
Boswell Energy Center	Cohasset	MN	RET-LANDFILL-1	Retired/Closed Landfills	Hibbing Ash Cell	Yes	No	1058	1994	NA
Brame Energy Center	Lena	LA	LANDFILL-A	Planned Landfills	Ash management area - cell 1	Yes	Yes	1000	2009	NA
Brayton Point Station	Somerset	MA	RET-LANDFILL-2	Retired/Closed Landfills	Cell 9	Yes	Yes	200	1985	NA
Brayton Point Station	Somerset	MA	RET-LANDFILL-1	Retired/Closed Landfills	Cell 10A	Yes	Yes	450	1993	NA

Brayton Point Station	Somerset	MA	RET-LANDFILL-3	Retired/Closed Landfills	Cells 1 - 8	Yes	Yes	250	1979	NA
Brayton Point Station	Somerset	MA	LANDFILL-1	Active/Inactive/Open Landfills	Cell 10	Yes	Yes	250	1993	No
Brayton Point Station	Somerset	MA	RET-LANDFILL-4	Retired/Closed Landfills	Cell 1A	Yes	No	800	1979	NA
Bull Run	Clinton	TN	LANDFILL-1	Active/Inactive/Open Landfills	Fly Ash Stack	No	Yes	5800	1982	No
Bull Run	Clinton	TN	RET-LANDFILL-1	Retired/Closed Landfills	East/West Dredge Cell	No	No	100	1981	NA
Bull Run	Clinton	TN	LANDFILL-A	Planned Landfills	BRF/KIF Regional Landfill	Yes	Yes	-111	2014	NA
C D McIntosh Jr. Power Plant	Lakeland	FL	LANDFILL-1	Active/Inactive/Open Landfills	Landfill (active)	Yes	No	180	1982	No
C R Huntley Generating Station	Tonawanda	NY	LANDFILL-1	Active/Inactive/Open Landfills	Huntley Ash Landfill	Yes	Yes	1010	1970	Yes
Canadys Station	Walterboro	SC	LANDFILL-A	Planned Landfills	Canadys	Yes	Yes	500	2015	NA
Cane Run	Louisville	KY	LANDFILL-1	Active/Inactive/Open Landfills	Cane Run Special Waste Landfill	No	No	200	1980	No
Cane Run	Louisville	KY	LANDFILL-A	Planned Landfills	Cane Run Special Waste Landfill-Permit Modification	Yes	Yes	2000	2013	NA
Cardinal	Brilliant	OH	LANDFILL-1	Active/Inactive/Open Landfills	FAR 1 Residual Waste Landfill	Yes	Yes	200	2008	No
Cayuga	Cayuga	IN	LANDFILL-1	Active/Inactive/Open Landfills	Cayuga RWS 1 Landfill	Yes	Yes	1150	2008	No
Chalk Point Generating Station	Aquasco	MD	LANDFILL-1	Active/Inactive/Open Landfills	brandywine	Yes	Yes	30	1972	No
Chesapeake Energy Center	Chesapeake	VA	LANDFILL-1	Active/Inactive/Open Landfills	ash landfill	Yes	No	50	1985	No
Cheswick Power Station	Springdale	PA	LANDFILL-1	Active/Inactive/Open Landfills	Lefever	Yes	Yes	1200	1982	No
Choctaw Generation, LP	Ackerman	MS	LANDFILL-1	Active/Inactive/Open Landfills	AMU	Yes	Yes	300	2000	No
Cholla Power Plant	Joseph City	AZ	LANDFILL-1	Active/Inactive/Open Landfills	Bottom Ash Monofill	No	Yes	1700	1999	No
Cliffside Steam Station	Cliffside	NC	LANDFILL-A	Planned Landfills	Gypsum Landfill	Yes	Yes	2850	2010	NA
Clifty Creek Station	Madison	IN	LANDFILL-2	Active/Inactive/Open Landfills	Type I Fly Ash Landfill	Yes	Yes	1600	2010	No
Clifty Creek Station	Madison	IN	LANDFILL-1	Active/Inactive/Open Landfills	Type III Fly Ash Landfill	No	No	1600	1991	No
Clinch River Plant	Cleveland	VA	LANDFILL-1	Active/Inactive/Open Landfills	Clinch River Industrial Waste Landfill, Permit 223	Yes	Yes	250	1975	No
Clinch River Plant	Cleveland	VA	LANDFILL-A	Planned Landfills	Possum Hollow Industrial Waste Landfill, Permit 607	Yes	Yes	1300	2011	NA
Clover Power Station	Clover	VA	LANDFILL-A	Planned Landfills	Stage 4	No Answer	No Answer	-999	-999	NA
Clover Power Station	Clover	VA	RET-LANDFILL-1	Retired/Closed Landfills	Stage 1&2	Yes	Yes	50	1994	NA
Clover Power Station	Clover	VA	LANDFILL-1	Active/Inactive/Open Landfills	Stage 3	Yes	Yes	50	2002	No
Coal Creek	Underwood	ND	RET-LANDFILL-3	Retired/Closed Landfills	SW Section 16	Yes	No	41.154	1989	NA
Coal Creek	Underwood	ND	RET-LANDFILL-2	Retired/Closed Landfills	Section 31	Yes	No	909 08	1988	NA
Coal Creek	Underwood	ND	RET-LANDFILL-1	Retired/Closed Landfills	Section 5	No	No	1836.35	1979	NA
Coal Creek	Underwood	ND	LANDFILL-1	Active/Inactive/Open Landfills	SE Section 16	Yes	Yes	1741.7	1994	No
Coal Creek	Underwood	ND	LANDFILL-2	Active/Inactive/Open Landfills	Section 32	Yes	No	1726.86	1989	No
Coal Creek	Underwood	ND	LANDFILL-3	Active/Inactive/Open Landfills	Section 26	Yes	No	616.45	1996	Yes
Colbert	Tuscumbia	AL	LANDFILL-A	Planned Landfills	COF New Landfill (all)	Yes	Yes	-111	2014	NA
Colbert	Tuscumbia	AL	LANDFILL-1	Active/Inactive/Open Landfills	#5 Dry Stack (fly ash)	No	No	1200	1984	Yes
Coleto Creek Power, L.P.	Fannin	TX	LANDFILL-A	Planned Landfills	Combustion By-products	Yes	Yes	6823	2015	NA
Colstrip Energy Limited Partnership	Colstrip	MT	LANDFILL-1	Active/Inactive/Open Landfills	CELP	No	No	1800	2006	No
Colstrip Energy Limited Partnership	Colstrip	MT	RET-LANDFILL-1	Retired/Closed Landfills	CELP	No	No	1800	1990	NA
Comanche Station	Pueblo	CO	LANDFILL-1	Active/Inactive/Open Landfills	Comanche ADF	No	No	3800	1987	No
Conemaugh	New Florence	PA	LANDFILL-A	Planned Landfills	Stage III	Yes	Yes	100	2014	NA
Conemaugh	New Florence	PA	LANDFILL-1	Active/Inactive/Open Landfills	Stage II	Yes	Yes	325	1985	No
Conemaugh	New Florence	PA	RET-LANDFILL-1	Retired/Closed Landfills	Stage I	No	Yes	150	1970	NA
Cope	Cope	SC	LANDFILL-1	Active/Inactive/Open Landfills	Cope Landfill	Yes	No	230	1995	No
Coronado Generating Station	St Johns	AZ	LANDFILL-1	Active/Inactive/Open Landfills	Ash Disposal	Yes	Yes	18802	1979	No
Coronado Generating Station	St Johns	AZ	RET-LANDFILL-1	Retired/Closed Landfills	N/A	No Answer	No Answer	-999	-999	NA
Coronado Generating Station	St Johns	AZ	LANDFILL-A	Planned Landfills	N/A	No Answer	No Answer	-999	-999	NA
Coyote Station	Beulah	ND	LANDFILL-1	Active/Inactive/Open Landfills	Blue Pit	Yes	No	1130	1999	No
Coyote Station	Beulah	ND	LANDFILL-2	Active/Inactive/Open Landfills	Purple Pit	No	No	1060	1981	No
Coyote Station	Beulah	ND	RET-LANDFILL-1	Retired/Closed Landfills	Green Pit	Yes	No	1860	1981	NA
Coyote Station	Beulah	ND	RET-LANDFILL-2	Retired/Closed Landfills	Black Pit	Yes	No	590	1990	NA
Cross Generating Station	Pineville	SC	LANDFILL-3	Active/Inactive/Open Landfills	-999	No Answer	No Answer	-999	-999	Yes
Cross Generating Station	Pineville	SC	LANDFILL-1	Active/Inactive/Open Landfills	Poz-O-Tec	No	No	3000	1982	No

Cross Generating Station	Pineville	SC	LANDFILL-2	Active/Inactive/Open Landfills	-999	No Answer	No Answer	-999	-999	Yes
Cross Generating Station	Pineville	SC	LANDFILL-4	Active/Inactive/Open Landfills	-999	No Answer	No Answer	-999	-999	Yes
Crystal River Energy Complex	Crystal River	FL	LANDFILL-A	Planned Landfills	Landfill-2	Yes	Yes	13940	2016	NA
Crystal River Energy Complex	Crystal River	FL	LANDFILL-1	Active/Inactive/Open Landfills	Landfill-1	No	No	11303	1982	No
Cumberland	Cumberland City	TN	LANDFILL-A	Planned Landfills	CUF New Landfill (all)	Yes	Yes	-111	2014	NA
D.B. Wilson Station	Centertown	KY	LANDFILL-2	Active/Inactive/Open Landfills	Phase II Landfill	No	No	500	2010	No
D.B. Wilson Station	Centertown	KY	LANDFILL-1	Active/Inactive/Open Landfills	Phase I Landfill	No	No	500	1983	No
Dallman	Springfield	IL	RET-LANDFILL-1	Retired/Closed Landfills	Unit 1	No	No	500	1976	NA
Dallman	Springfield	IL	LANDFILL-1	Active/Inactive/Open Landfills	Unit 2	Yes	Yes	500	1988	Yes
Danskammer Generating Station	Newburgh	NY	LANDFILL-1	Active/Inactive/Open Landfills	Danskammer Solid Waste Management Facility	Yes	Yes	1000	1987	No
Dave Johnston Plant	Glenrock	WY	LANDFILL-1	Active/Inactive/Open Landfills	Dave Johnston Plant Industrial Landfill	No	No	3700	1959	No
DE Karn Power Plant	Essexville	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
Deerhaven Generating Station	Gainesville	FL	LANDFILL-1	Active/Inactive/Open Landfills	Fly Ash Landfill	Yes	Yes	1600	1981	No
Dickerson Generating Station	Dickerson	MD	LANDFILL-2	Active/Inactive/Open Landfills	Westland Ash Storage Site	Yes	Yes	500	1980	No
Dolet Hills Power Station	Mansfield	LA	LANDFILL-1	Active/Inactive/Open Landfills	Flyash/FGD Landfill	Yes	Yes	35000	1986	No
Dominion - Chesterfield Power Station	Chester	VA	LANDFILL-A	Planned Landfills	Reymet Road	Yes	Yes	1000	2018	NA
Duck Creek Power Plant	Canton	IL	LANDFILL-1	Active/Inactive/Open Landfills	Landfill	Yes	Yes	1700	2009	No
Dunkirk Generating Plant	Dunkirk	NY	LANDFILL-1	Active/Inactive/Open Landfills	SWMF	Yes	Yes	2100	1988	No
Earl F Wisdom	Spencer	IA	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	No	No	250	1959	No
East Bend Station	Rabbit Hash	KY	LANDFILL-1	Active/Inactive/Open Landfills	East Landfill	Yes	Yes	600	1981	No
Eastlake Power Plant	Eastlake	OH	LANDFILL-1	Active/Inactive/Open Landfills	North Park	Yes	Yes	300	1990	No
Edgewater Generating Station	Sheboygan	WI	LANDFILL-1	Active/Inactive/Open Landfills	I-43 ADF	Yes	No	115	1985	No
Edgewater Generating Station	Sheboygan	WI	RET-LANDFILL-1	Retired/Closed Landfills	Edgewater 1-4 Closed ADF	No	No	300	1969	NA
Elrama Power Plant	Elrama	PA	RET-LANDFILL-1	Retired/Closed Landfills	Fern Valley	Yes	Yes	700	1989	NA
EME Homer City Generation L.P.	Homer City	PA	LANDFILL-2	Active/Inactive/Open Landfills	Coal Refuse Disposal Site	Yes	Yes	3000	1977	No
EME Homer City Generation L.P.	Homer City	PA	LANDFILL-1	Active/Inactive/Open Landfills	Ash Disposal Site	No	Yes	2800	1969	No
EME Homer City Generation L.P.	Homer City	PA	RET-LANDFILL-1	Retired/Closed Landfills	Emergency Strike Landfill	No	No	400	1980	NA
Entergy Gulf States, LLC - Roy S. Nelson Station	Westlake	LA	LANDFILL-1	Active/Inactive/Open Landfills	CFB Ash Landfill	Yes	Yes	4333.12	1985	No
Entergy Gulf States, LLC - Roy S. Nelson Station	Westlake	LA	LANDFILL-2	Active/Inactive/Open Landfills	Unit 6 Coal Ash	Yes	Yes	4147.35	1985	No
Escalante Station	Prewitt	NM	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
Fair Station	Muscatine	IA	LANDFILL-1	Active/Inactive/Open Landfills	CIPCO landfill	Yes	No	250	1974	No
Fayette Power Project	LaGrange	TX	LANDFILL-2	Active/Inactive/Open Landfills	CCB Landfill	Yes	No	-111	1988	No
Flint Creek Power Plant	Gentry	AR	LANDFILL-1	Active/Inactive/Open Landfills	Ash landfill	Yes	Yes	2075	1978	No
Fort Martin Power Station	Maidsville	WV	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	No	Yes	800	1982	No
Fort Martin Power Station	Maidsville	WV	LANDFILL-A	Planned Landfills	Gypsum Phase II Landfill	Yes	Yes	1000	2011	NA
Fort Martin Power Station	Maidsville	WV	LANDFILL-2	Active/Inactive/Open Landfills	Gypsum Phase I Landfill	Yes	Yes	550	2009	No
Four Corners Steam Electric Station	Fruitland	NM	LANDFILL-1	Active/Inactive/Open Landfills	Dry Flyash Disposal Area	Yes	Yes	3000	2007	No
Four Corners Steam Electric Station	Fruitland	NM	LANDFILL-2	Active/Inactive/Open Landfills	Plant Disposal (Gridded)	No	No	4000	1963	No
Frank E. Ratts Generating Station	Petersburg	IN	LANDFILL-B	Planned Landfills	Phase II	Yes	Yes	1675	2016	NA
Frank E. Ratts Generating Station	Petersburg	IN	LANDFILL-A	Planned Landfills	Phase I landfill	Yes	Yes	1410	2011	NA
Gallagher Generating Station	New Albany	IN	LANDFILL-C	Planned Landfills	N/A	No Answer	No Answer	-999	-999	NA
Gallagher Generating Station	New Albany	IN	LANDFILL-1	Active/Inactive/Open Landfills	N/A	No Answer	No Answer	-999	-999	No Answer
Gallagher Generating Station	New Albany	IN	LANDFILL-2	Active/Inactive/Open Landfills	N/A	No Answer	No Answer	-999	-999	No Answer
Gallagher Generating Station	New Albany	IN	LANDFILL-D	Planned Landfills	N/A	No Answer	No Answer	-999	-999	NA
Gallagher Generating Station	New Albany	IN	LANDFILL-3	Active/Inactive/Open Landfills	N/A	No Answer	No Answer	-999	-999	No Answer
Gallagher Generating Station	New Albany	IN	RET-LANDFILL-1	Retired/Closed Landfills	N/A	No Answer	No Answer	-999	-999	NA
Gallagher Generating Station	New Albany	IN	RET-LANDFILL-2	Retired/Closed Landfills	N/A	No Answer	No Answer	-999	-999	NA
Gallagher Generating Station	New Albany	IN	LANDFILL-4	Active/Inactive/Open Landfills	N/A	No Answer	No Answer	-999	-999	No Answer
Gallagher Generating Station	New Albany	IN	RET-LANDFILL-3	Retired/Closed Landfills	N/A	No Answer	No Answer	-999	-999	NA
Gallagher Generating Station	New Albany	IN	RET-LANDFILL-4	Retired/Closed Landfills	N/A	No Answer	No Answer	-999	-999	NA

Gallagher Generating Station	New Albany	IN	LANDFILL-A	Planned Landfills	Restricted Waste Landfill	Yes	Yes	200	2010	NA
Gallagher Generating Station	New Albany	IN	LANDFILL-B	Planned Landfills	N/A	No Answer	No Answer	-999	-999	NA
Gallatin	Gallatin	TN	LANDFILL-A	Planned Landfills	GAF New Landfill (all)	Yes	Yes	-111	2014	NA
General James M. Gavin	Cheshire	OH	LANDFILL-1	Active/Inactive/Open Landfills	FGD Landfill	Yes	Yes	500	1995	No
Genoa #3	Genoa	WI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
Genoa #3	Genoa	WI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
George Neal North	Sergeant Bluff	IA	LANDFILL-3	Active/Inactive/Open Landfills		No Answer	No Answer	-999	-999	No Answer
George Neal North	Sergeant Bluff	IA	LANDFILL-1	Active/Inactive/Open Landfills	Neal North Landfill Active	Yes	Yes	900	2009	No
George Neal North	Sergeant Bluff	IA	LANDFILL-2	Active/Inactive/Open Landfills		No Answer	No Answer	-999	-999	No Answer
George Neal North	Sergeant Bluff	IA	RET-LANDFILL-1	Retired/Closed Landfills	Neal North Landfill West	No	No	110	1975	NA
George Neal North	Sergeant Bluff	IA	RET-LANDFILL-2	Retired/Closed Landfills	Neal North Landfill East	No	No	126	1982	NA
George Neal North	Sergeant Bluff	IA	LANDFILL-A	Planned Landfills	Neal North Landfill Planned	Yes	Yes	803	-111	NA
George Neal South	Salix	IA	LANDFILL-1	Active/Inactive/Open Landfills	Neal 4 Landfill	No	No	3485	1979	No
Georgia Power Company - Plant Bowen	Cartersville	GA	LANDFILL-1	Active/Inactive/Open Landfills	CCB Disposal Facility	Yes	No	100	2008	No
Georgia Power Company - Plant Wansley	Carrollton	GA	LANDFILL-A	Planned Landfills	Gypsum Landfill	Yes	Yes	50	2012	NA
Gerald Gentleman Station	Sutherland	NE	LANDFILL-1	Active/Inactive/Open Landfills	Fossil Fuels Combustion Ash Landfill	Yes	No	4005	1979	Yes
Ghent	Ghent	KY	LANDFILL-A	Planned Landfills	Special Waste Landfill	Yes	Yes	7000	2013	NA
Gibbons Creek Steam Electric Station	Anderson	TX	LANDFILL-2	Active/Inactive/Open Landfills	Site F	Yes	Yes	555	1990	No
Gibbons Creek Steam Electric Station	Anderson	TX	LANDFILL-1	Active/Inactive/Open Landfills	Site A	Yes	Yes	367	1983	Yes
Gibson Generating Station	Owensville	IN	LANDFILL-2	Active/Inactive/Open Landfills	S Aggregate Landfill (26-06)	Yes	Yes	1472	2007	No
Gibson Generating Station	Owensville	IN	LANDFILL-1	Active/Inactive/Open Landfills	Aggregate Landfill (26-02)	Yes	Yes	1471	1982	No
Glen Lyn Plant	Glen Lyn	VA	LANDFILL-1	Active/Inactive/Open Landfills	Glen Lyn Industrial Waste Landfill, Permit 222	Yes	Yes	150	1977	Yes
Grant Town Power Plant	Grant Town	WV	LANDFILL-1	Active/Inactive/Open Landfills	Grant Town	No	No	2	1993	No
Grant Town Power Plant	Grant Town	WV	LANDFILL-3	Active/Inactive/Open Landfills	Farmington	No	No	500	2009	No
Grant Town Power Plant	Grant Town	WV	LANDFILL-2	Active/Inactive/Open Landfills	Barrackville	No	No	2200	1994	No
GRDA	Chouteau	OK	RET-LANDFILL-1	Retired/Closed Landfills	construction/demolition landfill	No	No	1460	1981	NA
GRDA	Chouteau	OK	LANDFILL-1	Active/Inactive/Open Landfills	ash landfill	Yes	No	3330	1981	No
Great River Energy Stanton Station	Stanton	ND	LANDFILL-1	Active/Inactive/Open Landfills	Fly Ash Landfill	Yes	Yes	187	1996	No
Great River Energy Stanton Station	Stanton	ND	LANDFILL-2	Active/Inactive/Open Landfills	Bottom Ash Landfill	Yes	No	1247	1995	Yes
Great River Energy Stanton Station	Stanton	ND	RET-LANDFILL-1	Retired/Closed Landfills	Old Ash Landfill	Yes	No	976	1986	NA
Harrington Station	Amarillo	TX	LANDFILL-2	Active/Inactive/Open Landfills	1	Yes	No	286	1989	No
Harrington Station	Amarillo	TX	LANDFILL-1	Active/Inactive/Open Landfills	117	Yes	No	1369	2001	Yes
Harrison Power Station	Haywood, WV	WV	LANDFILL-1	Active/Inactive/Open Landfills	CCB Landfill	Yes	Yes	200	1980	No
Hatfield's Ferry Power Station	Masontown	PA	LANDFILL-A	Planned Landfills	Disposal Site Expansion	Yes	Yes	3000	2011	NA
Hatfield's Ferry Power Station	Masontown	PA	LANDFILL-1	Active/Inactive/Open Landfills	Ash Disposal Site	No	Yes	3000	1990	No
Hayden Station	Hayden	CO	LANDFILL-1	Active/Inactive/Open Landfills	Hayden Coal Ash Disposal Facility	No	No	800	1983	No
Hennepin Power Station	Hennepin	IL	LANDFILL-1	Active/Inactive/Open Landfills	-999	Yes	Yes	-999	-999	Yes
Hennepin Power Station	Hennepin	IL	LANDFILL-A	Planned Landfills	East Ashfill	Yes	Yes	300	2011	NA
Holcomb Station	Holcomb	KS	LANDFILL-1	Active/Inactive/Open Landfills	HCF	No	Yes	8860	1982	No
Hoot Lake Plant	Fergus Falls	MN	RET-LANDFILL-4	Retired/Closed Landfills	Area 4	No	No	40	1959	NA
Hoot Lake Plant	Fergus Falls	MN	LANDFILL-2	Active/Inactive/Open Landfills	IL001-II	No	No	900	1980	Yes
Hoot Lake Plant	Fergus Falls	MN	LANDFILL-1	Active/Inactive/Open Landfills	IL001-I	No	No	650	1980	Yes
Hoot Lake Plant	Fergus Falls	MN	LANDFILL-3	Active/Inactive/Open Landfills	IL002-Phase 1	Yes	Yes	900	2003	No
Hoot Lake Plant	Fergus Falls	MN	LANDFILL-A	Planned Landfills	IL002-Phase 1A	Yes	Yes	1100	2011	NA
Hoot Lake Plant	Fergus Falls	MN	RET-LANDFILL-3	Retired/Closed Landfills	Area 3	No	Yes	100	1972	NA
Hoot Lake Plant	Fergus Falls	MN	RET-LANDFILL-2	Retired/Closed Landfills	Area 2	No	No	15	1959	NA
Hoot Lake Plant	Fergus Falls	MN	RET-LANDFILL-1	Retired/Closed Landfills	Area 1	No	No	15	1959	NA

Hugo	Fort Towson	OK	LANDFILL-1	Active/Inactive/Open Landfills	Fly Ash Landfill	Yes	No	4200	1982	No
Hunter Plant	Castle Dale	UT	LANDFILL-1	Active/Inactive/Open Landfills	FGD Cell	No	No	5650	1978	Yes
Huntington	Huntington	UT	LANDFILL-1	Active/Inactive/Open Landfills	class III-b Industrial Waste Landfill	No	No	1000	1999	No
Huntington	Huntington	UT	LANDFILL-2	Active/Inactive/Open Landfills	Conditionally Exempt Combustion Waste Landfill	No	No	500	1999	No
Huntington	Huntington	UT	RET-LANDFILL-1	Retired/Closed Landfills	Old Landfill	No	No	200	1974	NA
Iatan Generating Station	Weston	MO	LANDFILL-1	Active/Inactive/Open Landfills	Utility Waste Landfill	Yes	Yes	5232	2009	No
Independence Plant	Newark	AR	LANDFILL-1	Active/Inactive/Open Landfills	ISES Landfill	Yes	No	8385	1982	No
Indian River Generating Station	Dagsboro	DE	RET-LANDFILL-1	Retired/Closed Landfills	Burton Island Landfill	No	No	10	1957	NA
Indian River Generating Station	Dagsboro	DE	LANDFILL-A	Planned Landfills	-999	Yes	Yes	-999	-999	NA
Indian River Generating Station	Dagsboro	DE	LANDFILL-1	Active/Inactive/Open Landfills	Solid Waste Landfill	Yes	No	400	1979	No
Indianapolis Power & Light Company - Petersburg Generating Station	Petersburg	IN	LANDFILL-1	Active/Inactive/Open Landfills	RWS Type III	Yes	No	700	1977	No
Interstate Power and Light - Lansing Generating Station	Lansing	IA	LANDFILL-1	Active/Inactive/Open Landfills	Active Ash Disposal Facility	No	No	40	2000	No
Interstate Power and Light - Lansing Generating Station	Lansing	IA	RET-LANDFILL-1	Retired/Closed Landfills	Closed Ash Disposal Facility	No	No	40	1947	NA
Interstate Power and Light - Ottumwa Generating Station	Ottumwa	IA	LANDFILL-1	Active/Inactive/Open Landfills	Ottumwa Midland Landfill	Yes	Yes	3986	1985	No
Interstate Power and Light - Sutherland Generating Station	Marshalltown	IA	RET-LANDFILL-2	Retired/Closed Landfills	Marshalltown East	Yes	Yes	2184	1993	NA
Interstate Power and Light - Sutherland Generating Station	Marshalltown	IA	RET-LANDFILL-1	Retired/Closed Landfills	Marshalltown West	No	No	2184	1975	NA
J. K. Spruce Power Plant	San Antonio	TX	LANDFILL-1	Active/Inactive/Open Landfills	Landfill (NOR 010)	Yes	No	2309	1992	No
J.E. Corette Treatment Plant	Billings	MT	RET-LANDFILL-1	Retired/Closed Landfills	Fly Ash Landfill	No	No	350	1968	NA
Jack Watson	Gulfport	MS	LANDFILL-1	Active/Inactive/Open Landfills	Dry Ash Monofill	Yes	Yes	800	2004	No
James De Young Generating Station	Holland	MI	LANDFILL-1	Active/Inactive/Open Landfills	Zeeland Township Landfill	No	Yes	300	1992	No
James River Power Station	Springfield	MO	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	Yes	Yes	100	1985	No
JC Weadock Power Plant	Essexville	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
JEA- St. Johns River Power Park	Jacksonville	FL	RET-LANDFILL-1	Retired/Closed Landfills	Area 1	No	No	3000	1986	NA
JEA- St. Johns River Power Park	Jacksonville	FL	LANDFILL-2	Active/Inactive/Open Landfills	Area 2	No	No	4000	2002	No
JEA- St. Johns River Power Park	Jacksonville	FL	LANDFILL-3	Active/Inactive/Open Landfills	Area B	No	No	5000	2008	No
Jeffrey Energy Center	St Marys	KS	LANDFILL-2	Active/Inactive/Open Landfills	Gypsum Landfill	No	Yes	11100	2008	No
Jeffrey Energy Center	St Marys	KS	LANDFILL-1	Active/Inactive/Open Landfills	Fly Ash Landfill	No	No	9200	1978	No
JH Campbell Power Plant	West Olive	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
JH Campbell Power Plant	West Olive	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
JH Campbell Power Plant	West Olive	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
JH Campbell Power Plant	West Olive	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
JH Campbell Power Plant	West Olive	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
JH Campbell Power Plant	West Olive	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
JH Campbell Power Plant	West Olive	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
Jim Bridger Power Plant	Point of Rocks	WY	LANDFILL-1	Active/Inactive/Open Landfills	Landfill	No	No	33528	1986	No
JM Stuart Station	Aberdeen	OH	LANDFILL-1	Active/Inactive/Open Landfills	Landfill 9	Yes	Yes	400	1982	Yes
JM Stuart Station	Aberdeen	OH	LANDFILL-A	Planned Landfills	Carter Hollow Landfill	Yes	Yes	1000	2013	NA
JM Stuart Station	Aberdeen	OH	LANDFILL-2	Active/Inactive/Open Landfills	Landfill 11	Yes	Yes	400	2004	Yes
John E. Amos Plant	Winfield	WV	LANDFILL-1	Active/Inactive/Open Landfills	Quarrier Landfill	Yes	Yes	100	1985	No
John E. Amos Plant	Winfield	WV	LANDFILL-2	Active/Inactive/Open Landfills	John E Amos FGD Landfill	Yes	Yes	100	2009	No
John P. Madgett	Alma	WI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
John P. Madgett	Alma	WI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
John P. Madgett	Alma	WI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
John Sevier	Rogersville	TN	LANDFILL-A	Planned Landfills	Sanders Property	Yes	Yes	800	2012	NA
John Sevier	Rogersville	TN	LANDFILL-1	Active/Inactive/Open Landfills	Dry Fly Ash Stack	Yes	Yes	100	1955	No
Johnsonville	New Johnsonville	TN	RET-LANDFILL-1	Retired/Closed Landfills	South Rail Loop	No	No	1500	1981	NA

Johnsonville	New Johnsonville	TN	LANDFILL-1	Active/Inactive/Open Landfills	DuPont Dredge Cell	No	No	2000	1990	Yes
Joppa Steam	Joppa	IL	LANDFILL-1	Active/Inactive/Open Landfills	-999	Yes	Yes	-999	-999	No Answer
Joppa Steam	Joppa	IL	LANDFILL-A	Planned Landfills	CCB Landfill	Yes	Yes	4850	2010	NA
JR Whiting Power Plant	Luna Pier	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
JR Whiting Power Plant	Luna Pier	MI	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
JT Deely Steam Electric Station	San Antonio	TX	LANDFILL-D	Planned Landfills	-999	No Answer	No	-999	-999	NA
JT Deely Steam Electric Station	San Antonio	TX	LANDFILL-1	Active/Inactive/Open Landfills	JTD / Evaporation Pond #021	Yes	No	1630	1996	No
Kingston	Harriman	TN	LANDFILL-A	Planned Landfills	BRF/KIF Reg Landfill (all)	Yes	Yes	-111	2015	NA
Kingston	Harriman	TN	LANDFILL-B	Planned Landfills	Gypsum Phase 2 Landfill (all)	Yes	Yes	-111	2012	NA
LaCygne Generating Station	LaCygne	KS	LANDFILL-1	Active/Inactive/Open Landfills	Utility Waste Landfill	Yes	No	5238	1973	No
Lake Road Generating Station	St. Joseph	MO	RET-LANDFILL-1	Retired/Closed Landfills	Fly Ash Landfill	Yes	No	2397	1980	NA
Laramie River Station	Wheatland	WY	LANDFILL-1	Active/Inactive/Open Landfills	Landfill	No	Yes	1500	1980	No
Lawrence Energy Center	Lawrence	KS	LANDFILL-2	Active/Inactive/Open Landfills	Landfill 0847	Yes	Yes	226	2006	No
Lawrence Energy Center	Lawrence	KS	RET-LANDFILL-1	Retired/Closed Landfills	Landfill 0333	No	No	1628	1978	NA
Lawrence Energy Center	Lawrence	KS	LANDFILL-1	Active/Inactive/Open Landfills	Landfill 600	No	No	438	1992	Yes
Leland Olds Station	Stanton	ND	LANDFILL-1	Active/Inactive/Open Landfills	SP-038	No	No	100	1966	No
Leland Olds Station	Stanton	ND	LANDFILL-2	Active/Inactive/Open Landfills	SP-143	Yes	No	100	1994	No
Lewis & Clark Station	Sidney	MT	LANDFILL-1	Active/Inactive/Open Landfills	Savage Mine	No	No	31680	1993	No
Lewis & Clark Station	Sidney	MT	RET-LANDFILL-2	Retired/Closed Landfills	-999	No	No	-999	-999	NA
Limestone Electrical Generating Station	Jewett	TX	LANDFILL-1	Active/Inactive/Open Landfills	Class II Landfill	Yes	Yes	175	1985	No
Lon D. Wright Power Plant	Fremont	NE	LANDFILL-1	Active/Inactive/Open Landfills	Ash Monofill	Yes	Yes	10520	1994	No
Louisa Generating Station	Muscatine	IA	LANDFILL-1	Active/Inactive/Open Landfills	CCR Landfill	No	No	3450	1983	No
Marion Generating Station	Marion	IL	LANDFILL-1	Active/Inactive/Open Landfills	1990555005	No	No	400	1979	Yes
Marshall Steam Station	Terrell	NC	LANDFILL-1	Active/Inactive/Open Landfills	FGD Residue Landfill	Yes	Yes	4124	2006	No
Marshall Steam Station	Terrell	NC	LANDFILL-A	Planned Landfills	Industrial Landfill	Yes	Yes	2459	2011	NA
Marshall Steam Station	Terrell	NC	RET-LANDFILL-1	Retired/Closed Landfills	Ash Landfill	No	No	2608	1983	NA
Martin Drake	Colorado Springs	CO	LANDFILL-1	Active/Inactive/Open Landfills	-999	No	No	-999	-999	Yes
Martin Lake Steam Electric Station	Tatum	TX	RET-LANDFILL-1	Retired/Closed Landfills	Caney Branch	Yes	Yes	56	1976	NA
Martin Lake Steam Electric Station	Tatum	TX	LANDFILL-1	Active/Inactive/Open Landfills	A-1 ash disposal	Yes	Yes	7900	1980	No
Martin Lake Steam Electric Station	Tatum	TX	RET-LANDFILL-3	Retired/Closed Landfills	PDP #2	Yes	Yes	2106	1980	NA
Martin Lake Steam Electric Station	Tatum	TX	RET-LANDFILL-4	Retired/Closed Landfills	PDP #3	Yes	Yes	2630	1982	NA
Martin Lake Steam Electric Station	Tatum	TX	LANDFILL-A	Planned Landfills	SPD-6	Yes	Yes	2572	2025	NA
Martin Lake Steam Electric Station	Tatum	TX	RET-LANDFILL-2	Retired/Closed Landfills	PDP #1	Yes	Yes	1390	1979	NA
Mayo Electric Generating Plant	Roxboro	NC	LANDFILL-A	Planned Landfills	CCP Landfill	Yes	Yes	250	2013	NA
McMeekin Station	Columbia	SC	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	No	No	850	1987	No
Merom Generating Station	Sullivan	IN	LANDFILL-A	Planned Landfills	Area 3	Yes	No	6000	2011	NA
Merom Generating Station	Sullivan	IN	LANDFILL-1	Active/Inactive/Open Landfills	Area 2	Yes	No	3750	1997	No
Merom Generating Station	Sullivan	IN	RET-LANDFILL-1	Retired/Closed Landfills	Area 1	No	No	3500	1982	NA
Miami Fort Station	North Bend	OH	RET-LANDFILL-1	Retired/Closed Landfills	Miamiview Road Ash Landfill	Yes	No	230	1982	NA
Miami Fort Station	North Bend	OH	LANDFILL-1	Active/Inactive/Open Landfills	Lawrenceberg Road Ash Landfill	Yes	Yes	180	1992	No
Mill Creek	Louisville	KY	LANDFILL-3	Active/Inactive/Open Landfills	Mill Creek Special Waste Landfill-Site B	No	No	1500	1980	Yes
Mill Creek	Louisville	KY	LANDFILL-2	Active/Inactive/Open Landfills	Mill Creek Special Waste Landfill-Site C	Yes	Yes	300	2009	No
Mill Creek	Louisville	KY	LANDFILL-1	Active/Inactive/Open Landfills	Mill Creek Special Waste Landfill-Site A	No	No	1500	1990	No
Milton R Young Station	Center	ND	LANDFILL-B	Planned Landfills	Cell 3 30 Year Ponds	Yes	Yes	3500	2020	NA
Milton R Young Station	Center	ND	LANDFILL-A	Planned Landfills	Cell 2 30 Year Ponds	Yes	Yes	2200	2013	NA
Milton R Young Station	Center	ND	RET-LANDFILL-3	Retired/Closed Landfills	IT-197	No	No	21200	2000	NA
Milton R Young Station	Center	ND	RET-LANDFILL-2	Retired/Closed Landfills	IT-068	No	No	12000	1985	NA
Milton R Young Station	Center	ND	RET-LANDFILL-1	Retired/Closed Landfills	Horseshoe Pit	No	Yes	8000	1983	NA
Milton R Young Station	Center	ND	LANDFILL-2	Active/Inactive/Open Landfills	IT-205 Section 3	No	Yes	21200	2002	No
Milton R Young Station	Center	ND	LANDFILL-1	Active/Inactive/Open Landfills	Cell 1 30 Year Ponds	Yes	Yes	2200	2004	No

Mirant Mid-Atlantic, LLC	Newburg	MD	LANDFILL-2	Active/Inactive/Open Landfills	Faulkner Ash Site	Yes	Yes	520	1970	Yes
Mitchell Power Station	Courtney	PA	RET-LANDFILL-1	Retired/Closed Landfills	Inactive coal combustion byproduct disposal site	No	Yes	900	1949	NA
Mitchell Power Station	Courtney	PA	LANDFILL-1	Active/Inactive/Open Landfills	Active Coal Combustion byproduct disposal site	No	Yes	2100	1982	No
Monticello Steam Electric Station	Mount Pleasant	TX	LANDFILL-1	Active/Inactive/Open Landfills	B Area	No	No	242	1976	No
Monticello Steam Electric Station	Mount Pleasant	TX	LANDFILL-2	Active/Inactive/Open Landfills	G Area	Yes	No	7800	1990	No
Monticello Steam Electric Station	Mount Pleasant	TX	RET-LANDFILL-1	Retired/Closed Landfills	A Area	No	No	93	1977	NA
Montrose Generating Station	Montrose	MO	LANDFILL-A	Planned Landfills	Utility Waste Landfill Expansion	Yes	Yes	1605	2012	NA
Montrose Generating Station	Montrose	MO	LANDFILL-1	Active/Inactive/Open Landfills	Utility Waste Landfill	Yes	No	775	1958	No
Mount Storm Power Station	Mt. Storm	WV	LANDFILL-2	Active/Inactive/Open Landfills	Phase A Landfill (FGD)	Yes	Yes	2661	1994	Yes
Mount Storm Power Station	Mt. Storm	WV	LANDFILL-1	Active/Inactive/Open Landfills	Phase B Landfill	No	Yes	3939	1989	No
Mount Storm Power Station	Mt. Storm	WV	RET-LANDFILL-1	Retired/Closed Landfills	Closed Ash Mtn	Yes	Yes	2112	1981	NA
Mount Storm Power Station	Mt. Storm	WV	LANDFILL-3	Active/Inactive/Open Landfills	Phase A Landfill (ASH)	Yes	Yes	2661	1986	Yes
Mount Tom Generating Company,LLC	Holyoke	MA	RET-LANDFILL-4	Retired/Closed Landfills	Former Bottom Ash Basin "A"	No	No	100	1960	NA
Mountaineer Plant	New Haven	WV	LANDFILL-1	Active/Inactive/Open Landfills	Little Broad Run Landfill	Yes	Yes	100	1980	No
Mt Carmel Cogen (formerly Foster Wheeler)	Marion Heights	PA	LANDFILL-1	Active/Inactive/Open Landfills	-999	No Answer	Yes	-999	-999	No
Muscatine Power and Water Generating Station	Muscatine	IA	LANDFILL-1	Active/Inactive/Open Landfills	Coal Combustion Residue Landfill	Yes	No	500	1985	No
Muskingum River	Beverly	OH	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
Navajo Generating Station	Page	AZ	LANDFILL-1	Active/Inactive/Open Landfills	Ash Disposal Area	No	No	10000	1974	Yes
Nearman Creek Power Plant	Kansas City	KS	LANDFILL-2	Active/Inactive/Open Landfills	Fly Ash Dry Deposition Area	No	No	800	1981	Yes
Nearman Creek Power Plant	Kansas City	KS	LANDFILL-1	Active/Inactive/Open Landfills	Bottom Ash Pond	Yes	No	650	1981	Yes
Nebraska City Station	Nebraska City	NE	LANDFILL-2	Active/Inactive/Open Landfills	NC2 Landfill Cell 1	Yes	Yes	4000	2009	No
Nebraska City Station	Nebraska City	NE	LANDFILL-A	Planned Landfills	NC2 Landfill Cell 2	Yes	Yes	4921	2013	NA
Nebraska City Station	Nebraska City	NE	LANDFILL-1	Active/Inactive/Open Landfills	NC1 landfill	No	No	4367	1978	No
Nebraska City Station	Nebraska City	NE	LANDFILL-B	Planned Landfills	NC2 Landfill Cell 3	Yes	Yes	6335	2013	NA
New Castle Power Plant	West Pittsburg	PA	LANDFILL-1	Active/Inactive/Open Landfills	Fly Ash Landfill	Yes	Yes	750	1987	Yes
New Madrid Power Plant	Marston	MO	LANDFILL-1	Active/Inactive/Open Landfills	UCW landfill	Yes	Yes	12521	2007	No
Newton	Newton	IL	RET-LANDFILL-1	Retired/Closed Landfills	Landfill Phase I	No	No Answer	2481	1979	NA
Newton	Newton	IL	LANDFILL-1	Active/Inactive/Open Landfills	Landfill Phase II	Yes	Yes	2500	1997	No
NIPSCO Bailly Generating Station	Chesterton	IN	RET-LANDFILL-1	Retired/Closed Landfills	BGS North Landfill	No	No	360	1962	NA
NIPSCO Bailly Generating Station	Chesterton	IN	RET-LANDFILL-2	Retired/Closed Landfills	BGS South Landfill	No	No	50	1965	NA
North Omaha Station	Omaha	NE	LANDFILL-1	Active/Inactive/Open Landfills	North Omaha Ash Landfill	No	No	590	1976	No
North Omaha Station	Omaha	NE	RET-LANDFILL-1	Retired/Closed Landfills	North Omaha Ash Landfill closed area	Yes	No	1362	1976	NA
North Vamly Generating Station	Valmy	NV	LANDFILL-1	Active/Inactive/Open Landfills	U1, U2 & U3 Ash Landfill	No	No	6917	1981	No
Northeastern Power Station	Oolagah	OK	LANDFILL-1	Active/Inactive/Open Landfills	Fly Ash Landfill	Yes	No	125	1979	No
Northside Generating Station	Jacksonville	FL	LANDFILL-1	Active/Inactive/Open Landfills	Outdoor pile 1	Yes	Yes	570	2002	No
Oak Creek Power Plant	Oak Creek	WI	RET-LANDFILL-2	Retired/Closed Landfills	Oak Creek South Ash Landfill	No	Yes	250	1974	NA
Oak Creek Power Plant	Oak Creek	WI	RET-LANDFILL-1	Retired/Closed Landfills	Oak Creek North Ash Landfill	No	No	200	1960	NA
Oak Creek Power Plant	Oak Creek	WI	LANDFILL-1	Active/Inactive/Open Landfills	Caledonia Ash Landfill	Yes	Yes	400	1990	No
Oak Grove Steam Electric Station	Franklin	TX	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill 1	Yes	No	975	2009	No
Oak Grove Steam Electric Station	Franklin	TX	LANDFILL-3	Active/Inactive/Open Landfills	-999	No	No	-999	-999	No Answer
Oak Grove Steam Electric Station	Franklin	TX	LANDFILL-2	Active/Inactive/Open Landfills	-999	No	No	-999	-999	No Answer
Osage Power Plant	Osage	WY	LANDFILL-2	Active/Inactive/Open Landfills	Old Ash Dam	No	No	1000	1990	Yes
Osage Power Plant	Osage	WY	RET-LANDFILL-1	Retired/Closed Landfills	Historic Ash Dam	No	No	800	1960	NA
OVEC - Kyger Creek Station	Cheshire	OH	LANDFILL-1	Active/Inactive/Open Landfills	Type III landfill	Yes	Yes	2732.93	2010	No
PacifiCorp Energy - Carbon Plant	Helper	UT	RET-LANDFILL-1	Retired/Closed Landfills	Original Landfill	No	No	150	1954	NA
PacifiCorp Energy - Carbon Plant	Helper	UT	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	No	No	570	1991	No
Paradise	Drakesboro	KY	LANDFILL-A	Planned Landfills	PAF New Landfill	Yes	Yes	-999	2014	NA
Pawnee Station	Brush	CO	LANDFILL-1	Active/Inactive/Open Landfills	Pawnee Station Landfill	No	No	2100	1981	No

Pirkey	Hallsville	TX	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
Pirkey	Hallsville	TX	Redacted	Redacted	Redacted	Redacted	Redacted	-9999	-9999	Redacted
Plant Crist	Pensacola	FL	LANDFILL-A	Planned Landfills	Gypsum Area 2	Yes	No	1100	2018	NA
Plant Crist	Pensacola	FL	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	Yes	Yes	860	1980	No
Plant Hammond	Rome	GA	LANDFILL-1	Active/Inactive/Open Landfills	Huffaker CCB	Yes	Yes	100	2008	No
Plant Harllee Branch	Milledgeville	GA	LANDFILL-A	Planned Landfills	Gypsum Stack	Yes	Yes	120	2013	NA
Plant Kraft	Port Wentworth	GA	LANDFILL-1	Active/Inactive/Open Landfills	Grumman Road Dry Ash Monofill	No	No	200	1986	No
Plant Lansing Smith	Southport	FL	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	Yes	No	840	1985	No
Plant Scherer	Juliette	GA	LANDFILL-A	Planned Landfills	Gypsum Storage	Yes	Yes	1700	2010	NA
Plant Yates	Newnan	GA	LANDFILL-2	Active/Inactive/Open Landfills	Gypsum Solid Waste Facility	Yes	No	3000	1992	No
Plant Yates	Newnan	GA	LANDFILL-1	Active/Inactive/Open Landfills	R-6 Ash Monofill	No	No	4000	1985	No
Platte Generating Station	Grand Island	NE	RET-LANDFILL-1	Retired/Closed Landfills	Ash Disposal Phase I	No	No	800	1982	NA
Platte Generating Station	Grand Island	NE	LANDFILL-1	Active/Inactive/Open Landfills	Ash Disposal Phase II	No	No	570	1986	Yes
Pleasant Prairie Power Plant	Pleasant Prairie	WI	LANDFILL-1	Active/Inactive/Open Landfills	Pleasant Prairie	Yes	Yes	250	1980	No
Plesants Power Station	Willow Island	WV	LANDFILL-1	Active/Inactive/Open Landfills	McElroy's Run	Yes	Yes	1470	1978	No
PPL Brunner Island	Mt. Wolf	PA	LANDFILL-1	Active/Inactive/Open Landfills	Disposal Area 8	Yes	Yes	225	2009	No
PPL Montour	Washingtonville	PA	LANDFILL-1	Active/Inactive/Open Landfills	Ash Area No. 3	Yes	Yes	1800	1993	No
PPL Montour	Washingtonville	PA	RET-LANDFILL-1	Retired/Closed Landfills	Ash Area No. 2	No Answer	No Answer	200	1982	NA
Presque Isle Power Plant	Marquette	MI	RET-LANDFILL-1	Retired/Closed Landfills	Presque Isle Power Plant Ash Landfill #1	No	No	900	1988	NA
Presque Isle Power Plant	Marquette	MI	LANDFILL-1	Active/Inactive/Open Landfills	Presque Isle Power Plant Ash Landfill #3	Yes	Yes	900	2005	No
Presque Isle Power Plant	Marquette	MI	RET-LANDFILL-2	Retired/Closed Landfills	Presque Isle Power Plant Ash Landfill #2	Yes	Yes	900	1993	NA
PSEG Hudson Generating Station	Jersey City	NJ	LANDFILL-1	Active/Inactive/Open Landfills	Landfill 1	No	No	1300	1964	Yes
PSEG Mercer Generating Station	Hamilton Township	NJ	LANDFILL-1	Active/Inactive/Open Landfills	Landfill 1	No	No	200	1961	No
PSNH - Merrimack Station	Bow	NH	LANDFILL-1	Active/Inactive/Open Landfills	Coal Ash Landfill	Yes	Yes	918	1985	No
PSNH - Schiller Station	Portsmouth	NH	RET-LANDFILL-1	Retired/Closed Landfills	Closed Landfill	No	No	490	1949	NA
Pulliam	Green Bay	WI	RET-LANDFILL-1	Retired/Closed Landfills	Pulliam Landfill	No	No	40	1951	NA
Quindaro Power Plant	Kansas City	KS	LANDFILL-1	Active/Inactive/Open Landfills	Quindaro Ash Landfill	Yes	No	800	1976	Yes
R D Green	Robards	KY	LANDFILL-1	Active/Inactive/Open Landfills	Green Station Landfill	No	Yes	288	1979	No
R. M. Schahfer Generating Station	Wheatfield	IN	LANDFILL-1	Active/Inactive/Open Landfills	RMSGS Landfill	Yes	Yes	60	1983	No
R. Paul Smith Power Station	Williamsport	MD	LANDFILL-1	Active/Inactive/Open Landfills	CCB Landfill	Yes	Yes	150	1965	No
R.D. Morrow Sr. Generating Site	Purvis	MS	LANDFILL-2	Active/Inactive/Open Landfills	West Active Landfill	No Answer	No	1200	1978	No
R.D. Morrow Sr. Generating Site	Purvis	MS	LANDFILL-A	Planned Landfills	West 26 Acres	Yes	Yes	800	2022	NA
R.D. Morrow Sr. Generating Site	Purvis	MS	LANDFILL-3	Active/Inactive/Open Landfills	Cells 1-6	Yes	Yes	650	2005	No
R.D. Morrow Sr. Generating Site	Purvis	MS	LANDFILL-1	Active/Inactive/Open Landfills	East Inactive Landfill	No Answer	No	750	1978	Yes
R.M. Heskett Station	Mandan	ND	RET-LANDFILL-1	Retired/Closed Landfills	Old Ash Landfill	No	No	50	1954	NA
R.M. Heskett Station	Mandan	ND	LANDFILL-1	Active/Inactive/Open Landfills	Ash Disposal Site	Yes	Yes	58	1990	No
Rawhide Energy Station	Wellington	CO	LANDFILL-1	Active/Inactive/Open Landfills	CCR Monofill	No	No	10500	1984	No
Ray D Nixon	Fountain	CO	LANDFILL-1	Active/Inactive/Open Landfills	Clear Spring Ranch Ash Landfill	No	No	11867	1979	No
Reid Gardner Generating Station	Moapa	NV	LANDFILL-1	Active/Inactive/Open Landfills	Landfill	No	No	3960	1994	Yes
Rivesville Power Station	Rivesville	WV	LANDFILL-1	Active/Inactive/Open Landfills	Ash disposal	No	Yes	1500	1981	No
Rivesville Power Station	Rivesville	WV	RET-LANDFILL-1	Retired/Closed Landfills	Closed ash site	No	No	1500	1944	NA
Rockport	Rockport	IN	LANDFILL-1	Active/Inactive/Open Landfills	Rockport Plant Ash Landfill	Yes	No	100	1984	No
Roxboro Steam Plant	Semora	NC	LANDFILL-1	Active/Inactive/Open Landfills	Fly ash landfill	No	Yes	250	1988	No
RRI Energy Inc. Portland Generating Station	Mt. Bethel	PA	RET-LANDFILL-1	Retired/Closed Landfills	Quarry 1	No	No	70	1970	NA
RRI Energy Inc. Portland Generating Station	Mt. Bethel	PA	LANDFILL-1	Active/Inactive/Open Landfills	Bangor Landfill	Yes	Yes	475	1977	No
RRI Energy Inc. Portland Generating Station	Mt. Bethel	PA	RET-LANDFILL-3	Retired/Closed Landfills	-999	No	No	-999	-999	NA
RRI Energy Inc. Portland Generating Station	Mt. Bethel	PA	RET-LANDFILL-2	Retired/Closed Landfills	Quarry 2 & 3	No	No	400	1977	NA

RRI Energy Keystone Generating Station	Shelocta	PA	LANDFILL-A	Planned Landfills	West Valley Ash Site-Stage 4	Yes	Yes	250	-999	NA
RRI Energy Keystone Generating Station	Shelocta	PA	LANDFILL-2	Active/Inactive/Open Landfills	West Valley Ash Site	Yes	Yes	1215	2002	No
RRI Energy Keystone Generating Station	Shelocta	PA	LANDFILL-1	Active/Inactive/Open Landfills	East Valley Ash Site	Yes	Yes	780	1985	Yes
RRI Energy Keystone Generating Station	Shelocta	PA	RET-LANDFILL-1	Retired/Closed Landfills	Original Ash Site	No	No	320	1967	NA
Rush Island	Festus	MO	RET-LANDFILL-1	Retired/Closed Landfills	-999	No	No	-999	-999	NA
San Miguel Electric Cooperative, Inc.	Christine	TX	RET-LANDFILL-1	Retired/Closed Landfills	Emergency Ash Pit	Yes	No	6000	1982	NA
San Miguel Electric Cooperative, Inc.	Christine	TX	LANDFILL-1	Active/Inactive/Open Landfills	Mine Pits	Yes	No	7300	1982	No
Sandow Steam Electric Station	Rockdale	TX	LANDFILL-4	Active/Inactive/Open Landfills	Comb Slag-Bot Ash Landfills	No	No	21300	1952	No
Sandow Steam Electric Station	Rockdale	TX	LANDFILL-1	Active/Inactive/Open Landfills	B Pit	Yes	No	25900	1986	No
Sandow Steam Electric Station	Rockdale	TX	LANDFILL-2	Active/Inactive/Open Landfills	Bottom Ash Fines	No	No	29700	1988	No
Sandow Steam Electric Station	Rockdale	TX	LANDFILL-3	Active/Inactive/Open Landfills	Class II Landfill	No	No	29100	1970	No
Sandow Steam Electric Station	Rockdale	TX	RET-LANDFILL-2	Retired/Closed Landfills	-999	No Answer	No	-999	-999	NA
Sandow Steam Electric Station	Rockdale	TX	LANDFILL-A	Planned Landfills	C Pit	Yes	No	26300	2010	NA
Seminole Generating Station	Palatka	FL	LANDFILL-A	Planned Landfills	Increment 2	Yes	Yes	7700	2022	NA
Seminole Generating Station	Palatka	FL	LANDFILL-1	Active/Inactive/Open Landfills	FGD Landfill	Yes	Yes	6424	1984	No
Shawnee	West Paducah	KY	LANDFILL-A	Planned Landfills	Allen/Shawnee Regional Landfill	Yes	Yes	-111	2015	NA
Shawnee	West Paducah	KY	LANDFILL-2	Active/Inactive/Open Landfills	-999	No Answer	No Answer	-999	-999	Yes
Shawnee	West Paducah	KY	LANDFILL-1	Active/Inactive/Open Landfills	AFBC Fly Ash &	No	No	5000	1982	Yes
Shawville	Shawville	PA	LANDFILL-1	Active/Inactive/Open Landfills	Current	Yes	Yes	1500	1993	No
Shawville	Shawville	PA	RET-LANDFILL-1	Retired/Closed Landfills	Original	No	Yes	1500	1954	NA
Sheldon Station	Hallam	NE	RET-LANDFILL-1	Retired/Closed Landfills	Ash Landfill No. 3	Yes	No	311	1990	NA
Sheldon Station	Hallam	NE	RET-LANDFILL-2	Retired/Closed Landfills	Ash Landfill No. 2	No	No	301	1984	NA
Sheldon Station	Hallam	NE	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill No. 4	Yes	Yes	495	2002	No
Sheldon Station	Hallam	NE	RET-LANDFILL-3	Retired/Closed Landfills	Ash Landfill No. 1	No	No	1128	1977	NA
Sherburne County Generating Plant	Becker	MN	LANDFILL-1	Active/Inactive/Open Landfills	Landfill	Yes	Yes	2400	1987	No
Sibley Generating Station	Sibley	MO	LANDFILL-A	Planned Landfills	Landfill-A	Yes	Yes	1500	2010	NA
Sibley Generating Station	Sibley	MO	LANDFILL-1	Active/Inactive/Open Landfills	Utility Waste Landfill	Yes	Yes	1500	1988	No
Southwest Power Station	Springfield	MO	RET-LANDFILL-1	Retired/Closed Landfills	Demonstration	No	Yes	10600	1976	NA
Southwest Power Station	Springfield	MO	LANDFILL-1	Active/Inactive/Open Landfills	Landfill active	No	Yes	2640	1980	No
Springerville Generating Station	Springerville	AZ	LANDFILL-1	Active/Inactive/Open Landfills	Ash LandFill	No	No	51744	1987	No
Stanton Energy Center	Orlando	FL	LANDFILL-1	Active/Inactive/Open Landfills	CWSA	No	No	2500	1987	No
Streeter Station	Cedar Falls	IA	LANDFILL-1	Active/Inactive/Open Landfills	Leversee Road	No	No	5500	1976	No
Sunnyside Cogeneration Associates	Sunnyside	UT	LANDFILL-1	Active/Inactive/Open Landfills	Sunnyside Ash Landfill - Landfill 1	No	No	150	1993	No
Taconite Harbor Energy Center	Schroeder	MN	LANDFILL-A	Planned Landfills	Cell 4	Yes	Yes	1168	2012	NA
Taconite Harbor Energy Center	Schroeder	MN	LANDFILL-B	Planned Landfills	Cell 5	Yes	Yes	1046	2015	NA
Taconite Harbor Energy Center	Schroeder	MN	LANDFILL-2	Active/Inactive/Open Landfills	Cell 2	Yes	Yes	1381	2005	No
Taconite Harbor Energy Center	Schroeder	MN	LANDFILL-3	Active/Inactive/Open Landfills	Cell 3	Yes	Yes	1296	2009	No
Taconite Harbor Energy Center	Schroeder	MN	LANDFILL-1	Active/Inactive/Open Landfills	Cell 1	Yes	Yes	1398	2002	Yes
Tampa Electric - Big Bend Station	Apollo Beach	FL	LANDFILL-1	Active/Inactive/Open Landfills	FGD Storage Area	No	Yes	900	1985	Yes
Tecumseh Energy Center	Tecumseh	KS	RET-LANDFILL-1	Retired/Closed Landfills	Old Landfill	No	No	830	1975	NA
Tecumseh Energy Center	Tecumseh	KS	LANDFILL-1	Active/Inactive/Open Landfills	Landfill 322	No	No	2047	1978	Yes
Titus Generation Station	Birdsboro	PA	RET-LANDFILL-1	Retired/Closed Landfills	Old Ash Site (Flyash)	No	No	1000	1951	NA
Titus Generation Station	Birdsboro	PA	LANDFILL-1	Active/Inactive/Open Landfills	Beagle Club Ash Disposal Site	No	Yes	300	1976	No
Titus Generation Station	Birdsboro	PA	RET-LANDFILL-2	Retired/Closed Landfills	Old Ash Site (Bottom Ash)	No	No	1000	1951	NA
Titus Generation Station	Birdsboro	PA	RET-LANDFILL-3	Retired/Closed Landfills	Eyler Station Ash Site	No	No	1000	1910	NA
Tolk Station	Earth	TX	LANDFILL-4	Active/Inactive/Open Landfills	116	No	No	95040	2001	No
TransAlta Centralia Generation, LLC	Centralia	WA	LANDFILL-1	Active/Inactive/Open Landfills	Limited Purpose Landfill	Yes	Yes	2000	2009	No

Trenton Channel Power Plant	Trenton	MI	LANDFILL-1	Active/Inactive/Open Landfills	Sibley Quarry	No	No	2000	1951	Yes
Trimble County	Bedford	KY	LANDFILL-A	Planned Landfills	Trimble County Landfill	Yes	Yes	9500	2013	NA
Twin Oaks Power	Bremond	TX	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	Yes	Yes	650	1990	No
Urquhart Station	Beech Island	SC	LANDFILL-1	Active/Inactive/Open Landfills	Urquhart Landfill 1	No	No	450	1987	No
Valley Power Plant	Milwaukee	WI	RET-LANDFILL-1	Retired/Closed Landfills	Highway 59 Ash Landfill	No	No	100	1969	NA
Valley Power Plant	Milwaukee	WI	LANDFILL-2	Active/Inactive/Open Landfills	Highway 32 Ash Landfill	Yes	Yes	300	1978	No
Valley Power Plant	Milwaukee	WI	LANDFILL-1	Active/Inactive/Open Landfills	Caledonia Ash Landfill	Yes	Yes	400	1990	No
Valley Power Plant	Milwaukee	WI	RET-LANDFILL-2	Retired/Closed Landfills	System Control Center Ash Landfill	Yes	Yes	3600	1988	NA
Valmont Station	Boulder	CO	RET-LANDFILL-1	Retired/Closed Landfills	Closed Valmont Station ADF	No	No	600	-999	NA
Valmont Station	Boulder	CO	LANDFILL-1	Active/Inactive/Open Landfills	Valmont Station ADF	No	No	500	1993	No
Victor J Daniel Jr	Escatawpa	MS	RET-LANDFILL-2	Retired/Closed Landfills	-999	No Answer	No	-999	-999	NA
Victor J Daniel Jr	Escatawpa	MS	LANDFILL-2	Active/Inactive/Open Landfills	CAMU - Central Ash Mngt. Unit	Yes	No	1000	1994	Yes
Victor J Daniel Jr	Escatawpa	MS	LANDFILL-1	Active/Inactive/Open Landfills	NAMU - North Ash Mngt. Unit	Yes	No	1000	2009	No
Victor J Daniel Jr	Escatawpa	MS	RET-LANDFILL-1	Retired/Closed Landfills	-999	No Answer	No	-999	-999	NA
Victor J Daniel Jr	Escatawpa	MS	LANDFILL-A	Planned Landfills	Gypsum Cell 1	Yes	Yes	2500	2014	NA
W H Zimmer Station	Moscow	OH	LANDFILL-1	Active/Inactive/Open Landfills	Class III Residual	Yes	Yes	125	1989	No
W. A. Parish E.G S.	Thompsons	TX	LANDFILL-1	Active/Inactive/Open Landfills	WAP Landfill	Yes	No	200	1977	Yes
W. H. Sammis Plant	Stratton	OH	LANDFILL-1	Active/Inactive/Open Landfills	Hollow Rock	Yes	Yes	100	2010	No
Walter C Beckjord Station	New Richmond	OH	LANDFILL-1	Active/Inactive/Open Landfills	Pond Run Ash Disposal	Yes	Yes	125	1990	Yes
Walter C Beckjord Station	New Richmond	OH	RET-LANDFILL-1	Retired/Closed Landfills	Beckjord Ash Landfill	No	Yes	700	1971	NA
Walter Scott Jr. Energy Center	Council Bluffs	IA	LANDFILL-1	Active/Inactive/Open Landfills	Monofill	Yes	Yes	2059	2007	No
Wateree Station	Eastover	SC	LANDFILL-1	Active/Inactive/Open Landfills	Wateree	Yes	Yes	4400	2010	No
Welsh	Pittsburg	TX	LANDFILL-1	Active/Inactive/Open Landfills	Ash landfill	No	No	468	1977	No
White Bluff Plant	Redfield	AR	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	Yes	No	8000	1981	No
Widows Creek	Stevenson	AL	LANDFILL-A	Planned Landfills	WCF New Landfill	Yes	Yes	-111	2014	NA
Williams Station	Goose Creek	SC	LANDFILL-1	Active/Inactive/Open Landfills	Hwy 52	Yes	Yes	2000	2010	No
Williams Station	Goose Creek	SC	LANDFILL-2	Active/Inactive/Open Landfills	Hwy 17A	Yes	Yes	150	1987	No
Willow Island Power Station	Willow Island	WV	LANDFILL-1	Active/Inactive/Open Landfills	-999	Yes	Yes	-999	-999	No Answer
Wisconsin Power and Light - Columba Energy Center	Pardeeville	WI	RET-LANDFILL-1	Retired/Closed Landfills	Ash Pond Disposal Facility	No	No	1400	1975	NA
Wisconsin Power and Light - Columba Energy Center	Pardeeville	WI	LANDFILL-1	Active/Inactive/Open Landfills	Dry Ash Disposal Facility	Yes	Yes	4242	1985	No
Wisconsin Power and Light - Nelson Dewey Generating Station	Cassville	WI	RET-LANDFILL-1	Retired/Closed Landfills	Ash Disposal Facility	No	No	1000	1960	NA
Wisconsin Public Service - Weston Plant	Rothschild	WI	LANDFILL-1	Active/Inactive/Open Landfills	Weston Ash - Legner	Yes	Yes	11000	1989	Yes
Wisconsin Public Service - Weston Plant	Rothschild	WI	RET-LANDFILL-1	Retired/Closed Landfills	Weston Onsite Ash Landfill #2879	No	No	700	1982	NA
Wisconsin Public Service - Weston Plant	Rothschild	WI	LANDFILL-A	Planned Landfills	-999	Yes	Yes	-999	-999	NA
WPS Westwood Generation, LLC	Tremont	PA	RET-LANDFILL-1	Retired/Closed Landfills	Closed Ash Landfill	Yes	Yes	100	1986	NA
Yorktown Power Station	Yorktown	VA	LANDFILL-1	Active/Inactive/Open Landfills	Ash Landfill	Yes	Yes	100	1984	No

Exhibit B

HYDROGEOLOGIC ASSESSMENT PLAN
JOLIET GENERATING STATION NO. 29
ROCKDALE, ILLINOIS

SUBMITTED BY:
MIDWEST GENERATION, LLC
235 REMINGTON BLVD, SUITE A
BOLINGBROOK, IL 60440

SUBMITTED TO:
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
1021 N GRAND AVENUE EAST
SPRINGFIELD, IL 62702

PREPARED BY:
PATRICK ENGINEERING INC.
4970 VARSITY DRIVE
LISLE, ILLINOIS 60532

PATRICK PROJECT NO. 21053.026

JULY 2010

PATRICK
ENGINEERING

1.0 INTRODUCTION

1.1 Background

The Illinois Environmental Protection Agency (Illinois EPA) has requested of various owners/operators of facilities which include ash impoundment ponds in Illinois that hydrogeologic conditions associated with these ponds be investigated and reported to the Illinois EPA. Midwest Generation, LLC (MWG) owns and operates several of these facilities in Illinois, including the Joliet Generating Station No. 29 in Rockdale, Illinois.

This document presents the Hydrogeologic Assessment (HA) Plan for the on-site ash impoundment areas at the Joliet No. 29 facility. This Plan was developed as the result of numerous communications between MWG and the Illinois EPA, the most recent being a meeting held at Illinois EPA's offices in Springfield, Illinois on June 10, 2010. During that meeting, a conceptual approach to completing hydrogeologic assessments of MWG's ash ponds at a number of sites (including Joliet No. 29) was presented by MWG and was conceptually agreed to by the parties. MWG subsequently agreed to submit the substance of the proposed investigative plans in written form to the Illinois EPA by mid-July 2010 for each of the relevant sites.

This HA Plan for the Joliet No. 29 facility describes the goals of the assessment, the specific scope items that will achieve this result, and a description of the contents of the final report of the assessment.

1.2 Site Location

The Joliet No. 29 facility (the Site) is located in Section 19, Township 35 North, Range 10 East, in the Village of Rockdale, Will County, Illinois. Figure 1 provides a Site Location Map.

Major features of the Site include a coal-fired power plant, coal piles, and three active ash ponds. Two of the ponds are lined with a high-density polyethylene (HDPE) while the third is lined with

12" of geo-composite pavement on the bottom; the total area of the three ash ponds is approximately 10 acres. Figure 2 shows the locations of the various ash ponds.

2.0 SCOPE OF WORK

2.1 Hydrogeologic Assessment Objectives

The Scope of Work for this HA has been developed based upon the overall objectives of the investigative program. These objectives were defined by the Illinois EPA in their original informational request, and have been incorporated by MWG into the specific scope of work developed for the Site:

1. Identification of Potable Well Use within 2,500 Feet of the Ash Pond Areas
2. Evaluation of the Potential for Contaminant Migration from the Ash Pond Areas
3. Characterization of Subsurface Hydrogeology

Each of these objectives are discussed in more detail below, along with the specific scope of work developed to achieve each of these objectives individually.

2.2 Identification of Potable Well Use

An investigation of potable water well use within 2,500 feet of the ash pond areas has already been completed for the Site. MWG submitted a letter to the Illinois EPA with the results of this investigation in July 2009. The results of this investigative effort will also be incorporated in the final report of the HA to be submitted to the Illinois EPA after the assessment of the Site is complete.

2.3 Evaluation of Contaminant Migration Potential

Illinois EPA has requested that an evaluation of the potential for contaminant migration from the ash pond areas be performed, in accordance with the groundwater non-degradation standard of IAC Part 620, Subpart C. Evaluation of the non-degration standard will required the installation and sampling of monitoring wells located both up- and downgradient of the relevant ash ponds. These investigative tasks are described briefly below.

Exhibit C

HYDROGEOLOGIC ASSESSMENT REPORT
WAUKEGAN GENERATING STATION
WAUKEGAN, ILLINOIS

SUBMITTED BY:
MIDWEST GENERATION, LLC
235 REMINGTON BLVD, SUITE A
BOLINGBROOK, ILLINOIS 60440

SUBMITTED TO:
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
1021 N GRAND AVENUE EAST
SPRINGFIELD, ILLINOIS 62702

PREPARED BY:
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PATRICK PROJECT NO. 21053.070

FEBRUARY 2011

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MIDWEST GENERATION
An EDISON INTERNATIONAL[SM] Company

1.0 INTRODUCTION

1.1 Background

Pursuant to the request of the Illinois Environmental Protection Agency (Illinois EPA), this document presents the Hydrogeologic Assessment Report for the on-site ash pond areas at the Midwest Generation, LLC (MWG) Waukegan Generating Station in Waukegan, Illinois. This hydrogeologic assessment was performed in accordance with the Hydrogeologic Assessment Plan, approved by the Illinois EPA, dated September 3, 2010.

As defined by the Hydrogeologic Assessment Plan, the purpose of this investigation was to: (i) evaluate the potential, if any, for migration of ash-related constituents from the on-site ash ponds and to conduct monitoring for groundwater constituents regulated by the Illinois Part 620 groundwater standards, as requested by the Illinois EPA; (ii) characterize the subsurface hydrogeology; and (iii) identify potable well use within 2,500 feet of the ash ponds. The results of this investigation are described in this Hydrogeologic Assessment Report.

1.2 Site Location and Description

The Waukegan facility (the Site) is located in Section 15, Township 45 North, Range 12 East, in the City of Waukegan, Lake County, Illinois. Figure 1 provides a Site Location Map.

The Site contains two active ash ponds. The ponds are lined with a high-density polyethylene (HDPE); the total area of the two ash ponds is approximately 25 acres. Figure 2 shows the locations of the two ash ponds.

1.3 Regional Setting

The Site is located along the shore of Lake Michigan on the northeast side of Waukegan. The surrounding land use consists of undeveloped land to the north, apparently vacant industrial land to the south, residential properties to the west, and Lake Michigan to the east.

Patrick Engineering Inc. (Patrick) conducted a review of publically available geological information from the Illinois State Geological Survey website. Based upon water well logs from the area, the geology beneath the Site consists of approximately 100 feet of sand deposits, underlain by Silurian Dolomite to approximately 360 feet below ground surface, underlain by the Maquoketa shale. The Maquoketa shale is generally considered to be an aquitard that separates the shallow groundwater in the unconsolidated units and the Silurian dolomite from the underlying aquifers.

Groundwater flow in the shallow, unconsolidated aquifer would be expected to flow towards Lake Michigan, to the east. Groundwater flow in the deeper aquifers is controlled by the regional hydraulic gradient in these aquifers, which is to the northeast.

2.0 HYDROGEOLOGIC ASSESSMENT METHODOLOGY

The following sections present the methodologies used to evaluate the potential for migration of ash-related constituents from the ash ponds and to monitor for all Part 620-regulated constituents, to characterize the subsurface hydrogeology, and to identify potable well use within 2,500 feet of the Site.

2.1 Evaluation of Ash-Related Constituents Migration Potential

The Illinois EPA requested that an evaluation of the potential for migration of ash-related constituents from the ash ponds and that monitoring for all Part 620-regulated constituents be performed in accordance with the groundwater standards included in 35 Illinois Administrative Code (IAC) Part 620, Subparts C and D. Accordingly, groundwater monitoring wells were installed at the Site in locations both upgradient and downgradient of the two ash ponds.

2.1.1 Installation of Groundwater Monitoring Wells

Patrick installed five (5) groundwater monitoring wells spaced approximately 150 to 300 feet apart around the perimeter of the ash ponds. The well locations were selected so that both upgradient and downgradient wells were represented, based upon available data regarding the expected groundwater flow direction. The spacing of the well locations at the Site along the downgradient edge of the ash ponds was calculated so as to detect a groundwater plume emanating from a point source beneath the ash ponds. Figure 3 shows the location of the five monitoring wells.

One of the installed monitoring wells is located upgradient of the ash ponds; the additional four wells are located downgradient of the ash ponds. The well borings were advanced using hollow-stem augers to depths ranging from 30 to 32 feet below ground surface (bgs). Borings were terminated after the field geologist determined that the boring was installed approximately 10 feet past the first intersection of the groundwater table in order to ensure that a representative