BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

SIERRA CLUB	)	
	)	
Complainant,	)	
	)	
v.	)	
	)	**PCB No. 19-78**
ILLINOIS POWER GENERATING COMPANY, ILLINOIS POWER RESOURCES GENERATING, LLC, ELECTRIC ENERGY, INC., and VISTRA ENERGY CORP.	)	**(Enforcement – Water)**
	)	
Respondents.	)	

NOTICE OF FILING:

To:

Brad Halloran, Hearing Officer
Illinois Pollution Control Board
James R. Thompson Center
100 West Randolph, Suite 11-500
Chicago, IL 60601
(312) 814-8917
brad.halloran@illinois.gov

Don Brown, Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph Street, Suite 11-500
Chicago, IL 60601
don.brown@illinois.gov

Counsel for Respondents:

Daniel J. Deeb (Lead Attorney)
Joshua R. More
Ryan C. Granholm
Caitlin M. Ajax
233 South Wacker Drive, Suite 7100
Chicago, IL 60606
Phone: 312-258-5591
Fax: 312-258-5600
cajax@schiffhardin.com

P. Stephen Gidiere III
Balch & Bingham LLP
1901 Sixth Avenue North, Suite 1500
Birmingham, AL 35203-4642
(205) 226-8735
sgidiere@balch.com

Michael L. Raiff
Gibson, Dunn & Crutcher LLP
2100 McKinney Avenue, Suite 1100
Dallas, TX 75201-6912
(214) 698-3350
mraiff@gibsondunn.com

PLEASE TAKE NOTICE that I have filed the following Complainants' Opposition to Motion to Bifurcate, and accompanying Exhibit A before the Illinois Pollution Control Board in the above-captioned case today, copies of which are hereby served upon you.

Respectfully submitted,

_*/s/ Greg Wannier*_________________

Gregory E. Wannier
2101 Webster St., Ste. 1300
Oakland, CA 94612
(415) 977-5646
greg.wannier@sierraclub.org

Attorney for Sierra Club

Dated: April 29, 2019

BEFORE THE
ILLINOIS POLLUTION CONTROL BOARD

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Complainant,	)	
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COMPLAINANT'S OPPOSITION TO MOTION TO BIFURCATE

COMES NOW Complainant Sierra Club ("Complainant"), by its attorneys, and asks the Illinois Pollution Control Board ("Board") to deny in its entirety the Motion to Bifurcate ("Motion") filed by Respondents Electric Energy, Inc.; Illinois Power Generating Company; Illinois Power Resources Generating, LLC; and Vistra Energy Corp. (collectively, "Respondents"). In opposition to the Motion, Sierra Club states as follows:

1. On December 18, 2018, Sierra Club filed its Complaint against Respondents with the Board. The Complaint alleges three instances of unlawful pollution resulting from improper treatment of coal combustion residuals ("CCR") that has contaminated the groundwater at three facilities ultimately owned (through subsidiaries) by a single company, Vistra Energy Corporation ("Vistra").

2. The unlawful contamination Complainant has identified, based on all available information, began decades ago, and has continued into the present day. The

large number of groundwater sampling data offered by Sierra Club over a long period of time serves to demonstrate that the contamination alleged has been pervasive and continuous.

3. Sierra Club has requested that the Board grant relief in the singular form of a declaratory judgment that includes both civil penalties against Vistra and injunctive relief to protect against further contamination.

4. On April 15, 2019, Vistra and its three named subsidiaries in the complaint, represented by a single team of attorneys, filed a single Answer to Sierra Club's Complaint, alternatively admitting or denying all of the allegations laid forth by Complainant. Together with that Answer, Respondents filed a motion to bifurcate this legal proceeding into separate trials to resolve the question of liability before addressing the appropriate remedy that will be required.

5. Although Complainant acknowledges this case will necessarily require consideration of evidence for three different locations, based on experience from other matters before the Board and for the reasons given below, it does not agree with Respondents that "it is necessary to bifurcate the liability and remedy phases of this case." (Mot. Para. 3.) Separating the case into two phases is unnecessary given the simplicity of the issues raised here as compared with other similar claims that have been brought in other contexts; it would needlessly waste the parties' and the Board's resources by dragging this case out unnecessarily; and it would unreasonably delay Complainant's and the public's right to a timely resolution of this dispute, and remediation of the ongoing pollution that Complainant has ably demonstrated.

I. The Complaint Presents a Clear-Cut Case on both Liability and Relief.

6. This case presents evidence demonstrating clearly that Respondents' management of the three sites caused the unlawful contamination that is being alleged. In particular, Complainant will present evidence that Respondents, in their own reporting under the federal Coal Combustion Residuals ("CCR") Rule, have identified this contamination and acknowledged that changes must be made to remediate this contamination. Thus, although the Complaint does discuss three different sites, each of these sites is situated similarly, and Complainant believes the information it already possesses could very nearly decide the issue of liability.

7. Sierra Club does not dispute that "determining whether any violations have occurred will also require detailed inquiry." (Mot. Para. 6.) It does dispute that the Board will need to evaluate the "unreasonableness" of these violations using the three-factor test provided by Section 33(c) of the Illinois Environmental Protection Act ("Act"), 415 ILCS 5/33(c), but in any event that question would need to be resolved as part of the liability phase even if this case were bifurcated. *See* PCB 13-15, Citizen Groups' Response Brief at 31-34 (Aug. 30, 2018). But as discussed further below, even though the Board will need to decide independently on liability and remedy questions, in practice there is no way to fully separate those two inquiries, because they turn on much of the same evidence. Complainant is confident in its ability to present, and the Board's ability to comprehend, these two related lines of inquiry in order to come to a fully appropriate resolution of this case in a timely manner. Indeed, there are multiple examples, including a nearly identical Board case discussed below, of tribunals considering remedial actions concurrently with questions of liability.

8. Although Respondents seek to make Sierra Club's claims and requests for relief sound complicated, they are in fact quite simple. Complainant has identified ongoing violations of Illinois state law at three sites, and at each site it is asking the Board to hold Respondents liable for these ongoing violations and take actions to prevent continuation of those violations.

II. Bifurcation of Liability and Remedy Issues Is Never Mandatory, and Should Be Avoided Where It Needlessly Prevents the Timely Resolution of Cases.

9. The Board's procedural rules specifically leave the decision to bifurcate in the hands of the Board: "The Board *in its discretion* may hold a hearing on the violation and a separate hearing on the remedy." 35 Ill. Admin. Code § 103.212(d) (emphasis added). The Board's rules also direct the hearing officer to ensure that a case proceeds in a timely manner, and "ensure development of a clear, complete, and concise record for *timely* submission to the Board." 35 Ill. Admin. Code § 101.610 (emphasis added).

10. Enforcement cases before the Board sometimes involve separate hearings on remedy and liability, but a single unified hearing is and should remain the norm for enforcement hearings, consistent with the Board bifurcation rules. 35 Ill. Admin. Code § 103.212(d).

11. Respondents spend much of their Motion arguing that this case should be bifurcated because it is similar to Case No. PCB 2013-15, in which Sierra Club, together with three co-complainants, filed a similar complaint against Midwest Generation, LLC, for its operation of four facilities in Northern Illinois (the "MWG Case"). As Respondents note, that case has been bifurcated into separate liability and remedy proceedings, PCB 13- 15, Hearing Officer Order (Feb. 9, 2017), and the parties currently

are awaiting resolution of the liability proceedings by the Board. However, this case is distinct from that case in a few crucial respects. In addition to involving an additional site, the MWG Case has been complicated both legally and factually by Illinois Environmental Protection Agency's ("IEPA's") and the site operator's efforts to remediate the contamination in that case. Specifically, IEPA had established Groundwater Management Zones at most of the sites, and had entered into Compliance Commitment Agreements at all of the sites. And similarly, the site operators had taken at least some steps, which the complainants in that case allege were unsuccessful, to reduce contamination from the on-site storage of coal combustion byproducts. Here, as Complainants will demonstrate, no such efforts have been made, either by IEPA or by the site operators of the three sites, making the case both legally and factually simpler.

12. Instead, this case can be better compared with Case No. PCB 2018-11 before the Board, in which Sierra Club, together with two co-complainants, filed a similar complaint against City Water, Light & Power in Springfield Illinois ("CWLP"), for its operation of multiple impoundments at a site in Springfield, Illinois (the "CWLP Case"). As with the situation here, CWLP did not line its ponds, causing ongoing contamination; and as with the situation here, IEPA has failed to make any meaningful efforts to prevent this contamination from continuing, either by establishing a Groundwater Management Zone or by entering into a Compliance Commitment Agreement with CWLP. That case is currently ongoing as a single comprehensive proceeding, involves a single expert report thus far, and even after multiple delays is expected to conclude by early 2020, only two and a half years after the complainants in that case filed their original complaint.

13. Respondents' references to bifurcation in completely separate statutory and legal contexts are not controlling of the Board's decision here; Complainant does not dispute that federal courts bifurcate matters in different contexts, including often when resolving complex statutory regimes, but it notes that bifurcation decisions made in a completely different context and under a different set of procedural rules have limited utility here. That said, the most relevant bifurcation example Respondents offer in the environmental context itself demonstrates the extreme nature of the bifurcation remedy. As Respondents point out, courts often bifurcate proceedings under the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"). *Amoco Oil Co. v. Borden, Inc.*, 889 F.2d 664, 667 (5th Cir. 1989). CERCLA is unique among environmental cases however in that often the question of liability hinges both on the presence of contamination and on complex ownership structures and history that can require analysis of years of ownership and transactional records, bring in multiple past owners, and create a true multi-party proceeding with several diverging interests among a large set of parties. *See id.* None of these very reasonable justifications for bifurcation exist in this case, which involves straightforward claims of active contamination against a unified group of Vistra and its three named subsidiaries.

14. If Respondents were going to offer federal court bifurcation decisions, they should also have informed the Board of the general standard that is applied when making bifurcation decisions in federal court. Because bifurcation is equally discretionary in federal courts there is little caselaw on this question outside of the district court level. *Getty Petroleum Corp. v. Island Transp. Corp.*, 862 F.2d 10, 15 (2nd Cir. 1988) ("[W]hether to bifurcate a trial into liability and damages phases is a matter within

the sound discretion of the trial court.") However, as one district court recently described the decision:

> While there is no single factor that is determinative, when considering whether to bifurcate, "courts should consider whether (a) there will be overlap in testimony and evidence between the two proceedings, (b) the issues to be decided at trial are complex and the factfinder is likely to become confused, (c) bifurcation will promote settlement, and (d) a single trial will cause unnecessary delay."

Wyeth v. Abbott Labs., No. CIV.A. Nos. 08-0230 JAP-TJB, 08-1021-JAP-TJB, 2010 WL 4553545, at *1 (D.N.J. Nov. 3, 2010); *see also WeddingChannel.Com, Inc. v. The Knot, Inc.*, No. 03 CIV. 7369 (RWS), 2004 WL 2984305, at *1 (S.D.N.Y. Dec. 23, 2004) (explaining that bifurcation is disfavored where it "will lead to repeat presentations of the same evidence and witnesses"). As these cases explain, while there may be appropriate contexts to bifurcate a proceeding, such determinations are highly fact-specific, and turn on the distinct issues within each case. Furthermore, while bifurcation is discretionary, it is disfavored where it would cause unnecessary delay of the case.

15. Finally, Complainant notes that because bifurcation is discretionary, federal courts generally recognize that "[a] defendant seeking bifurcation has the burden of presenting evidence that a separate trial is proper in light of the general principle that a single trial tends to lessen the delay, expense and inconvenience to all parties." *McCrae v. Pittsburgh Corning Corp.*, 97 F.R.D. 490, 492 (E.D. Pa. 1983). For the reasons discussed in the following sections, Respondents have failed to meet that burden.

III. Bifurcation is Inappropriate Because It Would Waste Judicial Resources

16. Respondents' claim that bifurcation of this proceeding would preserve judicial resources ignores the significant judicial economy that would be preserved by a simultaneous consideration of the contamination, and opportunities to control that

contamination. Remedying coal ash groundwater contamination such as that alleged by Complainant in this proceeding is a distinct undertaking from other forms of environmental control and remediation for two reasons. First, fashioning an appropriate remedy requires a deep understanding of the underlying causes and impacts of the pollution. In particular, in order to design an appropriate remedy, the parties and tribunal must understand the site-specific hydrogeology, including groundwater flow, rate of leakage, groundwater table height, and numerous other attributes that can help determine how best to clean the site. *See* Supplemental Expert Report of Mark A. Hutson, PG, attached hereto as Exhibit A ("Hutson Report"), at 23-31.

17. Unsurprisingly, all of these same questions must also be resolved in order to determine the cause and responsibility for existing groundwater contamination; one cannot determine that a respondent is responsible for violating state groundwater standards without concluding that the contaminated groundwater in fact flowed from (or was inundated by) impoundments operated by that respondent.

18. The second reason remedying coal ash contamination is a distinct undertaking from remedying many other types of pollution is that the actual technologies needed to address the pollution are actually quite simple, and tend to center around construction of physical barriers or removal of contaminating material. *See* Hutson Report at 23-31. While there are certainly technical considerations for all of these remedies, the complexity of the discussion around which remedy is appropriate tends to center more on how they would interact with the specific hydrogeology of the site, than on the specifications of the control measures themselves.

19. Thus, considering the remedy question separate from the liability portion of this case will in fact hurt judicial economy in the long run, by forcing the Board to dig through the complex site-specific evidence Respondents have admitted will be needed to resolve this case not just once, but twice. In sum, although the Board might save a small amount of time in the short run by putting off its consideration of appropriate remedies in this case, it would lose time in the long run, while also subjecting itself to a needlessly repetitive second presentation of some of the most complex issues that will be discussed in this case.

20. Respondents' citation to the MWG Case actually underscores this point. As Respondents observed, any remedy proceeding in that case will require "the expert testimony of engineers, hydrologists, and toxicologists." (Mot. Para. 19.) But what Respondents leave unsaid is that resolving the liability of that same case has *already required* the testimony of engineers, hydrologists, and toxicologists. As the Board and Hearing Officer Halloran (who oversaw that case) are well aware, both parties in that case offered extensive testimony on many of the exact questions that would be needed to resolve liability here, in one of the largest cases ever heard by the Board. Should a liability finding be made in that proceeding, many of those same experts and fact witnesses will need to be brought back to testify further about groundwater regimes, water tables, and the like to discuss which of several different remediation options is most appropriate. Thus, even if this case were not noticeably simpler than the MWG Case (per above), Complainant would still have concerns about using the MWG Case to justify making that same discretionary choice here.

IV. Bifurcation is Inappropriate Because It Would Unfairly Delay Remediation of the Alleged Harm

21. Finally, Bifurcation of this case would unfairly delay resolution of this case, unfairly and needlessly depriving Complainant of a timely resolution of the concerns it has raised in this Complaint. Again, a holistic examination of the MWG Case and CWLP Case is instructive: the MWG Case was first filed on October 2, 2012. The case was delayed for over a year due to bankruptcy proceedings, but otherwise has moved forward at a steady pace since then. Parties participated in a two-part hearing in that case in October 2017 and January-February 2018, and filed post-hearing briefs in the summer of 2018. And as of today, the Board has still not issued an order resolving the liability phase of that case. *See generally* PCB 13-15. Factoring in the likely length of any remedy proceeding that could become necessary, as a result of bifurcation the complainants in that case may be waiting for upwards of a decade before having their concerns, which include multiple allegations of ongoing groundwater contamination, resolved by the Board. Especially in the context of environmental cases, where ongoing and active harm is being done to public resources such as groundwater reserves, and where a remedy at law will not fully remediate this ongoing harm, this is too long to wait.

22. An examination of the CWLP Case timeline is similarly instructive: the complainants in that case filed their initial complaint on September 26, 2017. After a year and a half, fact discovery has concluded, expert discovery is wrapping up, and dispositive motions are currently due in November 2019. *See generally* PCB 18-11. All of this has been accomplished while parties have presented evidence pertaining both to liability and potential remedies. That case may still take more than three years to resolve

completely, which is longer than Complainant would prefer here, but considering liability and remedy issues together will at least offer a much more timely resolution of that case.

23. Again, bifurcation is a highly case-specific determination, and rests on multiple considerations that cannot be broadly applied. In other contexts, Sierra Club has supported bifurcation of proceedings, because such bifurcation would help a more efficient resolution of the issues in those cases. But where, as here, there are significant concerns about the time needed to resolve the claims, and there is significant overlap between the factual determinations that would be needed to resolve the liability and remedy phases of a case, Complainant does not believe there is any reason to delay resolution of its claims.

V. Even if the Board Bifurcates the Hearing Stage of this Proceeding, Parties Should Still Develop the Entire Case

24. Even if the Board does bifurcate the proceeding, it should not prevent the Parties from conducting the necessary discovery and analysis to prepare the case for as quick as possible resolution of any remedy issues. As stated above, Complainants believes that much of the evidence relevant to a liability determination would also be used during the remedy phase; but there are a small number of specific targeted inquiries that would help Complainant develop an advanced position on remedy. Failing to allow Complainant to procure this information while parties are already actively discussing and contesting discovery responses would only further delay any eventual remedy proceeding, and would provide virtually no benefit to the Board, parties' time, or efficient resolution of the issues in this case.

WHERFORE, Complainant respectfully requests that the Board deny Respondents' motion to bifurcate, and allow this case to proceed normally.

Respectfully submitted the 29th of April, 2019,

_*/s/ Greg Wannier*_________________
Gregory E. Wannier
Bridget M. Lee
2101 Webster St., Ste. 1300
Oakland, CA 94612
(415) 977-5646
greg.wannier@sierraclub.org
bridget.lee@sierraclub.org

Faith E. Bugel
1004 Mohawk
Wilmette, IL 60091
(312) 282-9119
fbugel@gmail.com

Attorneys for Sierra Club

EXHIBIT A

GEO-HYDRO, INC
Consulting in Geology and Hydrogeology

16 Mesa Oak
Littleton, Colorado 80127
(303) 948-1417

SUPPLEMENTAL EXPERT REPORT OF MARK A. HUTSON, PG
City Water, Light & Power
Dallman Station
Springfield, IL

Prepared for:
SIERRA CLUB
Environmental Law Program
2101 Webster Street
Suite 1300
Oakland, CA 94612

March 26, 2019

GEO-HYDRO, INC.

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1. Introduction

City Water, Light & Power (CWLP) operates Dallman Station (Dallman), a coal-fired electric power plant on Lake Springfield, in Springfield, IL. Coal Combustion Waste (CCW) storage and disposal facilities, including Fly Ash Ponds and a Flue Gas Desulfurization Sludge (FGDS) Landfill, are located on CWLP property downstream of Lake Springfield and Spalding Dam (Figure 1). I have been asked by Sierra Club to review the available information and data and provide my expert opinions on whether the data indicate that the coal ash facilities at Dallman are impacting water quality so as to cause exceedances of water quality standards and if so, what remedial actions might be effective.

2. Qualifications

The opinions expressed in this document have been formulated based upon my formal education in geology and over 38 years of experience in the fields of geology, hydrogeology, and investigation and remediation of a wide range of contaminant impacted sites. My educational background includes a B.S. in Geology from Northern Illinois University and an M.S. in geology from the University of Illinois at Chicago. I am a registered as a Professional Geologist in the states of Illinois, Indiana, Kansas, Nebraska, North Carolina, and Wisconsin. I have been a Certified Professional Geologist by the American Institute of Professional Geologists for over 30 years. I am also active in the Colorado Groundwater Association, having served on the Board of Directors as Vice-President, President, and Past-President of the organization.

My entire professional career has been focused on regulatory, site characterization, and remediation issues related to waste handling and disposal practices and facilities. I have worked on contaminated sites in over 35 states and the Caribbean. My site characterization and remediation experience includes activities at sites located in a full range of geologic conditions, involving soil and groundwater contamination in both unconsolidated and consolidated geologic media, and a wide range of contaminants. I have served in various technical and managerial roles in conducting all aspects of site characterization and remediation including definition of the nature and extent of contamination, directing human health and ecological risk assessments, conducting feasibility studies for selection of appropriate remedies to meet remediation goals, and implementing remedial strategies. Much of my consulting activity over the past 12 years has been related to groundwater contamination and permitting issues at coal ash storage and disposal sites.

A copy of my curriculum vitae is attached as Appendix A.

3. Summary of Opinions Formed

Based upon my review of the available information I have formed the following opinions on the historic and continuing impacts to groundwater quality caused by the disposal and storage of the coal combustion wastes at the CWLP generating station.

Opinion 1: Coal Ash Stored in the Dallman Ash Pond is Contaminating Groundwater

Opinion 2: Groundwater Located Downgradient of the Dallman Ash Pond is Contaminated at Concentrations Exceeding Background and Illinois Groundwater Quality Standards

Opinion 3: CWLP Has Not Determined the Downgradient Extent of Impacts Nor Taken Identifiable Steps to Control Groundwater Contamination

Opinion 4: Opinion 4: CWLP Should Close Their Impoundments to Additional Waste Disposal and Implement Site Closure by Excavating and Removing the Waste

The background and rationale behind each of these opinions are described in this report.

4. Background

CWLP owns and operates CCW storage and disposal facilities that service Dallman including two coal ash disposal ponds, the Lakeside Ash Pond and Dallman Ash Pond, an FGDS Landfill, a clarification pond, and 3 lime ponds that have been constructed over portions of the Lakeside Ash Pond (collectively, the Coal Ash Facilities). Bottom ash, fly ash, and FGDS are all sluiced to these facilities. Available water quality data are insufficient to identify and distinguish between possible impacts from the Lakeside Ash Pond and FGDS Landfill. The Lakeside Ash Pond and FGDS Landfill are discussed in this section because those facilities do impact groundwater flow across the site. However, a monitoring system has been established that has developed data allowing identification of impacts from the Dallman Ash Pond. Groundwater impacts from the Dallman Ash Pond are therefore the primary focus of this report.

4.1 Site Setting and History

4.1.1 **Site Location**

The CWLP Coal Ash Facilities are located on the north side of East Lake Shore drive, and east of Interstate 55 in Springfield, Illinois. All of these facilities were constructed on the floodplain of Sugar Creek downstream of Spaulding Dam, the dam that forms Lake Springfield (Figure 1). The entirety of the coal ash ponds, lime storage ponds, FGDS Landfill, and gypsum storage areas are located within the 1% annual chance flood area[1] indicated on the current Federal Emergency Management Agency (FEMA) Flood Hazard map (Figure 2). The 1% annual chance flood, commonly referred to as the 100-year flood, is the area of the Sugar Creek floodplain that has a 1% chance of flooding during any calendar year.

The location of the CWLP waste facilities on the floodplain and within the area of inundation of Sugar Creek is problematic for at least two reasons. First, the wastes in the unlined waste disposal cells will be re-wetted from below by rising groundwater associated with even relatively minor flood events. During high water events groundwater flows from the stream into the groundwater contained in surrounding sediments causing the groundwater elevation to increase. Where the bottoms of unlined waste disposal cells are located at or below the normal water table, such as at the CWLP site, rising groundwater elevations will re-wet wastes that might not be wet under normal conditions (See Section 4.2.2). Re-wetting of disposed wastes stimulates leachate production from higher elevation wastes that might normally be located above the groundwater.

The second issue with the location of the waste disposal facilities adjacent to Sugar Creek is the increased danger of damage and/or catastrophic release of coal ash during flood events. Eric

[1] FEMA National Flood Hazard Layer Viewer

Staley stated that flooding of areas of the site where monitoring well RW-3 is located is "almost an annual event."[2] Damage to monitoring wells and erosion of berms is a continuing problem associated with even moderate storm events. Monitoring wells AP-1, AP-2, and AW-3 are known to have been damaged during high water events and replaced with new wells located near the original locations.[3] The events that damaged the monitoring system were minor flood events compared with the damage to the site that should be expected with a major flood.

Under major flood events such as the 1%-annual-chance-flood (Figure 2), erosion of the berms that currently contain the disposed coal wastes should be expected. The probability of significant berm erosion is enhanced by the location of a bedrock outcrop allocated across the stream channel from the normal Springfield Lake spillway. The bedrock outcrop forces flow in the creek to make a sharp eastward turn below the spillway. During flood conditions flow will impinge directly on the berms on the western side of the Lakeside ash ponds.

Further enhancing the chance of significant release of wastes is the possibility of floodwater flowing across the roadway which crosses Spaulding Dam and onto the CWLP property near the Lakeside lime softening ponds. Water that flows over the dam and onto the ash pond site will have considerable erosive power due to its rapid drop in elevation as it crosses the dam (Figure 2). Re-wetting of disposed waste during high water events and the potential for a catastrophic release of disposed waste during major storm events are both reasons that the current location of CWLP coal waste facilities is far sub-optimal.

4.1.2 **History of Development**

Dallman Ash Pond

The 34.5-acre Dallman Ash Pond was placed into service in approximately 1976. The berms for the Dallman Ash Pond are reportedly constructed of earthen materials to a height of approximately 27 feet.[4] The bottom of the Dallman Ash Pond was reported to be at an elevation of 527 feet above msl and was constructed on natural clayey soils with relatively low permeability.[5] However, the natural clayey soils that form the bottom of the ponds were not compacted except at locations where the berms crossed over the pre-existing Sugar Creek channel,[6] and no engineered liner was used to line the bottom of the Lakeside Ash Pond.[7] As a result, all areas within the Dallman Ash Pond are appropriately considered by CWLP consultants to be unlined.[8]

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2 Transcript of deposition of Eric Staley, p. 28
3 Transcript of deposition of Kim Van Pelt, pp. 16-18
4 Andrews Engineering, 2016a, p. 3
5 Stabilize, Inc. 2010, p.2
6 Andrews Engineering, 2016b, p. 2
7 Andrews Engineering, 2016b, p. 3
8 Burns and McDonnell, 2013, pp. 6-6 thru 6-7

Fly ash, bottom ash, and some water treatment sludge from generating facilities have historically been sluiced to both the Lakeside and Dallman Ash Ponds. The Lakeside power plant is no longer in operation, so only water treatment sludge is still being sluiced to ponds located on the Lakeside Ash Pond. The Dallman power plant continues to operate, so fly ash and bottom ash continue to be sluiced to the Dallman Ash Pond.[9] Settled water from both the ponds flows into the Clarification Pond before being discharged into Sugar Creek.

The normal pool level (545.5 feet) and maximum elevation (554.0 feet) in the Dallman Ash Pond reportedly provides a typical freeboard of 8.5 feet.[10] My observations of conditions at the Dallman Ash Pond during a site visit conducted on March 1, 2019 showed several conditions of concern. Of particular concern at the Dallman pond was the observed lack of any freeboard. At the time of my visit the elevation of water contained within the Dallman Pond was nearly equal to the top of berm elevation on the northwest corner of the Dallman Ash Pond. This condition makes overtopping of the Dallman Pond berms very likely during any significant precipitation event. Erosion of the berm and release of waste would be a significant concern should the berm be overtopped.

Even without overtopping of the berm, erosion of the outside of the berm on the northwest corner of the Dallman Ash Pond was observed during the site. An active seep and associated small slump of berm sediment was observed to be active during the site visit. These features showed that water is migrating through the berms and reducing their strength and resistance to erosion. Operation of the Dallman Ash pond without the normal amount of available freeboard increases the potential for overtopping the berms during a significant precipitation event and increases the water level inside the impoundment that drives the flow of water through the berm material; neither of these observations is acceptable for an operating facility.

Lakeside Ash Pond

The 44-acre Lakeside Ash Pond was constructed prior to 1958.[11] The Lakeside Ash Pond is bounded by Spaulding Dam to the south and by earthen berms on the east, north, and south. The original bottom elevation of the Lakeside Ash Pond was identified on drawings to be located at an elevation approximately 537 feet above mean sea level (msl).[12] The earthen berms were reportedly built to 18 to 20 feet above the pond bottom elevation.[13] The normal pool level (564 feet) and maximum elevation (565.0 feet) in the Lakeside Ash Pond reportedly provides a typical freeboard of 1.0 foot.[14]

9 Stabilize, Inc. 2010, p. 2
10 Andrews Engineering, 2016c, p. 2
11 Andrews Engineering, 2016a, p. 3
12 Hanson Engineers, 1988, Sheet 2 of 2
13 Andrews Engineering, 2016a, p. 3
14 Andrews Engineering, 2016c, p. 2

The capacity of the Lakeside Ash Pond was expanded in 1988 by constructing berms on top and inside of the existing berms, and over bottom ash fill. During this time period, interior berms were constructed on the southern portion of the Lakeside Ash Pond to create lime-softening ponds that are indicated on the Site Location and Layout Map (Figure 1). The vertical expansion berms were reportedly constructed using compacted Flue Gas Desulfurization (FGD) scrubber sludge and clay as the base berm material and a silty clay lining on the interior of the berms.[15] Use of FGD sludge in construction of the berms introduced a source of potential groundwater contaminants outside of the pond's clay lining. Bottom ash is spread liberally on top and outside slopes of the Lakeside Ash Pond berms where it is readily washed downslope, and is spread on the surface adjacent to Sugar Creek where it can readily be transported downstream during high water events.

The Lakeside Ash Pond was constructed on natural clayey soils with relatively low permeability, but the natural clayey soils that form the bottom of the ponds were not compacted,[16] and no engineered liner was used to line the bottom of the Lakeside Ash Pond.[17] As a result, all areas within the Lakeside Ash Pond are appropriately considered by consultants for CWLP to be unlined.[18]

Subsequent to construction of the original and expansion berms CWLP installed a toe drain system at the base of the expansion berm to collect leakage along the west side of the Lakeside Ash Pond. Water collected in the toe drain system is pumped to the clarification pond for disposal. This toe drain system was originally installed soon after pond expansion in 1988 and redone again in 2018.[19] Common leakage though the connection between the original and expansion berm has been attributed to a "poor design".[20]

Another area of leakage from the west side of the Lakeside Ash Pond is located at the base of the original berm, near Sugar Creek. Persistent seepage in this location caused CWLP to install a sump in the alluvial sediments along the creek to collect leakage.[21] Water collected in the sump is pumped to the ash line for discharge into the Dallman Ash pond.[22] At the time of my March 1, 2019 site visit I observed a shallow ditch dug into the alluvial sediments that directs surface water from Sugar Creek into the sump. It is unclear why clear creek water was being

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[15] Burns and McDonnell, 2013, Section 6.5
[16] Andrews Engineering, 2016b, p. 2
[17] Andrews Engineering, 2016b, p. 2
[18] Burns and McDonnell, 2013, pp. 6-6 thru 6-7
[19] Transcript of deposition of Susan Corcoran, p. 37
[20] Transcript of deposition of Susan Corcoran, p. 36
[21] Transcript of deposition of Susan Corcoran, p. 37
[22] Transcript of deposition of William Antonacci, p. 33

directed into the sump,[23] but the effect of this practice will be to add water to the ash that will increase generation and migration of leachate from the impoundment.

A third area of frequent leachate seepage has been reported on the northeast side of the Lakeside Ash Pond. Leakage from the impoundment at this location is reportedly the result of "a weak spot" in the berm.[24] A shallow ditch has been constructed to collect seepage and direct that seepage into the clarification pond. No seepage was observed at this location during my March 1 site visit.

Flue Gas Desulfurization Landfill

The FGDS Landfill is located immediately east of the Dallman Ash Pond and north of the Lakeside Ash Pond and Clarification Pond. The Landfill was originally designed with three disposal cells that have since been broken into two regulated units. Unit 1 is a 10.5-acre area that encompasses the filled and closed south disposal cell.[25]

The berm that originally separated the middle and north cells has been removed. Unit 2 is a 22.3-acre area encompassing the middle and northern disposal cells. The active portion of the Landfill is currently in the northwest corner of Unit 2 (cell 3). This area has been lined with five feet of low permeability clayey soils borrowed from adjacent areas and reportedly includes leachate collection above the liner.[26] The active area receives gypsum solids that are dredged from the active lime ponds on the Lakeside Ash Pond and stored pending shipment for offsite reuse.

The middle cell of Unit 2 is undeveloped and reportedly often experiences near-saturated ground conditions.[27] The reported saturated or near-saturated soils in the undeveloped middle cell are not surprising. The original bottom elevation of the FGDS Landfill was identified on design drawings to be located at an elevation of approximately 523 feet above msl. Ground surface elevations at several of the monitoring wells and piezometers located inside Unit 2 are in the range from 522.7 to 526.7. [28] Comparison of ground surface elevations to the potentiometric surfaces shown in Appendix B indicates that much of the interior of Unit 2 lies at or below the potentiometric surface.[29]

[23] Our site visit escort, Eric Staley, indicated that he did not know the purpose of directing creek water into the sump.
[24] Transcript of deposition of Susan Corcoran, p. 43
[25] Andrews Engineering, 2017a, p. 012905
[26] Andrews Engineering, 1992
[27] Burns and McDonnell, 2013, p. 6-7
[28] Stabilize, 2010 b, Table 1
[29] The potentiometric surface represents the elevation to which groundwater rises in wells completed in confined geologic units. It is mapped (rather than a water table) since groundwater below some areas of the site is present under confined conditions.

Three "evaporation ponds" on the east side of Unit 2 collect inflowing groundwater and precipitation that accumulates in the Landfill. The impounded water is reportedly "a mixture of seepage, artesian groundwater and precipitation entering the middle portion of the Landfill also known as Cell 2 and the undeveloped remainder of Cell 3".[30] Collected water is pumped from the Landfill to the Dallman Ash Pond. [31]

4.2 Geology and Hydrogeology

There have been several phases of geologic and hydrogeology characterization of the area of the CWLP Coal Ash ponds. Many of the characterization activities were performed primarily to support development and permitting activities on the adjacent FGDS Landfill. Examples of the geologic and hydrogeologic characterizations reviewed include:

- Andrews Environmental Engineering (March, 1990) - This investigation was performed to install six monitoring wells at the facility.
- Patrick Engineering (July, 1992) - This investigation was performed to further characterize the hydrogeology of the Landfill setting. Approximately 44 soil boring and piezometers were installed.
- Patrick Engineering (June, 1993) - This investigation was performed in support of an application for a permit modification at the FGDS Landfill.
- Stabilize, Inc. (December, 2008) - This investigation installed three new monitoring wells as part of an assessment program for the FGDS Landfill.
- Stabilize (September, 2010) – This investigation described the geology, hydrogeology, and water quality in the vicinity of the ash ponds.
- Andrews Environmental Engineering (2017) – Coal Combustion Residuals Surface Impoundments, Groundwater Monitoring Program. This document review site geology and hydrogeology and describes the groundwater monitoring program at the Dallman Ash Pond.

The following sections provide summaries of the geology and hydrogeology of the CWLP Coal Ash ponds based on information developed in part by the above investigations.

4.2.1 **Geology**

Geologic materials encountered in the vicinity of the CWLP waste storage facilities are highly variable due to their location over alluvial deposits that overlie bedrock in the Sugar Creek Valley. Characterization of alluvial sediments is an extremely difficult task due to the very irregular thickness, discontinuous extent, and propensity for abrupt lithology changes that are

[30] Stabilize, 2010a, Attachment A

[31] The documentation reviewed indicated that some FGDS wells have been designated as assessment wells and others have been designated as zone of attenuation wells. I could not locate any further documentation that described an agreement to establish a groundwater management zone. I also could locate no other regulatory agreements that might clarify the status of the impacted wells located downgradient of the FGDS landfill and/or Lakeside Ash Pond. I reserve the right to identify further issues related to groundwater impacts downgradient of these facilities once their status is clarified.

all characteristics of alluvial sediments. The materials encountered at the site are described in the following sections and summarized from shallowest to deepest units in the table below.[32]

Summary of Geologic Material Properties			
Unit	**Material Types**	**Thickness**	**Hydraulic Conductivity (cm/sec)**
Upper Cohesive Deposit	Silt, Silty Clays, and Clayey Silt	2.5 to 19 feet	1.6×10^{-5} to 5.2×10^{-7}
Shallow Sand Unit	Silty to Clayey Fine Sand	1 to 3 feet	2.9×10^{-2} to 3.6×10^{-3}
Lower Cohesive Unit	Clays, Silty Clays, and Clayey Silts	0 to 22 feet	4.6×10^{-5} to 7.6×10^{-5}
Channel Fill	Highly Variable - Silty Clays to Silty Sands	Undetermined	1.1×10^{-4} to 7.1×10^{-5}
Basal Sand Unit	Silty and Clayey Fine Sand to Sand with some Gravel	0 to 12.3 feet	3.6×10^{-2} to 5.6×10^{-4}
Pennsylvanian Bedrock	Shale	Undetermined	1.3×10^{-6} to 1.8×10^{-7}

Alluvial Sediments

The CWLP Coal Ash ponds are located in and along the alluvial valley of Sugar Creek. In fact, both the Dallman Ash Pond and the FGDS Landfill were constructed within the floodplain and over the previous location of the meandering channel of Sugar Creek.[33] The creek channel was relocated to the west of the Dallman Ash Pond to allow construction of the waste storage facilities.[34]

Various alluvial units and placed fill materials overlie the Pennsylvanian Shale bedrock. As is typical of alluvial sediments, the unconsolidated sediments that overlie bedrock include various combinations of sands, gravels, silts and clays in generally fining upward sequences of highly variable thickness. The naturally occurring sediments have been described in various characterization reports[35] and grouped into the general units described below.

Upper Cohesive Deposit

The uppermost naturally occurring sediment unit generally encountered at the site is the Upper Cohesive Deposit. This unit consists of silt, silty clays and clayey silts. This unit was reported to vary in thickness from 2.5 to 19 feet.[36] The remaining thickness of this unit after site

[32] Stabilize, 2010b; Andrews Engineering, 2017b, section 2
[33] City Water, Light & Power, 1976, p. 11
[34] City Water, Light & Power, 1976, p. 11
[35] Stabilize, 2010b: Andrews Engineering, 2017b, Section 2
[36] Stabilize, 2010b, p. 9

development should be assumed to be reduced in many locations as this unit was excavated and used in facility construction.[37] Laboratory tests of samples from this unit indicate that hydraulic conductivity is relatively low with laboratory tests of vertical conductivity values ranging between 1.6 x 10^{-5} cm/sec and 5.2 x 10^{-7} cm/sec.[38] Horizontal hydraulic conductivity should be expected to be roughly an order of magnitude more conductive than the vertical laboratory test results indicate.

Shallow Sand Unit

The Shallow Sand Unit often underlies the Upper Cohesive Deposit. This unit was not encountered at all locations across the site, but where it was encountered it was found to underlie the Upper Cohesive Deposit. Where present, this unit consists of silty to clayey fine sand that varies in thickness from one to three feet. Slug tests conducted on two piezometers completed in this unit show values of 3.6 x 10^{-3} cm/sec and 2.9 x 10^{-2} cm/sec.[39]

Lower Cohesive Deposit

The Lower Cohesive unit consists of clays, silty clays, and clayey silts that range in thickness from 0 to 22 feet.[40] The average thickness is reported to be approximately 15 feet. This deposit is missing in some areas along the abandoned creek bed where it has likely been removed by erosion. The horizontal hydraulic conductivity of the Lower Cohesive Unit ranges from 4.6 x 10^{-5} cm/sec to 7.6 x 10^{-5} cm/sec.[41]

Basal Sand Unit

The Basal Sand unit is composed of silty to clayey fine sands to sand with some gravel. It generally overlies the bedrock surface and underlies the lower cohesive deposit. This unit is not present everywhere, but where present its thickness varies from 0 to 12.3 feet with a top elevation of from 491 to 513 feet above msl.[42] The Basal Sand Unit is the most conductive of any material encountered on site with measured hydraulic conductivity ranging from 3.6 x 10^{-2} to 5.6 x 10^{-4} cm/sec.[43] CWLP has appropriately identified the Basal Sand Unit as the Uppermost Aquifer on the site.[44] This is the unit that is targeted by the groundwater monitoring system.

[37] Andrews Engineering, 2016a, p. 2
[38] Andrews Engineering, 2017b, Section 2
[39] Andrews Engineering, 2017b, Section 2
[40] Stabilize, 2010b, p 10
[41] Andrews Engineering, 2017b, Section 2
[42] Stabilize, 2010b, p 11
[43] Andrews Engineering, 2017b, p. 6
[44] Andrews Engineering, 2017b, p. 6

Channel Fill

Fill materials were used during site development to increase the elevation of low areas, specifically including the former channel of Sugar Creek. Borings completed into the Channel Fill materials show that fill consists of variable cohesive and granular soils classified as ranging from silty clays to silty sands.[45] The field horizontal hydraulic conductivity of the fill materials is highly variable, ranging from 6.1×10^{-2} cm/sec in granular fill to 7.1×10^{-5} cm/sec in cohesive fill.[46] The creek fill affects site hydrogeology and transport of contaminants because in some areas granular fill materials extend down to the top of bedrock, interconnecting the Channel Fill with the Upper Sand Unit and the Basal Sand Unit.[47] This interconnection of the sand units creates a conduit for transfer of CCR contaminants to the uppermost aquifer (Basal Sand) at the CWLP site.

Bedrock

The uppermost bedrock that underlies the CWLP site is Pennsylvanian Shale. The top of the bedrock surface generally slopes from both the east and west toward the center of the Landfill area. The measured elevation varies from a low of 492 feet above msl near the center of the Landfill, to a high of approximately 554 feet above msl on a bedrock outcrop located near the southeast corner of Landfill Cell 1.[48] Two tests of the hydraulic conductivity of the upper portions of the shale returned values of 1.8×10^{-7} cm/sec and 1.3×10^{-5} cm/sec.[49] Vertical flow through the bedrock unit is not expected to be significant unless currently unidentified fracture zones were to be identified.

4.2.2 Hydrogeology

Potentiometric surface maps depicting the change in groundwater potential across the CWLP Waste disposal facilities during 2016 and 2017 were included in the Groundwater Monitoring Program document[50] and are provided in Figures 2 and 3, respectively. At the CWLP site, high elevation groundwater is found along the south side of the Lakeside Ash Pond near Springfield Lake and on the highland area to the east of the Lakeside Ash Pond. General groundwater flow is from south to north toward Sugar Creek with significant local aberrations in the area around the Dallman Ash Pond and FGDS Landfill.[51] Both of these maps indicate the presence of mounded groundwater beneath the Dallman Ash Pond.[52] As a result of this mounded water, groundwater flows from the Dallman Ash Pond toward the north, east, and west. Flow toward the north and west is moving water from the ash pond toward discharge areas along Sugar

[45] Andrews Engineering, 2017b, p. 4
[46] Andrews Engineering, 2017b, p. 5
[47] Andrews Engineering, 2017b, p. 4
[48] Andrews Engineering, 2017b, p. 5
[49] Stabilize, 2010b, p 12
[50] Andrews Engineering, 2017b, Appendix A
[51] See potentiometric surface maps in Figures 2 and 3.
[52] See potentiometric surface maps in Figures 2 and 3.

Creek. Eastward flow from the Dallman Ash Pond moves groundwater toward the FGDS Landfill where it contributes to the shallow saturated conditions on that site.

Descriptions of the Lakeside and Dallman Ash Ponds provided above identify the elevations of the bottom of the Lakeside and Dallman Ash Ponds to be at approximately 537 and 527 feet above msl, respectively.[53] The potentiometric surface maps in Figures 2 and 3 show the groundwater elevation in the Dallman Ash Pond to be mounded with elevations ranging from approximately 535 to 530 feet above msl. Subtracting out the elevation of the base of the Dallman Ash Pond (527 feet above msl) indicates that at least 3 to 8 feet of the waste in the Dallman Ash Pond is saturated with groundwater. However, the actual elevation of the zone of saturation within the pond is likely much greater. The potentiometric maps do not reflect the elevation of standing water held within the unlined ash ponds. Rather, the potentiometric maps only reflect groundwater elevations measured in monitoring wells locate around the perimeter of the pond.[54] In reality, nearly the entire volume of waste held in the Dallman Ash Pond is likely saturated and leaching ash-related contaminants to groundwater. Constantly saturated coal ash creates the opportunity for continuous leaching and migration of contaminants from the Dallman Ash Pond.

Similarly, the potentiometric surface maps in Figures 2 and 3 show the groundwater elevation in the Lakeside Ash Pond decreases from a high of 565 feet above msl on the southeast corner to approximately 540 feet above msl along the northern berm. Subtracting out the elevation of the base of the Lakeside Ash Pond (537 feet above msl) indicates that at least 3 to 28 feet of the waste in the Lakeside Ash Pond is saturated with groundwater. Groundwater elevations at the Lakeside Ash Pond are measured in monitoring wells located around the perimeter of the pond and do not reflect the elevation of standing water held within the ash pond. Nearly the entire volume of waste held in the impoundment is likely saturated and leaching ash-related contaminants to groundwater.

Water-soluble metals and other contaminants in the ash dissolve into the groundwater as it passes through the waste material or are transported into the groundwater by infiltrating sluice water and precipitation. Contaminant loading through these processes is responsible for the elevated concentration of ash contamination detected in groundwater monitoring wells located downgradient of the ash ponds.

Other than the CWLP waste facilities that are being discussed herein, there are no other known sources that could be contributing the CCW-related constituents to groundwater. Some drawings included in early documents indicate the presence of a sewage treatment pond located

[53] Hanson Engineers, 1988, Sheet 2 of 2; Stabilize, Inc. 2010, p. 2
[54] More accurate potentiometric surface maps could not be prepared without nearly concurrent measurements of pond water and monitoring well water elevations.

immediately east of the first cell of the FGDS Landfill. The former location of that pond to the east of the FGDS Landfill places that pond on the opposite side of the Dallman Ash Pond groundwater mound from the Dallman monitoring wells and therefore the source of contaminants in the Dallman wells cannot be attributed to that location. Even if the groundwater mound was not present, contaminants from that pond would not be expected to include high concentrations of coal ash contaminants.[55]

4.2.3 Groundwater Monitoring Systems

The groundwater monitoring system at the Dallman Ash Pond consists of two upgradient monitoring wells (AP-4 and AP-5) and four downgradient monitoring wells (AP-1, AP-2, AP-3 and AW-3/RW-3).[56] Upgradient wells are purposefully placed in areas that are not thought to be impacted by facility operations to provide information about naturally occurring concentrations of chemical parameters. Downgradient monitoring wells are placed hydraulically downgradient of the waste unit, between the ash pond and Sugar Creek, in order to detect changes in water chemistry caused by the Ash Pond. Unfortunately, the close proximity of the ash ponds to Sugar Creek makes the monitoring system susceptible to damage during even moderate flood events.[57] Each of the monitoring wells in the Dallman groundwater monitoring system was constructed with screened intervals set to monitor the quality of water flowing immediately above the bedrock in the Basal Sand (Uppermost Aquifer).

Monitoring of the Dallman Ash Pond was initiated in 2010 with a single analysis from each well. A regular systematic monitoring program was initiated in February 2012 and continues to the present.[58] Water from all of the tested wells is sampled and analyzed for a wide range of ash-related parameters including antimony, arsenic, barium, boron, beryllium, cadmium, calcium, chloride, cobalt, fluoride, lead, lithium, mercury, molybdenum, pH, selenium, sulfate, thallium, total dissolved solids (TDS), and radium 226 & 228.[59] Analytical results are compared to statistically derived background concentrations and relevant water quality standards to determine if groundwater quality has been significantly impacted by site operations.

4.3 Groundwater Quality Criteria

Analytical data from monitoring wells tell us nothing without a standard or benchmark against which to judge whether a result shows significant degradation of water quality from site operations. I compared these monitoring results to both applicable water quality standards and

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[55] Minnesota Pollution Control Agency, 1999, Table 4
[56] Monitoring well AW-3/RW-3 serves the double purpose of being included in both the Dallman Ash Pond and FGDS groundwater monitoring systems.
[57] At the time of my March 1, 2019 site visit Eric Staley indicated that wells AP-2 and AP-3 are subject to flooding and that AP-3 had recently flooded and had not yet been repaired.
[58] CWLP Ash Pond Groundwater Laboratory Reports 2010 to present. BATES 6.6
[59] CWLP Ash Pond Groundwater Laboratory Reports 2010 to present. BATES 6.6

statistically derived background values for the CWLP site, where available. The results of these comparisons of applicable standards and background values to data from the Dallman monitoring system is described in the following sections.

4.3.1 Groundwater Classification

Illinois groundwater quality regulations establish a groundwater classification system and associated numeric groundwater concentration standards for each classification.[60] Class I groundwater is defined as potable resource groundwater and is generally considered to be Class I unless otherwise demonstrated.[61] Hanson Engineers performed a formal evaluation of the appropriate classification of groundwater at the FGDS Landfill[62] in support of the 1995 Significant Permit Modification Application.[63] The results of that evaluation indicate that "[a]ll groundwater in the Creek Fill, Shallow Sand Unit, Lower Cohesive deposit and the Basal Sand Unit is Class I."[64] The Basal Sand Unit between the Dallman Ash Pond and Sugar Creek is considered to be Class I groundwater.

Class I Groundwater Quality Standards for Inorganic Constituents[65]			
Parameter	Class I Water Quality Standard (mg/l)	Parameter	Class I Water Quality Standard (mg/l)
Antimony	0.006	Manganese	0.15
Arsenic	0.010	Mercury	0.002
Barium	2	Nickel	0.1
Beryllium	0.004	Nitrate as N	10.0
Boron	2.0	pH	6.5 – 9.0
Cadmium	0.005	Perchlorate	0.0049
Chloride	200.0	Selenium	0.05
Chromium	0.1	Silver	0.05
Cobalt	1.0	Sulfate	400.0
Copper	0.65	Thallium	0.002
Cyanide	0.2	TDS	1,200
Fluoride	4.0	Vanadium	0.049
Iron	5.0	Zinc	5.0
Lead	0.0075		

60 Title 35, Part 620 Groundwater Quality, Section 620.410
61 Hanson Engineers, 1995, p. 5 of 11
62 Hanson Engineers, 1995
63 Andrews Engineering, 1995
64 Hanson Engineers, 1995, p. 11 of 11
65 Section 620.410 Groundwater Quality Standards for Class I: Potable Resource Groundwater

4.3.2 Background Groundwater Quality

Six years after the initiation of groundwater sampling CWLP has established proposed background water quality values. The statistical method employed is the calculation of the 95% Upper Prediction Limit (both upper and lower for pH). This is a standard statistical test that complies with EPA guidance[66] on the statistical analysis of groundwater; it identifies the concentration limit which is then compared to one or more observations from a compliance point population.[67] In this case, the concentration limit is identified as the Proposed Background Concentrations. Proposed background values calculated by CWLP for the Dallman Ash Pond are summarized in the table below.

Proposed Background Concentrations[68]			
Parameter	Proposed Background Value (mg/l)	Parameter	Proposed Background Value (mg/l)
Antimony	0.16	Lead	0.638
Arsenic	0.0724	Lithium	0.05
Barium	5.24	Mercury	0.0008
Beryllium	0.0164	Molybdenum	0.025
Boron	0.787	pH	6.76-7.63
Cadmium	0.128	Selenium	0.0079
Calcium	176.63	Sulfate	84.5
Chloride	24.2	TDS	597.94
Chromium	0.811	Thallium	0.00556
Cobalt	0.297	Radium 226	7.1
Fluoride	0.62	Radium 228	5.1

Where laboratory analytical values exceed the calculated background value, the sample is considered to be statistically above background.

4.4 Nature and Extent of Groundwater Contamination

I identified constituents of concern at this site by comparing analytical results to background values, Class I Groundwater Quality Standards, or both where they have each been established. The following table identifies the wells that routinely show impacts by ash-related contaminants of concern in the Dallman Ash Pond groundwater monitoring system. Data summarized below were prepared using data taken from the reports of laboratory analyses.[69]

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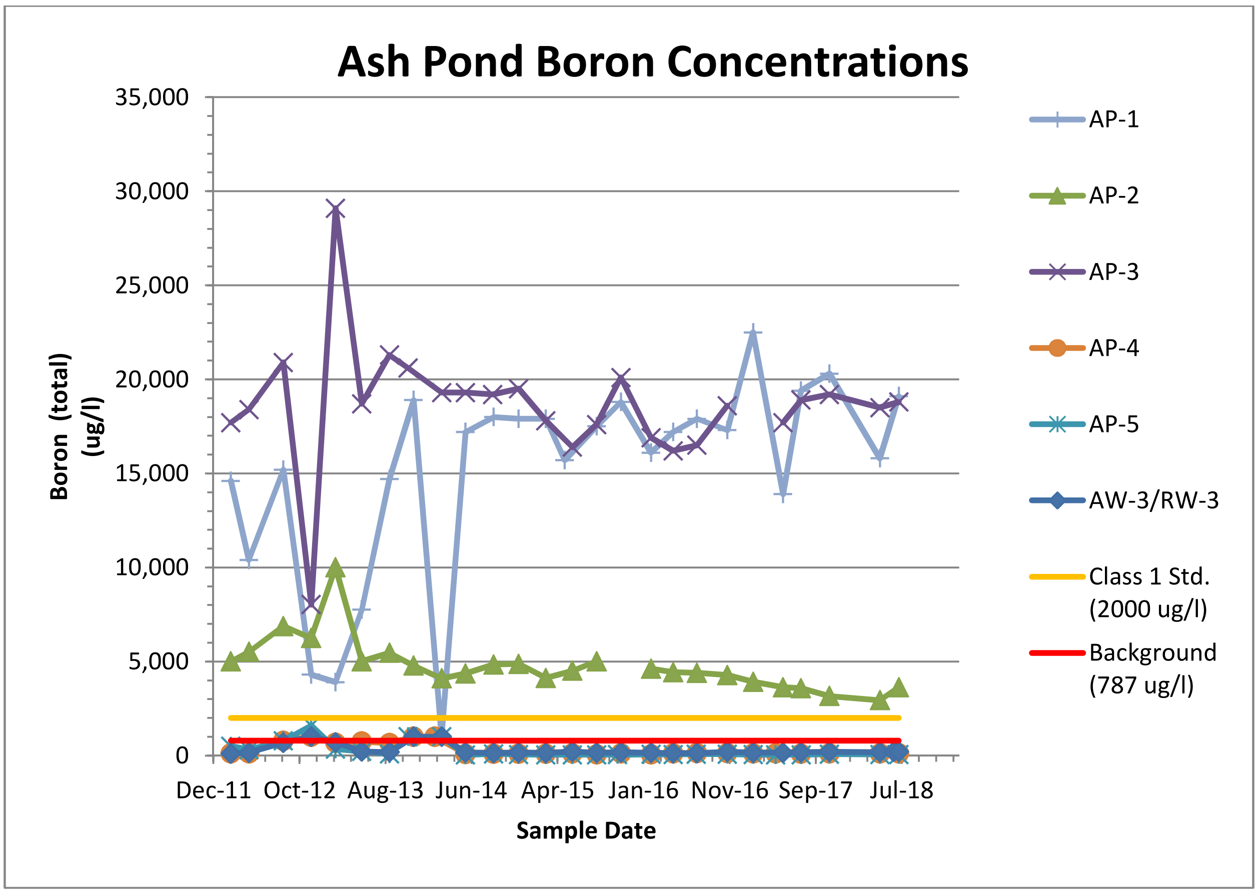
[66] USEPA, 2009
[67] USEPA, 2009
[68] Proposed Background Concentrations found in Andrews (2017b), Groundwater Monitoring Program
[69] Laboratory data reports used were provided during discovery at Bates 6.6 and 6.7, and obtained from the CWLP CCR Compliance web site

Parameter	Routine Detections Above Background	Routine Detections Above Class 1 Standard
Boron	AP-1, AP-2, and AP-3	AP-1, AP-2, and AP-3
Sulfate	AP-1, AP-2, and AP-3	AP-1 and AP-2
Manganese	AP-2 and AP-3	AP-2 and AP-3
Arsenic	AW-3/RW-3	AW-3/RW-3
TDS	AP-1, AP-2, and AP-3	AP-1

Time versus concentration graphs of several parameters that illustrate the magnitude of water quality impacts in Dallman Ash Pond monitoring wells are provided and discussed in the following sections.

4.4.1 **Boron Contamination**

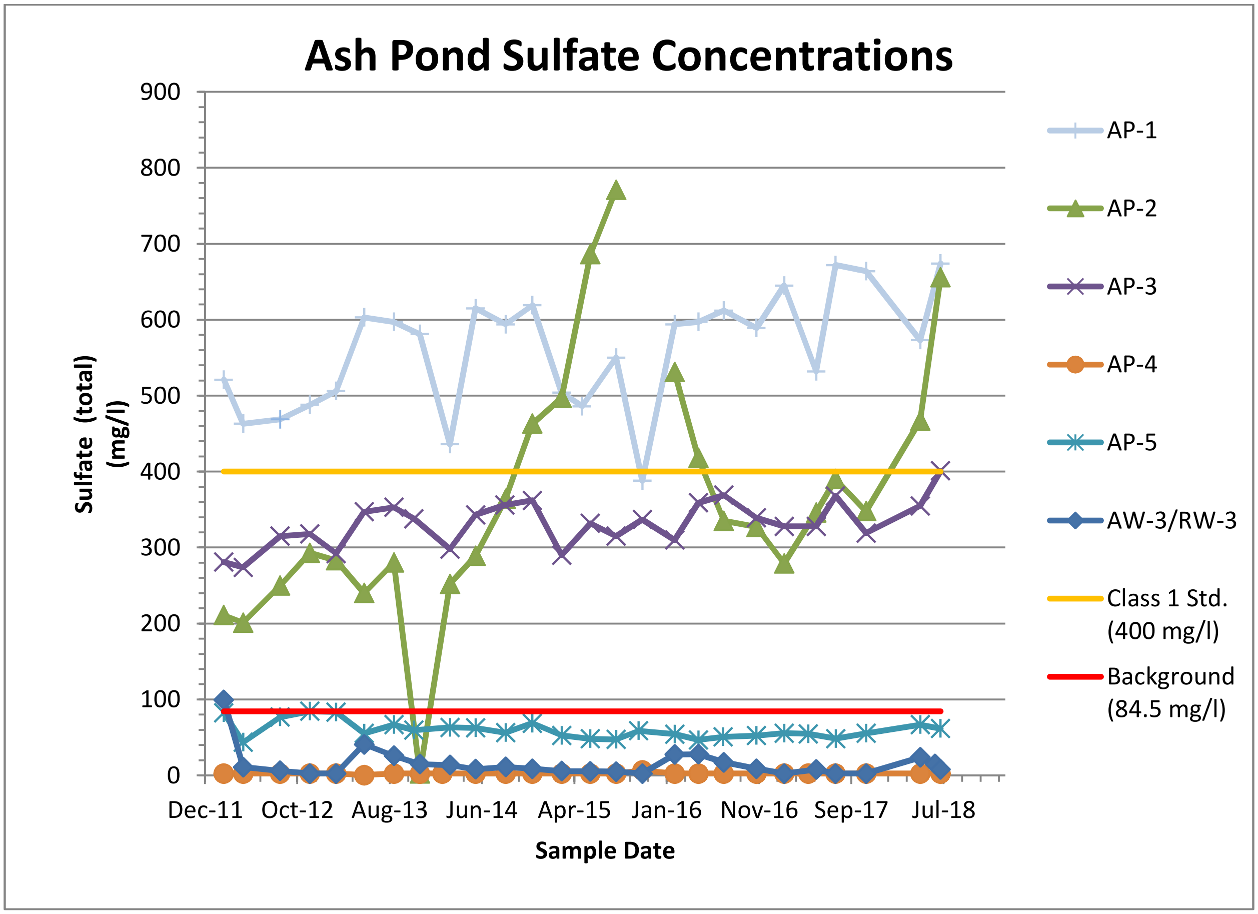


Boron is a very common coal ash constituent that is regularly found to be contaminating groundwater at ash disposal sites,[70] and the CWLP site is no exception. The above graph shows that the concentration of boron in downgradient monitoring wells AP-1, AP-2 and AP-3 is consistently above both background concentrations and Illinois Class I Groundwater Quality

[70] EPRI, 1998

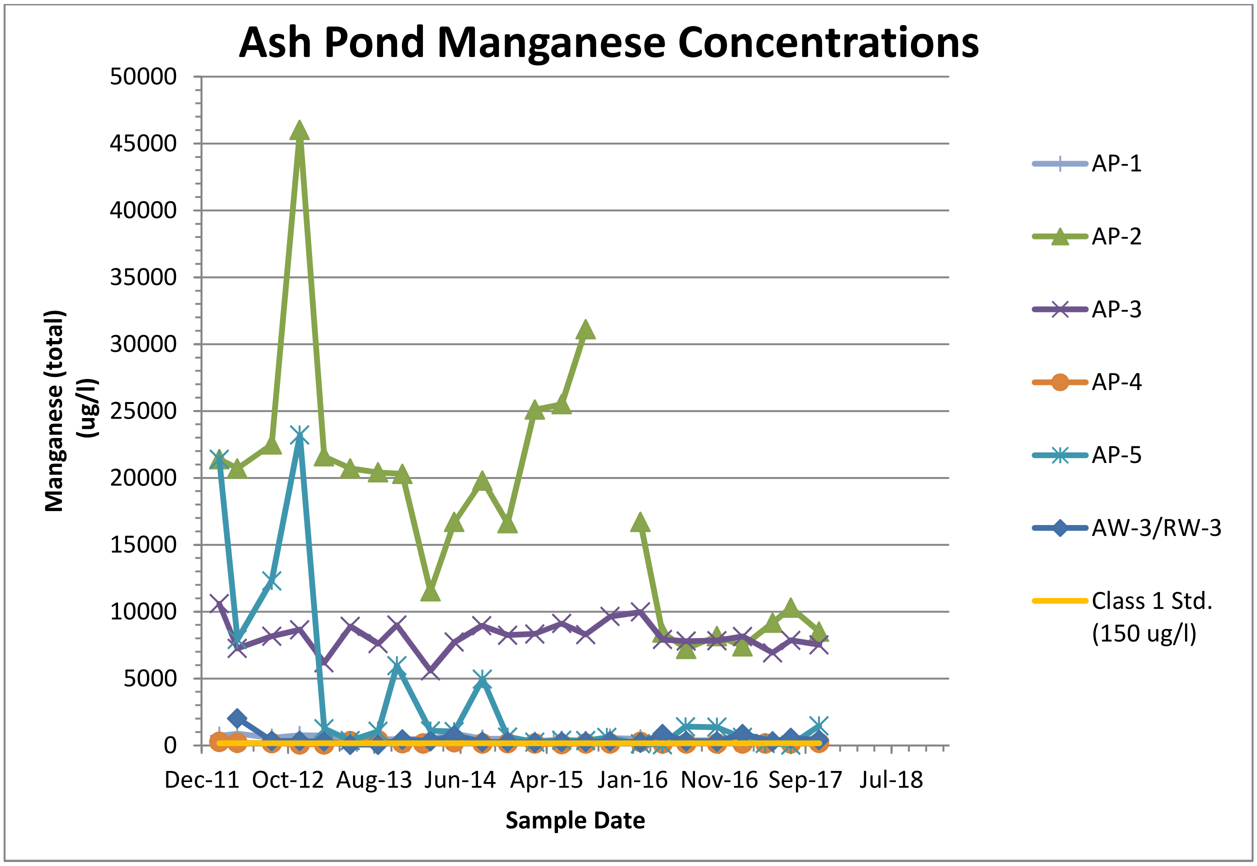
Standards. I also note that the two upgradient wells (AP-4 and AP-5) contain only small concentrations of boron compared to the downgradient wells.

4.4.2 Sulfate Contamination



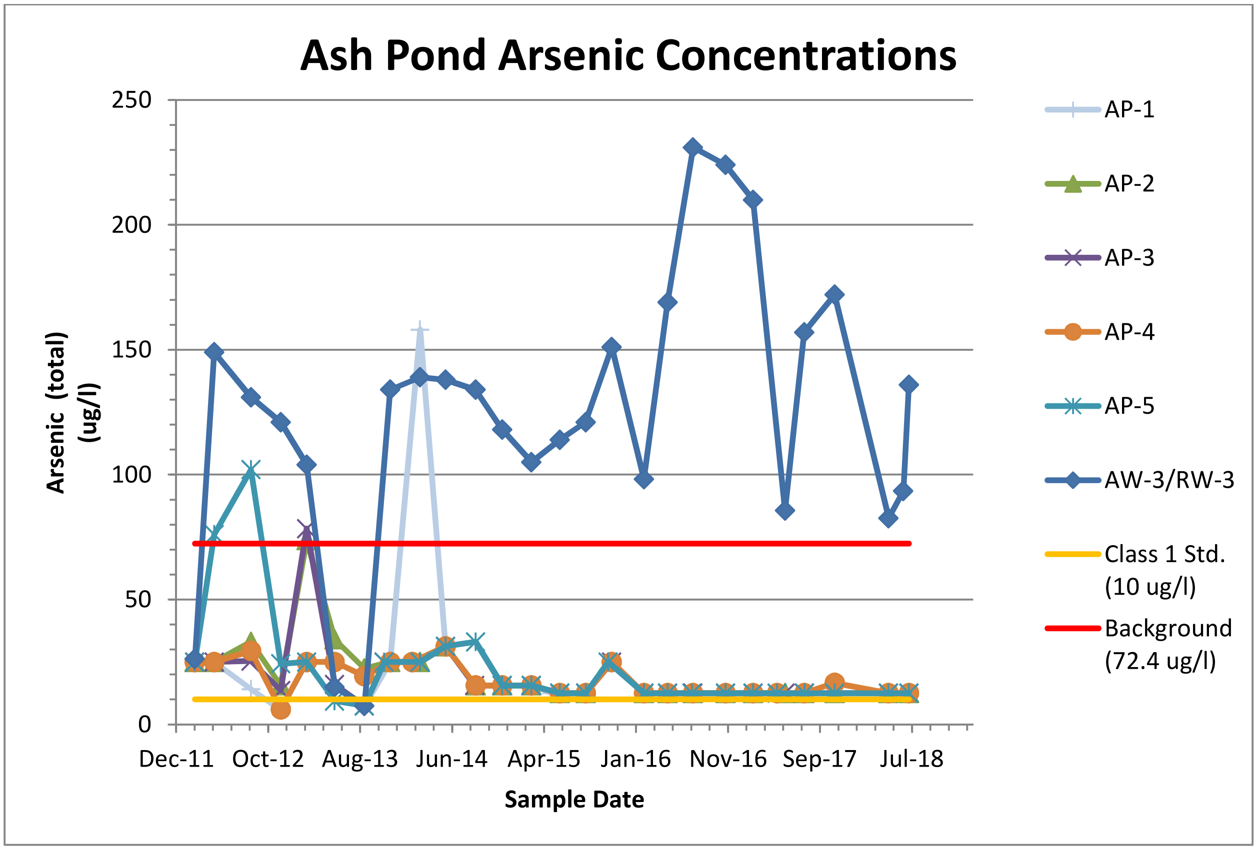
Sulfate is another very common coal ash constituent that is regularly found to be contaminating groundwater at ash disposal sites, and which also is impacting groundwater at the CWLP site. The above graph shows that the concentration of sulfate in downgradient monitoring well AP-1 is consistently above both background concentrations and Illinois Class I Groundwater Quality Standards. The concentration of sulfate in monitoring well AP-2 is variable with the most recent samples showing concentrations well above both background and the Class 1 standard. Monitoring well AP-3 shows concentrations of sulfate that are elevated well above background at concentrations and generally just below the Class 1 Standard. The two upgradient wells (AP-4 and AP-5) contain comparatively low concentrations of sulfate.

4.4.3 **Manganese Contamination**



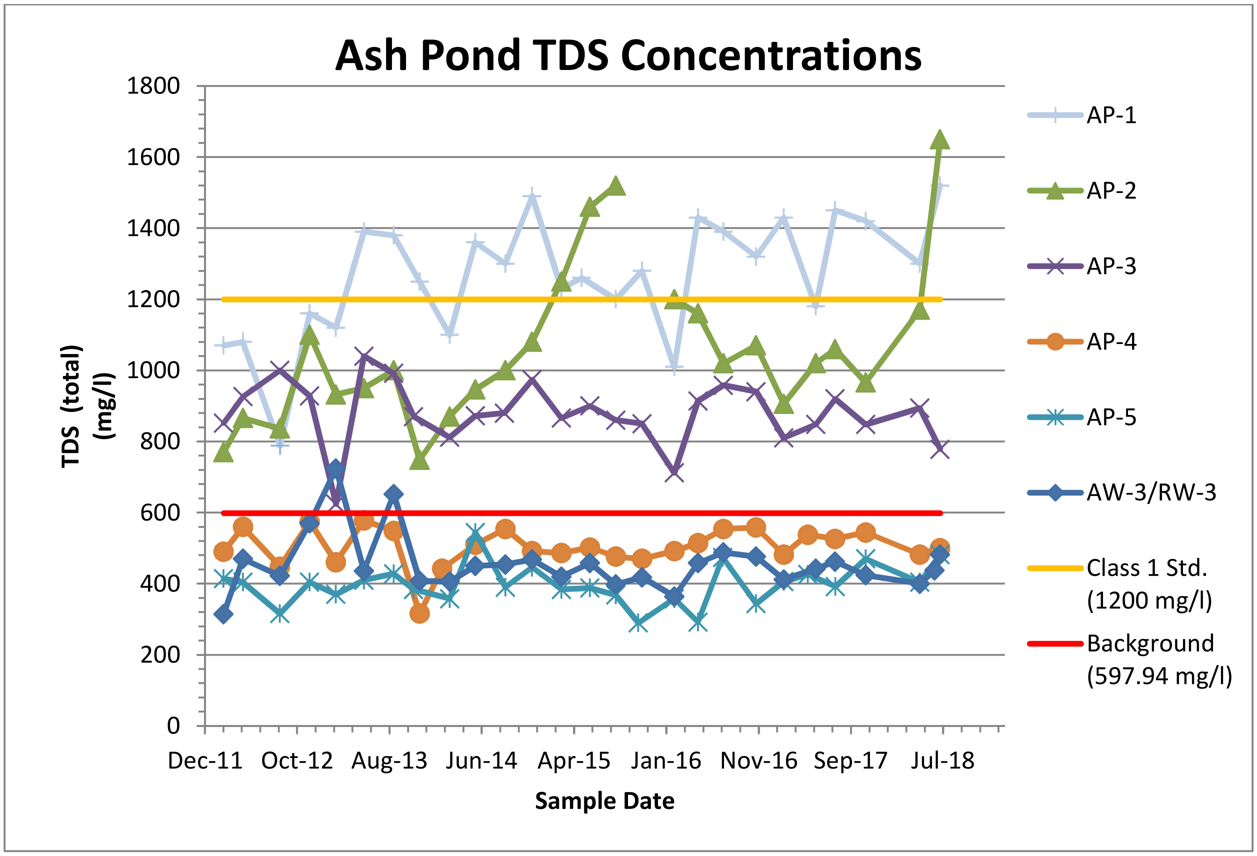
Manganese is another common ash constituent that contaminates groundwater at ash disposal sites, and also is impacting groundwater at the CWLP site. The above graph shows that the concentration of sulfate in downgradient monitoring wells AP-2 and AP-3 is consistently above the Illinois Class I Groundwater Quality Standards. A numeric background concentration for manganese has not been identified, but it is clear from the above graph that the concentrations of manganese in wells AP-2 and AP-3 are elevated over those recorded for background wells AP-4 and AP-5. The two upgradient wells AP-4 and AP-5, generally contain low concentrations of manganese with the exception of the first few analyses from well AP-5. Higher than expected concentrations observed in the first few samples in an analytical data set is something that I have occasionally observed in water quality data sets from coal ash disposal facilities. It appears that the first few samples from some wells were subject to either inadequate well development or poor sampling techniques that resulted in some higher concentrations being reported. For this reason I have not focused closely on the contaminant concentrations from the early sample events.

4.4.4 Arsenic Contamination



While a common constituent of coal ash, in my experience arsenic is a less frequently detected groundwater contaminant found downgradient of leaking coal ash facilities. The lower frequency of detection is due to the fact that arsenic is generally not as mobile as other ash contaminants that migrate from ash ponds. Arsenic was detected in downgradient monitoring wells AW-3/RW-3 in concentrations well above both background and Class I Water Quality Standards. Early detections of arsenic in well AP-5 may be the result of sampling and/or development errors similar to the manganese results described above. It is currently unclear if the high concentration of arsenic has been mobilized directly from the Dallman Ash Pond or is present in groundwater as a result of interaction of ash pond leachate with discharges from the adjacent FGDS Landfill and/or gypsum storage area. However, based on the location of wells AW-3/RW-3, it is clear that some combination of leachate from the Dallman Ash Pond and/or the FGDS Landfill is causing mobilization of arsenic that is being detected in the Dallman Ash Pond groundwater monitoring system at wells AW-3/RW-3. The two upgradient wells AP-4 and AP-5, contain low concentrations of arsenic as compared to the concentrations consistently detected in well AW-3/RW-3.

4.4.5 TDS Contamination



Total Dissolved Solids (TDS) is a very common parameter that is found, sometimes at very high concentrations, at ash disposal sites. The above graph shows that the concentration of TDS in downgradient monitoring well AP-1 is routinely above both background concentrations and the Illinois Class I Groundwater Quality Standards. The concentration of TDS in monitoring well AP-2 is variable with the most recent sample showing concentrations well above both background and the Class 1 standard. Monitoring well AP-3 shows concentrations of TDS that are elevated above background at concentrations and below the Class 1 Standard. Upgradient wells AP-4 and AP-5 contain low concentrations of TDS by comparison. These results are similar to the sulfate concentration trends that were previously described.

In summary, each of the downgradient monitoring wells is impacted with ash contaminants. Because there are no unimpacted monitoring wells located further downgradient of the Coal Ash Facilities, it is impossible to determine the full extent of the downgradient groundwater contaminant plume. Similarly, there is insufficient information to determine the lateral extent of groundwater contamination. There are no unimpacted monitoring wells capable of detecting passage of the leading edge of the contaminant plume. The lateral extent of the plume is likely to be limited to the west of the Dallman Ash Pond by the presence of local areas of discharge to Sugar Creek. It is expected, but should be verified with additional wells, that most of the contaminants migrating from the Dallman Ash Pond will be discharged into Sugar Creek. It is however possible that some portion of the ash contaminants migrate for some undetermined distance north of the site through the alluvial sediments that fill the valley of Sugar Creek. There is no indication that anyone has investigated the extent of any downgradient migration from the site, nor that other sources are responsible for any of the identified contaminants of concern.

There is no indication that there have been any actions taken to reduce or eliminate the groundwater contamination that IEPA had indicated were violations in 2012 and 2013. CWLP continues to store coal ash in the unlined Dallman Ash Ponds, as well as the Lakeside Ash Pond. Groundwater monitoring data shows that contamination was caused by storage of coal fly ash in the unlined Dallman Ash Pond, that it was ongoing when monitoring was started, that it currently continues unabated, and the contamination shows no indication of decreasing to concentrations below background or applicable standards.

5. Potential Remedies

5.1 Remedial Goals

In order to provide some basis for discussing and comparing various remedial actions I have identified remedial action goals. These remedial action goals identified are general goals for use in comparing the ability of each remedial option to reduce current environmental impacts and protect against future environmental impacts from the CWLP coal ash impoundments. They are similar to the evaluation criteria identified by USEPA for use in remedy selection for Superfund Remedial Actions,[71] but have been modified to more directly address the relevant issues at the CWLP site. The goals used in this analysis to compare the effectiveness of remedial options include:

- Reduce the volume of leachate generation.
- Reduce releases of leachate to groundwater and surface water.
- Minimize long-term operation and maintenance requirements.
- Permanent solutions are preferable to temporary fixes.
- Eliminate the long-term risk of catastrophic release into Sugar Creek.

Implementation costs and public and/or regulatory acceptance of the various options will also play significantly into selection of the remedy.

5.2 Potential Remedial Actions

The following discussion of remedies commonly proposed to control contaminant releases at coal ash sites is intended as an overview that describes the positive and negative aspects of each remedy. In practice, many of these remedial actions are combined to fit the needs of the particular location. It should be expected that multiple actions will be required to mitigate the observed groundwater contamination and eliminate the threat of further environmental impacts.

5.2.1 **Discontinue Disposal of Waste in the Impoundments**

The first law of holes[72] describes an appropriate response to the situation at CWLP. It states that “if you find yourself in a hole, stop digging.” Wastes currently in impoundments include fly ash, bottom ash, boiler slag, and lime sludge. CWLP currently has contracts to send some portion of each of these waste streams off-site for beneficial use or disposal.[73] A total of approximately 79,000 tons of fly ash and 38,000 tons of bottom ash (117,000 tons combined) are generated annually by all the generating units.[74] Of the combined 117,000 tons of waste, approximately 30,000 to 35,000 tons are shipped back to the coal mine.[75] Approximately 18,000 tons of fly ash per year is removed under

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[71] USEPA, 1990, Exhibit 3
[72] Anecdote variously attributed to Will Rogers.
[73] Offsite use of these materials was discussed during the deposition of William Antonacci on January 16, 2019.
[74] Transcript of deposition of William Antonacci, p. 73
[75] Transcript of deposition of William Antonacci, p. 74

a contract with Ozinga and another 18,000 tons of bottom ash is removed for use by Harsco.[76] Contracts with Fly ash Direct and Champaign County result in removal of approximately 7,000 tons of fly ash and 2,000 tons of bottom ash, respectively. The result is that approximately 68% of the fly ash and bottom ash that is generated annually is being removed for offsite beneficial uses. CWLP should investigate other beneficial re-use or disposal options for each of these waste streams so that additional source materials are not added to existing contaminant sources.

Every day that additional waste is disposed of into the leaking CWLP ash ponds increases the contaminant source volume and extends the time duration over which, in the absence of effective remediation, the waste will continue impacting water quality. It has been nearly 9 years since the first monitoring results showing clear impacts to groundwater were generated and the volume of the contaminant source material (ash) continues to grow. Discontinuing disposal of the fly ash, bottom ash, boiler slag, and lime sludge in the impoundments will not stop releases to the environment from already placed ash, it is not a final closure remedy, and does not eliminate the threat of catastrophic release of ash during a flood event. It would, however, at least stop the growth of source material volume. Discontinuing disposal in the impoundments, at least temporarily, is also a prerequisite for implementing several other potential remedies that may be considered to remediate contamination from the current source materials.

5.2.2 **Eliminate Wet Handling of Waste**

In the event that complete elimination of ash disposal in leaking impoundments cannot be implemented under current conditions, the potential for switching plant operations from wet to dry ash handling should be evaluated.[77] CWLP is currently able to send its dry ash offsite for beneficial reuse.[78] Eliminating wet handling of ash would have the effect of facilitating additional off-site reuse of coal wastes.

While not a final closure remedy, switching operations to dry ash disposal would reduce the rate of infiltration into groundwater by eliminating discharge of sluice water into the impoundments. Eliminating discharge of sluice water would eliminate one major water input, alter the water balance of the impoundments, and should slow migration of leachate out of the impoundments. A careful study of the water balance of the impoundments would be required in order to evaluate whether eliminating sluice water would lower internal heads sufficiently to reduce contaminant discharges into downgradient water. Discontinuing wet disposal of the fly ash and bottom ash in the impoundments will not stop releases to the environment from already placed ash, is not a final closure remedy, and does not eliminate the threat of catastrophic release of ash during a major flood event.

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[76] Transcript of deposition of William Antonacci, pp. 75 and 49
[77] William Antonnocci indicated during his January 16, 2019 deposition that CWLP has already done some investigation of the feasibility of converting to dry handling of coal ash, but did not know the current status.
[78] Transcript of deposition of William Antonacci, pp. 75

5.2.3 Leachate Collection and Treatment

Installation and operation of leachate collection systems such as sumps or wells inside the impoundments could lower the leachate head within the impoundment and reduce the flux of contaminants out of the impoundments. Collection of leachate from within an ash impoundment was utilized at the Wateree Generating Station in South Carolina as a temporary measure to reduce contaminant releases from an ash impoundment until such time excavation and removal of the accumulated waste could remove the source material[79]. Lowering the leachate head provided an additional benefit of initiating the dewatering process in preparation for excavation and removal of the ash to a secure disposal site. However, active operation and maintenance of the leachate collection and water treatment systems would be necessary for as long as leachate continues to be generated, a time period that may continue for many decades following the placement of the final wastes within the impoundment.

Furthermore, this option could be complicated by the potential need to treat collected leachate prior to discharge. Coal ash porewater often contains higher concentrations of ash constituents than are found in surface water that is discharged through the regulated outfall. This has been documented at multiple sites including the Belews Creek[80], Mayo[81], and Roxboro[82] sites in North Carolina. As a result, extraction of leachate from within the waste would be expected to contain higher concentrations of ash constituents than is currently being discharged into Sugar Creek. The expected concentration of ash constituents at the CWLP site would need to be determined in order to evaluate whether leachate treatment would be necessary prior to discharge.

Collecting leachate within the impoundments alone is not a final closure remedy and does not reduce the risk of catastrophic release of ash. It might however be used to reduce the flux of leachate from the impoundments into groundwater and result in decreased contaminant concentrations in the groundwater for as long as the system is operated. Collecting leachate within the impoundments also would likely not eliminate groundwater contamination. It could however be implemented as a component of an overall remediation strategy.

5.2.4 Groundwater Collection and Treatment

Installation and operation of groundwater collection wells or trenches installed through high permeability materials below or outside of the impoundments could potentially be used to capture contaminated groundwater. Applicability of this option would need to be carefully evaluated to determine the feasibility of this option given the proximity of Sugar Creek, as well as to determine the number of wells, spacing of trenches, and/or pumping rates necessary to capture contaminants released from the leaking impoundments. There is very little distance between the edge of the

[79] Personal communication from Jim Landreth at the time of November 2016 site visit.
[80] Duke Energy Carolinas, 2016a, Tables 3-2 and 3-3
[81] Duke Energy Progress, 2017a, Appendix B
[82] Duke Energy Progress, 2017b, Appendix B

impoundments and Sugar Creek in some locations[83] on the site (See Figure 1). Wells or trenches placed between the impoundments and Sugar Creek could unintentionally capture significant amounts of water from Sugar Creek rather than impacted groundwater flowing from the leaking impoundments. Active operation and maintenance of the leachate collection and water treatment systems would be necessary for as long as leachate continues to be generated and migrating from the impoundments, a time period that may continue for many decades following the last placement of waste.

In practice, it has often been difficult to intercept all of the contaminants in a plume using wells or trenches installed in alluvial sediments. The highly variable composition, orientation, and discontinuous nature of alluvial sediments can hinder the ability of wells and trenches to capture enough of the contaminated groundwater to halt plume migration. For example, both capture wells and interceptor trenches have been unsuccessfully utilized at the Colstrip[84] generating station in Montana in an effort to stop the spread of multiple contaminant plumes. The location of the facilities on the alluvial Fort Union Formation and recent alluvial sediments has limited the effectiveness of these measures.

Installation and operation of groundwater collection wells or trenches installed below or outside of the impoundments alone is not a final closure remedy and does not reduce the risk of damage or catastrophic release of ash. It might however be used to reduce the flux of contaminated groundwater that is migrating from the leaking impoundments and result in decreased contaminant concentrations in the groundwater for as long as the system is operated.

5.2.5 **Physical Barriers**

Construction of physical barriers such as low permeability walls constructed around the perimeter of the impoundments could restrict lateral flow of groundwater. As is the case for groundwater collection wells and trenches (Section 5.2.4), construction of an effective low permeability barrier in alluvial sediments can be problematic. The effectiveness of these remedies is often dependent on construction quality, the ability to obtain a positive seal between the barrier and underlying low permeability unit, and the ability of underlying low permeability unit to prevent flow beneath the barrier. Low permeability barriers were utilized at the Colstrip power station in Montana[85] and at the Wateree generating station in South Carolina[86] in an effort to stop the spread of contamination. Both of these facilities have since switched their processes to dry ash handling and the Wateree

[83] Figure 1 and observations made during a site visit conducted on March 1, 2019 indicate that the distance from the outside of the impoundment berms to Sugar Creek are on the order of a few tens of feet in the vicinity of the clarification pond and the northwest corner of the Dallman Pond.
[84] PPL Montana, 2014, Table 3-2
[85] PPL Montana, 2014, Table 3-2
[86] Personal communication from Jim Landreth at the time of November 2016 site visit

station has excavated and disposed of the ash in the impoundment that was the source of the contamination[87].

Installation of low permeability barriers alone is not a final closure remedy. Construction of a physical barrier around the perimeter of the impoundments would only be appropriate if implemented along with other remedies meant to eliminate or control the formation of leachate within the impoundments. One benefit of physical barriers is that once installed there is little to no required operation and maintenance other than routine monitoring. However, since the waste would remain in place within impoundments located adjacent to Sugar Creek, construction of below grade physical barriers would not reduce the risk of damage or catastrophic release of ash during a major flood event.

5.2.6 Retrofit Impoundments

In an evaluation of compliance with CCR Rule surface impoundment location restrictions[88] prepared for CWLP, Andrews Engineering concluded that;

> "unlined ponds are placed directly above and within 5 feet of the high water table for the uppermost aquifer. Either it must be demonstrated that there will not be intermittent, recurring or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer, or cessation of disposal and closure must begin."[89]

It goes on to state that "Hydraulic separation can be shown by retrofitting the ponds. A composite liner consisting of a two-foot (minimum) low hydraulic conductivity ($< 1.0 \times 10^{-7}$ cm/sec) clayey material overlain by a minimum 30 mil geomembrane (or equivalent) will be adequate to demonstrate hydraulic separation."[90]

Retrofitting the impoundments at the CWLP site to the specifications identified by Andrews would require that the waste that is currently located in the impoundments be removed so that a new composite liner system could be constructed. Low hydraulic conductivity clay soils would then be trucked to the impoundment, spread and compacted. Following placement of the low conductivity base material a synthetic liner system would be installed. Alternative handling plans for newly generated wastes would be necessary while construction takes place. Once completed, the retrofitted impoundments could again be utilized for waste disposal. The newly retrofitted impoundments would however remain potentially susceptible to damage or catastrophic release of wastes during flood events.

Retrofitting the existing unlined impoundments could be effective at controlling groundwater contamination, at least for the immediate future. While even new liner systems leak to some extent,

[87] Ash impoundments at the Colstrip Units 3&4 Effluent Holding Ponds are located well above the floodplain of local streams making flood-related damage or releases highly improbable.
[88] Andrews Engineering, 2018, p. 3
[89] Andrews Engineering, 2018, p. 3
[90] Andrews Engineering, 2018, p. 3

the flux of contaminants out of the impoundment would be expected to be significantly reduced. A composite liner system should contain ash leachate inside the impoundment as long as the amount of leachate contained within the liner is controlled.

Retrofitting the impoundments may meet the CCR location restrictions but would commit CWLP to additional costs associated with long term operation and maintenance as well as eventual closure of these facilities,[91] including at least 30 years of post-closure monitoring if waste remains in place and the impoundment would remain susceptible to damage or catastrophic release of waste into Sugar Creek during a major flood.

The lined impoundment would have already incurred the costs of removing existing wastes once in preparation for retrofitting the impoundments with a liner system. If the waste is to be removed from the current leaking impoundments, future waste disposal should be relocated to a properly sited and constructed disposal facility, or wet ash handling should be eliminated so that most waste can readily be beneficially used.

5.2.7 **Cap in Place**

A commonly utilized method of reducing impacts to groundwater at coal ash sites is to close the impoundments by capping the waste in place. The combination of elimination of sluice water entering the impoundment and installation of a cap system over the waste would reduce leachate head and slow migration release of contaminants to groundwater. However, this remedial option is effective only as long as there is separation between the bottom of the waste and the water table. This is exactly the point of the federal CCR rule location restriction discussed above. Waste placed too close to groundwater, such as in the CWLP impoundments, will be rewetted from below during high water events even though the cap may be functioning as planned. In the case of the CWLP impoundments "unlined ponds are placed directly above and within 5 feet of the high water table for the uppermost aquifer."[92] Rewetting of the waste during high water events will cause renewed leachate generation and continued release of contaminants to the groundwater.

Capping the Dallman and Lakeside impoundments could be effective if combined with installation of a liner system to provide separation from the groundwater and to comply with CCR Rule location restrictions.[93] Removal of the existing wastes to facilitate lining in the current location on the floodplain would continue the unit's susceptibility to flooding.

5.2.8 **Excavation and Beneficial Reuse**

Excavation and beneficial reuse of the waste stored in the Dallman impoundment is a final closure option that should be carefully evaluated when the site is closed. Beneficial reuse of some of the coal

[91] Impoundment closure could consist of either again removing all of the waste contained in the impoundments or installing a composite cap system over the wastes.
[92] Andrews Engineering, 2018, Evaluation of CCR Location Restrictions
[93] See Section 5.2.6

combustion wastes that are currently being produced and disposed in the CWLP impoundments has occurred in the past and continues to occur. In fact, William Antonacci indicated in his recent deposition that most of the ash contained in the Dallman Ash Pond was taken for beneficial use in rebuilding a highway interchange as recently as 2008 or 2009.[94] While it is unclear if an appropriate use for all of the waste stored in the CWLP impoundments could readily be found, it is clear that beneficial reuse opportunities are occasionally available and that additional opportunities would be available if ash was handled dry.

Benefits of excavation and beneficial reuse include: elimination of the source of groundwater and surface water contaminants from the floodplain, elimination of the risk of a catastrophic release to the environment, elimination of at least 30 years of site monitoring and maintenance costs, elimination potential liabilities of disposing of waste in another disposal facility. For all of these reasons, I recommend the option excavation and beneficial reuse for the CWLP impoundments.

5.2.9 **Excavation and Disposal**

Disposal of excavated ash in a new or existing Landfill capable of minimizing contact between ash and water, and containing ash contaminants would: eliminate the source of groundwater and surface water contaminants from the floodplain, eliminate the risk of a catastrophic release to the environment, and elimination of at least 30 years of site monitoring and maintenance costs.

This option would remove the source of groundwater contamination from the current location but depending on its final disposition, has the potential to create environmental liabilities at its new location. Waste removed from the current leaking impoundments should be removed to a properly sited and constructed disposal facility

5.2.10 **Comparison of Potential Remedies to Remedial Goals**

A summary of each of the above potential remedies compared to the previously identified remedial goals is provided in Table 1. This summary shows that the remedial alternatives that best protect the environment are those that include removal of the waste from the Sugar Creek floodplain and then either utilization of the waste for a beneficial use or disposal of the waste in a secure off-site location.

A combination of retrofitting the impoundments with a composite liner system, leachate collection and treatment, and eventually capping the waste in place would allow the impoundments to continue operation and likely reduce the impact of ash disposal on groundwater, at least until the next major flood event. However, implementation of this group of alternatives would require that the existing wastes be removed from the impoundments in order for the composite liner system to be installed. If

[94] See page 47 of transcript of William Antonacci deposition dated January 16, 2016.

the waste is to be removed from the current leaking impoundments, future waste disposal should be relocated to a properly cited and constructed Landfill.

Closing the impoundments by capping them in place would slow the release of contaminants into the groundwater. However, waste located at or below the water table would continue to release contaminants, especially after high water events re-saturate the waste. The closed impoundments would also be susceptible to damage or release of wastes during flood.

Other remedial options may reduce contaminant concentrations to some extent for as long as one or more systems are operated and maintained. The overarching problem with this site would however remain. The CWLP impoundments were constructed in a location that is very poorly suited to waste disposal facilities. If the CWLP impoundments were located away from Sugar Creek and above the normal water table there would likely be more alternatives that could be effective at containing the waste and controlling the release of contaminants into the environment. However, the CWLP ash is currently contained in:

- impoundments that have been described by CWLP personnel as poorly designed and constructed impoundments,
- impoundments known to be releasing ash-related contaminants to groundwater in concentrations well above Illinois Class I Groundwater Quality Standards,
- Impoundments with bottoms located at or below the water table, and
- Impoundments located on the Sugar Creek floodplain and completely within the zone of inundation during the 100-year flood.

For these reasons I see no responsible choice other than to recommend that the impoundments be closed to additional waste disposal and that the existing wastes be excavated and either beneficially reused or disposed in a properly sited and constructed disposal facility.

Table 1
Summary of Example Remediation Effectiveness

	Reduce Leachate Generation	Reduce Releases to Groundwater and Surface Water	Permanent Solution Rather than Temporary Fix	Minimize Long-Term Operation and Maintenance	Eliminate Long-Term Risk of Catastrophic Release	Comments
Stop Further Disposal of Ash	**Effective**	**Effective**	**Not Effective**	**Not Effective**	**Not Effective**	Eliminating new disposal of ash in the impoundments restricts growth of the total volume of the contaminant source material and is a prerequisite for implementing many other remedial options.
Eliminate Wet Handling of Ash	**Effective**	**Effective**	**Not Effective**	**Not Effective**	**Not Effective**	Dry ash disposal may reduce the rate of infiltration into groundwater by eliminating discharge of sluice water into the impoundments.
Leachate Collection and Treatment	**Not Effective**	**Effective**	**Not Effective**	**Not Effective**	**Not Effective**	Continuous operation and maintenance required to control leachate levels.
Groundwater Collection and Treatment	**Not Effective**	**Effective**	**Not Effective**	**Not Effective**	**Not Effective**	Requires continuous operation and maintenance of system.
Physical Barriers	**Not Effective**	**Effective**	**Partially Effective**	**Effective**	**Not Effective**	Effectiveness is often dependent on construction quality and underlying materials. Only effective as long as the volume of leachate inside the containment is controlled.
Retrofit Impoundments	**Not Effective**	**Effective**	**Not Effective**	**Not Effective**	**Not Effective**	The flux of contaminants out of the impoundment would be expected to be significantly reduced as long as the amount of leachate contained within the liner is controlled. Requires that all waste in an impoundment be removed to install liner system.
Cap in Place	**Effective**	**Effective**	**Partially Effective**	**Partially Effective**	**Not Effective**	Caps are subject to deterioration and leakage over time. Waste will still be in place and capable of generating leachate when the cap begins to leak. Not completely effective if waste is in contact with groundwater as is the case at CWLP.
Excavation and Beneficial Reuse	**Effective**	**Effective**	**Effective**	**Effective**	**Effective**	This is a permanent remedy that has the added benefit of not creating or adding to another disposal site.
Excavation and Disposal	**Effective**	**Effective**	**Effective**	**Effective**	**Effective**	This is a permanent remedy that fills all remediation goals but that creates or adds to another disposal site..

6. Opinions Formed

6.1 Opinion 1: Coal Ash Stored in the Dallman Ash Pond is Contaminating Groundwater

The discussion provided above shows that coal ash in the Dallman Ash Pond is the source of contaminants detected in downgradient groundwater wells. The contaminants were transferred from ash to groundwater via the unlined pond, which was made worse by the fact that at least some portion of the waste is saturated with water. Groundwater, sluice water, and precipitation that migrate through the waste dissolve water-soluble contaminants in the ash, which are then transferred to and subsequently detected in downgradient groundwater. Groundwater monitoring data collected regularly since 2012 show that downgradient concentrations of boron, sulfate, manganese, TDS, and to a lesser extent arsenic are detected in much higher concentrations in downgradient wells than in background wells.

6.2 Opinion 2: Groundwater Located Downgradient of the Dallman Ash Ponds is Contaminated at Concentrations Exceeding Background and Illinois Groundwater Quality Standards

The uppermost aquifer at the site, the Basal Sand Layer, has been identified as Class 1 groundwater on the basis its depth and hydraulic conductivity above 10^{-4} cm/sec. The discussion provided above shows that the coal ash contamination caused by the Dallman Ash Pond exceeds both Illinois Class I Groundwater Quality Standards and locally derived background values.

6.3 Opinion 3: CWLP Has Not Determined the Downgradient Extent of Impacts Nor Taken Identifiable Steps to Control Groundwater Contamination

Groundwater monitoring data collected regularly since 2012 show that groundwater downgradient of the Dallman Ash Pond is contaminated above background by the ash basin with boron, sulfate, manganese, TDS, and to a lesser extent arsenic. The extent of groundwater impacts outside of the ash pond has not been identified. It is likely that the extent of contamination is limited in areas west of the Dallman Ash Pond since groundwater will likely discharge, along with its dissolved contaminants, into Sugar Creek. It is however possible that some portion of the ash contaminants migrate downgradient of the site to the north through the alluvial sediments. There is no indication that the extent of any downgradient migration from the site has been investigated. The available documentation indicates that although IEPA at one time intended to enforce compliance with groundwater quality standards,[95] no such enforcement has occurred and groundwater contamination downgradient of the Dallman Ash Pond continues unabated as of this date.

6.4 Opinion 4: CWLP Should Close Their Impoundments to Additional Waste Disposal and Implement Site Closure by Excavating and Removing the Waste

The CWLP impoundments were constructed in a location that is very poorly suited to waste disposal facilities. If the CWLP impoundments were located away from Sugar Creek and above the normal water table there would likely be more alternatives that could be effective at containing the waste and controlling the release of contaminants into the environment. However, the CWLP ash is currently contained in:

- impoundments that have been described by CWLP personnel as poorly designed and constructed impoundments,
- impoundments known to be releasing ash-related contaminants to groundwater in concentrations well above Illinois Class I Groundwater Quality Standards,
- impoundments with bottoms located at or below the water table, and
- impoundments located on the Sugar Creek floodplain and completely within the zone of inundation during the 100-year flood.

For these reasons I see no responsible choice other than to recommend that the impoundments be closed to additional waste disposal and that the existing wastes be excavated and either beneficially reused or disposed in a properly sited and constructed disposal facility.

[95] IEPA ,2014

7. Compensation

My hourly rate in reviewing documentation, preparing this report and for any necessary depositions and testimony is $140 per hour.

8. Concluding Remarks

This report sets forth my opinions and the information upon which I relied in forming those opinions. I reserve the right to supplement this report and/or my opinions as new or additional information is brought to light in the future.

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Mark A. Hutson, P.G.
Illinois Licensed Professional Geologist No. 196.001465

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Figures

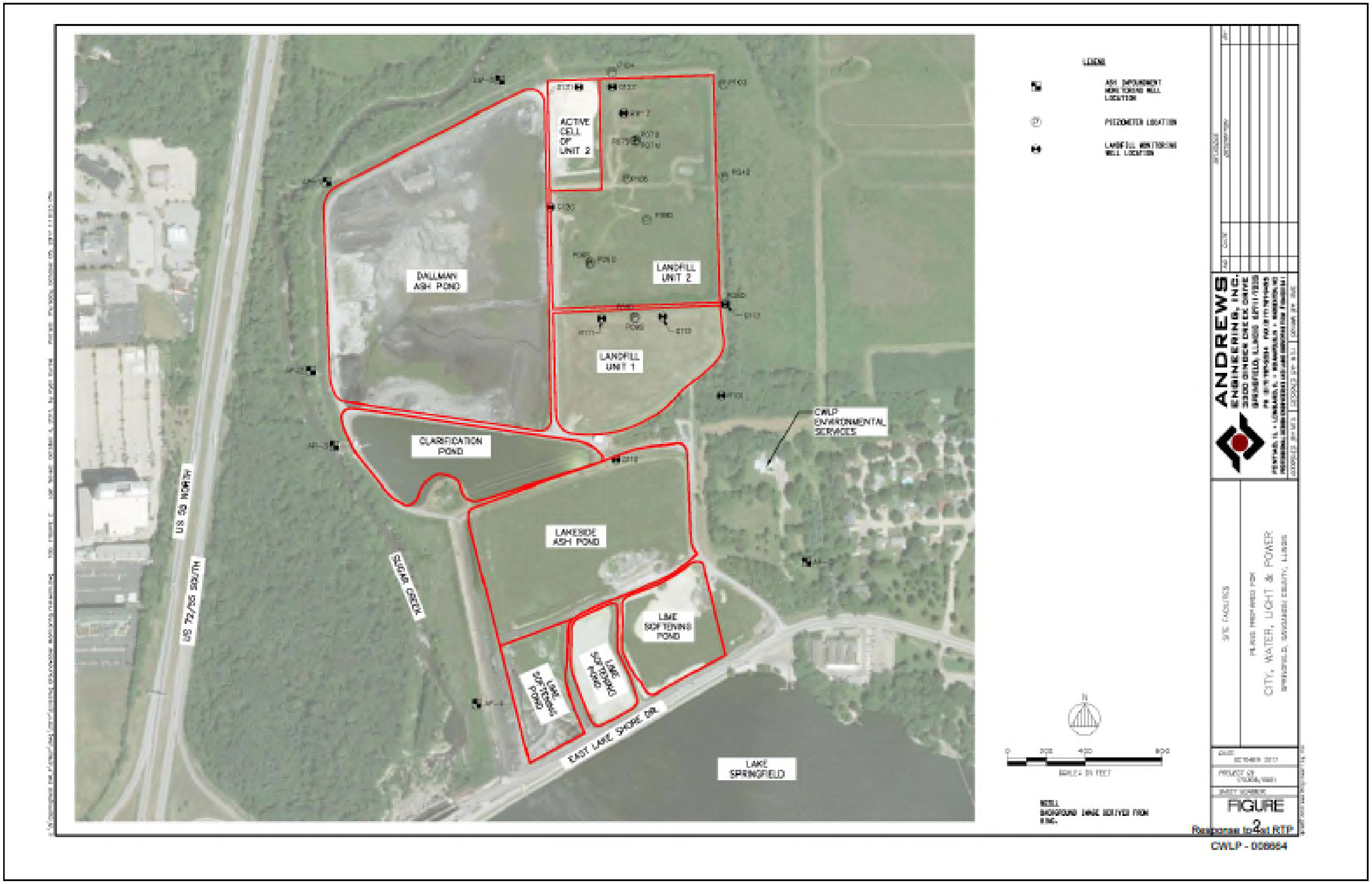

Figure 1
Site Location and Layout

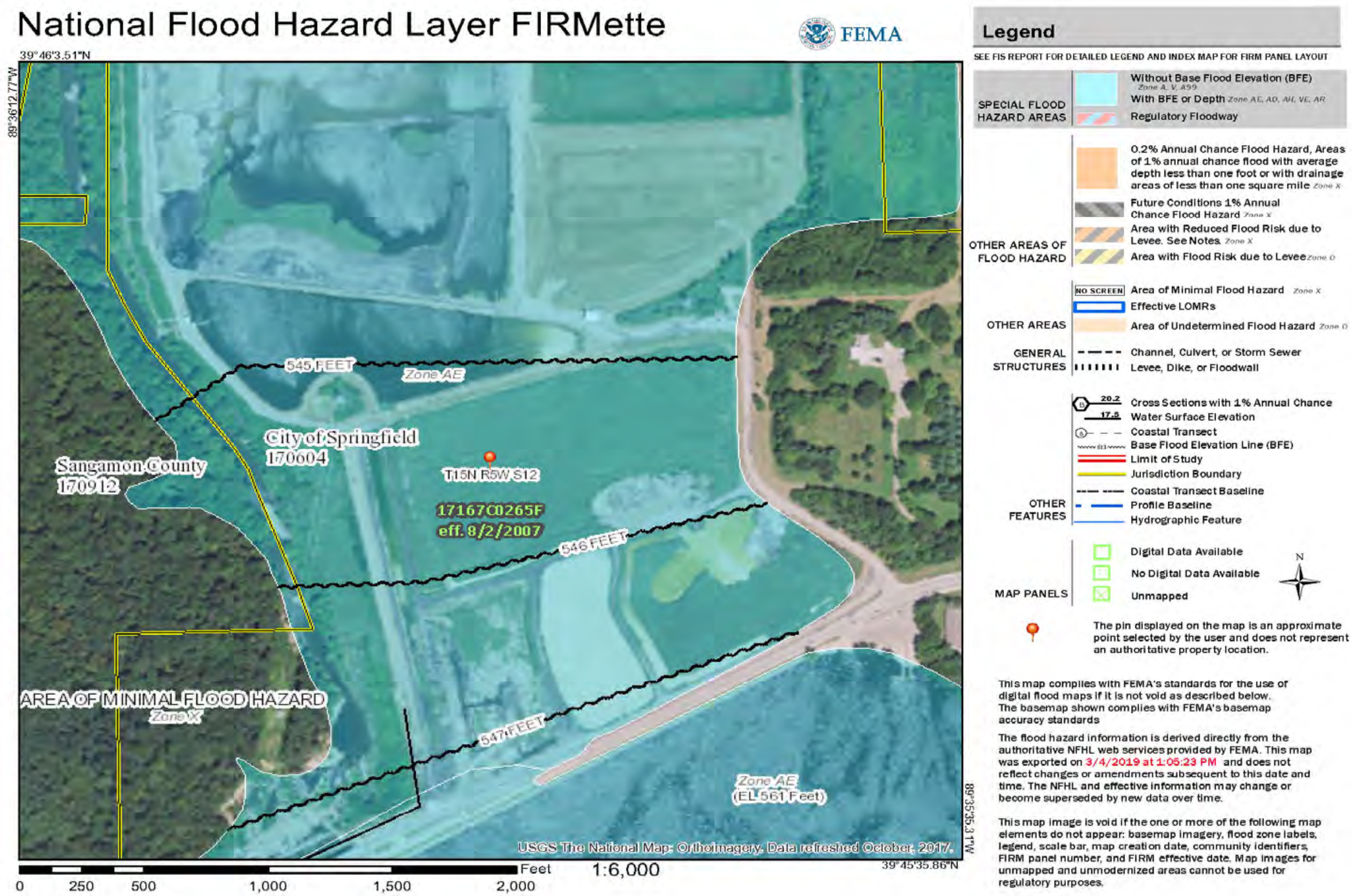

Figure 2
FEMA 1% Annual Chance Flood Map

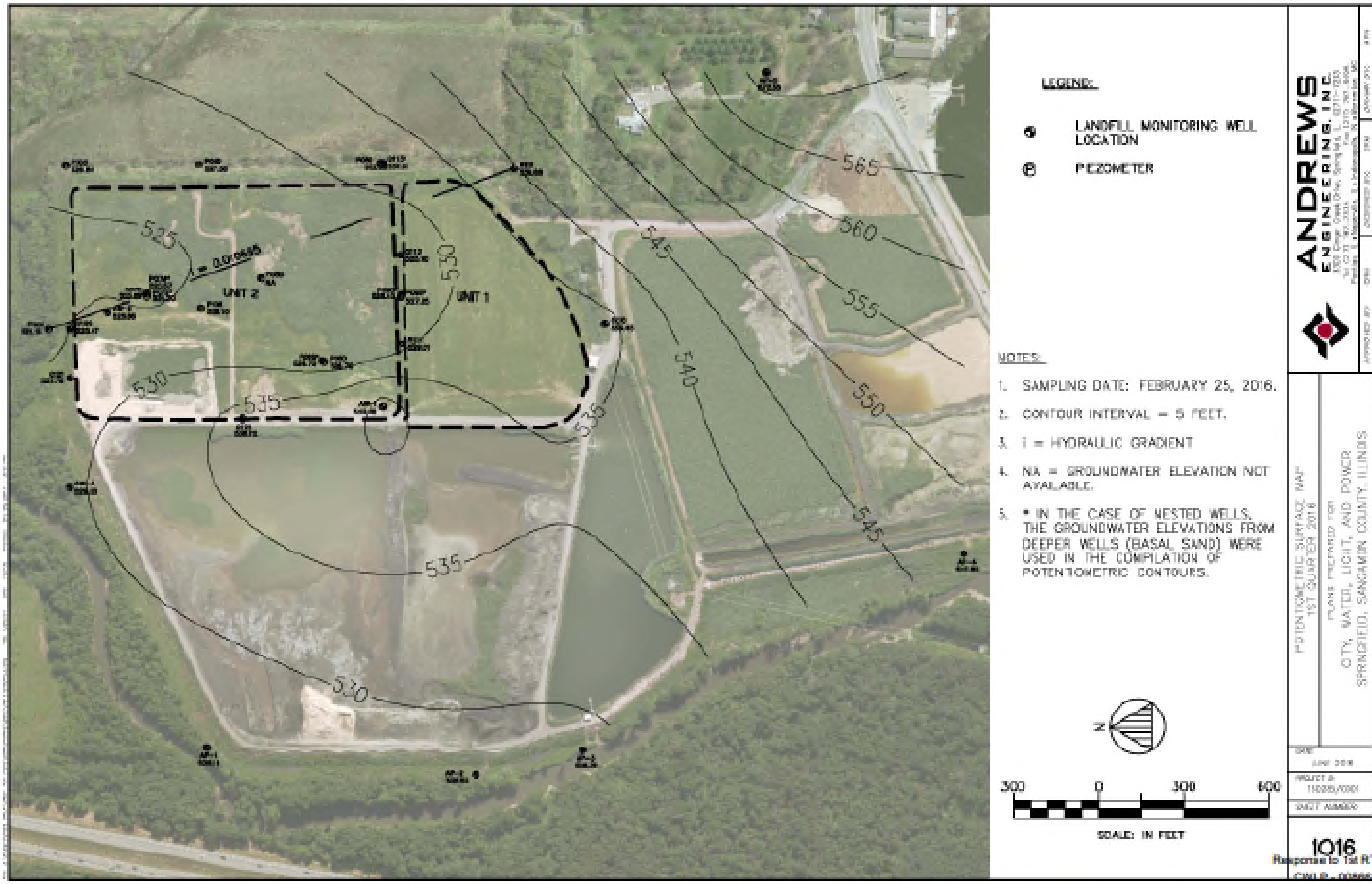

Figure 3
1st Quarter 2016 Potentiometric Surface Map

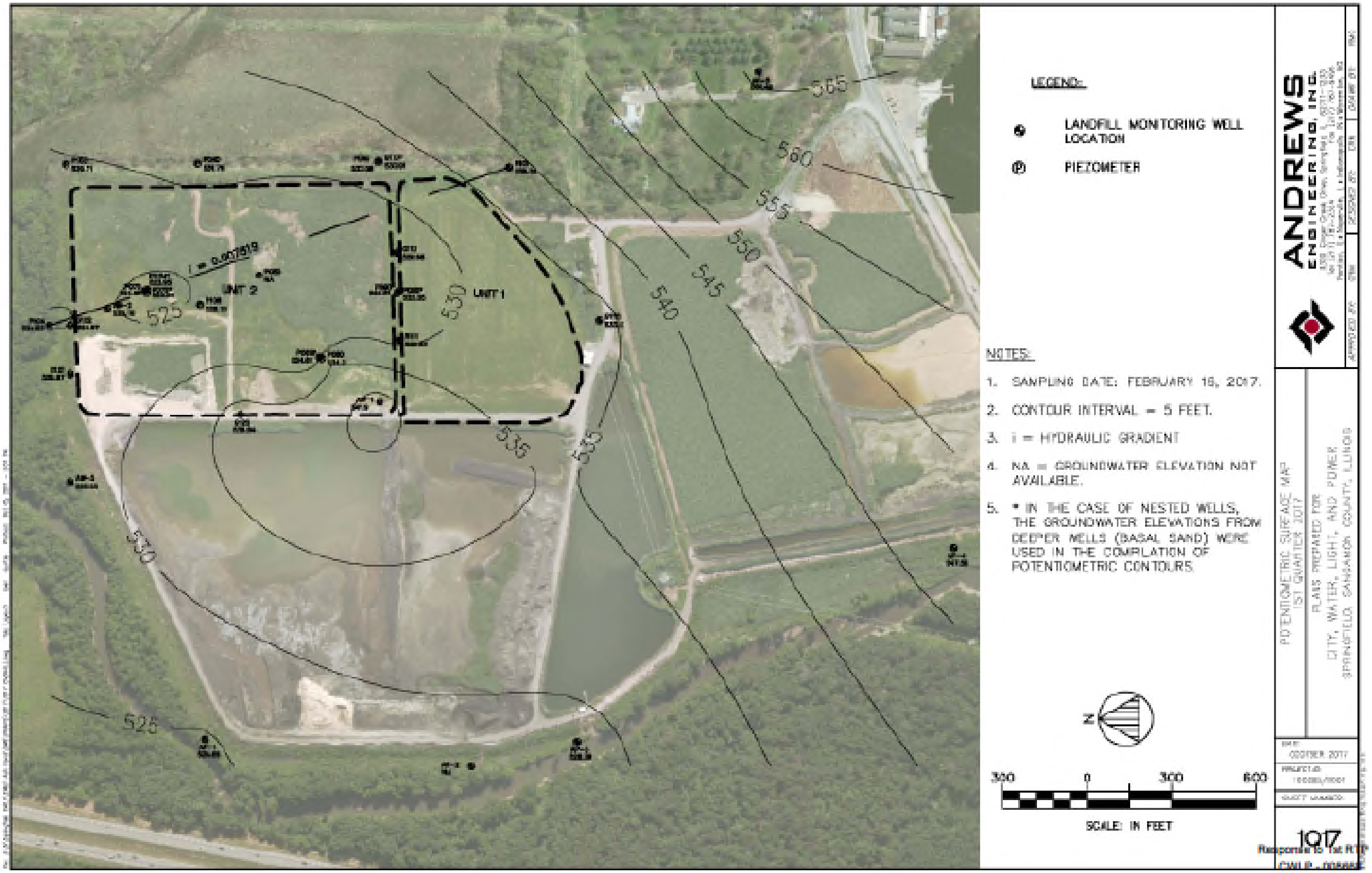

Figure 4
1st Quarter 2017 Potentiometric Surface Map

Appendix A
Curriculum Vitae

Mark A. Hutson, P.G.

Summary of Qualifications

Over 38 years professional experience performing and managing site characterization, RI/FS's, RFI's, and soil and/or groundwater remediation projects. Management experience includes all aspects of projects for industrial, governmental, and non-profit clients. I have provided technical review, comments, and oversight on preparation of numerous permit applications and a wide array of projects.

Professional Experience

Geo-Hydro, Inc., 2006-Present, Principal/Senior Scientist

Weston Solutions, Inc., 2002-2006, Senior Project Manager/Business Line Operations Manager

Ellis Environmental Group, LLC, 2001-2002, Senior Project Manager

Foothill Engineering Consultants, 1997-2001, Senior Project Manager

Burns & McDonnell Waste Consultants, Inc., 1996-1997, Senior Project Manager

Hydro-Search, Inc., 1990-1996, Senior Project Manager/Operations Manager

Roy F. Weston, Inc., 1984-1990, Senior Geologist/ Project Manager

University of Illinois at Chicago, 1982-1984, Teaching Assistant

Ecology and Environment, Inc., 1980-1982, Hydrogeologist

Illinois Environmental Protection Agency, 1978-1980, Environmental Protection Specialist

Professional Registrations, Memberships, and Affiliation

Professional Geologist - Wisconsin (No. 889), Illinois (196.001465), Indiana (No. 754), Kansas (No. 709), Nebraska (No. G-0329), North Carolina (No. 2513)

American Institute of Professional Geologists - Certified Professional Geologist (No. 7302)

Colorado Ground Water Association - (Past-President 2015-2016), President 2014-2015, Vice President 2013-2014, Education Committee Chair, 2011-2018)

Education

M.S., Geology, University of Illinois at Chicago, 1989

B.S., Geology, Northern Illinois University, 1978

Graduate Studies in Business, Northern Illinois University, 1979-81

Various courses on computer software and geographic information systems

Select Project Experience
Technical Oversight and Consulting

- Consultant tasked with reviewing and summarizing water quality data from 66 Coal Combustion Residual sites to gain insight into the nature and magnitude of the documented impacts that CCR units have on groundwater quality. Results were submitted to EPA by my client during the public comment period on proposed revisions to the 2015 Coal Combustion Residual Rules.

- Consultant tasked with reviewing and providing my Expert Opinions on EPA's proposed revisions to the 2015 Coal Combustion Residual rules. Opinions were submitted to EPA by my client during the public comment period.

- Consultant tasked with reviewing and providing comments on Site Assessment Plans, Comprehensive Site Assessments, and Corrective Action Plans for coal ash impoundments at the Mayo, Roxboro, and Belews Creek Generating Stations in North Carolina. Coal ash impoundments at each of these sites were constructed in stream valleys and resulted in burying perennial streams below sluiced ash.

- Consultant for the Western Environmental Law Center initially tasked with reviewing and providing comments on the mine permit application for the Bull Mountains Mine, Montana. I was subsequently asked to provide testimony about concerns over inadequate evaluation of potential impacts to springs and seeps as well as water supplies on surrounding properties.

- Consultant tasked with reviewing closure plan information and monitoring reports from the Santee Cooper Grainger Generating Station ash pond closure. The site is located near Conway, SC. Documents were reviewed to evaluate the effectiveness of the proposed closure plan and comments were provided to counsel for use in negotiations with the company.

- Technical Consultant tasked with reviewing and preparing comments on the Draft Environmental Impact Statement for the Four Corners Power Plant and Navajo Mine Energy Project in New Mexico. Reviewed documentation from Office of Surface Mining Reclamation and Enforcement sources and prepared comments covering the effects of current and previous mining and coal ash disposal practices and identifying proposed activities likely to adversely impact environmental quality.

- Consultant providing support to counsel by reviewing and providing comments on Groundwater Assessment Work Plans and Drinking Water Supply Well and Receptor Surveys at 14 coal ash disposal facilities located in the southeast. The document reviews were conducted in order to evaluate the appropriateness of proposed characterization, make recommendations to improve characterization, and identify any sites that showed a particularly high risk to off-site receptors.

- Consultant tasked with reviewing and preparing comments on the 2012 reports covering the Plant Area, Stage One and Stage Two Evaporation Ponds Area, and Units 3 & 4 Evaporation Holding Ponds Area of the Colstrip Steam Electric Station located at Colstrip, MT. Reviewed documents and prepared comments and talking points that were submitted subsequently submitted to regulators.

- Consultant on the Pines Groundwater Plume Site through a USEPA Technical Assistance Program grant from PRPs to local citizens' group. The Pines site is a coal combustion waste landfill with significant spread of contaminants. Provide assistance to the citizens through grant to provide assessment and feedback on site work products as they are developed and implemented, explain the remediation processes and activities to the citizens, and serve as technical liaison between citizens and remediation team.

- Technical Consultant tasked by with reviewing a variety of documents and monitoring data from the Rosebud Mine located near Colstrip, MT. Document and data reviews included groundwater monitoring data, MPDES permits and discharge monitoring reports, and permit renewal documents. In each case, documentation and data were reviewed and comments were prepared and submitted to counsel.

- Technical Consultant providing support at the Massachusetts Military Reservation (MMR) on Cape Cod, MA. Under contract to the Corps of Engineers, provided third-party technical support services for the Selectmen of four towns surrounding MMR from 1998 thru 2011. The project involved oversight of impact area characterization and remediation activities including UXO location and disposal, and characterization of explosive impacted soil and groundwater, volatile organics, and perchlorate. Provided technical review of remediation data as well as comments and advice to the Selectmen on technical issues.

- Environmental Consultant to the City of Afton, MN to review and provide comments on an application to develop a coal combustion waste landfill on the site of a former sand and gravel mining operation. On behalf of the City of Afton, GHI reviewed the available materials, identified data gaps and potential concerns, and submitted detailed comments on the plan. Major concerns included the susceptibility of the local water supply to contamination from the facility, the unacceptable geologic characteristics of the site for construction of a waste disposal facility, poor characterization of wastes to be placed in the facility, improper modeling of the site conducted in support of the EIS, and the location of many potential receptors downgradient of the facility.

- Project Manager and Consultant tasked with reviewing and providing technical comments on the Faulkner, Westland and Brandywine coal combustion waste disposal facilities in rural Maryland. Provided comments on the adequacy of characterization of the nature and extent of contaminants released from these facilities. Subsequently supported the legal team in negotiating the details of necessary actions to be taken during closure of these facilities to protect human health and the environment.

- Consultant tasked with reviewing and preparing comments on a permit amendment application for the Savage Mine located in eastern Montana. Comments submitted to counsel primarily concerned the adequacy of the site characterization, the hydrologic balance and probable hydrologic consequences of proposed application.

- Project Manager and Consultant on the review and preparation of technical comments on an application by a major utility to develop an unlined coal combustion waste (CCW) disposal facility in western Kansas. Major issues included the leachability of CCW in the landfill environment, inadequacy of the proposed groundwater monitoring plan and the lack of necessary groundwater protection systems in the design. Comments were provided to counsel for inclusion in the public review process.

- Environmental Consultant tasked with reviewing and preparing comments on a permit application for a proposed lignite mine located near South Heart, North Dakota. Comments submitted to counsel included identification of inadequacies in the site characterization, the monitoring plan, the Probable Hydrologic Consequences, and the evaluation of potential alluvial valley floors. Comments were submitted to counsel.

- Project Manager and Consultant for Robinson Township and Environmental Integrity Project on a review of a permit application submitted to the State of Pennsylvania to mine coal refuse, generate electricity and dispose of coal combustion waste at the location of a large coal refuse pile. Services included permit application review and preparation of comments. Review identified deficiencies in the characterization of geologic materials, groundwater, surface water, and the hydrologic balance provided in the permit application.

- Geologist on a geologic and hydrogeologic assessment of a proposed regional landfill in Kendall County, Il. Research documented problems with the geologic and hydrogeologic characterization, including karst features in the area that had not been noted or anticipated in the permit application materials.

Site Characterization and Remediation

- Lead author on a Groundwater Impact Assessment at a coal combustion waste disposal facility in Illinois. This project was conducted to assist an electric generating station investigate the nature and extent of contaminants that had been released to the groundwater and to investigate remedial options necessary to minimize future releases. Results of this study are currently being implemented by the company and are projected to adequately contain contamination and avoid exposures to surrounding residents.

- PCP Contaminated Soil Remediation, Beaver Wood Products, Columbia Falls, MT, Project Manager. Manager of a project to investigate, excavate and bio-remediate PCP impacted soils at a former pole treatment site. Soil treatment was conducted via an on-site Land Treatment Unit (LTU). At the time of project completion over 20,000 cubic yards of impacted soil had been excavated, treated, and returned to the site. Responsible for project planning and execution, budget and schedule tracking, and cost control.

- Project Manager of a project to remediate and remove an oil interceptor pond containing PCB-contaminated sediment at a generating facility in North Dakota. Oily sludge in the pond contained PCB's in sufficient concentrations to require special handling and disposal. Responsible for all aspects of the project including evaluating remedial action alternatives, preparing construction plans, representing the client with regulatory agencies, and implementation of the approved site closure. Fly ash was added as a stabilizing agent to stabilize the sediment within the pond. Stabilized and characterized sediment was shipped to a permitted TSCA facility for disposal.
- Remediation of hydrocarbon contaminated soils at natural gas collection and pumping Stations, KN Energy, Project Manager. The project consisted of identification of areas of visually impacted soils, excavation of soils to visually clean, screening soils with field instrumentation, collecting verification samples for laboratory analysis, directing contaminated soil excavation, and replacing excavated soil with clean backfill. Impacted soil was transported to pre-existing landfarm areas for treatment by the client.

- Project Manager and Principal Investigator on a mixed waste treatability study performed for Kerr-McGee Corporation to investigate methods of making radiologically impacted hydrocarbon sludge acceptable for disposal without increasing the total volume. The project included characterization of the physical, chemical, and radiologic composition of the available waste materials, and evaluating the feasibility of combining wastes to produce an acceptable material. Pilot scale testing was conducted on the most promising materials to identify the proportions necessary to produce an optimum mixture.

- Project Manager on a groundwater remedial design project at a Phillips Petroleum facility in Beatrice, Nebraska. Project tasks included a general site characterization, geophysical surveys, soil borings and chemical analysis, pump testing, and design of ground water remediation system. Remedial technologies selected utilized air stripping and carbon absorption.

- Project Geologist involved in the installation of a petroleum hydrocarbon recovery system at the Hess Oil refinery on St. Croix US Virgin Islands. Activities included daily coordination with refinery personnel and drilling contractors, logging and installing recovery wells, and performing recovery tests on completed installations.

- Project Manager of a program to investigate, design and construct ground water remediation systems at three Chevron facilities in Puerto Rico. Project included ground water characterization, pump testing and conceptual and detailed designs of remediation systems. Systems were constructed, operated for a period of approximately 2 years and have now been removed.

- Prepared Detailed Plans and Specifications for construction and operation of a land treatment unit to remove hydrocarbon and volatile organics from soil in North Dakota, Project Manager. Managed a team of people involved in preparation of a complete design and specifications package for construction and operation of a land treatment unit to treat soils impacted with petroleum hydrocarbon and chlorinated solvents. This project was completed on schedule, has been built and was successfully completed.

- Project Manager and author of a revised and updated Site Decommissioning Plan for the Kerr-McGee facility in Cushing, OK. Plan preparation included summarizing site conditions, establishing clean-up criteria, specifying remedial actions for each of 16 radioactive materials areas (RMAs) including measurement and sorting of materials, and planning final survey procedures. The scope of the remediation was negotiated with Nuclear Regulatory Commission headquarters and regional personnel as the document was being drafted to attempt to minimize the time for subsequent review and approval.

- Project Manager of a multi-million dollar U.S. Army program to identify and properly abandon wells located on Rocky Mountain Arsenal (RMA) that could possibly be conduits for downward migration of contamination. This work was conducted in accordance with an Administrative Order ceasing remedial activities at RMA. Over 350 wells were identified and abandoned under this program.

- Project Manager on the characterization of Bombing Target 5 for the Pueblo of Laguna, NM. Portions of the Laguna Pueblo were used during WWII as a bombing practice area. The project consisted of preparation of detailed UXO planning documents, surface clearance of the area around the target, and excavation of the target to a depth of 5-feet below the surface. Material found to potentially present and explosive hazard were collected on-site and detonated on-site at the end of the project. The Pueblo of Laguna and the Corps of Engineers approved all procedures and field activities.

- Multi-phase AFCEE Soil And Groundwater Investigation And Monitoring Program at the Former Bergstrom Air Force Base in Austin, Texas, Project Manager. Investigation areas included an oil-water separator at an engine test facility, a former maintenance facility, and the base landfills. Soils were contaminated with heavy metals including lead and solvents. Contaminated soils were excavated and disposed at an off-site facility. Closure reports for all three areas were submitted and approved by TNRCC.

- Project Manager on a contract to the Department of Energy to perform a surface clearance for UXO at three former bombing targets at the Tonopah Test Site in Nevada. Materials encountered included practice bombs and rockets that had been fired several decades ago. UXO technicians inspected each piece of material for potential explosive hazards. Materials that potentially contained explosive hazards were blown-in-place by Tonopah personnel. Scrap material was secured on-site and disposed appropriately at the end of the project.

- Project Manager for the investigation of subsurface contamination at several high priority solid waste management units at Rocky Flats Plant. Work included identification and characterization of surface and subsurface soil contamination, source characterization, and evaluation of ground water quality and movement.

- Project Manager under contract to Rockwell International to develop usable and defensible background geochemical data sets for various media at the Rocky Flats Plant. The occurrence of low-level radioactive material contamination from many years of plant operations, surrounding land uses, and atomic test fallout necessitated an extensive program to develop data and apply statistical analysis to describe background conditions. Additional statistical testing was performed to identify investigative results that showed results above defensible background values.

- Project Manager on a multi-phase soil and groundwater investigation and monitoring program at the former Bergstrom Air Force Base in Austin, Texas. Investigation areas included an oil-water separator at an engine test facility, a former maintenance facility, and the base landfills. Closure reports for all three areas are currently being prepared.

- Project Manager on a geophysical survey program at the Rocky Flats Plant designed to identify sources of chemical and radiological contamination at high priority solid waste management units. Surveys included electromagnetic, magnetic, and electrical resistivity methods used in conjunction with aerial photographs to identify possible source areas.

- Project Manager on a contract for USEPA Region 5 to plan and execute an investigation of the Federal Marine Terminals site near Detroit, Michigan. The investigation included a detailed review of historical aerial photographs, geophysical surveys of potential burial sites, soil sampling, monitoring well construction and sampling, and preparation of a site investigation report. Documentation and depositions on findings were provided to Region 5 enforcement.

- Project Geologist on a preliminary investigation of possible JP-4 impacts to soil and groundwater from the fueling system at Forbes Field Air National Guard base in Topeka, KS. The investigation included drilling through runway and ramp areas, around fuel storage facilities, and evaluation of possible migration pathways.

- Project Geologist on a project to use electromagnetic geophysical techniques to trace the lateral migration of shallow, high TDS groundwater plumes associated with three DOE uranium mill tailings sites located in different parts of the western U.S. Results of these surveys showed that electromagnetics was useful for tracing the plumes and allowed a minimal number of subsequent monitoring wells to be installed to quantify leading edge impacts.

Remedial Investigations/Feasibility Studies

- Project Manager for the Remedial Investigation at a former Atlas Missile site located near Holton, Kansas, Responsible for completion of a site investigation and risk assessment for the Kansas City District. Direct push soil sampling, sonic drilling and well installation, and indoor air, surface water, sediment, and groundwater sampling have been conducted in and around the former facility to determine the level and extent of contamination that may be present. An ecological and human health risk assessment was conducted to evaluate the potential health risks associated with the site.

- Project Manager on a Remedial Investigation and Focused Feasibility Study of JP-4 contaminated soils at the Fire Protection Training Area at Minot Air Force Base. Performed under contract to the U.S. Corp of Engineers, this project utilized Laser Induced Fluorescence, an innovative investigation technique, to characterize the extent of subsurface contamination. The Focused Feasibility Study examined eight potential remedial actions and was successful in gaining State acceptance of on-site land treatment as the chosen remedial alternative.

- Project Manager for the Remedial Investigation/Feasibility Study (RI/FS) of the Landfill Solids and Gases Operable Units at the Lowry Landfill CERCLA site. This project involves the characterization and assessment of the extent of potential contamination within the unsaturated solid and gaseous phases of the materials at this high profile site. Responsible for coordinating the activities of up to 30 project staff assigned to multiple concurrent tasks. Responsibilities also included extensive coordination and interaction with multiple clients and PRP groups as well as the Colorado Department of Health and Environment and USEPA Region 8 personnel.

- Technical Advisor under contract to EPA Region V on the Remedial Investigation at the Marion Bragg Landfill CERCLA site. Provided technical assistance to the project team related to investigation techniques to be used in characterizing the landfill and surrounding areas, including evaluating and providing remedies to difficult well installation encountered during the remedial investigation.

- Project Manager on a Feasibility Study/Risk Assessment program at a former Rocketdyne fuel test facility located near Spanish Springs, NV. This program included performing a risk assessment on an impacted groundwater plume, performing a feasibility study to evaluate appropriate remedial options, and performing treatability studies on two alternatives to verify and quantify effectiveness and estimate costs.

- Project Geologist and Site Manager on contract to USEPA Region V on the Remedial Investigation of the Skinner Landfill CERCLA site located near Cincinnati, OH. Prepared planning documents including the Sampling and Analysis Plan, Quality Assurance Project Plan, and Health and Safety Plan. Managed implementation of the remedial investigation that included geophysical surveys, aquatic biology surveys, well installation, and soil and groundwater sampling.

Publications and Presentations

Hutson, M.A., " Oil Interceptor Pond Closure, Sediment, PCB's and Groundwater on a Budget", presented at the 2005 Air Force Environmental Symposium, Louisville, KY, March 2005.

Holliway, K.D., Witt, M.E., and M.A. Hutson, "Abandoned Well Closure Program at a Hazardous Waste Facility, Rocky Mountain Arsenal, Denver, Colorado" Hazardous Materials Control, vol. 5, no.1, January 1992.

Karnauskas, R.J., Deigan, G.J., Schoenberger, R.J., and M. A. Hutson, "Closure of Lead Contaminated Glass Manufacturing Waste Lagoons" Proceedings of HAZMACON 87, April 1987.

Hutson, M.A., and R. J. Karnauskas, "Groundwater Contamination Study, Forbes Field Air National Guard Based, Shawnee County Kansas, Defense Technical Information Center, 1985.

Testimony and Depositions Given

Denver, CO, 2017, Montana Board of Environmental Review, Cause No. BER 2016-07 SM, Appeal Amendment Application AM3, Signal Peak Energy LLC's Bull Mountain Mine No. 1, Permit No. C1993017. Deposition concerning opinions expressed in permit application comments.

Chapel Hill, NC, 2017, Roanoke River Basin Association vs. Duke Energy Progress, LLC, United States District Court for the Middle District of North Carolina, Civil Action Nos. 1:16-cv-607 and 1:17-cv-0042. Deposition concerning opinions expressed in Expert Report.

Chapel Hill, NC, February 2017, State of North Carolina, ex rel, North Carolina Department of Environmental Quality, et. al. v. Duke Energy Progress, LLC., Civil Action No. 13-CVS-11032 and 13-CVS-14461. Deposition concerning opinions expressed in Expert Report.

Chapel Hill, NC, July 2016, State of North Carolina, ex rel, North Carolina Department of Environmental Quality, et. al. v. Duke Energy Progress, LLC., Civil Action No. 13-CVS-11032 and 13-CVS-14461. Deposition concerning opinions expressed in Expert Report.

Denver, CO, 2015, Montana Environmental Information Center et. al. v. Montana Department of Environmental Quality, et. al., 16th Jud. Dist. No. DV 12-42. Deposition concerning opinions expressed in Expert Report.

Denver, CO, 2015, City of Loves Park, IL vs. Browning Ferris Industries. Deposition on behalf of Browning Ferris Industries regarding meetings held and documents produced during employment at the Illinois Environmental Protection Agency.

Chicago, IL, 1982, United States Environmental Protection Agency vs. Federal Marine Terminals. Deposition on behalf of USEPA regarding findings of site investigation at a Federal Marine Terminals site in Detroit, Mi.

Dixon, IL, 1980, Illinois Environmental Protection Agency vs. Lee County Landfill, Testified in state court on behalf of the IEPA regarding violations of state environmental laws at the Lee County landfill.

CERTIFICATE OF SERVICE

I hereby certify that the foregoing Notice of Electronic Filing, Complainants' Opposition to Motion to Bifurcate, and accompanying Exhibit A were served to all parties of record listed below by electronic mail on April 29th, 2019.

*/s/ Akriti Bhargava*______________

Akriti Bhargava
Research Analyst
Sierra Club
2101 Webster Street, Suite 1300
Oakland, CA 94612
(415) 977-5629
akriti.bhargava@sierraclub.org