SIERRA CLUB

September 10, 2021

Submitted electronically to epdcomments@dnr.ga.gov

Georgia Department of Natural Resources
Environmental Protection Division
Land Protection Branch
4244 International Parkway
Atlanta Tradeport – Suite 104
Atlanta, Georgia 30354

Re: Sierra Club Comments on Draft CCR Closure Permit No. 057-026D (CCR) to Georgia Power Plant Hammond Inactive CCR Surface Impoundment AP-3

The Sierra Club hereby submits the following comments concerning the Environmental Protection Division's ("EPD") draft coal combustion residuals ("CCR") closure permit, No. 057-026D (CCR) for the Georgia Power Plant Hammond CCR Surface Impoundment AP-3 (the "Draft Permit").[1] Sierra Club's comments incorporate and rely upon the attached Exhibit 1, expert report of Mark Quarles with the BBJ Group, and Exhibit 2, expert report of Dr. Chris Groves.[2] Mark Quarles is a Registered Professional Geologist, who has expertise in karst geology investigations, as well as CCR contaminant investigations, closure methods, and groundwater monitoring. Dr. Chris Groves is a Registered Professional Geologist and an internationally-awarded and academic geoscience professor specializing in karst hydrogeology.

[1] All references to Georgia Power Company also includes its contractors and subcontractors who drafted the supporting reports and certifications.
[2] Mark Quarles, BBJ Group, Inc. for Sierra Club, *Analysis of Draft Closure / Post-Closure Permit for Coal Combustion Residuals Permit No. 057-026D (CCR) Georgia Power Company Plant Hammond Surface Impoundment AP-3*, (September 9, 2021) (attached hereto as Exhibit 1) [hereinafter Quarles Comments]; Chris Groves, PhD, for Sierra Club, *Karst Hydrogeology of the Georgia Power Plant Hammond Surface Impoundment AP-3, Floyd County, Georgia, and Impacts on the Fate and Transport of Coal Combustion Residuals*, (September 10, 2021) (attached hereto as Exhibit 2) [hereinafter Groves Comments].

INTRODUCTION

In July 1977, just one month after AP-3 was put into service, it suffered a catastrophic failure where a sinkhole opened up underneath AP-3, resulting in the loss of approximately one million gallons of CCRs per day.[3] Georgia Power took undefined "actions" to "address the issue," and AP-3 was placed back into operation just three months later.[4] Two years later, *another* sinkhole collapse appears to have occurred sometime in 1979, based on a design drawing dated November 1979 and a "Proposed Sinkhole Repair" construction detail drawing included in Georgia Power's Part B application.[5] This sinkhole was 58 feet in diameter.[6] Georgia Power conveniently forgot to mention or discuss in its permit application the severity of the 1977 sinkhole and release of CCRs or the 1979 sinkhole collapse and repair.[7] This catastrophic failure and the instability issues surrounding AP-3 should have been front and center in the permit application, along with a discussion of all repairs that were done to stabilize AP-3. It should not have been buried 1200 pages into the Part B application. Instead, in both its 2018 History of Construction and the revised 2019 History of Construction, Georgia Power concluded that "*no structural instability issues have been observed for AP-3*" and "*structural instability issues have not been observed for AP-3*," respectively [emphasis added].[8] Georgia Power is required to meet "generally accepted good emerging practices" in the design and closure of AP-3, and ignoring the obvious signs of karst terrain and sinkholes is not even close to good engineering practices.

It is a known fact that AP-3 is located in a mature karst aquifer. The data itself, including Georgia Power's own borings in 1977, prior to AP-3 becoming operational, show that an "extensive underground karst drainage system" exists underneath AP-3, and yet Georgia Power ignores, downplays, and even attempts to draw attention away from this fundamental conclusion.[9] This poses an ongoing risk that additional sinkholes could form in the future, resulting in CCRs entering

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[3] *Report of Safety Assessment Coal Combustion Surface Impoundments, Georgia Power, Plant Hammond, Rome, Georgia,* AMEC Earth & Environmental, Inc. (Dec. 2010) at PDF p.62, attached as Exhibit 3; *see also* Quarles Comments at 4-5; Groves Comments at 8.
[4] Quarles Comments at 4-5; Groves Comments at 13-14.
[5] Quarles Comments at 4; Groves Comments at 15.
[6] Groves Comments at 15. Figure 8 at 14.
[7] Groves Comments at 4, 15-16, 21-22.
[8] History of Construction at 4; Quarles Comments at 5.
[9] Groves Comments at 10-13,21-22; Quarles Comments at 8.

the groundwater.[10] Simply because Georgia Power has not personally "observed" an additional sinkhole collapse since the 1970s does not mean that another one cannot occur, or that a slow subsidence sinkhole is not already occurring.[11] Either Georgia Power is choosing to ignore the instability issues beneath AP-3 or it fundamentally does not understand karst terrain and its potential for developing sinkholes. Either way, this history and ongoing risk of catastrophic failure and release of CCRs into the groundwater and neighboring properties must be considered when determining whether to allow AP-3 to be closed in place or whether it should be fully excavated, similar to what is being done at Hammond AP-1 and Hammond AP-2. There is no justifiable reason why Georgia Power is choosing to close AP-3 differently than it is at neighboring AP-1 and AP-2. Even more disconcerting is that Georgia Power is not even being consistent with how it is treating the closure at Plant Bowen AP-1, which is also located in karst terrain. The draft closure plan for Bowen AP-1 states that it will be excavated, lined, with "foundation improvements" to provide a "stable subgrade."[12] However, at Hammond AP-3, they are simply choosing to ignore it.[13]

In addition to the risk of collapse of AP-3 due to the unstable karst terrain, AP-3, which is unlined, does not and cannot meet either the Georgia or federal CCR closure-in-place standards due to saturated CCRs remaining in AP-3 40 years after Georgia Power converted to dry ash handling, which has led to the on-going presence of CCR contaminants in the groundwater.[14] Georgia Power's final cover system for its cap-in-place closure method "will not prevent the continued leaching of CCR constituents to groundwater because CCRs will remain saturated."[15] In 2019, Georgia Power found statistically significant levels of barium, chromium, cobalt, fluoride, lead, lithium, molybdenum, and combined radium 226/228.[16] In 2020 and 2021, Georgia Power again found statistically significant levels of molybdenum, as well as boron, calcium, sulfate, and total

[10] Quarles Comments at 6-7; Groves Comments at 8, 23-25.
[11] Quarles Comments at 7.
[12] *Amended Written Closure Plan 40 C.F.R. Part 257.102 Plant Bowen Ash Pond 1 (AP-1), Georgia Power Company* (March 2020).
[13] The Sierra Club's references to the Draft Closure Plan for Bowen AP-1 is not an approval for or agreement with Georgia Power's plans to close Bowen AP-1. The Sierra Club will be filing comments on the Draft Permit for Bowen AP-1 when it is issued.
[14] Quarles Comments at 9.
[15] Quarles Comments at 9.
[16] Geosyntec for Georgia Power, *2019 Semiannual Groundwater Monitoring & Corrective Action Report – Revision 01 Georgia Power Company Plant Hammond Ash Pond 3 (AP-3),* at 6 (March 2020).

dissolved solids, and was required to do an Assessment of Corrective Measures ("ACM").[17] However, to the Sierra Club's knowledge, while Georgia Power prepared an ACM Report in December 2020, it has yet to select an interim or final groundwater remedy. Allowing the CCR waste to remain in place and saturated, due to its close proximity with the uppermost aquifer, (the CCR waste does not have at least five feet of separation from the uppermost portion of the aquifer—thus in violation of the location restriction),[18] poses an ongoing risk of continued groundwater contamination.[19] In fact, the groundwater has already shown to be contaminated and CCRs will continue to leach from AP-3 in perpetuity if it is allowed to close-in-place.[20]

Contrary to the conclusions in the Draft Permit, AP-3's closure plan violates both the Georgia CCR Rule (391-3-4-.10(7)(b)) and the US EPA CCR Rule (40 CFR Part 257.102(d)) on multiple fronts. First, the final cover system will not prevent the continued leaching of CCR contaminants into the uppermost aquifer, nor will it prevent lateral inflow of the uppermost aquifer into the bottom of AP-3 where CCRs already exist and will remain impounded and saturated.[21] Second, the unstable karst conditions have not been mitigated beneath AP-3, leading to an ongoing threat of collapse and leakage of CCRs.[22] Third, no evidence or modeling was provided by Georgia Power demonstrating how the closure-in-place at AP-3 will improve groundwater over time.[23] Lastly, AP-3's groundwater monitoring system fails to meet the Georgia CCR Rule and the EPA CCR Rule because it fails to monitor all three aquifer zones: soil, highly weathered bedrock, and deeper bedrock; and fails to have co-located cluster wells to monitor vertical changes in the aquifer, as stated in the 1991 Georgia EPD Manual for Groundwater Monitoring.[24] This is a manual that Georgia Power said it used and relied upon when developing its groundwater monitoring system.

[17] Geosyntec for Georgia Power, *2021 Annual Groundwater Monitoring & Corrective Action Report – Revision 01 Georgia Power Company Plant Hammond Ash Pond 3 (AP-3)*, at iii (July 2021); Quarles Comments at 12.
[18] 40 C.F.R. §§ 257.64, 257.60; Ga. Comp. R. & Regs. 391-3-4-.10(3); Quarles Comments at 9-10.
[19] Groves Comments at 24.
[20] *See* fn 16-17.
[21] Quarles Comments at 10-11.
[22] Quarles Comments at 11-12.
[23] Quarles Comments at 11.
[24] 40 C.F.R. §§ 257.91(a)(2), 257.91(b); Ga. Comp. R. & Regs. 391-3-4-.10(6)(a); Quarles Comment at 12-17; Georgia Department of Natural Resources, Environmental Protection Division, *Manual for Groundwater Monitoring*, at 5 (Sept. 1991) ("1991 EPD Manual") attached as Exhibit 4.

The current groundwater monitoring system fails to provide an early warning system prior to any contamination leaving AP-3.

Due to the ongoing threat of another sinkhole collapse beneath AP-3, the on-going presence of saturated CCRs within AP-3, indications that unpermitted discharges of leachate to surface water exist, and the impact on the receiving streams that have yet to be defined, the Draft Permit violates both Georgia and federal law. Georgia Power should not be permitted to close AP-3 in-place, and it should not be considered "generally accepted good engineering practice" to leave CCRs in-place indefinitely in a known unstable karst environment. Instead, Georgia Power should be required to fully excavate AP-3 similar to what it is doing at Hammond AP-1 and AP-2 and Bowen AP-1.

COMMENTS

A. AP-3 Violates State and Federal Location Restriction Requirements

AP-3 fails to comply with state and federal location restriction requirements for CCR surface impoundments. The federal CCR Rule sets a variety of location restrictions on CCR impoundments, which the state of Georgia has adopted.[25] These location restriction requirements include a restriction against CCR surface impoundments being located in unstable areas and a restriction against CCR surface impoundments being within five feet of the uppermost aquifer.[26]

The CCR Rule's unstable area location restriction states that existing CCR surface impoundments:

> must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (d) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted.[27]

The CCR Rule's aquifer location restriction specifies that ash ponds must be at least:

> five feet[] above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to

[25] 40 C.F.R. § 257.60 *et seq*.; Ga. Comp. R. & Regs. 391-3-4-.10.
[26] 40 C.F.R. §§ 257.64, 257.60; Ga. Comp. R. & Regs. 391-3-4-.10(3).
[27] 40 C.F.R. § 257.64(a).

normal fluctuations in groundwater elevations (including the seasonal high water table).[28]

As discussed in more detail below, AP-3 is located in karst terrain (which has a propensity to develop sinkholes), there is a history of sinkholes developing beneath AP-3, and the CCRs within AP-3 are saturated and located within the groundwater, despite the fact that sluicing operations ended in 1982. These conditions at AP-3 violate both the state and federal unstable area location restriction[29] and that AP-3 be five feet above the uppermost aquifer, since AP-3 is in fact *in* the uppermost aquifer.[30]

1. **AP-3 is located in unstable karst terrain, which resulted in at least two major sinkholes, one of which caused a catastrophic release; yet Georgia Power ignored it and failed to show it has addressed the unstable areas beneath the 25-acre impoundment.**

Federal and state law require that a CCR surface impoundment not be located in an unstable area unless the owner or operator demonstrates that "recognized and generally accepted good engineering practices" have been used to ensure the integrity of the impoundment.[31] Contrary to what Georgia Power believes or wants EDP to believe, beneath AP-3 lies a well-developed karst aquifer, a highly unstable terrain that is prone to sinkholes.[32] Georgia Power even recognized that "unstable areas" include "poor foundation soil conditions, areas susceptible to mass movements, and geological conditions such as karst terrains."[33] Yet, the application and certifications Georgia Power submitted to EPD understated and downplayed the risks of the underlying karst terrain and the prior sinkholes when it concluded that "*no structural instability issues have been observed for AP-3*" [emphasis added].[34] Georgia Power failed to show that it has met the good engineering

[28] 40 C.F.R. § 257.60(a).
[29] 40 C.F.R. § 257.64; Ga. Comp. R. & Regs. 391-3-4-.10(3)(b); Quarles Comments at 8-9.
[30] 40 C.F.R. § 257.60(a); Ga. Comp. R. & Regs. 391-3-4-.10(3)(a); Quarles Comments at 9-10.
[31] 40 C.F.R. § 257.64(a); Ga. Comp. R. & Regs. 391-3-4-.10(3)(b).
[32] Groves Comments at 9-13, 15.
[33] *Location Restriction Demonstration Unstable Areas, Plant Hammond Ash Pond 3 (AP-3)* Georgia Power Company (Nov. 18, 2019).
[34] Quarles Comments at 5; Groves Comments at 16.

practice requirement for an unstable area and in fact cannot meet this standard since AP-3 lies within known karst terrain.[35]

Karst terrain is characterized by heterogenous openings in bedrock (such as dense bedrock paired with large voids) with high hydraulic connectivity (or permeability – how easily water can move through the rock).[36] The high permeability found in karst aquifers creates a "Swiss Cheese" character to the rock allowing water to pass quickly and easily.[37] This in turn allows contaminants to move easily and quickly through the aquifer, making karst aquifers "highly vulnerable to contamination."[38]

Due to the presence of voids in the karst aquifers, there is also the potential for sinkholes to form: in other words, for the ground surface to collapse.[39] This can occur by a cover collapse sinkhole, as shown in Figure 1 (where the soil above the bedrock is washed down into a void that ultimately collapses) or a subsidence sinkhole, as shown in Figure 2 (support is lost from the bottom).

[35] 40 C.F.R. § 257.64; Ga. Comp. R. & Regs. 391-3-4-.10(3)(b); Quarles Comments at 5-6, 8-9.
[36] Groves Comments at 7.
[37] *Id.*
[38] *Id.*
[39] *Id.*

Figure 1: Cover Collapse Sinkhole[40]

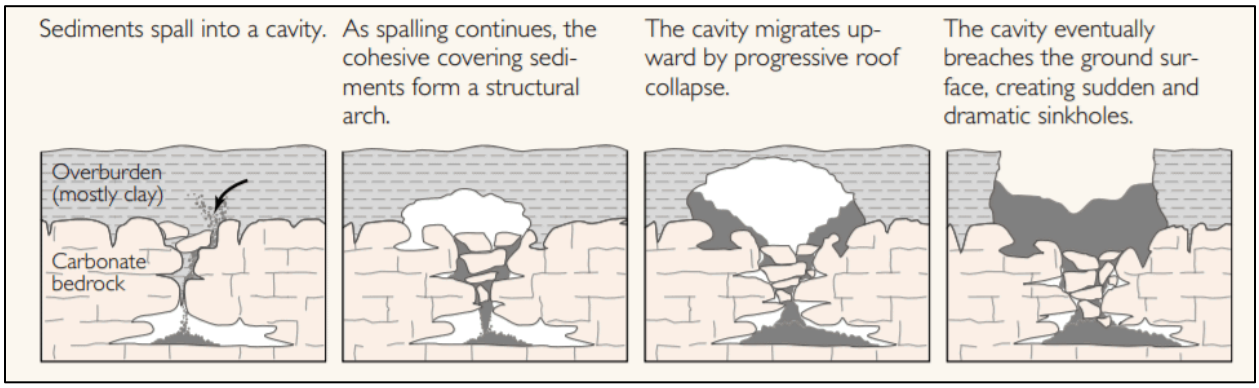
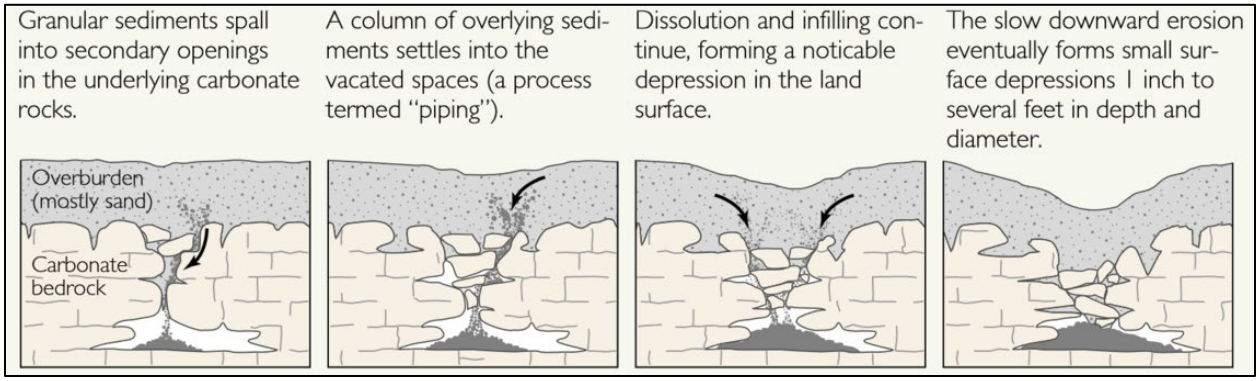


Figure 2: Subsidence Sinkhole[41]



If either of these sinkholes or collapses were to occur under AP-3, it would lead to the release of CCRs into the groundwater, which is exactly what happened in 1977.

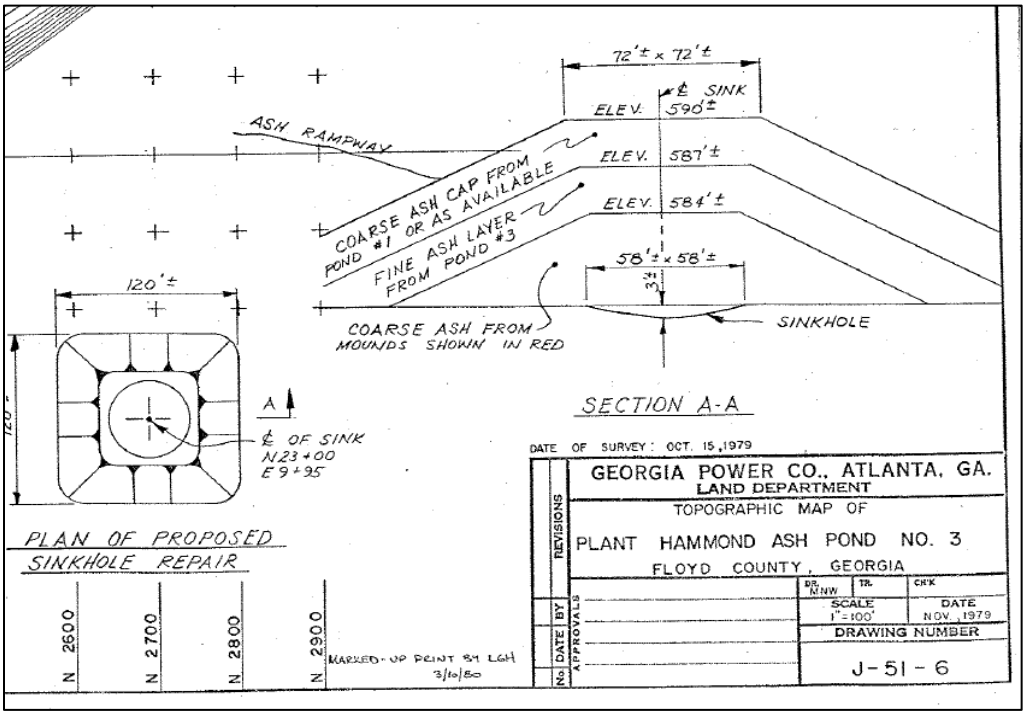
AP-3 catastrophically failed in July 1977, just one month after AP-3 was put into operation, when a sinkhole opened beneath it and released an estimated one million gallons per day of CCRs into the karst aquifer, some of which migrated onto the adjacent church property.[42] The only time Georgia Power mentions this catastrophic failure was over 1200 pages into its Part B Application in the History of Construction Report and subsequent design drawings, which Georgia Power downplayed as a mere "seepage" event.[43] Not only did they downplay the collapse, but they failed to discuss the severity of the collapse, the high volumes of CCR that were released, and any repairs that were undertaken or mitigation efforts that were implemented to prevent a future collapse

[40] Groves Comments at 8, Figures 1 and 2.
[41] Groves Comments at 8, Figure 2.
[42] Groves Comments at 13; Quarles Comments at 4-5; Exhibit 3 at 62.
[43] Quarles Comments at 4-5; Groves Comments at 13, 15.

within the 25-acre footprint of AP-3.[44] Furthermore, the details of the 1977 collapse and failure were only found in a 2010 Report of Safety Assessment, conducted by AMEC on behalf of the U.S. EPA as part of a site assessment of selected CCR impoundments—not because Georgia Power willingly disclosed the information.[45]

In addition to the 1977 sinkhole event, approximately two years later, there is evidence of a *second* sinkhole under AP-3, 58 feet in diameter.[46] Again, Georgia Power failed to mention or disclose this *second* sinkhole in its application other than to include a design drawing (over 1200 pages into its application) dated November 1979 showing a "Plan for Proposed Sinkhole Repair," as shown in Figure 3.[47]

Figure 3. Details of proposed sinkhole repair



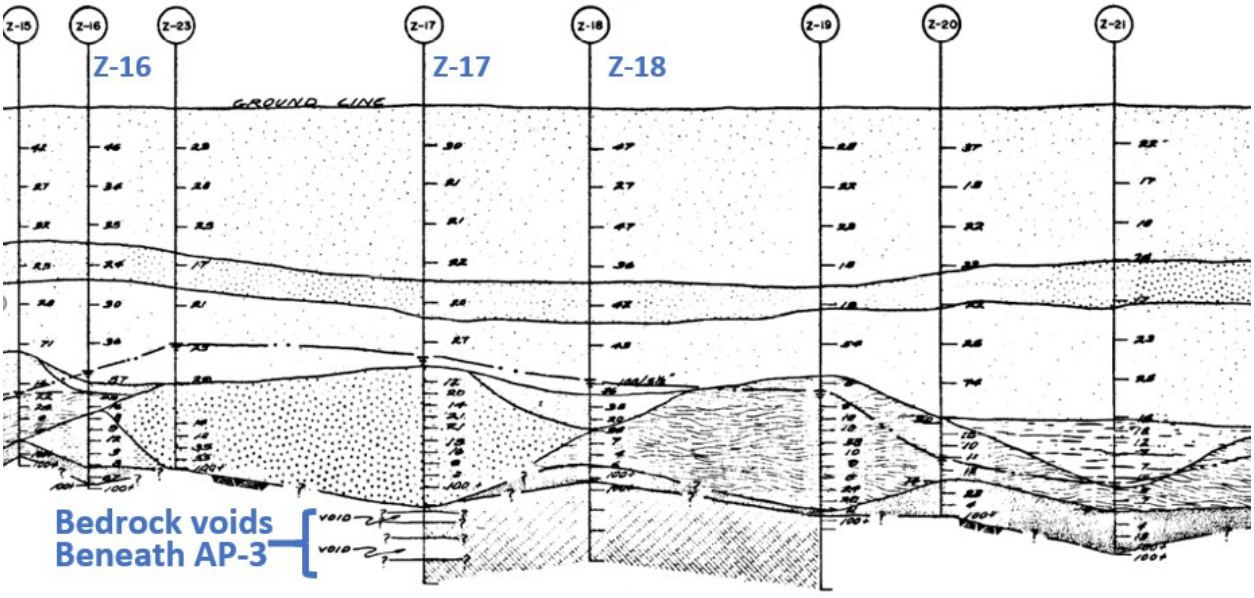
In addition to these two known sinkhole occurrences, there is additional ample subsurface evidence of a well-developed karst aquifer beneath AP-3, contrary to Georgia Power's mere reliance on

[44] Quarles Comments at 4-5; Groves Comments at 13, 15-16, 21-24.
[45] *See* Exhibit 3 at 62.
[46] Quarles Comments at 4; Groves Comments at 15.
[47] Groves Comments at 15, Figure 2 at 14.

topographic maps to certify its Location Restriction Demonstration, which acknowledges the *potential* existence of karst conditions, but at the same time claims there is no risk. [48]

Borings taken before AP-3 became operational in June 1977 show several voids, or spaces, in the bedrock beneath AP-3, as shown in Figure 4, indicating heterogeneity in the bedrock and the presence of karst.[49] A fact known to Georgia Power *prior to* when AP-3 began receiving CCR.

Figure 4. 1977 sketch of borings showing voids in the bedrock beneath AP-3 that have formed from limestone dissolution that were known before AP-3 was initiated.[50]



Additional investigations occurred in August 1977, with boring logs also showing multiple voids, along with an October 1977 report likewise indicating the presence of voids or areas that were "open with no fill material."[51] Lastly, in 2017, boring logs, as shown in Table 1 below, continued to show several voids, one of which was 30 feet of void space, which was described as "no recovery" (no rock was found, just empty space), "drilling water lost" (area where drilling fluid drains into underground karst conduits), or "drilling rod dropped down," all of which are clear indications of a karst aquifer.[52]

[48] *Location Restriction Demonstration Unstable Areas, Plant Hammond Ash Pond 3 (AP-3)* Georgia Power Company (Nov. 18, 2019); Quarles Comments at 6-8; Groves Comments at 9-13.
[49] Groves Comments at 10; Quarles Comments at 8.
[50] Groves Comments at 10, Figure 4.
[51] Groves Comments at 10-111.
[52] Groves Comments at 12.

Table 1. Identification of numerous bedrock voids.[53]

Borehole	Number of voids	Void interval*	Void height	comments
AP3 B4	1	~60'-61'	<1'	drilling rod dropped down, drilling water lost
AP3 B7	1	60'-65'	5'	
AP3 B9	2	60'-70'	10'	drilling rod dropped down, drilling water lost
		75'-95'	20'	drilled through void with soft material
AP3 B10	2	75'-81'	6'	drilled through void with soft material
		85'-90'	5'	no rock recovered, drilling water lost
AP3 B11	2	55'-60'	5'	in weathered limestone, no rock recovered
		75'-76'	1'	drilling rod dropped down, drilling water lost
P21	2	59'-59'4'	4" or 0.4'	drilling water lost
		65'-69'6"	4'6"	
Z18-B	multiple	47.3'-57.3'		40% of rock not recovered over several voids
HGWC 121A	1	30'-35'	5'	no recovery
*values are feet below the ground surface				

Despite the mounting evidence of an unstable area beneath AP-3 that developed at least two sinkholes, Georgia Power not only omitted the existence of the prior sinkholes in its History of Construction, attached to its Part B application, but it also misrepresented this risk in its Location Restriction Demonstration Certification. In its 2018 History of Construction, Georgia Power concluded that "*no structural instability issues have been observed for AP-3*" [emphasis added].[54] A sinkhole collapse is undoubtedly a known "structural instability issues" and yet Georgia Power didn't feel compelled to discuss it. In its 2019 Revised History of Construction, Georgia Power altered the conclusion slightly to say that "structural instability issues have not been observed" since mitigation efforts were conducted (mitigation that included drawing down the water in AP-3).[55] Even more alarming is that in its November 2019 Location Restriction Demonstration, Unstable Area, Certification, Georgia Power concluded that there was "no known history of issues associated with settlement or differential settlement at AP-3."[56] Again, a sinkhole collapse is a *known* issue associated with settlement. When discussing the geology beneath AP-3, Georgia Power concluded that the underlying limestone bedrock "may be potentially affected by karst,"

[53] Groves Comments at 13, Table 1.
[54] Quarles Comments at 5; Groves Comments at 16.
[55] Quarles Comments at 5.
[56] Quarles Comments at 6.

and that rock core samples "do not suggest the presence of large, laterally continuous karst features such as caverns or sinkholes."[57] However, the facts included in Georgia Power's own reports belie these claims, as evidenced by Georgia Power's own borings from as recent as 2017, which show that there are many large, heterogenous voids that are in fact hydraulically connected, which strongly indicate a mature karst geology that could result in sinkholes like the one that caused massive CCR waste loss from AP-3.[58]

Georgia Power knew of the existence of the sinkholes, failed to disclose it, and ignored or downplayed the evidence of a mature or well-developed karst aquifer, along with the potential for a future collapse and subsequent groundwater contamination. Further, the CCR waste within AP-3 is saturated by groundwater. The rise and fall of groundwater could erode the soil underneath AP-3 and, because of the karst terrain under the soil, create a collapse sinkhole—a process illustrated above in Figure 1.[59]

Georgia Power failed to show that good engineering practices would ensure AP-3's integrity, despite its location in an unstable, well-developed karst aquifer. Because AP-3 is located in an unstable area, Georgia Power was required by federal and state law to demonstrate that good engineering practices had been incorporated into AP-3's design to ensure that its structural integrity will not be disrupted and another catastrophic failure will be avoided.[60] Georgia Power stated that the repair conducted after the 1977 sinkhole (or "seepage" event as Georgia Power refers to it) and conversion to dry ash handling would prevent future collapses.[61] However, Georgia Power provides no evidence that the repair of the sinkhole in 1977 or the subsequent sinkhole repair in 1979 stabilized the entirety of the 25-acre area underneath AP-3.[62] Furthermore, the fact that AP-3 was converted to dry ash handling ignores the fact that groundwater flows into AP-3 laterally, saturating the CCRs and creating the potential for another sinkhole if the water erodes the soil and bedrock.[63] Georgia Power has not provided any evidence that closure-in-place will prevent groundwater from flowing into AP-3, has not provided any evidence it has stabilized the

[57] Quarles Comments at 6-8; Groves Comments at 21-22.
[58] Quarles Comments at 6; Groves Comments at 9-13.
[59] Quarles Comments at 7; Groves Comments at 23-25.
[60] 40 C.F.R. § 257.64(a); Ga. Comp. R. & Regs. 391-3-4-.10(3)(b).
[61] Quarles Comments at 6-7.
[62] Quarles Comments at 7-8; Groves Comments at 23.
[63] Quarles Comments at 7; Groves Comments at 22-24.

entirety of the karst terrain under the 25-acre pond. Thus, it has failed to show that it has ensured AP-3's structural integrity will not be disrupted.

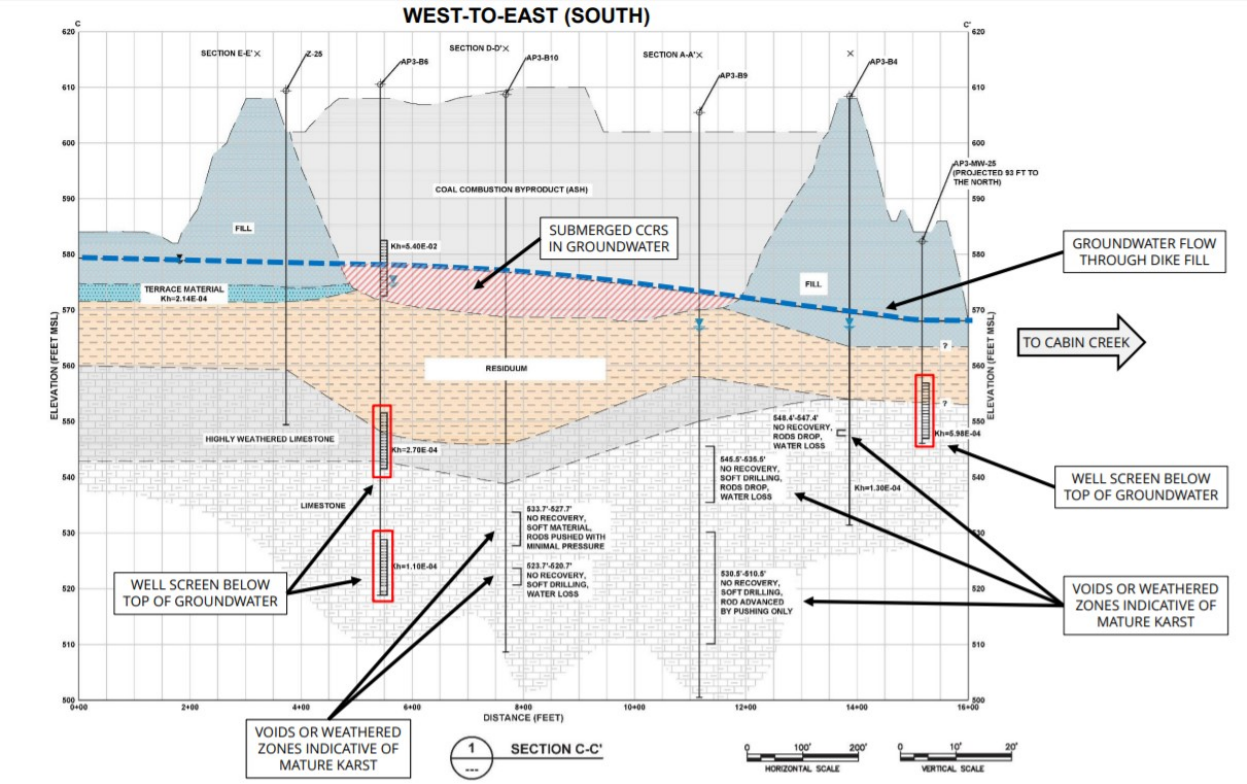
Because AP-3 is located on mature karst terrain that can potentially result in sinkholes, like the massive sinkhole in 1977 and again in 1979, and as explained in the expert reports of Mark Quarles and Dr. Groves, Georgia Power has not and cannot meet the unstable area location restriction requirement that AP-3 be closed using "generally accepted good engineering practices."[64] Because Georgia Power failed to demonstrate that it had employed adequate engineering measures to ensure AP-3's structural integrity in spite of the risks, the AP-3 closure plan and Draft Permit violate 40 C.F.R. § 257.64(a) and Ga. Comp. R. & Regs. 391-3-4-.10(3)(b).

2. AP-3 violates the aquifer location restriction because it fails to provide five feet of separation between the CCR waste and the aquifer.

Federal and state law require that a CCR surface impoundment be placed at least five feet above the uppermost aquifer, or that the owner or operator must show that there is no intermittent or sustained hydraulic connection between the CCR surface impoundment and the aquifer.[65] Georgia Power admits that, because the groundwater infiltrates AP-3, AP-3 does not satisfy the aquifer location restriction under federal and state law.[66] As shown in Figure 5, the CCRs contained in AP-3 are saturated in groundwater and are within the uppermost aquifer.[67]

[64] Quarles Comments at 9; Groves Comments at 23-25.
[65] 40 C.F.R. § 257.60(a); Ga. Comp. R. & Regs. 391-3-4-.10(3)(a).
[66] Georgia Power Company, *Location Restriction Demonstration: Placement Above the Uppermost Aquifer (40 C.F.R. Part 257.60) Plant Hammond Ash Pond 3* (AP-3) (Nov. 2019).
[67] Quarles Comments at 9-10, Figure 2-3; Groves Comments at 23-24.

Figure 5. West to East Cross Section of AP-3.[68]



Because AP-3 was constructed using excavated sandy, clayey and gravelly soil from within AP-3, those types of soils, which are permeable, make it easier for CCR contaminants to be transported into groundwater through the dikes and the bottom of AP-3.[69] This is evident by Georgia Power's recent borings into AP-3, which shows saturated CCRs 40 years after they converted to dry ash handling.[70]

In addition, when Georgia Power built AP-3, they excavated soil from within AP-3 to build the dike surrounding the impoundment; this process removed a thin layer of soil and made the solution enlarged bedrock even closer to the CCRs.[71] The 2010 Safety Assessment explicitly confirms this by concluding that "the removal of relatively impermeable material overlying the jointed [fractured] bedrock had allowed water to move from the pond."[72]

[68] Quarles Comments, Figure 2.
[69] Quarles Comments at 9.
[70] Quarles Comments at 9.
[71] Quarles Comments at 9;
[72] Exhibit 3 at 62.

Georgia Power claims that its closure of AP-3, which included "dewatering and grading CCR...to promote stormwater drainage and installing a geomembrane cover" and "no longer impounds free water nor receives CCR or other waste streams" ignores the fact that the CCRs continue to remain saturated in groundwater and *in* the uppermost aquifer and therefore fails to meet the location restriction for Placement Above the Uppermost Aquifer (Rule 391-3-4-.10(3) and 257.60).

B. AP-3 Violates State and Federal Performance Standards for Closure of CCR Units

AP-3 fails to comply with both state and federal closure-in-place performance standards. Among other things, the performance standards require that Georgia Power meet the following standards:

- Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;
- Preclude the probability of future impoundment of water, sediment, or slurry;
- Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;
- Minimize the need for further maintenance of the CCR unit; and
- Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.[73]

Georgia Power's closure plan and the Draft Permit meet none of these requirements. First, Georgia Power did not dewater or remove any water below ground: it merely removed stormwater to "provide a stable base."[74] Second, the cover system (which was completed in 2018) will not prevent the continued leaching of CCR constituents into the groundwater because AP-3 is unlined and the CCRs remain saturated within the uppermost aquifer.[75] While the completed cover will hypothetically reduce vertical infiltration of water into AP-3, it will not prevent the lateral inflow of groundwater into AP-3 where the CCRs remain saturated.[76] Third, the leachate within AP-3 will continue to remain trapped beneath the completed cover.[77] Lastly, Georgia Power has not mitigated the unstable karst terrain beneath the entirety of the 25-acre AP-3 footprint; therefore,

[73] 40 C.F.R. §§ 257.102(d)(1)(i), 257.102(d)(1); Ga. Comp. R. & Regs. 391-3-4-.10(7)(b).
[74] Quarles Comments at 10.
[75] Quarles Comments at 11.
[76] Quarles Comments at 11.
[77] Quarles Comments at 11.

there remains an on-going risk of another catastrophic collapse and release of high quantities of CCR constituents into groundwater.[78] Each of these individual failures of Georgia Power's closure plan and Draft Permit is a violation of the closure-in-place performance standards and should not be considered "generally accepted good engineering practice." Georgia Power should therefore be required to fully excavate AP-3 similar to what it is doing at Hammond AP-1 and AP-2 and Plant Bowen AP-1.

1. **Georgia Power failed to show that its closure plan will eliminate or minimize the release of CCR waste into the groundwater.**

    a. ***AP-3 could suffer another catastrophic sinkhole, as it did in 1977, which would cause large quantities of CCR waste to be released into the groundwater.***

AP-3 previously released CCRs into the groundwater through a sinkhole. As previously stated, a sinkhole opened beneath AP-3 in 1977 – releasing an estimated one million gallons of CCRs *per day* into the groundwater.[79] This sinkhole was a result of the karst terrain underlying AP-3, as demonstrated by borings recorded before and after the sinkhole formed in Figure 4 and Table 1, above.[80] This sinkhole was followed shortly thereafter by another one, 58 feet in diameter, in approximately 1979, as demonstrated by Figure 3 above, which required substantial repair.[81] Georgia Power provided no evidence showing that these repairs fully stabilized the 25-acre footprint of AP-3 to prevent another sinkhole from forming and leaching CCR contaminants into groundwater.[82]

There is an ongoing risk that AP-3 could release CCR waste into the groundwater through another sinkhole since it still sits above a well-developed, mature karst aquifer, and its CCRs are saturated by groundwater and sitting within the uppermost aquifer.[83] Borings from the area around AP-3, taken in 2017, showed that there are heterogenous voids in the bedrock, and that in some cases these voids were hydraulically connected.[84] These findings are characteristic of mature karst

[78] Quarles Comments at 11.
[79] Quarles Comments at 4-5, Groves Comments at 13; Exhibit 3 at 62.
[80] Quarles Comments at 8; Groves Comments at 9-12.
[81] Quarles Comments at 4; Groves Comments at 14.
[82] Quarles Comments at 9, 11.
[83] Quarles Comments at 4-10; Groves Comments at 22-24.
[84] Quarles Comments at 6-8; Groves Comments at 12.

terrain.[85] Furthermore, because portions of AP-3 are currently saturated by groundwater, there is the potential that the groundwater could erode the soil and, because of the karst terrain underlying AP-3, ultimately result in a sinkhole releasing the CCR waste into the groundwater.[86]

Due to Georgia Power's failure to demonstrate that it has mitigated the risk of future sinkholes, which could cause CCRs to be released into the groundwater, similar to the one that occurred in 1977, the AP-3 closure plan and Draft Permit fail to comply with the closure-in-place performance standards.

b. AP-3's closure plan fails to prevent post-closure infiltration of liquids into the CCR and releases of CCR or leachate into groundwater.

The federal and state performance standards for closure-in-place of a CCR surface impoundment require that the closure plan control, minimize, or eliminate the post-closure infiltration of liquids into the CCR waste and subsequent releases into groundwater,[87] and preclude the probability of future impoundment of water or slurry in AP-3.[88]

As stated previously, the CCRs in AP-3 sit within the uppermost aquifer and are saturated by groundwater.[89] In addition, the CCRs have historically leached into the groundwater – as demonstrated by testing from 2019, 2020, and 2021— all of which reported statistically significant levels of Appendix III and Appendix IV constituents.[90] More specifically, in 2019, testing found barium, chromium, cobalt, fluoride, lead, lithium, molybdenum, and combined radium 226/228.[91] In 2020 and 2021, Georgia Power again found molybdenum, as well as boron, calcium, and sulfate

[85] Quarles Comments at 8; Groves Comments at 7-13.
[86] Quarles Comments at 7-9; Groves Comments at 7-15.
[87] 40 C.F.R. § 257.102(d)(1)(i); Ga. Comp. R. & Regs. 391-3-4-.10(7)(b).
[88] 40 C.F.R. § 257.102(d)(1)(ii); Ga. Comp. R. & Regs. 391-3-4-.10(7)(b).
[89] Georgia Power Company, *Location Restriction Demonstration: Placement Above the Uppermost Aquifer (40 C.F.R. Part 257.60) Plant Hammond Ash Pond 3* (AP-3) (Nov. 2019); Quarles Comments at 9-10.
[90] Geosyntec for Georgia Power, *2019 Semiannual Groundwater Monitoring & Corrective Action Report – Revision 01 Georgia Power Company Plant Hammond Ash Pond 3 (AP-3)* (March 2020); Geosyntec for Georgia Power, *2021 Annual Groundwater Monitoring & Corrective Action Report – Revision 01 Georgia Power Company Plant Hammond Ash Pond 3 (AP-3)* (July 2021); Quarles Comments at 12.
[91] Geosyntec for Georgia Power, *2019 Semiannual Groundwater Monitoring & Corrective Action Report – Revision 01 Georgia Power Company Plant Hammond Ash Pond 3 (AP-3),* at 6 (March 2020).

at statistically significant levels, and was required to evaluate corrective measures in July 2020; however, no interim or final corrective measures have been selected.[92]

Georgia Power provided no evidence that it eliminated or minimized the ongoing flow of groundwater through AP-3 in order to remedy the perpetual threat of groundwater contamination.[93] Nor has Georgia Power provided any evidence that its completed cap and cover system will improve groundwater quality over time.[94] All they have provided are conclusory statements that it will "provide a source control measure."[95] While the cap and cover system may prevent vertical infiltration of water into the CCRs, the completed cover cannot control or prevent the lateral inflow of groundwater into the CCRs[96] nor can it prevent the continued leaching of the already saturated CCRs into the karst aquifer.[97] Thus, Georgia Power has failed to show that it has eliminated or minimized the potential for AP-3's CCR waste to be released into the groundwater – violating the state and federal performance standard for closing AP-3 in place.

In addition, the fact that groundwater flows into AP-3 and saturates the CCRs means that AP-3 continues to impound water.[98] Georgia Power has not shown how it will prevent the groundwater from continuing to flow into AP-3.[99] As a result, it has not shown that it can preclude the future impoundment of groundwater and thus violates state and federal performance standards.[100]

C. AP-3's Groundwater Monitoring System Violates State and Federal Regulations

State and federal regulations, in conjunction with monitoring well guidance issued by EPD, all contain performance standards for groundwater monitoring that require, among other things, that the groundwater monitoring system be based on site specific information to ensure it comprehensively monitors the groundwater.[101] AP-3's groundwater monitoring system fails to

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[92] Geosyntec for Georgia Power, *2021 Annual Groundwater Monitoring & Corrective Action Report – Revision 01 Georgia Power Company Plant Hammond Ash Pond 3 (AP-3),* at iii (July 2021).
[93] Georgia Power Company, *Location Restriction Demonstration: Placement Above the Uppermost Aquifer (40 C.F.R. Part 257.60) Plant Hammond Ash Pond 3* (AP-3) (Nov. 2019); Quarles Comments at 8-9.
[94] Quarles Comments at 11.
[95] Quarles Comments at 11.
[96] 40 C.F.R. § 257.102(d)(1)(i); Ga. Comp. R. & Regs. 391-3-4-.10(7)(b); Quarles Comments at 7-9, 11.
[97] Quarles Comments at 7-11.
[98] Quarles Comments at 9-10.
[99] *Id*.
[100] *Id*.; 40 C.F.R. § 257.102(d)(1)(ii); Ga. Comp. R. & Regs. 391-3-4-.10(7)(b).
[101] 40 C.F.R. § 257.91(b); Ga. Comp. R. & Regs. 391-3-4-.10(6)(a); Exhibit 4 at 5.

account for the specifics of the site and therefore fails to provide a comprehensive groundwater monitoring scheme.[102]

The fundamental purpose behind a groundwater monitoring system is to detect contamination before it leaves the AP-3 boundary and to enable corrective measures in a timely fashion.[103] A groundwater monitoring system must "consist[s] of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that accurately represents the quality of the background water that has not been affected by leakage from a CCR Unit" and "accurately represent the quality of the groundwater passing the waste boundary of the CCR unit."[104] Georgia Power's current groundwater monitoring system does not meet the 1991 EPD Manual, or state or federal CCR requirements.[105]

As previously discussed, AP-3 sits on top of karst terrain, with groundwater flowing through both soil and the bedrock karst formation, and potentially has springs nearby flowing into the Coosa River.[106] The water flow rates through the different media are necessarily different, meaning the CCR contamination concentrations can differ by depth and distance from AP-3.[107] The bedrock wells were randomly placed laterally and may or may not intercept the preferential pathways below. Because the aquifer is heterogenous, the current wells may not "ensure" detection.[108]

A comprehensive groundwater monitoring system must account for these site-specific conditions and Georgia Power's system fails to do so. A 1991 groundwater monitoring well manual from Georgia EPD – whose requirements Georgia Power asserted it satisfied[109] – states that a groundwater monitoring system should use closely-spaced cluster wells at multiple depths where the aquifer is heterogeneous with multiple interconnected aquifers and variable lithology.[110] The karst terrain under AP-3 has a heterogeneous aquifer with a complex interconnected subsurface

[102] Quarles Comments at 12-17.
[103] Quarles Comments at 12.
[104] 40 C.F.R. § 257.91(a)(2); Ga. Comp. R. & Regs. 391-3-4-.10(6)(a).
[105] Quarles Comments at 12-17.
[106] Quarles Comments at 7, 12-17.
[107] Quarles Comments at 12-14.
[108] Quarles Comments at 16.
[109] Geosyntec for Georgia Power Company, *Groundwater Monitoring Plan: Plant Hammond – Ash Pond 3 (AP-3) Floyd County, Georgia*, 4 (Jan. 2021).
[110] Exhibit 4 at 5, 8, 10; Quarles Comments at 15.

drainage system and a variable lithology, which would require cluster wells under the manual.[111] Cluster wells are considered to be the industry standard, essential in defining the nature and extent of contamination by depth.[112] Cluster wells around AP-3 should be installed at variable depths (all three aquifer zones: soil, highly weathered bedrock, and deeper bedrock) in order to monitor changes in groundwater quality at varying depths.[113] However, Georgia Power failed to install cluster wells at different depths.[114] Instead, Georgia Power chose to only monitor groundwater largely in bedrock, making their well system woefully inadequate and incomplete.[115] By relying on an incomplete well system that misses the portion of the aquifer nearest to CCRs at the bottom of AP-3, it can lead to an under-reporting of higher contaminant concentrations.[116] It should not be assumed that the contaminants in the deeper portion of the aquifer are representative of the contaminants in the shallow portions of the aquifer.[117]

In addition, Georgia Power's well system also failed to adequately sample the uppermost portion of the aquifer surrounding AP-3, and it is unclear if the few newer, shallower wells will be sufficient to monitor this portion of the aquifer.[118] Georgia Power acknowledges that the uppermost portion of the aquifer surrounding AP-3 exists in the residuum as well as the bedrock, yet its monitoring system has so far focused on the much deeper bedrock. The residuum and alluvial soil portion of the aquifer is nearest to the CCRs and is influent to Cabin Creek.[119] Unfortunately, only one of the historic monitoring wells even monitors the residuum, which means the historical wells cannot adequately characterize the quality of all of the groundwater at the uppermost portion of the aquifer.[120]

The AP-3 groundwater monitoring system fails to comply with the 1991 EPD manual, and state and federal CCR regulations for multiple reasons: failure to monitor the shallowest portion of the

[111] Quarles Comments at 15.
[112] Quarles Comments at 14.
[113] Quarles Comments at 14.
[114] Geosyntec for Georgia Power Company, *Groundwater Monitoring Plan: Plant Hammond – Ash Pond 3 (AP-3) Floyd County, Georgia* (Jan. 2021); Quarles Comments at 14-15.
[115] Quarles Comments at 13-14.
[116] *Id.*
[117] *Id.*
[118] 40 C.F.R. § 257.91(a)(2); Ga. Comp. R. & Regs. 391-3-4-.10(6)(a); Quarles Comments at 12-14.
[119] Geosyntec for Georgia Power Company, *Groundwater Monitoring Plan: Plant Hammond – Ash Pond 3 (AP-3) Floyd County, Georgia*, at 3 (Jan. 2021).
[120] Quarles Comments at 13, 16.

aquifer nearest the bottom of AP-3 where wastes are submerged in groundwater, which is influent to Cabin Creek; poorly placed bedrock wells that are randomly located, which do not provide a "high level of certainty" that contaminants will be "immediately detected;" and failure to install co-located cluster wells at varying depths to define the nature and extent of the contamination and to have accurate and timely detection during routine monitoring events.[121]

CONCLUSION

AP-3 poses an ongoing threat to human health and the environment, and fails to comply with state and federal CCR regulations. Georgia Power blatantly misrepresented the geologic conditions underlying AP-3, especially considering the plethora of data in the application to support the conclusion that there is a well-developed karst system underlying AP-3. As previously discussed, AP-3 suffered a catastrophic failure caused by the formation of a sinkhole in 1977, which resulted in the release of one million gallons *per day* of CCRs, and another sinkhole in approximately 1979 (of unknown size or severity). Georgia Power not only failed to discuss this catastrophic event in its application, but it also downplayed it as a "seepage" event and even went so far as to conclude that "no structural instability issues have been observed for AP-3." And yet, Georgia Power provided no evidence that it has taken any action to mitigate the risk of another sinkhole beneath the entire 25-acre impoundment—a condition which could happen again and could lead to the ultimate failure and collapse of the now "closed" AP-3, causing the release of large quantities of saturated CCRs into the groundwater. A collapse will not be prevented by the completed cover system. This is an egregious violation of the unstable area location restriction requirement and cannot meet the "generally accepted good engineering practice" standard. There is nothing generally accepted about leaving saturated CCRs in an unlined impoundment, submerged in groundwater over a thin layer of soil that overlies bedrock with solution enlarged conduits, on top of an unstable karst aquifer.

Not only is AP-3 located on an unstable karst aquifer, but AP-3 is not located five feet above the uppermost aquifer; it is *in* the uppermost aquifer. In fact, the CCRs remain saturated even though Georgia Power converted to dry ash handling in 1982 and completed its final cover system in 2018.

[121] 40 C.F.R. § 257.91(a)(2) and (b); Ga. Comp. R. & Regs. 391-3-4-.10(6)(a); Georgia Department of Natural Resources, Environmental Protection Division, *Manual for Groundwater Monitoring*, p.5 (Sept. 1991); Quarles Comments at 16.

This demonstrates that the cover system violates the closure-in-place standards and is ineffective in preventing post-closure infiltration of liquid into the CCR waste (because the CCR waste is currently inundated by groundwater), and because it cannot preclude the future impoundment of water (since the groundwater continues to flow through AP-3). The ongoing saturation of CCRs in AP-3 could result in a sinkhole underneath AP-3 due to the instability of the karst terrain underlying AP-3 and the release of CCRs into groundwater, similar to what happened in 1977 and 1979.

Lastly, AP-3's groundwater monitoring system violates state and federal regulations because it fails to respond to site conditions to ensure the groundwater is comprehensively monitored and because Georgia Power has not shown that the monitoring system will adequately monitor the uppermost aquifer and the quality of the groundwater passing the CCR waste boundary.

For all of these reasons, Georgia Power should not be permitted to close AP-3 in-place, and it should not be considered "generally accepted good engineering practice" to leave CCRs in-place indefinitely in a known unstable karst environment. Instead, Georgia Power should be required to fully excavate AP-3 similar to what it is doing at Hammond AP-1 and AP-2 and Bowen AP-1.

Sincerely,

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