February 22, 2024

Attention: Commissioner Walter Raybun
Commissioner's Office
Georgia Department of Natural Resources
2 Martin Luther King, Jr. Drive, SE
Suite 1252 – East Tower
Atlanta, GA 30334
cathy.barnette@dnr.ga.gov

Re: Initial Comments on the Proposed Bryan and Bulloch Counties' Groundwater Withdrawal Permits for the Hyundai Mega-Site, Which Fails to Consider Any Adverse Environmental Impacts, Including Additional Dewatering of the Ogeechee and Savannah Rivers and the Okefenokee Swamp/Okefenokee National Wildlife Refuge (ONWR), and the Destruction of Designated Habitat of Federally Endangered and Threatened Species Associated with Those Ecosystems

Dear Commissioner Raybun:

The coverage of your appointment as Commissioner of the Georgia Department of Natural Resources (GDNR) by the 8/22/23 Atlanta Journal-Constitution (AJC) news article, at the following link, included the following quote from Governor Kemp:

https://www.ajc.com/news/department-of-natural-resources-gets-new-commissioner/JWKEDBBRSZGM3LSAWPYUO2FYH4/

"Throughout his many years of service to the State of Georgia and our Department of Natural Resources, Walter Rabon has dedicated himself to the mission of protecting hardworking Georgians and their ability to enjoy our outdoor spaces," said Kemp. "I look forward to DNR's continued success ensuring our state is a good steward of its natural resources as he continues to lead the department."

Based on that high praise from Governor Kemp related to your stewardship of Georgia's "outdoor spaces" and "protecting hardworking Georgians," I am addressing my initial comments on the **Proposed Bryan and Bulloch Counties' Groundwater Withdrawal Permits for the Hyundai Mega-Site** directly to you, because this proposed Mega-Site project not only threatens the source of potable water for hardworking Georgians, but also threatens to further dewater both the Ogeechee and Savannah Rivers, as well as the Okefenokee Swamp and the Okefenokee National Wildlife Refuge (ONWR), in conflict with current attempts to have the ONWR designated as a World Heritage Site.

I also am providing a copy of my initial comments to the GDNR, Environmental Protection Division (EPD), "Watershed Protection" Branch via that email address identified at the end of this comment letter, that was provided on the Notice of Informational Meeting Regarding Groundwater Withdrawal Applications for the Bryan County Mega-Site (Notice). I received a copy of that Notice from Bill Frechette, the contact for Municipal and Industrial Groundwater Withdrawals, in the GDNR EPD "Watershed Protection" Branch, on 2/16/24.

I also am providing a copy of these initial comments to Senator Jon Ossoff, who is the Senator leading the current efforts to have the ONWR listed as a World Heritage Site. He sent a letter dated 2/1/24 to Shannon Estenoz, the US Department of the Interior (DOI) Assistant Secretary for Fish and Wildlife and Parks, urging her to "nominate the Okefenokee National Wildlife Refuge (Refuge) for inscription on the UNESCO World Heritage List." I also am providing a copy of these comments to Assistant Secretary Estenoz, in addition to the USFWS and the NOAA NMFS, because those agencies appear to be unaware that this proposed Mega-site project would destroy designated habitat for federally endangered and threatened species and result in unpermitted take and jeopardy to the survival and recovery of federally endangered and threatened species. I also am providing copies of these initial comments to the media and environmental organizations and individuals who have expressed concerns about similar harm to the ONWR.

1. Approximately Six Times the Requested Volume of Groundwater Withdrawals as for the Proposed Twin Pines Minerals, LLC Mining Adjacent to the Okefenokee Swamp/ONWR and Gross Deficiencies of the Public Notice and Premature Scheduling of the Public Meeting for the Proposed Mega-Site

Twin Pines Minerals, LLC (Twin Pines), proposes to "recover" titanium dioxide and zircon from a **"demonstration mine" less than 3 miles from the south side of the Okefenokee Swamp/ONWR,** according to documents provided to GDNR. According to the "Updated Industrial Groundwater Withdrawal Permit Application" submitted on 5/19/22 to GDNR by Twin Pines, that company **allegedly is requesting 1.44 MILLION GALLONS OF WATER PER DAY (MGD) as monthly and annual average withdrawals from "2 wells" drilled into the regional Floridan aquifer system** for that "Saunders Demonstration Mine." A copy of that Permit Application is available for download from the following link:

https://epd.georgia.gov/twin-pines

In comparison, the Notice for the proposed Mega-Site includes the following statement about the proposed groundwater withdrawals from the regional Floridan aquifer system, with "mgd" being the abbreviation for MILIONS OF GALLONS OF WATER PER DAY (emphasis added):

> **"The cumulative total of 6.625 mgd on an annual average will be used to provide water to the Bryan County Mega-Site."**

That proposed withdrawal of 6.625 MGD of groundwater "on an annual average" from the regional Floridan aquifer system for the proposed Mega-Site is approximately 6 times the amount of groundwater withdrawals allegedly requested for the proposed Twin Pines mining adjacent to the Okefenokee Swamp/ONWR. According to the "Twin Pines Minerals, LLC Permitting Fact Sheet" (also available for download from https://epd.georgia.gov/twin-pines), **that proposed mine adjacent to the Okefenokee Swamp/ONWR is 740 acres in size.**

2. No Information Provided Regarding the Total Size/Acreage of the Proposed Bryan and Bulloch Counties' Mega-Site Project or the Size/Acreage of Impervious Surface for that Mega-Site

A copy of that 1-page Notice is included with this initial comment letter as **Attachment A**, in case you were not aware of this proposed project. That Notice provides the following information about the pending public meeting, where and how to provide written comments by email and by USPS mail, and states that, "**The comment period closes on Friday, March 8**."

"Meeting DATE: February 26, 2024
Meeting TIME: 6 P. M. t o 9 P. M.
Meeting LOCATION: Southeast Bulloch High School, Auditorium 9184 Brooklet-Denmark Highway, Brooklet, Ga 30415"

When Bill Frechette responded to my initial email inquiry on 2/16/24 about those proposed groundwater withdrawals for the proposed Mega-Site, he provided the link (https://epd.georgia.gov/water-withdrawal-permitting) that not only included the downloadable Notice for this proposed project, but also the potential special condition language for the permit. **It appears that the "public meeting" will be held and the public "comment period" will close before the public even has access to the bare minimum information to provide all of the necessary comments about the proposed withdrawal of 6.625 MGD of groundwater from the regional Floridan aquifer system**.

The first example for that happening is that the Notice for the proposed Mega-Site – **that would withdraw approximately 6 times the amount of groundwater from the regional Floridan aquifer system as the proposed mining operation adjacent to the Okefenokee Swamp/ONWR** – provides no information about the total size/acreage of that proposed Mega-Site or the size/acreage of the proposed impervious surface for that proposed Mega-Site.

The second example that the public meeting will be held and the comment period closed before adequate information is provided to review and comment on the proposed groundwater withdrawals is that the Notice also does not provide any information about how many acres of that proposed Mega-Site would be impervious surfaces. The acreage of impervious surface for that proposed Mega-Site is a **critical factor in determining how much natural base flow to the Ogeechee and Savannah Rivers and the Okefenokee Swamp/ONWR will be lost**, and **how much natural recharge to the regional Floridan aquifer system will be lost** by that proposed project.

That loss of natural base flow to streams and wetlands, and the loss of natural recharge from impervious surfaces must be added to the loss of natural base flow to streams and wetlands, and the loss of natural recharge caused by the **6.625 MILLION GALLONS PER DAY "on an annual average" of groundwater that is proposed to be withdrawn from the regional Floridan aquifer system** for the proposed Mega-Site project.

3. Additional Dewatering of the Ogeechee and Savannah Rivers and the Okefenokee Swamp/Okefenokee National Wildlife Refuge (ONWR), and the Destruction of Designated Habitat of Federally Endangered and Threatened Species Associated with Those Ecosystems

3.1 Addressing Groundwater Impacts ("Effects") Under the Clean Water Act (CWA), the National Environmental Policy Act (NEPA), and the Endangered Species Act (ESA)

Adverse impacts, also known as "effects," are regulated **under the Clean Water Act (CWA), the National Environmental Policy Act (NEPA), and the Endangered Species Act (ESA)**. Subsection 4.1 of the Part 1 companion study,

included as **Attachment B**, summarizes the **federal regulations of those adverse impacts under the CWA, NEPA, and the ESA, including "direct effects," "indirect effects," and "cumulative effects."** Examples of those adverse effects from groundwater withdrawals that have occurred in the regional Floridan aquifer system and other aquifers, also are provided in subsection 4.1 of the Part 1 companion study, included as **Attachment B**.

Groundwater withdrawals from a karst aquifer system in Texas previously resulted in **legal action in federal court for violations of the Endangered Species Act (ESA) because those groundwater withdrawals were jeopardizing the recovery and survival of federally endangered and threatened species by destroying essential habitat for those species**. Those groundwater withdrawals were from the Edwards aquifer and also were industrial use. The Part 2 companion study publication, included as **Attachment C**, provides background and discussion about the circumstances that led to that legal action.

Neither the GDNR Notice for the proposed groundwater withdrawals from Bulloch County, Georgia for the proposed Mega-Site, nor the link for additional information regarding those proposed groundwater withdrawals that was provided to me by Bill Frechette, the Municipal and Industrial Groundwater Withdrawals representative for the GDNR EPD "Watershed Protection" Branch, included any information regarding the status of any reviews by the USFWS and the NOAA NMFS regarding the adverse effects from those proposed groundwater withdrawals on federally endangered and threatened species and their habitat. Both the proposed groundwater withdrawals for the proposed Mega-Site and the actual proposed Mega-Site project will result in cumulative adverse impacts that will jeopardize the survival and recovery of numerous federally endangered and threatened species. **Examples of those federally endangered and threatened species and additional details regarding how preferential flow through the fractures and other karst conduits of the Floridan aquifer system, driven by those proposed groundwater withdrawals, are provided in the following subsections and sections and the referenced Attachments in those subsections and sections.**

3.2. Additional Dewatering of the Ogeechee and Savannah Rivers and the Okefenokee Swamp/Okefenokee National Wildlife Refuge (ONWR)

The peer-reviewed, open access publications included in **Attachment B** and **Attachment C** provide extensive documentation of the **severe dewatering of the Ogeechee and Savannah Rivers and the Okefenokee Swamp/Okefenokee National Wildlife Refuge (ONWR), and other adverse impacts that already have occurred from mining and other groundwater withdrawals and activities.** The links for downloading free copies of both of those publications also are included at the end of those publication titles.

The Part 1 publication provided in **Attachment B** describes the specific characteristics of karst aquifers in general and the regional, karst, Floridan aquifer system specifically, including preferential flow through linear fractures and bedding plains and other, non-linear karst conduits. This publication also provides a brief summary of the groundwater declines in the regional Floridan aquifer system and implications of those declines for the species dependent on that regional aquifer system for survival and recovery. On 2/15/24, the US District Court for the District of Columbia issued an Opinion reaffirming for the US Fish and Wildlife Service (USFWS) and the State of Florida that if **"incidental take" is "reasonably certain to occur," – which it will for these proposed groundwater withdrawals –** "**the consulting agency is required to issue an Incidental Take Statement** ('ITS'), which, among other things, 'specifies the impact of such incidental taking on the species' and 'sets forth the terms and conditions . . . that must be complied with by the [action] agency or applicant (if any), or both,' in order to 'minimize such impact, 16 U.S.C. § 1536(b)(4)."

Figure 1 of that Part 1 paper shows the submarine and landward extent of the regional Floridan aquifer system, through the entire Coastal Plain of Georgia and the entire State of Florida, in addition to portions of South Carolina, Alabama, and Mississippi. That figure also shows the extent of the study area of that publication, which was the **Greater Okefenokee Swamp Basin**, and which extends approximately equally into both Georgia and Florida.

Figure 3 of that Part 1 paper shows the extensive fracture networks in the regional Floridan aquifer system that have been mapped throughout the State of Florida, in addition to the equally extensive fracture networks in that same aquifer system that were mapped in Dougherty County, Georgia. Note that the entire Dougherty County image in Figure 3 appears to be solid fractures and only when you are able to "zoom out" of that mapped image are you able to see the densely packed, individual fractures that were mapped.

The fact that the fracture networks were not mapped throughout the entire extent of the Floridan aquifer system in Georgia does not mean that the remaining portion of the Floridan aquifer system in Georgia is not as densely fractured as the State of Florida and Dougherty County, Georgia. In fact, all of those fractures that were mapped up to the state line between Florida and Georgia do not suddenly stop at that state line, but extend into Georgia, throughout the entire **Greater Okefenokee Swamp Basin** and beyond, with additional, unmapped fracture networks and other karst conduits throughout the entire extent of the Floridan aquifer system – including under both Bulloch and Bryan Counties.

Figures 5a and 5b in that Part 1 paper show the extensive dewatering of the Floridan aquifer system that occurred in the **Greater Okefenokee Swamp Basin** and surrounding areas from the estimated levels for "pre-development" (prior to large-scale groundwater extractions from that regional aquifer system) to the documented levels in 1980. Note the more than 20-foot decline in

the potentiometric surface of the Floridan aquifer underlying the **Greater Okefenokee Swamp Basin** through 1980. The fact that the **Greater Okefenokee Swamp Basin** is underlain by extensive fracture networks results in induced lateral, downward flow from the overlying surficial aquifer system of the **Okefenokee Swamp/ONWR**, into the Floridan aquifer system. That induced dewatering of the **Okefenokee Swamp/ONWR** is known as "induced recharge" into the Floridan aquifer system and occurs in response to groundwater extractions from the Floridan aquifer system.

The same induced lateral, downward flow also occurs under all of the streams (the generic term for riverine systems of all sizes) within the **Greater Okefenokee Swamp Basin** and surrounding areas from those groundwater extractions. In addition to the dewatering of riverine systems from induced lateral, downward flow, streams also are dewatered from the severe reduction and total loss of base flow into those streams. Without appropriate reviews and regulation of groundwater extractions, the dewatering of streams from groundwater extractions continues until flow completely stops and/or is reduced so significantly that those streams no longer can provide "fishable" and "swimmable" recreation opportunities and no longer provide essential/critical habitat for any aquatic or anadromous fishes, including federally endangered and threatened species.

An example of those disruptions to the natural hyroperiods of wetlands and streams is provided in **Attachment B**, **Attachment C**, and **Attachment D**. **Attachment D** also revealed that large-scale flooding of private and public property downstream of Trail Ridge mining was not the result of rainfall associated with Hurricane Irma, but pre-hurricane impact discharges of industrial wastewater, in violation of the NPDES permit conditions.

More extensive dewatering of the **Greater Okefenokee Swamp Basin** has occurred within that basin and surrounding areas in the 44 years since those 1980 potentiometric contour lines shown in Figure 5b were established. The decades of mining of Trail Ridge by DuPont/Chemours in Florida, south of the **Okefenokee Swamp/ONWR**, since approximately 1950, has been an instrumental factor in the continuing dewatering of the entire **Okefenokee Swamp/ONWR** and **Greater Okefenokee Swamp Basin**.

Figures 6 and 7 of that Part 1 paper confirm that those drastic declines in the Floridan aquifer system were not the result of decreased precipitation during the period from pre-development to 1980. Likewise, Figures 6 and 7 also confirm that additional, drastic declines in the potiometric surface of the Floridan aquifer system in that area since 1980 was not from decreased precipitation.

3.3. Additional Dewatering and the Destruction of Designated Habitat of Federally Endangered and Threatened Species Associated with Those Ecosystems

Attachment C, the Part 2 companion case study of **Attachment B**, provides an extensive discussion of the marine and aquatic species and their designated critical habitat adversely affected by groundwater declines in the Greater Okefenokee Swamp Basin, in US Southeastern Coastal Plain Physiographic Ecoregion, which includes the entire extent of the Floridan aquifer system in Georgia. Specifically discussed are the **federally endangered south Atlantic Distinct Population Segments (DPS) of the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), shortnose sturgeon (*Acipenser brevirostrum*), and oval pigtoe mussel (*Pleurobema pyriforme*), as well as the federally threatened Gulf subspecies of the Atlantic sturgeon (Acipenser oxyrinchus desotoi) and Suwannee moccasinshell (*Medionidus walkeri*)**.

Subsection 3.3.3. of the Part 2 publication also discusses the failure of USFWS and the National Marine Fisheries Service (NMFS) to ensure no jeopardy to federally listed species, prior to and during the State of Florida's assumption of the Clean Water Act (CWA) Section 404 Regulatory Authority in 2020. On 2/15/24, that state assumption of federal regulatory duties was overturned by the US District Court for the District of Columbia.

Subsection 3.4. of the Part 2 publication discusses the adverse effects of mining, and associated groundwater withdrawals, in the Greater Okefenokee Swamp Basin and Southeastern Coastal Plain Ecoregion, resulting in degradation of the physical, chemical, and biological integrity of surface waters on which federally endangered and threatened marine and aquatic species depend. That discussion includes background and threats, range, critical habitat and maps of critical habitat, in addition to summaries.

Subsection 3.4.1. of the Part 2 publication specifically discusses the adverse effects on the **federally endangered Atlantic sturgeon (*Acipenser oxyrinchus*)**. That discussion includes designated habitat for that endangered sturgeon in the Savannah River, SC/GA, the Altamaha River, GA, the Ogeechee River, GA, the Satilla River, GA, the St. Mary's River, GA/FL, the St. John's River, FL, and rivers farther south. The most profound adverse impact of this proposed groundwater withdrawals and other aspects of this Mega-Site project will be on the habit and fish in the Ogeechee River, Savannah River, and St. Mary's River, including the federally endangered Atlantic sturgeon.

Subsection 3.4.2. of the Part 2 publication specifically discusses the adverse effects on the **federally endangered shortnose sturgeon (*Acipenser brevirostrum*)**. The 1998 NOAA NMFS publication quoted in that subsection emphasized the importance of "thermal refugia" in southern rivers in the summer for both the **shortnose sturgeon and the Gulf sturgeon *Acipenser oxyrinchus desotoi*)** (pages 123-124). Natural groundwater discharges into those streams southern streams provide cooler water that is essential for those thermal refugia.

That subsection also includes the following excerpt on page 125 (emphasis added):

"That aquifer depletion not only would have reduced water levels and depths in the St. Marys River, but also reduced dissolved oxygen and increased temperatures in any water that remained in the St. Marys River after that aquifer depletion. Each of those factors is known to constitute 'harm' to the habitat that is essential for the recovery and survival of both the federally endangered shortnose sturgeon and the federally endangered south Atlantic Distinct Population Segments of the Atlantic sturgeon. **The preceding excerpts also acknowledge that '[P]rojects that may adversely affect sturgeon include dredging' (NOAA NMFS, 1998). Mining of Trail Ridge, in addition to phosphate mining, and other related mining in the Southeastern Coastal Plain Ecoregion are recognized as 'dredging' by the federal regulatory agencies and the discharge of mining related material is considered as dredged material in permitting under Section 404 of the CWA."**

Subsection 3.4.3. of the Part 2 publication specifically discusses the adverse effects on the **federally endangered oval pigtoe mussel (*Pleurobema pyriforme*) and the designated critical habitat for that species.** Subsection 3.4.4. of the Part 2 publication specifically discusses the adverse effects on the **federally threatened Atlantic sturgeon, Gulf subspecies (*Acipenser oxyrinchus desotoi*)**. Subsection 3.4.5. of the Part 2 publication specifically discusses the adverse effects on the **federally threatened Suwannee moccasinshell (*Medionidus walkeri*)** and the proposed designated critical habitat for that species.

Attachment E focused on both fractures and sinkholes in the Floridan aquifer system, with sinkholes naturally occurring over fractures and particularly at fracture intersections, and the relevance of those features to **adverse impacts to environmentally sensitive areas in Florida and Georgia, including the Apalachicola-Chattahoochee-Flint (ACF) River Basins, the Okefenokee Swamp, and Georgia's "Priority Amphibian and Reptile Conservation Areas" (PARCAs)**. This peer-reviewed publication expands the discussion of adverse impacts from groundwater withdrawals and aquifer injections beyond sturgeons and mussels, to priority amphibians and reptiles identified by the State of Georgia, including those in the vicinity of the proposed Mega-Site.

Table 4 of **Attachment E** provides **rankings of standardized threats to high priority fish and aquatic invertebrate species in Georgia in 2005 and 2015**. Table 5A of **Attachment E** provides examples of **Georgia's high priority state and federally listed bird species in the ACF River Basins and Coastal Plain with jeopardized survival and recovery by adverse direct, indirect, and cumulative impacts from Floridan-aquifer injections and withdrawals in Florida, Georgia**, and South Carolina. Table 5B of **Attachment E** provides examples of **Georgia's high priority state and federally listed amphibian and reptile species in the ACF River Basins and coastal plain with jeopardized survival and recovery by adverse direct, indirect, and cumulative impacts from Floridan-aquifer injections and withdrawals in Florida, Georgia**, and South Carolina. Table 5C of **Attachment E** provides examples of **Georgia's high priority state and federally listed fish and invertebrate species in the ACF River Basins and coastal plain with jeopardized survival and recovery by adverse direct, indirect, and cumulative impacts from Floridan-aquifer injections and withdrawals in Florida, Georgia**, and South Carolina.

Tables 4 and 5 of **Attachment E** expand the evidence of adverse impacts related to anthropogenic alterations of natural hydroperiods, and accompanying physico-chemical alterations, to species of fish other than sturgeon, aquatic invertebrates other than mussels, reptiles and amphibians, and birds. **Attachment F** further expands the evidence of adverse impacts related to anthropogenic alterations of natural hydroperiods to mammals, by providing evidence suggesting that dewatering of the Floridan aquifer system via preferential fracture flow is degrading what limited "habitat" the Florida panthers have for raising offspring. Finally, **Attachment G** expands the evidence of adverse impacts related to preferential fracture and other karst aquifer flow to coral reefs.

4. The Extent of Preferential Flow Through Fracture Networks and Other Karst Conduits in the Floridan Aquifer System

The peer-reviewed publication provided in **Attachment G** also provided evidence suggesting that municipal effluent injected into the Floridan aquifer system in Florida was flowing through fractures and discharging in coral areas in the Florida Keys, and resulting in focused macrobenthic algal blooms. As one example in **Attachment G**, **the distance of a fracture extending southwest from the Marco Island aquifer injection well, for municipal sewage, to the Marquesas Keys in Florida, where focused macrobenthic algal blooms were documented, is approximately 100 miles.** This suggests that **preferential flow of water injected into, or withdrawn from, the highly fractured Floridan aquifer system can travel distances of approximately 100 miles from the location of the injection or withdrawal wells.**

Dye tracer research conducted by Kincaid et al. (2004) established rapid flow times for municipal sewage effluent sprayed on open fields in Tallahassee, Florida, before surfacing in recreational springs approximately 15 miles south of Tallahassee. Additional research conducted by Kincaid et al (2012) throughout the extensive Wakulla Springshed, extending from the submarine spring off the coast of Spring Creek, Florida, north into southwest Georgia provided evidence that agricultural withdrawals of water from the Florida aquifer system for center-pivot irrigation and non-agricultural withdrawals were the primary factors dewatering the entire Wakulla Springshed, including the submarine spring adjacent to Spring Creek. Those findings were discussed in **Attachment E**. The area surrounding the Dougherty County, Georgia fractures shown in Figure 3A of **Attachment E**, also is densely populated

with center-pivot irrigations, which can be seen in that satellite image. Figure 3A of **Attachment E** also includes a "zoomed out" view of the previously referenced mapped fractures in Dougherty County, Georgia.

Long-time local residents of Spring Creek reported to me that decades ago, the discharges of fresh water from that submarine spring were so voluminous that the discharging water from that spring sounded like a freight train. At the time of the additional research of that springshed by Kincaid et al. (2012), Kincaid described to me that the flow from that submarine spring was so weak that at times – including while he was scuba diving in the spring conduit with instrumentation, that the flow reversed and saline water from Apalachee Bay was sucked into the spring's karst conduits with such force that it disrupted their dive. During that same approximate time, I conducted an investigation of what was reported, by Wakulla Springs State Park rangers, as the sudden death of previously healthy bald cypress trees (*Taxodium distichum*) at the perimeter of that Wakulla Springs and concluded that those cypress trees had been killed by exposure to saline water, presumably that traveled through a karst conduit connecting the submarine spring at Spring Creek to that part of Wakulla Springs during one of those flow reversals.

The evidence of dewatering of the Wakulla Spring shed extending from the submarine spring offshore of Spring Creek, northward to southwest Georgia greatly extends evidence of the extent of preferential flow through fractures and other karst conduits in the Floridan aquifer system. **Attachment H1** is a satellite image map that I created showing that the center-pivot irrigation systems in southwest Florida extend at least as for north as Perry, Georgia. **Attachment H2** is a **map that I created showing the approximate mileage from Perry, Georgia to Spring Creek, Florida, which is a distance of approximately 194 miles. Attachment H3** is a map that I created **showing the approximate distance from Perry, Georgia to Spring Creek, Florida, compared to Bulloch County, Georgia (east of Perry, Georgia) to the ONWR**. The final map that I created for these initial comments, **Attachment H4**, is a **map showing the approximate distance of 135 miles, from the proposed Mega-Site withdrawal wells in Bulloch County to the Okefenokee Swamp/ONWR**. **That distance is approximately 60 miles less than the distance from Perry, Georgia to Spring Creek, Florida.**

5. Gross Deficiencies of the Public Notice and Premature Scheduling of the Public Meeting for the Proposed Groundwater Withdrawals for the Proposed Bryan and Bulloch Counties' Mega-Site Project

The 2/16/24 email response from Bill Frechette, to my initial email regarding the proposed groundwater withdrawals for the proposed Mega-Site Project included the following statements (emphasis added):

> "The link to the EPD website containing the Notice of the Informational Meeting and the proposed DRAFT Special Conditions which are anticipated to include in the permits is:
> https://epd.georgia.gov/water-withdrawal-permitting
> The top two items under Related Items are the meeting's public notice and the potential special condition language.
>
> Bryan County and Bulloch County each have a groundwater withdrawal application in-house.
> Bryan County
> **2 Floridan aquifer wells in Bulloch County**
> Requesting a total of 3.500 mgd on an annual average
> Bulloch County
> **2 Floridan aquifer wells in Bulloch County**
> Requesting a total of 3.125 mgd on an annual average
> The water produced under these municipal permits will eventually be sold to Hyundai at the Bryan County Mega-Site, for use in their multiple industrial processes"

5.1. The Proposed "DRAFT" Special Conditions

5.1.2 Proposed "DRAFT" Special Conditions Addressing Short-Term Impacts

The fact that "DRAFT" Special Conditions already have been prepared, "which are anticipated to include in the permits" [sic] suggests that GDNR intends to issue a permit for these proposed groundwater withdrawals, not only without having all of the documents and information available online for download and review by the public <u>prior to the public meeting scheduled on 2/26/24</u>, but apparently not even having that necessary in-house for staff review and having no review/consultation from the USFWS and NOAA NMFS. This not only is putting the "cart before the horse" – this is an example of an unmanned, horseless cart careening down a steep ravine, headed to total destruction.

The Proposed "DRAFT" Special Conditions are dated "01/30/24." This 2-page pdf document, downloaded from the link above, provided by Bill Frechette, includes two sections. The first section, titled **"Addressing Short-Term Impacts,"** includes the following two provisions (emphasis added):

> "A) A joint Bulloch County and Bryan County **municipal managed fund will be created by the permitted counties, which may include industrial monetary contributions and assistance, to address any potential unreasonable impacts to existing permitted individual Floridan aquifer residential** (permitted by local health departments) **or**

agricultural wells (permitted by EPD) in the nearby area within a 5-mile radius of the I-16 and Highway 119 interchange. This **mitigating mechanism will exist for the term (10 years) of this permit.**

B) **If an EPD approved party conducts an independent investigation which indicates that an unreasonable impact to an existing water well meeting the above parameters is considered to have been caused by the Floridan Aquifer drawdown engendered by the use of the 4 municipal wells providing water to the industries** at the Bryan county Mega-Site, **money from the fund may be used to indemnify the affected party to solve such delineated water problems.** These options may include methods proposed using best management practices of a Georgia licensed well driller, **such as resetting the water pump deeper or by other proposed solutions."**

Proposed "Draft" Short-Term Permit Condition A: The reference to a "**5-mile radius**" in Proposed "DRAFT" Special Condition "A," above, **strongly suggests that the GDNR "Watershed Protection" Branch somehow believes that the dewatering caused by those proposed groundwater withdrawals will be confined – by some imaginary, impenetrable, subsurface column extending from ground level to the bottom of the Floridan aquifer system that will prevent preferential flow through fractures and other karst conduits throughout the entire Floridan aquifer system.** That also would suggest that the two permit applications for the proposed groundwater withdrawals from the **4 proposed wells that would be drilled in Bulloch County for the proposed Mega-Site in Bryan County** are the first permit applications in the Floridan aquifer system that the GDNR "Watershed Protection" Branch has ever reviewed.

Ironically (or not), preceding sections and subsections of this initial comment letter clearly documented that center-pivot irrigation systems for agricultural fields occur throughout the Floridan aquifer system in southwest Georgia and that those groundwater withdrawals have continued for decades, resulting in the most significant factor in the dewatering of the Wakulla Springs springshed, from southwest Georgia to the Apalachee Bay (in the Gulf of Mexico). Presumably you also are aware of the extensive dewatering of the Flint River by those center-pivot irrigation systems in southwest Georgia. Although the extensive, multi-state adverse environmental impacts - including to federally endangered and threatened species - from groundwater withdrawals for those center-pivot irrigation systems would suggest that none of those withdrawals are being regulated by anyone.

Unfortunately, the more logical conclusion is that those groundwater withdrawals in southwest Georgia are being regulated by the GDNR "Environmental Protection" Division's "Watershed Protection" Branch, and that the staff in the "Watershed Protection" Branch simply lack the basic knowledge about groundwater withdrawals (and aquifer injections) in the regional, karst, Floridan aquifer system.

The proposed "10 years" term referenced in the proposed "DRAFT" condition "A" for the proposed groundwater withdrawal permit is too long for a permit that knowingly will jeopardize the survival and recovery of numerous federally endangered and threatened species. That same term/time span also is too short as a compensation period for all of the harm that occurs beyond that arbitrary "5-mile radius" considering that the general public, the media, and apparently even the USFWS and NOAA NMFS (based on the recent, 2/15/24 ruling by the US District Court in DC) appear to be as uninformed about the unavoidable adverse impacts from groundwater withdrawals in the Floridan aquifer system as the GDNR staff who are attempting to regulate these withdrawals.

Additionally, **it is unlikely that those two counties could provide a sufficient amount of money for the "municipal managed fund" (referenced in "DRAFT" condition "A") to cover all of the extensive environmental and other damage that those proposed groundwater withdrawals would cause.** Ultimately that would result in even more expensive legal fees, similar to those that amassed during the years of legal battles in the Tri-State water wars between Georgia, Florida, and Alabama.

Proposed "Draft" Short-Term Permit Condition B: The second and final proposed "DRAFT" permit condition under the "Short-Term" category is suggesting that EPD would be in charge of all vetting to either "approve" or "deny" each "independent investigation" by each "party" that is harmed by these proposed industrial groundwater withdrawals. Specifically, that proposed "DRAFT" condition would anoint EPD to determine if "**an unreasonable impact to an existing water well meeting the above parameters is considered to have been caused by the Floridan Aquifer drawdown engendered by the use of the 4 municipal wells providing water to the industries** at the Bryan county Mega-Site. Again, this condition excludes all adverse environmental impacts – including property damage, premature death of trees, etc. and restricts covered adverse impacts only to damage to wells, specifically "pumps."

Equally as problematic is the fact that the severe problems from the groundwater withdrawals for the center-pivot irrigation in southwest Georgia has continued to cause catastrophic and wide-spread environmental damage since at least the early 1990s, when I conducted an agency site investigation of numerous wetlands in the Albany, Georgia area and all were completely dewatered, with trees already prematurely dead and dying – yet those groundwater withdrawals continue. **That confirms that the EPD is the LEAST QUALIFIED ENTITY to judge if an "unreasonable impact" to ANYTHING has occurred from "the use of the 4 municipal wells providing water to the industries at the Bryan county Mega-Site." Please re-read my previous**

comments in the last paragraph under the proposed "DRAFT" condition "A" – regarding initiating a new decades-long Water Wars in southeast Georgia.

5.1.3. Proposed "DRAFT" Special Conditions Addressing Long-Term Impacts

The second section under the Proposed "DRAFT" Special Conditions, dated "01/30/24," is titled **"Addressing Long-Term Impact."** That section includes the following five provisions (emphasis added):

"C) **The Georgia Environmental Protection Division (EPD) strongly encourages Bryan County and Bulloch County to work together to expeditiously plan for the timely provision of treated surface water (or other alternatives) and the construction of all infrastructure necessary to deliver sufficient quantities of treated water to northern Bryan County and southern Bulloch County. This provision of treated surface water (or other alternatives) and the construction of all infrastructure necessary should not exceed 25 years.** Such planning should be premised on making sufficient surface water (or other alternatives) available to provide for offsetting permitted Floridan aquifer groundwater withdrawals tied to the Bryan County Mega-Site and the future water needs of any additional industrial, commercial, and residential growth which may occur in this area because of Bryan County Mega-Site development.

D) **Groundwater withdrawals from the proposed four (4) municipal Floridan Aquifer wells in the Green Zone of Bulloch County must be reduced upon completion and operation of infrastructure to deliver surface water in the area, in coordination and compliance with any contract restrictions placed on the use of the wells by the initial funding source requirements.**

E) **Any future suggestion to drill new Floridan aquifer wells away from the Savannah Cone of Depression (such as farther west or north) and then transfer or move any already issued permitted groundwater limits must comply with all EPD policy and permitting requirements in place at the time of such a proposal.**

F) Bryan County and Bulloch County must submit an initial joint annual report to EPD within 12 months of the withdrawal permits being issued, informing EPD of the pending status regarding:
1. The investigation of, and discovery or development of, sufficient funding sources to pay for any effort to expand surface water availability in a timely manner.
2. All negotiations between the above parties and any others working towards the construction of necessary surface water and pipeline infrastructure.
3. Contractual documents between the parties proposed or approved.
4. A solid, firm and feasible front-loaded timetable for such developments,
5. Any other information pertaining to this effort.

G) Bryan County and Bulloch County must also submit annual updates to the initial report, which must at a minimum address each of the five items above, summarizing progress and providing any new information available. As significant progress, changes in conditions, or changes in timelines may occur, the level of detail provided in the annual reporting should be sufficient to appropriately inform EPD of the project status. Three years after the initial report and every three years thereafter, Bryan County and Bulloch County must submit an updated report summarizing all progress taking place and setting goals and milestones to be achieved in the next three-year period."

SERIOUSLY? ARE THOSE SERIOUS "DRAFT" PERMIT CONDITIONS OR ARE THEY A JOKE?

AND ACCORDING TO PROPOSED "DRAFT" CONDITION "D" THESE 4 PROPOSED WELLS ARE "in the Green Zone of Bulloch County"???

Nothing was available at the GNDR link that Bill Frechette provided to me that described "Green Zone of Bulloch County," provided a location map of where that "Green Zone" was, or what the restrictions of that "Green Zone" are. One thing is certain, nothing will turn a "Green Zone" within the Flordan aquifer system BROWN faster than groundwater withdrawal wells.

Based on my decades of research and professions work related to the adverse impacts from groundwater withdrawals within the Southeastern Coastal Plain Ecoregion, it won't even take the 10-year proposed term for these proposed groundwater withdrawals to inflict irreversible damage to all of the native trees in the "Green Zone" and far beyond. That irreversible damage will result in thousands of dollars in property damage to private and public property with trees, to have those trees removed before they cause more extensive property damage to homes and other structures, and possibly deaths of residents and visitors from falling trees and wildfires, if those prematurely declining and dying trees are left standing.

I couldn't even determine if the proposed "DRAFT" Special Condition "C" means that GDNR already knows that groundwater withdrawals from those 4 proposed wells will eliminate all groundwater availability for current and future residents in Bulloch County and surrounding Counties. Is this condition implying that all of those residents simply will have to drink contaminated surface water or have no potable water at all?

Proposed "DRAFT" Special Condition "E" references "Any future suggestion to drill new Floridan aquifer wells away from the Savannah Cone of Depression (such as farther west or north)" – with the Savannah Cone of Depression providing yet another example of how the GDNR "Environmental Protection" Division provides absolutely no "Protection" for any part of the "Environment" – including the Floridan aquifer system - which is the absolute life-blood for the entire environment in the Southeastern Coastal Plain Ecoregion.

5.1.4. Summary and Conclusion Related to the proposed "DRAFT" Special Conditions

The only meaningful words in any part of the proposed "DRAFT" Special Conditions were "(or other alternatives)." **The "ALTERNATIVE" is for GDNR to DENY these 2 permit applications for the proposed 4 groundwater withdrawal wells.**

Bryan County and Bulloch County then should notify Hyundai that Hyundai needs to construct a reverse osmosis (RO) filtration facility (as has been done by municipalities in Arizona) and negotiate a contract with one or both of those counties to:

1. buy a total of 6.625 MGD of municipal wastewater for all uses in the proposed Mega-Site for Hyundai;
and
2. have the pipes constructed to convey that municipal wastewater to the proposed Hyundai Mega-Site.

Additionally if Bryan County is the county that will be authorizing the construction of the Hyundai Mega-Site, within the boundaries of that County, Bryan County should require Hyundai to capture all rainfall from the roof of that Mega-Site to supplement the municipal wastewater that it is purchasing from Bryan and/or Bulloch Counties to reduce the volume of water that requires RO processing.

5.1.5 Additional Grounds for Denial of Both Permit Applications from Bulloch and Bryan Counties Due to Insufficient Information

On 2/19/24 I sent and email to Bill Frechette requesting examples of the minimum basic information that should have been provided by Bulloch and Bryan counties as part of their applications to GDNR for those two requested groundwater withdrawal permits from those 4 proposed withdrawal wells – and that should have been made available to the public before the public "Meeting" was scheduled for 2/26/24. As of 5 PM today, that information still has not been provided to me and I have not received any additional emails from Bill Frechette. I am assuming that the reason he has not responded is that he does not have any of that information, because if he had received that information from the 2 municipal applicants, that information would be posted at the link that he sent to me.

The minimum information that should have been submitted with those two applications, that I requested in my email to him on 2/26/24 was as follows:

"QUESTION 1.

THE FOLLOWING EXCERPT IS FROM PARAGRAPH 2 OF THE "Notice of Informational Meeting Regarding Groundwater Withdrawal Applications for the Bryan County Mega-Site" ("NOTICE") BUT THAT NOTICE DOES NOT INCLUDE ANY MAPS OF THE PROPOSED LOCATIONS FOR THOSE 4 PROPOSED WITHDRAWAL WELLS FROM THE REGIONAL FLORIDAN AQUIFER SYSTEM:

"Bulloch County has submitted an application to EPD for two Floridan aquifer wells sited in Bulloch County, asking for up to 3.125 million gallons a day (mgd) on an annual average. Bryan County has submitted an application to EPD for two Floridan aquifer wells sited in Bulloch County, asking for up to 3.500 mgd on an annual average. The cumulative total of 6.625 mgd on an annual average will be used to provide water to the Bryan County Mega-Site."

YOUR EMAIL RESPONSE BELOW ALSO PROVIDED THE FOLLOWING INFORMATION THAT WAS HELPFUL:

"Bryan County and Bulloch County each have a groundwater withdrawal application in-house.

Bryan County

2 Floridan aquifer wells in Bulloch County

Requesting a total of 3.500 mgd on an annual average

Bulloch County

2 Floridan aquifer wells in Bulloch County

Requesting a total of 3.125 mgd on an annual average"

CAN YOU PLEASE SEND ME A COPY OF THE MAPS SHOWING THE PROPOSED LOCATIONS FOR THOSE 4 PROPOSED WELLS, IN RELATION TO THE:
a. WETLANDS MAPPED BY THE NATIONAL WETLANDS INVENTORY FOR BOTH COUNTIES;
b. 100-YEAR FLOODPLAIN DESIGNATED BY FEMA FOR BOTH COUNTIES;
c. BRYAN AND BULLOCK COUNTY BOUNDARIES; AND
d. OGEECHEE AND SAVANNAH RIVERS AND THEIR TRIBUTARIES?

QUESTION 2.
THE LAST SENTENCE OF THAT SECOND PARAGRAPH FROM THE NOTICE SUGGESTS THAT THE PROPOSED "MEGA-SITE" WILL BE CONSTRUCTED ENTIRELY IN BRYAN COUNTY, BUT
NEITHER THE NOTICE NOR THE PROPOSED/DRAFT SPECIAL CONDITIONS FOR THOSE 4 WELLS PROVIDED ANY MAPS SHOWING THE PROPOSED LOCATION FOR THAT PROPOSED MEGA-SITE.

CAN YOU PLEASE SEND ME A COPY OF THE MAPS SHOWING THE PROPOSED LOCATION FOR THE MEGA-SITE, IN RELATION TO THE:
a. WETLANDS MAPPED BY THE NATIONAL WETLANDS INVENTORY FOR BOTH COUNTIES;
b. 100-YEAR FLOODPLAIN DESIGNATED BY FEMA FOR BOTH COUNTIES;
c. BRYAN AND BULLOCK COUNTY BOUNDARIES; AND
d. OGEECHEE AND SAVANNAH RIVERS AND THEIR TRIBUTARIES?

QUESTION 3.
YOUR EMAIL RESPONSE BELOW ANSWERED ONE OF MY QUESTIONS BY PROVIDING THE FOLLOWING INFORMATION, WHICH ALSO WAS HELPFUL:
"The water produced under these municipal permits will eventually be sold to Hyundai at the Bryan County Mega-Site, for use in their multiple industrial processes."

CAN YOU PLEASE SEND ME THE TOTAL ACREAGE OF THAT PROPOSED INDUSTRIAL MEGA-SITE FOR HYUNDAI, IN ADDITION TO THE TOTAL IMPERVIOUS SURFACE FOR THAT MEGA-SITE?

PLEASE NOTE THAT THE MAPS AND OTHER INFORMATION REQUESTED IN #1, #2, AND #3 ABOVE, ARE STANDARD DOCUMENTS INCLUDED AS PART OF THE APPLICATIONS FOR PROPOSED MUNICIPAL AND INDUSTRIAL PROJECTS IN OTHER AREAS OF THE REGIONAL FLORIDAN AQUIFER SYSTEM IN FLORIDA.

THAT INFORMATION GENERALLY IS POSTED ONLINE BY THE PERMITTING AGENCIES BEFORE ANY SPECIAL CONDITIONS ARE DRAFTED.

CONSEQUENTLY, I'M ASSUMING THOSE REQUESTED MAPS AND OTHER INFORMATION ARE READILY AVAILABLE AS PART OF APPLICATIONS THAT WERE SUBMITTED BY BRYAN AND BULLOCH COUNTIES.

QUESTION 4:
THE FOLLOWING LINK THAT YOU PROVIDED ALSO INCLUDED THE FOLLOWING INFORMATION, INDICATING THAT YOU ARE THE CONTACT PERSON FOR BOTH MUNICIPAL AND INDUSTRIAL GROUNDWATER WITHDRAWAL PERMITS:
https://epd.georgia.gov/water-withdrawal-permitting
Municipal and Industrial Groundwater Withdrawals
Bill Frechette <mailto:Bill.Frechette@dnr.ga.gov>
470-524-0567

I'M ALSO REQUESTING THE SUMMARY INFORMATION (presumably via spreadsheet), FOR ALL OF THE GROUNDWATER WITHDRAWAL WELLS PERMITTED IN BRYAN COUNTY AND IN BULLOCH COUNTY, INCLUDING:
a. NAME/ADDRESS OF THE PERMITTEES (e.g. city, county, Ag, Industry);
b. USE TYPES (i.e., Municipal, Industrial, Agriculture)

c. DATES EACH WELL WAS PERMITTED TO BEGIN WITHDRAWALS AND IF ANY OF THOSE WELLS HAVE BEEN ABANDONED AND CAPPED;
d. TOTAL VOLUME OF WATER PERMITTED FOR WITHDRAWAL (i.e. MGD);
e. HOW THE WITHDRAWAL VOLUMES ARE MONITORED AND WHAT ENTITY MONITORS THE WITHDRAWALS (e.g., dataloger, GEPD, permittee; and
f. ESTIMATED TOTAL VOLUME OF GROUNDWATER WITHDRAWALS FROM PRIVATE RESIDENTIAL WELLS THAT ARE NOT PERMITTED/MONITORED BY GEPD

QUESTION 5:
THE HYDROLOGIC MODEL INFORMATION FROM THE NOTICE WAS PROVIDED IN THE FOLLOWING EXCERPT THAT WAS PARAGRAPH 3 IN THE NOTICE:
"EPD has run multiple hydrologic models to determine the impacts expected from these Floridan aquifer withdrawals. EPD will present these results and provide a regional overview of the impact on the Floridan aquifer. EPD will also make available an interactive map, which will show the potential modeled impact at specific locations, such as at residential or agricultural
wells."

CAN YOU PLEASE TELL ME THE NAME(S) OF THE HYDROLOGIC MODEL(S) USED AND HOW THE MODEL(S) USED INCORPORATED FRACTURE FLOW AND OTHER KARST CONDUIT FLOW THAT ARE COMMON IN THE FLORIDAN AQUIFER SYSTEM?"

Please note that the information I requested in #4 and #5, above, should be information that GNDR already has compiled and should be readily available online for the public – and applicants to download. Please also note that any groundwater flow models that are being used, but do not model preferential flow through fractures and other karst conduits that are extensive throughout the entire Floridan aquifer system are meaningless.

6. Summary and Conclusions of This Initial Comment Letter

It should be clear from my initial comments in this letter, above, that the "Floridan aquifer bank" is empty and that any additional withdrawals simply are increasing the magnitude of the existing harm from unsustainable groundwater withdrawals. No "SPECIAL CONDITIONS" added to a permit to withdraw an additional 6.625 MGD from the "Floridan aquifer bank" will make that water magically appear.

Additionally, none of the proposed "DRAFT" Special Conditions, referenced above, address or even acknowledge any adverse environmental impacts, particularly the irreversible adverse effects that will jeopardize the survival and recovery of any of the federally endangered and threatened species and their essential habitat referenced in the preceding sections and subsections of this comment letter. Those species and habit include those in the Ogeechee and Savannah Rivers, the Okefenokee Swamp/ONWR, and throughout the Greater Okefenokee Swamp Basin.

The fact that "proposed DRAFT Special Conditions" already have been prepared and a public meeting scheduled, despite the gross inadequacies of the information submitted/available and no evidence of any involvement/consultation with the USFWS and the NOAA NMFS suggests that GDNR simply intended to issue those permits without the necessary information or federal agency involvement.

Based on all of the comments related to environmental impacts in this comment letter, GDNR also should remove the words "Environmental Protection" from the EPD name and "Watershed Protection" from that Branch name and rename that Division and Branch to reflect what actually is done in that Division and Branch.

I am restating, below, my comments under the 5.1.4. Summary and Conclusion Related to the proposed "DRAFT" Special Conditions as **the most realistic "alternative" for the permit applicants after their permit application is denied:**

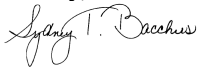
The only meaningful words in any part of the proposed "DRAFT" Special Conditions were "(or other alternatives)." **The "ALTERNATIVE" is for GDNR to DENY these 2 permit applications for the proposed 4 groundwater withdrawal wells.**

Bryan County and Bulloch County then should notify Hyundai that Hyundai needs to construct a reverse osmosis (RO) filtration facility (as has been done by municipalities in Arizona) and negotiate a contract with one or both of those counties to:
1. buy a total of 6.625 MGD of municipal wastewater for all uses in the proposed Mega-Site for Hyundai;
and
2. have the pipes constructed to convey that municipal wastewater to the proposed Hyundai Mega-Site.

Additionally if Bryan County is the county that will be authorizing the construction of the Hyundai Mega-Site, within the boundaries of that County, Bryan County should require Hyundai to capture all rainfall from the roof of that

Mega-Site to supplement the municipal wastewater that it is purchasing from Bryan and/or Bulloch Counties to reduce the volume of water that requires RO processing.

Sincerely,



Sydney T. Bacchus, Ph.D.
Hydroecologist
appliedenvirserve@gmail.com

cc:
GDNR, Environmental Protection Division, Watershed Protection Branch (EPDComments@dnr.ga.gov)
Shannon Estenoz USDOI Assistant Secretary for Fish and Wildlife and Parks (shannon_estenoz@ios.doi.gov)
Peter Maholland Field Supervisor, USFWS Georgia Ecological Services (peter_maholland@fws.gov)
USFWS Georgia Ecological Services (GAES_Assistance@FWS.gov)
Paul Doremus, Assistant Administrator NOAA National Marine Fisheries Service (paul.n.doremus@noaa.gov)
Senator Jon Ossoff (CaseworkTeam@ossoff.senate.gov)
Gil Rogers, SELC Georgia Director (grogers@selcga.org)
Joshua Marks, President, Georgians for the Okefenokee (Joshua.Marks@att.net)
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Lois Norder, AJC Investigations Editor (Lois.Norder2@ajc.com)
Mary Landers, The Current (mary.thecurrent@gmail.com)

Attachments:
A. 1/30/24 Notice of Informational Meeting Regarding Groundwater Withdrawal Applications for the Bryan County Mega-Site

B. Bacchus et al. (2023). Implications of Declining Ground Water and Water Quality in the US Southeastern Coastal Plain Ecoregion and Areawide Environmental Impact Statement Required for Mining in the Greater Okefenokee Swamp Basin—Part 1. Journal of Geoscience and Environment Protection, 11, 201-276. doi: 10.4236/gep.2023.113014 (https://www.scirp.org/pdf/gep_2023033011321222.pdf)

C. Bacchus (2023). Implications of Declining Ground Water and Water Quality in the Greater Okefenokee Swamp Basin for Survival and Recovery of Federally Endangered and Threatened Marine and Aquatic Species and Critical Habitat in the US Southeastern Coastal Plain Ecoregion—Part 2. Journal of Geoscience and Environment Protection, 11, 86-156. doi: 10.4236/gep.2023.114008 (https://www.scirp.org/pdf/gep_2023042814422560.pdf)

D. Bernardes et al. (2019). Analysis and Extent of Santa Fe River Flooding in North Florida Attributed to Rainfall and Wind Damage Associated with Hurricane Irma. Journal of Geoscience and Environment Protection, 7, 253-310. https://doi.org/10.4236/gep.2019.711019 (https://www.scirp.org/pdf/gep_2019112817190557.pdf)

E. Xu et al. (2016). Mapped Fractures and Sinkholes in the Coastal Plain of Florida and Georgia to Infer Environmental Impacts from Aquifer Storage and Recovery (ASR) and Supply Wells in the Regional Karst Floridan Aquifer System. Journal of Geography and Geology 8(2):76-110. doi.org/10.5539/jgg.v8n2p76

F. Xu et al. (2018). Management Implications of Aquifer Fractures on Ecosystem and Habitat Suitability for Panthers in Southern Florida. Journal of Geoscience and Environment Protection 6:184-208. doi: 10.4236/gep.2018.62012 (https://www.scirp.org/pdf/GEP_2018022814042672.pdf)

G. Bacchus et al. (2014). Benthic macroalgal blooms as indicators of nutrient loading from aquifer-injected sewage effluent in environmentally sensitive near-shore waters associated with the South Florida Keys. Journal of Geography and Geology 6(4)164-198. doi.org/10.5539/jgg.v6n4p164

H1. 2/19/24 Center-pivot irrigation in vicinity of Perry GA and south map
H2. 2/19/24 Distance from Perry GA to Spring Creek FL map
H3. 2/19/24 Approximate distance: Perry GA to Spring Creek FL vs Bulloch Co Ga to Okefenokee Swamp map
H4. 2/19/24 Distance from Bulloch County to ONWR map