United States Department of the Interior
NATIONAL PARK SERVICE
Buffalo National River
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IN REPLY REFER TO
1.A.1 (BUFF)

ELECTRONIC CORRESPONDENCE ONLY

October 24, 2018

Becky Keogh, Director
Arkansas Department of Environmental Quality
5301 Northshore Drive
North Little Rock, AR 72118-5317

Comments Submitted Electronically: Water-Draft-Comment@adeq.state.ar.us

Dear Director Keogh:

Thank you for the opportunity to provide comments on the draft permit denial for C&H Hog Farms, Inc., application # AFIN-51-00164, Permit #5264-W.

I am the superintendent at Buffalo National River (BNR), a unit of the National Park Service (NPS). The BNR was created pursuant to the Buffalo National River Enabling Act of 1972 (P.L. 92-237). It was the first national river designated as a park unit, in recognition of its free-flowing condition and its scenic, scientific, recreational and fish and wildlife habitat values. The NPS is charged with protecting BNR values for the benefit and enjoyment of present and future generations in accordance with Federal law.

The NPS has reviewed the draft permit denial for the facility, and agrees with all points in ADEQ's Statement of Basis for Denial. While the facility is located outside of the boundaries of the BNR, it is within the greater Buffalo River Watershed and its proximity to the river presents a defined risk of contamination to BNR resources. Due to the karst environment throughout the area, there is a demonstrated hydrologic connection between the facility's operations and the Buffalo River. Please consider the following comments as you make a final decision on denying this permit.

General Comments:

- The NPS continues to have serious concerns about the impacts from the operation of C&H on the waters of Big Creek and the BNR. These concerns are confirmed by the ADEQ 2018 draft 303d listing of the Buffalo River and the section of Big Creek

adjacent to the facility and its spreading fields for *E.coli*, and lower Big Creek for dissolved oxygen impairment. As the hydrologic base level of the watershed, the Buffalo River assimilates pollutants from diverse sources within the watershed. The operation of the facility inevitably introduces nutrients and other pollutants into ground and surface waters that are critically important to the continued well-being of the river and the health and safety of those who enjoy its recreational values.

- The Buffalo River is classified as an Outstanding National Resource Water (ONRW), Extraordinary Resource Water (ERW), and Natural and Scenic Waterway (NSW). This makes the watershed a poor setting for the placement of a high volume liquid animal waste storage facility under an NPDES (Regulation 6) or State non-discharge permit (Regulation 5). Karst conditions present persistent waste storage pond leakage and irreversible infiltration of waste products into the groundwater from spreading fields.

Specific Comments:

1. Deficiencies in the Geological Investigation:

The NPS agrees with ADEQ that there are significant deficiencies in the Geologic Investigation of the Facility location and the Waste Application Field locations.

The area where the C&H barns and waste storage ponds sit is on the Boone Formation, a Mississippian-age limestone. The Boone Formation is widespread in northwest Arkansas and is a southern extension of several limestone formations present in Missouri. Anywhere the Boone Formation outcrops should be considered to have a very high likelihood of karst development. Within Buffalo National River, 39% of the caves are found in the Boone Formation, which comprises only 31% of the surface geology. In addition to caves, there are countless sinkholes, sinking streams, and springs present in this karst-intensive geologic formation.

The Animal Waste Management Field Handbook (AWMFH) is based on decades of experience by the Natural Resource Conservation Service, working in diverse landscapes and geologic settings across the United States. Karst areas are locations that present unique challenges to construction, waste pond design, and waste disposal. The AWMFH is an appropriate beginning place to design a facility and its operation in an environment such as the Buffalo River Watershed. The dye tracing performed by Dr. Brahana and his team[1] showed dye travelling long distances from the injection point near spreading field 15 to numerous points along Big Creek and the Buffalo River, both upstream and

[1] Brahana J.V., C. Bitting, K. Kosic-Ficco, T. Turk, J. Murdoch, B. Thompson, and R. Quick. Utilizing fluorescent dyes to identify meaningful water-quality sampling locations and enhance understanding of groundwater flow near a hog CAFO on mantled karst – Buffalo National River, southern Ozarks. 2017. 26 pp.

downstream of Big Creek. This shows there is a high likelihood of pollutants flowing from the facility to the BNR.

Electrical Resistivity Imaging (ERI) by scientists from Oklahoma State University[2] in waste application fields and around the waste storage ponds showed signatures indicating karst features below the soils in the fields as well as below the waste storage ponds. A drilling test by Harbor Environmental[3] indicates areas of lost drilling fluids, highly weathered rock with features consistent with karst development, and loss of grout near the level of the pond invert. This study provided a single data point that appears to validate the Fields and Halihan ERI survey of the waste storage pond area. Ground Penetrating Radar (GPR) studies were conducted for Big Creek Research and Extension Team (BCRET) in November 2013 at two fields. The GPR surveys noted anomalies in the profiles that were indicative of karst features directly beneath the mantle of sediments in fields 1 and 5.

Data from the USGS gaging stations on Big Creek, specifically the gage established below the CAFO and the gage at BUF-T06 indicate the section of Big Creek between these two stations loses discharge during base flow conditions, despite the fact that Left Fork of Big Creek and several smaller tributaries enter the mainstem of Big Creek in this reach. Combine this with the USGS gain-loss survey of the Buffalo River[4] which shows that the Buffalo River gains more than 8 cfs flow from groundwater sources between Big Creek and Lick Creek, about 4 miles downstream, all indications are that any leakage from the waste storage ponds and any downward percolation of contaminants from the waste application fields are highly likely to re-emerge in the channel of the Buffalo River below Big Creek. Water flowing through karst conduits does not get filtered effectively and is not exposed to sunlight. Consequently, there is no attenuation of pollutants. This can expose park visitors to increased risk, cause problems with algal growth, including cyanobacteria or Harmful Algal Blooms (HABs), and adversely impact aquatic fauna through eutrophication and disruption of the physical habitat.

A thorough geologic and hydro-geologic investigation of the facility is required. Without such a review, it is not possible to conduct an Antidegradation Review as required by 40 CFR 131.12(a)(2) as laid out in the EPA Water Quality Handbook, Chapter 4 – Antidegradation, as amended.

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[2] Fields J. and T. Halihan. Electrical resistivity surveys of applied hog manure sites, Mount Judea, Arkansas. 2016. 55pp.

[3] Harbor Environmental and Safety. Drilling Study Report. 2016. 542pp.

[4] Moix M.W. and J.M. Galloway. Base flow, water quality, and streamflow gain and loss of the Buffalo River, Arkansas, and selected tributaries, July and August 2003. United States Geological Survey, Scientific Investigations Report 2004-5274. 2004. 44pp.

2. Water Quality Issues

The National Park Service agrees with ADEQ that there are significant water quality issues associated with the operation of this facility.

The particular waste pollutants from this facility are providing an extensive load of phosphorus, nitrogen, and *E. coli* to the watershed. The Nutrient Management Plan, and Arkansas Phosphorus Index upon which it is based, allow for manure slurry to be applied to fields at rates designed to meet nitrogen needs. This means that the phosphorus is over applied by a large factor with each application. Over time, this phosphorus builds up in the soil bank, becoming what is known as "legacy phosphorus".

Best Management Practices (BMPs) are enacted at agricultural facilities to help limit their direct impact to receiving waters; however, current research (Hamilton 2011[5]; Meals et al. 2010[6]) suggest a lag-time response of many streams (and no response in others) from implementation to measurable results. One paper of particular interest (Jarvie, et al. 2013[7]) notes that long-term monitoring, measured by decades, will likely be necessary to capture the responses (both water quality and ecologically) to the implementation of BMPs. Of particular interest to the current permit is an article by Jarvie, et al. 2014[8] measuring the retention and remobilization of phosphorus in karst terrain. The authors report that the karst terrain of an experimental watershed in northwest Arkansas has the ability to retain high amounts of phosphorus within the karst drainage (noted as a phosphorus sink); however, they also caution once this source is remobilized, it may become a long-term source of legacy phosphorus to surface waters. The lack of a response of water quality or biota to the current nutrient loading of C&H may not indicate that a problem does not exist (even though 4 stream sections are being proposed as impaired in the 2018 Integrated Water Quality Monitoring Report); however, it might be a sign that the soil and karst environments have not been saturated to allow excess nutrients (mainly nitrogen and phosphorus) to begin leeching to surface water. If this is allowed to occur, given the above-mentioned articles, recovery may take decades, or worse, create an irreversible altered state (Carpenter et al. 1999[9]). Waiting for data to

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[5] Hamiliton, S.K. Biogeochemical time lags may delay responses of streams to ecological restoration. Freshwater Biology. 2011 DOI:10.1111/j.1365-2427.2011.02685.x

[6] Meals, D.W., S.A. Dressing, and T.E. Davenport. 2010. Lag time in water quality response to best management practices: a review. J. Environ. Qual. 39:85-96.

[7] Jarvie, H.P, A.N. Sharpley, P.J.A. Withers, J.T. Scott, B.E. Haggard, and C. Neal. 2013. Phosphorus mitigation to control river eutrophication: murky waters, inconvenient truths, and "postnormal" science. J. Environ. Qual. 42:295-304.

[8] Jarvie, H.P., A.N. Sharpley, V. Brahana, T. Simmons, A. Price, C. Neal, A.J. Lawlor, D. Sleep, S. Thacker, and B.E. Haggard. Phosphorus retention and remobilization along hydrological pathways in karst terrain. Environ. Sci. Technol. 2014. Dx.doi.org/10.1021/es405585b

[9] Carpenter. S.R., D. Ludwig, and W.A. Brock. 1999. Management of eutrophication for lakes subject to potentially irreversible change. Ecol. Appl. 9:751-771.

show degradation of the environment to begin remediation does not fit with the purpose of the Clean Water Act or the Antidegration Policy in Regulation 2.

3. Aquatic Threatened and Endangered Species Issues

Buffalo National River provides habitat for the Threatened Rabbitsfoot mussel (*Quadrula cylindrica cylindrica*) and the Snuffbox mussel (*Epioblasma triquetra*). The Buffalo River from the mouth of Cove Creek near Erbie to the U.S. Route 65 crossing at Grinder's Ferry is Critical Habitat for the Rabbitsfoot mussel. Nutrient loading of streams is one of the primary threats facing the Rabbitsfoot mussel[10] Nutrient loading is exacerbated by the addition of Zinc (Zn) and Copper (Cu) in swine rations to increase growth rates. The application of effluent enriched in these plant micro-nutrients can cause accumulation in sandy soils.[11] Up to 95% of the Cu ingested by swine is passed through and excreted, with much of it being in a readily soluble form.[12] Juvenile freshwater mussels are particularly sensitive to Cu enrichment of water.[13]

4. Terrestrial Threatened and Endangered Species

BNR is home to four species of bat listed as Threatened or Endangered. The Gray bat (*Myotis grisescens*) was first listed in 1976. The Gray bat utilizes subterranean habitats year around for roosting, hibernation, and rearing of young. One of the sites where the bat roosts is John Eddings Cave, which was also a location where fluorescent dye from one of the groundwater traces conducted by Brahana et al. was detected. The Gray bat specializes in capturing emergent aquatic insects from streams and large ponds and lakes. The Buffalo River is an undammed 152 mile resource for this species. Contamination of the roost cave with waste from the CAFO has the potential to have impacts upon this confined space. Contamination of the Buffalo River has the potential to have even greater impacts upon this species' survival. An additional Gray bat cave is located along Big Creek, not far from the confluence with the Buffalo River. *Ephemeroptera*, *Plecoptera*, and *Tricoptera* are very important to the diet of Gray bats[14] Pollutants can

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[10] Butler RS. 2015. Status assessment report for the Rabbitsfoot, *Quadrula cylindrica cylindrica*, a freshwater mussel occurring in the Mississippi River and Great Lakes Basin. Research April 2015. DOI: 10.13140/RG.2.1.3065.4883. 208 pp.

[11] Novak J, AA Szogi, and DW Watts. Copper and zinc accumulation in sandy soils and constructed wetlands receiving pig manure effluent applications *in* Trace elements in animal production systems. pp. 45 - 54

[12] Schwarz MS, KR Echols, MJ Wolcott, and KJ Nelson. 2004. Environmental contaminants associated with a swine concentrated animal feeding operation and implications for McMurtrey National Wildlife Refuge. United States Fish and Wildlife Service. 98 pp.

[13] Wang N, CG Ingersoll, IE Greer, DK Hardesty, CD Ivey, JL Kunz, WG Brumbaugh, FJ Dwyer, AD Roberts, T Augspurger, CM Kane, RJ Neves, and MC Barnhart. 2007. Contaminant sensitivity of freshwater mussels: Chronic toxicity of copper and ammonia to juvenile freshwater mussels (*Unionidae*). Environmental Toxicology and Chemistry, V26, N10, pp2048-2056.

[14] Brack Jr. V and RK LaVal. 2006. Diet of the gray Myotis (*Myotis grisescens*): Variability and consistency, opportunism, and selectivity. Journal of Mammalogy V87, N1. pp. 7-18.

reduce species richness of taxa from these three groups, potentially resulting in adverse impacts to the Gray bat. This is an impact that is additional to the impacts from climate change and White Nose Syndrome (WNS). BNR is close to the southern edge of the range for the Gray bat, changing climate is likely to push this range northerly where it may be difficult for the species as a whole to find adequate numbers and distribution of suitable roost sites. WNS is a disease that effects cave dwelling bats. At the current time, it does not seem to be adversely impacting the Gray bat in Arkansas, but reductions in diet variety and abundance may change the current equation.

5. Primary Contact Recreation and Impairment of Scenic Values

Pollutants flowing down Big Creek and reaching the Buffalo River via groundwater pathways have apparently impaired the Buffalo River for *E. coli*. In addition the 'unique scenic and scientific features' which the national river was established to conserve have been negatively impacted by algae production in the river. The long-term impact of nutrients washing off the fields at C&H Hog Farm, particularly nitrogen and phosphorus compounds, have the potential to become chronic additions to the soil surface leading to continued impairment of adjacent stream segments and the length of time the impairment will last.

The NPS agrees with the actions of ADEQ to deny this permit. We have a continuing interest in working with you to ensure that there are no negative impacts to the water and air quality of BNR, a resource of great concern. It is critical that BNR receive the utmost consideration and permanent protection from activities determined to threaten this exceptional water resource. Should you have any questions, please direct them to Mark Foust, Superintendent, at 870-365-2732, or mark_foust@nps.gov.