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Presentation before Arkansas Pollution Control and Ecology  
Commission, April 29, 2016 by Richard Mays on behalf of the  
Buffalo River Coalition

We are here today to alert the Commission to information which, while collected over a year ago, is just now coming to light. There is evidence that there has been and continues to be a possible release of contamination beneath the C&H hog farm.

Slide 2:

This evidence is in the form of an Electrical Resistivity Imaging (ERI) study done in March 2015 by Dr. Todd Halihan of Oklahoma State University under contract with the Big Creek Research and Extension Team and Cooperative Extension Service.

In October of 2015, Tim Kresse, a water quality specialist with the USGS and a member of the BCRET, sent an e-mail to BCRET team leader Dr. Andrew Sharpley which stated in part :

***“...it would be nice to put a well on the west side in the vicinity of where Todd believed he saw a major fracture and movement of waste. This could be critical to resolving the interpretation of the resistivity data. Todd would be willing to assist on getting the drilling done for free.” .... “Todd is fairly confident of his interpretation”***

When the Alliance received a copy of this email in January 2016 in response to a Freedom of Information Act request, red flags went up.

### Slide 3:

- ERI is a geophysical technique for imaging sub-surface structures based upon electrical resistivity measurements made on the surface.
- The Transects, such as shown here, are two dimensional images approximately 300 ft wide and 90 ft deep.

The studies were conducted on application fields (an example of which is in this slide) and under the facility itself to determine the nature of the underlying substrata, such as karst, through which hog wastes might flow. This was done in connection with the monitoring effort under the BCRET Memorandum of Agreement with ADEQ.

### Slide 4:

This color scale represents the range of electrical conductivity shown on the transects.

Grey represents solids such as bedrock while violet suggests conductive material such as soils or fluids with high salinity.

According to the OSU study, hog wastes have the possibility of providing a more electrically conductive signature. Thus, hog wastes would likely appear in a purple or blue color, depending on the concentration.

### Slide 5:

In addition to the 3 C&H fields, OSU also examined the area around the C&H waste storage ponds and 4 ERI transects were conducted as shown on this slide.

### Slide 6:

This slide shows the transect on the North end of the ponds.

Slide 7:

This is the East side of the ponds and begins to show high conductivity signals (purple) extending some 40 feet beneath the surface .

Slide 8:

This is the Southern end of the ponds and shows much deeper penetration of high conductivity signals to as deep as 60' and a possible flow channel (shown in blue).

Slide 9:

This image was taken on the West side between the ponds and the barns and shows even deeper penetration of high conductivity signals, extending deeper than 90' and reveals the possible “major fracture and movement of waste” attributed to Dr Hallihan in the quote from Tim Kresse.

Slide 10:

Because neither OSU nor BCRET offered any further explanation of this concerning information, the Alliance sought independent expert opinions. Dr Christopher Liner, a geophysicist at the U of A states,

*“In my opinion, interpretation of the holding pond data implies ground water contamination to a depth of at least 120 ft, most logically from leakage of the hog manure storage pond. According to the Arkansas state geology map, the Mount Judea area is underlain by the Mississippian Boone limestone formation. This introduces the possibility of rapid and distant groundwater transport through weathered limestone pathways.”*

And noted geologist Tom Aley also states, *“In my professional opinion the resistivity profiles in the vicinity of the hog manure ponds and the comments by Tim Kresse are a matter of significant*

*concern. The data strongly suggest that there is appreciable leakage downward out of the manure ponds. Such leakage not only introduces pollutants into the groundwater system but in this karst setting may also lead to subsidence or collapse of the ponds. At a minimum the data indicate that an adequate drilling program is needed prior to the installation of a liner in the ponds. Such a program is in the interest of C&H Hog Farm, various state and federal agencies, and those people and groups concerned with the protection of the Buffalo National River.”*

Slide 11:

These transects represent evidence of potential contamination being released from the hog farm. This raises the following questions:

1. Do these transects represent evidence of karst including possible weak areas beneath the ponds?
2. Why were no subsurface drilling samples taken to provide definitive interpretation of the transects? OSU offered to drill for free.
3. When did BCRET become aware of this information?
4. Has ADEQ been informed?
5. Why was this data and the risk it represents not mentioned in the federal agencies' Environmental Assessment or the BCRET Quarterly Reports?

Slide 12:

**The Coalition requests these actions by the Commission and ADEQ**

1. Immediately halt farm operations until an investigation can evaluate possible damage or risk of damage.
2. Immediately halt the ADEQ permitted installation of pond liners. Tom Aley stated, “*A thin synthetic liner lacks the*

*strength to span even a relatively small subsidence or sinkhole feature”*

3. Immediately order subsurface drilling to complete a definitive assessment of geologic conditions beneath the ponds. Dr. Liner states, “*It should be noted that interpretation of resistivity data is subjective until calibrated with soil and drilling measurements, which were not available in this case.*”

Drilling and analysis should be performed by the OSU Team or by an independent third party competent in the field and results should be promptly released to the public.

4. Instruct BECRET to promptly and fully disclose to ADEQ and the public any and all evidence that it may now or in the future have of any release or potential for release from the facility.

The Buffalo River Coalition is hopeful that by bringing this information to your attention you will take prompt action to require a thorough investigation and ensure that corrective and protective measures are implemented before further damage is done. To do less could be viewed by the public as negligence.

References:

Big Creek Research an Extension Team ERI Page:

[http://www.bigcreekresearch.org/electrical\\_resistivity/](http://www.bigcreekresearch.org/electrical_resistivity/)

Comments from Dr. Chris Liner, geophysicist, and Tom Aley, geologist:

*“To Buffalo River Watershed Alliance*

*Thank you for asking me to look at the geophysical resistivity survey report and data publicly available on this web site:*

[http://www.bigcreekresearch.org/electrical\\_resistivity/](http://www.bigcreekresearch.org/electrical_resistivity/)

*The report describes resistivity surveys undertaken between Dec*

*2014 to March 2015 on agricultural fields in the area of Mount Judea, Arkansas. Resistivity measurements primarily respond to water quality. Pure water is highly resistive, while water contaminated with metals, salts or other dissolved solids has lower resistivity. Resistivity above 50 Ohm-m is often used as an indicator of potable water (safe for drinking by humans). Observations of resistivity below 50 Ohm-m can be an indicator of water quality problems.*

*The agricultural field surveys in the report (figures 12-16) show resistivity values above 50 in all cases, except a controlled test in which a field was treated with hog manure as fertilizer (figure 17). In the manure test, resistivity fell below 50 at various locations along the survey line from surface to maximum depth of 8 m (24 ft). These results are discussed in the report.*

*Also on the web site is data from four resistivity transects performed on the perimeter of a hog manure holding pond nearby. One transect (110) shows resistivity consistent with the untreated fields described in the report. However, three of the holding pond transects (107,108,109) show significant subsurface regions with resistivity values below 50 Ohm-m at depths up to 40 m (120 ft). Since deep high-resistivity features are not observed in nearby fields as described in the report, it seems unlikely that the holding pond high-resistivity zones are caused by natural soil or geological variations.*

*In my opinion, interpretation of the holding pond data implies ground water contamination to a depth of at least 120 ft, most logically from leakage of the hog manure storage pond. According to the Arkansas state geology map, the Mount Judea area is underlain by the Mississippian Boone limestone formation. This introduces the possibility of rapid and distant groundwater transport through weathered limestone pathways.*

*It should be noted that interpretation of resistivity data is subjective until calibrated with soil and drilling measurements, which were not available in this case.*

*Best regards,*

*Prof. Christopher Liner  
Maurice F. Storm Endowed Chair  
Department of Geosciences  
University of Arkansas”*

Statement from Tom Aley:

*“I have reviewed your proposed Power Point presentation for an upcoming Arkansas Pollution Control and Ecology Commission meeting and find it technically understandable. In my professional opinion the resistivity profiles in the vicinity of the hog manure ponds (developed by Dr. Todd Halihan, School of Geology, Oklahoma State University) and the comments by Tim Kresse are a matter of significant concern. The data strongly suggest that there is appreciable leakage downward out of the manure ponds. Such leakage not only introduces pollutants into the groundwater system but in this karst setting may also lead to subsidence or collapse of the ponds. At a minimum the data indicate that an adequate drilling program is needed prior to the installation of a liner in the ponds. Such a program is in the interest of C&H Hog Farm, various state and federal agencies, and those people and groups concerned with the protection of the Buffalo National River.*

*You are welcome to share my professional*

*opinions with others as you wish.*

*Sincerely,*

*Tom Aley, Arkansas Professional Geologist #1646  
President, Ozark Underground Laboratory, Inc.”*