Response to the Expert Panel Review of the BCRET Project

We greatly appreciate the Review Panel's time and effort spent reviewing our Big Creek Research and Extension Team's Project at Mt. Judea. Your visit to the sites, meeting with Project personnel, and preparing a detailed report has been very helpful to our project. A response to the comments and suggestions raised in your report is given below detailing how the Team will address them.

A. **Potential Leakage from the Waste Storage Ponds:** We agree that the potential for leakage of manure from the storage ponds needs to be closely monitored. To address this we will install a trench downslope of the storage ponds that will intercept any subsurface flow of leakage moving along a restricting or less permeable layer. See Figure 1 for site plans. Initial soil coring reveals a natural cherty layer about 48 inches deep in the profile. Digging a trench below this depth will enable more precise characterization of this, and any other relevant low-permeability features. Once identified, a metal plate will be positioned on the profile just below the preferential flow layer to ensure water is intercepted and collected in a perforated pipe, taking flow to a downslope sampling point. Depending on site conditions, it is envisaged that this trench will be approximately 30' to 40' long and 6' deep. The perforated pipe will be embedded in pea-sized gravel and the top foot of the trench backfilled with soil. This trench collection system has been widely used to monitor shallow subsurface flows in karst systems and USGS have successfully installed one locally in the past to monitor leakage from a swine lagoon. We feel this approach is more technically rigorous to detect and collect seepage than installing single-point wells downslope of the waste storage ponds. Installation will be complete by the end of July. An inventory of karst seeps or springs immediately down slope of the storage ponds will be conducted. These karst features represent natural emergence points where integration of flow occurs and will offer additional sampling points for detecting potential leakage.

B. **Pond Water Balance:** The panel recommended conducting a short-term detailed water balance of the storage ponds. Given precision limits for the various direct and indirect measurements needed to estimate the seepage loses and the fact that the ADEQ's design criteria is 5000 gal/ac/day which is the same as 0.0013 in/day, we are concerned that a detailed water balance determination is not appropriate at this time. Rather the trench collection system will be used to test soil water for indications that it is seeping from the ponds. If these results indicate the need they and a rough water balance based on precipitation and pumping records will be used to reassess the feasibility of a detailed measured water balance for the storage ponds.

C. **Effects of Land Application:**

(i) We plan to conduct a water quality inventory along the reach of Big Creek between up and downstream sampling points this summer and fall with sondes continually determining water temperature, pH, dissolved oxygen, and turbidity. At the same time, USGS Hydrogeologists will conduct a visual survey for any obvious springs along the near stream areas of Big Creek.

(ii) While a detailed land use surveys to determine field management practices in the Big Creek Watershed is a laudable recommendation, it is outside the scope of our "charge." Voluntary

participation in such as survey by farmers in the watershed would likely be minimal given the public scrutiny of the project and Arkansas's Freedom of Information requirements. However, an aerial land-use survey will be conducted in the main watershed to determine the areas under pasture and forest.

(iii) Seepage survey: we plan to conduct such a survey, led by the USGS Hydrogeologists on the Team and recruited University of Arkansas Geology students.

(iv) Rating curves for both up and downstream monitoring and water sampling locations are in development. This has been contracted to USGS.

(v) Tracer studies with multiple dyes will be conducted on known sink holes on permitted monitoring fields (i.e., Fields 1, 5a, and 12) and on the losing reach of Big Creek, while this will identify surface and subsurface flow connectivity, it does not relate to current manure management practices, which broadcast slurry to pastures.

D. **Dry Creek Monitoring:** Plans are underway to monitor flow and collect base and stream flow samples where Dry Creek enters Big Creek. Installation should be completed by the end of July. Dry Creek contains approximately 1/3 of the fields permitted to receive manure that are more distant from Big Creek but drain into Dry Creek and ultimately to Big Creek.

E. **Electrical Resistivity Measurements:** We do plan to contract with experts to conduct electrical resistivity measurements that can identify subsurface flow pathways with minimal surface disturbance, more accurately than ground penetrating radar already conducted. This is planned for before and after a manure application; ideally in the fall or spring when forage height is minimal.

F. **Nutrient Buildup:** The detailed grid-soil sampling (0.25 acre grid) will be conducted annually in late fall or early winter for each monitored permitted field (i.e., Fields 1, 5a, and 12).

G. **Bacterial Source, Isotope or PCR Tracking:** We agree that these methods are time consuming and prohibitively expensive, as well as being research tools that might qualify but not quantify sources, and we will consider them, along with the measurement of antibiotics and hormones, if and when elevated contaminant levels are found at a specific location.

H. **Supplemental Chemical Parameter Measurement:** Will be considered on an as needed basis and with funding availability. A Master's Student has been enlisted to conduct a survey of the biological and nutrient status of several waters in the Buffalo River Watershed, including Big Creek at the downstream sampling station.

I. Storm-Event Sampling: Is now occurring at all water quality monitoring sites; Big Creek up and downstream of the C&H Farm, surface runoff from Fields 1, 5a, and 12, culvert draining the subwatershed draining the production houses and manure storage ponds. We collaborated with USGS to continuously monitor nitrate concentrations in Big Creek downstream of the C&H Farm.

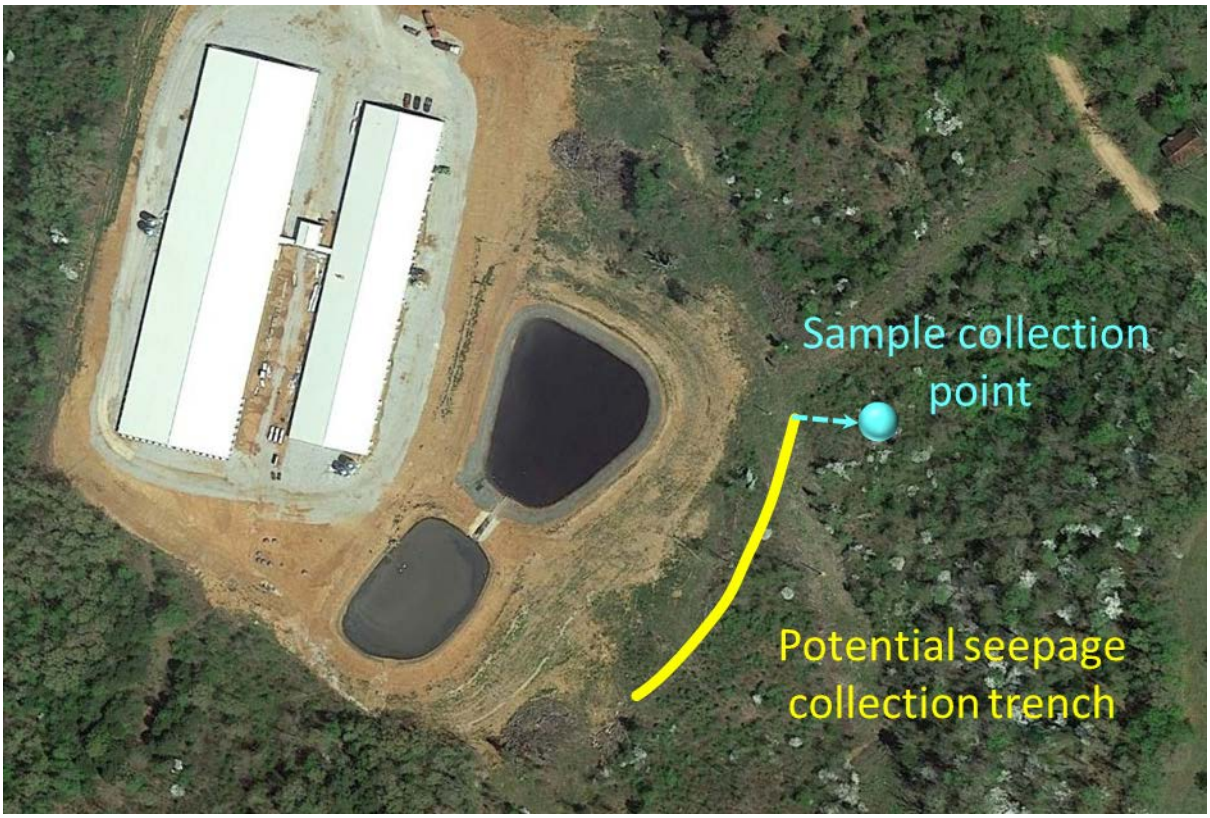

Figure 1. Plan of possible site of seepage monitoring trench.