ADEQ
ARKANSAS
Department of Environmental Quality

January 14, 2010

Claudia Hosch (6WQ-P)
Associate Director
U.S. Environmental Protection Agency
1445 Ross Avenue
Dallas, TX 75202-2733

Re: Comments on the Memorandum for Model Selection for the Illinois River TMDL in AR/OK

Dear Ms. Hosch:

The Arkansas Department of Environmental Quality (ADEQ) would like to thank Region 6 Environmental Protection Agency (EPA) for allowing us to review and provide comments on Aqua Terra's November 22, 2010 draft "Model Selection for Illinois River Memorandum" (the Memo). Up to this point, EPA has responded only to comments on draft documents during conference calls. In an effort to provide clarity on the decisions that are made going forward, ADEQ requests EPA to provide written responses to our comments. We also ask EPA to notify us when draft documents are finalized.

The following comments have been developed with Arkansas stakeholders, including Rogers Water Utilities (Tom McAlister, Director) and consultants to Rogers Water Utilities, including Professor Marty Matlock, P.E., of the University of Arkansas, Professor Larry Roesner, P.E., of Colorado State University, and Wright Water Engineers, Inc., of Denver (Jonathan Jones, P.E., D.WRE, and Jane Clary, CPESC, LEED AP). Our comments include general and specific comments on the draft Model Selection Memo, as well as issues that we believe must be addressed in the forthcoming Model Simulation Plan. We hope these comments foster the information exchange necessary to ensure the usefulness of the models selected. Throughout this process, we will continue to emphasize that model outcomes are dependent upon the comprehensiveness and accuracy of the data utilized in calibrating and validating the models, and more importantly the capability of the models to simulate current conditions in the watershed for purposes of TMDL development.

Model Selection Memo

In general, we concur that the models selected in the Memo appear to be appropriate for the Illinois River Watershed, given the advantages and disadvantages characterized in the report. The selection of the Hydrological Simulation Program – Fortran (HSPF), integrated into BASINS, for watershed modeling is reasonable if the calibration and validation processes are transparent and well documented and funded at a level to enable Aqua Terra to conduct the analysis with full rigor.

The selection of Environmental Fluids Dynamic Code (EFDC) for lake modeling is reasonable for lake hydrodynamics and water quality simulation. This model would be most advantageous in three-dimensional analysis; however, detailed bathymetry and sectional monitoring of Lake Tenkiller have not been conducted for more than 15 years. The sediment and nutrient regimes of the riverine, transitional, and lacustrian zones have changed in that time period. These data are critical for understanding and modeling the ecological productivity and hydrogeobiochemical elements in EFDC when analyzed at three dimensions. Adequate time and resources should be allocated to this project to obtain the needed data.

We submit the following specific questions and comments associated with the Model Selection Memorandum, followed by comments addressing important issues associated with the forthcoming model simulation plan, data adequacy and the inclusion of Lake Tenkiller in the modeling effort.

1. Page 1, Third Paragraph: This paragraph describes changes that have occurred in Arkansas related to "fast-growing urban areas" and "intensive agricultural animal production." Have there been changes in Oklahoma that should be similarly described? Further the geomorphological characteristics of the Illinois River in Arkansas are vastly different than the geomorphological characteristics of the Illinois River in Oklahoma. These differences should be characterized in the Memo.

2. Page 1, Fourth Paragraph: This paragraph notes the Illinois River in Arkansas is not listed as impaired for Total Phosphorus (TP) but states "several" tributaries to the Illinois River in Arkansas are impaired for TP and lists three examples (which happen to be the only examples possible). ADEQ has on numerous occasions maintained that these three tributaries have met and currently meet all their designated uses, and these tributaries have not been included on any Impaired Water Bodies List through an independent action of ADEQ. EPA added these three segments to Arkansas' previous 303(d) lists and supported its listing of these streams for TP by comparing ambient monitoring data with the national criterion for TP. However, neither ADEQ nor EPA has adopted this national criterion as the numeric water quality standard for TP. Arkansas' water quality standards contain a narrative nutrient standard—not a numeric TP standard. Consequently, the Memo should be revised to reflect that, prior to the 2010 303(d) list, three (not "several") streams were added by EPA to Arkansas' 303(d) list and, furthermore, it has been demonstrated through an intensive two year study concluding in 2009 that two of those tributaries (Osage and Spring Creeks) meet all designated uses and are not impaired by TP.

3. Page 5, Third Paragraph: The report references the "Illinois River Watershed Partnership Watershed Management Plan." How does Aqua Terra currently envision that this watershed management plan will interface with the development of models to support the TMDL?

4. Page 28., #5: How will cyanobacteria be addressed since EFDC does not simulate cyanobacteria?

Model Simulation Plan

While the models selected are considered reasonably appropriate for modeling conditions in the basin, the usefulness of these models will be contingent on the proper use of the most recent existing data, model calibration and validation, and explicit incorporation of uncertainty for modeling results. While these issues are anticipated to be addressed in the forthcoming Model Simulation Plan, the following comments are provided to EPA to aid in the preparation of that plan.

1. It will be important to document how agricultural loadings and BMP practices are being simulated in the HSPF model.

2. Page 7, Table 2.2 states that Basins/HSPF can provide "detailed instream routing and WQ processes, including sediment-nutrient interactions." Similarly, page 13 states, "The sediment transport and instream water quality capabilities of HSPF provide a better process-based representation of the fate and transport processes for nutrients, including phosphorus, along with sediment-nutrient interactions and scour/deposition impacts with the sediment bed. This is expected to provide an improved simulation of both point source and nonpoint source contributions of phosphorus both to the OK/AR state line and to Lake Tenkiller." Can these sediment-nutrient interactions and scour/deposition processes be accurately simulated in the Illinois River Watershed? We believe this is an important issue, given that much of the phosphorus movement will be in association with sediment. We request EPA to provide more information regarding how this will be accomplished in the Model Simulation Plan.

3. Pages 12 and 13, Bullet Points Comparing HSPF and SWAT Models: Ability to model karst topography is not included in this list. Will HSPF be able to adequately incorporate surface water/groundwater interactions and are there enough data to provide calibration and validation of this important factor? We request EPA to further describe how this issue is addressed in the Model Simulation Plan.

4. The minimum level of rigor for allocation of loads in a complex watershed TMDL should be calibration and validation over the range of expected outcomes. A suite of calibration metrics should be applied to analyze these processes: hydrology (base flow and storm conditions) and water temperature (indicator of groundwater and interflow calibration) at each USGS gauging station; land-based constituent loading parameters; in-stream processes including sediment and nutrient biochemical processes; and biotic processes, including chlorophyll density and concentrations.

5. Both models should be calibrated and validated across conditions that bracket existing and expected future conditions, to the extent feasible. Using a model to predict a parameter or condition outside the range of calibration is not an appropriate level of rigor, given the substantial potential investments that may be necessary to reduce loads as a result of model outcomes. The challenge for Aqua Terra in the Illinois River Watershed is that conditions have been changing significantly for the last 10 years. Phosphorus

loads from point and nonpoint sources have been decreasing, sediment loads predominantly from hydrologic regime alteration have been increasing, and stream bed sediment and gravel loads have been increasing, while size has been decreasing. Riparian cover has decreased across the upper Illinois River Watershed. Calibration and sensitivity analysis using data from before 2004 will not represent the current and future condition of this ecosystem.

6. Sensitivity analysis should be performed for both models as part of the calibration and validation process. The most sensitive input variables that impact the outcome parameters of concern should be characterized for each of the bracketed conditions. The relative sensitivity of each input variable should be stable across simulated conditions.

7. Uncertainty analysis should be performed to determine the variability and uncertainty in model outputs associated with variability and uncertainty in model inputs. Without uncertainty analysis, the utility of the model to predict outcomes for critical parameters is compromised. Any remediation strategy should predict outcomes that are significantly different from current conditions. Failure to predict significant changes in outcome parameters undermines the utility of the model for policy development.

8. For the reservoir modeling, the simulation plan should address reservoir operations and management options as part of the long-term strategy for protecting lake water quality.

ADEQ emphasizes the critical importance of the proper use of existing data, model calibration and validation, and performing the sensitivity analysis and uncertainty analysis. We highlight the importance of all these steps, in part, due to a statement made in the "Quality Assurance Project Plan Water Quality Modeling and TMDL Development for the Illinois River Watershed" (Aqua Terra December 15, 2009). This document acknowledged the need to consider sensitivity analysis and uncertainty analysis, but qualified this need with the caveat, "Subject to the concurrence of the EPA WAM and subject to budget limitations..." **Limited time and resources must not impede the proper development, calibration, and validation of the HSPF model**. We ask EPA and Aqua Terra to review the existing schedule and budget to determine whether the proposed schedule and funding are adequate to accomplish the goals of the project—that is, to develop reliable hydrologic and water quality models for this extensive and complex hydrologic area, including a large reservoir. If schedule and budget are not adequate, we ask EPA and Aqua Terra to determine how much additional time and funding are required to adequately accomplish the project goals or how this project can be modified to ensure the proper development, calibration and validation of the watershed model.

We believe the project schedule provides that a draft "Simulation Plan" will be available within four to six weeks. ADEQ respectfully requests adequate time to review this very important document with the Arkansas stakeholders. Accordingly, we ask that a minimum of six weeks be provided for review and comment on that document

Data Adequacy Issues

On page 28 of the Memo, Aqua Terra states, "We believe that adequate data are available to support application of either [lake] model." ADEQ previously provided to EPA comment letters from Arkansas stakeholders raising concerns about data adequacy for model development and

calibration (see Attachments 1 and 2 to these comments) Formal responses to these comments have not been provided by EPA, so it is not clear how these issues are being resolved. These data adequacy issues are not repeated in this comment letter, but remain substantial concerns. Irrespective of which models are selected, there must be adequate physical, chemical and biological data to assure that the models realistically represent the Illinois River, its major tributaries and Lake Tenkiller. Representative areas of concern include:

1. Use of current land use conditions, particularly given significant changes in land use in recent years and changes projected to occur in the coming years.

2. Use of the most current and comprehensive water quality data (see specific comments in Attachments 1 and 2). The project should reflect current water quality conditions, including recent data, and not rely on historical data or extensively on reference stream data.

3. Use of the most reliable rainfall source, which is believed to be NexRad.

4. Use of an appropriate data quality screening process.

5. Full consideration and incorporation of all nutrient sources around Lake Tenkiller in Oklahoma, in addition to those addressed for the main stem of the Illinois River.

Lake Tenkiller

As a final point, it seems important to again address the issue of Lake Tenkiller. Although including the lake was contemplated in the Project plan, modeling Lake Tenkiller appears to be an entirely separate project from the Illinois River TMDL. The lake's inclusion is important for Oklahoma, but this modeling effort seems to range far beyond the scope of EPA's Illinois River TMDL and may divert limited resources needed to achieve the Project's objectives. ADEQ has previously indicated that it has no objection to including Lake Tenkiller (see attached December 1, 2010 letter), assuming the results of that modeling effort have no impact on the Arkansas portion of the Illinois River. However, if modeling the lake consumes scarce resources needed to achieve reliable watershed modeling results for TP in the Illinois River, then the lake modeling may have unintended adverse impacts on Arkansas. In short, if time and financial constraints require the Project to be modified, a logical place to "cut-back" would be in the lake modeling. It has been our understanding that the purpose of the Illinois River TMDL Project was to address the impairment in the Oklahoma portion of the Illinois River due to the exceedance of the 0.037 mg/L *total phosphorus standard* established for Oklahoma's Scenic Rivers. The Scenic River designation for the Illinois River ends at the confluence of Baron Fork (upstream of Lake Tenkiller). Lake Tenkiller is neither a Scenic River nor does it have any applicable total phosphorus water quality standard. Furthermore, Lake Tenkiller is not listed on Oklahoma's 303(d) list as impaired for TP. For these reasons, the lake modeling would appear to be outside the scope of EPA's proposed Illinois River TMDL Project and should not be included if doing so diverts limited resources from the principal project purposes. For clarification, we ask EPA to explain how the Lake Tenkiller water quality standards interface with the 0.037 mg/l TP goal (at the state line).

Again, we thank you for the opportunity to provide comments and look forward to working with EPA as it proceeds to finalize the Model Selection Memo and begins drafting a Simulation Plan. If you have any questions concerning these comments, you can contact me by phone at (501) 682-0629 or by email at the following address: bailey@adeq.state.ar.us

Sincerely,

John Bailey, P.E.
Permits Branch Manager, Water Division

Attachments:

1. January 6, 2010 Letter from 2010 Letter to Mr. John Bailey, Arkansas Dept. of Environmental Quality from Tom McAlister, Rogers Water Utilities Regarding Comments on the Draft Illinois River Phosphorus TMDL QAPP.

2. August 30, 2010 Letter to Mr. John Bailey, Arkansas Dept. of Environmental Quality from Tom McAlister, Rogers Water Utilities Regarding Comments on Draft Preliminary Data Review and Analysis for Water Quality Modeling and TMDL Development for the Illinois River Watershed.

3. December 1, 2010 Letter to Miguel I. Flores, USEPA Region 6 from J. Ryan Benefield, P.E., Deputy Director, ADEQ Regarding EPA's Illinois River TMDL Project.

cc: Teresa Marks, Director, ADEQ
Ryan Benefield, P.E. Deputy Director, ADEQ
Steve Drown, Water Division Chief, ADEQ
Sarah Clem, Water Quality Planning Branch Manager, ADEQ
Robert George, V.P. & Associate General Counsel, Tyson Foods, Inc.
J. Randy Young, P.E., Executive Director, ANRC
Tom McAlister, Director, Rogers Water Utilities
Steven A. Thompson, Executive Director, Oklahoma Department of Environmental Quality
J.D. Strong, Water Board Director, Oklahoma Water Resource Board
Tom Elkins, Administrator for Cherokee Nation Environmental Programs, Cherokee Nation
Brandi Ross, Natural Resources director, United Keetoowah Band

ROGERS WATER UTILITIES

"SERVING ROGERS - PROTECTING THE ENVIRONMENT"

January 6, 2010

Mr. John Bailey
Arkansas Department of Environmental Quality
ADDRESS
CITY STATE ZIP

Re: Comments on the Draft Illinois River Phosphorus TMDL QAPP

Dear Mr. Bailey:

Rogers Water Utilities has retained Wright Water Engineers, Inc., (WWE) to review and comment on the December 15, 2009 version of the document entitled "Quality Assurance Project Plan Water Quality Modeling and TMDL Development for the Illinois River Watershed," (draft QAPP) prepared by Aqua Terra Consultants of Mountain View, California. WWE was joined in this review by Professor Marty Matlock, Ph.D., P.E., CSE, of the University Arkansas-Fayetteville, and Professor Larry Roesner, Ph.D., P.E., D.WRE of Colorado State University. The purpose of this letter is to summarize our major comments on the draft QAPP. Rogers Water Utilities would urge ADEQ to include these comments in its comments on the draft QAPP.

The draft QAPP is well written—the text is clear and logical. There are many valuable components of quality assurance proposed, and many EPA and Aqua Terra staff have been assigned to promoting quality in the overall project. Aqua Terra is highly qualified to perform the necessary modeling, and apparently has prior experience in the Illinois River watershed. The QAPP indicates that Aqua Terra may bring in additional consultants to assist them, which could be valuable. The four models that are currently under consideration for this TMDL are, in a general sense, appropriate, although our review team offers some comments (below) on potential model limitations. The QAPP appropriately emphasizes the importance of proper model calibration and validation, and specifies performance criteria. The QAPP indicates that wide-ranging data sources will be reviewed, which is essential.

We turn now to potential concerns and recommendations for the draft QAPP.

Page 1, 4th Paragraph—Is the scope of this effort limited to watershed model development or does it also include applying the model to determine any necessary point and nonpoint source phosphorus reductions?

Page 3, Section 2, provides four Project Quality Assurance/Quality Control Goals for the project. These goals are critical for legitimate policy development from complex modeling activities. However, the QAPP does not provide an explicit description of how each goal will be accomplished. For example, the goal of "Transparency" implies participation from stakeholders throughout the process.

No mechanism has been proposed to engage stakeholders in this process, other than EPA and state agencies. The municipalities whose NPDES permits will be affected do not have a voice in this process. The Cherokee Nation, which has unambiguous jurisdiction over the Oklahoma portion of the Illinois River, does not have a voice in this process. The legitimacy of the analysis is dependent upon some level of direct participation and agreement to the process by the major stakeholders.

Page 3, Section 2–One of the stated goals for the work assignment is "Transparency." The text indicates that the documentation will make it clear which sources of data are used. It would be helpful if the documentation could also indicate which potential data sources were not used.

Page 8, Section 4.3, concerning "Dispute Resolution"–The QAPP notes that there will be "open and frank communication among members of the quality and technical staff." Although this will be important, what about open and frank communication with representatives of the state agencies and with outside parties who can offer important perspectives and data and who will be affected by the ultimate outcome of the TMDL?

Page 9, Section 5.0 "Project/Task Organization"–The first paragraph states that the objective "is to develop a scientifically robust and defensible watershed model to determine reductions in phosphorus loads needed to meet water quality standards in both states, Arkansas and Oklahoma." However, on page 14, the stated goal is limited to Oklahoma, without mention of Arkansas. Then, on page 18 in Section 7.1, the text again mentions both states. Can the draft QAPP authors please clarify?

Page 9, Section 5.0, the objective of Work Assignment (WA) 3-36 is "to develop a scientifically robust and defensible watershed model to determine reductions in phosphorus loads needed to meet water quality standards in both states, Arkansas and Oklahoma." The numeric criteria for Oklahoma are described, but not those for Arkansas. If the goal is to meet the Oklahoma standard at the Oklahoma state line, and to meet the narrative criteria of Arkansas, that should be explicitly stated. It would not be appropriate to apply Oklahoma's standard as the Arkansas standard, or to establish a daily load for both Arkansas and Oklahoma sources to meet Oklahoma's standard.

Furthermore, the decision of the U.S. Court of Appeals for the D.C. Circuit in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015, (April 25, 2006), and subsequent memorandum from EPA Assistant Administrator Benjamin Grumbles, the recommendation is that load allocations be made on a daily basis, unless explicitly justified otherwise. Thus, the time-step of the load allocation should be explicitly stated in the goals and justified (daily, monthly geometric mean, annual not-to-exceed, etc.).

Page 9, Section 5.1–Can Aqua Terra elaborate on the significance of its past modeling efforts in the Illinois River watershed, such as data limitations, important lessons learned from the modeling, anticipated limitations, etc.?

On Page 9, Section 5.1–The data compilation section describes what data will be used in calibrating and validating the model(s) for load allocation. This dataset is incomplete and inadequate. No USGS sites in Arkansas are included in Figure 4, probably because this figure was the product of Storm et al., (2006). While we recognize that this does not mean that Arkansas USGS stations will not be used, it does raise questions regarding the scope and rigor of the effort for data compilation. The model cannot be calibrated effectively without the Arkansas sites.

Additional concerns are raised regarding the data temporal context for calibration and validation. For example, the City of Springdale AR completed upgrades to its wastewater treatment plant (WWTP) in 2004 that reduced TP in the outfall to Spring Creek from >5 mg/l to <1 mg/l. Only after 2005 did instream total phosphorus (TP) concentrations begin to reflect the total impact of Springdale's reductions because of stream channel sediment release of P. If the model selected for the TMDL is calibrated with pre-2004 data, it will not represent current conditions. In fact, calibrating the model under pre-2005 conditions could result in boundary condition failures for validation. Predicting what was will have little utility for developing the TMDL.

The QAPP goes on to describe nonpoint source (NPS) load estimates on Page 10. As with point source (PS), NPS loads and production activities have changed in the basin over the past 4 years. Dr. Storm's initial model was for 2005 land use. That dataset was incomplete at the time (as are almost all NPS model datasets) and is out of date now. It will not allow for contemporary assessment of loads from NPS activities. A new, recalibrated model of the entire system that incorporates the impact of the $60 million Conservation Reserve Program (CRP) impact on riparian zone protection should be conducted. Failure to consider this and other land use management changes in the basin will undermine the legitimacy of the TMDL allocation.

Page 10, Section 5.1–How will Aqua Terra and EPA determine what assumptions will be made regarding poultry litter management practices?

Page 11, Section 5.1–Will Tenkiller Reservoir operational practices change in the future, and if so, how will this effect reservoir operations? This emphasizes the importance of the observation that the data relied upon must reflect contemporary point and nonpoint source management practices as well as anticipated (short term) management practices, such as operations of Tenkiller Reservoir.

Page 11, Section 5.1–The draft QAPP notes that, per the WA request, within 15 days following QAPP approval, Aqua Terra will complete and submit a data gaps analysis report. Is this a sufficient amount of time to develop a report of such great importance? In addition, what happens if additional data gaps emerge as the project proceeds? Will state representatives be able to comment on data gaps as the modeling effort unfolds?

Page 12, Section 5.3, provides a description of water quality model development. The goal as stated is to develop both watershed and reservoir models for this system, and to link them together. As stated, sediment fate and transport is a

key variable for watershed process modeling of TP, and is not addressed well by SWAT. HSPF has some improvements in sediment transport, but the hydrogeology of this region is Karst-dominated, with significant interflow and surface-groundwater interactions. These become particularly dominant during the critical flow period of July - September. HSPF does not simulate this complex mass balance well, but rather uses mass losses and returns as calibration points for flow. A more appropriate hydrologic model for this system could potentially be MIKE-SHE or similar complex hydrologic models; unfortunately, these are not public domain models and thus violate the transparency criterion for this TMDL. Reservoir modeling is similarly challenging. The EFDC might serve the purpose of complex flow balance, but the model was released in 2002, has not been updated (at least publicly) since, and the GIS preprocessor has still not been released. Calibration of hydrology in this system for daily flows is going to be a major challenge. AQUATOX was not recommended for use in TMDLs by the EPA peer review panel (Dr. Matlock served on the first two) because of complexity and difficulty with daily flows in case studies.

The criteria for selection of the models are not clearly stated; only that the team will perform "further evaluation of the previous applications..." and give "consideration of the specific modeling needs of EPA Region 6." This raises a number of concerns that should be addressed in the QAPP. The stated objective of the project is "to develop a scientifically robust and defensible watershed model to determine reductions in phosphorus loads needed to meet water quality standards in both states, Arkansas and Oklahoma. This watershed model will serve as a tool for sound technical decisions on appropriate point and nonpoint source controls to meet those standards." This should be the criterion for selection.

Page 14, Section 5.3, says "Following the model calibration and validation, and in consultation with the EPA WAM, we will develop various point and nonpoint source reduction scenarios to meet the State of Oklahoma's TP water quality criterion." There is no discussion in the QAPP as to how this will be accomplished. There is no acknowledgement that there will be wastewater treatment plant flow and quality data that will need to be integrated into the calibration.

Page 15, Section 6, describes data acquisition. The distinction between primary data, secondary data, and supplemental data is not clear. The use of each class of data is not clear. The presumption is that secondary data are those that were not collected for this TMDL; thus all data used in this analysis will be secondary or supplemental data. How will the Team ensure that all relevant data are inventoried, categorized, and utilized appropriately? How will data usage be documented? How will data use be attributed? How will the Team integrate data across studies and over time? Each of these questions should be explicitly addressed in the QAPP.

Page 15, Section 6—The authors state, "To a large extent, the quality of a modeling study is determined by the expertise of the modeling and quality assessment teams." Although we agree with the importance of the expertise of the modeling study team, we also believe that the quality of the underlying data that the model relies upon is extremely important. We believe that the draft QAPP

should note the importance of comprehensive and contemporary data upon which the model was based.

Page 16, Section 6.1–The draft QAPP talks about the need to "maintain a continuing dialog with the EPA WAM on technical data issues." Can this statement be broadened to include continuing dialog with the relevant state agencies?

Page 18, Section 7, describes model setup and calibration. As indicated earlier, TP concentrations in this system due to point source contributions are on a temporal trajectory downward. Calibration and validation using temporal data that do not correct for or account for this trajectory will introduce significant bias. The purpose of the model is to be able to predict loads of TP from PS and NPS in the basin. The criteria for calibration are reasonable IF the data are representative of the system being modeled. How will this change over time be accounted for in modeling the system?

Page 19, Section 7.1–This section includes a quotation, in italics, regarding the 30-day geometric mean of 0.037 mg/L adopted by the State of Oklahoma. Can the draft QAPP please clarify the distinction between meeting this concentration versus managing phosphorus loads, which is frequently listed as an objective in the draft QAPP?

Page 19–The following statement is made: "The overarching objective is to identify/evaluate phosphorus management scenario(s) that achieve (in the waters of the Illinois River at the border between the States) the numerical water quality standard that the State of Oklahoma adopted in 2002 for phosphorus. . . While the stated purpose of this study is as stated above, EPA recognizes the value of performing holistic modeling of the Illinois River Watershed that includes consideration of Tenkiller Lake." Please clarify what value is recognized in doing this additional holistic modeling.

Page 20, Table 2–A monthly and annual time-step is too long to accomplish the stated objectives of the draft QAPP. For example, wet weather issues will probably need to be addressed on a daily time-step.

Beginning on Page 23, Section 8 describes assessment and oversight. On pages 24 and 25 of this section, the team acknowledges the need to consider sensitivity analysis and uncertainty analysis, but qualifies this with "Subject to the concurrence of the EPA WAM, and subject to budget limitations..." The seven tasks indicated on page 25 (data acquisition assessments, model calibration studies, sensitivity analyses, uncertainty analyses, data quality assessments, model evaluations, and internal peer reviews) are not optional for competent TMDL assessment. The costs to stakeholders resulting from implementation of this TMDL could potentially be measured in millions of dollars. Consequently, the effort should not be shorted due to "budget limitations."

All data points have some uncertainty about them. The higher the uncertainty associated with an input variable, the less certain any results derived from that variable. Sources of uncertainty are a function of many facets of data, including reliability of measurements, sample size relative to total populations, representativeness of the sample, geographic variability, and many other

characteristics. Sources of uncertainty can generally be categorized as (1) variability and (2) knowledge uncertainty. Variability is the inherent noisiness of a system, the stochastic nature of a process. An example would be rainfall intensity; no matter how much you measure rainfall intensity, it will still vary over time and space because rainfall is inherently variable, though the characterization of the distribution of probable outcomes can be enhanced. Knowledge uncertainty is a measure of our ignorance of a system; it could be defined, given knowledge about the system (data), but those data are often not available for the given analysis. Each type of uncertainty exists in any complex analysis, especially in TMDLs. The major sources of uncertainty are knowledge uncertainty associated with water quality data. Honest assessment and development of a TMDL requires quantifying both types of uncertainty in the output. Failure to consider uncertainty in complex system modeling is simply intellectually dishonest.

Page 24, Section 8.0—This section speaks of "limitations in scope and/or budget." At this stage in the process, does EPA and/or Aqua Terra anticipate that there will be significant limitations in the scope and/or budget? If so, these should be disclosed to relevant parties and the implications should be defined. How will any such limitations be addressed?

Page 25, Section 8.0—This section notes "internal peer reviews." Can this be broadened to include external peer reviews?

On Page 27, Section 10.0—"Project breakpoints" are listed. Will draft deliverables of each of the listed items be made available to state representatives for review?

Page 27, Section 10 describes seven project breakpoints. However, no clear timelines are provided, no critical path analysis is presented, and no deadlines for completion are provided. The QAPP should have each of these elements.

In closing, our review team has a few general questions, as follows:

1. A number of important major issues were raised in the draft QAPP, but there was no follow-up discussion. These issues include POTWs, poultry farm runoff, blue-green algae and turbidity. It would be helpful for the final QAPP to elaborate on each of these topics.

2. We did not find discussion regarding background water quality. Are there adequate data to determine what the background phosphorus concentrations in this watershed would be in the absence of man-caused point and nonpoint sources? Will the watershed model be utilized to determine whether the Oklahoma standard of 0.037 mg/L would be attainable if there were no anthropogenic point and nonpoint sources? This is an essential element and the final product should include this information.

3. Additional discussion of how wet weather issues will be addressed is merited, such as the process to define the broad categories of nonpoint sources, how event mean concentrations for each land use category will be

assigned, what approach will be used for establishing BMP performance, assumed effectiveness of hydrologic controls in urban areas, etc. The model simulation period must be long enough to include large storms that will have associated high sediment loads (and phosphorus concentrations).

4. The draft QAPP does not appear to discuss whether and how the model will be updated in the future in response to new data, new regulations or other changing factors. This would be helpful.

5. How do Tenkiller Reservoir water quality standards interface with the 0.037 mg/L total phosphorus goal (at the state line)? If point and nonpoint discharges in Arkansas are going to have to meet a 0.037 mg/L standard at the state line, why is the model being extended downstream into Tenkiller Reservoir?

6. We are curious to learn what, specifically, the 0.037 mg/l standard represents and how that will relate to the constituent, "TP," as simulated in the model. Does this geometric mean apply to nonsettleable phosphorus (dissolved plus colloidal material) that would be measured in a sample taken during normal flow regimes when bottom sediment has not been scoured and entrained into the water column, or does it also include the high flow regimes when bottom sediment that contains attached phosphorus has been entrained into the water column and would be captured in a water sample taken under those conditions? Depending on the answer, it is important to know whether the collected samples data were filtered during high flow events and, if so, the size filter opening. Are the modelers optimistic that they will be able to reasonably track the fate and transport of TP in river sediment in light of potential model and data limitations?

On behalf of Wright Water Engineers, Inc., Prof. Marty Matlock, P.E., and Prof. Larry Roesner, P.E., the Rogers Water Utility sincerely appreciates the opportunity to offer these comments for your consideration. In the event you have any questions or need additional information to assist in forwarding these comments to EPA, please do not hesitate to contact me.

Very truly yours,

Tom McAlister, Manager
Rogers Water utilities

cc EPA
Aqua Terra
Chuck Nestrud
File: Comment letter to ADEQ re QAPP for Illinois River Watershed TMDL, 1-6-10

Via email
Mr. John Bailey
Arkansas Department of Environmental Quality
5301 North Shore Drive
North Little Rock, AR 72118

Re: Comments on Draft *Preliminary Data Review and Analysis for Water Quality Modeling and TMDL Development for the Illinois River Watershed* (Prepared August 3, 2010 by Aqua Terra Consultants, Mountain View, CA, for the U.S. EPA)

Dear Mr. Bailey:

Rogers Water Utilities sincerely appreciates the opportunity to comment on the draft document noted above, which we will subsequently refer to as the —Data Review Report. || As you may recall, Rogers Water Utilities commented on the Draft Illinois River Phosphorus TMDL QAPP in a letter on January 6, 2010, and we continue to maintain considerable interest in the development of this TMDL. To assist us with reviewing the Data Review Report, we have again engaged Wright Water Engineers, Inc. (WWE)[1] to assist in preparation of the comments provided in this letter.
As was the case in our January 6, 2010, letter, we have many positive comments regarding the draft Data Review Report; for example:
The report is well written—it is comprehensive, understandable, with helpful supporting graphics, well referenced and professional.

Aqua Terra has obtained data from many different sources, in both Arkansas and Oklahoma, and listed many of the data gaps they have uncovered to date. Aqua Terra staff demonstrate familiarity with the Illinois River watershed from past modeling experience.

Aqua Terra has acknowledged the importance of the karst geology that characterizes a significant part of the watershed and has stated that they are currently determining how to best represent karst characteristics in the model that will be selected for the Simulation Report.

---

[1] These comments also include review and input from WWE's peer reviewers/advisors for this project, Dr. Larry Roesner, P.E., of Colorado State University, and Dr. Marty Matlock, P.E., of the University of Arkansas.

For the available hydrologic, water quality, land use and other data that they will be drawing upon, Aqua Terra has clearly indicated the time period during which the data were collected. This will be very helpful when weighing the comparative value of the various datasets as the model is developed. For example, older data will not represent upgrades in municipal and industrial wastewater treatment facility performance or current land use.

The Data Review Report indicates that the best available land use dataset, collected during 2001, is old, and they will attempt to address this shortcoming.

The Data Review Report correctly indicates that channel sediments can be an important sink/source of phosphorus, and duly notes the limitations of the currently available data of this kind.

The authors refer to not only model calibration but to validation as well, which causes us to be optimistic that the final models will do a reasonable job of reflecting —real world || conditions.

We concur with the important language at the bottom of page 37 which emphasizes the importance of modeling —all significant sources of phosphorus. || Given the great regulatory and financial significance of this phosphorus TMDL, particularly in light of historic interactions between Oklahoma and Arkansas, it will be essential for the models to properly represent all significant phosphorus sources as well as the behavior of phosphorus in the Illinois River, its tributaries and Tenkiller Reservoir.

The remainder of this letter provides specific questions and comments on the Data Review Report. Attachment 1 provides Dr. Marty Matlock's comments, which focus primarily on additional data sources that should be included in the report.
Addressing Identified Data Gaps: The report identifies much available data that will be considered for use in the model as well as various data gaps and relative adequacies of the data. A summary list of data that will be pursued due to the identified data gaps and inadequacies would be helpful and important in ensuring that these data gaps are appropriately addressed. The —Data Deficiencies for GIS Coverages || provides a good start on such a list, noting the following data deficiencies:

NRCS Hydrologic Soil Groups (*WWE Note: GIS soil group coverage should be available through the NRCS, located in Field 18 of the table "muaggatt.")*

More recent land use/land cover data

Location of known karst formations

Animal populations and distribution

Fertilizer and manure applications

Soil nutrient concentrations

What steps will be taken to address these and other data deficiencies between now and the modeling effort? Will targeted data collection occur, and if so, can the way that this will occur please be explained?
Baseline Dataset: A number of the datasets that Aqua Terra includes in the data summary are pre-2004 data. However, as explained on page 3 of our January 6 letter, utilizing pre-2004 data will not represent current conditions. Calibrating the model under pre-2005 conditions could result in boundary condition failures for validation. Timeframe is an important factor in assessing adequacy of the existing dataset.

Relationship to Previous and Concurrent Efforts: We have these questions regarding use of data from previous and ongoing efforts:
Aqua Terra does a nice job of summarizing previous computer modeling efforts in the watershed. In the final draft, could Aqua Terra elaborate on data gaps/deficiencies that were identified in these past modeling studies, and provide an update as to whether these gaps/deficiencies have been addressed? If not, what are the implications for the current modeling effort? As an example, the QAPP noted that Storm (2006) relied on a relatively simple representation of riverine processes for Total P—was this because of data limitations that will also affect the current modeling effort?

Additionally, the Data Review Report notes that the —Illinois River Watershed Partnership Watershed Management Plan || (for the State of Arkansas) was recently published and that there is a —comparable effort ongoing for the Oklahoma portion by the Oklahoma Conservation Commission. || How will the modeling effort/TMDL interface with the Arkansas and Oklahoma watershed management plans?

We asked our utilities attorney to comment on the advisability of utilizing data from the ongoing litigation involving the State of Oklahoma and the poultry industry. In this regard, we observe that before raw data from any source are used, Aqua Terra should independently verify that the data are complete, reliable and verifiable, including a thorough a review of sample collection and laboratory analytical QA/QC procedures. To the extent that raw data are included in a report prepared for litigation, the raw data, but not the interpretive report, may be an appropriate source of information, provided the raw data are found to be complete, reliable and verifiable.

Figure 2-4, —USGS Stream Gage Locations in the IRW, || indicates that there was only one USGS station in Arkansas used in previous HSPF and SWAT models.

By contrast, five were used in Oklahoma upstream from the reservoir. Why is there such a discrepancy?
Background Conditions: Background loading is a key component of the TMDL load allocations; however, neither the QAPP nor the Data Review Report provides much information in this regard. Are existing data adequate to determine background phosphorus concentrations and loads in this watershed? Fundamentally, it is important to know whether background sources would cause the Oklahoma standard of 0.037 mg/L to be exceeded in the absence of anthropogenic point and nonpoint sources.

Land Use Data: Section 3.3 addresses land use. We have questions regarding how both urban and pervious land use data will be integrated, as well as specific questions related to agricultural management practices.
With regard to pervious areas, we presume that Aqua Terra will identify different kinds of forest cover, meadows, pastures and other areas that are largely pervious. In our experience, in these areas, it will be important to realistically represent surface runoff, interflow (both —quick || and —delayed || interflow), groundwater return flow and deep groundwater loss. Are there watershed-specific data for these factors that Aqua Terra has been able to locate? We believe that defining the nature of return flows to the surface stream system is very important because phosphorus concentrations (and types of phosphorus) will vary depending on the nature of the return flow.

With regard to the cropland GIS data layer, how will NLCD data be adjusted to reflect 2005 – 2007 land use for non-cropland land uses? What percent of the basin is cropland and covered by the CDL? An additional issue related to characterizing agricultural land use in the model includes management practices such as crop rotation and varying land use conditions due to demand for product. Will these practices be taken into consideration with regard to agricultural land use characterization? The ability to account for such factors should be a consideration in model selection, given the significant land area dedicated to agriculture in this watershed.

With regard to urban land uses, runoff quantities and quality, the Data Review Report has very little discussion regarding urban runoff quantities or quality, use of BMPs, and how the hydrology will be simulated, depending on the timestep selected for modeling. We presume that this type of information will be more clearly described in the Simulation Report.
Precipitation Data: How will data from the five stations with hourly precipitation data be adjusted to represent rainfall in other parts of the watershed? It appears that none of these stations are in the watershed itself. Does the Fayetteville Airport have hourly data that could be used? If only hourly data are available, will that time step be sufficient to simulate runoff from urban areas?

Water Quality Data: We recognize that it is very difficult to model the various forms of phosphorus, including transformations, in a system of this size and complexity. Nevertheless, we were anticipating more discussion of this topic in the Data Review Report. It is not clear whether adequate data are available for the various water chemistry parameters that affect phosphorus transformations/chemistry. Per the Executive Summary, Aqua Terra indicates that the water quality data —appear to be adequate based on this initial assessment || and will address this further in the Model Simulation report. We concur that a more thorough evaluation of the adequacy of the water quality data is needed. Specific comments include: With regard to the STORET data, how many of the stations include flow data taken at the time of water quality sampling? Does the CDM/USGS effort include both flow and water quality?

Hardness should be among the constituents included in the phosphorus model since it influences the chemical processes that precipitate and dissolve various compounds of phosphorus into and from stream sediments and minerals. Hardness may be particularly important in karst areas. Additionally, alkalinity may also be important (particularly in

Tenkiller Reservoir) due to its buffering effect on pH, which in turn affects phosphorus transformations.
Phosphorus Transport/Sources: Delivery processes for nutrients can include surface water, groundwater, atmospheric deposition, release from sediment, and natural background/other sources. The primary emphasis of the Data Review Report is on surface water. Although it may be determined later that surface water is the dominant source of phosphorus, information on other sources should not be discounted in the early stages of the project. For example: Regarding Table 1.1, —Data Requirements for Typical Watershed Model Applications, || we do not see an item that addresses the interrelationship between groundwater and surface water, yet this is very important. Similarly, there seems to be more emphasis on storm runoff than on baseflows.

Internal loading of phosphorus from reservoir sediments in Tenkiller Reservoir could be a significant limiting factor for modeling the lake and the effect of management alternatives during later stages of the project.

The report recognizes that atmospheric deposition of phosphorus, known to be significant, is a data-gap item, and attempts will be made to try to estimate it. It is our understanding that data for atmospheric loading of phosphorus may be available through the USGS National Atmospheric Data Program (NADP), even though such data are not explicitly listed on the NADP website.

Channel Characteristics: The Data Review Report discusses the significance of channel cross sections and sediment-bound phosphorus movement through the system. This is noted as an area where more data are desirable. Based on the information presented in the report, it is not clear how much of the stream has adequate cross-section data or geomorphic/ecologic data, nor is it clear how much more additional data are required. Will it be feasible to gather enough data for this key topic, given the geographic scope and diversity of channel types in the watershed? What is the plan for acquiring these data and how current are the existing cross-section data? Also, will sediment contributions from channel scour be distinguishable from surface runoff? Will the data collected, particularly for higher order streams, be sufficient to distinguish between varying bed load characteristics as stream order and morphology change?

Geology: In addition to soils data, are GIS data available with information on geology/bedrock? EPA's Nutrient TMDL Guidance (1999) notes that streams draining watersheds with phosphorus-rich geologic formations (such as those of sedimentary or volcanic origin) can be sources of phosphorus loading. Although this may not be a specific input parameter for the model itself, this information may be important to consider, since it could affect background loading.

Effect of Karst Geology: As previously noted, we are pleased that the report includes consideration of karst geology. We anticipate that karst geology may have both water quality and hydrologic implications for modeling. Key comments include:
General: From Figure 3.5, it is difficult to discern how the karst areas relate to the stream system and the watershed in general. An overlay onto the stream system would be helpful in assessing adequacy of the karst information. This is an area where a local karst expert would be very helpful in appropriately accounting for karst conditions in the model.

Hydrology: Karst formations in the watershed could significantly reduce storm runoff, and stream flows could be affected by water flowing out of the karst layer into the river or into the karst layer from the river. If the karst intersects the river channel, this could result in additions or subtractions of river flow that would be challenging to quantify.
Adequacy of Point Source Data: The report states that point source data are —not a data gap || (p. ii); however, adequate characterization of point sources in terms of time series and loads is critical to the model and must be carefully completed. This is acknowledged in the report, but we emphasize that this is an area where careful review of screening criteria and assumptions will be important in the next stage of the project. From the Data Review Report, it is not clear whether currently available data for point sources are adequate. Other specific questions related to point sources include:

Because this TMDL process has the potential to significantly impact the wastewater treatment facilities in the watershed, could a list of the NPDES permittees be provided to include information for each, including permitted flow rate, type of treatment processes, etc? Based on the information presented in Figure 2.7, there appears to be only ten NPDES permits with point sources.

Page 27 of the Data Review Report indicates that where site-specific data are unavailable, effluent data may be derived from a national inventory of wastewater NPDES records that were used to develop a table of typical effluent concentrations. When effluent data for specific facilities are available, we concur that site-specific datasets should be used rather than generalized, national data (as per Table 2.10 on page 28). With regard to potential use of national data, we have the following additional questions and comments:
i. Which of the wastewater treatment facilities in the watershed have specific phosphorus loading data?

ii. Where site-specific data are not available, can site-specific monitoring be requested to obtain these data? This is a critical aspect to the entire study.

iii. Lacking site-specific phosphorus data from the wastewater dischargers, can a more refined research effort be made to determine the phosphorus concentrations in wastewater effluent with specific, different kinds of treatment? Relying on the national inventory of NPDES records is not adequate for the purposes of establishing TMDLs. Based on our own research, the phosphorus data that are presented in Table 2.10 for —Secondary, || —Advanced Secondary, || and —Advanced Wastewater Treatment || mischaracterize the removal and concentrations.
The importance of using current data for POTWs is demonstrated in the QAPP report, which notes that the City of Springdale, Arkansas, POTW upgrades in 2004 reduced total phosphorus concentrations in the discharge from > 5 mg/L to < 1 mg/L.

Figure 2.7 on page 30 indicates that there are many construction stormwater general permits, particularly in Arkansas. Is Aqua Terra proposing to model sediment/phosphorus inputs from construction sites, and if so, what data will be utilized regarding quantity and quality of these sites?
Mass and Water Balances: Would it be feasible for Aqua Terra to provide simple schematic diagrams depicting the key components of hydrologic and mass balances for this watershed as part of final Data Review Report? In such schematics, all of the significant surface and

subsurface factors that affect the water balance and phosphorus balance for the river system, and the corresponding data for each component, could be shown. Based on our review of the draft Data Review Report, we are not certain that all of the significant components of these balances have been taken into account.

Tenkiller Reservoir: We have questions regarding scope of effort and operational practices.

Scope: From the standpoint of interests in Arkansas, why is it necessary to include Tenkiller Reservoir in the TMDL and associated modeling effort? Will the reservoir modeling be used to determine whether the current state-line phosphorus standard of 0.037 mg/L is appropriate to achieve beneficial uses and accompanying numeric standards in Tenkiller Reservoir?

Reservoir Operational Practices: Will Tenkiller Reservoir operational practices change in the future and, if so, how will this affect phosphorus and chlorophyll-a concentrations? This emphasizes the importance of our observation that the data relied upon must reflect contemporary activities and management practices.

Other Preliminary Comments Related to Subsequent Phases of the Project

As we reviewed the Data Review Report, several additional considerations were apparent that are more applicable to subsequent stages of the project, including:

Project Scope: We have two general questions regarding the scope of the modeling effort:

1. Model Uses: A question that we posed in our January 6 letter still applies: Is the scope of this effort limited to watershed model development or does it also include applying the model to allocate point and nonpoint source phosphorus reductions and evaluate alternative management approaches? Assuming that the model will be used to evaluate management alternatives, when will data collection regarding expected performance of management alternatives (e.g., BMPs) be addressed?

2. Phosphorus-only versus General Water Quality Model: Our understanding is that the overall objective of the project is to determine reductions in phosphorus loads needed to meet standards. If this is the case, why are nitrogen species included in the modeling? Will the study include the analysis of nitrogen loading and impacts to the water quality standards regarding nitrogen forms? Will the objectives of the study be expanded to include an analysis of the impact of nitrogen/phosphorus relationships to the overall trophic status of the streams and Tenkiller Reservoir? Similarly, will the model assess the dissolved oxygen conditions in the reservoir with respect to water quality standards?

General TMDL Approach: Given potential data gaps and inadequacies, is a phased TMDL with adaptive management provisions being considered as the general direction of the project? If this type of process is envisioned, then there may be more flexibility in terms of assumptions related to data gaps and inadequacies than if this is envisioned as a one-phase, final TMDL. A phased TMDL could account for improved wastewater treatment, significant land use changes, new regulations, etc. The initial TMDL is always limited by available data, and after it is in place, more data gaps become evident, and there should be a mechanism for updating.

Margin of Safety: Given the ultimate use of the model in development of the TMDL, will an implicit or explicit margin of safety envisioned? Although only peripherally related to this

Data Review Report, assumptions related to data sources that are conservative should be well documented if an implicit margin of safety is envisioned.

Reasonableness Checks: Although Aqua Terra thoroughly emphasizes the importance of data for calibration and validation, we did not see text regarding simple —reasonableness checks. || That is, before even getting to the stage of calibration/validation, are the model results reasonable? For example:

Are unit rates of runoff for various return frequencies for different categories of land use and soil types reasonable and consistent with other hydrologic studies in the area? (Stated another way, are the calculated values in terms of cfs/acre reasonable?)

Are predicted phosphorus concentrations from different kinds of land use for different return frequency storms reasonable?

For different kinds of land use, are the predicted ratios of dissolved phosphorus to total phosphorus reasonable and consistent with other data from comparable land use types?

Again, Rogers Water Utilities sincerely appreciates your consideration of our questions and comments. We would welcome the opportunity to meet in person with all interested parties.

Very truly yours,

Tom McAlister Director
Attachment

ADEQ

ARKANSAS
Department of Environmental Quality

December 1, 2010

Mr. Miguel I. Flores
Director, Water Quality Protection Division
USEPA, Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Re: EPA's Illinois River TMDL Project

Dear Mr. Flores:

As per the November 12, 2010 meeting regarding the Illinois River Watershed TMDL, I was asked to respond to the issue of including Lake Tenkiller in the Illinois River TMDL Project. Including the lake, as I understand it, was contemplated in the Project plan; however, I have never understood how the lake's inclusion would impact water quality standards or permit effluent discharge limits for nutrients (specifically total phosphorus) beyond Oklahoma's borders. I understood the Illinois River TMDL Project purpose was to address the impairment in the Oklahoma portion of the Illinois River due to the exceedance of the 0.037 mg/L *total phosphorus standard* established for Oklahoma's Scenic Rivers. Lake Tenkiller is almost 70 miles from the Oklahoma/Arkansas border and is not designated as a Scenic River. To the best of my knowledge, Oklahoma has no total phosphorus water quality standard for Lake Tenkiller. For these reasons, the lake would appear to be outside the scope of EPA's proposed Illinois River TMDL project.

Oklahoma does have a chlorophyll-a standard for Lake Tenkiller. However, ADEQ would not expect a model to adequately represent the complex and dynamic relationship among total phosphorus, total nitrogen, and chlorophyll-a in Lake Tenkiller. Nonetheless, I have no objection to including Lake Tenkiller in the TMDL Project provided that the results of the modeling effort on the lake will have no impact on the Arkansas portion of the Illinois River, which is not impaired and resides many miles from the lake. However, ADEQ reserves the right to object, and will object, to the lake's inclusion should EPA's TMDL Project fail to consider the sources of nutrients posed by all the development on and around Lake Tenkiller or, further, if the inclusion of Lake Tenkiller results in any effort to regulate nutrients outside Oklahoma's border. My understanding of the basis for including the Arkansas portion of the Illinois River in EPA's TMDL Project, was to ascertain the point and nonpoint source allocations of total phosphorus in Arkansas necessary to meet a 0.037 mg/L standard at the Oklahoma border. Any other

application of EPA's TMDL Project to Arkansas's waters will serve as a basis for ADEQ to withdraw its support for EPA's Illinois River TMDL Project.

In addition, I would like to emphasize that the data utilized in the TMDL Project should reflect current water quality conditions and not rely on historical data or extensively on reference stream data. We are fortunate a great deal of total phosphorus data from the Illinois River has been collected over the last few years. In order to obtain a meaningful cause and effect relationship from this Project, data should not be used which does not reflect current in-stream values.

Thank you for the opportunity to comment on this issue.

Sincerely,

J. Ryan Benefield, P.E.
Deputy Director

cc: Steven L. Drown, Water Division Chief, ADEQ
Steven A. Thompson, Executive Director, Oklahoma Department of Environmental Quality
Randy Young, P.E., Arkansas Natural Resource Commission
J.D. Strong, Oklahoma Water Resource Board