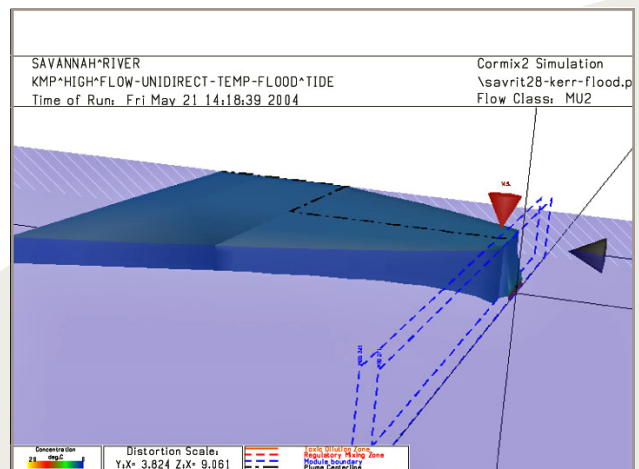


# TMDL STUDIES AND WATER QUALITY MODELING

**GBM<sup>c</sup> & Associates provides expertise to municipal and industrial clients in order to develop technically sound TMDL and waste load allocation studies. We have considerable experience in running EPA supported water quality models including QUAL2E, WASP, and CORMIX. GBM<sup>c</sup> & Associates field crews are experienced in conducting studies that directly effect the results of TMDL modeling including low flow analysis, hydraulic and dye studies, and collection of water quality and in-situ data on both large and small streams. GBM<sup>c</sup> & Associates has long-term working relationships with State and EPA staff in Oklahoma, Arkansas, Missouri, and Louisiana. We have successfully negotiated permit limits, results of TMDL studies and approval of special water quality studies with personnel in each of these states.**

## Experience and Capabilities

- Conducted more than a dozen water quality modeling/TMDL related studies in EPA Region 6 and 7 states, including Oklahoma, Arkansas, Missouri, and Louisiana. This multi-state experience enables GBM<sup>c</sup> to select the most useful components from the approach of each state for use in pertinent situations. This experience has, on occasion, led to our clients saving substantial sums by completing only the specific type of study needed, rather than accepting the "shotgun" approach originally suggested by the regulatory agency.
- Experienced in the use of numerous EPA supported water quality models including QUAL2E(K), Multi-SMP, WASP, AQUATOX, and CORMIX.
- Have completed dozens of waste load allocations for various conservative and non-conservative water quality constituents including dissolved oxygen, ammonia, nutrients (P & N), chloride, TDS, pH, bacteria, temperature, metals, and pesticides.
- Completed field studies and TMDL modeling for oxygen demanding substances at several sawmills in South Arkansas to avoid stringent permit limits for the dischargers.
- Completed a water quality and low flow frequency study, coupled with an oxygen demand TMDL to develop multi-tiered permit limits that were satisfactory to an oil refinery in Arkansas.
- Conducted a comprehensive eutrophication study in the Ouachita River and Felsenthal NWR system. Nutrient fate and transport modeling was completed using QUAL2K and WASP to determine the effect of discharged nutrients from a combined pipeline in the River and connected lake system. The combined pipeline discharge included industrial and municipal wastewater.
- Macrophyte (aquatic plant) biomass modeling was completed for a complex reservoir system using the EPA AQUATOX Model. The fate of phosphorus and nitrogen compounds in the system and the plant relationship to substrate and light availability were key elements of the study.



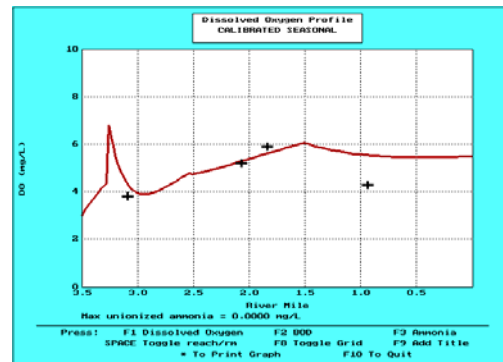
# TMDL STUDIES and WATER QUALITY MODELING (cont.)

- Completed an intensive field study for a municipal discharger in Oklahoma in order to obtain data for development of site specific coefficients and for calibration of the water quality model.
- Completed numerous mixing zone studies in large rivers and estuaries to determine waste load allocations for various pollutants, including metals and temperature. Discharge size ranged from less than 2 mgd to greater than 100 mgd.



- Completed numerous studies of the Arkansas River concerning multiple discharge TMDLs for facilities including the department of defense, multiple paper mills, and a municipality.
- Completed a dissolved oxygen waste load allocation for a food processing facility in Louisiana, which included a field study and QUAL2E model.
- Wrote and developed a pH model for an Oklahoma facility. The model was designed to calculate pH of two mixed streams and predict downstream pH change due to instream conditions.

- Completed detailed review and comment on a number of EPA sponsored TMDL's. Projects completed for a number of industrial, agricultural, and forestry concerns.
- Completed TMDLs for oxygen demanding substances and ammonia toxicity to various waterbodies, including the Ouachita River, to assist a municipality and several industries in choosing a combined discharge location.
- Have conducted detailed evaluations of non-point source related models (such as the USDA model SWAT) for industrial clients engaged in litigation.
- Have conducted many other studies associated with TMDLs in Oklahoma and Arkansas including 303(d) de-listing efforts, storm water runoff modeling where non-point sources are important, mixing and time of travel/hydraulic studies.
- Actively participate in state and regional development of water quality standards and individual criterion for both surface water and sediments. GBM<sup>®</sup> personnel keep abreast of regulatory development in Region 6 and 7 states and have assisted clients in amending state rules and water quality standards on numerous occasions during the past 10 years.



**GBM<sup>®</sup> Contacts**

**Shon Simpson, Greg Phillips or Vince Blubaugh**