

# HYDROLOGICAL and HYDRAULIC STUDIES

***GBM<sup>c</sup> & Associates have completed numerous hydrological and hydraulic studies for a wide range of applications. Many studies have been completed in support of TMDL and waste load allocations. Projects often include dye tracer studies to determine time of travel, mathematical flow modeling and direct instream measurement of flow using the velocity area method. On several occasions GBM<sup>c</sup> & Associates have calculated new regulatory low flows (7Q10, 7Q2, etc) for permittees resulting in increases to stream background flows and associated allowable increases in pollutant loading to the receiving stream. GBM<sup>c</sup> & Associates has a long-time relationship working with state, USGS, and EPA Environmental Quality staff on hydrological and other water quality issues.***

## Experience and Capabilities

- Conducted numerous time-of-travel studies using dye tracers in surface waters and in wastewater treatment plants treating domestic and industrial wastewater. Utilized the dilution gauging method to accurately measure flow in a small stream using the dye tracer Rhodamine WT.
- Have completed dozens of instream flow studies utilizing the velocity area method for measuring flow.
- Completed dozens of low flow frequency studies which included recalculating 7Qx (7Q10, 7Q2, etc.) values in an effort to increase pollutant assimilative capacity in receiving streams.
- Frequently analyze and model storm water runoff contributions to instream flow and to waste water treatment systems. Utilized various methodologies including the SCS Curve Number Method, TR-55, Hydrocad and the Rationale Method.
- Designed and implemented long term flow monitoring studies using level loggers and flow rating curves.
- Have completed several hydraulic studies with non-typical flow circumstances such as with lock and dam systems, and reservoir releases.
- Completed a detailed water balance (inflow/outflow) study on a small reservoir in NW Arkansas. Results were used to assess critical low flow release rates and industrial water usage allowances.
- Completed a water quality and low flow frequency study for an oil refinery, coupled with an oxygen demand TMDL to develop multi-tiered permit limits
- Completed extensive hydraulic study for a poultry processing facility in Missouri that included time of travel, dilution gauging, instream flow, and losing stream analysis.
- Completed low flow frequency analysis of Ouachita River, AR to project permit limits for use in determining benefits of building a wastewater pipeline.



# ***HYDROLOGICAL and HYDRAULIC STUDIES (cont.)***

- Developed hydrograph controlled release (HCR) plans on multiple occasions to increase discharge flexibility.
- Completed a water quality and low flow frequency study for an oil refinery, coupled with an oxygen demand TMDL to develop multi-tiered permit limits that were satisfactory to the facility.



- Completed extensive hydraulic study for a poultry processing facility in Missouri that included time of travel, dilution gauging, instream flow, and losing stream analysis.
- Completed low flow frequency analysis of Ouachita River, AR to project permit limits for use in determining benefits of building a wastewater pipeline.
- Completed instream flow measurements and low-flow frequency analysis in the North Canadian River, OK to recalculate the regulatory low-flow (7Q2) used in determining permit limits. Recalculated values were adopted and used in updating the Oklahoma Water Quality Standards.



- Developed conceptual engineering design for a storm water retention basin system at a fertilizer manufacturing facility in Eastern Arkansas. Incorporated runoff hydraulics into the initial concept.
- Analyzed discharge structure design options for a recirculation pond at a saw mill in South Arkansas to determine which design would cause the least loading of oxygen demanding wastes to the receiving stream during annual rainfall events. Flow volume and frequency, reaeration, and BOD5 loading were considered in the analysis. (Completed in 2002).



***GBM<sup>c</sup> Contacts  
Shon Simpson or Greg Phillips***