CE 641 FATE AND TRANSPORT MODELING OF ECOSYSTEMS

Project 1: Determination of Assimilative Capacity of Walnut Creek near Troy, Alabama

Fall 2007 Due: October 1, 2007

A review of the Walnut Creek wasteload allocation study conducted by Alabama Department of Environmental Management (ADEM) in 1993 revealed a number of technical issues associated with their stream BOD/DO modeling effort. At the request of the City of Troy, you have developed a stream BOD/DO model using the STREAM code to assess the assimilative capacity of Walnut Creek regarding the allowable BOD loads from the Troy wastewater treatment plant.

Water quality data collected in two surveys (August and October 1991) by ADEM were used to calibrate and verify the DO model of Walnut Creek. Now you will be using the calibrated and verified model to quantify the assimilative capacity.

Since the in-stream CBOD data are inadequate to derive the stream deoxygenation coefficient, an independent analysis of more recent water samples from the treatment plant effluent and ambient water column above and below the plant discharge would be necessary. See the attached spreadsheets for the lab results developed in May 2004. Your first task is to determine the bottle rate of CBOD of these samples.

Also included is an input data file to run the STREAM code for assimilative capacity calculations. The ambient environmental conditions are: water temperature at 27°C and the river flow rate above the Troy wastewater treatment plant is 6.14 cfs.

Your second task is to determine the allowable CBOD loads (in lb/day of $CBOD_5$) for the Troy plant as a function of the in-stream deoxygenation rate (day^{-1}) to meet a water quality standard of 5 mg/L DO below the Troy plant discharge.

The following files have been uploaded to the course website:

1. Oct91prj.inp – the input data file to run STREAM
2. STREAM.exe – the executable image of the model
3. The Troy Ultimate BOD.xls file containing the 2004 lab results of BOD analysis

Note that the CBOD load in lb/day and the stream kinetic coefficients are shown in XXXX in their fields. You must vary them in a series of model runs to come up with the results.

Finally, you will prepare a brief report summarizing the analysis results of this exercise. Information such as style and format for the report will follow.