A new water treatment plant is planned for a community of 50,000 people in rural Iowa. The new plant will consist of rapid mix for coagulation, flocculation, and sedimentation basins, followed by rapid sand filters. The water quality for the plant will be similar to the Lake Lavern water sample tested in the lab during the past two weeks (i.e., surface water). Use the following as a basis of design of the rapid mix, slow mix (flocculators), sedimentation basins, and rapid sand filters:

- design population: 50,000
- average demand: 90 gallons per capita per day
- maximum day demand: 2.5 times average
- cold water temperature: 10°C
- avg. floc particle size: 50 μ sand
- specific gravity: 2.65
- effective size, mm: 0.50
- uniformity coefficient: 1.35
- shape factor: 0.86
- bed porosity: 0.42

Prepare a design for the rapid mix, slow mix (flocculators), sedimentation basins, and rapid sand filters and include a plan sketch of the entire facility. For the rapid mix and slow mix basins, provide tank dimensions and horsepower requirements for the mixers. For the rapid sand filter, include section views showing details for the underdrain, support media, media, and washwater troughs. Prepare a design report providing a summary of the basis of design, any assumptions that were made (G and Gt values, sedimentation loading rate, filtration loading rate, depth of sand, backwash rate, etc.), and design calculations. Use the example on the web as a guide for sizing the washwater troughs. Example problems 3-25 through 3-28 in the text provide examples of the hydraulic calculations. Follow the guidelines for writing a design report given in the CCEE Technical Communication Guide (see page 55 & following in: http://www.ccee.iastate.edu/fileadmin/www.ccee.iastate.edu/academics/commguide.pdf)