Design Assignment 6.
Primary Treatment for the Greater Drain, OR Sewage Treatment Plant

Now that Drain is entering the 21st Century of environmental engineering, the community has expressed an interest in getting off of septic tanks and connecting the community to a sewer system. This will also address concerns by Oregon DEQ that the septic tanks in the valley are leaching into Elk Creek and causing elevated BOD and nutrient levels.

Because the problem is distributed throughout the valley, it has been proposed that Drain join with neighboring Elkton and Yoncalla, as well as the unincorporated areas in between and for the Greater Drain Sanitation District. The combined population to be served is approximately 7100, but to allow for the modest growth expected in the next 20 years (about 1% per year), the plant will be designed for a population of 9000.

The interim director of the Sanitation District, Ms. Anne Arobick, has requested preliminary design data for the proposed POTW. Your first assignment is to estimate the proper design flow and loadings and size a primary clarifier.

- Assume the average TSS in the raw wastewater is 200 mg/L and the average BOD_5 is 200 mg/L.

- Because the total flows will be relative small, it will be possible to have an aerated storage pond with a retention time of a few hours to absorb short term fluctuations in the hydraulic loading. Find the size of a square retention pond that is 2 m deep with a capacity of 4 hr of average flow.

- Because we have the retention pond, we do not have to worry about flow spikes on an hourly scale. Instead find the peak values of flow, BOD, and TSS for the average annual peak day, using the "generic" method we discussed in class, using the equations in the handout.

- Determine the dimensions for two rectangular primary clarifier tanks based on the following criteria obtained from a design manual:

    - An overflow rate of 30 m^3/m^2d

    - A side water depth of 2.0 m

    - A weir loading in the range of 125-250 m^3/m d

    - A length to width ratio in the range of 3:1 to 5:1

    - Standard sizes of sludge removing conveyors are 4 m wide and 5 m wide. Choose the size that best fits your needs.

- Calculate the TSS and BOD of the effluent from this clarifier and calculate the mass of raw (wet) primary sludge per day, assuming a solids content of 1% by weight

    - For this type of system you can assume a BOD removal of about 35% and a solids removal of about 50%