CIEG 125 **Introduction to Civil Engineering**

Homework 5.
Due: 3:35pm, Monday October 30, 2005.

Please use a word processor for preparing your answers to Questions 1, 2, and 3. Answers to Question 4 should follow the guidelines provided for calculations.

QUESTION 1.

What services do career services provide for undergraduates?
How will **you** use these services?

QUESTION 2.

Prepare and submit your resume.

QUESTION 3.

In his guest lecture on Monday October 10, Terry Neimeyer identified several things that you can do now (or soon) to help you in your career. (slide 15 in the presentation). Go through the list point by point and identify what you are doing or plan to do to make this happen.

Note: you may have to do a little research to understand some of these points.

QUESTION 4.

The West Point Treatment Plant[1] is part of King County's regional system that treats wastewater for about 1.4 million people and covers 420 square miles in the Puget Sound region of Washington. Every day, the West Point Plant cost-effectively treats wastewater and stormwater from homes, offices, schools, agencies, businesses and industries in Seattle, north King County, south Snohomish County, and some areas of Lake Washington.

The average capacity for wet weather flow is 133 million gallons per day. The maximum capacity is 440 million gallons per day during peak storms.

Wastewater coming into the plant undergoes a series of treatments, including the following:

- Preliminary treatment: where large debris like rags, paper, and leaves are removed

[1] Information obtained from http://dnr.metrokc.gov/wtd/westpoint/

- Primary treatment: skimming and settling to remove sludge (heavy materials) and scum (lighter materials), which are sent onto the solids handling process
- Secondary treatment: a biological process that consumes suspended and dissolved organic material, leaving the remaining water or secondary effluent at least 85 percent cleaner than when it entered the plant
- Disinfection destroys most remaining pathogens, or disease-causing bacteria before the final effluent is released through an outfall pipe and diffuser into Puget Sound.

West Point's wastewater treatment process produces valuable byproducts that can be reused within the plant and throughout the region, including:

- Biosolids, the nutrient-rich organic matter produced by treating wastewater solids, are used as a soil amendment for dryland and irrigated agriculture, forest fertilization and is composted for landscaping and gardening.
- Reclaimed Water – after disinfection, some secondary effluent undergoes advanced treatment and is reused on site for cleaning and in-plant processes.
- Energy recovery – digester gas, or methane is a byproduct of the biosolids digestion process and is collected and used on-site in generators that produce electricity and for powering pumps.

Your assignment:

A major storm "dumps" 8 inches of rain in a 24-hour period on the area serviced by the West Point wastewater treatment plant. Your task is to determine if the plant can handle the water from the storm or if it will have to discharge untreated sewage and stormwater.

Given:

- Normal flows into the plant – 133 million gallons per day
- Capacity of the plant – 440 millions gallons per day
- Areas served – 420 square miles
- Rainfall event – 8inches in 24 hours

Assumptions:

- Rainfall occurs uniformally over the catchment area
- 30% of the rainfall flows into the storm sewer, the remainder flows in open bodies of water, the ground water or evaporates

Other useful information:

The Standard Rain Gauge

The most common rain gauge – currently used by official forecasters and at airports – was invented over 100 years ago. It consists of a large cylinder with a funnel and a smaller measuring tube inside it. The "official" rain gauge specified by the United States Weather Bureau is a 50 cm tall cylinder with a 20 cm diameter funnel. Water is collected in a measuring tube that has exactly one-tenth the cross-sectional area of the top of the funnel. As a result, the height of the water collected in the measuring tube is precisely ten times what it would be if it had been collected in the cylinder alone. For example, one-tenth of a centimeter of rainfall would fill one centimeter of the measuring tube. This exaggeration of the height of water in the tube enables meteorologists to make more precise rainfall measurements. A special measuring stick inserted into the measuring tube is scaled to take the exaggeration into account.

The standard rain gauge can measure up to 5 cm (1.97 in) of rain. If rainfall exceeds five centimeters, water overflows into the cylinder surrounding the measuring tube. To find the total rainfall, the observer empties the 5 cm in the full measuring tube, then takes the water in the cylinder and very carefully pours it into the now-empty tube. That measurement added to the five cm gives the final rainfall amount.

Source: http://www.seed.slb.com/en/scictr/lab/engineer/

Notes:

- This is a relatively simple conservation of mass (you are trying to make sure you can account for all the water) calculation.
- You have been given some redundant information.
- You will need to pay attention to units, conversion factors and use the appropriate number of significant digits.
- Don't forget to look at the grading sheet!

GRADING SHEET – HOMEWORK 5.

CIEG 125 - Introduction to Civil Engineering.

NAME: _____

This sheet MUST be stapled to the front of your homework.

		Points awarded	Max points
General Presentation (3 points total)	Name, Date, Assignment # Neatness (don't forget to staple the sheets together in the correct order!)		1 2
Question 1. (25 points)	List of services How you will use these services		10 15
Question 2. (30 points)	Resume Layout Completeness/ Content Logical Presentation Spelling/Grammar		 10 10 5 5
Question 3. (27 points)	3 points for each item		27
Question 4. (15 points)	Total rainfall in area Total rainfall in the stormwater system Total flow in the stormwater/ sewage system Conclusion		4 4 4 3
TOTAL			100