Wastewater Assignment

As urban centers grew in size, it became apparent that dumping raw **sewage** into streets, creeks, rivers, and lakes ultimately threatened the drinking water supply. The concept of wastewater management was born.
Once water has entered a structure, it is inevitable that the water will be used and the quality changed—usually for the worse. The used water is called wastewater. The constituents (impurities) within wastewater are dependent upon how the water has been used.

Sanitary wastewater is generally accepted to consist of human waste, household cleaning solutions, oil and grease from cooking activities, small solid particles from garbage grinders, or soil from cleaning clothes and floors. Wastewater from commercial establishments may include metals, strong acids and bases, cleaning solvents, oil and grease, and grit (small plastic, glass, stone, or metal particles), in addition to sanitary wastewater. Sometimes water is used for cooling purposes; thermal pollution is created and must be managed correctly.

The selected method of wastewater management depends upon the quantity (i.e., flow rate) and quality of the wastewater, available treatment technologies, codes and regulations, and economics.

A civil (environmental) engineer must decide how to manage the wastewater by considering three broad categorical options:

- **Reuse**: Wastewater that can be used again without treatment of any kind
- **Recycling**: Wastewater that is treated either on-site or off-site and used again
- **Discharge/treatment**: Wastewater that is simply discharged from the structure for treatment either on-site or off-site

In this activity, you will learn to select an appropriate wastewater management method and perform fundamental layout calculations.

Procedure

For the purpose of this activity, you will assume that the primary contaminant in the wastewater is organic matter and NOT toxic to microorganisms.

1. Apply what you have learned about wastewater management and the Example Residential Plumbing Codes Requirements to choose a wastewater treatment method for your Affordable Housing project.
2. Design the building sewer from the house to the system. Show all work and document your design. Assume that the **invert elevation** of the 14-in. sewer main where the building sewer will connect is 763.15 ft.
   a. Create a sketch showing the sewer main, the building drain, the building sewer, the house foundation, and the lowest floor elevation. (The sketch is basically a long right triangle)
   b. Calculate approximate crown elevation of the existing 14-in. sanitary sewer main. Show this elevation on your sketch.
   c. Assume that the building sewer must connect to the **main** on 10th Street. Determine horizontal distance from the structure to the existing sewer main. Indicate this dimension on your sketch.
   d. Determine the minimum size allowed for the building sewer (sewer lateral). Justify the pipe size using the Example Residential Plumbing Code Requirements and the number of **drainage fixture units** served by the building sewer for your Affordable Home design.
   e. Determine the maximum building sewer pipe invert elevation at the structure foundation and indicate this elevation on your sketch. Assume that the sewer invert must be at least 2 ft below the lowest floor requiring sanitary sewer drainage.
   f. Calculate the slope of the proposed building sewer from the structure to the sewer main.
   g. What is the minimum slope allowed for the building sewer pipe? Justify your answer using the Example Residential Plumbing Code Requirements and the number of drainage fixture units for your Affordable Home. Does your design meet the requirement? If not, revise your design to meet the requirements.
3. Include the location and size of your building sewer in your 3D model of your Affordable Housing Project.