



2013 ASCE PACIFIC SOUTH WEST CONFERENCE

Environmental Design Competition

OBJECTIVE:

Design and build a municipal sewer system for a small community.

PARTICIPANTS:

- Each school may enter one team only.
- Each team consists of a minimum of 4 and a maximum of 5 students.
- Each team member must be a registered participant of the PSWC 2013.
- Each team must have at least one underclassman.
- Each team must have at least one female member.
- Participation must be voluntary, not for credit or considered coursework.
- Professor guidance should not be necessary and should be kept to a minimum.

EVENT DESCRIPTION:

The Fruitsville community is expanding with new residential units and commercial properties. As a civil engineer, you have been hired to design the sewer collection system for this new area and connect it to the existing sewers. The community has an existing Orange Pump Station located at the intersection of Orange and Blueberry. All the existing sewage discharges into this pump station. In addition, the main concern of the community is redundancy; therefore an additional pump station will be needed.

GENERAL RULES:

All teams will bring with them a poster of their design and a bench-scale demonstration of the sanitary sewer collection system. A five (5) minute informal oral presentation is also required.



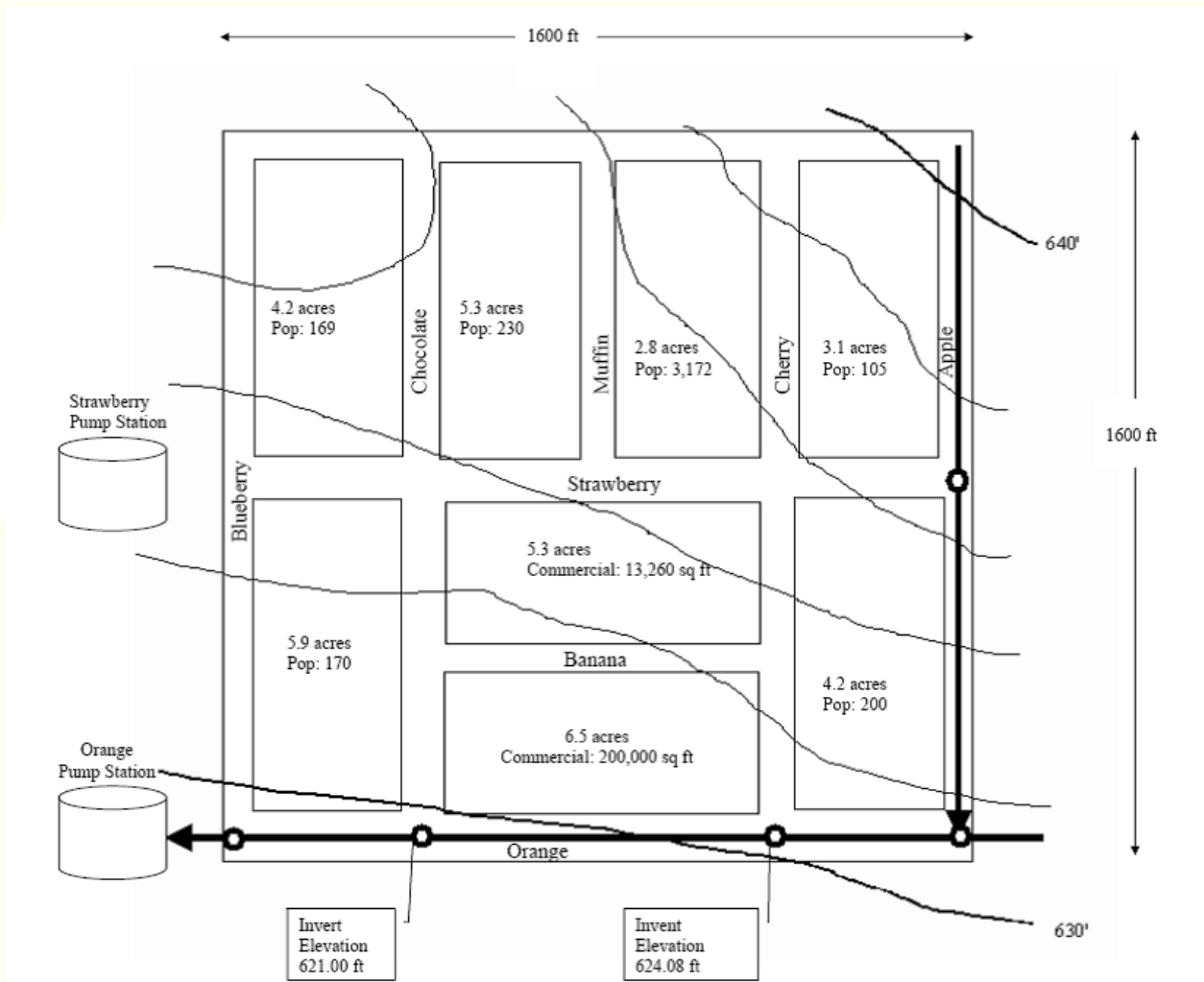
DESIGN GUIDELINES:

Design Criteria for the Fruitsville Community Development:

- Groundwater infiltration rate (I/I): 2000 gal/acre/day
- Minimum scouring velocity: 2 feet/sec
- Friction coefficient: To be determined by each team
- Residential Sewage Generation Rate: 75 GPCD.
- Commercial Sewage Generation Rate: 80 GPD/1000 sq feet.
- Plan view of the subdivision including topographic contours lines, acreage, and land use is provided in Figure 1
- Existing Sewage in the Apple Sewer is 1 MGD. The pipe diameter and slope will be determined by each team.
- Existing Orange Pump Station is located on Orange/Blueberry.
- Strawberry Pump Station, a new pump station will be built on Strawberry/Blueberry.
- Maintenance Holes (MH): Must be at every intersection; break in slope or angle on profile. MH should be less than 500 feet apart.
- Pipe diameters must be designed so that peak flows (including I/I) are at depth/diameter of 50% full. Pipe diameters must be commercial size.
- Provide at least two (2) redundancy measures in the system (flow splits).
- 75% of the flows must feed into Orange Pump Station and the remaining flows will feed into the new Strawberry Pump Station.



Figure 1 – Fruitsville Community Development – Plan View of Sub-divisions





Design Criteria for the Bench Scale Demonstration:

- Bench scale demonstration must be made up with materials that are stand-alone during the competition.
- The sanitary system must fit within a 6 ft X 6 ft maximum square area and 7 feet height limit.
- Bench-scale demonstration may be built prior to the competition date.
- The pump station wet well (collection containers) with volume markings must be provided by each team and will be used to score the efficiency of the design.
- Clear piping must be used to determine if the flow is at 50% full for scoring the design criteria.
- There must be 4 inlets to the system and a total of 6 gallons of wastewater will be provided and divided amongst the inlets in the following manner: 0.50 Gallons, 0.50 Gallons, 1 Gallon, and 4 Gallons.
- Street names, elevation, and d/D at 50% full must be pre-marked on the pipes.
- Maintenance Holes (MH): Must be at every intersection; break in slope or angle on profile. MH should be less than 500 feet apart.
- Pipe diameters must be designed so that peak flows are at depth/diameter of 50% full. Pipe diameters must be scaled to commercial size.
- Provide at least two (2) redundancy measures in the system (flow splits).
- 75% of the flows must feed into Orange Pump Station and the remaining flows will feed into the new Strawberry Pump Station.
- No manual diversions are allowed.

EVENT PROCEEDINGS:

- A PSWC 2013 volunteer will be assigned to each team.
- Systems must be setup in the first 20 minutes of the competition. All materials and tools for construction should be supplied by each team.
- Presentations will be made after setup and before the bench scale demonstration is done.
- During the bench scale demonstration, 4 team members will be simultaneously discharging the sewage into the 4 inlets. The judging team will then score the efficiency of the demonstration.
- Sewage of high solid content will be distributed by the PSWC 2013 volunteer to each team.



Presentation and Poster Guidelines:

- Presentation and poster must explain the process of designing, constructing the structure/apparatus, and the location of the redundancy in the system.
- Total time of the presentation is 10 minutes, 5 of which are reserved for questions
- A poster is required for the presentation and must include the following:
 - Size may not exceed 60 inch by 60 inch, but may be double sided.
 - Statement of the problem
 - Calculations showing the design results
 - A plan view of the new community collection system.
 - Cost breakdown of material used in constructing the structure.
 - Cost breakdown will include all materials used except for the existing structures (i.e. the existing pump station, Apple Sewer, and Orange Sewer will not be included in the cost).

SCORING:

The maximum amount of points a team can score is 100 points, with specific scores determined by the judges.

Breakdown of Points:

- Presentation (30 points)
- Poster (10 points)
- Bench Scale Demonstration (45 points)
- Aesthetics of Apparatus (10 points)
- Efficiency (25 points)
- Redundancy (10 points)
- Cost (5 points)



Calculations of Scoring:

- Presentation (30 points)
 - Detail how the process of how the design was completed with step by step procedures including software used, etc. (18 points)
 - Explain what measurement scale was used and how it was decided. (2 points)
 - Explain and detail where the redundancy is located in the system and why. (10 points)
- Poster (10 points)
 - Poster requirements (2 points/item)
- Bench Scale Demonstration (45 points)
 - Shows that the sewage flows at or below the $d/D = 0.50$ (4 points)
 - Discharge into the inlets are done with 4 team members (2 points/item)
 - No sewage loss or clogged pipes during the demonstration (4 points)
 - Efficiency (25 points)
 - 75% flow to Orange Pump Station and 25% flow to Strawberry Pump Station (25 points)
 - Redundancy (10 points)
 - One Flow Split (5 points)
 - Two Flow Splits (10 points)
 - Three Flow Splits (Extra 3 points)
- Aesthetics of Apparatus (10 points)
 - Proper size (1 Points)
 - Proper labeling (50% full mark, street names, pipe size) (9 points)
- Cost (5 points)
 - Clearly details the cost (3 points)
 - Excludes existing structures (2 points)