Problem #4 - Main 2

Solution Calculations

Sta. 11+75 to 3+15, Grade = 0.30 %   DC = $^3/_8$ inch

   Begin with a 5 inch CPT - Maximum Capacity = 10.5 Ac

   First 6 laterals are 900 ft. long with 50' spacing
   Contribution by each lateral: 950' x 50'

$$\frac{950' \times 50'}{43,560} = 1.09 \text{ Ac/lat}$$

   6 x 1.09 Ac. = 6.5 Ac.

   Capacity remaining in the tile:
   10.5 Ac. - 6.54 Ac. = 3.96 Ac.

   The Main between 9+75 and 7+75 is providing dainage to 200 feet with a 50'
   spacing contributing:

$$\frac{200' \times 50'}{43,560} = 0.23 \text{ Ac/lat}$$

   The farmstead lateral that junctions with the Main at Station 7+75 is next,
   It is 350 ft long with 50' spacing
   Contribution by the lateral is

$$\frac{400' \times 50'}{43,560} = 0.46 \text{ Ac/lat}$$

   Capacity remaining in the tile:
   3.96 Ac. - 0.69 Ac. = 3.27 Ac.

   Next 14 laterals are 1100 ft. long. Contributing area for each lateral is:

$$\frac{1150' \times 50'}{43,560} = 1.32 \text{ Ac/lat}$$

   $\frac{3.27 \text{ Ac.}}{1.32 \text{ Ac.}}$ = 2.5 laterals

   Add 2 more laterals to use the remaining capacity of the 5" Main at Station
   6+75. **Total Drainage Area to this point is 9.87 acres.**

Problem #4 - Main 2

Sta. 6+75 to Sta. 3+15, 0.30% grade

Switch to a 6 inch CPT - Maximum Capacity = 17.0 Ac.

Capacity remaining in the tile:
17.0 Ac. - 9.87 Ac. = 7.13 Ac.

$$\frac{7.13 \text{ Ac.}}{1.32 \text{ Ac.}} = 5.4 \text{ laterals}$$

Add 5 more laterals to use the remaining capacity of the 6" Main at Station 4+25. **Total Drainage Area to this point is 16.47 Ac**.

NOTE: Grade change at 3+15 so only 2 more laterals remain before grade change.

Switch to an 8 inch CPT - Maximum Capacity = 36.5 Ac.

Capacity remaining in the tile:
36.5 Ac. - 16.47 Ac. = 20.03 Ac.

laterals x 1.32 Ac/lat = 2.64 Ac.

Add 2 more laterals to reach the grade break at 3+15.
Total Drainage Area to this point is 19.11 Ac.

Sta. 3+15 to 0+00, 0.25% grade

Recompute **8 inch CPT - Maximum Capacity = 33.0 Ac.**

5 remaining laterals x 1.32 Ac/lat = 6.60 Ac.

And the southern most lateral that junctions at 0+25 has a length of 750 feet with a contributing area of:

$$\frac{800' \times 50'}{43,560} = 0.92 \text{ Ac/lat}$$

Adding these last 6 laterals completes the design.
Total Drainage Area at the outlet 26.63 Ac, which is less than the 33.0 Ac capacity of the 8" Main.