

Clean Water Diversion Calculations

Diversion Berm Design Storms

According to the PADEP Erosion and Sediment Pollution Control Program Manual, temporary channels and berms must be designed to convey 1.6 cfs/acre or peak discharge from a 2-year/1-hour storm. Temporary channels in special protection watersheds must be designed to convey 2.25 cfs/acre or the peak discharge from a 5-year/1-hour storm.

The diversions were designed using the peak flow using the Rational Method. The intensity used in the peak flow calculations was based on a 2-year storm using Steel's Formula (for Region 3), which is located on page 114 of the E&S manual,

$$I = \frac{106}{(T_c + 17)}, \text{ in/hr}$$

Typically when using the Rational Method, the time of concentration is used for the storm duration to produce a conservative (highest) intensity since this is the time it takes for the entire drainage area to contribute to the flow. Therefore, the peak flow for all diversions with a time of concentration of less than 60 minutes, will be greater than using the 2-year/1-hour storm for the rainfall intensity.

The rainfall intensity can also be found for specific locations using the National Oceanic and Atmospheric Administration Atlas 14. For example, the intensity for the 2-year/1-hour storm using Steel's Formula is,

$$I = \frac{106}{(60 + 17)} = 1.38 \text{ in/hr}$$

Compare this to the 2-year/1-hour rainfall intensity from NOAA Atlas 14 for western Pennsylvania in Washington County (1.18 in/hr) and eastern Pennsylvania in Delaware County (1.45 in/hr).

For special protection watersheds, the required design storm is the 5-year/1-hour storm if not using the multiplier. Using the Steel's Formula, the design intensity is

$$I = \frac{135}{(T_c + 19)} = \frac{135}{(60 + 19)} = 1.70 \text{ in/hr}$$

The intensity for the 2-year/1-hour storm from NOAA Atlas 14 ranges from 1.48 in/hr in western Pennsylvania to 1.80 in/hr in eastern Pennsylvania.

The 2-year return period storm was used for all of the runoff calculations. However, since the time of concentration was used for the storm duration, the vast majority of the diversions were designed conservatively compared to strictly using the 5-year/1-hour storm event. Since most of the drainage areas are relatively small, time of concentration values were typically between 5 minutes, which corresponds to an intensity of 4.8 in/hr and 35 minutes, which corresponds to an intensity of 2.03 in/hr. The intensities used can be found on the flow summary tables entitled

“TABLE FOR CALCULATING THE PEAK RUNOFF RATE FOR DRAINAGE PIPES USED FOR CLEAN WATER DIVERSIONS”. The calculations have been reviewed to identify if any intensity values were less than the 1.70 in/hr requirement. Revised tables have been provided that use an intensity of the greater of either the 2-year storm with the time of concentration as the duration or the 5-year/1-hour storm.

Level Spreader Design

The clean water diversions must discharge to a stabilized area. In order to prevent damage to downstream properties, the concentrated flow through the pipe must be returned to sheet flow prior to entering receiving waters.

According to the Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual, drainage areas to earthen level spreaders must be limited to 1.0 acre. Due to the temporary nature of the work and lack of real estate and workspace, structural level spreaders are not feasible. Therefore, we have designed a more construction-friendly level spreader that will be adequate for the limited lifespan of the level spreader.

The clean water diversion will direct the clean runoff to a rock filter to slow the water and allow some filtering and infiltration. Once the water passes through the rock filter, it will enter a pipe that conveys the clean water across the workspace. In order to dissipate energy and return the concentrated flow to sheet flow, the pipe will be connected to a capped perforated pipe situated parallel to the contours. The level spreader will be wrapped with and placed on geotextile fabric for additional protection. AASHTO No. 1 Stone will be placed over the level spreader with a minimum stone depth over the pipe of 4-inches. Compost filter sock will be located up grade from the level spreader acting as a sediment barrier from the workspace. An 18-inch compost filter sock will also be placed down grade of the level spreader.

The pipe specification used was taken from the JM Eagle Technical Bulletin (Eagle Corr PE). A nominal pipe size of 12-inches was chosen in order to be used for a wide range of flows. The 12-inch perforated pipe has circular perforations with a diameter of 0.375 inches. There are six (6) rows of perforations for the 12-inch pipe which corresponds to a nominal water inlet area of 4.10 in²/ft.

The orifice flow equation, $Q = C_d A_o (2gh)^{1/2}$, is used to find the flow through an orifice. The six (6) openings per row is known. Using the nominal water inlet area, the spacing of the rows is calculated and then turned into a ft³/s/ft value based on the number of openings. The peak flow for a diversion is known from the diversion calculations and then a length of level spreader is calculated based on the available static head, the elevation difference across the workspace.

All lengths were then rounded up to the next multiple of 5 feet. The minimum level spreader length was also 5 feet.

After construction and once the disturbed area tributary to the compost filter sock in the vicinity is permanently stabilized with vegetation, the diversions and level spreaders will be removed along with other erosion and sedimentation control BMPs.

Chester County

**Chester County
Temporary Diversion Berm Calculations**

| STATION | Roughness Coefficient | Channel Slope (ft/ft) | Normal Depth (ft) | Left Side Slope (ft/ft (H:V)) | Right Side Slope (ft/ft (H:V)) | Discharge (ft ³ /s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | Top Width (ft) | Critical Depth (ft) | Critical Slope (ft/ft) | Velocity (ft/s) | Velocity Head (ft) | Specific Energy (ft) | Froude Number | Flow Type |
|-------------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------------------|--------------------------------|------------------------------|-----------------------|-----------------------|----------------|---------------------|------------------------|-----------------|--------------------|----------------------|---------------|---------------|
| 14341+95 - 14343+95 | 0.025 | 0.02 | 0.33 | 0.1 | 12.5 | 1.65 | 0.68 | 4.47 | 0.15 | 4.15 | 0.34 | 0.0182 | 2.41 | 0.09 | 0.42 | 1.05 | Supercritical |
| 14343+95 - 14348+60 | 0.025 | 0.02 | 0.32 | 0.1 | 10 | 1.19 | 0.51 | 3.52 | 0.15 | 3.22 | 0.32 | 0.0189 | 2.32 | 0.08 | 0.4 | 1.03 | Supercritical |
| 14364+55 - 14366+25 | 0.025 | 0.01 | 0.23 | 0.1 | 12 | 0.43 | 0.32 | 3 | 0.11 | 2.79 | 0.2 | 0.0217 | 1.34 | 0.03 | 0.26 | 0.7 | Subcritical |
| 14367+90 - 14372+60 | 0.025 | 0.01 | 0.68 | 0.1 | 5.5 | 3.33 | 1.29 | 4.47 | 0.29 | 3.79 | 0.61 | 0.0168 | 2.59 | 0.1 | 0.78 | 0.78 | Subcritical |
| 14385+60 - 14385+30 | 0.025 | 0.02 | 0.25 | 0.1 | 21 | 1.4 | 0.68 | 5.59 | 0.12 | 5.35 | 0.26 | 0.0192 | 2.06 | 0.07 | 0.32 | 1.02 | Supercritical |
| 14390+70 - 14393+40 | 0.025 | 0.02 | 0.31 | 0.1 | 12 | 1.39 | 0.6 | 4.1 | 0.15 | 3.8 | 0.32 | 0.0186 | 2.33 | 0.08 | 0.4 | 1.04 | Supercritical |
| 14419+75 - 14422+10 | 0.025 | 0.03 | 0.38 | 0.1 | 11 | 2.58 | 0.8 | 4.58 | 0.17 | 4.22 | 0.42 | 0.0171 | 3.22 | 0.16 | 0.54 | 1.3 | Supercritical |
| 14428+70 - 14429+40 | 0.025 | 0.01 | 0.79 | 0.1 | 6 | 5.45 | 1.89 | 5.58 | 0.34 | 4.8 | 0.72 | 0.0156 | 2.89 | 0.13 | 0.92 | 0.81 | Subcritical |
| 14501+50 - 14503+10 | 0.025 | 0.01 | 0.26 | 0.1 | 24 | 1.21 | 0.81 | 6.5 | 0.13 | 6.26 | 0.23 | 0.0197 | 1.49 | 0.03 | 0.29 | 0.73 | Subcritical |
| 14503+10 - 14505+00 | 0.025 | 0.01 | 0.55 | 0.1 | 22 | 8.21 | 3.35 | 12.68 | 0.26 | 12.17 | 0.51 | 0.0152 | 2.45 | 0.09 | 0.64 | 0.82 | Subcritical |
| 14520+20 - 14521+55 | 0.025 | 0.04 | 0.18 | 0.1 | 8 | 0.29 | 0.13 | 1.63 | 0.08 | 1.46 | 0.2 | 0.0228 | 2.21 | 0.08 | 0.26 | 1.3 | Supercritical |
| 14544+15 - 14544+75 | 0.025 | 0.01 | 0.16 | 0.1 | 18 | 0.25 | 0.23 | 3.06 | 0.08 | 2.91 | 0.14 | 0.0238 | 1.07 | 0.02 | 0.18 | 0.67 | Subcritical |
| 14545+35 - 14546+50 | 0.025 | 0.01 | 0.31 | 0.1 | 12.5 | 1 | 0.61 | 4.22 | 0.14 | 3.92 | 0.27 | 0.0194 | 1.64 | 0.04 | 0.35 | 0.73 | Subcritical |
| 14548+00 - 14550+20 | 0.025 | 0.02 | 0.34 | 0.1 | 12 | 1.68 | 0.69 | 4.4 | 0.16 | 4.08 | 0.34 | 0.0181 | 2.44 | 0.09 | 0.43 | 1.05 | Supercritical |
| 14460+40 - 14601+00 CH | 0.025 | 0.03 | 0.29 | 0.1 | 7 | 0.79 | 0.3 | 2.35 | 0.13 | 2.07 | 0.31 | 0.02 | 2.62 | 0.11 | 0.4 | 1.21 | Supercritical |
| 14600+00 - 14600+20 CH | 0.025 | 0.02 | 0.22 | 0.1 | 10 | 0.42 | 0.23 | 2.38 | 0.1 | 2.18 | 0.21 | 0.0217 | 1.79 | 0.05 | 0.27 | 0.96 | Subcritical |
| 14628+20 - 14629+00 CH | 0.025 | 0.04 | 0.15 | 0.1 | 17 | 0.39 | 0.19 | 2.7 | 0.07 | 2.56 | 0.17 | 0.0224 | 2.04 | 0.06 | 0.21 | 1.32 | Supercritical |
| 14629+10 - 14631+50 CH | 0.025 | 0.03 | 0.33 | 0.1 | 7 | 1.07 | 0.38 | 2.64 | 0.14 | 2.32 | 0.36 | 0.0192 | 2.82 | 0.12 | 0.45 | 1.23 | Supercritical |
| 14631+70 - 14632+80 CH | 0.025 | 0.04 | 0.29 | 0.1 | 12 | 1.64 | 0.52 | 3.83 | 0.14 | 3.55 | 0.34 | 0.0182 | 3.15 | 0.15 | 0.45 | 1.45 | Supercritical |
| 14644+00 - 14646+70 CH | 0.025 | 0.03 | 0.27 | 0.1 | 10 | 0.91 | 0.36 | 2.95 | 0.12 | 2.7 | 0.29 | 0.0196 | 2.53 | 0.1 | 0.37 | 1.22 | Supercritical |
| 14646+70 - 14648+60 CH | 0.025 | 0.03 | 0.1 | 0.1 | 13 | 0.09 | 0.07 | 1.42 | 0.05 | 1.33 | 0.1 | 0.0268 | 1.34 | 0.03 | 0.13 | 1.05 | Supercritical |
| 14678+40 - 14679+80 CH | 0.025 | 0.06 | 0.3 | 0.1 | 10 | 1.74 | 0.45 | 3.3 | 0.14 | 3.02 | 0.37 | 0.018 | 3.86 | 0.23 | 0.53 | 1.76 | Supercritical |
| 14679+80 - 14682+10 CH | 0.025 | 0.03 | 0.5 | 0.1 | 5 | 2.3 | 0.64 | 3.05 | 0.21 | 2.55 | 0.55 | 0.0178 | 3.62 | 0.2 | 0.7 | 1.28 | Supercritical |
| 14682+10 - 14684+20 CH | 0.025 | 0.04 | 0.4 | 0.1 | 6 | 1.79 | 0.49 | 2.83 | 0.17 | 2.44 | 0.46 | 0.0181 | 3.68 | 0.21 | 0.61 | 1.45 | Supercritical |
| 14684+20 - 14685+60 CH | 0.025 | 0.05 | 0.39 | 0.1 | 5 | 1.5 | 0.38 | 2.36 | 0.16 | 1.97 | 0.46 | 0.0188 | 3.94 | 0.24 | 0.63 | 1.58 | Supercritical |
| 14685+60 - 14687+00 CH | 0.025 | 0.06 | 0.25 | 0.1 | 5 | 0.52 | 0.16 | 1.53 | 0.1 | 1.28 | 0.3 | 0.0217 | 3.24 | 0.16 | 0.41 | 1.61 | Supercritical |
| 14690+20 - 14693+80 CH | 0.025 | 0.12 | 0.4 | 0.1 | 3 | 1.45 | 0.25 | 1.67 | 0.15 | 1.24 | 0.56 | 0.0207 | 5.8 | 0.52 | 0.92 | 2.28 | Supercritical |
| 14693+80 - 14696+40 CH | 0.025 | 0.03 | 0.47 | 0.1 | 3 | 1.11 | 0.34 | 1.96 | 0.18 | 1.46 | 0.5 | 0.0214 | 3.22 | 0.16 | 0.63 | 1.17 | Supercritical |
| 14704+50 - 14706+00 CH | 0.025 | 0.01 | 1.58 | 0.1 | 0.67 | 2.42 | 0.96 | 3.49 | 0.28 | 1.22 | 1.2 | 0.0441 | 2.52 | 0.1 | 1.68 | 0.5 | Subcritical |
| 14744+00 - 14744+00 CH | 0.025 | 0.05 | 0.42 | 0.1 | 6 | 2.34 | 0.55 | 3 | 0.18 | 2.58 | 0.52 | 0.0175 | 4.27 | 0.28 | 0.71 | 1.64 | Supercritical |
| 14784+30 - 14785+40 CH | 0.025 | 0.05 | 0.16 | 0.1 | 7 | 0.2 | 0.09 | 1.28 | 0.07 | 1.12 | 0.18 | 0.0241 | 2.25 | 0.08 | 0.24 | 1.41 | Supercritical |
| 14848+00 - 14851+90 CH | 0.025 | 0.07 | 0.42 | 0.1 | 8 | 3.63 | 0.71 | 3.79 | 0.19 | 3.38 | 0.55 | 0.0163 | 5.14 | 0.41 | 0.83 | 1.98 | Supercritical |
| 15522+45 to 15522+90 CH | 0.025 | 0.01 | 0.31 | 0.1 | 3.5 | 0.25 | 0.17 | 1.44 | 0.12 | 1.12 | 0.26 | 0.0252 | 1.45 | 0.03 | 0.34 | 0.65 | Subcritical |

**Chester County
Temporary Slope Pipe Calculations**

| STATION | Roughness Coefficient | Channel Slope (ft/ft) | Normal Depth (ft) | Diameter (ft) | Discharge (ft ³ /s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | Top Width (ft) | Critical Depth (ft) | Percent Full (%) | Critical Slope (ft/ft) | Velocity (ft/s) | Velocity Head (ft) | Specific Energy (ft) | Froude Number | Maximum Discharge (ft ³ /s) | Discharge Full (ft ³ /s) | Slope Full (ft/ft) | Flow Type |
|-------------------------|-----------------------|-----------------------|-------------------|---------------|--------------------------------|------------------------------|-----------------------|-----------------------|----------------|---------------------|------------------|------------------------|-----------------|--------------------|----------------------|---------------|--|-------------------------------------|--------------------|---------------|
| 14341+95 - 14343+95 | 0.023 | 0.05 | 0.6 | 0.67 | 1.65 | 0.33 | 1.68 | 0.2 | 0.4 | 0.59 | 90.1 | 0.0508 | 4.93 | 0.38 | 0.98 | 0.95 | 1.66 | 1.55 | 0.05683 | SubCritical |
| 14343+95 - 14348+60 | 0.023 | 0.03 | 0.54 | 0.67 | 1.19 | 0.31 | 1.51 | 0.2 | 0.52 | 0.52 | 81.3 | 0.0334 | 3.88 | 0.23 | 0.78 | 0.89 | 1.29 | 1.2 | 0.02956 | SubCritical |
| 14364+55 - 14366+25 | 0.023 | 0.12 | 0.22 | 0.5 | 0.43 | 0.08 | 0.72 | 0.11 | 0.5 | 0.33 | 43.4 | 0.0298 | 5.26 | 0.43 | 0.65 | 2.28 | 1.18 | 1.1 | 0.01838 | SuperCritical |
| 14367+90 - 14372+60 | 0.023 | 0.11 | 0.5 | 1 | 3.33 | 0.39 | 1.57 | 0.25 | 1 | 0.78 | 49.9 | 0.0301 | 8.5 | 1.12 | 1.62 | 2.39 | 7.18 | 6.68 | 0.02735 | SuperCritical |
| 14385+60 - 14385+30 | 0.023 | 0.14 | 0.35 | 0.67 | 1.4 | 0.19 | 1.08 | 0.17 | 0.67 | 0.56 | 52.4 | 0.04 | 7.49 | 0.87 | 1.22 | 2.5 | 2.79 | 2.59 | 0.04092 | SuperCritical |
| 14390+70 - 14393+40 | 0.023 | 0.05 | 0.5 | 0.67 | 1.39 | 0.28 | 1.39 | 0.2 | 0.59 | 0.55 | 74 | 0.0396 | 4.97 | 0.38 | 0.88 | 1.27 | 1.66 | 1.55 | 0.04033 | SuperCritical |
| 14419+75 - 14442+10 | 0.023 | 0.05 | 0.54 | 1 | 2.58 | 0.44 | 1.66 | 0.26 | 1 | 0.69 | 54.3 | 0.0245 | 5.93 | 0.55 | 1.09 | 1.58 | 4.84 | 4.5 | 0.01642 | SuperCritical |
| 14428+70 - 14429+40 | 0.023 | 0.18 | 0.58 | 1 | 5.45 | 0.47 | 1.73 | 0.27 | 0.99 | 0.94 | 58 | 0.0633 | 11.53 | 2.07 | 2.65 | 2.94 | 9.19 | 8.54 | 0.07325 | SuperCritical |
| 14501+50 - 14503+10 | 0.023 | 0.05 | 0.45 | 0.67 | 1.21 | 0.25 | 1.28 | 0.19 | 0.63 | 0.52 | 66.6 | 0.034 | 4.85 | 0.37 | 0.81 | 1.36 | 1.66 | 1.55 | 0.03056 | SuperCritical |
| 14503+10 - 14505+00 | 0.023 | 0.03 | 1.01 | 1.5 | 8.21 | 1.27 | 2.89 | 0.44 | 1.4 | 1.11 | 67.6 | 0.0237 | 6.46 | 0.65 | 1.66 | 1.2 | 11.1 | 10.3 | 0.01912 | SuperCritical |
| 14520+20 - 14521+55 | 0.023 | 0.13 | 0.17 | 0.5 | 0.29 | 0.06 | 0.63 | 0.1 | 0.47 | 0.27 | 34.3 | 0.0252 | 4.87 | 0.37 | 0.54 | 2.42 | 1.23 | 1.14 | 0.00836 | SuperCritical |
| 14544+15 - 14544+75 | 0.023 | 0.07 | 0.19 | 0.5 | 0.25 | 0.07 | 0.66 | 0.1 | 0.48 | 0.25 | 37.4 | 0.0243 | 3.73 | 0.22 | 0.4 | 1.77 | 0.9 | 0.84 | 0.00621 | SuperCritical |
| 14545+35 - 14546+50 | 0.023 | 0.04 | 0.42 | 0.67 | 1 | 0.23 | 1.23 | 0.19 | 0.65 | 0.47 | 63 | 0.029 | 4.27 | 0.28 | 0.71 | 1.25 | 1.49 | 1.38 | 0.02088 | SuperCritical |
| 14548+00 - 14550+20 | 0.023 | 0.04 | 0.45 | 1 | 1.68 | 0.34 | 1.47 | 0.23 | 1 | 0.55 | 45.1 | 0.0202 | 4.89 | 0.37 | 0.82 | 1.47 | 4.33 | 4.03 | 0.00696 | SuperCritical |
| 14460+40 - 14601+00 PIP | 0.023 | 0.04 | 0.36 | 0.67 | 0.79 | 0.19 | 1.11 | 0.18 | 0.67 | 0.42 | 54.1 | 0.0253 | 4.06 | 0.26 | 0.62 | 1.32 | 1.49 | 1.38 | 0.01303 | SuperCritical |
| 14460+40 - 14601+00 PIP | 0.023 | 0.06 | 0.25 | 0.5 | 0.39 | 0.1 | 0.79 | 0.13 | 0.5 | 0.32 | 50.1 | 0.0283 | 3.96 | 0.24 | 0.49 | 1.57 | 0.84 | 0.78 | 0.01512 | SuperCritical |
| 14600+00 - 14600+20 PIP | 0.023 | 0.05 | 0.28 | 0.5 | 0.42 | 0.11 | 0.84 | 0.13 | 0.5 | 0.33 | 55.4 | 0.0294 | 3.76 | 0.22 | 0.5 | 1.4 | 0.76 | 0.71 | 0.01754 | SuperCritical |
| 14629+10 - 14631+50 PIP | 0.023 | 0.08 | 0.35 | 0.67 | 1.07 | 0.19 | 1.09 | 0.17 | 0.67 | 0.49 | 52.7 | 0.0305 | 5.68 | 0.5 | 0.85 | 1.89 | 2.11 | 1.96 | 0.0239 | SuperCritical |
| 14631+70 - 14632+80 PIP | 0.023 | 0.04 | 0.44 | 1 | 1.64 | 0.34 | 1.46 | 0.23 | 0.99 | 0.54 | 44.5 | 0.02 | 4.86 | 0.37 | 0.81 | 1.47 | 4.33 | 4.03 | 0.00663 | SuperCritical |
| 14644+00 - 14646+70 PIP | 0.023 | 0.04 | 0.4 | 0.67 | 0.91 | 0.22 | 1.18 | 0.18 | 0.66 | 0.45 | 59.2 | 0.0273 | 4.19 | 0.27 | 0.67 | 1.29 | 1.49 | 1.38 | 0.01729 | SuperCritical |
| 14646+70 - 14648+60 PIP | 0.023 | 0.01 | 0.18 | 0.5 | 0.09 | 0.06 | 0.65 | 0.1 | 0.48 | 0.15 | 36.4 | 0.0221 | 1.39 | 0.03 | 0.21 | 0.67 | 0.34 | 0.32 | 0.00081 | SubCritical |
| 14678+40 - 14679+80 PIP | 0.023 | 0.03 | 0.5 | 1 | 1.74 | 0.39 | 1.57 | 0.25 | 1 | 0.56 | 49.9 | 0.0204 | 4.44 | 0.31 | 0.81 | 1.25 | 3.75 | 3.49 | 0.00747 | SuperCritical |
| 14679+80 - 14682+10 PIP | 0.023 | 0.07 | 0.46 | 1 | 2.3 | 0.35 | 1.49 | 0.24 | 1 | 0.65 | 45.9 | 0.0229 | 6.54 | 0.66 | 1.12 | 1.94 | 5.73 | 5.33 | 0.01305 | SuperCritical |
| 14682+10 - 14684+20 PIP | 0.023 | 0.08 | 0.5 | 0.67 | 1.79 | 0.28 | 1.41 | 0.2 | 0.58 | 0.61 | 75.2 | 0.0584 | 6.29 | 0.62 | 1.12 | 1.58 | 2.11 | 1.96 | 0.06689 | SuperCritical |
| 14684+20 - 14685+60 PIP | 0.023 | 0.1 | 0.41 | 0.67 | 1.5 | 0.22 | 1.2 | 0.19 | 0.65 | 0.57 | 60.8 | 0.0439 | 6.69 | 0.69 | 1.1 | 2.01 | 2.35 | 2.19 | 0.04697 | SuperCritical |
| 14685+60 - 14687+00 PIP | 0.023 | 0.13 | 0.24 | 0.5 | 0.52 | 0.09 | 0.76 | 0.12 | 0.5 | 0.37 | 47.3 | 0.0339 | 5.69 | 0.5 | 0.74 | 2.34 | 1.23 | 1.14 | 0.02689 | SuperCritical |
| 14690+20 - 14693+80 PIP | 0.023 | 0.2 | 0.42 | 0.5 | 1.45 | 0.18 | 1.16 | 0.15 | 0.37 | 0.49 | 84.2 | 0.1903 | 8.22 | 1.05 | 1.47 | 2.08 | 1.53 | 1.42 | 0.20906 | SuperCritical |
| 14693+80 - 14696+40 PIP | 0.023 | 0.33 | 0.24 | 0.67 | 1.11 | 0.11 | 0.86 | 0.13 | 0.64 | 0.5 | 36.2 | 0.0314 | 9.65 | 1.45 | 1.69 | 4.03 | 4.28 | 3.98 | 0.02572 | SuperCritical |
| 14704+50 - 14706+00 PIP | 0.023 | 0.06 | 0.49 | 1 | 2.42 | 0.39 | 1.56 | 0.25 | 1 | 0.67 | 49.4 | 0.0235 | 6.25 | 0.61 | 1.1 | 1.77 | 5.31 | 4.93 | 0.01444 | SuperCritical |
| 14744+00 - 14744+00 PIP | 0.023 | 0.09 | 0.43 | 1 | 2.34 | 0.32 | 1.43 | 0.23 | 0.99 | 0.65 | 43.2 | 0.0231 | 7.21 | 0.81 | 1.24 | 2.22 | 6.5 | 6.04 | 0.0135 | SuperCritical |
| 14784+30 - 14785+40 PIP | 0.023 | 0.04 | 0.19 | 0.5 | 0.2 | 0.07 | 0.67 | 0.1 | 0.49 | 0.22 | 38.6 | 0.0233 | 2.87 | 0.13 | 0.32 | 1.33 | 0.68 | 0.63 | 0.00398 | SuperCritical |
| 14848+00 - 14851+90 CH | 0.023 | 0.1 | 0.54 | 1 | 3.63 | 0.43 | 1.65 | 0.26 | 1 | 0.81 | 54.1 | 0.033 | 8.37 | 1.09 | 1.63 | 2.24 | 6.85 | 6.37 | 0.0325 | SuperCritical |
| 15522+45 to 15522+90 P | 0.023 | 0.21 | 0.14 | 0.5 | 0.25 | 0.05 | 0.56 | 0.08 | 0.45 | 0.25 | 28 | 0.0243 | 5.54 | 0.48 | 0.62 | 3.08 | 1.56 | 1.45 | 0.00621 | SuperCritical |

Chester County
Temporary Diversion Berm
Erosion Control Blanket Calculations

| STATION | Channel Slope (ft/ft) | Normal Depth (ft) | Discharge (ft ³ /s) | Velocity (ft/s) | Shear or Velocity Method (S or V) | Max. Allowable Velocity (ft/s) | Max. Allowable Shear Stress (lb/ft ²) | Shear Stress (lb/ft ²) | Blanket Specification |
|-------------------------|-----------------------|-------------------|--------------------------------|-----------------|-----------------------------------|--------------------------------|---|------------------------------------|-----------------------|
| 14341+95 - 14343+95 | 0.02 | 0.33 | 1.65 | 2.41 | V | 8.0 | 2.00 | 0.41 | SC150 |
| 14343+95 - 14348+60 | 0.02 | 0.32 | 1.19 | 2.32 | V | 8.0 | 2.00 | 0.40 | SC150 |
| 14364+55 - 14366+25 | 0.01 | 0.23 | 0.43 | 1.34 | V | 8.0 | 2.00 | 0.14 | SC150 |
| 14367+90 - 14372+60 | 0.01 | 0.68 | 3.33 | 2.59 | V | 8.0 | 2.00 | 0.42 | SC150 |
| 14385+60 - 14385+30 | 0.02 | 0.25 | 1.4 | 2.06 | V | 8.0 | 2.00 | 0.31 | SC150 |
| 14390+70 - 14393+40 | 0.02 | 0.31 | 1.39 | 2.33 | V | 8.0 | 2.00 | 0.39 | SC150 |
| 14419+75 - 14422+10 | 0.03 | 0.38 | 2.58 | 3.22 | V | 8.0 | 2.00 | 0.71 | SC150 |
| 14428+70 - 14429+40 | 0.01 | 0.79 | 5.45 | 2.89 | V | 8.0 | 2.00 | 0.49 | SC150 |
| 14501+50 - 14503+10 | 0.01 | 0.26 | 1.21 | 1.49 | V | 8.0 | 2.00 | 0.16 | SC150 |
| 14503+10 - 14505+00 | 0.01 | 0.55 | 8.21 | 2.45 | V | 8.0 | 2.00 | 0.34 | SC150 |
| 14520+20 - 14521+55 | 0.04 | 0.18 | 0.29 | 2.21 | V | 8.0 | 2.00 | 0.45 | SC150 |
| 14544+15 - 14544+75 | 0.01 | 0.16 | 0.25 | 1.07 | V | 8.0 | 2.00 | 0.10 | SC150 |
| 14545+35 - 14546+50 | 0.01 | 0.31 | 1 | 1.64 | V | 8.0 | 2.00 | 0.19 | SC150 |
| 14548+00 - 14550+20 | 0.02 | 0.34 | 1.68 | 2.44 | V | 8.0 | 2.00 | 0.42 | SC150 |
| 14460+40 - 14601+00 CHN | 0.03 | 0.29 | 0.79 | 2.62 | V | 8.0 | 2.00 | 0.54 | SC150 |
| 14600+00 - 14600+20 CHN | 0.02 | 0.22 | 0.42 | 1.79 | V | 8.0 | 2.00 | 0.27 | SC150 |
| 14628+20 - 14629+00 CHN | 0.04 | 0.15 | 0.39 | 2.04 | V | 8.0 | 2.00 | 0.37 | SC150 |
| 14629+10 - 14631+50 CHN | 0.03 | 0.33 | 1.07 | 2.82 | V | 8.0 | 2.00 | 0.62 | SC150 |
| 14631+70 - 14632+80 CHN | 0.04 | 0.29 | 1.64 | 3.15 | V | 8.0 | 2.00 | 0.72 | SC150 |
| 14644+00 - 14646+70 CHN | 0.03 | 0.27 | 0.91 | 2.53 | V | 8.0 | 2.00 | 0.51 | SC150 |
| 14646+70 - 14648+60 CHN | 0.03 | 0.1 | 0.09 | 1.34 | V | 8.0 | 2.00 | 0.19 | SC150 |
| 14678+40 - 14679+80 CHN | 0.06 | 0.3 | 1.74 | 3.86 | V | 8.0 | 2.00 | 1.12 | SC150 |
| 14679+80 - 14682+10 CHN | 0.03 | 0.5 | 2.3 | 3.62 | V | 8.0 | 2.00 | 0.94 | SC150 |
| 14682+10 - 14684+20 CHN | 0.04 | 0.4 | 1.79 | 3.68 | V | 8.0 | 2.00 | 1.00 | SC150 |
| 14684+20 - 14685+60 CHN | 0.05 | 0.39 | 1.5 | 3.94 | V | 8.0 | 2.00 | 1.22 | SC150 |
| 14685+60 - 14687+00 CHN | 0.06 | 0.25 | 0.52 | 3.24 | V | 8.0 | 2.00 | 0.94 | SC150 |
| 14690+20 - 14693+80 CHN | 0.12 | 0.4 | 1.45 | 5.8 | S | 9.5 | 3.00 | 3.00 | SC250 |
| 14693+80 - 14696+40 CHN | 0.03 | 0.47 | 1.11 | 3.22 | V | 8.0 | 2.00 | 0.88 | SC150 |
| 14704+50 - 14706+00 CHN | 0.01 | 1.58 | 2.42 | 2.52 | V | 8.0 | 2.00 | 0.99 | SC150 |
| 14744+00 - 14744+00 CHN | 0.05 | 0.42 | 2.34 | 4.27 | V | 8.0 | 2.00 | 1.31 | SC150 |
| 14784+30 - 14785+40 CHN | 0.05 | 0.16 | 0.2 | 2.25 | V | 8.0 | 2.00 | 0.50 | SC150 |
| 14848+00 - 14851+90 CHN | 0.07 | 0.42 | 3.63 | 5.14 | V | 8.0 | 2.00 | 1.83 | SC150 |
| 15522+45 to 15522+90 CH | 0.01 | 0.31 | 0.25 | 1.45 | V | 8.0 | 2.00 | 0.19 | SC150 |

Chester County
Temporary Slope Pipe Calculations

| STATION | Diversion Discharge (ft ³ /s) | Available Static Head (ft) | Level Spreader Pipe Diameter (in.) | Perforation Diameter (in.) | Number of Perforations per Row | Orifice Area per Foot (in ² /ft) | Row Spacing (in.) | Orifice Coefficient (Cd) | Level Spreader Capacity per foot of length (ft ³ /s per ft) | Required Length (ft) | Nominal Length (ft) | Overall Level Spreader Capacity(ft ³ /s) |
|---------------------------|--|----------------------------|------------------------------------|----------------------------|--------------------------------|---|-------------------|--------------------------|--|----------------------|---------------------|---|
| 14341+95 - 14343+95 | 1.65 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 6.83 | 10 | 2.41 |
| 14343+95 - 14348+60 | 1.19 | 2 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.197 | 6.04 | 10 | 1.97 |
| 14364+55 - 14366+25 | 0.43 | 10 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.441 | 0.98 | 5 | 2.20 |
| 14367+90 - 14372+60 | 3.33 | 7 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.369 | 9.03 | 10 | 3.69 |
| 14385+60 - 14385+30 | 1.4 | 1.5 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.171 | 8.20 | 10 | 1.71 |
| 14390+70 - 14393+40 | 1.39 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 5.76 | 10 | 2.41 |
| 14419+75 -14442+10 | 2.58 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 10.69 | 15 | 3.62 |
| 14428+70 - 14429+40 | 5.45 | 16 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.558 | 9.78 | 10 | 5.58 |
| 14501+50 - 14503+10 | 1.21 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 5.01 | 10 | 2.41 |
| 14503+10 - 14505+00 | 8.21 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 34.01 | 35 | 8.45 |
| 14520+20 - 14521+55 | 0.29 | 13 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.503 | 0.58 | 5 | 2.51 |
| 14544+15 - 14544+75 | 0.25 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 1.04 | 5 | 1.21 |
| 14545+35 - 14546+50 | 1 | 1 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.139 | 7.17 | 10 | 1.39 |
| 14548+00 - 14550+20 | 1.68 | 2 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.197 | 8.52 | 10 | 1.97 |
| 14600+40 - 14601+00 PIPE | 0.79 | 5 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.312 | 2.53 | 5 | 1.56 |
| 14628+20 - 14629+00 PIPE | 0.39 | 4 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.279 | 1.40 | 5 | 1.39 |
| 14600+00 - 14600+20 PIPE | 0.42 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 1.74 | 5 | 1.21 |
| 14629+10 - 14631+50 PIPE | 1.07 | 7 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.369 | 2.90 | 5 | 1.84 |
| 14631+70 - 14632+80 PIPE | 1.64 | 5 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.312 | 5.26 | 10 | 3.12 |
| 14644+00 - 14646+70 PIPE | 0.91 | 4 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.279 | 3.26 | 5 | 1.39 |
| 14646+70 - 14648+60 PIPE | 0.09 | 2 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.197 | 0.46 | 5 | 0.99 |
| 14678+40 - 14679+80 PIPE | 1.74 | 4 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.279 | 6.24 | 10 | 2.79 |
| 14679+80 - 14682+10 PIPE | 2.3 | 2.5 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.220 | 10.44 | 15 | 3.31 |
| 14682+10 - 14684+20 PIPE | 1.79 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 7.41 | 10 | 2.41 |
| 14684+20 - 14685+60 PIPE | 1.5 | 7 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.369 | 4.07 | 5 | 1.84 |
| 14685+60 - 14687+00 PIPE | 0.52 | 14 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.522 | 1.00 | 5 | 2.61 |
| 14690+20 - 14693+80 PIPE | 1.45 | 16 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.558 | 2.60 | 5 | 2.79 |
| 14693+80 - 14696+40 PIPE | 1.11 | 26 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.711 | 1.56 | 5 | 3.55 |
| 14704+50 - 14706+00 PIPE | 2.42 | 8 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.394 | 6.14 | 10 | 3.94 |
| 14744+00 - 14744+00 PIPE | 2.34 | 5 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.312 | 7.51 | 10 | 3.12 |
| 14784+30 - 14785+40 PIPE | 0.2 | 1.5 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.171 | 1.17 | 5 | 0.85 |
| 14848+00 - 14851+90 CHN | 3.63 | 5 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.312 | 11.65 | 15 | 4.67 |
| 15522+45 to 15522+90 PIPE | 0.25 | 15 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.540 | 0.46 | 5 | 2.70 |

TABLE FOR CALCULATING THE PEAK RUNOFF RATE FOR DRAINAGE PIPES USED FOR CLEAN WATER DIVERSION

| Start Sta. | End Sta. | Area of Drainage (sq ft) | Length of Sheet Flow (ft) | Slope of Ground during Sheet Flow (ft/ft) | Soil Type | Roughness Coefficient (n) | Time of Concentration in Sheet Flow (min) | Length of Shallow Concentrated Flow (ft) | Slope of Ground during Shallow Concentrated Flow (ft/ft) | Shallow Concentrated Flow Velocity (ft/sec) | Time of Concentration in Shallow Concentrated Flow (min) | Total Time of Concentration (min) | 2-Year Storm Rainfall Intensity (in/hr) | Runoff Coefficients for the Rational Equation | Channel Longitudinal Slope (ft/ft) | Channel Side Slope (H:V) (ft/ft) | Peak Runoff Rate (CFS) | Size of Diversion Sock (in) | Pipe Slope (ft/ft) | Size of Slope Pipe (in) |
|------------|----------|--------------------------|---------------------------|---|-----------|---------------------------|---|--|--|---|--|-----------------------------------|---|---|------------------------------------|----------------------------------|------------------------|-----------------------------|--------------------|-------------------------|
| 14341+95 | 14343+95 | 111,375 | 100 | 0.03 | Type D | 0.300 | 9.20 | 596 | 0.04 | 1.50 | 6.62 | 15.82 | 3.23 | 0.20 | 0.02 | 12.5:1 | 1.65 | 12 | 0.05 | 8 |
| 14343+95 | 14348+60 | 71,119 | 100 | 0.04 | Type D | 0.300 | 8.60 | 346 | 0.06 | 1.65 | 3.49 | 12.10 | 3.64 | 0.20 | 0.02 | 10:1 | 1.19 | 12 | 0.03 | 8 |
| 14364+55 | 14366+25 | 24,858 | 100 | 0.05 | Type D | 0.300 | 8.17 | 187 | 0.17 | 1.00 | 3.12 | 11.28 | 3.75 | 0.20 | 0.01 | 12:1 | 0.43 | 12 | 0.12 | 6 |
| 14367+90 | 14372+60 | 207,485 | 100 | 0.12 | Type D | 0.300 | 6.65 | 342 | 0.12 | 0.85 | 6.71 | 13.36 | 3.49 | 0.20 | 0.01 | 5.5:1 | 3.33 | 18 | 0.11 | 12 |
| 14385+60 | 14385+30 | 92,577 | 100 | 0.05 | Type D | 0.300 | 8.17 | 670 | 0.05 | 1.60 | 6.98 | 15.14 | 3.30 | 0.20 | 0.02 | 21:1 | 1.40 | 12 | 0.14 | 8 |
| 14390+70 | 14393+40 | 72,140 | 100 | 0.25 | Type D | 0.300 | 5.61 | 292 | 0.70 | 1.80 | 2.70 | 8.31 | 4.19 | 0.20 | 0.02 | 12:1 | 1.39 | 12 | 0.05 | 8 |
| 14419+75 | 14422+10 | 151,551 | 100 | 0.13 | Type D | 0.300 | 6.53 | 721 | 0.12 | 2.40 | 5.01 | 11.54 | 3.71 | 0.20 | 0.03 | 11:1 | 2.58 | 12 | 0.05 | 12 |
| 14428+70 | 14429+40 | 304,778 | 100 | 0.05 | Type D | 0.300 | 8.17 | 286 | 0.12 | 2.30 | 2.07 | 10.24 | 3.89 | 0.20 | 0.01 | 6:1 | 5.45 | 18 | 0.18 | 12 |
| 14501+50 | 14503+10 | 93,570 | 100 | 0.03 | Type D | 0.300 | 9.20 | 652 | 0.04 | 0.95 | 11.44 | 20.64 | 2.82 | 0.20 | 0.01 | 24:1 | 1.21 | 12 | 0.05 | 8 |
| 14503+10 | 14505+00 | 704,015 | 100 | 0.02 | Type D | 0.300 | 10.11 | 964 | 0.06 | 1.10 | 14.61 | 24.72 | 2.54 | 0.20 | 0.01 | 22:1 | 8.21 | 18 | 0.03 | 12 (2) |
| 14520+20 | 14521+55 | 16,755 | 100 | 0.04 | Type D | 0.300 | 8.60 | 247 | 0.09 | 1.40 | 2.94 | 11.54 | 3.71 | 0.20 | 0.04 | 8:1 | 0.29 | 12 | 0.13 | 6 |
| 14544+15 | 14544+75 | 14,786 | 100 | 0.07 | Type D | 0.300 | 7.55 | 414 | 0.06 | 1.60 | 4.31 | 11.86 | 3.67 | 0.20 | 0.01 | 18:1 | 0.25 | 12 | 0.07 | 6 |
| 14545+35 | 14546+50 | 62,264 | 100 | 0.06 | Type D | 0.300 | 7.82 | 533 | 0.06 | 1.60 | 5.55 | 13.38 | 3.49 | 0.20 | 0.01 | 12.5:1 | 1.00 | 12 | 0.04 | 8 |
| 14548+00 | 14550+20 | 101,807 | 100 | 0.05 | Type D | 0.300 | 8.17 | 401 | 0.05 | 1.55 | 4.31 | 12.48 | 3.60 | 0.20 | 0.02 | 12:1 | 1.68 | 12 | 0.04 | 12 |

Delaware County

**Delaware County
Temporary Diversion Berm Calculations**

| STATION | Roughness Coefficient | Channel Slope (ft/ft) | Normal Depth (ft) | Left Side Slope (ft/ft (H:V)) | Right Side Slope (ft/ft (H:V)) | Discharge (ft ³ /s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | Top Width (ft) | Critical Depth (ft) | Critical Slope (ft/ft) | Velocity (ft/s) | Velocity Head (ft) | Specific Energy (ft) | Froude Number | Flow Type |
|---------------------|-----------------------|-----------------------|-------------------|-------------------------------|--------------------------------|--------------------------------|------------------------------|-----------------------|-----------------------|----------------|---------------------|------------------------|-----------------|--------------------|----------------------|---------------|---------------|
| 15367+75 - 15639+30 | 0.025 | 0.02 | 0.2 | 0.1 | 25 | 0.94 | 0.52 | 5.32 | 0.1 | 5.13 | 0.2 | 0.0205 | 1.79 | 0.05 | 0.25 | 0.99 | Subcritical |
| 15567+70 - 15661+75 | 0.025 | 0.02 | 0.31 | 0.1 | 15 | 1.68 | 0.72 | 4.96 | 0.15 | 4.67 | 0.31 | 0.0183 | 2.33 | 0.08 | 0.39 | 1.04 | Supercritical |
| 15654+90 - 15655+85 | 0.025 | 0.03 | 0.14 | 0.1 | 15 | 0.25 | 0.15 | 2.25 | 0.07 | 2.12 | 0.15 | 0.0236 | 1.69 | 0.04 | 0.18 | 1.12 | Supercritical |
| 15656+00 - 15657+70 | 0.025 | 0.02 | 0.33 | 0.1 | 17 | 2.31 | 0.94 | 5.99 | 0.16 | 5.68 | 0.34 | 0.0177 | 2.45 | 0.09 | 0.43 | 1.06 | Supercritical |
| 15660+15 - 15662+40 | 0.025 | 0.02 | 0.28 | 0.1 | 25 | 2.22 | 1 | 7.34 | 0.14 | 7.08 | 0.29 | 0.0183 | 2.22 | 0.08 | 0.36 | 1.04 | Supercritical |
| 15662+40 - 15663+75 | 0.025 | 0.04 | 0.2 | 0.1 | 20 | 0.97 | 0.39 | 4.16 | 0.09 | 3.98 | 0.23 | 0.02 | 2.47 | 0.09 | 0.29 | 1.38 | Supercritical |
| 15689+50 - 15689+50 | 0.025 | 0.02 | 0.21 | 0.1 | 18 | 0.74 | 0.41 | 4.03 | 0.1 | 3.84 | 0.21 | 0.0206 | 1.82 | 0.05 | 0.26 | 0.99 | Subcritical |
| 15695+30 - 15695+45 | 0.025 | 0.03 | 0.25 | 0.1 | 28 | 2.33 | 0.91 | 7.4 | 0.12 | 7.16 | 0.28 | 0.0183 | 2.55 | 0.1 | 0.36 | 1.26 | Supercritical |
| 15695+45 - 15697+65 | 0.025 | 0.03 | 0.24 | 0.1 | 28 | 1.98 | 0.81 | 6.96 | 0.12 | 6.74 | 0.26 | 0.0187 | 2.45 | 0.09 | 0.33 | 1.25 | Supercritical |
| 15814+35 - 15814+35 | 0.025 | 0.05 | 0.26 | 0.1 | 5 | 0.52 | 0.17 | 1.59 | 0.11 | 1.32 | 0.3 | 0.0217 | 3.02 | 0.14 | 0.4 | 1.48 | Supercritical |
| 15814+40 - 15819+80 | 0.025 | 0.02 | 0.21 | 0.1 | 12 | 0.49 | 0.27 | 2.77 | 0.1 | 2.57 | 0.21 | 0.0214 | 1.79 | 0.05 | 0.26 | 0.97 | Subcritical |
| 15861+75 - 15863+50 | 0.025 | 0.02 | 0.24 | 0.1 | 13 | 0.71 | 0.37 | 3.32 | 0.11 | 3.1 | 0.24 | 0.0204 | 1.94 | 0.06 | 0.29 | 0.99 | Subcritical |
| 15861+75 - 15863+50 | 0.025 | 0.02 | 0.35 | 0.1 | 11 | 1.71 | 0.68 | 4.23 | 0.16 | 3.9 | 0.36 | 0.018 | 2.5 | 0.1 | 0.45 | 1.05 | Supercritical |
| 15886+50 - 15887+45 | 0.025 | 0.03 | 0.28 | 0.1 | 16 | 1.62 | 0.61 | 4.7 | 0.13 | 4.44 | 0.3 | 0.0184 | 2.65 | 0.11 | 0.38 | 1.26 | Supercritical |
| 15924+30 - 15925+70 | 0.025 | 0.03 | 0.29 | 0.1 | 14 | 1.55 | 0.58 | 4.3 | 0.13 | 4.03 | 0.31 | 0.0184 | 2.7 | 0.11 | 0.4 | 1.26 | Supercritical |
| 15951+40 - 15951+55 | 0.025 | 0.02 | 0.23 | 0.1 | 10 | 0.49 | 0.26 | 2.52 | 0.1 | 2.3 | 0.23 | 0.0213 | 1.86 | 0.05 | 0.28 | 0.97 | Subcritical |
| 15961+25 - 15966+90 | 0.025 | 0.09 | 0.32 | 0.1 | 7 | 1.73 | 0.36 | 2.57 | 0.14 | 2.26 | 0.43 | 0.0181 | 4.81 | 0.36 | 0.68 | 2.12 | Supercritical |
| 15964+55 - 15966+20 | 0.025 | 0.1 | 0.19 | 0.1 | 4 | 0.24 | 0.07 | 0.96 | 0.07 | 0.77 | 0.24 | 0.0248 | 3.34 | 0.17 | 0.36 | 1.93 | Supercritical |
| 15967+05 - 15967+55 | 0.025 | 0.32 | 0.17 | 0.1 | 1.5 | 0.1 | 0.02 | 0.47 | 0.05 | 0.27 | 0.25 | 0.0386 | 4.43 | 0.3 | 0.47 | 2.69 | Supercritical |
| 15991+60 - 15991+90 | 0.025 | 0.01 | 0.32 | 0.1 | 43 | 3.86 | 2.23 | 14.15 | 0.16 | 13.86 | 0.29 | 0.0179 | 1.73 | 0.05 | 0.37 | 0.76 | Subcritical |
| 15991+90 - 15992+80 | 0.025 | 0.03 | 0.34 | 0.1 | 10 | 1.69 | 0.57 | 3.72 | 0.15 | 3.4 | 0.37 | 0.018 | 2.96 | 0.14 | 0.47 | 1.27 | Supercritical |

Delaware County
Temporary Slope Pipe Calculations

| STATION | Roughness Coefficient | Channel Slope (ft/ft) | Normal Depth (ft) | Diameter (ft) | Discharge (ft ³ /s) | Flow Area (ft ²) | Wetted Perimeter (ft) | Hydraulic Radius (ft) | Top Width (ft) | Critical Depth (ft) | Percent Full (%) | Critical Slope (ft/ft) | Velocity (ft/s) | Velocity Head (ft) | Specific Energy (ft) | Froude Number | Maximum Discharge (ft ³ /s) | Discharge Full (ft ³ /s) | Slope Full (ft/ft) | Flow Type |
|---------------------|-----------------------|-----------------------|-------------------|---------------|--------------------------------|------------------------------|-----------------------|-----------------------|----------------|---------------------|------------------|------------------------|-----------------|--------------------|----------------------|---------------|--|-------------------------------------|--------------------|---------------|
| 15367+75 - 15639+30 | 0.023 | 0.02 | 0.53 | 0.67 | 0.94 | 0.3 | 1.46 | 0.2 | 0.55 | 0.46 | 78.6 | 0.0278 | 3.16 | 0.16 | 0.68 | 0.76 | 1.05 | 0.98 | 0.01845 | SubCritical |
| 15567+70 - 15661+75 | 0.023 | 0.05 | 0.42 | 1 | 1.68 | 0.32 | 1.42 | 0.22 | 0.99 | 0.55 | 42.3 | 0.0202 | 5.32 | 0.44 | 0.86 | 1.66 | 4.84 | 4.5 | 0.00696 | SuperCritical |
| 15654+90 - 15665+85 | 0.023 | 0.03 | 0.24 | 0.5 | 0.25 | 0.09 | 0.76 | 0.12 | 0.5 | 0.25 | 47.3 | 0.0243 | 2.73 | 0.12 | 0.35 | 1.13 | 0.59 | 0.55 | 0.00621 | SuperCritical |
| 15656+00 - 15657+70 | 0.023 | 0.05 | 0.51 | 1 | 2.31 | 0.4 | 1.59 | 0.25 | 1 | 0.65 | 50.8 | 0.023 | 5.77 | 0.52 | 1.03 | 1.61 | 4.84 | 4.5 | 0.01316 | SuperCritical |
| 15660+15 - 15662+40 | 0.023 | 0.03 | 0.58 | 1 | 2.22 | 0.47 | 1.73 | 0.27 | 0.99 | 0.64 | 58 | 0.0225 | 4.7 | 0.34 | 0.92 | 1.2 | 3.75 | 3.49 | 0.01215 | SuperCritical |
| 15662+40 - 15663+75 | 0.023 | 0.03 | 0.46 | 0.67 | 0.97 | 0.26 | 1.3 | 0.2 | 0.62 | 0.47 | 68.3 | 0.0284 | 3.78 | 0.22 | 0.68 | 1.04 | 1.29 | 1.2 | 0.01964 | SuperCritical |
| 15689+50 - 15689+50 | 0.023 | 0.03 | 0.38 | 0.67 | 0.74 | 0.21 | 1.14 | 0.18 | 0.66 | 0.41 | 56.8 | 0.0246 | 3.58 | 0.2 | 0.58 | 1.13 | 1.29 | 1.2 | 0.01143 | SuperCritical |
| 15695+30 - 15695+45 | 0.023 | 0.02 | 0.69 | 1 | 2.33 | 0.58 | 1.96 | 0.29 | 0.93 | 0.65 | 68.8 | 0.0231 | 4.05 | 0.25 | 0.94 | 0.9 | 3.06 | 2.85 | 0.01339 | SubCritical |
| 15695+45 - 15697+65 | 0.023 | 0.03 | 0.54 | 1 | 1.98 | 0.43 | 1.65 | 0.26 | 1 | 0.6 | 53.9 | 0.0214 | 4.58 | 0.33 | 0.87 | 1.23 | 3.75 | 3.49 | 0.00967 | SuperCritical |
| 15814+35 - 15814+35 | 0.023 | 0.05 | 0.32 | 0.5 | 0.52 | 0.13 | 0.92 | 0.14 | 0.48 | 0.37 | 63.6 | 0.0339 | 3.94 | 0.24 | 0.56 | 1.33 | 0.76 | 0.71 | 0.02689 | SuperCritical |
| 15814+40 - 15819+80 | 0.023 | 0.11 | 0.24 | 0.5 | 0.49 | 0.09 | 0.77 | 0.12 | 0.5 | 0.36 | 48 | 0.0324 | 5.26 | 0.43 | 0.67 | 2.15 | 1.13 | 1.05 | 0.02387 | SuperCritical |
| 15858+80 - 15861+65 | 0.023 | 0.11 | 0.3 | 0.5 | 0.71 | 0.12 | 0.89 | 0.14 | 0.49 | 0.42 | 60.2 | 0.0473 | 5.75 | 0.51 | 0.81 | 2.02 | 1.13 | 1.05 | 0.05012 | SuperCritical |
| 15861+75 - 15863+50 | 0.023 | 0.08 | 0.48 | 0.67 | 1.71 | 0.27 | 1.36 | 0.2 | 0.6 | 0.6 | 72.3 | 0.0539 | 6.26 | 0.61 | 1.09 | 1.63 | 2.11 | 1.96 | 0.06104 | SuperCritical |
| 15924+30 - 15925+70 | 0.023 | 0.02 | 0.53 | 1 | 1.55 | 0.42 | 1.62 | 0.26 | 1 | 0.53 | 52.6 | 0.0197 | 3.7 | 0.21 | 0.74 | 1.01 | 3.06 | 2.85 | 0.00593 | SuperCritical |
| 15951+40 - 15951+55 | 0.025 | 0.05 | 0.32 | 0.5 | 0.49 | 0.13 | 0.93 | 0.14 | 0.48 | 0.36 | 64.7 | 0.0383 | 3.65 | 0.21 | 0.53 | 1.21 | 0.7 | 0.65 | 0.02821 | SuperCritical |
| 15991+60 - 15991+90 | 0.023 | 0.04 | 0.78 | 1 | 3.86 | 0.66 | 2.18 | 0.3 | 0.82 | 0.83 | 78.5 | 0.0356 | 5.84 | 0.53 | 1.31 | 1.15 | 4.33 | 4.03 | 0.03675 | SuperCritical |
| 15991+90 - 15992+80 | 0.023 | 0.03 | 0.49 | 1 | 1.69 | 0.38 | 1.55 | 0.25 | 1 | 0.55 | 49.1 | 0.0202 | 4.41 | 0.3 | 0.79 | 1.25 | 3.75 | 3.49 | 0.00704 | SuperCritical |

Delaware County
Temporary Diversion Berm
Erosion Control Blanket Calculations

| STATION | Channel Slope (ft/ft) | Normal Depth (ft) | Discharge (ft ³ /s) | Velocity (ft/s) | Shear or Velocity Method (S or V) | Max. Allowable Velocity (ft/s) | Max. Allowable Shear Stress (lb/ft ²) | Shear Stress (lb/ft ²) | Blanket Specification |
|---------------------|-----------------------|-------------------|--------------------------------|-----------------|-----------------------------------|--------------------------------|---|------------------------------------|-----------------------|
| 15367+75 - 15639+30 | 0.02 | 0.2 | 0.94 | 1.79 | V | 8.0 | 2.00 | 0.2496 | SC150 |
| 15567+70 - 15661+75 | 0.02 | 0.31 | 1.68 | 2.33 | V | 8.0 | 2.00 | 0.3869 | SC150 |
| 15654+90 - 15655+85 | 0.03 | 0.14 | 0.25 | 1.69 | V | 8.0 | 2.00 | 0.2621 | SC150 |
| 15656+00 - 15657+70 | 0.02 | 0.33 | 2.31 | 2.45 | V | 8.0 | 2.00 | 0.4118 | SC150 |
| 15660+15 - 15662+40 | 0.02 | 0.28 | 2.22 | 2.22 | V | 8.0 | 2.00 | 0.3494 | SC150 |
| 15662+40 - 15663+75 | 0.04 | 0.2 | 0.97 | 2.47 | V | 8.0 | 2.00 | 0.4992 | SC150 |
| 15689+50 - 15689+50 | 0.02 | 0.21 | 0.74 | 1.82 | V | 8.0 | 2.00 | 0.2621 | SC150 |
| 15695+30 - 15695+45 | 0.03 | 0.25 | 2.33 | 2.55 | V | 8.0 | 2.00 | 0.468 | SC150 |
| 15695+45 - 15697+65 | 0.03 | 0.24 | 1.98 | 2.45 | V | 8.0 | 2.00 | 0.4493 | SC150 |
| 15814+35 - 15814+35 | 0.05 | 0.26 | 0.52 | 3.02 | V | 8.0 | 2.00 | 0.8112 | SC150 |
| 15814+40 - 15819+80 | 0.02 | 0.21 | 0.49 | 1.79 | V | 8.0 | 2.00 | 0.2621 | SC150 |
| 15861+75 - 15863+50 | 0.02 | 0.24 | 0.71 | 1.94 | V | 8.0 | 2.00 | 0.2995 | SC150 |
| 15861+75 - 15863+50 | 0.02 | 0.35 | 1.71 | 2.5 | V | 8.0 | 2.00 | 0.4368 | SC150 |
| 15886+50 - 15887+45 | 0.03 | 0.28 | 1.62 | 2.65 | V | 8.0 | 2.00 | 0.5242 | SC150 |
| 15924+30 - 15925+70 | 0.03 | 0.29 | 1.55 | 2.7 | V | 8.0 | 2.00 | 0.5429 | SC150 |
| 15951+40 - 15951+55 | 0.02 | 0.23 | 0.49 | 1.86 | V | 8.0 | 2.00 | 0.287 | SC150 |
| 15961+25 - 15966+90 | 0.09 | 0.32 | 1.73 | 4.81 | V | 8.0 | 2.00 | 1.7971 | SC150 |
| 15964+55 - 15966+20 | 0.1 | 0.19 | 0.24 | 3.34 | S | 12.5 | 2.00 | 1.1856 | SC150 |
| 15967+05-15967+55 | 0.32 | 0.17 | 0.1 | 4.43 | S | 12.5 | 4.00 | 3.3946 | P550 |
| 15991+60 - 15991+90 | 0.01 | 0.32 | 3.86 | 1.73 | V | 8.0 | 2.00 | 0.1997 | SC150 |
| 15991+90 - 15992+80 | 0.03 | 0.34 | 1.69 | 2.96 | V | 8.0 | 2.00 | 0.6365 | SC150 |

**Delaware County
Temporary Slope Pipe Calculations**

| STATION | Diversion Discharge (ft ³ /s) | Available Static Head (ft) | Level Spreader Pipe Diameter (in.) | Perforation Diameter (in.) | Number of Perforations per Row | Orifice Area per Foot (in ² /ft) | Row Spacing (in.) | Orifice Coefficient (Cd) | Level Spreader Capacity per foot of length (ft ³ /s per ft) | Required Length (ft) | Nominal Length (ft) | Overall Level Spreader Capacity(ft ³ /s) |
|---------------------|--|----------------------------|------------------------------------|----------------------------|--------------------------------|---|-------------------|--------------------------|--|----------------------|---------------------|---|
| 15637+75 - 15639+30 | 0.94 | 1 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.139 | 6.74 | 10 | 1.39 |
| 15654+90 - 15655+85 | 0.25 | 1 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.139 | 1.79 | 5 | 0.70 |
| 15656+00 - 15657+70 | 2.31 | 6 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.341 | 6.77 | 10 | 3.41 |
| 15657+70 - 15661+75 | 1.68 | 7 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.369 | 4.56 | 5 | 1.84 |
| 15660+15 - 15662+40 | 2.22 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 9.20 | 10 | 2.41 |
| 15662+40 - 15663+75 | 0.97 | 2 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.197 | 4.92 | 5 | 0.99 |
| 15689+50 - 15689+50 | 0.74 | 2 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.197 | 3.75 | 5 | 0.99 |
| 15695+30 - 15695+45 | 2.33 | 2 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.197 | 11.82 | 15 | 2.96 |
| 15695+45 - 15697+65 | 1.98 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 8.20 | 10 | 2.41 |
| 15814+35 - 15814+35 | 0.52 | 4 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.279 | 1.87 | 5 | 1.39 |
| 15814+40 - 15816+95 | 0.49 | 12 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.483 | 1.01 | 5 | 2.41 |
| 15858+80 - 15861+65 | 0.71 | 14 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.522 | 1.36 | 5 | 2.61 |
| 15861+75 - 15863+50 | 1.71 | 6 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.341 | 5.01 | 10 | 3.41 |
| 15924+30 - 15925+70 | 1.55 | 1 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.139 | 11.12 | 15 | 2.09 |
| 15951+40 - 15951+55 | 0.49 | 5 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.312 | 1.57 | 5 | 1.56 |
| 15991+60 - 15991+90 | 3.86 | 3 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.241 | 15.99 | 20 | 4.83 |
| 15991+90 - 15992+80 | 1.69 | 4 | 12 | 0.38 | 6 | 4.10 | 1.94 | 0.61 | 0.279 | 6.06 | 10 | 2.79 |

TABLE FOR CALCULATING THE PEAK RUNOFF RATE FOR DRAINAGE PIPES USED FOR CLEAN WATER DIVERSION

| Start Sta. | End Sta. | Area of Drainage (sq ft) | Length of Sheet Flow (ft) | Slope of Ground during Sheet Flow (ft/ft) | Soil Type | Roughness Coefficient (n) | Time of Concentration in Sheet Flow (min) | Length of Shallow Concentrated Flow (ft) | Slope of Ground during Shallow Concentrated Flow (ft/ft) | Shallow Concentrated Flow Velocity (ft/sec) | Time of Concentration in Shallow Concentrated Flow (min) | Total Time of Concentration (min) | 2-Year Storm Rainfall Intensity (in/hr) | Runoff Coefficients for the Rational Equation | Channel Longitudinal Slope (ft/ft) | Channel Side Slope (H:V) (ft/ft) | Peak Runoff Rate (CFS) | Size of Diversion Sock (in) | Pipe Slope (ft/ft) | Size of Slope Pipe (in) |
|------------|----------|-----------------------------|------------------------------|--|-----------|------------------------------|--|---|---|--|---|--------------------------------------|--|---|---------------------------------------|-------------------------------------|---------------------------|--------------------------------|-----------------------|----------------------------|
| 15637+75 | 15639+30 | 56,902 | 100 | 0.05 | Type D | 0.300 | 8.17 | 430 | 0.06 | 1.70 | 4.22 | 12.38 | 3.61 | 0.20 | 0.02 | 25:1 | 0.94 | 12 | 0.02 | 8 |
| 15654+90 | 15655+85 | 16,172 | 100 | 0.07 | Type D | 0.800 | 11.94 | 284 | 0.06 | 1.70 | 2.78 | 14.72 | 3.34 | 0.20 | 0.03 | 15:1 | 0.25 | 12 | 0.03 | 6 |
| 15656+00 | 15657+70 | 172,702 | 100 | 0.05 | Type D | 0.800 | 12.91 | 589 | 0.05 | 1.50 | 6.54 | 19.46 | 2.91 | 0.20 | 0.02 | 17:1 | 2.31 | 12 | 0.05 | 12 |
| 15657+70 | 15661+75 | 135,372 | 100 | 0.02 | Type D | 0.800 | 16.00 | 527 | 0.04 | 1.40 | 6.27 | 22.27 | 2.70 | 0.20 | 0.02 | 15:1 | 1.68 | 12 | 0.05 | 12 |
| 15660+15 | 15662+40 | 167,769 | 100 | 0.04 | Type D | 0.800 | 13.60 | 512 | 0.04 | 1.40 | 6.10 | 19.70 | 2.89 | 0.20 | 0.02 | 25:1 | 2.22 | 12 | 0.04 | 12 |
| 15662+40 | 15663+75 | 87,898 | 100 | 0.04 | Type D | 0.800 | 13.60 | 960 | 0.03 | 1.20 | 13.33 | 26.94 | 2.41 | 0.20 | 0.02 | 20:1 | 0.97 | 12 | 0.03 | 8 |
| 15689+50 | 15689+50 | 53,035 | 100 | 0.04 | Type D | 0.800 | 13.60 | 374 | 0.05 | 1.50 | 4.16 | 17.76 | 3.05 | 0.20 | 0.04 | 18:1 | 0.74 | 12 | 0.03 | 8 |
| 15695+30 | 15695+45 | 227,590 | 100 | 0.03 | Type D | 0.800 | 14.55 | 1194 | 0.03 | 1.25 | 15.92 | 30.47 | 2.23 | 0.20 | 0.03 | 28:1 | 2.33 | 12 | 0.02 | 12 |
| 15695+45 | 15697+65 | 168,097 | 100 | 0.03 | Type D | 0.800 | 14.55 | 739 | 0.03 | 1.25 | 9.85 | 24.40 | 2.56 | 0.20 | 0.03 | 28:1 | 1.98 | 12 | 0.03 | 12 |
| 15814+35 | 15814+35 | 30,056 | 100 | 0.05 | Type D | 0.300 | 8.17 | 383 | 0.08 | 2.00 | 3.19 | 11.36 | 3.74 | 0.20 | 0.05 | 5:1 | 0.52 | 12 | 0.05 | 6 |
| 15814+40 | 15819+80 | 28,200 | 100 | 0.04 | Type D | 0.300 | 8.60 | 340 | 0.10 | 2.20 | 2.58 | 11.18 | 3.76 | 0.20 | 0.13 | 12:1 | 0.49 | 12 | 0.11 | 6 |
| 15858+80 | 15861+65 | 49,545 | 100 | 0.05 | Type D | 0.800 | 12.91 | 256 | 0.19 | 1.00 | 4.27 | 17.18 | 3.10 | 0.20 | 0.02 | 13:1 | 0.71 | 12 | 0.11 | 6 |
| 15861+75 | 15863+50 | 131,158 | 100 | 0.03 | Type D | 0.300 | 9.20 | 529 | 0.11 | 0.80 | 11.02 | 20.22 | 2.85 | 0.20 | 0.02 | 11:1 | 1.71 | 12 | 0.08 | 8 |
| 15886+50 | 15887+45 | 113,393 | 100 | 0.03 | Type D | 0.300 | 9.20 | 795 | 0.06 | 1.70 | 7.79 | 16.99 | 3.12 | 0.20 | 0.03 | 16:1 | 1.62 | 12 | n/a | n/a |
| 15924+30 | 15925+70 | 105,901 | 100 | 0.12 | Type D | 0.300 | 6.65 | 980 | 0.14 | 1.70 | 9.61 | 16.26 | 3.19 | 0.20 | 0.03 | 14:1 | 1.55 | 12 | 0.02 | 12 |
| 15951+40 | 15951+55 | 28,019 | 100 | 0.16 | Type D | 0.300 | 6.22 | 344 | 0.23 | 1.20 | 4.78 | 11.00 | 3.79 | 0.20 | 0.02 | 10:1 | 0.49 | 12 | 0.05 | 6 |
| 15961+25 | 15966+90 | 92,954 | 100 | 0.08 | Type D | 0.300 | 7.32 | 140 | 0.26 | 1.30 | 1.79 | 9.11 | 4.06 | 0.20 | 0.09 | 7:1 | 1.73 | 12 | n/a | n/a |
| 15964+55 | 15966+20 | 12,877 | 100 | 0.08 | Type D | 0.300 | 7.32 | 153 | 0.16 | 1.70 | 1.50 | 8.82 | 4.11 | 0.20 | 0.10 | 4:1 | 0.24 | 12 | n/a | n/a |
| 15967+05 | 15967+55 | 3,360 | 100 | 0.18 | Type D | 0.300 | 6.05 | 91 | 0.52 | 1.00 | 1.52 | 7.57 | 4.31 | 0.30 | 0.32 | 1.5:1 | 0.10 | 12 | n/a | n/a |

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| Start Sta. | End Sta. | Area of Drainage (sq ft) | Length of Sheet Flow (ft) | Slope of Ground during Sheet Flow (ft/ft) | Soil Type | Roughness Coefficient (n) | Time of Concentration in Sheet Flow (min) | Length of Shallow Concentrated Flow (ft) | Slope of Ground during Shallow Concentrated Flow (ft/ft) | Shallow Concentrated Flow Velocity (ft/sec) | Time of Concentration in Shallow Concentrated Flow (min) | Total Time of Concentration (min) | 2-Year Storm Rainfall Intensity (in/hr) | Runoff Coefficients for the Rational Equation | Channel Longitudinal Slope (ft/ft) | Channel Side Slope (H:V) (ft/ft) | Peak Runoff Rate (CFS) | Size of Diversion Sock (in) | Pipe Slope (ft/ft) | Size of Slope Pipe (in) |
|-----------------|----------|-----------------------------|------------------------------|--|-----------|------------------------------|--|---|---|--|---|--------------------------------------|--|---|---------------------------------------|-------------------------------------|---------------------------|--------------------------------|-----------------------|----------------------------|
| 15991+60 | 15991+90 | 248,954 | 100 | 0.03 | Type D | 0.300 | 9.20 | 624 | 0.08 | 2.00 | 5.20 | 14.40 | 3.38 | 0.20 | 0.01 | 43:1 | 3.86 | 12 | 0.04 | 12 |
| 15991+90 | 15992+80 | 102,526 | 100 | 0.05 | Type D | 0.300 | 8.17 | 463 | 0.07 | 1.80 | 4.29 | 12.45 | 3.60 | 0.20 | 0.03 | 10:1 | 1.69 | 12 | 0.03 | 12 |