



PLANT SYSTEMS GROUP - SALT LAKE CITY, UTAH

# CALCULATION COVER SHEET

| JOB NUMBER | CLIENT | PROJECT        | CALC. NUMBER |
|------------|--------|----------------|--------------|
| 11021      | CC&V   | High Grade Ore | CV-003       |

## TITLE/SUBJECT:

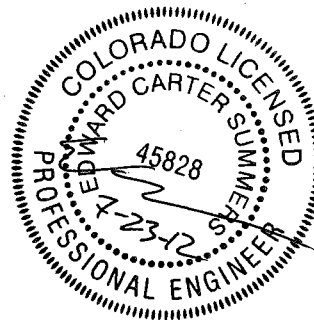
Mill Area Drainage

## STATEMENT OF PROBLEM:

Calculations of runoff as follows:

1. Total Runoff
2. Maximum Discharge
3. Size of Ditches (3)
4. Size of Culverts (5)

P.E. SEAL



## SOURCES OF DATA, FORMULA & REFERENCES:

Site Plans by FLSmidth  
NOAA Atlas 2 Storm Data (use 2.9 inches for 25-yr, 24-hour storm)  
SCS Methods/Formula  
Win TR-55 small Watersheds  
Win TR-55 software  
HY-8 Culvert Design Software

## CONCLUSIONS & RECOMMENDATIONS:

Per Summary Sheet- see page 1 of Calculations

| A   | Mar-12 | Ready for Check    | CCK        | JBK        |                       |              |
|-----|--------|--------------------|------------|------------|-----------------------|--------------|
| B   | Jul-12 | For Permit         | CCK        | JBK        |                       |              |
|     |        |                    |            |            |                       |              |
|     |        |                    |            |            |                       |              |
|     |        |                    |            |            |                       |              |
| 0   |        |                    |            |            |                       |              |
| REV | DATE   | DESCRIPTION/STATUS | CALC<br>BY | CHKD<br>BY | DWG./SPECS<br>REVISED | QA<br>REVIEW |



|         |                        |          |                 |
|---------|------------------------|----------|-----------------|
| PROJECT | Cripple Creek & Victor | Proj No. | 11021           |
|         |                        | Calc No. |                 |
| SUBJECT | Drainage Area Summary  | By       | CCK Mar-16-2012 |
|         |                        | Check    |                 |
|         |                        | Sheet    | of              |

#### Area Definition and Discharge

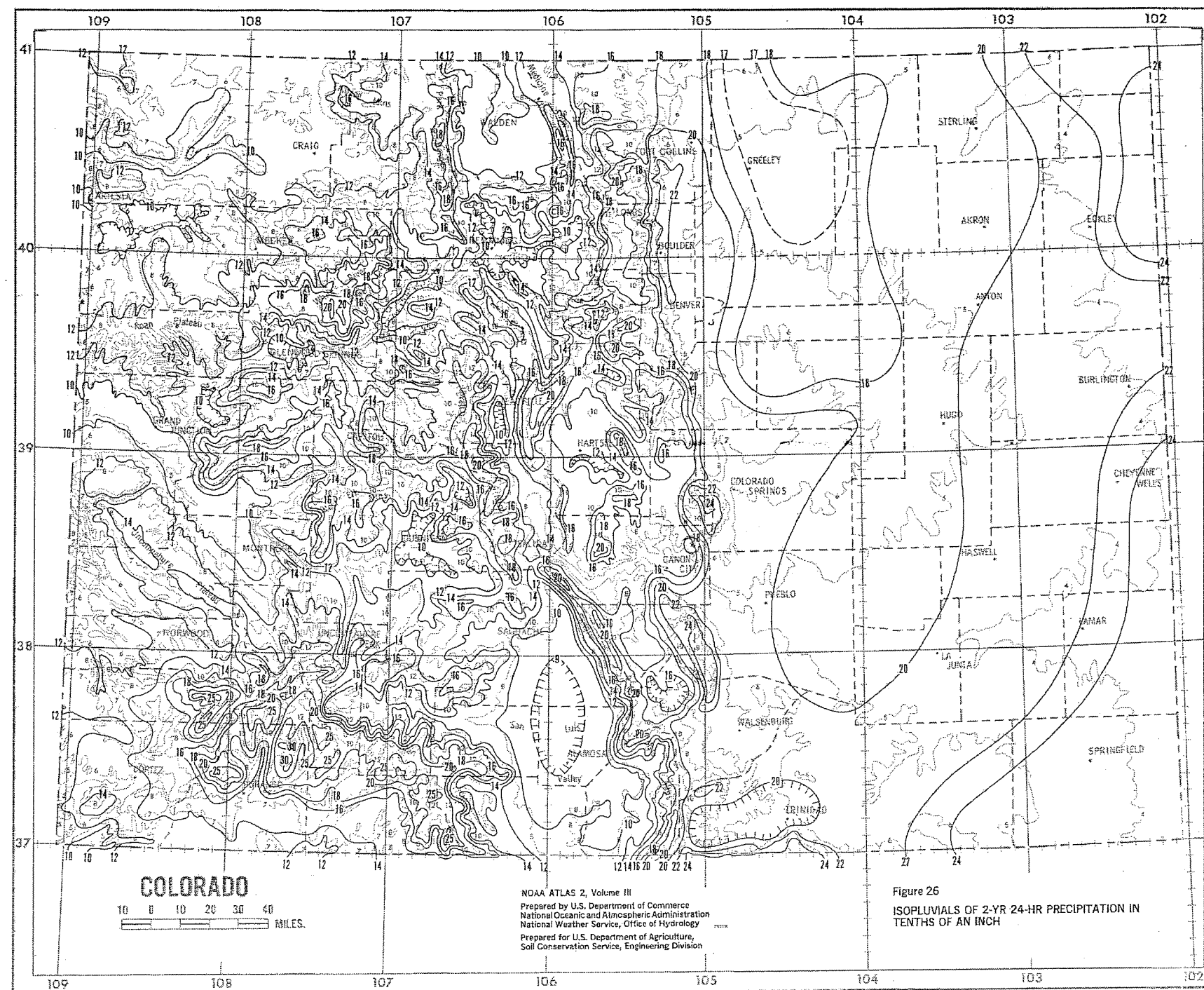
|                            |                                                                             |
|----------------------------|-----------------------------------------------------------------------------|
| Sub Area 1A1:              | 0.92 acres<br>1.75 cfs discharging to start of Reach 1 (through Culvert 1)  |
| Sub Area 1A2:              | 7.93 acres<br>12.48 cfs discharging into sump (CB-4)                        |
| Sub Area 1A (1A1+1A2):     | 8.86 acres<br>12.48 cfs discharging into sump (CB-4)                        |
| Sub Area 1B1:              | 8.64 acres<br>11.38 cfs discharging to start of Reach 2 (through Culvert 2) |
| Sub Area 1B2:              | 3.96 acres<br>19.30 cfs discharging to start of Reach 3 (through Culvert 3) |
| Sub Area 1B3:              | 1.05 acres<br>21.22 cfs discharging to start of Reach 4 (through Culvert 4) |
| Sub Area 1B (1B1+1B2+1B3): | 13.65 acres<br>21.22 cfs discharging into sump                              |
| Sub Area 1C:               | 1.95 acres<br>3.54 cfs discharging into sump (through Culvert 5)            |
| Total Area:                | 24.44 acres<br>36.78 cfs (990,412 gpm does not include 63 gpm process flow) |

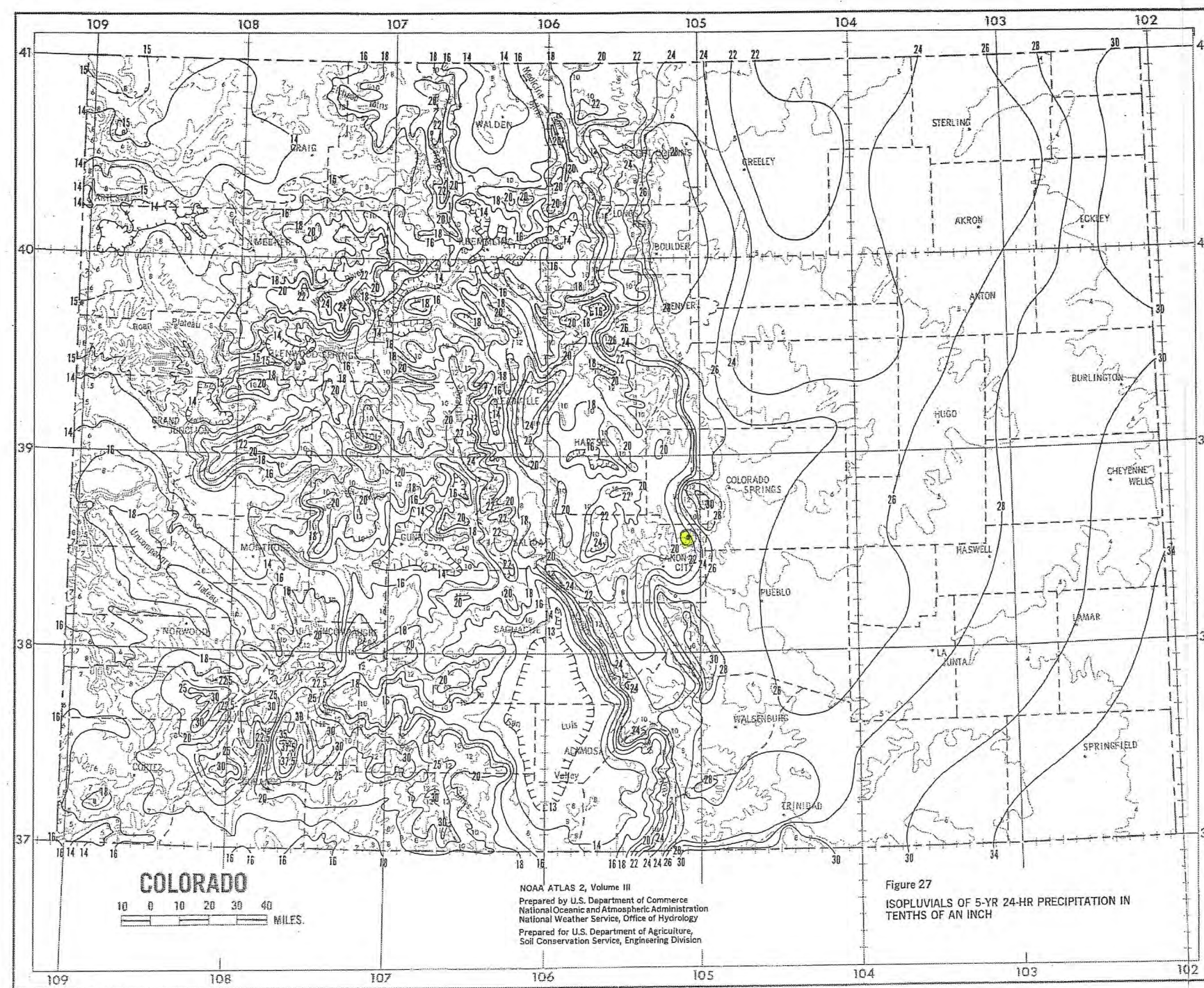
#### Channel Summary

|                         |                                                                                                                                                    |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| Reach 1:                | V-ditch: 1.5/1 side slopes, channel slope 1.0%<br>Min 1'8" feet deep<br>Discharges into Sump (CB-5)<br>Culvert 1: 18" Corrugated PE, slope 37.5%   |
| Reach 2:                | V-ditch: 1.5/1 side slopes, channel slope 1.0%<br>Min 1'8" feet deep<br>Discharges into Reach 3 (CB-3)<br>Culvert 2: 18" Corrugated PE, slope 1.0% |
| Reach 3:                | Culvert 3: 30" dia. Corrugated PE, slope 1.0%<br>Discharges into sump (CB-3)                                                                       |
| Reach 4:                | Culvert 4 (CV5): 30" dia. Corrugated PE, slope 1.0%<br>Discharges into Sump (CB-4)                                                                 |
| Reach 5: (from Area 1C) | Culvert 5: 18" dia. Corrugated PE, slope 50.0%                                                                                                     |

#### Total Runoff

|                 |                                                        |
|-----------------|--------------------------------------------------------|
| Flow in inches: | 1.18 in                                                |
| Volume:         | 104,824 ft <sup>3</sup><br>2.41 acre-ft<br>784,141 Gal |





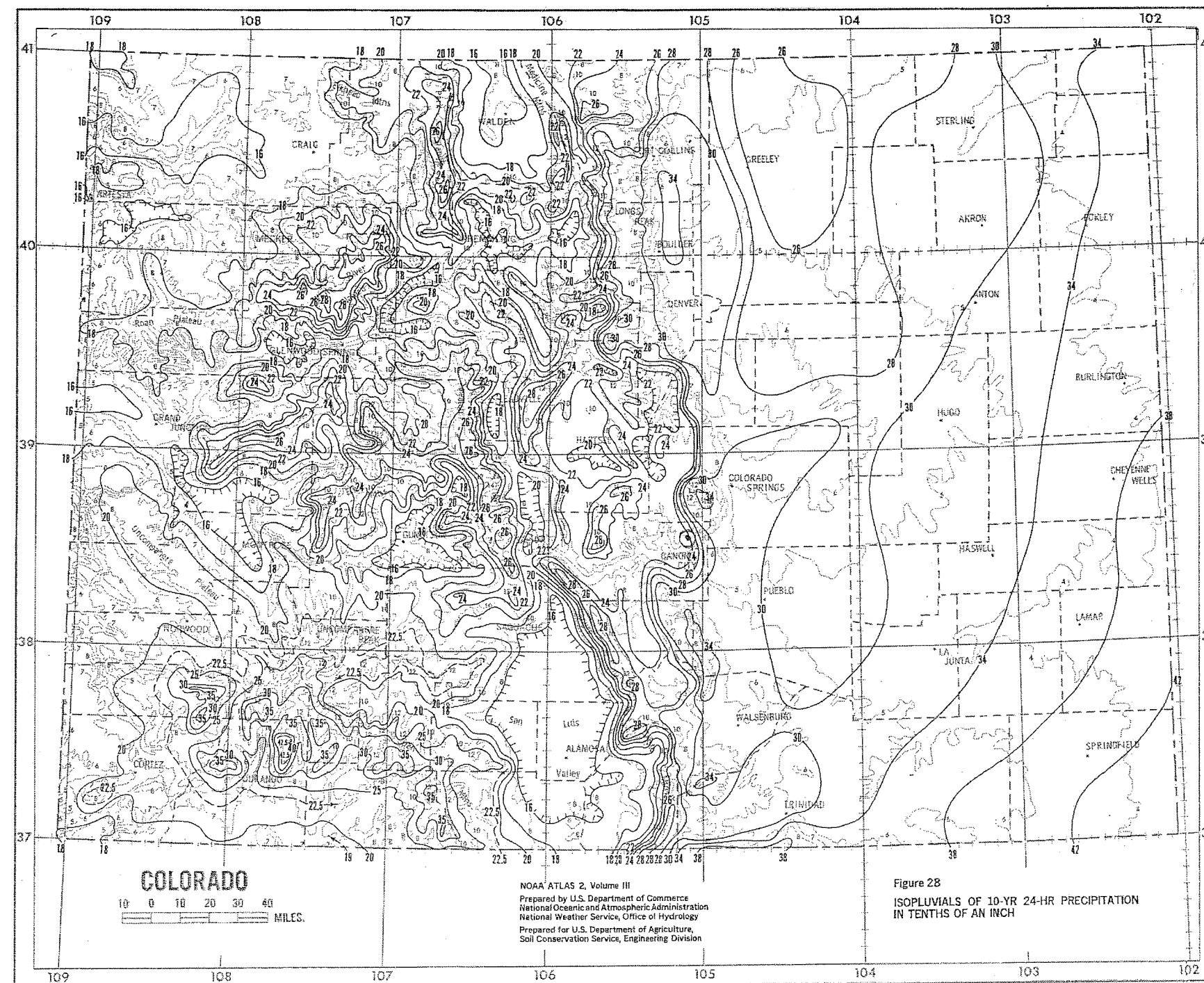
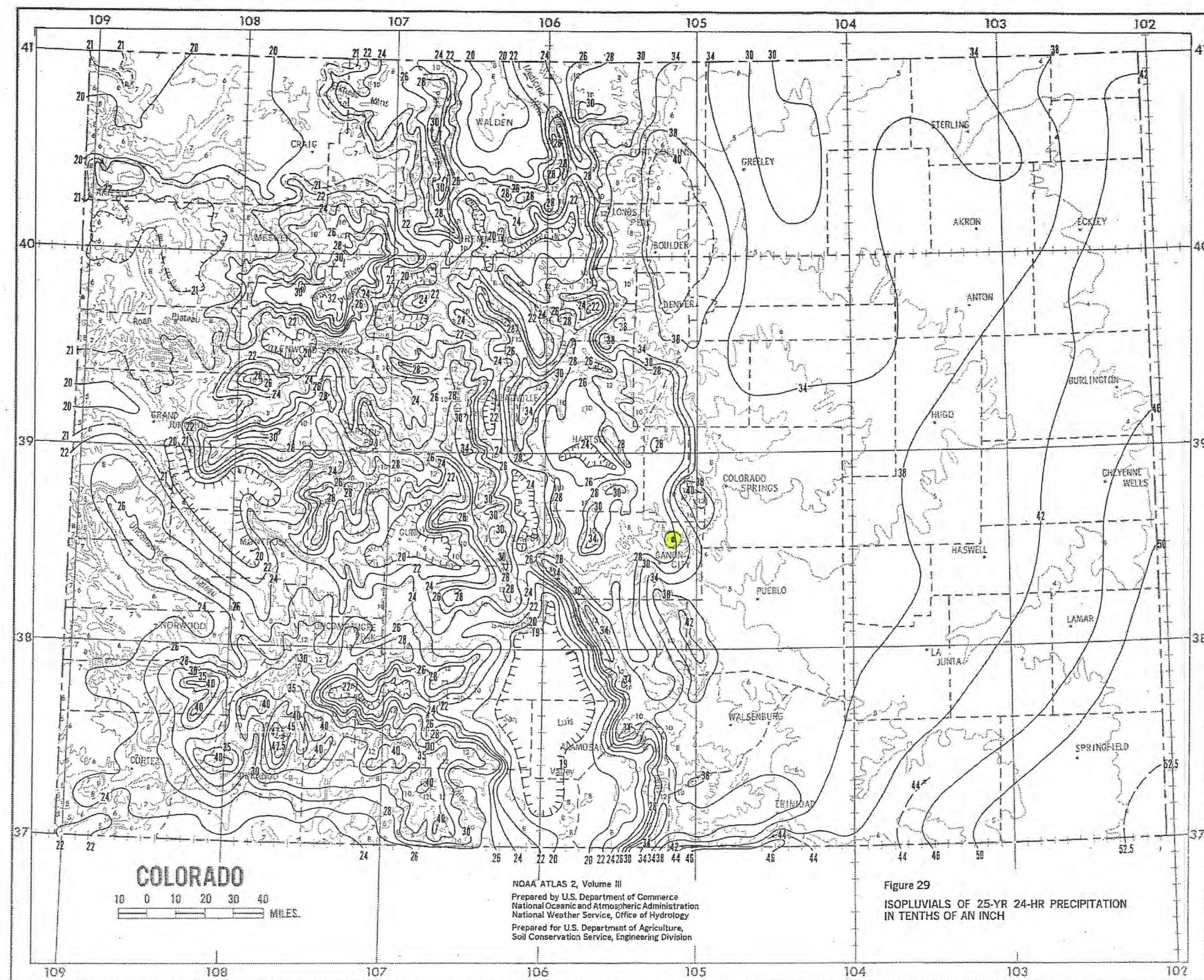
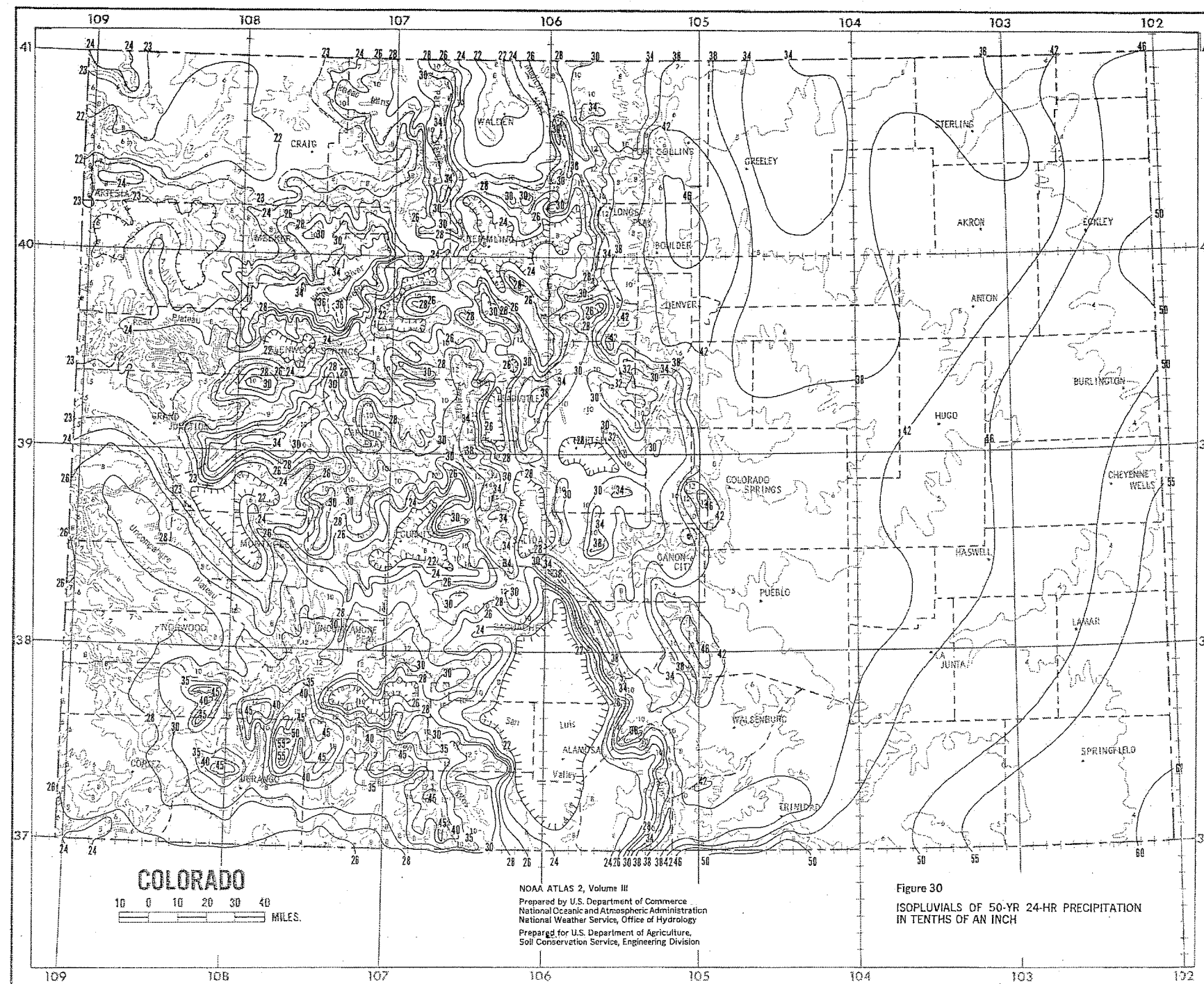
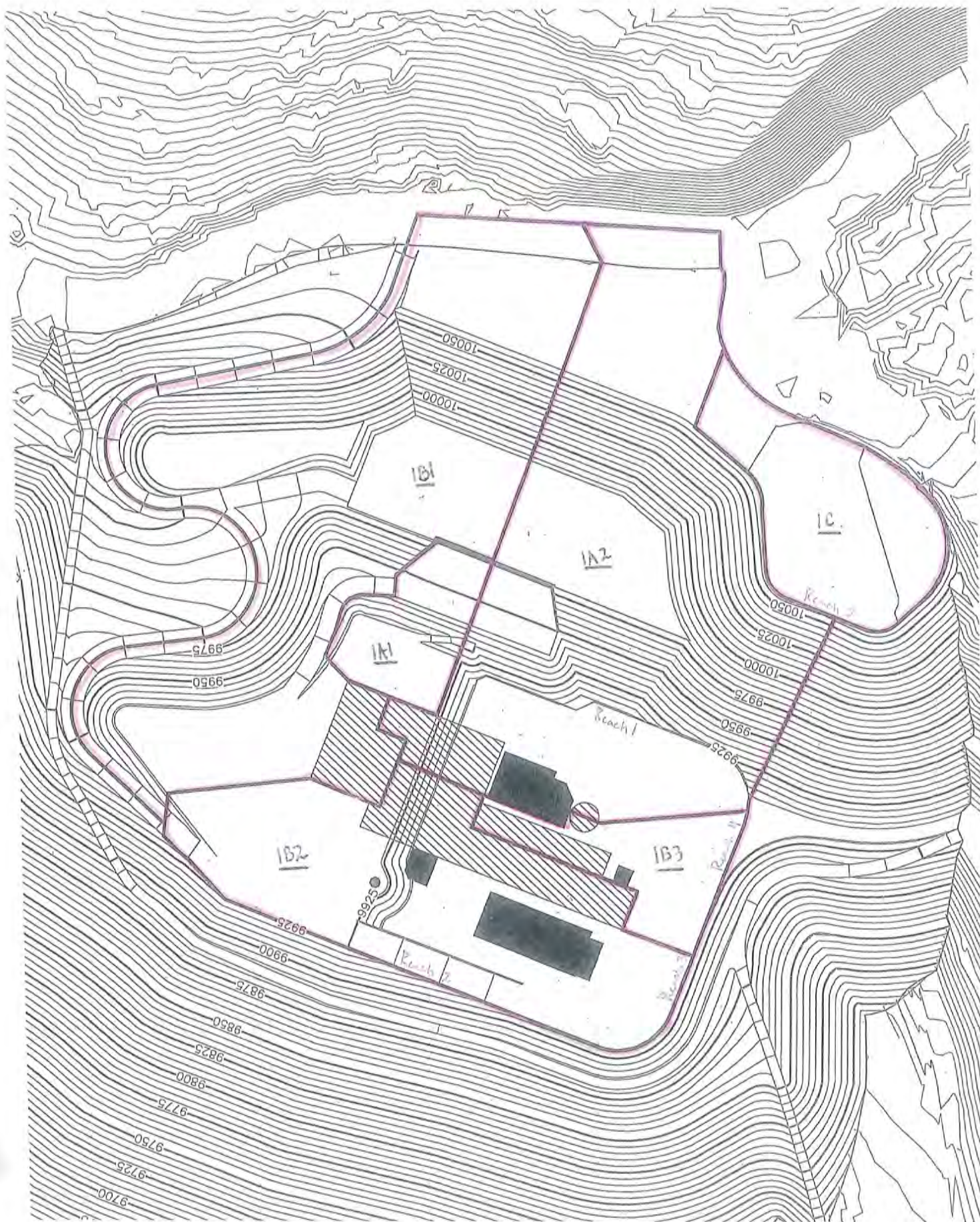


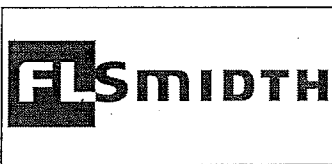
Figure 28  
 ISOPLUVIALS OF 10-YR 24-HR PRECIPITATION  
 IN TENTHS OF AN INCH









|                                                                                   |         |                        |          |                 |
|-----------------------------------------------------------------------------------|---------|------------------------|----------|-----------------|
|  | PROJECT | Cripple Creek & Victor | Proj No. | 11021           |
|                                                                                   |         |                        | Calc No. |                 |
|                                                                                   | SUBJECT | Site Drainage Summary  | By       | CCK Mar-21-2012 |
|                                                                                   |         |                        | Check    |                 |
|                                                                                   |         |                        | Sheet    | of              |

## AREA SUMMARY

|           |        |       |
|-----------|--------|-------|
| Area 1A1  | 40,275 |       |
| Building  | 0      | sq ft |
| Road Base | 32,275 | sq ft |
| Remainder | 8,000  | sq ft |

|           |         |       |
|-----------|---------|-------|
| Area 1A2  | 345,600 |       |
| Building  | 15,300  | sq ft |
| Road Base | 171,700 | sq ft |
| Remainder | 158,600 | sq ft |

|           |         |       |
|-----------|---------|-------|
| Area 1B1  | 376,400 |       |
| Building  | 16,650  | sq ft |
| Road Base | 187,600 | sq ft |
| Remainder | 172,150 | sq ft |

|           |         |       |
|-----------|---------|-------|
| Area 1B2  | 172,600 |       |
| Building  | 35,550  | sq ft |
| Road Base | 131,550 | sq ft |
| Remainder | 5,500   | sq ft |

|           |        |       |
|-----------|--------|-------|
| Area 1B3  | 45,600 |       |
| Building  | 8,950  | sq ft |
| Road Base | 36,650 | sq ft |
| Remainder | 0      | sq ft |

|           |        |       |
|-----------|--------|-------|
| Area C1   | 85,100 |       |
| Building  | 0      | sq ft |
| Road Base | 85,100 | sq ft |
| Remainder | 0      | sq ft |

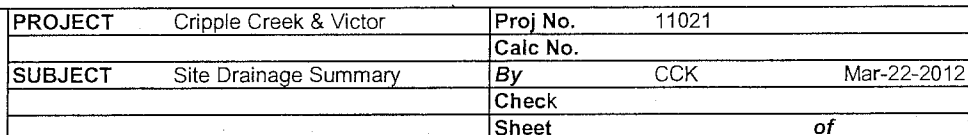
|           |         |       |
|-----------|---------|-------|
| Area 1A   | 385,875 |       |
| Building  | 15,300  | sq ft |
| Road Base | 203,975 | sq ft |
| Remainder | 166,600 | sq ft |

|              |         |       |
|--------------|---------|-------|
| Area 1B2+1B1 | 549,000 |       |
| Building     | 52,200  | sq ft |
| Road Base    | 319,150 | sq ft |
| Remainder    | 177,650 | sq ft |

|           |         |       |
|-----------|---------|-------|
| Area 1B   | 594,600 |       |
| Building  | 61,150  | sq ft |
| Road Base | 355,800 | sq ft |
| Remainder | 177,650 | sq ft |

|           |        |       |
|-----------|--------|-------|
| Area C1   | 85,100 |       |
| Building  | 0      | sq ft |
| Road Base | 85,100 | sq ft |
| Remainder | 0      | sq ft |

|                 |           |       |
|-----------------|-----------|-------|
| Total All Areas | 1,065,575 |       |
| Building        | 76,450    | sq ft |
| Road Base       | 644,875   | sq ft |
| Remainder       | 344,250   | sq ft |



## Total

| <b>SOIL TYPE</b>     | <b>HYDROLOGIC GROUP</b> | <b>CN</b>                                          | <b>MAP AREA<br/>sq. ft.</b> | <b>ACTUAL AREA<br/>ACRES</b> | <b>CNxACRES</b> |
|----------------------|-------------------------|----------------------------------------------------|-----------------------------|------------------------------|-----------------|
| Buildings/Structures | B                       | 98                                                 | 75,460                      | 1.73                         | 169.77          |
| Roads/Pads-Road Base | B                       | 85                                                 | 644,875                     | 14.80                        | 1258.36         |
| Disturbed Granular   | A                       | 67                                                 | 344,250                     | 7.90                         | 529.49          |
|                      |                         |                                                    |                             | 0.00                         | 0.00            |
|                      |                         |                                                    |                             | 0.00                         | 0.00            |
|                      |                         |                                                    |                             | 0.00                         | 0.00            |
|                      |                         |                                                    |                             | 0.00                         | 0.00            |
|                      |                         |                                                    |                             | 0.00                         | 0.00            |
|                      |                         |                                                    |                             | 0.00                         | 0.00            |
|                      |                         |                                                    |                             | 0.00                         | 0.00            |
|                      |                         |                                                    |                             | 0.00                         | 0.00            |
|                      |                         | TOTALS:                                            | 1,064,585                   | 24.44                        | 1957.63         |
|                      |                         | <b>WEIGHTED CN (TOTAL CN X ACRES/TOTAL ACRES):</b> |                             |                              | <b>80.10</b>    |

scale 1"= 200 feet  
ACTUAL= 1,064,585 sq. ft. 24.44 acres

```

MAX. ELEV=      10065 feet
MIN. ELEV=      9905 feet
DELTA=         160 feet

```

|      | Elevation | Length (in) | Length (ft) |
|------|-----------|-------------|-------------|
| 0.00 | 9905      | 8.75        | 1750.0      |
| 0.25 | 9945      | 1.44        | 287.5       |
| 0.50 | 9985      | 0.38        | 75.0        |
| 0.75 | 10025     | 1.31        | 262.5       |
| 1.00 | 10065     | -           |             |

Ave. SLOPE= 8.924 %

MAP= 11.88 inches  
ACTUAL= 2375 feet

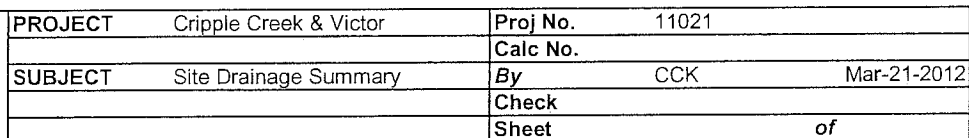
## 80.10

S= 2.484      Lag= 0.212      Tc= 0.353 hrs

HYDDATA1.XLS

$$S = (1000/CN) - 10$$
$$LAG = \text{Hyd. Length}^{.8} \cdot (S+1)^{.7} / (1900 \cdot \text{Slope}^{.5})$$
$$T_c = LAG / .6$$

Equations per SCS, 1972



## 1A

| SOIL TYPE<br>OR DESCRIPTION | HYDROLOGIC<br>GROUP | CN                                          | MAP AREA<br>sq. ft. | ACTUAL AREA<br>ACRES | CNxACRES |
|-----------------------------|---------------------|---------------------------------------------|---------------------|----------------------|----------|
| Buildings/Structures        | B                   | 98                                          | 15,300              | 0.35                 | 34.42    |
| Roads/Pads-Road Base        | B                   | 85                                          | 203,975             | 4.68                 | 398.02   |
| Disturbed Granular          | A                   | 67                                          | 166,600             | 3.82                 | 256.25   |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     | TOTALS:                                     | 385,875             | 8.86                 | 688.69   |
|                             |                     | WEIGHTED CN (TOTAL CN X ACRES/TOTAL ACRES): |                     |                      | 77.74    |

scale 1"= 200 feet

ACTUAL= 385,875 sq. ft. 8.86 acres

```

MAX. ELEV=      10065 feet
MIN. ELEV=      9905 feet
DELTA=         160 feet

```

|      | Elevation | Length (in) | Length (ft) |
|------|-----------|-------------|-------------|
| 0.00 | 9905      | 2.00        | 400.0       |
| 0.25 | 9945      | 0.56        | 112.5       |
| 0.50 | 9985      | 1.00        | 200.0       |
| 0.75 | 10025     | 1.50        | 300.0       |
| 1.00 | 10065     | -           |             |

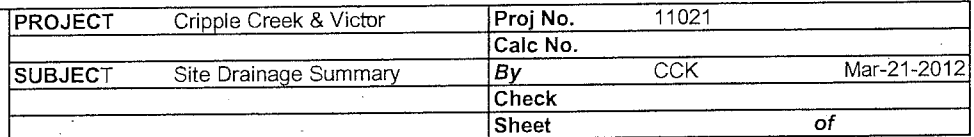
Ave. SLOPE= 10.496 %

MAP= 5.06 inches  
ACTUAL= 1012.5 feet

## 77.74

S= 2.863      Lag= 0.106      Tc= 0.177 hrs

Equations per SCS, 1972



## 1A1

| SOIL TYPE<br>OR DESCRIPTION | HYDROLOGIC<br>GROUP | CN                                          | MAP AREA<br>sq. ft. | ACTUAL AREA<br>ACRES | CNxACRES |
|-----------------------------|---------------------|---------------------------------------------|---------------------|----------------------|----------|
| Buildings/Structures        | B                   | 98                                          | 0                   | 0.00                 | 0.00     |
| Roads/Pads-Road Base        | B                   | 85                                          | 32,275              | 0.74                 | 62.98    |
| Disturbed Granular          | A                   | 67                                          | 8,000               | 0.18                 | 12.30    |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     | TOTALS:                                     | 40,275              | 0.92                 | 75.28    |
|                             |                     | WEIGHTED CN (TOTAL CN X ACRES/TOTAL ACRES): |                     |                      | 81.42    |

scale 1"= 200 feet

ACTUAL= 40,275 sq. ft. 0.92 acres

|            |           |
|------------|-----------|
| MAX. ELEV= | 9950 feet |
| MIN. ELEV= | 9925 feet |
| DELTA=     | 25 feet   |

|      | Elevation | Length (in) | Length (ft) |
|------|-----------|-------------|-------------|
| 0.00 | 9925      | 0.50        | 100.0       |
| 0.25 | 9931      | 0.13        | 25.0        |
| 0.50 | 9938      | 0.06        | 12.5        |
| 0.75 | 9944      | 0.50        | 100.0       |
| 1.00 | 9950      | -           |             |

Ave. SLOPE<sub>ave</sub> 3.686 %

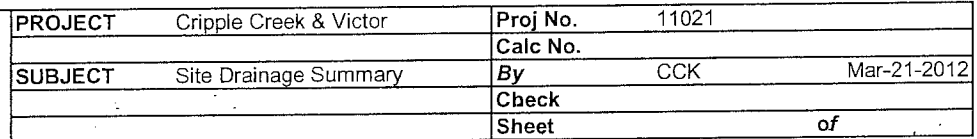
MAP= 1.19 inches  
ACTUAL= 237.5 feet

## 81.42

S= 2.281      Lag= 0.050      Tc= 0.083 hrs

$$\begin{aligned} S &= (1000/CN) - 10 \\ LAG &= \text{Hyd. Length}^{.8} \cdot (S+1)^{.7} / (1900 \cdot \text{Slope}^{.5}) \\ T_c &= LAG / .6 \end{aligned}$$

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## 1A2

| SOIL TYPE<br>OR DESCRIPTION | HYDROLOGIC<br>GROUP | CN                                          | MAP AREA<br>sq. ft. | ACTUAL AREA<br>ACRES | CNxACRES |
|-----------------------------|---------------------|---------------------------------------------|---------------------|----------------------|----------|
| Buildings/Structures        | B                   | 98                                          | 15,300              | 0.35                 | 34.42    |
| Roads/Pads-Road Base        | B                   | 85                                          | 171,700             | 3.94                 | 335.04   |
| Disturbed Granular          | A                   | 67                                          | 158,600             | 3.64                 | 243.94   |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     | TOTALS:                                     | 345,600             | 7.93                 | 613.41   |
|                             |                     | WEIGHTED CN (TOTAL CN X ACRES/TOTAL ACRES): |                     |                      | 77.32    |

ACTUAL= 345,600 sq. ft.      scale 1"= 200 feet      7.93 acres

```
MAX. ELEV=      10065 feet
MIN. ELEV=      9905 feet
DELTA=          160 feet
```

|      | Elevation | Length (in) | Length (ft) |
|------|-----------|-------------|-------------|
| 0.00 | 9905      | 2.00        | 400.0       |
| 0.25 | 9945      | 0.56        | 112.5       |
| 0.50 | 9985      | 1.00        | 200.0       |
| 0.75 | 10025     | 1.50        | 300.0       |
| 1.00 | 10065     | -           |             |

Ave. SLOPE= 11.719 %

MAP= 5.06 inches  
ACTUAL= 1012.5 feet

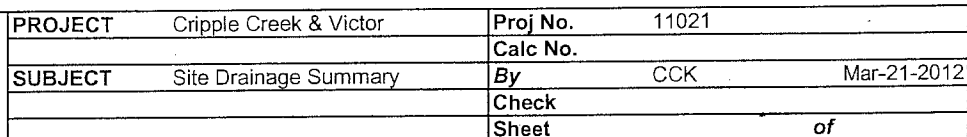
## 77.32

S= 2.934      Lag= 0.102      Tc= 0.170 hrs

$$\begin{aligned} S &= (1000/CN) - 10 \\ LAG &= \text{Hyd. Length}^{.8} (S+1)^{.7} / (1900 * \text{Slope}^{.5}) \\ T_c &= LAG / .6 \end{aligned}$$

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1B1

| WEIGHTED RUNOFF CURVE NUMBER |                     |                                             |                     |                      |          |
|------------------------------|---------------------|---------------------------------------------|---------------------|----------------------|----------|
| SOIL TYPE<br>OR DESCRIPTION  | HYDROLOGIC<br>GROUP | CN                                          | MAP AREA<br>sq. ft. | ACTUAL AREA<br>ACRES | CNxACRES |
| Buildings/Structures         | B                   | 98                                          | 16,650              | 0.38                 | 37.46    |
| Roads/Pads-Road Base         | B                   | 85                                          | 187,600             | 4.31                 | 366.07   |
| Disturbed Granular           | A                   | 67                                          | 172,150             | 3.95                 | 264.79   |
|                              |                     |                                             |                     | 0.00                 | 0.00     |
|                              |                     |                                             |                     | 0.00                 | 0.00     |
|                              |                     |                                             |                     | 0.00                 | 0.00     |
|                              |                     |                                             |                     | 0.00                 | 0.00     |
|                              |                     |                                             |                     | 0.00                 | 0.00     |
|                              |                     |                                             |                     | 0.00                 | 0.00     |
|                              |                     |                                             |                     | 0.00                 | 0.00     |
|                              |                     |                                             |                     | 0.00                 | 0.00     |
|                              |                     | TOTALS:                                     | 376,400             | 8.64                 | 668.31   |
|                              |                     | WEIGHTED CN (TOTAL CN X ACRES/TOTAL ACRES): |                     |                      | 77.34    |

scale 1"= 200 feet  
8.64 acres

```

MAX. ELEV=      10065 feet
MIN. ELEV=      9925 feet
DELTA=         140 feet

```

|      | Elevation | Length (in) | Length (ft) |
|------|-----------|-------------|-------------|
| 0.00 | 9925      | 2.75        | 550.0       |
| 0.25 | 9960      | 1.19        | 237.5       |
| 0.50 | 9995      | 0.31        | 62.5        |
| 0.75 | 10030     | 1.25        | 250.0       |
| 1.00 | 10065     | -           |             |

Ave. SLOPE= 10,228 %

MAP= 5.50 inches  
ACTUAL= 1100 feet

77.34

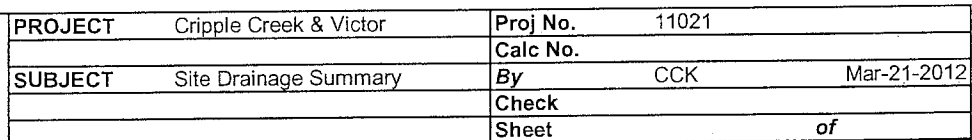
S= 2.929      Lag= 0.116      Tc= 0.194 hrs

HYDDATA1.XLS

$$\begin{aligned} S &= (1000/CN) - 10 \\ LAG &= \text{Hyd. Length}^{.8} \cdot (S+1)^{.7} / (1900 \cdot \text{Slope}^{.5}) \\ T_c &= LAG / .6 \end{aligned}$$

Equations per SCS, 1972





## 1B3

| SOIL TYPE<br>OR DESCRIPTION | HYDROLOGIC<br>GROUP | CN                                          | MAP AREA<br>sq. ft. | ACTUAL AREA<br>ACRES | CNxACRES |
|-----------------------------|---------------------|---------------------------------------------|---------------------|----------------------|----------|
| Buildings/Structures        | B                   | 98                                          | 8,950               | 0.21                 | 20.14    |
| Roads/Pads-Road Base        | B                   | 85                                          | 36,650              | 0.84                 | 71.52    |
| Disturbed Granular          | A                   | 67                                          | 0                   | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     | TOTALS:                                     | 45,600              | 1.05                 | 91.65    |
|                             |                     | WEIGHTED CN (TOTAL CN X ACRES/TOTAL ACRES): |                     |                      | 87.55    |

ACTUAL= 45,600 sq. ft.      scale 1"= 200 feet      1.05 acres

```

MAX. ELEV=      9925 feet
MIN. ELEV=      9905 feet
DELTA=          20 feet

```

|      | Elevation | Length (in) | Length (ft) |
|------|-----------|-------------|-------------|
| 0.00 | 9905      | 1.81        | 362.5       |
| 0.25 | 9910      | 0.38        | 75.0        |
| 0.50 | 9915      | 0.38        | 75.0        |
| 0.75 | 9920      | 1.94        | 387.5       |
| 1.00 | 9925      | -           |             |

Ave. SLOPE= 9.868 %

MAP= 4.50 inches  
ACTUAL= 900 feet

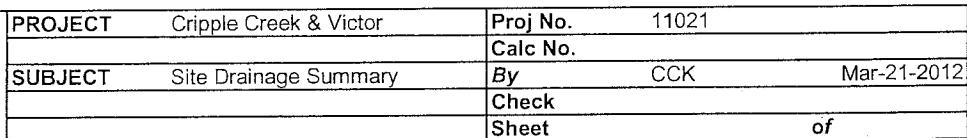
## 87.55

S= 1.422      Lag= 0.072      Tc= 0.120 hrs

HYDDATA1.XLS

$$\begin{aligned} S &= (1000/CN) - 10 \\ LAG &= \text{Hyd. Length}^{.8} \cdot (S+1)^{.7} / (1900 \cdot \text{Slope}^{.5}) \\ T_c &= LAG / .6 \end{aligned}$$

Equations per SCS, 1972



## 1C

| SOIL TYPE<br>OR DESCRIPTION | HYDROLOGIC<br>GROUP | CN                                          | MAP AREA<br>sq. ft. | ACTUAL AREA<br>ACRES | CNxACRES |
|-----------------------------|---------------------|---------------------------------------------|---------------------|----------------------|----------|
| Buildings/Structures        | B                   | 98                                          | 0                   | 0.00                 | 0.00     |
| Roads/Pads-Road Base        | B                   | 85                                          | 85,100              | 1.95                 | 166.06   |
| Disturbed Granular          | A                   | 67                                          | 0                   | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     |                                             |                     | 0.00                 | 0.00     |
|                             |                     | TOTALS:                                     | 85,100              | 1.95                 | 166.06   |
|                             |                     | WEIGHTED CN (TOTAL CN X ACRES/TOTAL ACRES): |                     |                      | 85.00    |

scale 1"= 200 feet

ACTUAL= 85,100 sq. ft. 1.95 acres

```

MAX. ELEV=      10065 feet
MIN. ELEV=      10060 feet
DELTA=          5 feet

```

|      | Elevation | Length (in) | Length (ft) |
|------|-----------|-------------|-------------|
| 0.00 | 10060     | 0.44        | 87.5        |
| 0.25 | 10061     | 0.44        | 87.5        |
| 0.50 | 10063     | 0.44        | 87.5        |
| 0.75 | 10064     | 0.44        | 87.5        |
| 1.00 | 10065     | -           |             |

Ave. SLOPE= 0.514 %

MAP= 1.75 inches  
ACTUAL= 350 feet

## 85.00

S= 1.765      Lag= 0.162      Tc= 0.270 hrs

$$\begin{aligned} S &= (1000/CN) - 10 \\ LAG &= \text{Hyd. Length}^{.8} \cdot (S+1)^{.7} / (1900 \cdot \text{Slope}^{.5}) \\ T_c &= LAG / .6 \end{aligned}$$

CV-003 Rev. B / Page 19 of 96

# WinTR-55 Current Data Description

## --- Identification Data ---

User: CK Date: 3/21/2012  
 Project: CC&V Mill Area Units: English  
 SubTitle: Contained Runoff Calculations Areal Units: Acres  
 State: Colorado  
 County: Teller  
 Filename: P:\11021\116 - Calculations\116.d - Arch\_Civil\_Struc\CV-003 Process Building Civil\CCV Mil

## --- Sub-Area Data ---

| Name | Description | Reach   | Area(ac) | RCN | Tc    |
|------|-------------|---------|----------|-----|-------|
| 1A1  | site A1     | Reach 1 | 0.92     | 81  | 0.100 |
| 1A2  | site A2     | Outlet  | 7.93     | 77  | 0.170 |
| 1B1  | site B1     | Reach 2 | 8.64     | 77  | 0.194 |
| 1B2  | site B2     | Reach 3 | 3.97     | 87  | 0.237 |
| 1B3  | site B3     | Outlet  | 1.05     | 88  | 0.120 |
| 1C   | site C      | Outlet  | 1.95     | 85  | 0.270 |

Total area: 24.46 (ac)

## --- Storm Data ---

### Rainfall Depth by Rainfall Return Period

| 2-Yr<br>(in) | 5-Yr<br>(in) | 10-Yr<br>(in) | 25-Yr<br>(in) | 50-Yr<br>(in) | 100-Yr<br>(in) | 1-Yr<br>(in) |
|--------------|--------------|---------------|---------------|---------------|----------------|--------------|
| 1.6          | 2.2          | 2.4           | 2.9           | 3.2           | 3.4            | .0           |

Storm Data Source: User-provided custom storm data  
 Rainfall Distribution Type: Type II  
 Dimensionless Unit Hydrograph: <standard>

CK

CC&V Mill Area  
Contained Runoff Calculations  
Teller County, Colorado

Storm Data

Rainfall Depth by Rainfall Return Period

| 2-Yr<br>(in) | 5-Yr<br>(in) | 10-Yr<br>(in) | 25-Yr<br>(in) | 50-Yr<br>(in) | 100-Yr<br>(in) | 1-Yr<br>(in) |
|--------------|--------------|---------------|---------------|---------------|----------------|--------------|
| 1.6          | .0           | 2.4           | 2.9           | 3.2           | 3.4            | .0           |

Storm Data Source: User-provided custom storm data  
Rainfall Distribution Type: Type II  
Dimensionless Unit Hydrograph: <standard>

CK

CC&V Mill Area  
Contained Runoff Calculations  
Teller County, Colorado

Watershed Peak Table

| Sub-Area<br>or Reach<br>Identifier | Peak Flow by Rainfall Return Period<br>25-Yr<br>(cfs) |
|------------------------------------|-------------------------------------------------------|
| -----                              |                                                       |
| SUBAREAS                           |                                                       |
| 1A1                                | 1.75                                                  |
| 1A2                                | 10.78                                                 |
| 1B1                                | 11.38                                                 |
| 1B2                                | 8.28                                                  |
| 1B3                                | 2.69                                                  |
| 1C                                 | 3.54                                                  |
| REACHES                            |                                                       |
| Reach 1                            | 1.75                                                  |
| Down                               | 1.73                                                  |
| Reach 3                            | 19.30                                                 |
| Down                               | 19.30                                                 |
| Reach 2                            | 11.38                                                 |
| Down                               | 11.32                                                 |
| OUTLET                             | 36.78                                                 |

CK

CC&V Mill Area  
Contained Runoff Calculations  
Teller County, Colorado

Hydrograph Peak/Peak Time Table

| Sub-Area<br>or Reach<br>Identifier | Peak Flow and Peak Time (hr) by Rainfall Return Period<br>25-Yr<br>(cfs)<br>(hr) |
|------------------------------------|----------------------------------------------------------------------------------|
|------------------------------------|----------------------------------------------------------------------------------|

SUBAREAS

|     |               |
|-----|---------------|
| 1A1 | 1.75<br>11.94 |
|-----|---------------|

|     |                |
|-----|----------------|
| 1A2 | 10.78<br>12.01 |
|-----|----------------|

|     |                |
|-----|----------------|
| 1B1 | 11.38<br>12.02 |
|-----|----------------|

|     |               |
|-----|---------------|
| 1B2 | 8.28<br>12.04 |
|-----|---------------|

|     |               |
|-----|---------------|
| 1B3 | 2.69<br>11.95 |
|-----|---------------|

|    |               |
|----|---------------|
| 1C | 3.54<br>12.05 |
|----|---------------|

REACHES

|         |               |
|---------|---------------|
| Reach 1 | 1.75<br>11.94 |
| Down    | 1.73<br>11.99 |

|         |                |
|---------|----------------|
| Reach 3 | 19.30<br>12.06 |
| Down    | 19.30<br>12.07 |

|         |                |
|---------|----------------|
| Reach 2 | 11.38<br>12.02 |
| Down    | 11.32<br>12.08 |

|        |       |
|--------|-------|
| OUTLET | 36.78 |
|--------|-------|

CK

CC&V Mill Area  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Summary Table

| Sub-Area<br>Identifier | Drainage<br>Area<br>(ac) | Time of<br>Concentration<br>(hr) | Curve<br>Number | Receiving<br>Reach | Sub-Area<br>Description |
|------------------------|--------------------------|----------------------------------|-----------------|--------------------|-------------------------|
| 1A1                    | .92                      | 0.100                            | 81              | Reach 1            | site A1                 |
| 1A2                    | 7.93                     | 0.170                            | 77              | Outlet             | site A2                 |
| 1B1                    | 8.64                     | 0.194                            | 77              | Reach 2            | site B1                 |
| 1B2                    | 3.97                     | 0.237                            | 87              | Reach 3            | site B2                 |
| 1B3                    | 1.05                     | 0.120                            | 88              | Outlet             | site B3                 |
| 1C                     | 1.95                     | 0.270                            | 85              | Outlet             | site C                  |

Total Area: 24.46 (ac)

CK

CC&V Mill Area  
Contained Runoff Calculations  
Teller County, Colorado

Reach Summary Table

| Reach<br>Identifier | Receiving<br>Reach<br>Identifier | Reach<br>Length<br>(ft) | Routing<br>Method |
|---------------------|----------------------------------|-------------------------|-------------------|
| Reach 1             | Outlet                           | 500                     | CHANNEL           |
| Reach 3             | Outlet                           | 150                     | CHANNEL           |
| Reach 2             | Reach 3                          | 900                     | CHANNEL           |

CK

CC&V Mill Area  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Time of Concentration Details

| Sub-Area Identifier/ | Flow Length (ft) | Slope (ft/ft) | Mannings's n | End Area (sq ft) | Wetted Perimeter (ft) | Velocity (ft/sec)     | Travel Time (hr) |
|----------------------|------------------|---------------|--------------|------------------|-----------------------|-----------------------|------------------|
| 1A1                  |                  |               |              |                  |                       |                       |                  |
| User-provided        |                  |               |              |                  |                       |                       | 0.100            |
|                      |                  |               |              |                  |                       | Time of Concentration | 0.100<br>=====   |
| 1A2                  |                  |               |              |                  |                       |                       |                  |
| User-provided        |                  |               |              |                  |                       |                       | 0.170            |
|                      |                  |               |              |                  |                       | Time of Concentration | 0.170<br>=====   |
| 1B1                  |                  |               |              |                  |                       |                       |                  |
| User-provided        |                  |               |              |                  |                       |                       | 0.194            |
|                      |                  |               |              |                  |                       | Time of Concentration | 0.194<br>=====   |
| 1B2                  |                  |               |              |                  |                       |                       |                  |
| User-provided        |                  |               |              |                  |                       |                       | 0.237            |
|                      |                  |               |              |                  |                       | Time of Concentration | 0.237<br>=====   |
| 1B3                  |                  |               |              |                  |                       |                       |                  |
| User-provided        |                  |               |              |                  |                       |                       | 0.120            |
|                      |                  |               |              |                  |                       | Time of Concentration | 0.120<br>=====   |
| 1C                   |                  |               |              |                  |                       |                       |                  |
| User-provided        |                  |               |              |                  |                       |                       | 0.270            |
|                      |                  |               |              |                  |                       | Time of Concentration | 0.270<br>=====   |

CK

CC&V Mill Area  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Land Use and Curve Number Details

| Sub-Area Identifier | Land Use                               | Hydrologic Soil Group | Sub-Area Area (ac) | Curve Number |
|---------------------|----------------------------------------|-----------------------|--------------------|--------------|
| 1A1                 | Gravel (w/ right-of-way)               | B                     | .74                | 85           |
|                     | Sagebrush (w/ grass understory) (poor) | B                     | .18                | 67           |
|                     | Total Area / Weighted Curve Number     |                       | .92                | 81           |
|                     |                                        |                       | ===                | ==           |
| 1A2                 | Paved; curbs and storm sewers          | B                     | .35                | 98           |
|                     | Gravel (w/ right-of-way)               | B                     | 3.94               | 85           |
|                     | Sagebrush (w/ grass understory) (poor) | B                     | 3.64               | 67           |
|                     | Total Area / Weighted Curve Number     |                       | 7.93               | 77           |
|                     |                                        |                       | ====               | ==           |
| 1B1                 | Paved parking lots, roofs, driveways   | B                     | .38                | 98           |
|                     | Gravel (w/ right-of-way)               | B                     | 4.31               | 85           |
|                     | Sagebrush (w/ grass understory) (poor) | B                     | 3.95               | 67           |
|                     | Total Area / Weighted Curve Number     |                       | 8.64               | 77           |
|                     |                                        |                       | ====               | ==           |
| 1B2                 | Paved parking lots, roofs, driveways   | B                     | .82                | 98           |
|                     | Gravel (w/ right-of-way)               | B                     | 3.02               | 85           |
|                     | Sagebrush (w/ grass understory) (poor) | B                     | .13                | 67           |
|                     | Total Area / Weighted Curve Number     |                       | 3.97               | 87           |
|                     |                                        |                       | ====               | ==           |
| 1B3                 | Paved parking lots, roofs, driveways   | B                     | .21                | 98           |
|                     | Gravel (w/ right-of-way)               | B                     | .84                | 85           |
|                     | Total Area / Weighted Curve Number     |                       | 1.05               | 88           |
|                     |                                        |                       | ====               | ==           |
| 1C                  | Gravel (w/ right-of-way)               | B                     | 1.95               | 85           |
|                     | Total Area / Weighted Curve Number     |                       | 1.95               | 85           |
|                     |                                        |                       | ====               | ==           |

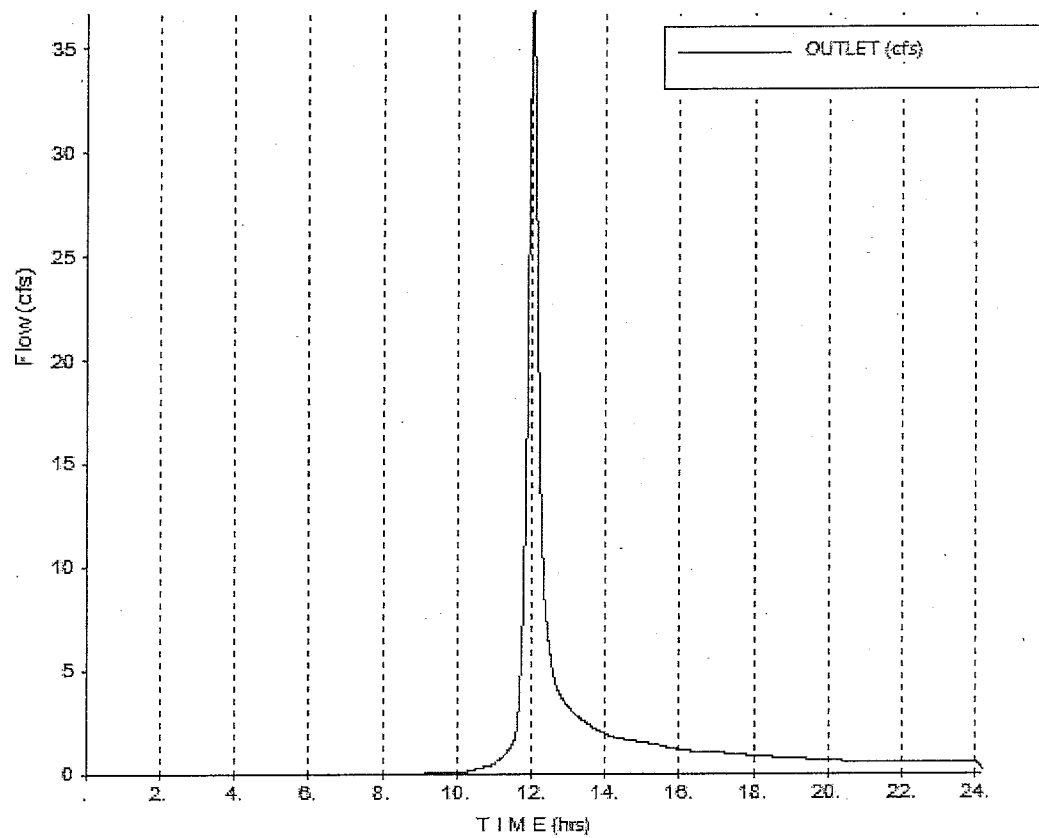
CK

CC&V Mill Area  
Contained Runoff Calculations  
Teller County, Colorado

Reach Channel Rating Details

| Reach Identifier | Reach Length (ft) | Reach Manning's n | Friction Slope (ft/ft) | Bottom Width (ft) | Side Slope |
|------------------|-------------------|-------------------|------------------------|-------------------|------------|
| Reach 1          | 500               | 0.035             | 0.01                   | 0.5               | 1.5 :1     |
| Reach 3          | 150               | 0.035             | 0.09                   | 0.5               | 1.5 :1     |
| Reach 2          | 900               | 0.035             | 0.01                   | 0.5               | 1.5 :1     |

| Reach Identifier | Stage (ft) | Flow (cfs) | End Area (sq ft) | Top Width (ft) | Friction Slope (ft/ft) |
|------------------|------------|------------|------------------|----------------|------------------------|
| Reach 1          | 0.0        | 0.000      | 0                | 0.5            | 0.01                   |
|                  | 0.5        | 1.112      | 0.6              | 2              |                        |
|                  | 1.0        | 5.257      | 2                | 3.5            |                        |
|                  | 2.0        | 27.864     | 7                | 6.5            |                        |
|                  | 5.0        | 283.684    | 40               | 15.5           |                        |
|                  | 10.0       | 1723.991   | 155              | 30.5           |                        |
|                  | 20.0       | 10702.834  | 610              | 60.5           |                        |
| Reach 3          | 0.0        | 0.000      | 0                | 0.5            | 0.09                   |
|                  | 0.5        | 3.337      | 0.6              | 2              |                        |
|                  | 1.0        | 15.772     | 2                | 3.5            |                        |
|                  | 2.0        | 83.591     | 7                | 6.5            |                        |
|                  | 5.0        | 851.053    | 40               | 15.5           |                        |
|                  | 10.0       | 5171.973   | 155              | 30.5           |                        |
|                  | 20.0       | 32108.501  | 610              | 60.5           |                        |
| Reach 2          | 0.0        | 0.000      | 0                | 0.5            | 0.01                   |
|                  | 0.5        | 1.112      | 0.6              | 2              |                        |
|                  | 1.0        | 5.257      | 2                | 3.5            |                        |
|                  | 2.0        | 27.864     | 7                | 6.5            |                        |
|                  | 5.0        | 283.684    | 40               | 15.5           |                        |
|                  | 10.0       | 1723.991   | 155              | 30.5           |                        |
|                  | 20.0       | 10702.834  | 610              | 60.5           |                        |



# WinTR-55 Current Data Description

## --- Identification Data ---

User: CK Date: 3/21/2012  
 Project: CC&V Mill Area A Units: English  
 SubTitle: Contained Runoff Calculations Areal Units: Acres  
 State: Colorado  
 County: Teller  
 Filename: P:\11021\116 - Calculations\116.d - Arch\_Civil\_Struc\CV-003 Process Building Civil\CCV Mil

## --- Sub-Area Data ---

| Name | Description | Reach   | Area(ac) | RCN | Tc    |
|------|-------------|---------|----------|-----|-------|
| 1A1  | site A1     | Reach 1 | 0.92     | 81  | 0.100 |
| 1A2  | site A2     | Outlet  | 7.93     | 77  | 0.170 |

Total area: 8.85 (ac)

## --- Storm Data ---

### Rainfall Depth by Rainfall Return Period

| 2-Yr<br>(in) | 5-Yr<br>(in) | 10-Yr<br>(in) | 25-Yr<br>(in) | 50-Yr<br>(in) | 100-Yr<br>(in) | 1-Yr<br>(in) |
|--------------|--------------|---------------|---------------|---------------|----------------|--------------|
| 1.6          | 2.2          | 2.4           | 2.9           | 3.2           | 3.4            | .0           |

Storm Data Source: User-provided custom storm data  
 Rainfall Distribution Type: Type II  
 Dimensionless Unit Hydrograph: <standard>

CK

CC&V Mill Area A  
Contained Runoff Calculations  
Teller County, Colorado

Storm Data

Rainfall Depth by Rainfall Return Period

| 2-Yr<br>(in) | 5-Yr<br>(in) | 10-Yr<br>(in) | 25-Yr<br>(in) | 50-Yr<br>(in) | 100-Yr<br>(in) | 1-Yr<br>(in) |
|--------------|--------------|---------------|---------------|---------------|----------------|--------------|
| 1.6          | 2.2          | 2.4           | 2.9           | 3.2           | 3.4            | .0           |

Storm Data Source: User-provided custom storm data  
Rainfall Distribution Type: Type II  
Dimensionless Unit Hydrograph: <standard>

CK

CC&V Mill Area A  
Contained Runoff Calculations  
Teller County, Colorado

Watershed Peak Table

| Sub-Area<br>or Reach<br>Identifier | Peak Flow by Rainfall Return Period<br>25-Yr<br>(cfs) |
|------------------------------------|-------------------------------------------------------|
| -----                              |                                                       |
| SUBAREAS                           |                                                       |
| 1A1                                | 1.75                                                  |
| 1A2                                | 10.78                                                 |
| REACHES                            |                                                       |
| Reach 1                            | 1.75                                                  |
| Down                               | 1.73                                                  |
| OUTLET                             | 12.48                                                 |

CK

CC&V Mill Area A  
Contained Runoff Calculations  
Teller County, Colorado

Hydrograph Peak/Peak Time Table

| Sub-Area<br>or Reach<br>Identifier | Peak Flow and Peak Time (hr) by Rainfall Return Period<br>25-Yr<br>(cfs)<br>(hr) |
|------------------------------------|----------------------------------------------------------------------------------|
|------------------------------------|----------------------------------------------------------------------------------|

SUBAREAS

|     |               |
|-----|---------------|
| 1A1 | 1.75<br>11.94 |
|-----|---------------|

|     |                |
|-----|----------------|
| 1A2 | 10.78<br>12.01 |
|-----|----------------|

REACHES

|         |               |
|---------|---------------|
| Reach 1 | 1.75<br>11.94 |
| Down    | 1.73<br>11.99 |

|        |       |
|--------|-------|
| OUTLET | 12.48 |
|--------|-------|

CK

CC&V Mill Area A  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Summary Table

| Sub-Area<br>Identifier | Drainage<br>Area<br>(ac) | Time of<br>Concentration<br>(hr) | Curve<br>Number | Receiving<br>Reach | Sub-Area<br>Description |
|------------------------|--------------------------|----------------------------------|-----------------|--------------------|-------------------------|
| 1A1                    | .92                      | 0.100                            | 81              | Reach 1            | site A1                 |
| 1A2                    | 7.93                     | 0.170                            | 77              | Outlet             | site A2                 |

Total Area: 8.85 (ac)

CK

CC&V Mill Area A  
Contained Runoff Calculations  
Teller County, Colorado

Reach Summary Table

| Reach<br>Identifier | Receiving<br>Reach<br>Identifier | Reach<br>Length<br>(ft) | Routing<br>Method |
|---------------------|----------------------------------|-------------------------|-------------------|
| Reach 1             | Outlet                           | 500                     | CHANNEL           |

CK

CC&V Mill Area A  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Time of Concentration Details

| Sub-Area<br>Identifier/ | Flow<br>Length<br>(ft) | Slope<br>(ft/ft) | Mannings's<br>n | End<br>Area<br>(sq ft) | Wetted<br>Perimeter<br>(ft) | Velocity<br>(ft/sec) | Travel<br>Time<br>(hr) |
|-------------------------|------------------------|------------------|-----------------|------------------------|-----------------------------|----------------------|------------------------|
| -----                   |                        |                  |                 |                        |                             |                      |                        |
| 1A1                     |                        |                  |                 |                        |                             |                      |                        |
| User-provided           |                        |                  |                 |                        |                             |                      | 0.100                  |
|                         |                        |                  |                 |                        | Time of Concentration       |                      | 0.100                  |
|                         |                        |                  |                 |                        |                             |                      | =====                  |
| 1A2                     |                        |                  |                 |                        |                             |                      |                        |
| User-provided           |                        |                  |                 |                        |                             |                      | 0.170                  |
|                         |                        |                  |                 |                        | Time of Concentration       |                      | 0.170                  |
|                         |                        |                  |                 |                        |                             |                      | =====                  |

CK

CC&V Mill Area A  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Land Use and Curve Number Details

| Sub-Area Identifier | Land Use                               | Hydrologic Soil Group | Sub-Area Area (ac) | Curve Number |
|---------------------|----------------------------------------|-----------------------|--------------------|--------------|
| 1A1                 | Gravel (w/ right-of-way)               | B                     | .74                | 85           |
|                     | Sagebrush (w/ grass understory) (poor) | B                     | .18                | 67           |
|                     | Total Area / Weighted Curve Number     |                       | .92<br>===         | 81<br>==     |
| 1A2                 | Paved; curbs and storm sewers          | B                     | .35                | 98           |
|                     | Gravel (w/ right-of-way)               | B                     | 3.94               | 85           |
|                     | Sagebrush (w/ grass understory) (poor) | B                     | 3.64               | 67           |
|                     | Total Area / Weighted Curve Number     |                       | 7.93<br>====       | 77<br>==     |

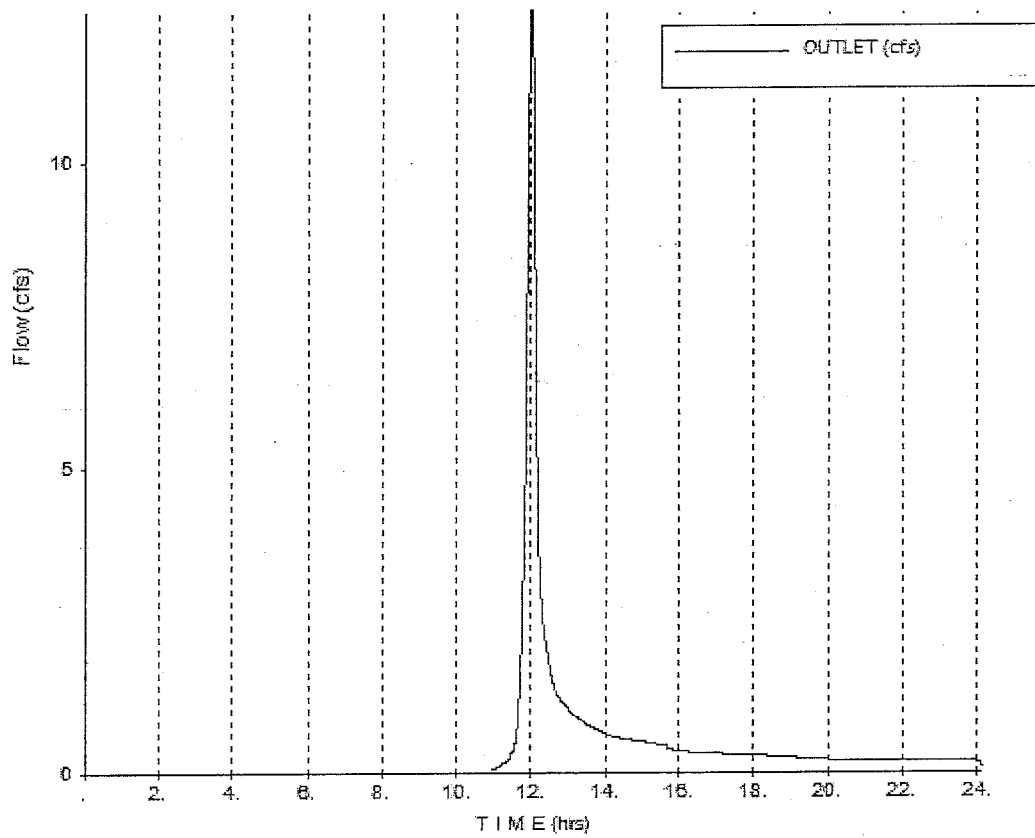
CK

CC&V Mill Area A  
Contained Runoff Calculations  
Teller County, Colorado

Reach Channel Rating Details

| Reach Identifier | Reach Length (ft) | Reach Manning's n | Friction Slope (ft/ft) | Bottom Width (ft) | Side Slope |
|------------------|-------------------|-------------------|------------------------|-------------------|------------|
| Reach 1          | 500               | 0.035             | 0.01                   | 0.5               | 1.5 :1     |

| Reach Identifier | Stage (ft) | Flow (cfs) | End Area (sq ft) | Top Width (ft) | Friction Slope (ft/ft) |
|------------------|------------|------------|------------------|----------------|------------------------|
| Reach 1          | 0.0        | 0.000      | 0                | 0.5            | 0.01                   |
|                  | 0.5        | 1.112      | 0.6              | 2              |                        |
|                  | 1.0        | 5.257      | 2                | 3.5            |                        |
|                  | 2.0        | 27.864     | 7                | 6.5            |                        |
|                  | 5.0        | 283.684    | 40               | 15.5           |                        |
|                  | 10.0       | 1723.991   | 155              | 30.5           |                        |
|                  | 20.0       | 10702.834  | 610              | 60.5           |                        |



# WinTR-55 Current Data Description

## --- Identification Data ---

User: CK Date: 3/21/2012  
 Project: CC&V Mill Area B Units: English  
 SubTitle: Contained Runoff Calculations Areal Units: Acres  
 State: Colorado  
 County: Teller  
 Filename: P:\11021\116 - Calculations\116.d - Arch\_Civil\_Struc\CV-003 Process Building Civil\CCV Mil

## --- Sub-Area Data ---

| Name | Description | Reach   | Area(ac) | RCN | Tc    |
|------|-------------|---------|----------|-----|-------|
| 1B1  | site B1     | Reach 2 | 8.64     | 77  | 0.194 |
| 1B2  | site B2     | Reach 3 | 3.97     | 87  | 0.237 |
| 1B3  | site B3     | Outlet  | 1.05     | 88  | 0.120 |

Total area: 13.66 (ac)

## --- Storm Data ---

### Rainfall Depth by Rainfall Return Period

| 2-Yr<br>(in) | 5-Yr<br>(in) | 10-Yr<br>(in) | 25-Yr<br>(in) | 50-Yr<br>(in) | 100-Yr<br>(in) | 1-Yr<br>(in) |
|--------------|--------------|---------------|---------------|---------------|----------------|--------------|
| 1.6          | 2.2          | 2.4           | 2.9           | 3.2           | 3.4            | .0           |

Storm Data Source: User-provided custom storm data  
 Rainfall Distribution Type: Type II  
 Dimensionless Unit Hydrograph: <standard>

CK

CC&V Mill Area B  
Contained Runoff Calculations  
Teller County, Colorado

Storm Data

Rainfall Depth by Rainfall Return Period

| 2-Yr<br>(in) | 5-Yr<br>(in) | 10-Yr<br>(in) | 25-Yr<br>(in) | 50-Yr<br>(in) | 100-Yr<br>(in) | 1-Yr<br>(in) |
|--------------|--------------|---------------|---------------|---------------|----------------|--------------|
| 1.6          | .0           | 2.4           | 2.9           | 3.2           | 3.4            | .0           |

Storm Data Source: User-provided custom storm data  
Rainfall Distribution Type: Type II  
Dimensionless Unit Hydrograph: <standard>

CK

CC&V Mill Area B  
Contained Runoff Calculations  
Teller County, Colorado

Watershed Peak Table

| Sub-Area<br>or Reach<br>Identifier | Peak Flow by Rainfall Return Period.<br>25-Yr<br>(cfs) |
|------------------------------------|--------------------------------------------------------|
| -----                              |                                                        |
| SUBAREAS                           |                                                        |
| 1B1                                | 11.38                                                  |
| 1B2                                | 8.28                                                   |
| 1B3                                | 2.69                                                   |
| REACHES                            |                                                        |
| Reach 2                            | 11.38                                                  |
| Down                               | 11.32                                                  |
| Reach 3                            | 19.30                                                  |
| Down                               | 19.30                                                  |
| OUTLET                             | 21.22                                                  |

CK

CC&V Mill Area B  
Contained Runoff Calculations  
Teller County, Colorado

Hydrograph Peak/Peak Time Table

| Sub-Area<br>or Reach<br>Identifier | Peak Flow and Peak Time (hr) by Rainfall Return Period<br>25-Yr<br>(cfs)<br>(hr) |
|------------------------------------|----------------------------------------------------------------------------------|
|------------------------------------|----------------------------------------------------------------------------------|

SUBAREAS

|     |                |
|-----|----------------|
| 1B1 | 11.38<br>12.02 |
|-----|----------------|

|     |               |
|-----|---------------|
| 1B2 | 8.28<br>12.04 |
|-----|---------------|

|     |               |
|-----|---------------|
| 1B3 | 2.69<br>11.95 |
|-----|---------------|

REACHES

|         |                |
|---------|----------------|
| Reach 2 | 11.38<br>12.02 |
| Down    | 11.32<br>12.08 |

|         |                |
|---------|----------------|
| Reach 3 | 19.30<br>12.06 |
| Down    | 19.30<br>12.07 |

|        |       |
|--------|-------|
| OUTLET | 21.22 |
|--------|-------|

CK

CC&V Mill Area B  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Summary Table

| Sub-Area<br>Identifier | Drainage<br>Area<br>(ac) | Time of<br>Concentration<br>(hr) | Curve<br>Number | Receiving<br>Reach | Sub-Area<br>Description |
|------------------------|--------------------------|----------------------------------|-----------------|--------------------|-------------------------|
| 1B1                    | 8.64                     | 0.194                            | 77              | Reach 2            | site B1                 |
| 1B2                    | 3.97                     | 0.237                            | 87              | Reach 3            | site B2                 |
| 1B3                    | 1.05                     | 0.120                            | 88              | Outlet             | site B3                 |

Total Area: 13.66 (ac)

CK

CC&V Mill Area B  
Contained Runoff Calculations  
Teller County, Colorado

Reach Summary Table

| Reach<br>Identifier | Receiving<br>Reach<br>Identifier | Reach<br>Length<br>(ft) | Routing<br>Method |
|---------------------|----------------------------------|-------------------------|-------------------|
| Reach 2             | Reach 3                          | 900                     | CHANNEL           |
| Reach 3             | Outlet                           | 150                     | CHANNEL           |

CK

CC&V Mill Area B  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Time of Concentration Details

| Sub-Area<br>Identifier/ | Flow<br>Length<br>(ft) | Slope<br>(ft/ft) | Mannings's<br>n | End<br>Area<br>(sq ft) | Wetted<br>Perimeter<br>(ft) | Velocity<br>(ft/sec) | Travel<br>Time<br>(hr) |
|-------------------------|------------------------|------------------|-----------------|------------------------|-----------------------------|----------------------|------------------------|
| -----                   |                        |                  |                 |                        |                             |                      |                        |
| 1B1                     |                        |                  |                 |                        |                             |                      |                        |
| User-provided           |                        |                  |                 |                        |                             |                      | 0.194                  |
|                         |                        |                  |                 |                        | Time of Concentration       |                      | 0.194                  |
|                         |                        |                  |                 |                        |                             |                      | =====                  |
| 1B2                     |                        |                  |                 |                        |                             |                      |                        |
| User-provided           |                        |                  |                 |                        |                             |                      | 0.237                  |
|                         |                        |                  |                 |                        | Time of Concentration       |                      | 0.237                  |
|                         |                        |                  |                 |                        |                             |                      | =====                  |
| 1B3                     |                        |                  |                 |                        |                             |                      |                        |
| User-provided           |                        |                  |                 |                        |                             |                      | 0.120                  |
|                         |                        |                  |                 |                        | Time of Concentration       |                      | 0.120                  |
|                         |                        |                  |                 |                        |                             |                      | =====                  |

CK

CC&V Mill Area B  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Land Use and Curve Number Details

| Sub-Area Identifier | Land Use                               | Hydrologic Soil Group | Sub-Area Area (ac) | Curve Number |
|---------------------|----------------------------------------|-----------------------|--------------------|--------------|
| 1B1                 | Paved parking lots, roofs, driveways   | B                     | .38                | 98           |
|                     | Gravel (w/ right-of-way)               | B                     | 4.31               | 85           |
|                     | Sagebrush (w/ grass understory) (poor) | B                     | 3.95               | 67           |
|                     | Total Area / Weighted Curve Number     |                       | 8.64               | 77           |
|                     |                                        |                       | ====               | ==           |
| 1B2                 | Paved parking lots, roofs, driveways   | B                     | .82                | 98           |
|                     | Gravel (w/ right-of-way)               | B                     | 3.02               | 85           |
|                     | Sagebrush (w/ grass understory) (poor) | B                     | .13                | 67           |
|                     | Total Area / Weighted Curve Number     |                       | 3.97               | 87           |
|                     |                                        |                       | ====               | ==           |
| 1B3                 | Paved parking lots, roofs, driveways   | B                     | .21                | 98           |
|                     | Gravel (w/ right-of-way)               | B                     | .84                | 85           |
|                     | Total Area / Weighted Curve Number     |                       | 1.05               | 88           |
|                     |                                        |                       | ====               | ==           |

CK

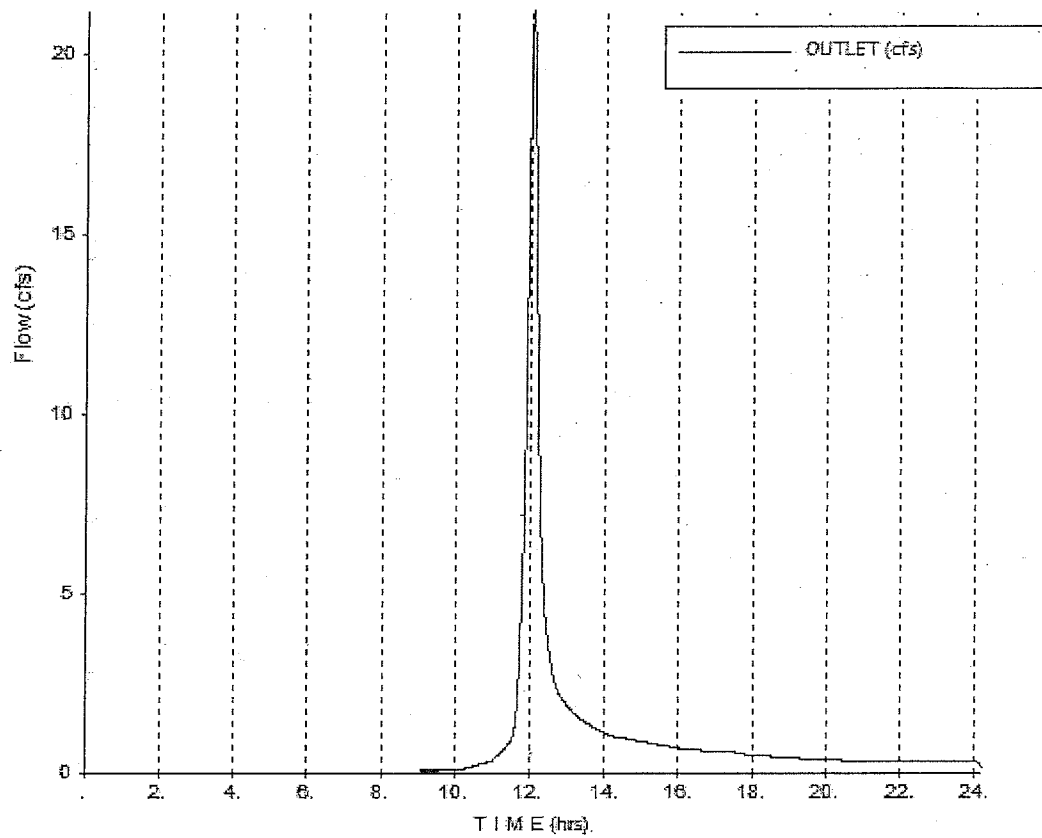
CC&V Mill Area B  
Contained Runoff Calculations  
Teller County, Colorado

Reach Channel Rating Details

| Reach Identifier | Reach Length (ft) | Reach Manning's n | Friction Slope (ft/ft) | Bottom Width (ft) | Side Slope |
|------------------|-------------------|-------------------|------------------------|-------------------|------------|
| Reach 2          | 900               | 0.035             | 0.01                   | 0.5               | 1.5 :1     |
| Reach 3          | 150               | 0.035             | 0.09                   | 0.5               | 1.5 :1     |

| Reach Identifier | Stage (ft) | Flow (cfs) | End Area (sq ft) | Top Width (ft) | Friction Slope (ft/ft) |
|------------------|------------|------------|------------------|----------------|------------------------|
| Reach 2          | 0.0        | 0.000      | 0                | 0.5            | 0.01                   |
|                  | 0.5        | 1.112      | 0.6              | 2              |                        |
|                  | 1.0        | 5.257      | 2                | 3.5            |                        |
|                  | 2.0        | 27.864     | 7                | 6.5            |                        |
|                  | 5.0        | 283.684    | 40               | 15.5           |                        |
|                  | 10.0       | 1723.991   | 155              | 30.5           |                        |
|                  | 20.0       | 10702.834  | 610              | 60.5           |                        |
| Reach 3          | 0.0        | 0.000      | 0                | 0.5            | 0.09                   |
|                  | 0.5        | 3.337      | 0.6              | 2              |                        |
|                  | 1.0        | 15.772     | 2                | 3.5            |                        |
|                  | 2.0        | 83.591     | 7                | 6.5            |                        |
|                  | 5.0        | 851.053    | 40               | 15.5           |                        |
|                  | 10.0       | 5171.973   | 155              | 30.5           |                        |
|                  | 20.0       | 32108.501  | 610              | 60.5           |                        |



# WinTR-55 Current Data Description

## --- Identification Data ---

User: CK Date: 3/23/2012  
 Project: CC&V Mill Area C Units: English  
 SubTitle: Contained Runoff Calculations Areal Units: Acres  
 State: Colorado  
 County: Teller  
 Filename: P:\11021\116 - Calculations\116.d - Arch\_Civil\_Struc\CV-003 Process Building Civil\CCV Mil

## --- Sub-Area Data ---

| Name | Description | Reach   | Area(ac) | RCN | Tc    |
|------|-------------|---------|----------|-----|-------|
| 1C   |             | Reach 1 | 1.95     | 85  | 0.270 |

Total area: 1.95 (ac)

## --- Storm Data --

### Rainfall Depth by Rainfall Return Period

| 2-Yr<br>(in) | 5-Yr<br>(in) | 10-Yr<br>(in) | 25-Yr<br>(in) | 50-Yr<br>(in) | 100-Yr<br>(in) | 1-Yr<br>(in) |
|--------------|--------------|---------------|---------------|---------------|----------------|--------------|
| 1.6          | 2.2          | 2.4           | 2.9           | 3.2           | 3.4            | .0           |

Storm Data Source: User-provided custom storm data  
 Rainfall Distribution Type: Type II  
 Dimensionless Unit Hydrograph: <standard>

CK

CC&V Mill Area C  
Contained Runoff Calculations  
Teller County, Colorado

Storm Data

Rainfall Depth by Rainfall Return Period

| 2-Yr<br>(in) | 5-Yr<br>(in) | 10-Yr<br>(in) | 25-Yr<br>(in) | 50-Yr<br>(in) | 100-Yr<br>(in) | 1-Yr<br>(in) |
|--------------|--------------|---------------|---------------|---------------|----------------|--------------|
| 1.6          | 2.2          | 2.4           | 2.9           | 3.2           | 3.4            | .0           |

Storm Data Source: User-provided custom storm data  
Rainfall Distribution Type: Type II  
Dimensionless Unit Hydrograph: <standard>

CK

CC&V Mill Area C  
Contained Runoff Calculations  
Teller County, Colorado

Watershed Peak Table

| Sub-Area<br>or Reach<br>Identifier | Peak Flow by Rainfall Return Period<br>25-Yr<br>(cfs) |
|------------------------------------|-------------------------------------------------------|
|------------------------------------|-------------------------------------------------------|

-----  
SUBAREAS

|    |      |
|----|------|
| 1C | 3.54 |
|----|------|

REACHES

|         |      |
|---------|------|
| Reach 1 | 3.54 |
| Down    | 3.54 |

|        |      |
|--------|------|
| OUTLET | 3.54 |
|--------|------|

CK

CC&V Mill Area C  
Contained Runoff Calculations  
Teller County, Colorado

Hydrograph Peak/Peak Time Table

| Sub-Area<br>or Reach<br>Identifier | Peak Flow and Peak Time (hr) by Rainfall Return Period<br>25-Yr<br>(cfs)<br>(hr) |
|------------------------------------|----------------------------------------------------------------------------------|
|------------------------------------|----------------------------------------------------------------------------------|

-----  
SUBAREAS

|    |               |
|----|---------------|
| 1C | 3.54<br>12.05 |
|----|---------------|

REACHES

|         |               |
|---------|---------------|
| Reach 1 | 3.54<br>12.05 |
| Down    | 3.54<br>12.05 |

|        |      |
|--------|------|
| OUTLET | 3.54 |
|--------|------|

CK

CC&V Mill Area C  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Summary Table

| Sub-Area<br>Identifier | Drainage<br>Area<br>(ac) | Time of<br>Concentration<br>(hr) | Curve<br>Number | Receiving<br>Reach | Sub-Area<br>Description |
|------------------------|--------------------------|----------------------------------|-----------------|--------------------|-------------------------|
|------------------------|--------------------------|----------------------------------|-----------------|--------------------|-------------------------|

|    |      |       |    |         |  |
|----|------|-------|----|---------|--|
| 1C | 1.95 | 0.270 | 85 | Reach 1 |  |
|----|------|-------|----|---------|--|

Total Area: 1.95 (ac)

CK

CC&V Mill Area C  
Contained Runoff Calculations  
Teller County, Colorado

Reach Summary Table

| Reach<br>Identifier | Receiving<br>Reach<br>Identifier | Reach<br>Length<br>(ft) | Routing<br>Method |
|---------------------|----------------------------------|-------------------------|-------------------|
| Reach 1             | Outlet                           | 1                       | CHANNEL           |

CC&V Mill Area C  
Contained Runoff Calculations  
Teller County, Colorado

| Sub-Area<br>Identifier/ | Flow<br>Length<br>(ft) | Slope<br>(ft/ft) | Mannings's<br>n | End<br>Area<br>(sq ft) | Wetted<br>Perimeter<br>(ft) | Velocity<br>(ft/sec) | Travel<br>Time<br>(hr) |
|-------------------------|------------------------|------------------|-----------------|------------------------|-----------------------------|----------------------|------------------------|
|-------------------------|------------------------|------------------|-----------------|------------------------|-----------------------------|----------------------|------------------------|

[illegible]

CK

CC&V Mill Area C  
Contained Runoff Calculations  
Teller County, Colorado

Sub-Area Land Use and Curve Number Details

| Sub-Area<br>Identifier             | Land Use                 | Hydrologic<br>Soil<br>Group | Sub-Area<br>Area<br>(ac) | Curve<br>Number |
|------------------------------------|--------------------------|-----------------------------|--------------------------|-----------------|
| 1C                                 | Gravel (w/ right-of-way) | B                           | 1.95                     | 85              |
| Total Area / Weighted Curve Number |                          |                             | 1.95                     | 85              |
|                                    |                          |                             | ====                     | ==              |

CK

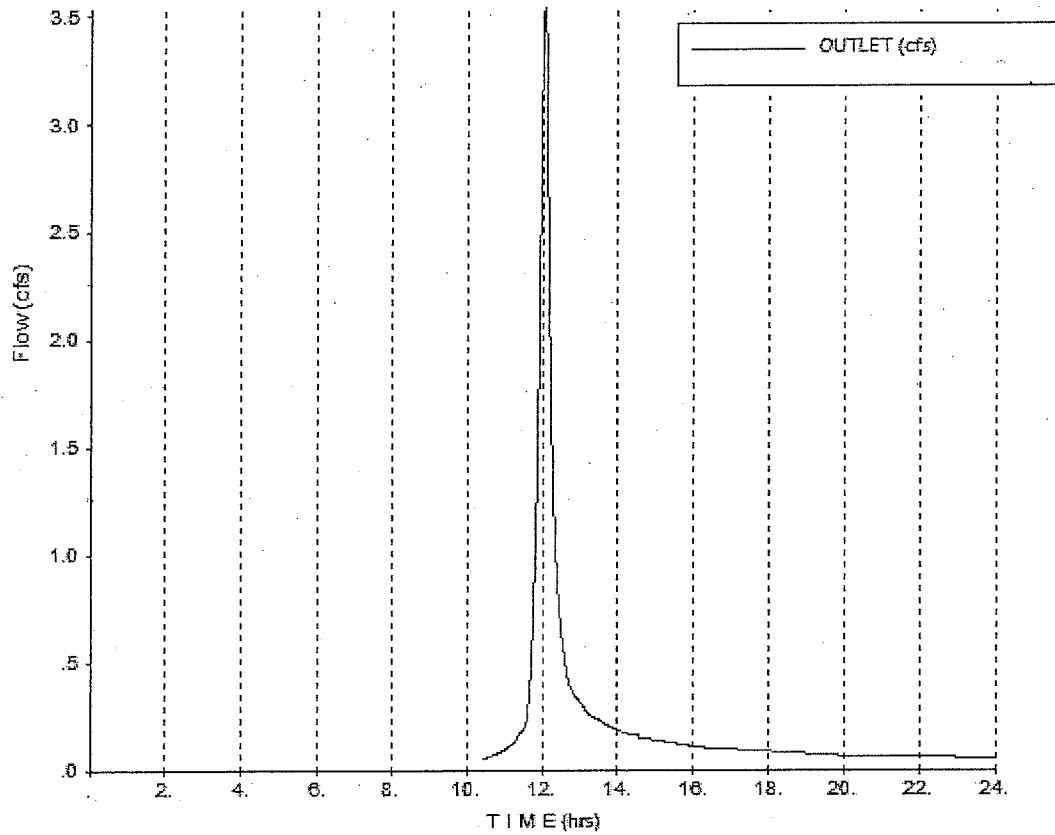
CC&V Mill Area C  
Contained Runoff Calculations  
Teller County, Colorado

Reach Channel Rating Details

| Reach Identifier | Reach Length (ft) | Reach Manning's n | Friction Slope (ft/ft) | Bottom Width (ft) | Side Slope |
|------------------|-------------------|-------------------|------------------------|-------------------|------------|
| Reach 1          | 1                 | 0.035             | 0.01                   | 0.5               | 2 :1       |

| Reach Identifier | Stage (ft) | Flow (cfs) | End Area (sq ft) | Top Width (ft) | Friction Slope (ft/ft) |
|------------------|------------|------------|------------------|----------------|------------------------|
| Reach 1          | 0.0        | 0.000      | 0                | 0.5            | 0.01                   |
|                  | 0.5        | 1.344      | 0.8              | 2.5            |                        |
|                  | 1.0        | 6.712      | 2.5              | 4.5            |                        |
|                  | 2.0        | 37.003     | 9                | 8.5            |                        |
|                  | 5.0        | 387.993    | 52.5             | 20.5           |                        |
|                  | 10.0       | 2384.029   | 205              | 40.5           |                        |
|                  | 20.0       | 14886.129  | 810              | 80.5           |                        |



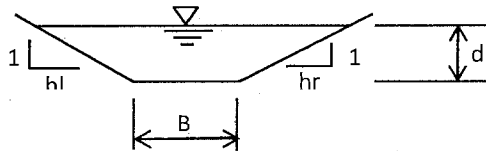


|                                |                    |
|--------------------------------|--------------------|
| PROJECT Cripple Creek & Victor | Proj No. 11021     |
|                                | Calc No.           |
| SUBJECT Open Channel Flow      | By CCK Mar-22-2012 |
| Reach 1                        | Check              |
|                                | Sheet of           |

## OPEN CHANNEL FLOW

### Input

Depth  $d = 1.601$  ft  
 Right Side Slope  $hr = 1.5$  (Defined as 1 vertical to "hr" horizontal)  
 Left Side Slope  $hl = 1.5$  (Defined as 1 vertical to "hl" horizontal)  
 Bottom Width  $B = 0.0$  ft (Use B=0 for triangular channels)  
 Roughness  $n = 0.035$  (Manning Coefficient per table)  
 Channel Slope  $s = 0.01$  (ft/ft)



### Calculations

Wetted Perimeter  $W_p = d^2 + (d \times hr)^2 + d^2 + (d \times hl)^2 + B = 5.8$  ft

Area  $A = \frac{\sqrt{(d^2 \times hr) + (d^2 \times hl)} + (d \times B)}{2} = 3.84$  sq ft

Hydraulic Radius  $R = \frac{A}{W_p} = 0.666$  ft

Discharge Flow  $Q = \frac{A^{1.49} R^{1/3} s^{1/2}}{n} = 12.48$  cfs

Velocity  $V = \frac{Q}{A} = 3.25$  ft/s

### Roughness Coefficients

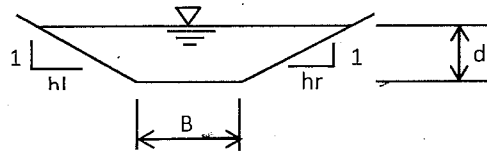
| Boundary                                                       | Manning Roughness |
|----------------------------------------------------------------|-------------------|
| Very Smooth such as glass, plastic, or brass                   | 0.010             |
| Very Smooth concrete or planed timber                          | 0.011             |
| Smooth Concrete                                                | 0.012             |
| Ordinary Concrete Lining                                       | 0.013             |
| Good Wood                                                      | 0.014             |
| Vitrified Clay                                                 | 0.015             |
| Shot Concrete, untroweled, or earth channels in best condition | 0.010             |
| Straight, unlined earth channels, good condition               | 0.020             |
| Rivers and earth channels in fair condition- some growth       | 0.025             |
| RipRap lined channels                                          | 0.035             |
| Winding streams and channels in poor condition                 | 0.035             |
| Mountain streams with rocky beds                               | 0.040             |

|                                                                                   |                                |                    |
|-----------------------------------------------------------------------------------|--------------------------------|--------------------|
|  | PROJECT Cripple Creek & Victor | Proj No. 11021     |
|                                                                                   |                                | Calc No.           |
|                                                                                   | SUBJECT Open Channel Flow      | By CCK Mar-22-2012 |
|                                                                                   | Reach 2                        | Check              |
|                                                                                   |                                | Sheet of           |

## OPEN CHANNEL FLOW

### Input

Depth  $d = 1.546$  ft  
 Right Side Slope  $hr = 1.5$  (Defined as 1 vertical to "hr" horizontal)  
 Left Side Slope  $hl = 1.5$  (Defined as 1 vertical to "hl" horizontal)  
 Bottom Width  $B = 0.0$  ft (Use B=0 for triangular channels)  
 Roughness  $n = 0.035$  (Manning Coefficient per table)  
 Channel Slope  $s = 0.01$  (ft/ft)



### Calculations

Wetted Perimeter  $W_p = d^2 + (d \times hr)^2 + d^2 + (d \times hl)^2 + B = 5.6$  ft

Area  $A = \frac{\sqrt{d^2 \times hr} + \sqrt{d^2 \times hl} + (d \times B)}{2} = 3.59$  sq ft

Hydraulic Radius  $R = \frac{A}{W_p} = 0.643$  ft

Discharge Flow  $Q = \frac{A^{1/3} R^{1/3} s^{1/2}}{n} = 11.38$  cfs

Velocity  $V = \frac{Q}{A} = 3.17$  ft/s

### Roughness Coefficients

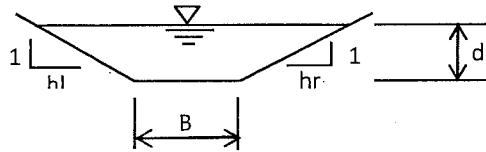
| Boundary                                                       | Manning Roughness |
|----------------------------------------------------------------|-------------------|
| Very Smooth such as glass, plastic, or brass                   | 0.010             |
| Very Smooth concrete or planed timber                          | 0.011             |
| Smooth Concrete                                                | 0.012             |
| Ordinary Concrete Lining                                       | 0.013             |
| Good Wood                                                      | 0.014             |
| Vitrified Clay                                                 | 0.015             |
| Shot Concrete, untroweled, or earth channels in best condition | 0.010             |
| Straight, unlined earth channels, good condition               | 0.020             |
| Rivers and earth channels in fair condition- some growth       | 0.025             |
| RipRap lined channels                                          | 0.035             |
| Winding streams and channels in poor condition                 | 0.035             |
| Mountain streams with rocky beds                               | 0.040             |

|                                                                                   |                                |          |                 |
|-----------------------------------------------------------------------------------|--------------------------------|----------|-----------------|
|  | PROJECT Cripple Creek & Victor | Proj No. | 11021           |
|                                                                                   |                                | Calc No. |                 |
|                                                                                   | SUBJECT Open Channel Flow      | By       | CCK Mar-22-2012 |
|                                                                                   | Reach 2B                       | Check    |                 |
|                                                                                   |                                | Sheet    | of              |

## OPEN CHANNEL FLOW

### Input

Depth  $d = 1.294$  ft  
 Right Side Slope  $hr = 1.5$  (Defined as 1 vertical to "hr" horizontal)  
 Left Side Slope  $hl = 1.5$  (Defined as 1 vertical to "hl" horizontal)  
 Bottom Width  $B = 0.0$  ft (Use B=0 for triangular channels)  
 Roughness  $n = 0.035$  (Manning Coefficient per table)  
 Channel Slope  $s = 0.09$  (ft/ft)



### Calculations

Wetted Perimeter  $W_p = d^2 + (d \times hr)^2 + d^2 + (d \times hl)^2 + B = 4.7$  ft

Area  $A = \frac{\sqrt{(d^2 \times hr) + \sqrt{(d^2 \times hl)}} + (d \times B)}{2} = 2.51$  sq ft

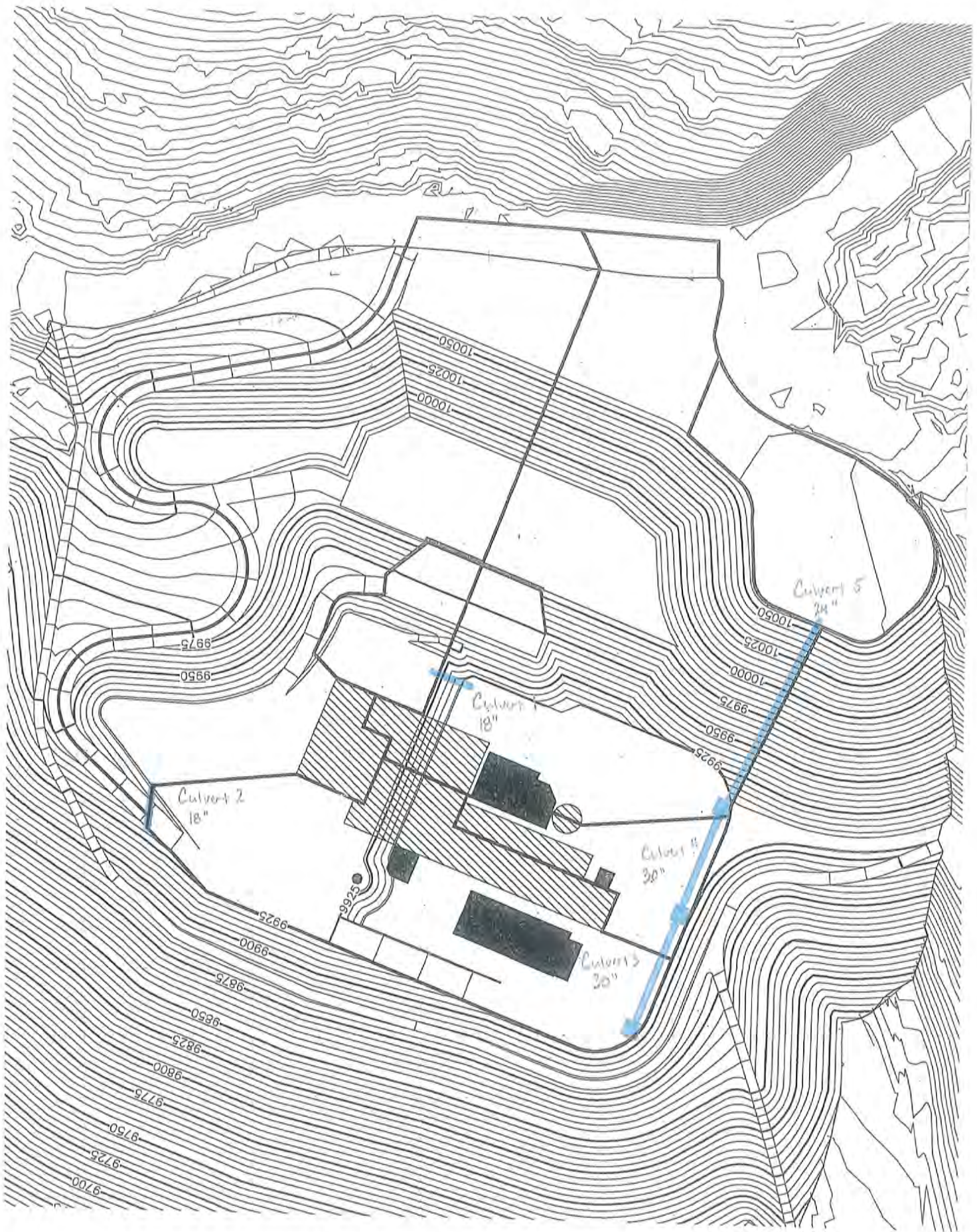
Hydraulic Radius  $R = \frac{A}{W_p} = 0.538$  ft

Discharge Flow  $Q = \frac{A 1.49 R^{1/3} s^{1/2}}{n} = 21.22$  cfs

Velocity  $V = \frac{Q}{A} = 8.45$  ft/s

### Roughness Coefficients

| Boundary                                                       | Manning Roughness |
|----------------------------------------------------------------|-------------------|
| Very Smooth such as glass, plastic, or brass                   | 0.010             |
| Very Smooth concrete or planed timber                          | 0.011             |
| Smooth Concrete                                                | 0.012             |
| Ordinary Concrete Lining                                       | 0.013             |
| Good Wood                                                      | 0.014             |
| Vitrified Clay                                                 | 0.015             |
| Shot Concrete, untroweled, or earth channels in best condition | 0.010             |
| Straight, unlined earth channels, good condition               | 0.020             |
| Rivers and earth channels in fair condition- some growth       | 0.025             |
| RipRap lined channels                                          | 0.035             |
| Winding streams and channels in poor condition                 | 0.035             |
| Mountain streams with rocky beds                               | 0.040             |



# HY-8 Culvert Analysis Report

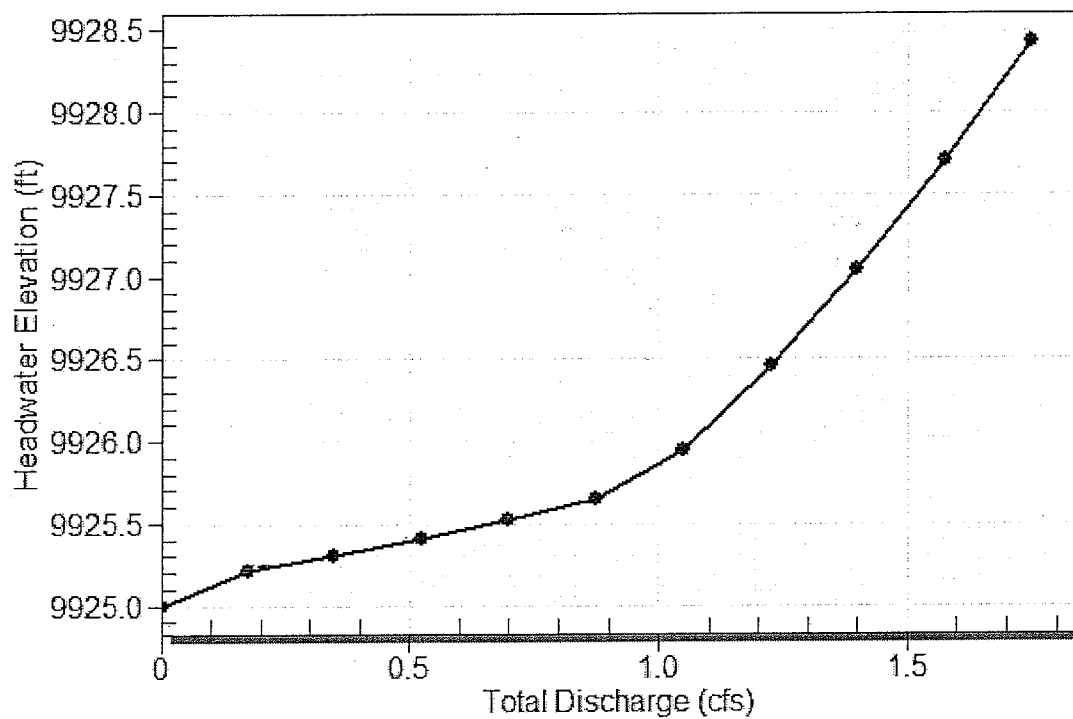
**Table 1 - Summary of Culvert Flows at Crossing: Crossing**

| Headwater Elevation<br>(ft) | Total Discharge (cfs) | Culvert 1 Discharge<br>(cfs) | Roadway Discharge<br>(cfs) | Iterations  |
|-----------------------------|-----------------------|------------------------------|----------------------------|-------------|
| 9925.00                     | 0.00                  | 0.00                         | 0.00                       | 1           |
| 9925.21                     | 0.17                  | 0.17                         | 0.00                       | 1           |
| 9925.31                     | 0.35                  | 0.35                         | 0.00                       | 1           |
| 9925.41                     | 0.52                  | 0.52                         | 0.00                       | 1           |
| 9925.52                     | 0.70                  | 0.70                         | 0.00                       | 1           |
| 9925.65                     | 0.88                  | 0.88                         | 0.00                       | 1           |
| 9925.94                     | 1.05                  | 1.05                         | 0.00                       | 1           |
| 9926.46                     | 1.22                  | 1.22                         | 0.00                       | 1           |
| 9927.04                     | 1.40                  | 1.40                         | 0.00                       | 1           |
| 9927.70                     | 1.58                  | 1.58                         | 0.00                       | 1           |
| 9928.43                     | 1.75                  | 1.75                         | 0.00                       | 1           |
| 9930.00                     | 2.08                  | 2.08                         | 0.00                       | Overtopping |

Rating Curve Plot for Crossing: Crossing

Total Rating Curve

Crossing: Crossing



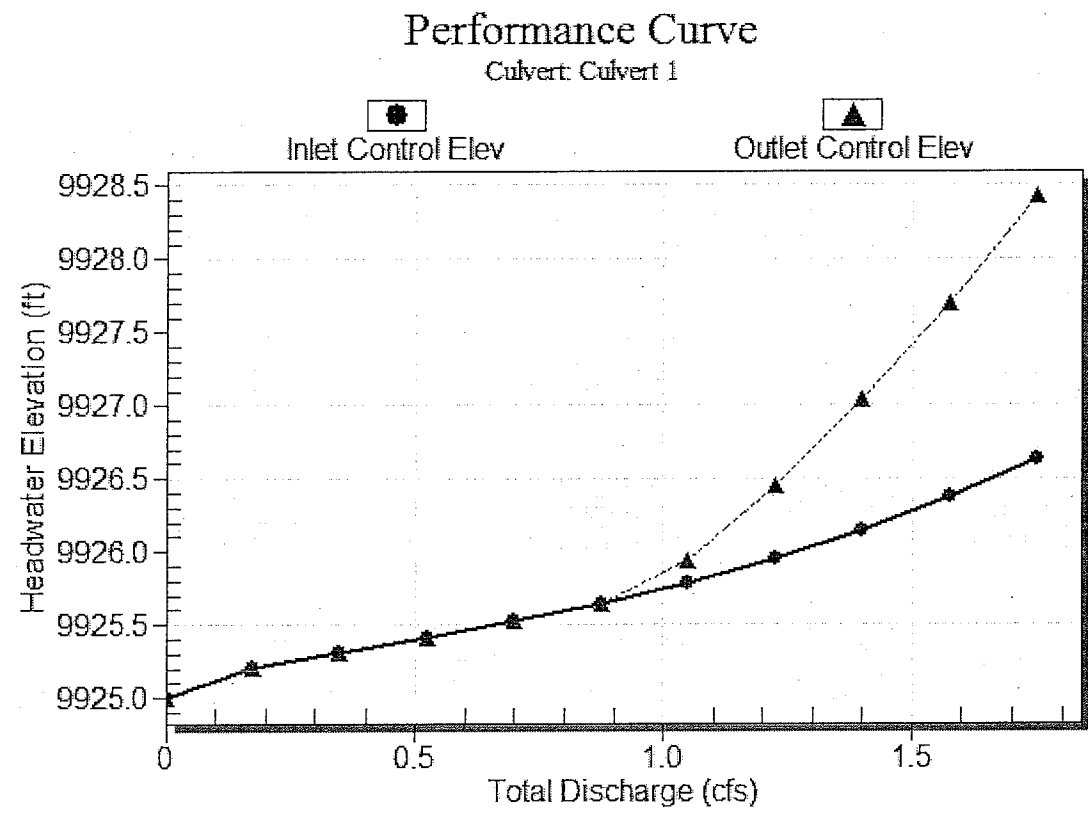
**Table 2 - Culvert Summary Table: Culvert 1**

| Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth (ft) | Outlet Control Depth (ft) | Flow Type | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|-----------------------|-------------------------|--------------------------|--------------------------|---------------------------|-----------|-------------------|---------------------|-------------------|----------------------|------------------------|---------------------------|
| 0.00                  | 0.00                    | 9925.00                  | 0.000                    | 0.000                     | 0-NF      | 0.000             | 0.000               | 0.000             | 0.000                | 0.000                  | 0.000                     |
| 0.17                  | 0.17                    | 9925.21                  | 0.212                    | 0.212                     | 1-S1f     | 0.089             | 0.190               | 0.190             | 0.323                | 2.118                  | 1.115                     |
| 0.35                  | 0.35                    | 9925.31                  | 0.307                    | 0.307                     | 1-S1f     | 0.132             | 0.274               | 0.274             | 0.419                | 2.586                  | 1.326                     |
| 0.52                  | 0.52                    | 9925.41                  | 0.407                    | 0.407                     | 1-S1f     | 0.160             | 0.339               | 0.339             | 0.488                | 2.937                  | 1.467                     |
| 0.70                  | 0.70                    | 9925.52                  | 0.522                    | 0.522                     | 5-S1f     | 0.186             | 0.394               | 0.394             | 0.544                | 3.252                  | 1.577                     |
| 0.88                  | 0.88                    | 9925.65                  | 0.646                    | 0.646                     | 5-S1f     | 0.210             | 0.441               | 0.441             | 0.592                | 3.543                  | 1.667                     |
| 1.05                  | 1.05                    | 9925.94                  | 0.787                    | 0.939                     | 4-FFf     | 0.230             | 0.484               | 0.670             | 0.633                | 2.978                  | 1.745                     |
| 1.22                  | 1.22                    | 9926.46                  | 0.952                    | 1.456                     | 4-FFf     | 0.251             | 0.522               | 0.670             | 0.671                | 3.475                  | 1.814                     |
| 1.40                  | 1.40                    | 9927.04                  | 1.146                    | 2.043                     | 4-FFf     | 0.271             | 0.553               | 0.670             | 0.706                | 3.971                  | 1.875                     |
| 1.58                  | 1.58                    | 9927.70                  | 1.372                    | 2.701                     | 4-FFf     | 0.289             | 0.580               | 0.670             | 0.737                | 4.467                  | 1.931                     |
| 1.75                  | 1.75                    | 9928.43                  | 1.631                    | 3.431                     | 4-FFf     | 0.306             | 0.606               | 0.670             | 0.767                | 4.964                  | 1.983                     |

\*\*\*\*\*  
 Inlet Elevation (invert): 9925.00 ft,    Outlet Elevation (invert): 9910.00 ft

Culvert Length: 42.72 ft,    Culvert Slope: 0.3750  
 \*\*\*\*\*

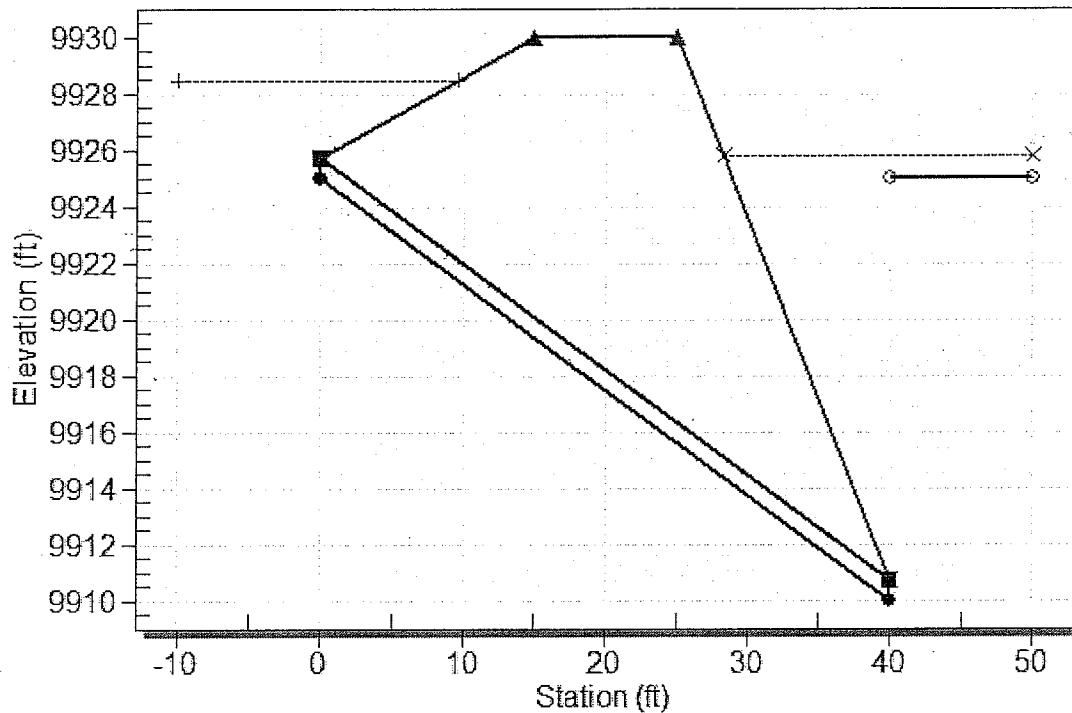
Culvert Performance Curve Plot: Culvert 1



### Water Surface Profile Plot for Culvert: Culvert 1

Crossing - Crossing, Design Discharge - 1.8 cfs

Culvert - Culvert 1, Culvert Discharge - 1.8 cfs



### Site Data - Culvert 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 9925.00 ft

Outlet Station: 40.00 ft

Outlet Elevation: 9910.00 ft

Number of Barrels: 1

### Culvert Data Summary - Culvert 1

Barrel Shape: Circular

Barrel Diameter: 0.67 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: NONE

**Table 3 - Downstream Channel Rating Curve (Crossing: Crossing)**

| Flow (cfs) | Water Surface Elev (ft) | Depth (ft) | Velocity (ft/s) | Shear (psf) | Froude Number |
|------------|-------------------------|------------|-----------------|-------------|---------------|
| 0.00       | 9925.00                 | 0.00       | 0.00            | 0.00        | 0.00          |
| 0.17       | 9925.32                 | 0.32       | 1.11            | 0.20        | 0.49          |
| 0.35       | 9925.42                 | 0.42       | 1.33            | 0.26        | 0.51          |
| 0.52       | 9925.49                 | 0.49       | 1.47            | 0.30        | 0.52          |
| 0.70       | 9925.54                 | 0.54       | 1.58            | 0.34        | 0.53          |
| 0.88       | 9925.59                 | 0.59       | 1.67            | 0.37        | 0.54          |
| 1.05       | 9925.63                 | 0.63       | 1.75            | 0.40        | 0.55          |
| 1.22       | 9925.67                 | 0.67       | 1.81            | 0.42        | 0.55          |
| 1.40       | 9925.71                 | 0.71       | 1.88            | 0.44        | 0.56          |
| 1.58       | 9925.74                 | 0.74       | 1.93            | 0.46        | 0.56          |
| 1.75       | 9925.77                 | 0.77       | 1.98            | 0.48        | 0.56          |

**Tailwater Channel Data - Crossing**

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 1.50 (1:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0350

Channel Invert Elevation: 9925.00 ft

**Roadway Data for Crossing: Crossing**

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 40.00 ft

Crest Elevation: 9930.00 ft

Roadway Surface: Gravel

Roadway Top Width: 10.00 ft

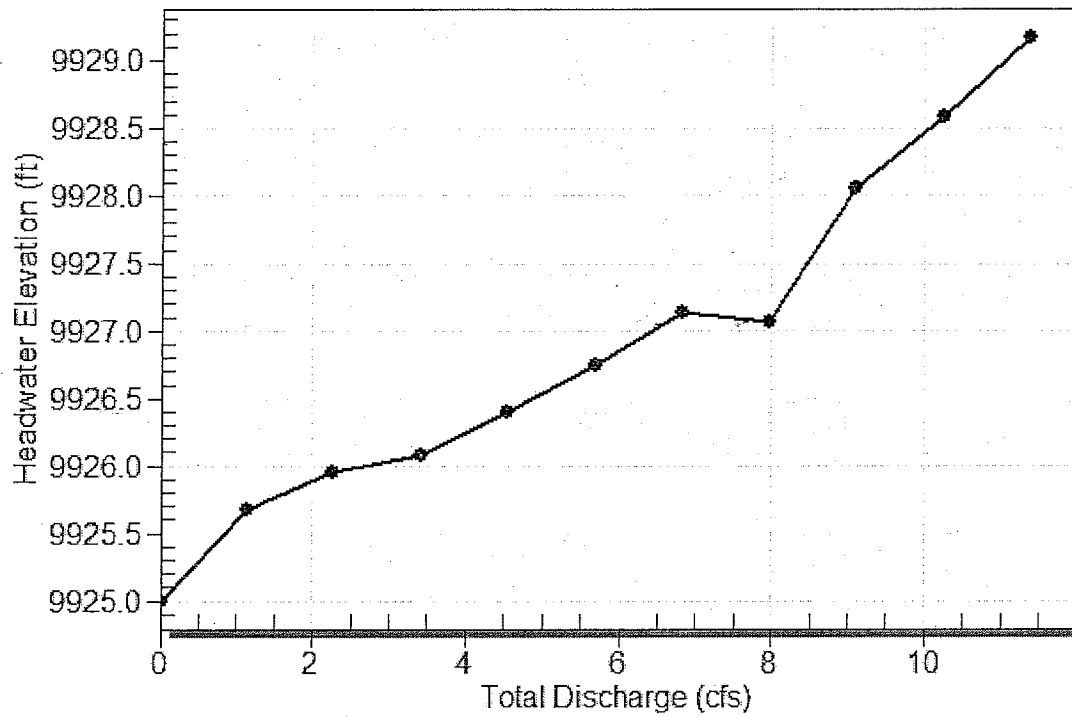
**Table 4 - Summary of Culvert Flows at Crossing: Crossing 2**

| Headwater Elevation<br>(ft) | Total Discharge (cfs) | Culvert 2 Discharge<br>(cfs) | Roadway Discharge<br>(cfs) | Iterations  |
|-----------------------------|-----------------------|------------------------------|----------------------------|-------------|
| 9925.00                     | 0.00                  | 0.00                         | 0.00                       | 1           |
| 9925.67                     | 1.14                  | 1.14                         | 0.00                       | 1           |
| 9925.95                     | 2.28                  | 2.28                         | 0.00                       | 1           |
| 9926.07                     | 3.41                  | 3.41                         | 0.00                       | 1           |
| 9926.39                     | 4.55                  | 4.55                         | 0.00                       | 1           |
| 9926.75                     | 5.69                  | 5.69                         | 0.00                       | 1           |
| 9927.14                     | 6.83                  | 6.83                         | 0.00                       | 1           |
| 9927.07                     | 7.97                  | 7.97                         | 0.00                       | 1           |
| 9928.05                     | 9.10                  | 9.10                         | 0.00                       | 1           |
| 9928.59                     | 10.24                 | 10.24                        | 0.00                       | 1           |
| 9929.17                     | 11.38                 | 11.38                        | 0.00                       | 1           |
| 9930.00                     | 12.83                 | 12.83                        | 0.00                       | Overtopping |

Rating Curve Plot for Crossing: Crossing 2

Total Rating Curve

Crossing: Crossing 2



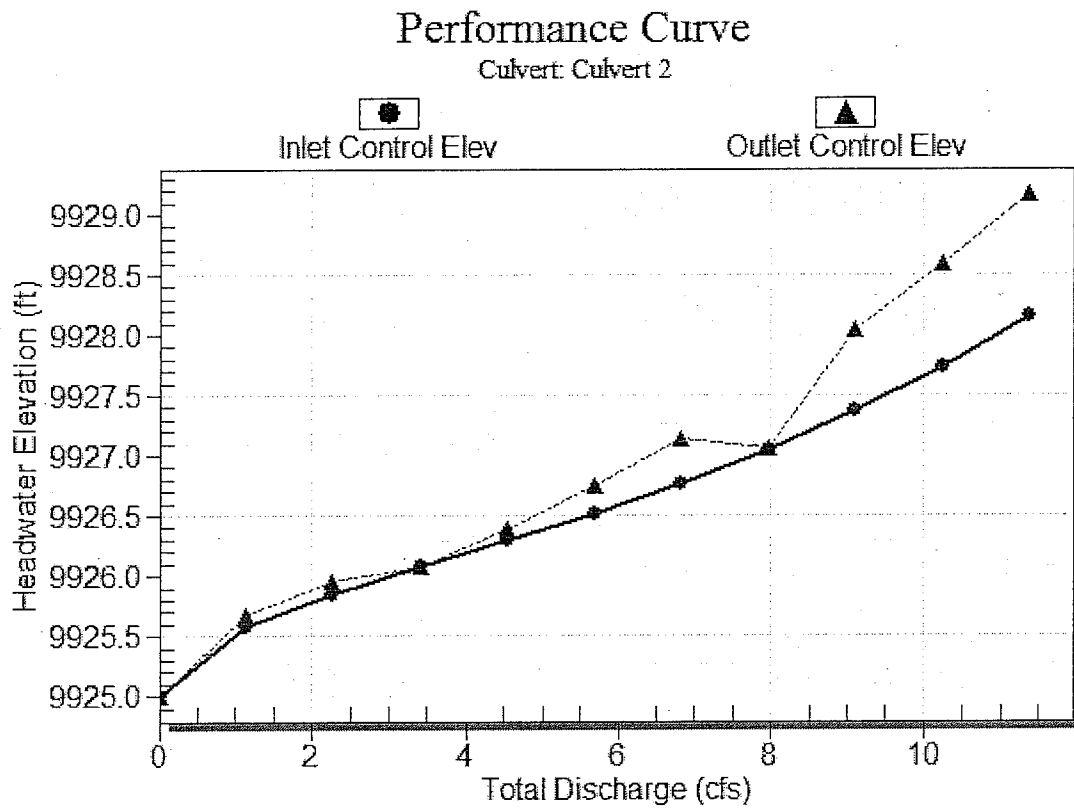
**Table 5 - Culvert Summary Table: Culvert 2**

| Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth (ft) | Outlet Control Depth (ft) | Flow Type | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|-----------------------|-------------------------|--------------------------|--------------------------|---------------------------|-----------|-------------------|---------------------|-------------------|----------------------|------------------------|---------------------------|
| 0.00                  | 0.00                    | 9925.00                  | 0.000                    | 0.000                     | 0-NF      | 0.000             | 0.000               | 0.000             | 0.000                | 0.000                  | 0.000                     |
| 1.14                  | 1.14                    | 9925.67                  | 0.576                    | 0.671                     | 1-S1f     | 0.354             | 0.392               | 1.500             | 0.573                | 0.644                  | 2.309                     |
| 2.28                  | 2.28                    | 9925.95                  | 0.841                    | 0.955                     | 1-S1f     | 0.510             | 0.567               | 1.500             | 0.743                | 1.288                  | 2.746                     |
| 3.41                  | 3.41                    | 9926.07                  | 1.073                    | 1.073                     | 1-S1f     | 0.638             | 0.701               | 0.701             | 0.865                | 4.209                  | 3.039                     |
| 4.55                  | 4.55                    | 9926.39                  | 1.294                    | 1.394                     | 1-S1f     | 0.754             | 0.816               | 1.500             | 0.964                | 2.576                  | 3.265                     |
| 5.69                  | 5.69                    | 9926.75                  | 1.521                    | 1.752                     | 4-FFf     | 0.865             | 0.919               | 1.500             | 1.048                | 3.220                  | 3.453                     |
| 6.83                  | 6.83                    | 9927.14                  | 1.769                    | 2.135                     | 4-FFf     | 0.978             | 1.009               | 1.500             | 1.122                | 3.864                  | 3.614                     |
| 7.97                  | 7.97                    | 9927.07                  | 2.049                    | 2.066                     | 3-M1f     | 1.100             | 1.090               | 1.500             | 1.189                | 4.508                  | 3.756                     |
| 9.10                  | 9.10                    | 9928.05                  | 2.370                    | 3.052                     | 4-FFf     | 1.255             | 1.164               | 1.500             | 1.250                | 5.152                  | 3.883                     |
| 10.24                 | 10.24                   | 9928.59                  | 2.738                    | 3.587                     | 4-FFf     | 1.500             | 1.226               | 1.500             | 1.307                | 5.796                  | 3.999                     |
| 11.38                 | 11.38                   | 9929.17                  | 3.160                    | 4.174                     | 4-FFf     | 1.500             | 1.278               | 1.500             | 1.359                | 6.440                  | 4.106                     |

\*\*\*\*\*  
Inlet Elevation (invert): 9925.00 ft,    Outlet Elevation (invert): 9924.00 ft

Culvert Length: 40.01 ft,    Culvert Slope: 0.0250  
\*\*\*\*\*

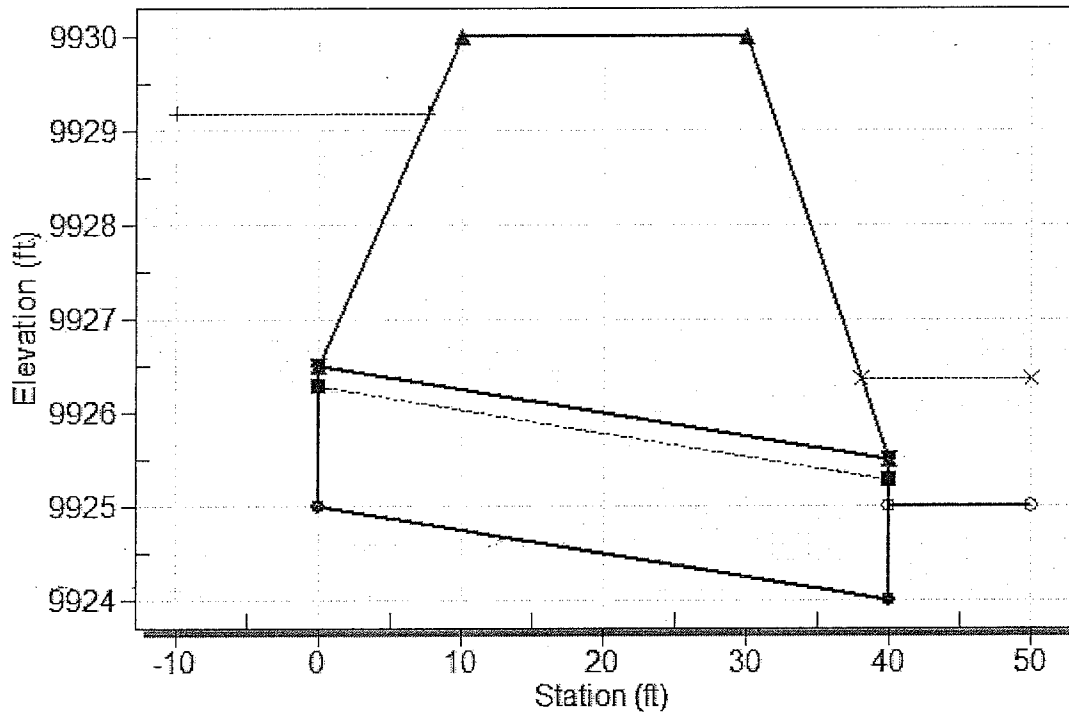
Culvert Performance Curve Plot: Culvert 2



## Water Surface Profile Plot for Culvert: Culvert 2

Crossing - Crossing 2, Design Discharge - 11.4 cfs

Culvert - Culvert 2, Culvert Discharge - 11.4 cfs



### Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 9925.00 ft

Outlet Station: 40.00 ft

Outlet Elevation: 9924.00 ft

Number of Barrels: 1

### Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: NONE

**Table 6 - Downstream Channel Rating Curve (Crossing: Crossing 2)**

| Flow (cfs) | Water Surface Elev (ft) | Depth (ft) | Velocity (ft/s) | Shear (psf) | Froude Number |
|------------|-------------------------|------------|-----------------|-------------|---------------|
| 0.00       | 9925.00                 | 0.00       | 0.00            | 0.00        | 0.00          |
| 1.14       | 9925.57                 | 0.57       | 2.31            | 0.72        | 0.76          |
| 2.28       | 9925.74                 | 0.74       | 2.75            | 0.93        | 0.79          |
| 3.41       | 9925.87                 | 0.87       | 3.04            | 1.08        | 0.81          |
| 4.55       | 9925.96                 | 0.96       | 3.27            | 1.20        | 0.83          |
| 5.69       | 9926.05                 | 1.05       | 3.45            | 1.31        | 0.84          |
| 6.83       | 9926.12                 | 1.12       | 3.61            | 1.40        | 0.85          |
| 7.97       | 9926.19                 | 1.19       | 3.76            | 1.48        | 0.86          |
| 9.10       | 9926.25                 | 1.25       | 3.88            | 1.56        | 0.87          |
| 10.24      | 9926.31                 | 1.31       | 4.00            | 1.63        | 0.87          |
| 11.38      | 9926.36                 | 1.36       | 4.11            | 1.70        | 0.88          |

**Tailwater Channel Data - Crossing 2**

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 1.50 (1:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 9925.00 ft

**Roadway Data for Crossing: Crossing 2**

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 40.00 ft

Crest Elevation: 9930.00 ft

Roadway Surface: Gravel

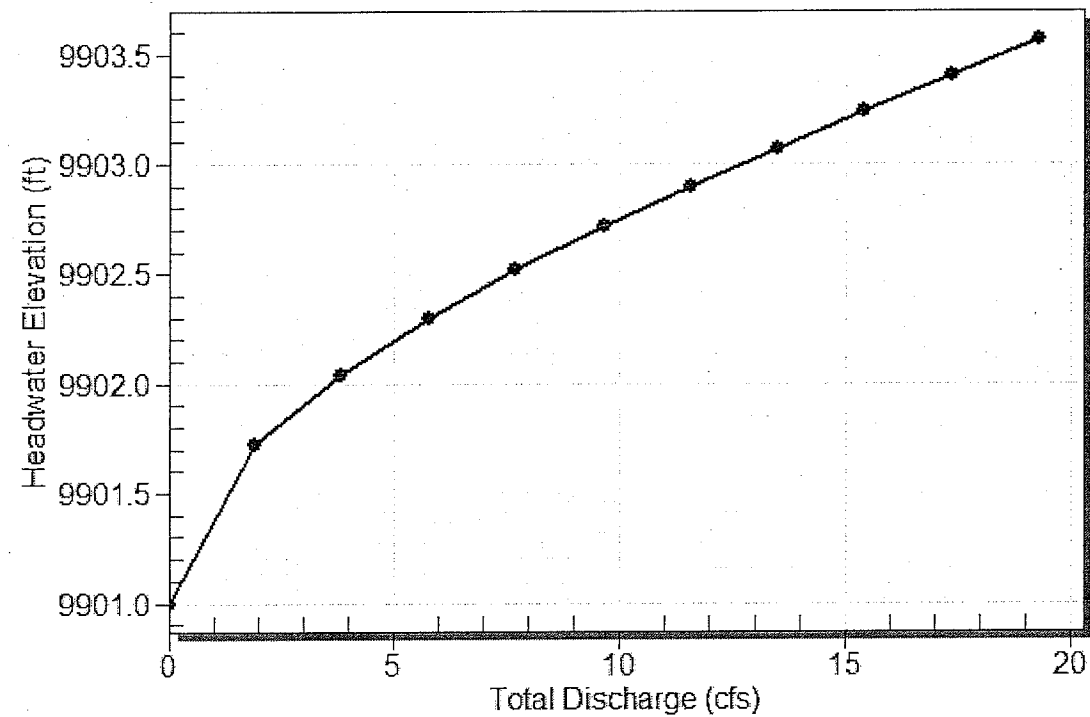
Roadway Top Width: 20.00 ft

**Table 7 - Summary of Culvert Flows at Crossing: Crossing 3**

| Headwater Elevation<br>(ft) | Total Discharge (cfs) | Culvert 3 Discharge<br>(cfs) | Roadway Discharge<br>(cfs) | Iterations  |
|-----------------------------|-----------------------|------------------------------|----------------------------|-------------|
| 9901.00                     | 0.00                  | 0.00                         | 0.00                       | 1           |
| 9901.73                     | 1.93                  | 1.93                         | 0.00                       | 1           |
| 9902.04                     | 3.86                  | 3.86                         | 0.00                       | 1           |
| 9902.30                     | 5.79                  | 5.79                         | 0.00                       | 1           |
| 9902.52                     | 7.72                  | 7.72                         | 0.00                       | 1           |
| 9902.71                     | 9.65                  | 9.65                         | 0.00                       | 1           |
| 9902.90                     | 11.58                 | 11.58                        | 0.00                       | 1           |
| 9903.07                     | 13.51                 | 13.51                        | 0.00                       | 1           |
| 9903.24                     | 15.44                 | 15.44                        | 0.00                       | 1           |
| 9903.41                     | 17.37                 | 17.37                        | 0.00                       | 1           |
| 9903.57                     | 19.30                 | 19.30                        | 0.00                       | 1           |
| 9906.00                     | 24.62                 | 24.62                        | 0.00                       | Overtopping |

Rating Curve Plot for Crossing: Crossing 3

Total Rating Curve  
Crossing: Crossing 3

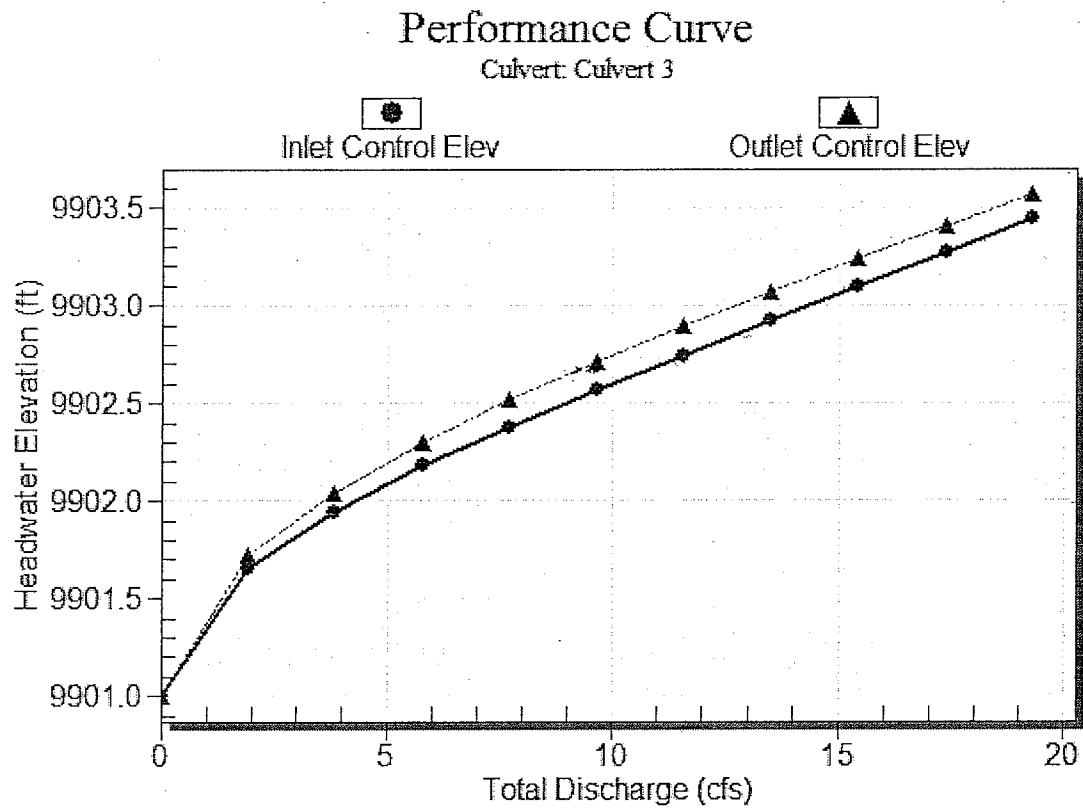


**Table 8 - Culvert Summary Table: Culvert 3**

| Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth (ft) | Outlet Control Depth (ft) | Flow Type | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|-----------------------|-------------------------|--------------------------|--------------------------|---------------------------|-----------|-------------------|---------------------|-------------------|----------------------|------------------------|---------------------------|
| 0.00                  | 0.00                    | 9901.00                  | 0.000                    | 0.000                     | 0-NF      | 0.000             | 0.000               | 0.000             | 0.000                | 0.000                  | 0.000                     |
| 1.93                  | 1.93                    | 9901.73                  | 0.657                    | 0.725                     | 3-M1f     | 0.497             | 0.441               | 2.500             | 0.699                | 0.393                  | 2.635                     |
| 3.86                  | 3.86                    | 9902.04                  | 0.946                    | 1.044                     | 3-M1f     | 0.698             | 0.634               | 2.500             | 0.906                | 0.786                  | 3.134                     |
| 5.79                  | 5.79                    | 9902.30                  | 1.180                    | 1.296                     | 3-M1f     | 0.864             | 0.791               | 2.500             | 1.055                | 1.180                  | 3.468                     |
| 7.72                  | 7.72                    | 9902.52                  | 1.376                    | 1.518                     | 3-M1f     | 1.015             | 0.916               | 2.500             | 1.175                | 1.573                  | 3.726                     |
| 9.65                  | 9.65                    | 9902.71                  | 1.565                    | 1.715                     | 3-M1f     | 1.148             | 1.034               | 2.500             | 1.278                | 1.966                  | 3.940                     |
| 11.58                 | 11.58                   | 9902.90                  | 1.746                    | 1.899                     | 3-M1f     | 1.279             | 1.134               | 2.500             | 1.368                | 2.359                  | 4.124                     |
| 13.51                 | 13.51                   | 9903.07                  | 1.921                    | 2.072                     | 3-M1f     | 1.405             | 1.235               | 2.500             | 1.450                | 2.752                  | 4.286                     |
| 15.44                 | 15.44                   | 9903.24                  | 2.095                    | 2.239                     | 3-M1f     | 1.533             | 1.321               | 2.500             | 1.524                | 3.145                  | 4.431                     |
| 17.37                 | 17.37                   | 9903.41                  | 2.270                    | 2.405                     | 3-M1f     | 1.664             | 1.405               | 2.500             | 1.593                | 3.539                  | 4.564                     |
| 19.30                 | 19.30                   | 9903.57                  | 2.449                    | 2.571                     | 3-M1f     | 1.803             | 1.489               | 2.500             | 1.657                | 3.932                  | 4.686                     |

\*\*\*\*\*  
 Inlet Elevation (invert): 9901.00 ft,    Outlet Elevation (invert): 9899.00 ft  
 Culvert Length: 200.01 ft,    Culvert Slope: 0.0100  
 \*\*\*\*\*

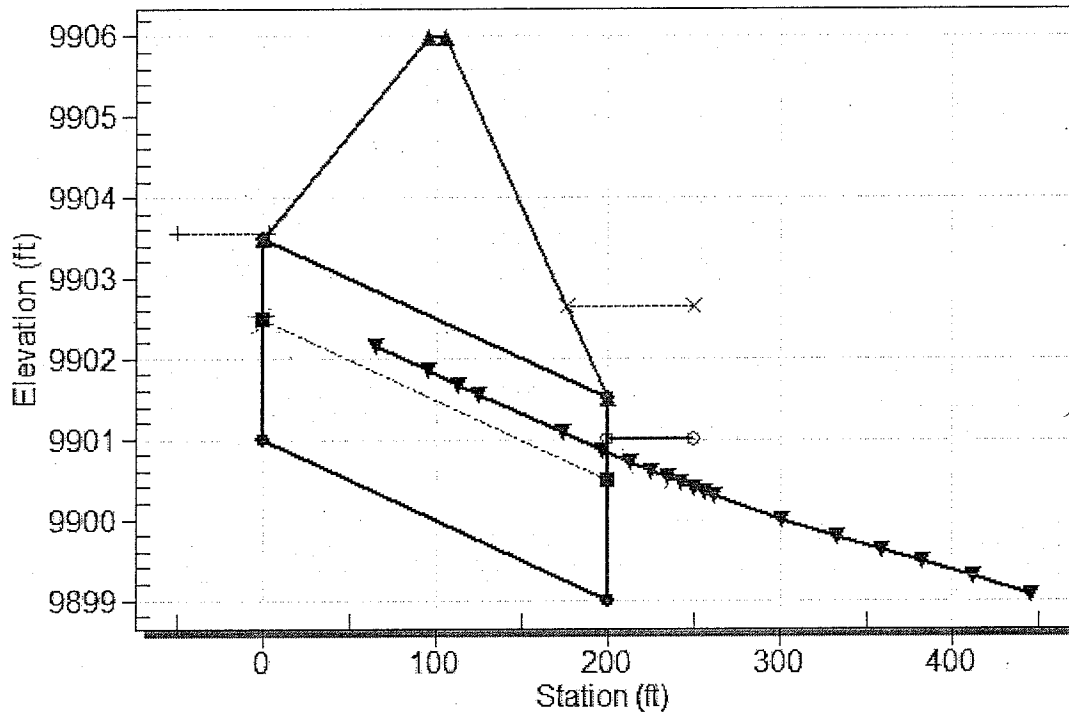
# Culvert Performance Curve Plot: Culvert 3



### Water Surface Profile Plot for Culvert: Culvert 3

Crossing - Crossing 3, Design Discharge - 19.3 cfs

Culvert - Culvert 3, Culvert Discharge - 19.3 cfs



### Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 9901.00 ft

Outlet Station: 200.00 ft

Outlet Elevation: 9899.00 ft

Number of Barrels: 1

### Culvert Data Summary - Culvert 3

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Corrugated PE

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: NONE

**Table 9 - Downstream Channel Rating Curve (Crossing: Crossing 3)**

| Flow (cfs) | Water Surface Elev (ft) | Depth (ft) | Velocity (ft/s) | Shear (psf) | Froude Number |
|------------|-------------------------|------------|-----------------|-------------|---------------|
| 0.00       | 9901.00                 | 0.00       | 0.00            | 0.00        | 0.00          |
| 1.93       | 9901.70                 | 0.70       | 2.63            | 0.87        | 0.79          |
| 3.86       | 9901.91                 | 0.91       | 3.13            | 1.13        | 0.82          |
| 5.79       | 9902.06                 | 1.06       | 3.47            | 1.32        | 0.84          |
| 7.72       | 9902.18                 | 1.18       | 3.73            | 1.47        | 0.86          |
| 9.65       | 9902.28                 | 1.28       | 3.94            | 1.59        | 0.87          |
| 11.58      | 9902.37                 | 1.37       | 4.12            | 1.71        | 0.88          |
| 13.51      | 9902.45                 | 1.45       | 4.29            | 1.81        | 0.89          |
| 15.44      | 9902.52                 | 1.52       | 4.43            | 1.90        | 0.89          |
| 17.37      | 9902.59                 | 1.59       | 4.56            | 1.99        | 0.90          |
| 19.30      | 9902.66                 | 1.66       | 4.69            | 2.07        | 0.91          |

**Tailwater Channel Data - Crossing 3**

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 1.50 (1:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0350

Channel Invert Elevation: 9901.00 ft

**Roadway Data for Crossing: Crossing 3**

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 15.00 ft

Crest Elevation: 9906.00 ft

Roadway Surface: Gravel

Roadway Top Width: 10.00 ft

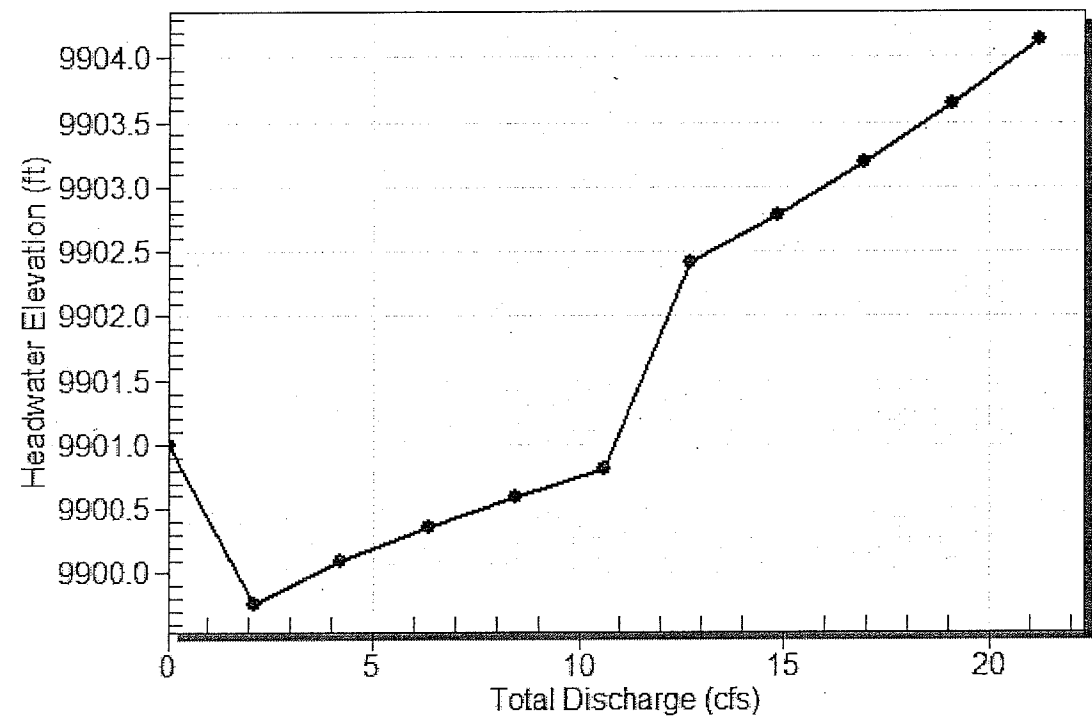
**Table 10 - Summary of Culvert Flows at Crossing: Crossing 4**

| Headwater Elevation<br>(ft) | Total Discharge (cfs) | Culvert 4 Discharge<br>(cfs) | Roadway Discharge<br>(cfs) | Iterations  |
|-----------------------------|-----------------------|------------------------------|----------------------------|-------------|
| 9901.00                     | 0.00                  | 0.00                         | 0.00                       | 1           |
| 9899.77                     | 2.12                  | 2.12                         | 0.00                       | 1           |
| 9900.10                     | 4.24                  | 4.24                         | 0.00                       | 1           |
| 9900.36                     | 6.37                  | 6.37                         | 0.00                       | 1           |
| 9900.60                     | 8.49                  | 8.49                         | 0.00                       | 1           |
| 9900.81                     | 10.61                 | 10.61                        | 0.00                       | 1           |
| 9902.41                     | 12.73                 | 12.73                        | 0.00                       | 1           |
| 9902.78                     | 14.85                 | 14.85                        | 0.00                       | 1           |
| 9903.19                     | 16.98                 | 16.98                        | 0.00                       | 1           |
| 9903.64                     | 19.10                 | 19.10                        | 0.00                       | 1           |
| 9904.14                     | 21.22                 | 21.22                        | 0.00                       | 1           |
| 9906.00                     | 27.83                 | 27.83                        | 0.00                       | Overtopping |

Rating Curve Plot for Crossing: Crossing 4

Total Rating Curve

Crossing: Crossing 4



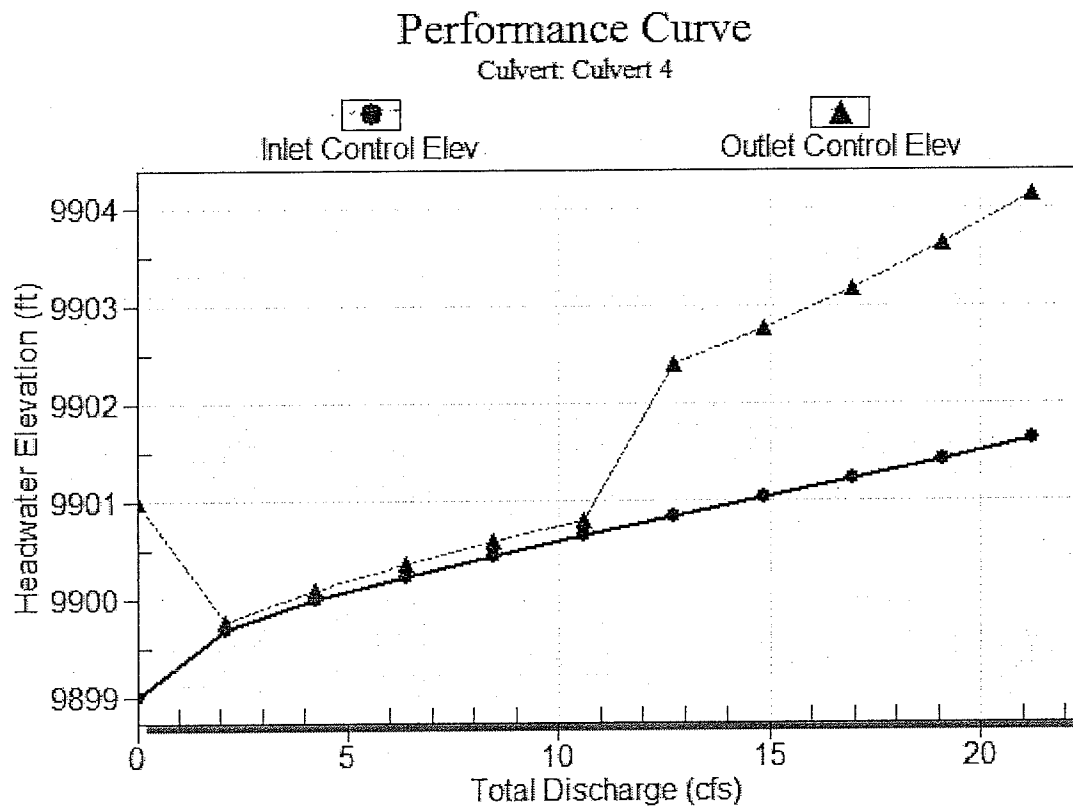
**Table 11 - Culvert Summary Table: Culvert 4**

| Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth (ft) | Outlet Control Depth (ft) | Flow Type | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|-----------------------|-------------------------|--------------------------|--------------------------|---------------------------|-----------|-------------------|---------------------|-------------------|----------------------|------------------------|---------------------------|
| 0.00                  | 0.00                    | 9901.00                  | 0.000                    | 2.000                     | 0-NF      | 0.000             | 0.000               | 0.000             | 0.000                | 0.000                  | 0.000                     |
| 2.12                  | 2.12                    | 9899.77                  | 0.691                    | 0.766                     | 3-M1f     | 0.518             | 0.468               | 2.500             | 0.182                | 0.432                  | 1.939                     |
| 4.24                  | 4.24                    | 9900.10                  | 0.994                    | 1.099                     | 3-M1f     | 0.738             | 0.668               | 2.500             | 0.280                | 0.865                  | 2.528                     |
| 6.37                  | 6.37                    | 9900.36                  | 1.236                    | 1.364                     | 3-M1f     | 0.910             | 0.828               | 2.500             | 0.360                | 1.297                  | 2.945                     |
| 8.49                  | 8.49                    | 9900.60                  | 1.452                    | 1.597                     | 3-M1f     | 1.068             | 0.966               | 2.500             | 0.432                | 1.729                  | 3.276                     |
| 10.61                 | 10.61                   | 9900.81                  | 1.656                    | 1.807                     | 3-M1f     | 1.214             | 1.084               | 2.500             | 0.497                | 2.161                  | 3.555                     |
| 12.73                 | 12.73                   | 9902.41                  | 1.851                    | 3.410                     | 4-FFf     | 1.355             | 1.194               | 2.500             | 0.559                | 2.594                  | 3.797                     |
| 14.85                 | 14.85                   | 9902.78                  | 2.042                    | 3.776                     | 4-FFf     | 1.493             | 1.296               | 2.500             | 0.617                | 3.026                  | 4.013                     |
| 16.98                 | 16.98                   | 9903.19                  | 2.234                    | 4.186                     | 4-FFf     | 1.637             | 1.388               | 2.500             | 0.672                | 3.458                  | 4.207                     |
| 19.10                 | 19.10                   | 9903.64                  | 2.430                    | 4.642                     | 4-FFf     | 1.787             | 1.480               | 2.500             | 0.726                | 3.891                  | 4.385                     |
| 21.22                 | 21.22                   | 9904.14                  | 2.633                    | 5.143                     | 4-FFf     | 1.957             | 1.561               | 2.500             | 0.777                | 4.323                  | 4.549                     |

\*\*\*\*\*  
 Inlet Elevation (invert): 9899.00 ft,    Outlet Elevation (invert): 9897.00 ft

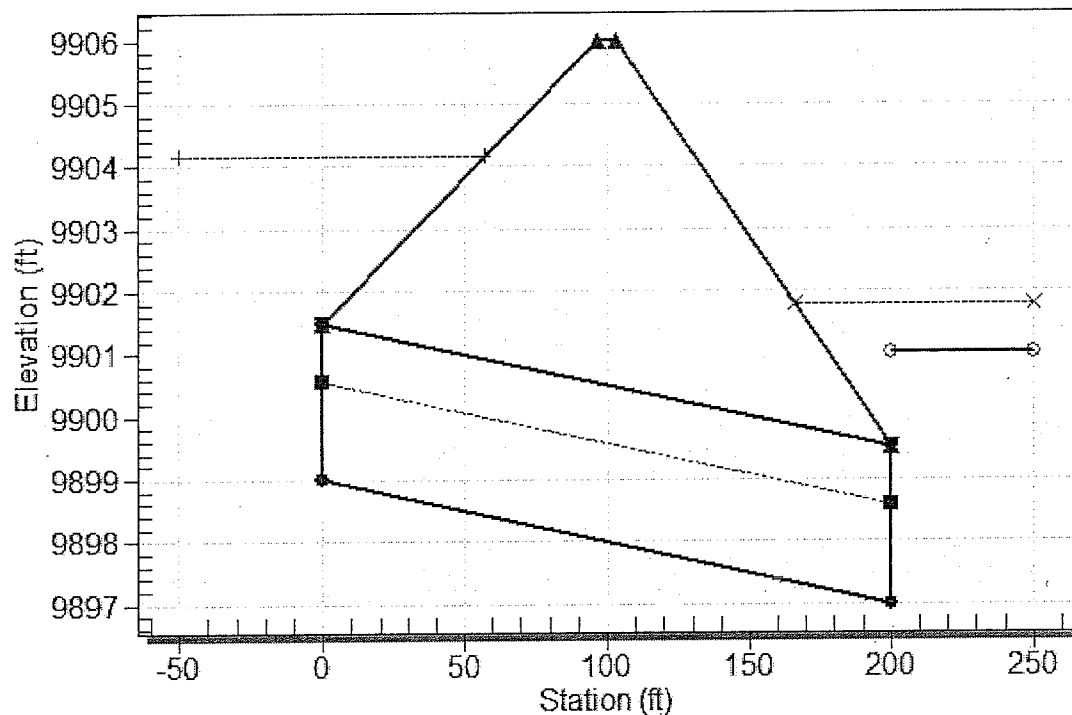
Culvert Length: 200.01 ft,    Culvert Slope: 0.0100  
 \*\*\*\*\*

# Culvert Performance Curve Plot: Culvert 4



### Water Surface Profile Plot for Culvert: Culvert 4

Crossing - Crossing 4, Design Discharge - 21.2 cfs  
Culvert - Culvert 4, Culvert Discharge - 21.2 cfs



### Site Data - Culvert 4

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 9899.00 ft

Outlet Station: 200.00 ft

Outlet Elevation: 9897.00 ft.

Number of Barrels: 1

### Culvert Data Summary - Culvert 4

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Corrugated PE

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: NONE

**Table 12 - Downstream Channel Rating Curve (Crossing: Crossing 4)**

| Flow (cfs) | Water Surface Elev (ft) | Depth (ft) | Velocity (ft/s) | Shear (psf) | Froude Number |
|------------|-------------------------|------------|-----------------|-------------|---------------|
| 0.00       | 9901.00                 | 0.00       | 0.00            | 0.00        | 0.00          |
| 2.12       | 9901.18                 | 0.18       | 1.94            | 0.23        | 0.80          |
| 4.24       | 9901.28                 | 0.28       | 2.53            | 0.35        | 0.84          |
| 6.37       | 9901.36                 | 0.36       | 2.94            | 0.45        | 0.86          |
| 8.49       | 9901.43                 | 0.43       | 3.28            | 0.54        | 0.88          |
| 10.61      | 9901.50                 | 0.50       | 3.55            | 0.62        | 0.89          |
| 12.73      | 9901.56                 | 0.56       | 3.80            | 0.70        | 0.90          |
| 14.85      | 9901.62                 | 0.62       | 4.01            | 0.77        | 0.90          |
| 16.98      | 9901.67                 | 0.67       | 4.21            | 0.84        | 0.90          |
| 19.10      | 9901.73                 | 0.73       | 4.39            | 0.91        | 0.91          |
| 21.22      | 9901.78                 | 0.78       | 4.55            | 0.97        | 0.91          |

**Tailwater Channel Data - Crossing 4**

Tailwater Channel Option: Rectangular Channel

Bottom Width: 6.00 ft

Channel Slope: 0.0200

Channel Manning's n: 0.0335

Channel Invert Elevation: 9901.00 ft

**Roadway Data for Crossing: Crossing 4**

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 6.00 ft

Crest Elevation: 9906.00 ft

Roadway Surface: Gravel

Roadway Top Width: 6.00 ft

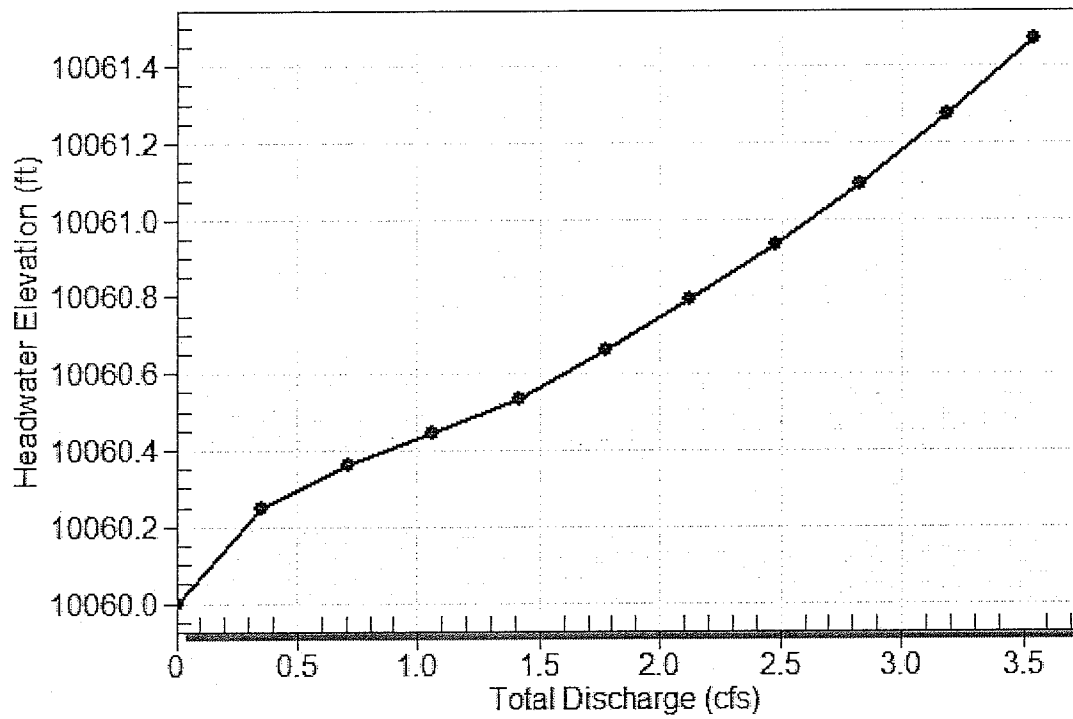
**Table 13 - Summary of Culvert Flows at Crossing: Crossing 5**

| Headwater Elevation<br>(ft) | Total Discharge (cfs) | Culvert 5 Discharge<br>(cfs) | Roadway Discharge<br>(cfs) | Iterations  |
|-----------------------------|-----------------------|------------------------------|----------------------------|-------------|
| 10060.00                    | 0.00                  | 0.00                         | 0.00                       | 1           |
| 10060.25                    | 0.35                  | 0.35                         | 0.00                       | 1           |
| 10060.36                    | 0.71                  | 0.71                         | 0.00                       | 1           |
| 10060.44                    | 1.06                  | 1.06                         | 0.00                       | 1           |
| 10060.53                    | 1.42                  | 1.42                         | 0.00                       | 1           |
| 10060.66                    | 1.77                  | 1.77                         | 0.00                       | 1           |
| 10060.79                    | 2.12                  | 2.12                         | 0.00                       | 1           |
| 10060.94                    | 2.48                  | 2.48                         | 0.00                       | 1           |
| 10061.09                    | 2.83                  | 2.83                         | 0.00                       | 1           |
| 10061.27                    | 3.19                  | 3.19                         | 0.00                       | 1           |
| 10061.47                    | 3.54                  | 3.54                         | 0.00                       | 1           |
| 10065.00                    | 4.91                  | 4.91                         | 0.00                       | Overtopping |

Rating Curve Plot for Crossing: Crossing 5

### Total Rating Curve

Crossing: Crossing 5



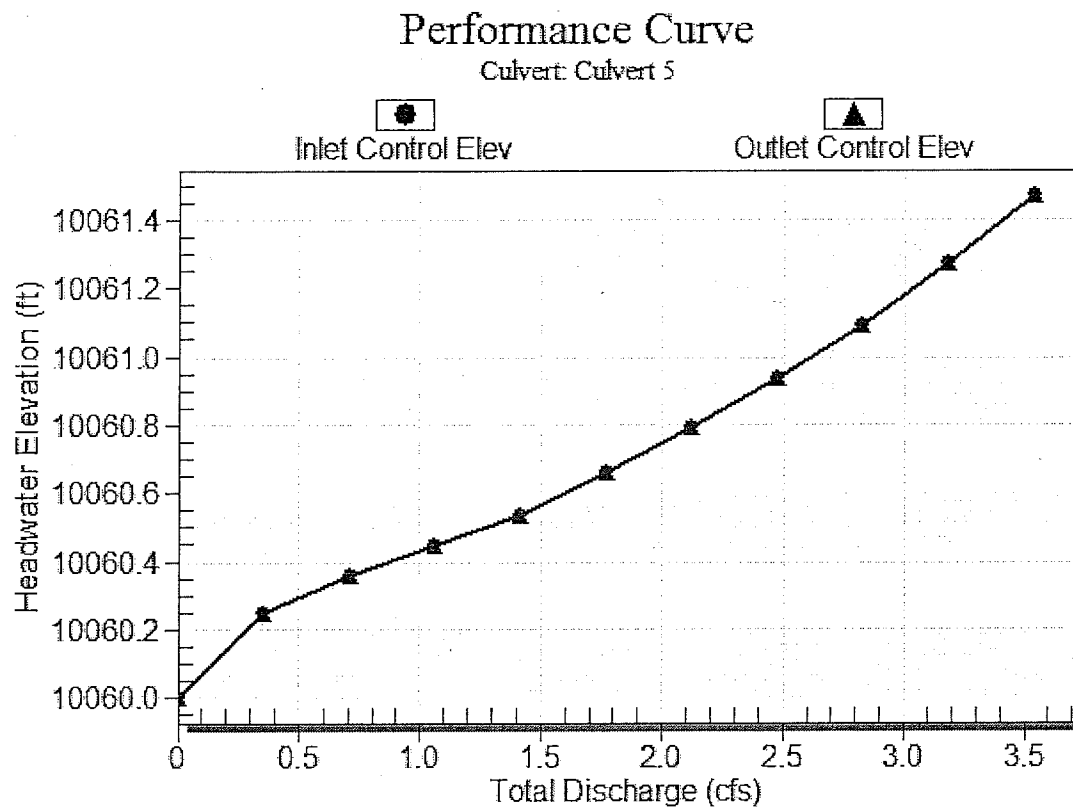
**Table 14 - Culvert Summary Table: Culvert 5**

| Total Discharge (cfs) | Culvert Discharge (cfs) | Headwater Elevation (ft) | Inlet Control Depth (ft) | Outlet Control Depth (ft) | Flow Type | Normal Depth (ft) | Critical Depth (ft) | Outlet Depth (ft) | Tailwater Depth (ft) | Outlet Velocity (ft/s) | Tailwater Velocity (ft/s) |
|-----------------------|-------------------------|--------------------------|--------------------------|---------------------------|-----------|-------------------|---------------------|-------------------|----------------------|------------------------|---------------------------|
| 0.00                  | 0.00                    | 10060.00                 | 0.000                    | 0.000                     | 0-NF      | 0.000             | 0.000               | 0.000             | 0.000                | 0.000                  | 0.000                     |
| 0.35                  | 0.35                    | 10060.25                 | 0.249                    | 0.249                     | 1-S1f     | 0.107             | 0.241               | 0.241             | 0.421                | 2.514                  | 1.330                     |
| 0.71                  | 0.71                    | 10060.36                 | 0.359                    | 0.359                     | 1-S1f     | 0.145             | 0.348               | 0.348             | 0.546                | 2.958                  | 1.581                     |
| 1.06                  | 1.06                    | 10060.44                 | 0.445                    | 0.445                     | 1-S1f     | 0.184             | 0.431               | 0.431             | 0.636                | 3.288                  | 1.750                     |
| 1.42                  | 1.42                    | 10060.53                 | 0.534                    | 0.534                     | 1-S1f     | 0.214             | 0.503               | 0.503             | 0.709                | 3.575                  | 1.880                     |
| 1.77                  | 1.77                    | 10060.66                 | 0.661                    | 0.661                     | 5-S1f     | 0.237             | 0.564               | 0.564             | 0.770                | 3.878                  | 1.988                     |
| 2.12                  | 2.12                    | 10060.79                 | 0.793                    | 0.793                     | 5-S1f     | 0.261             | 0.621               | 0.621             | 0.825                | 4.140                  | 2.081                     |
| 2.48                  | 2.48                    | 10060.94                 | 0.935                    | 0.935                     | 5-S1f     | 0.284             | 0.673               | 0.673             | 0.874                | 4.417                  | 2.163                     |
| 2.83                  | 2.83                    | 10061.09                 | 1.094                    | 1.094                     | 5-S1f     | 0.306             | 0.720               | 0.720             | 0.919                | 4.674                  | 2.236                     |
| 3.19                  | 3.19                    | 10061.27                 | 1.272                    | 1.272                     | 5-S1f     | 0.324             | 0.762               | 0.762             | 0.960                | 4.974                  | 2.303                     |
| 3.54                  | 3.54                    | 10061.47                 | 1.472                    | 1.472                     | 5-S1f     | 0.342             | 0.803               | 0.803             | 0.999                | 5.237                  | 2.365                     |

\*\*\*\*\*  
 Inlet Elevation (invert): 10060.00 ft,    Outlet Elevation (invert): 9906.00 ft

Culvert Length: 337.22 ft,    Culvert Slope: 0.5133  
 \*\*\*\*\*

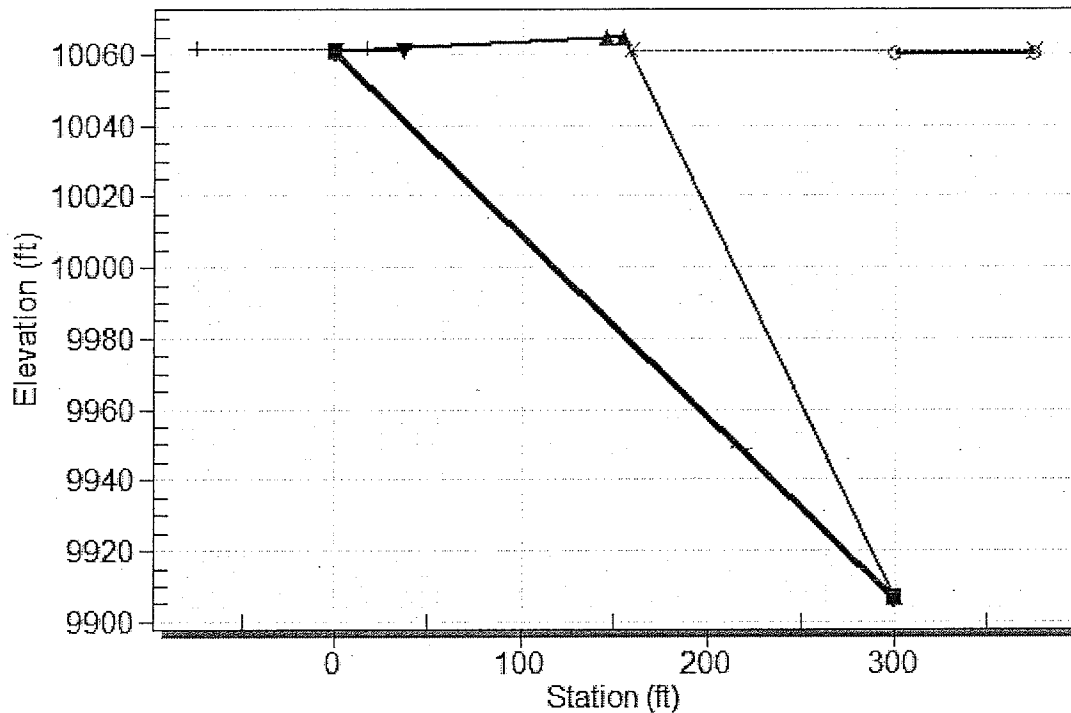
# Culvert Performance Curve Plot: Culvert 5



### Water Surface Profile Plot for Culvert: Culvert 5

Crossing - Crossing 5, Design Discharge - 3.5 cfs

Culvert - Culvert 5, Culvert Discharge - 3.5 cfs



### Site Data - Culvert 5

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 10060.00 ft

Outlet Station: 300.00 ft

Outlet Elevation: 9906.00 ft

Number of Barrels: 1

### Culvert Data Summary - Culvert 5

Barrel Shape: Circular

Barrel Diameter: 1.00 ft

Barrel Material: Corrugated PE

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Inlet Type: Conventional

Inlet Edge Condition: Thin Edge Projecting

Inlet Depression: NONE

**Table 15 - Downstream Channel Rating Curve (Crossing: Crossing 5)**

| Flow (cfs) | Water Surface Elev (ft) | Depth (ft) | Velocity (ft/s) | Shear (psf) | Froude Number |
|------------|-------------------------|------------|-----------------|-------------|---------------|
| 0.00       | 10060.00                | 0.00       | 0.00            | 0.00        | 0.00          |
| 0.35       | 10060.42                | 0.42       | 1.33            | 0.26        | 0.51          |
| 0.71       | 10060.55                | 0.55       | 1.58            | 0.34        | 0.53          |
| 1.06       | 10060.64                | 0.64       | 1.75            | 0.40        | 0.55          |
| 1.42       | 10060.71                | 0.71       | 1.88            | 0.44        | 0.56          |
| 1.77       | 10060.77                | 0.77       | 1.99            | 0.48        | 0.56          |
| 2.12       | 10060.82                | 0.82       | 2.08            | 0.51        | 0.57          |
| 2.48       | 10060.87                | 0.87       | 2.16            | 0.55        | 0.58          |
| 2.83       | 10060.92                | 0.92       | 2.24            | 0.57        | 0.58          |
| 3.19       | 10060.96                | 0.96       | 2.30            | 0.60        | 0.59          |
| 3.54       | 10061.00                | 1.00       | 2.36            | 0.62        | 0.59          |

**Tailwater Channel Data - Crossing 5**

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 1.50 (1:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0350

Channel Invert Elevation: 10060.00 ft

**Roadway Data for Crossing: Crossing 5**

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 ft

Crest Elevation: 10065.00 ft

Roadway Surface: Gravel

Roadway Top Width: 10.00 ft

|                                                                                   |         |      |          |              |
|-----------------------------------------------------------------------------------|---------|------|----------|--------------|
|  | PROJECT | CLAY | PROJ NO. | 11021        |
|                                                                                   |         |      | CALC NO. |              |
|                                                                                   | SUBJECT |      | BY       | DATE 8-21-12 |
|                                                                                   |         |      | CHK      | DATE         |
|                                                                                   |         |      | SHEET    | OF REV       |

Total Direct Runoff:

$$Q = \frac{(P - 0.25)^2}{P + 0.85}$$

$$P = 2.9 \quad (24 \text{ hr} - 25 \text{ yr Storm})$$

$$S = \frac{1000}{C_{\text{Overall}}} - 10 = \frac{1000}{80.1} - 10 = 2.484 \quad (24 \text{ hr} - 25 \text{ yr Storm})$$

(Claytonville From Spreadsheet)

$$Q = \frac{[2.9 - 0.2(2.484)]^2}{2.9 + 0.85(2.484)} = 1.18 \text{ in.}$$

Total Volume:

$$\text{Volume} = Q \cdot \text{Area Drainage} = \frac{1.18 \text{ in.}}{12} \cdot 1,064,585 \text{ ft}^2 = 104,824 \text{ ft}^3$$

$$= 104,824 \text{ ft}^3 \cdot \frac{7.48 \text{ gal}}{1 \text{ ft}^3} = 784,141 \text{ gal}$$

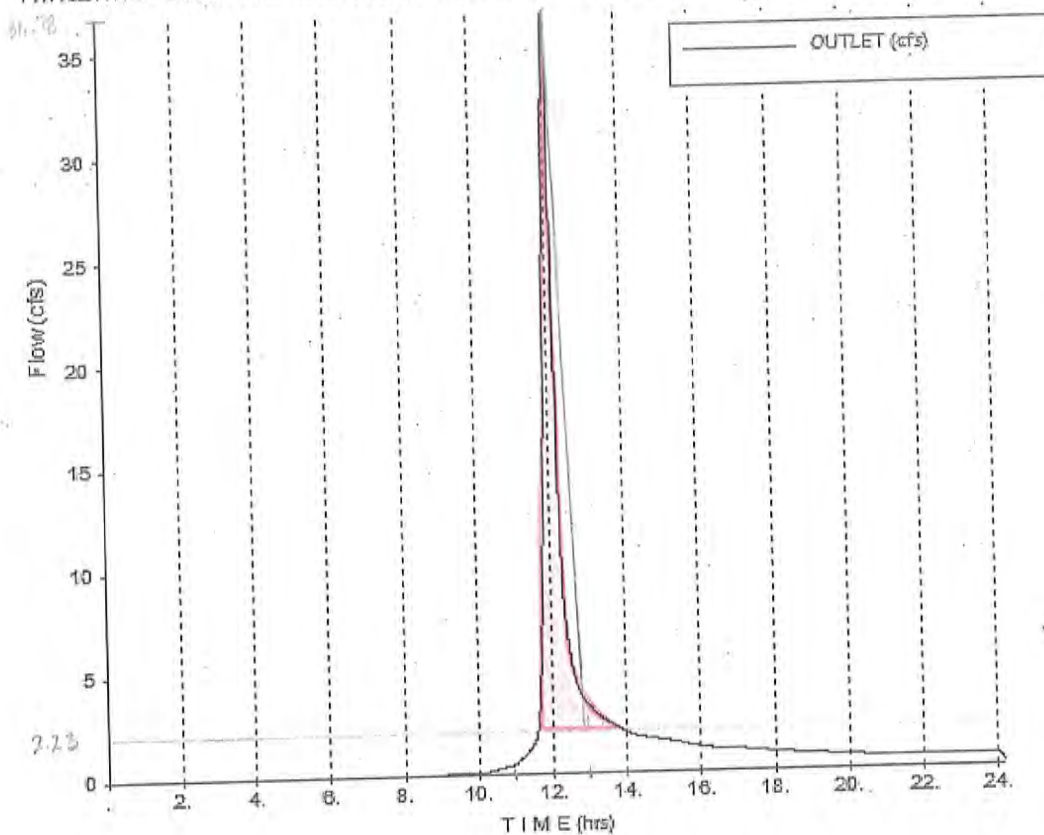
WinTR-55 Output Hydrograph

Project: CC&V Mill Area

3/21/2012

Subarea: (Outlet) Storm: 25-Yr

P:\11021\116 - Calculations\116.d - Arch\_Civil\_Struct\CV-003 Process Building Civil\CCV Mill Area Runoff.w55



Pump Outflow:

$$\frac{1000 \text{ gal}}{\text{min}} \cdot \frac{1 \text{ ft}^3}{7.48 \text{ gal}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = 2.23 \text{ cfs}$$

Storage Volume:

$$\frac{1}{2} (36.78 \text{ cfs} - 2.23 \text{ cfs}) (1.33 \text{ hr}) \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{60 \text{ sec}}{1 \text{ min}} = 82,713 \text{ ft}^3 = 618,700 \text{ gal}$$

Box Volume:

$$(9') (6') (15') = 810 \text{ ft}^3$$

$$\text{Retention Volume: } 82,713 \text{ ft}^3 + 810 \text{ ft}^3 = 81,903 \text{ ft}^3 \text{ so } 82,000 \text{ ft}^3$$

(612,635 gal)