# CONCEPT DRAINAGE REPORT
# DOWNTOWN BUSINESS IMPROVEMENT DISTRICT

*for*

## City of Colorado Springs

NOLTE and ASSOCIATES, Inc.
Engineers / Planners / Surveyors

# CONCEPT DRAINAGE REPORT
# DOWNTOWN BUSINESS
# IMPROVEMENT DISTRICT

*for*

**City of Colorado Springs**

**6 North Tejon Street**
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**Colorado Springs, Colorado 80903**

*by*

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# I. Introduction

Three criteria govern the design of drainage facilities for the Downtown Business Improvement District (BID).

The facilities must work with proposed street improvements.

The new street and drainage facilities must neither create drainage problems nor worsen existing drainage problems.

The new facilities must work with future drainage improvements.

This report is part of the Concept Design package for the Downtown Business Improvement District project. The report analyzes drainage characteristics of the basin tributary to the Central Business District and estimates the 5 and 100–year flows draining through the Central Business District (CBD). This report analyzes runoff in the CBD with, and without the proposed Boulder Street Storm Sewer.

## Summary of Assumptions and Findings

### Existing and proposed storm sewers

The existing storm sewers are too small to meet current design standards. However, flooding in the CBD is not a serious problem. The main reason is the east–west streets throughout the basin act as a relief valve to drain runoff to the east and away from the CBD.

The calculations show the proposed Boulder Street Storm Sewer is necessary to prevent flooding in the CBD.

### Drainage area

The predominate direction of flow is from north to south. East–west streets drain from west to east unless otherwise noted.

The center of Cascade Avenue forms the ridge line between the Fountain Creek and Shooks Run drainage basins. Runoff on Cascade Avenue typically drains east or west at the intersecting streets. Tejon Street and Nevada Avenue carry most of the basin runoff through or past the CBD. Runoff overtopping the crown of Tejon Street flows east to Nevada Avenue. Runoff overtopping the crown of Nevada Avenue flows east to Weber Street and eventually into Shooks Run.

The direction of excess flow (flow exceeding the storm sewer capacity) is largely dependent on the height of the crown of the east–west streets. Because of numerous pavement overlays, the relationship of the crown to the top of curb is not constant. The calculated street capacity at one location differs with the capacity upstream or downstream of the point of the calculation. This condition increases the difficulty of

determining the actual street capacity and pinpointing locations where the flow overtops the crown of the street. North–south flows do split at the east–west streets. The east gutter drains to the east at intersections. At the Tejon and Boulder and Tejon and Platte intersections, 40% of the west gutter drains to the east. This condition also occurs along Nevada where 25% of the gutter flow drains to the east at Platte and Bijou. We determined flow splits by a combination of surveys, site inspections and cross section analysis. Calculations contained in the Appendix include the results of the split determinations. The drawings contained in the map pockets also show the flow split information.

## Critical issues

GMS (Boulder Street Drainage Improvements, GMS Consulting Engineers, May 1995) determined the existing drainage system and streets north of Willamette Street intercept all tributary flow. Although no surveys were conducted in the upper basin, inspections of the area verified the GMS assumptions.

**The GMS Study assumed, "The runoff from the drainage areas lying north of this drainage basin would be intercepted by Cache LaPoudre, Dale and Willamette Streets." This is very important. East–west streets in the basin do intercept runoff in excess of storm sewer capacity and divert it to the east. Maintenance of the basin street/crown configuration is necessary for the GMS design to protect the CBD from the 100–year storm.**

Construction schedules are not set for the final section of the Boulder Street Storm Sewer. Therefore, calculations in this report include flows with, and without, the Boulder Street Storm Sewer. After construction of the Boulder Street system, local drainage becomes the only CBD drainage issue. The Wilson Study (Shooks Run Drainage Basin Planning Study, Wilson & Company, September 1993) depicts a slightly different upper basin boundary. However, it still shows Boulder Street as a Basin boundary.

The concept calculations indicate virtually all drainage facilities in the drainage basin are undersized. Drainage records, however, indicate only limited flood damage in the CBD. Still, the frequency of nuisance flooding is excessive for a high value commercial office district. Serious flooding does not occur in the CBD because of four conditions:

1. While the storm sewers are undersized, they do provide

partial relief to the area by removing some surface flow.

2. The east–west streets act as a safety valve. Runoff overtopping the crown of Tejon Street flows to Nevada Avenue. Runoff overtopping the crown of Nevada Avenue drains to Weber Street and eventually to Shooks Run. In the upper basin, crowns of the intersecting east–west streets divert runoff east and away from the CBD.

3. The major basin is long and narrow and drains from north to south. Storms travel across this basin rather than parallel to it. Both of these factors effectively increase the time-of-concentration and reduce the effective rainfall intensity. In turn, reduced rainfall intensity reduces peak runoff.

4. The eight-inch curb in the CBD adds significant runoff capacity to the streets.

# Proposed Plan

## Proposed improvements

Drainage improvements proposed for the project consist of inlet and lateral improvements only. The scope of this project does not include replacement of trunk storm sewers. The inlet and lateral designs include overflow provisions. Most of the storm sewer overflows drain to the east. The overflow then flows east to Nevada Avenue. The exception is at Platte Avenue. Because the east–west grade at the Tejon Street intersection is minimal, this overflow drains to the south. The overflow concept does increase the runoff in the east–west streets, but not enough to cause flooding. Most of the storm runoff concentrates on the west side of the north–south streets. The proposed plan does not include flow control devices on the inlets and laterals. The head on the existing storm sewer will limit the flow into the pipe. Flow in excess of pipe capacity will release through emergency overflow inlets. When the runoff exceeds the capacity of the inlets and laterals, the runoff will follow the historic patterns.

## Calculations

In the CBD, calculations list the total flow, flow not intercepted by storm sewers (bypass flow) and flow splits at each intersection. Calculations show runoff in the CBD with and without the Boulder Street Storm Sewer.

The Appendix includes the following calculations:

Rational Method calculations for the 5 and 100–year storms, with, and without the Boulder Street Storm Sewer.

"FlowMaster" calculations for 5 and 100–year street capacities with, and without the Boulder Street Storm

Sewer.

Rational Method hydrographs to graphically illustrate the impact of the Boulder Street Storm Sewer.

StormCAD calculations for the storm sewers.

## Level of protection

The proposed inlet and lateral connections for the CBD system accommodate the 5–year storm. Full, 5–year protection requires the installation of new, and larger, trunk storm sewers plus the Boulder Street Storm Sewer system. This project does not include the design of trunk storm sewers.

Construction of the proposed Boulder Street Storm Sewer is necessary to provide protection from upper basin runoff.

## Phasing of improvements

Construction of drainage facilities in the CBD will occur in three phases:

Phase I drainage improvements consist of the inlets and laterals constructed in conjunction with the BID project. Construction plans for the BID will include new inlets and laterals to replace the existing undersized inlets and laterals in the CBD. This phase is part of the scope of work proposed with the Downtown business improvement district.

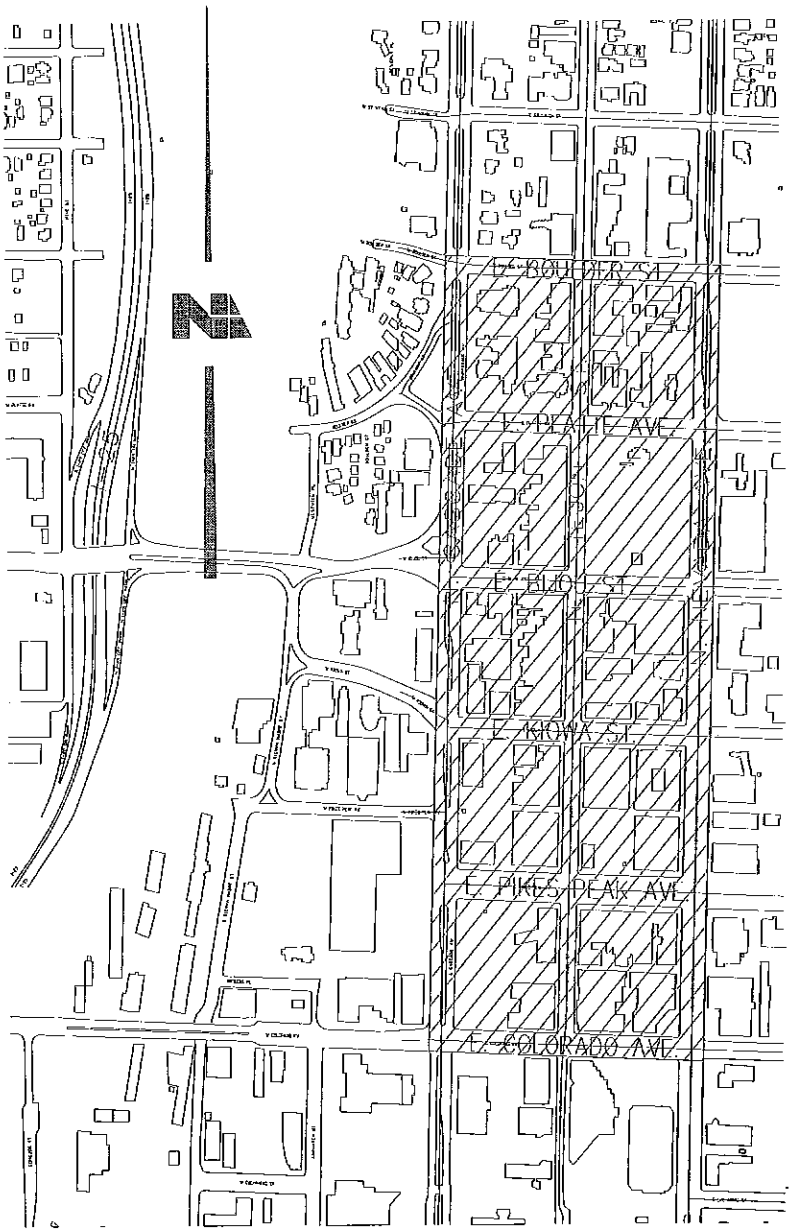
Phase II is the Boulder Street Storm Sewer System. This system is necessary to protect the CBD from storm runoff from the upper basin. This storm sewer intercepts runoff up to a 100–year storm from the upper basin and keeps it out of the CBD. GMS has completed this design.

Phase III includes the storm sewer main lines necessary to drain the 5–year storm runoff from the CBD. The Project involves the design and construction of a storm sewer system from Shooks Run to the CBD.

## Cost

The cost to reconstruct the CBD drainage system is beyond the scope of this project. The "Final Drainage Report" will include the detailed design of lateral and inlet improvements that work with both planned BID improvements and future major drainage systems. The Final Drainage Report will include a detailed cost estimate.

# Vicinity Map



# II. Location

**Major streets**

Cascade Avenue on the west, Nevada Avenue on the east, Boulder Street on the north and Colorado Avenue on the south form the perimeter of the BID.

**Existing drainage facilities**

Extensive drainage facilities exist in the CBD and the basin. The existing drainage facilities in do not meet current standards. Most of the pipes and laterals are undersized. Many of the inlets are old curb opening and grated designs that lack the capacity of the Colorado Springs D–10–R inlets.

**Area development and other considerations**

The drainage basins above Boulder Street are a mixture of residential and commercial development. The GMS study assumed a "$C_{100}$" factor of 0.80 for all basins. Many residential sites in the upper basin consist of large homes with minimal setbacks and limited open space. Most of the commercial/office sites also have very limited open space areas. Considering observations of the area, the GMS assumption for the upper basin is correct. ("C" factors in residential areas generally range from 0.45 to 0.65). The Nolte studies use a "C" factor of 0.65 for the 5–year storm and 0.81 the 100–year storm in the upper basin.

In "Storm Drainage Analysis for Pikes Peak Avenue," CH2M/Hill assumed a $C_5$ of 0.90 and $C_{100}$ of 0.95. These factors are correct for determining storm sewer sizes, but in this particular case, not correct for determining street flows. In the CBD, many roof drains connect directly to the storm sewer system. Therefore, roof–top runoff does not add to the runoff in the streets. Additionally, most roof–tops provide some limited ponding. Lastly, observations of alleys and small parking areas indicate these areas do not drain freely and pond significant amounts of water. Because of the roof drain condition, the assumption of a slightly lower "C" factor for calculating street flows in the CBD appears reasonable. Roofs draining directly into to storm sewers do not add to the flow in the streets. The alley drains do add directly to the flow in the storm sewers. ("C" factors in commercial areas generally range from 0.85 to 0.95.) These calculations reflect a "$C_5$" of 0.80 and a "$C_{100}$" of 0.88 in an attempt to approximate poorly draining alleys and parking lots plus roof–top detention.

This report did not consider the open space areas at the Colorado College campus and at Acacia Park.. This assumption

increases the safety factor by a small amount because of the additional pervious area at the campus and park.

This report does not recommend the construction of new inlets at the alleys. Although substantial runoff may drain from the alleys onto the streets, there is either no, or very limited capacity in the storm sewers. It is necessary to reserve storm sewer capacity for the intersections where pedestrians need to access cross walks.

# III. Drainage Basin and Sub–Basins

## Overall Basin Description

**Major drainageway studies**

The "Boulder Street Drainage Improvements" by GMS, Inc., Consultants, provided information regarding flows tributary to the downtown area. The "Shooks Run Drainage Basin Planning Study" by Wilson & Company provided information about the entire basin.

**Basin characteristics**

The basin drains in a south, south–easterly direction. The predominate grade is to the south. East–west streets typically drain to the east.

Based on field measurement, east–west street grades range from 0.5% to 0.8%. North–south street grades range from 0.8% to 1.0%. Lawn slopes in appear to be 0.5% to 1.0%.

Soil in the area is a sandy loam. Because of the limited open space in the basin, soil type has little impact on the runoff quantity.

In the CBD, little pervious surfacing exists. Acacia Park is the only significant open space area in the CBD. The runoff factors applied to Acacia Park do not recognize it as open space as a small added safety factor.

## Sub–Basin Descriptions

**Basin configuration**

The CBD drainage basin begins at the northwest corner of Cascade Avenue and Boulder Street. Very little runoff enters the CBD at this location. The crown of Cascade Avenue shifts to the east such that runoff in excess of gutter capacity flows to the west. Throughout the rest of the CBD, the crown of Cascade Avenue keeps the flow on the east side of the street in the CBD.

Approximately one–half the Boulder Street runoff enters the CBD at the intersection of Boulder and Tejon Streets. According to the GMS report, the 10 and 100–year flows are about 63 and 95 CFS respectively. The estimated flow split is 40% to the east and 60% to the south. The flow splits again at Tejon Street and Platte Avenue. Sixty percent of the flow

continues to flow south on the west side of the street and 40% of the runoff flows to the east. South of Platte Avenue, flows in Tejon Street remain in Tejon Street. However, the east curb line of Tejon does drain to the east at intersecting streets.

The upper basin flow at Boulder Street and Nevada Avenue is 54 CFS for the 10–year storm and 83 CFS for the 100–year storm. This flow splits at Platte Avenue and again at Bijou Street. The estimated split at each intersection is 25% of the flow to the east and 75% of the flow to the south.

## Business Improvement District

The Business Improvement District (BID) consists of Basins T–1 through T–23 west of the center of Tejon Street. Basins N–1 through N–23 are east of the center of Tejon Street. The old CBD storm sewer system has inlets on nearly every corner. However, the inlets and pipes are too small to properly drain the area.

Each block drains in a southeasterly direction with the low point at the southeast corner of the block. Except for the Acacia Park block and the blocks between Boulder and Platte, all the blocks have storm drains in the alleys. The alley drains have no impart on these calculations. Even if all the alley drains were constructed with adequately sized pipe, the storm sewers in the east–west streets are still too small allow the alley drains to flow freely in all but the most minor of storms. These calculations ignore the alley storm sewers. The calculations do assume the alley basins contribute to peak block flows by overland flow. Final design of the CBD storm sewer system should treat the alley basins as pipe flow.

## Downstream outfall

The project area is part of the Shooks Run drainage basin. Shooks Run drains from the north to south until it is south of the CBD. Then it turns west to Fountain Creek.

Storm sewers drain from west to east until they discharge into Shooks Run. East –west streets intercept and divert flow from the north–south streets.

# IV. Design Criteria

## Regulations

### Colorado Springs

The Drainage Criteria Manual (DCM) approved by the city of Colorado Springs and El Paso County is the source of design criteria used for this project.

### Basin planning study

The GMS study, "Drainage Basin Review for Boulder Street Drainage Improvements" provided information regarding flows and drainage basins tributary to the CBD. Assumptions regarding basin conditions agree with the information presented in the GMS report. The Shooks Run Report by Wilson and Company was also reviewed for consistency with the GMS Study and the Nolte findings.

## Hydrologic Criteria

### Rainfall source

Runoff calculations utilize Colorado Springs rainfall data. The appendix contains the rainfall nomograph used for the calculations. Rainfall curves represent the equation:

$$I = \frac{28.5 * I_{60}}{(10 + T_c)^{.786}}$$

Where:

I = the minute rainfall intensity,

$I_{60}$ = the 60–minute rainfall intensity, and

$T_c$ = the Time of concentration.

# V. Facility Design

## General Concept

### Design

The Concept Drainage Report follows several simplifying assumptions:

North–south streets were assumed to have a grade of 0.9%

East–west streets were assumed to have a grade of 0.5%

All storm sewers operate at capacity during most rainfall events.

Except where splits are shown, flow in excess of storm sewer capacity stays in the north–south streets.

The CBD has a "C" factor of 0.80 for the 5–year storm and 0.88 for the 100–year storm. Calculations for the upper (northern) portions of the basins reflect "C" factors of 0.65 and 0.81 for the 5 and 100–year storms respectively.

### Offsite considerations

Existing storm sewers at Dale Street and Boulder Street intercept part of the upper basin runoff. The upper basin storm sewers are too small to provide and only remove about 7 CFS from the runoff tributary to the CBD. Until new storm sewers provide additional capacity, runoff from upper areas of the basin will continue to drain into the CBD. This project will not alter drainage conditions in the area of construction. The proposed Boulder Street Storm Sewer eliminates concerns regarding upper basin runoff.

### Tables, nomographs, charts, etc.

The appendix includes charts copied from the DCM. The appendix also includes references for material not copied from the DCM.

### Proposed drainage patterns

Except at Platte Avenue, the storm sewer relief drains east along the east–west streets. When the runoff exceeds the inlet/lateral capacity, overflow follows the historic pattern.

# Specific Details

## Issues and solutions

The drainage system serving the CBD is unique. Systems serving the entire basin are undersized for even minor runoff events. However, serous flooding does not appear to be a significant problem.

The estimated storm sewer capacity in the basin is less than the 2–year storm. Some storm sewers in the CBD are closer to the desired size, but they are still too small. Most inlets and laterals in the CBD also appear to be too small and and/or poorly located. Based on the pipe size alone, it would be reasonable to assume serious flooding of the CBD would be a regular event.

The east–west streets act as a safety valve for the north–south streets and prevent serious flooding in the CBD. Except for isolated sumps, the east–west streets intercept north–south overflow and divert it to the east. During major storms, when runoff exceeds the crown of either Tejon or Nevada, it flows to the east towards Shooks Run. This condition prevents destructive flooding along both Tejon Street and Nevada Street.

Even though, serious flooding does not occur, the drainage system in the CBD is so inadequate that pedestrian movement in the CBD is difficult during runoff events. The crown of the north–south streets and the intersecting east–west streets functions almost like a weir. The weir overflows, but it also keeps the streets flowing at capacity whenever the runoff exceeds the capacity of the storm sewers.

## Future

Completion of the Boulder Street Storm Sewer will do much to relieve the potential of flooding in the CBD. Calculations show runoff overtops the curb along Tejon and Nevada without the Boulder Street Storm Sewer. With the Boulder Street Storm Sewer, the calculations show serious flooding only along Nevada Street at the southern end of the CBD. Construction of the Boulder system at the earliest possible date should be a priority as this system will intercept nearly all storm runoff currently tributary to the CBD. The system prevents upper basin 100–year and smaller runoff from entering the CBD.

The Boulder Street will eliminate the risk of serious flooding in the CBD. Nuisance flooding can only be eliminated by the construction of an outfall system for the CBD. For purposes of this report, nuisance flooding is flooding to a depth that impedes pedestrian traffic.

# VI. Conclusions

## Compliance with Standards

**Criteria**

All facilities to be designed for this project must meet the requirements of the City of Colorado Springs. The final design will specify pipe and inlet sizes for a 5–year runoff event. The design and construction of trunk sewers is beyond the Scope of Work unauthorized by the CBD. This project does not provide designs for the outfall systems necessary to provide total drainage protection necessary in the CBD. The existing pipe sizes are too small to provide protection beyond the 2–year event.

**Summary of plan**

The Concept Drainage Report establishes the criteria for the Final Drainage Report and facility designs for the Business Improvement District:

> The design of facilities must work with proposed street improvements.
>
> The design of the street and drainage facilities must neither create drainage problems nor worsen existing drainage problems.
>
> The facilities must work with future drainage improvements.
>
> **Maintenance of the upper basin street/crown configuration is essential.**

**Additional**

Not including runoff intercepted by the proposed Boulder Street Storm Sewer, the existing drainage improvements in the CBD may provide protection from a 2–year storm. During 5–year and greater storms, runoff flowing south over Boulder Street will increase flooding in the CBD. Completion of the Boulder Street Storm Sewer should be a priority for the City of Colorado Springs and the BID. Serious flooding in the CBD is not a frequent problem because the east–west streets divert a portion of upper basin and CBD runoff to the east. This diversion prevents a serious accumulation of major runoff along Tejon Street and Nevada Avenue.. The Boulder Street Storm Sewer is necessary to eliminate upper basin runoff from the CBD.

# APPENDIX

"C" Factors

Colorado Springs Rainfall Curves

**Rational Calculations With the Boulder Street Storm Sewer**

Time of Concentration With Boulder Street Storm Sewer

Tejon 5–Year

Tejon 100–Year

Nevada 5–Year

Nevada 100–Year

**Rational Calculations Without the Boulder Street Storm Sewer**

Time of Concentration Without Boulder Street Storm Sewer

Tejon 5–Year

Tejon 100–Year

Nevada 5–Year

Nevada 100–Year

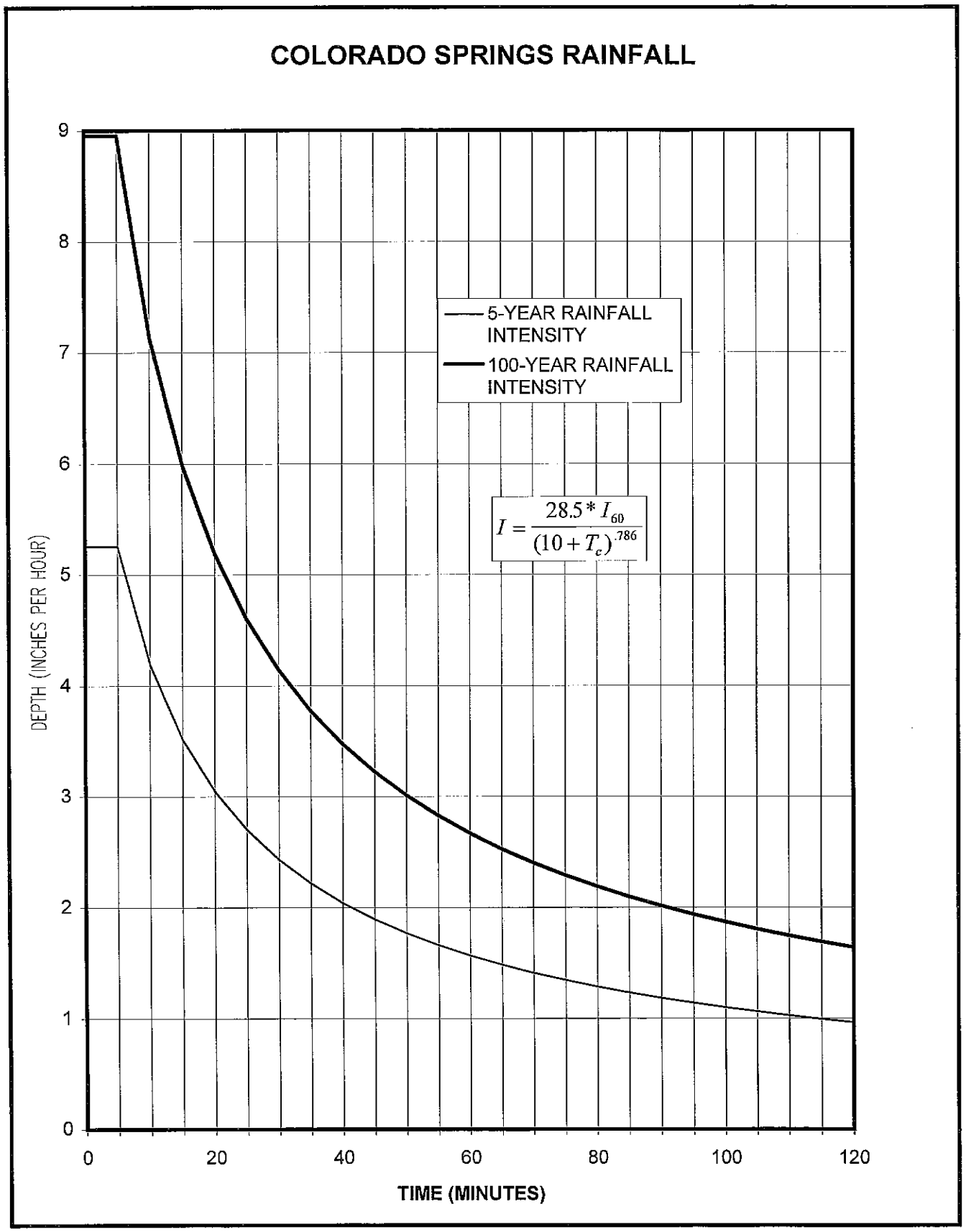
Storm Hydrographs

Street Capacity with and without the Boulder Street Storm Sewer

Storm Sewer Calculations

| Recommended Runoff Coefficients and Percent Impervious | | | | | | |
|---|---|---|---|---|---|---|
| LAND USE OR SURFACE CHARACTERISTICS | PERCENT IMPERVIOUS | | 2 | 5 | 10 | 100 |
| BUSINESS: | | | | | | |
| COMMERCIAL AREAS | 95 | | 0.87 | 0.87 | 0.88 | 0.89 |
| NEIGHBORHOOD AREAS | 70 | | 0.60 | 0.65 | 0.70 | 0.80 |
| RESIDENTIAL | | | | | | |
| SINGLE FAMILY | * | | 0.40 | 0.45 | 0.50 | 0.60 |
| MULTI-UNIT (DETACHED) | 50 | | 0.45 | 0.50 | 0.60 | 0.70 |
| MULTI-UNIT (ATTACHED) | 70 | | 0.60 | 0.65 | 0.70 | 0.80 |
| 1/2 ACRE LOT OR LARGER | * | | 0.30 | 0.35 | 0.40 | 0.60 |
| APARTMENTS | 70 | | 0.65 | 0.70 | 0.70 | 0.80 |
| INDUSTRIAL | | | | | | |
| LIGHT AREAS | 80 | | 0.71 | 0.72 | 0.76 | 0.82 |
| HEAVY AREAS | 90 | | 0.80 | 0.80 | 0.85 | 0.90 |
| PARKS, Cemeteries | 7 | | 0.10 | 0.10 | 0.35 | 0.60 |
| PLAYGROUNDS | 13 | | 0.15 | 0.25 | 0.35 | 0.65 |
| SCHOOLS | 50 | | 0.45 | 0.50 | 0.60 | 0.70 |
| RAILROAD YARDS | 40 | | 0.40 | 0.45 | 0.50 | 0.60 |
| UNDEVELOPED AREAS | | | | | | |
| HISTORIC FLOW ANALYSIS | 2 | (SEE LAWNS) | | | | |
| GREENBELTS, AGRICULTURAL | 2 | (SEE LAWNS) | | | | |
| OFFSITE FLOW ANALYSIS (WHEN OFFSITE LAND USE IS UNDEFINED) | 40 | | 0.43 | 0.47 | 0.55 | 0.65 |
| STREETS | | | | | | |
| PAVED | 100 | | 0.87 | 0.88 | 0.90 | 0.93 |
| GRAVEL | 13 | | 0.15 | 0.25 | 0.35 | 0.65 |
| DRIVE AND WALKS | 96 | | 0.87 | 0.87 | 0.88 | 0.89 |
| ROOFS | 90 | | 0.80 | 0.85 | 0.90 | 0.90 |
| LAWNS SANDY SOIL | | | | 0.01 | 0.05 | 0.20 |
| LAWNS CLAYEY SOIL | | | 0.05 | 0.10 | 0.20 | 0.40 |

* SEE UDFCD. FIGURE 2.1 FOR PERCENT IMPERVIOUS


COLORADO SPRINGS RAINFALL
9
8
7
6
5
4
3
2
1
0
DEPTH (INCHES PER HOUR)
5-YEAR RAINFALL INTENSITY
100-YEAR RAINFALL INTENSITY
$I = \frac{28.5 * I_{60}}{(10 + T_c)^{.786}}$
0
20
40
60
80
100
120
TIME (MINUTES)

## 5-year Time of Concentration

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL LENGTH | INITIAL SLOPE | INITIAL VELOCITY (FPS) | INITIAL TIME OF CONCENTRATION | TRAVEL LENGTH STREET | STREET SLOPE | STREET VELOCITY | STREET TIME (Tt) | SUB-BASIN TIME OF CONCENTRATION | STREET CHANNEL LENGTH | STREET CHANNEL SLOPE | PIPE DIAMETER | STREET VELOCITY | STREET TIME BETWEEN BASINS | BASIN TIME OF CONCENTRATION | BASIN $T_c$ | BYPASS TOTAL $T_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Til | Tis | Tiv | Ti | Ttl | Tts | Ttv | Tt | Tc | | | | | ΔT | $T_b$ | | |
| T - 1 | 0.77 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| T - 2 | 5.47 | 0.80 | 50 | 1 | 0.2 | 4.0 | 950 | 0.7 | 2.5 | 6.3 | 10.3 | 500 | 0.5 | | 2.1 | 4.0 | 10.5 | 10.5 | 10.3 |
| T - 3 | 0.62 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | | | | | | 7.5 | | |
| T - 4 | 0.73 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| T - 5 | 1.47 | 0.80 | 50 | 1 | 0.2 | 4.0 | 380 | 0.5 | 2.1 | 3.0 | 7.0 | 160 | 0.5 | | 2.1 | 1.3 | 7.8 | | |
| T - 6 | 1.93 | 0.80 | 50 | 1 | 0.2 | 4.0 | 420 | 0.5 | 2.1 | 3.3 | 7.3 | 180 | 0.5 | | 2.1 | 1.4 | 9.3 | | |
| T - 7 | 1.74 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 160 | 0.5 | | 2.1 | 1.3 | 10.5 | 10.5 | 12.9 |
| T - 8 | 0.52 | 0.80 | 50 | 1 | 0.2 | 4.0 | 280 | 0.5 | 2.1 | 2.2 | 6.2 | | | | | | 6.2 | | |
| T - 9 | 0.31 | 0.80 | 50 | 1 | 0.2 | 4.0 | 130 | 0.5 | 2.1 | 1.0 | 5.0 | | | | | | 5.0 | | |
| T - 10 | 0.75 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| T - 11 | 1.19 | 0.80 | 50 | 1 | 0.2 | 4.0 | 350 | 0.5 | 2.1 | 2.8 | 6.7 | 180 | 0.5 | | 2.1 | 1.4 | 8.0 | | |
| T -12 | 1.48 | 0.80 | 50 | 1 | 0.2 | 4.0 | 350 | 0.5 | 2.1 | 2.8 | 6.7 | 150 | 0.5 | | 2.1 | 1.2 | 9.2 | | |
| T - 13 | 1.71 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 170 | 0.5 | | 2.1 | 1.3 | 10.5 | 10.5 | 15.5 |
| T - 14 | 0.33 | 0.80 | 50 | 1 | 0.2 | 4.0 | 150 | 0.5 | 2.1 | 1.2 | 5.2 | | | | | | 5.2 | | |
| T - 15 | 0.32 | 0.80 | 50 | 1 | 0.2 | 4.0 | 150 | 0.5 | 2.1 | 1.2 | 5.2 | | | | | | 5.2 | | |
| T - 16 | 0.74 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| T - 17 | 2.32 | 0.80 | 50 | 1 | 0.2 | 4.0 | 380 | 0.5 | 2.1 | 3.0 | 7.0 | | | | | | 7.0 | | |
| T - 18 | 1.03 | 0.80 | 50 | 1 | 0.2 | 4.0 | 100 | 0.5 | 2.1 | 0.8 | 4.8 | 320 | 0.5 | | 2.1 | 2.5 | 9.5 | | |
| T - 19 | 1.39 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 180 | 0.5 | | 2.1 | 1.4 | 11.0 | 11.0 | 18.1 |
| T - 20 | 0.78 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | | | | | | 7.5 | | |
| T - 21 | 0.73 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| T - 22 | 2.82 | 0.80 | 50 | 1 | 0.2 | 4.0 | 380 | 0.5 | 2.1 | 3.0 | 7.0 | 320 | 0.5 | | 2.1 | 2.5 | 9.1 | | |
| T - 23 | 1.77 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 180 | 0.5 | | 2.1 | 1.4 | 10.5 | 10.5 | 20.8 |

* Calculations assume the Boulder Street Storm Sewer has been installed. The calculations also assume the small East - West Storm Drains are full and peak flow calculations are controlled by street time and not pipe time.

## 100-year Time of Concentration

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL LENGTH | INITIAL SLOPE | INITIAL VELOCITY (FPS) | INITIAL TIME OF CONCENTRATION | TRAVEL LENGTH STREET | STREET SLOPE | STREET VELOCITY | STREET TIME (Tt) | SUB-BASIN TIME OF CONCENTRATION | STREET CHANNEL LENGTH | STREET CHANNEL SLOPE | PIPE DIAMETER | STREET VELOCITY | STREET TIME BETWEEN BASINS | BASIN TIME OF CONCENTRATION | BASIN $T_c$ | BYPASS TOTAL $T_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Til | Tis | Tiv | Ti | Ttl | Tts | Ttv | Tt | Tc | | | | | ΔT | $T_b$ | | |
| T - 1 | 0.77 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| T - 2 | 5.47 | 0.88 | 50 | 1 | 0.3 | 2.9 | 950 | 0.7 | 2.5 | 6.3 | 9.2 | 500 | 0.5 | | 2.1 | 4.0 | 9.5 | 9.5 | 9.2 |
| T - 3 | 0.62 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | | | | | | 6.5 | | |
| T - 4 | 0.73 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| T - 5 | 1.47 | 0.88 | 50 | 1 | 0.3 | 2.9 | 380 | 0.5 | 2.1 | 3.0 | 5.9 | 160 | 0.5 | | 2.1 | 1.3 | 6.8 | | |
| T - 6 | 1.93 | 0.88 | 50 | 1 | 0.3 | 2.9 | 420 | 0.5 | 2.1 | 3.3 | 6.2 | 180 | 0.5 | | 2.1 | 1.4 | 8.2 | | |
| T - 7 | 1.74 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 160 | 0.5 | | 2.1 | 1.3 | 9.5 | 9.5 | 11.9 |
| T - 8 | 0.52 | 0.88 | 50 | 1 | 0.3 | 2.9 | 280 | 0.5 | 2.1 | 2.2 | 5.1 | | | | | | 5.1 | | |
| T - 9 | 0.31 | 0.88 | 50 | 1 | 0.3 | 2.9 | 130 | 0.5 | 2.1 | 1.0 | 3.9 | | | | | | 3.9 | | |
| T - 10 | 0.75 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| T - 11 | 1.19 | 0.88 | 50 | 1 | 0.3 | 2.9 | 350 | 0.5 | 2.1 | 2.8 | 5.7 | 180 | 0.5 | | 2.1 | 1.4 | 7.0 | | |
| T -12 | 1.48 | 0.88 | 50 | 1 | 0.3 | 2.9 | 350 | 0.5 | 2.1 | 2.8 | 5.7 | 150 | 0.5 | | 2.1 | 1.2 | 8.1 | | |
| T - 13 | 1.71 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 170 | 0.5 | | 2.1 | 1.3 | 9.5 | 9.5 | 14.5 |
| T - 14 | 0.33 | 0.88 | 50 | 1 | 0.3 | 2.9 | 150 | 0.5 | 2.1 | 1.2 | 4.1 | | | | | | 4.1 | | |
| T - 15 | 0.32 | 0.88 | 50 | 1 | 0.3 | 2.9 | 150 | 0.5 | 2.1 | 1.2 | 4.1 | | | | | | 4.1 | | |
| T - 16 | 0.74 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| T - 17 | 2.32 | 0.88 | 50 | 1 | 0.3 | 2.9 | 380 | 0.5 | 2.1 | 3.0 | 5.9 | | | | | | 5.9 | | |
| T - 18 | 1.03 | 0.88 | 50 | 1 | 0.3 | 2.9 | 100 | 0.5 | 2.1 | 0.8 | 3.7 | 320 | 0.5 | | 2.1 | 2.5 | 8.5 | | |
| T - 19 | 1.39 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 180 | 0.5 | | 2.1 | 1.4 | 9.9 | 9.9 | 17.1 |
| T - 20 | 0.78 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | | | | | | 6.5 | | |
| T - 21 | 0.73 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| T - 22 | 2.82 | 0.88 | 50 | 1 | 0.3 | 2.9 | 380 | 0.5 | 2.1 | 3.0 | 5.9 | 320 | 0.5 | | 2.1 | 2.5 | 8.1 | | |
| T - 23 | 1.77 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 180 | 0.5 | | 2.1 | 1.4 | 9.5 | 9.5 | 19.7 |

* Calculations assume the Boulder Street Storm Sewer has been installed. The calculations also assume the small East - West Storm Drains are full and peak flow calculations are controlled by street time and not pipe time.

## 5-year Time of Concentration

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL LENGTH | INITIAL SLOPE | INITIAL VELOCITY (FPS) | INITIAL TIME OF CONCENTRATION | TRAVEL LENGTH STREET | STREET SLOPE | STREET VELOCITY | STREET TIME (Tt) | SUB-BASIN TIME OF CONCENTRATION | STREET CHANNEL LENGTH | STREET CHANNEL SLOPE | PIPE DIAMETER | STREET CHANNEL VELOCITY | STREET TIME BETWEEN BASINS | BASIN TIME OF CONCENTRATION | BASIN $T_c$ | BYPASS TOTAL $T_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Til | Tis | Tiv | Ti | Ttl | Tts | Ttv | Tt | Tc | | | | | ΔT | $T_b$ | | |
| N - 1 | 0.73 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | | | | | | 7.5 | | |
| N - 2 | 0.74 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| N - 3 | 4.71 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 500 | 0.5 | | 2.1 | 4.0 | 10.5 | 10.5 | 10.5 |
| N - 4 | 0.75 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | | | | | | 7.5 | | |
| N - 5 | 0.70 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| N - 6 | 4.72 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 500 | 0.5 | | 2.1 | 4.0 | 10.5 | 10.5 | 13.2 |
| N - 7 | 0.78 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | | | | | | 7.5 | | |
| N - 8 | 0.70 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| N - 9 | 2.41 | 0.80 | 50 | 1 | 0.2 | 4.0 | 430 | 0.5 | 2.1 | 3.4 | 7.4 | 100 | 0.5 | | 2.1 | 0.8 | 7.4 | | |
| N - 10 | 0.67 | 0.80 | 50 | 1 | 0.2 | 4.0 | 160 | 0.5 | 2.1 | 1.3 | 5.2 | 200 | 0.5 | | 2.1 | 1.6 | 9.0 | | |
| N - 11 | 1.35 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 200 | 0.5 | | 2.1 | 1.6 | 10.5 | 10.5 | 15.8 |
| N - 12 | 0.31 | 0.80 | 50 | 1 | 0.2 | 4.0 | 150 | 0.5 | 2.1 | 1.2 | 5.2 | | | | | | 5.2 | | |
| N - 13 | 0.32 | 0.80 | 50 | 1 | 0.2 | 4.0 | 150 | 0.5 | 2.1 | 1.2 | 5.2 | | | | | | 5.2 | | |
| N - 14 | 0.74 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| N - 15 | 2.21 | 0.80 | 50 | 1 | 0.2 | 4.0 | 350 | 0.5 | 2.1 | 2.8 | 6.7 | | | | | | 6.7 | | |
| N - 16 | 1.05 | 0.80 | 50 | 1 | 0.2 | 4.0 | 200 | 0.5 | 2.1 | 1.6 | 5.6 | 280 | 0.5 | | 2.1 | 2.2 | 9.0 | | |
| N - 17 | 1.54 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 220 | 0.5 | | 2.1 | 1.7 | 10.7 | 10.7 | 18.4 |
| N - 18 | 0.47 | 0.80 | 50 | 1 | 0.2 | 4.0 | 250 | 0.5 | 2.1 | 2.0 | 6.0 | | | | | | 6.0 | | |
| N - 19 | 0.33 | 0.80 | 50 | 1 | 0.2 | 4.0 | 180 | 0.5 | 2.1 | 1.4 | 5.4 | | | | | | 5.4 | | |
| N - 20 | 0.78 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| N - 21 | 2.70 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | 100 | 0.5 | | 2.1 | 0.8 | 7.4 | | |
| N - 22 | 0.58 | 0.80 | 50 | 1 | 0.2 | 4.0 | 150 | 0.5 | 2.1 | 1.2 | 5.2 | 200 | 0.5 | | 2.1 | 1.6 | 9.0 | | |
| N - 23 | 1.36 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 200 | 0.5 | | 2.1 | 1.6 | 10.5 | 10.5 | 21.0 |

* Calculations assume the Boulder Street Storm Sewer has been installed. The calculations also assume the small East - West Storm Drains are full and peak flow calculations are controlled by street time and not pipe time.

## 100-year Time of Concentration

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL LENGTH | INITIAL SLOPE | INITIAL VELOCITY (FPS) | INITIAL TIME OF CONCENTRATION | TRAVEL LENGTH STREET | STREET SLOPE | STREET VELOCITY | STREET TIME (TT) | SUB-BASIN TIME OF CONCENTRATION | STREET CHANNEL LENGTH | STREET CHANNEL SLOPE | PIPE DIAMETER | STREET CHANNEL VELOCITY | STREET TIME BETWEEN BASINS | BASIN TIME OF CONCENTRATION | BASIN $T_c$ | BYPASS TOTAL $T_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Til | Tis | Tiv | Ti | Ttl | Tts | Ttv | Tt | Tc | | | | | ΔT | ΣTc | | |
| N - 1 | 0.73 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | | | | | | 6.5 | | |
| N - 2 | 0.74 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| N - 3 | 4.71 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 500 | 0.5 | | 2.1 | 4.0 | 9.5 | 9.5 | 9.5 |
| N - 4 | 0.75 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | | | | | | 6.5 | | |
| N - 5 | 0.7 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| N - 6 | 4.72 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 500 | 0.5 | | 2.1 | 4.0 | 9.5 | 9.5 | 12.1 |
| N - 7 | 0.78 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | | | | | | 6.5 | | |
| N - 8 | 0.7 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| N - 9 | 2.41 | 0.88 | 50 | 1 | 0.3 | 2.9 | 430 | 0.5 | 2.1 | 3.4 | 6.3 | 100 | 0.5 | | 2.1 | 0.8 | 6.3 | | |
| N - 10 | 0.67 | 0.88 | 50 | 1 | 0.3 | 2.9 | 160 | 0.5 | 2.1 | 1.3 | 4.2 | 200 | 0.5 | | 2.1 | 1.6 | 7.9 | | |
| N - 11 | 1.35 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 200 | 0.5 | | 2.1 | 1.6 | 9.5 | 9.5 | 14.7 |
| N - 12 | 0.31 | 0.88 | 50 | 1 | 0.3 | 2.9 | 150 | 0.5 | 2.1 | 1.2 | 4.1 | | | | | | 4.1 | | |
| N - 13 | 0.32 | 0.88 | 50 | 1 | 0.3 | 2.9 | 150 | 0.5 | 2.1 | 1.2 | 4.1 | | | | | | 4.1 | | |
| N - 14 | 0.74 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| N - 15 | 2.21 | 0.88 | 50 | 1 | 0.3 | 2.9 | 350 | 0.5 | 2.1 | 2.8 | 5.7 | | | | | | 5.7 | | |
| N - 16 | 1.05 | 0.88 | 50 | 1 | 0.3 | 2.9 | 200 | 0.5 | 2.1 | 1.6 | 4.5 | 280 | 0.5 | | 2.1 | 2.2 | 7.9 | | |
| N - 17 | 1.54 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 220 | 0.5 | | 2.1 | 1.7 | 9.7 | 9.7 | 17.3 |
| N - 18 | 0.47 | 0.88 | 50 | 1 | 0.3 | 2.9 | 250 | 0.5 | 2.1 | 2.0 | 4.9 | | | | | | 4.9 | | |
| N - 19 | 0.33 | 0.88 | 50 | 1 | 0.3 | 2.9 | 180 | 0.5 | 2.1 | 1.4 | 4.3 | | | | | | 4.3 | | |
| N - 20 | 0.78 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| N - 21 | 2.70 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | 100 | 0.5 | | 2.1 | 0.8 | 6.3 | | |
| N - 22 | 0.58 | 0.88 | 50 | 1 | 0.3 | 2.9 | 150 | 0.5 | 2.1 | 1.2 | 4.1 | 200 | 0.5 | | 2.1 | 1.6 | 7.9 | | |
| N - 23 | 1.36 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 200 | 0.5 | | 2.1 | 1.6 | 9.5 | 9.5 | 19.9 |

* Calculations assume the Boulder Street Storm Sewer has been installed. The calculations also assume the small East - West Storm Drains are full and peak flow calculations are controlled by street time and not pipe time.

TEJON RATIONAL METHOD

## 5-YEAR RATIONAL

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL TIME OF CONCENTRATION | TRAVEL TIME | SUBBASIN TIME OF CONCENTRATION | RAINFALL INTENSITY | C*A | SUB-BASIN "Q" | SUM C*A | TRAVEL TIME BETWEEN BASINS | TOTAL Tc | TOTAL RAINFALL INTENSITY | SUMMATION OF "Q" | SUMMATION OF AREA | CUMULATIVE $T_c$ | CUMULATIVE INTENSITY | CUMULATIVE SUM C*A | EXIT THROUGH PIPE FLOW | TOTAL "Q" | BYPASS "Q" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Ti | Tt | Tc | I | CA | Q | Σ CA | ΔT | Σ Tc | Σ I | Σ Q | ΣA | | | | $X_P$ | TQ | BQ |
| T - 1 | 0.77 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 3.0 | 0.6 | | | | | 0.8 | | | | | | |
| T - 2 | 5.47 | 0.80 | 4.0 | 6.3 | 10.3 | 4.1 | 4.4 | 18.1 | 5.0 | | 10.3 | 4.1 | 20.7 | 6.2 | 7.5 | 4.7 | 5.0 | 7 | 23.3 | 9.8 |
| T - 3 | 0.62 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 0.5 | 2.3 | 0.5 | | | | | 6.9 | | | | | | |
| T - 4 | 0.73 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.8 | 1.1 | | | | | 7.6 | | | | | | |
| T - 5 | 1.47 | 0.80 | 4.0 | 3.0 | 7.0 | 4.8 | 1.2 | 5.6 | 2.3 | 1.3 | | | | 9.1 | | | | | | |
| T - 6 | 1.93 | 0.80 | 4.0 | 3.3 | 7.3 | 4.7 | 1.5 | 7.3 | 3.8 | 1.4 | | | | 11.0 | | | | | | |
| T - 7 | 1.74 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.4 | 6.8 | 5.2 | 1.3 | 10.5 | 4.1 | 21.3 | 12.7 | 12.9 | 3.8 | 10.2 | 7 | 27.5 | 20.5 |
| T - 8 | 0.52 | 0.80 | 4.0 | 2.2 | 6.2 | 5.0 | 0.4 | 2.1 | 0.4 | | | | | 13.3 | | | | | | |
| T - 9 | 0.31 | 0.80 | 4.0 | 1.0 | 5.0 | 5.3 | 0.2 | 1.3 | 0.7 | | | | | 13.6 | | | | | | |
| T - 10 | 0.75 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.9 | 1.3 | | | | | 14.3 | | | | | | |
| T - 11 | 1.19 | 0.80 | 4.0 | 2.8 | 6.7 | 4.8 | 1.0 | 4.6 | 2.2 | 1.4 | | | | 15.5 | | | | | | |
| T -12 | 1.48 | 0.80 | 4.0 | 2.8 | 6.7 | 4.8 | 1.2 | 5.7 | 3.4 | 1.2 | | | | 17.0 | | | | | | |
| T - 13 | 1.71 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.4 | 6.6 | 4.8 | 1.3 | 10.5 | 4.1 | 19.6 | 18.7 | 15.5 | 3.5 | 15.0 | 7 | 35.3 | 28.3 |
| T - 14 | 0.33 | 0.80 | 4.0 | 1.2 | 5.2 | 5.2 | 0.3 | 1.4 | 0.3 | | | | | 19.0 | | | | | | |
| T - 15 | 0.32 | 0.80 | 4.0 | 1.2 | 5.2 | 5.2 | 0.3 | 1.3 | 0.5 | | | | | 19.3 | | | | | | |
| T - 16 | 0.74 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.9 | 1.1 | | | | | 20.1 | | | | | | |
| T - 17 | 2.32 | 0.80 | 4.0 | 3.0 | 7.0 | 4.8 | 1.9 | 8.9 | 3.0 | | | | | 22.4 | | | | | | |
| T - 18 | 1.03 | 0.80 | 4.0 | 0.8 | 4.8 | 5.3 | 0.8 | 4.4 | 3.8 | 2.5 | | | | 23.4 | | | | | | |
| T - 19 | 1.39 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.1 | 5.4 | 4.9 | 1.4 | 11.0 | 4.0 | 19.8 | 24.8 | 18.1 | 3.2 | 19.9 | 7 | 41.9 | 34.9 |
| T - 20 | 0.78 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 0.6 | 2.9 | 0.6 | | | | | 25.6 | | | | | | |
| T - 21 | 0.73 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.8 | 1.2 | | | | | 26.3 | | | | | | |
| T - 22 | 2.82 | 0.80 | 4.0 | 3.0 | 7.0 | 4.8 | 2.3 | 10.7 | 3.5 | 2.5 | | | | 29.2 | | | | | | |
| T - 23 | 1.77 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.4 | 6.9 | 4.9 | 1.4 | 10.5 | 4.1 | 20.0 | 30.9 | 20.8 | 3.0 | 24.7 | 3 | 47.2 | 44.2 |

* BYPASS AT T-2 IS SPLIT 60 / 40 BETWEEN BASINS T - 7 AND N - 4, WHERE THE 60% GOES TO BASIN T - 7

TEJON RATIONAL METHOD

## 100-YEAR RATIONAL

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL TIME OF CONCENTRATION | TRAVEL TIME | SUBBASIN TIME OF CONCENTRATION | RAINFALL INTENSITY | C*A | SUB-BASIN "Q" | SUM C*A | TRAVEL TIME BETWEEN BASINS | TOTAL Tc | TOTAL RAINFALL INTENSITY | SUMMATION OF "Q" | SUMMATION OF AREA | CUMULATIVE $T_c$ | CUMULATIVE INTENSITY | CUMULATIVE SUM C*A | EXIT THROUGH PIPE FLOW | TOTAL "Q" | BYPASS "Q" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Ti | Tt | Tc | I | CA | Q | Σ CA | ΔT | Σ Tc | Σ I | Σ Q | ΣA | | | | $X_P$ | TQ | BQ |
| T - 1 | 0.77 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 5.9 | 0.7 | | | | | 0.8 | | | | | | |
| T - 2 | 5.47 | 0.88 | 2.9 | 6.3 | 9.2 | 7.4 | 4.8 | 35.4 | 5.5 | 4.0 | 9.5 | 7.3 | 40.0 | 6.2 | 9.2 | 7.4 | 5.5 | 7 | 40.4 | 20.1 |
| T - 3 | 0.62 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 0.5 | 4.5 | 0.5 | | | | | 6.9 | | | | | | |
| T - 4 | 0.73 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.6 | 5.6 | 1.2 | | | | | 7.6 | | | | | | |
| T - 5 | 1.47 | 0.88 | 2.9 | 3.0 | 5.9 | 8.5 | 1.3 | 11.1 | 2.5 | 1.3 | | | | 9.1 | | | | | | |
| T - 6 | 1.93 | 0.88 | 2.9 | 3.3 | 6.2 | 8.4 | 1.7 | 14.3 | 4.2 | 1.4 | | | | 11.0 | | | | | | |
| T - 7 | 1.74 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.5 | 13.3 | 5.7 | 1.3 | 9.5 | 7.3 | 41.6 | 12.7 | 11.9 | 6.7 | 11.2 | 7 | 56.2 | 49.2 |
| T - 8 | 0.52 | 0.88 | 2.9 | 2.2 | 5.1 | 8.9 | 0.5 | 4.1 | 0.5 | | | | | 13.3 | | | | | | |
| T - 9 | 0.31 | 0.88 | 2.9 | 1.0 | 3.9 | 9.5 | 0.3 | 2.6 | 0.7 | | | | | 13.6 | | | | | | |
| T - 10 | 0.75 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 5.8 | 1.4 | | | | | 14.3 | | | | | | |
| T - 11 | 1.19 | 0.88 | 2.9 | 2.8 | 5.7 | 8.6 | 1.0 | 9.1 | 2.4 | 1.4 | | | | 15.5 | | | | | | |
| T -12 | 1.48 | 0.88 | 2.9 | 2.8 | 5.7 | 8.6 | 1.3 | 11.3 | 3.7 | 1.2 | | | | 17.0 | | | | | | |
| T - 13 | 1.71 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.5 | 13.1 | 5.2 | 1.3 | 9.5 | 7.3 | 38.2 | 18.7 | 14.5 | 6.1 | 16.4 | 7 | 77.0 | 70.0 |
| T - 14 | 0.33 | 0.88 | 2.9 | 1.2 | 4.1 | 9.4 | 0.3 | 2.7 | 0.3 | | | | | 19.0 | | | | | | |
| T - 15 | 0.32 | 0.88 | 2.9 | 1.2 | 4.1 | 9.4 | 0.3 | 2.6 | 0.6 | | | | | 19.3 | | | | | | |
| T - 16 | 0.74 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 5.7 | 1.2 | | | | | 20.1 | | | | | | |
| T - 17 | 2.32 | 0.88 | 2.9 | 3.0 | 5.9 | 8.5 | 2.0 | 17.4 | 3.3 | | | | | 22.4 | | | | | | |
| T - 18 | 1.03 | 0.88 | 2.9 | 0.8 | 3.7 | 9.6 | 0.9 | 8.7 | 4.2 | 2.5 | | | | 23.4 | | | | | | |
| T - 19 | 1.39 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.2 | 10.7 | 5.4 | 1.4 | 9.9 | 7.2 | 38.7 | 24.8 | 17.1 | 5.6 | 21.8 | 7 | 95.0 | 88.0 |
| T - 20 | 0.78 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 0.7 | 5.7 | 0.7 | | | | | 25.6 | | | | | | |
| T - 21 | 0.73 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.6 | 5.6 | 1.3 | | | | | 26.3 | | | | | | |
| T - 22 | 2.82 | 0.88 | 2.9 | 3.0 | 5.9 | 8.5 | 2.5 | 21.2 | 3.8 | 2.5 | | | | 29.2 | | | | | | |
| T - 23 | 1.77 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.6 | 13.6 | 5.4 | 1.4 | 9.5 | 7.3 | 39.1 | 30.9 | 19.7 | 5.2 | 27.2 | 3 | 109.9 | 106.9 |

* BYPASS AT T-2 IS SPLIT 60 / 40 BETWEEN BASINS T - 7 AND N - 4, WHERE THE 60% GOES TO BASIN T - 7

NEVADA RATIONAL METHOD

## 5-YEAR RATIONAL

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL TIME OF CONCENTRATION | TRAVEL TIME | BASIN TIME OF CONCENTRATION | RAINFALL INTENSITY | C*A | SUB-BASIN "Q" | SUM C*A | TRAVEL TIME BETWEEN BASINS | TOTAL Tc | TOTAL RAINFALL INTENSITY | SUMMATION OF "Q" | SUMMATION OF AREA | CUMULATIVE $T_c$ | CUMULATIVE INTENSITY | CUMULATIVE SUM C*A | EXIT THROUGH PIPE FLOW | TOTAL "Q" | BYPASS "Q" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Ti | Tt | Tc | I | CA | Q | Σ CA | ΔT | Σ Tc | Σ I | Σ Q | ΣA | | | | $X_p$ | TQ | BQ |
| N - 1 | 0.73 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 0.6 | 2.7 | 0.6 | | | | | 0.73 | | | | | | |
| N - 2 | 0.74 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.9 | 1.2 | | | | | 1.47 | | | | | | |
| N - 3 | 4.71 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 3.8 | 18.3 | 4.9 | 4.0 | 10.5 | 4.1 | 20.3 | 6.18 | 10.5 | 4.1 | 4.9 | 9 | 20.3 | 8.5 |
| N - 4 | 0.75 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 0.6 | 2.8 | 0.6 | | | | | 6.93 | | | | | | |
| N - 5 | 0.70 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.7 | 1.2 | | | | | 7.63 | | | | | | |
| N - 6 | 4.72 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 3.8 | 18.3 | 4.9 | 4.0 | 10.5 | 4.1 | 20.3 | 12.35 | 13.2 | 3.7 | 9.9 | 0 | 32.7 | 24.5 |
| N - 7 | 0.78 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 0.6 | 2.9 | 0.6 | | | | | 13.13 | | | | | | |
| N - 8 | 0.70 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.7 | 1.2 | | | | | 13.83 | | | | | | |
| N - 9 | 2.41 | 0.80 | 4.0 | 3.4 | 7.4 | 4.7 | 1.9 | 9.0 | 3.1 | 0.8 | | | | 16.24 | | | | | | |
| N - 10 | 0.67 | 0.80 | 4.0 | 1.3 | 5.2 | 5.2 | 0.5 | 2.8 | 3.6 | 1.6 | | | | 16.91 | | | | | | |
| N - 11 | 1.35 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.1 | 5.2 | 4.7 | 1.6 | 10.5 | 4.1 | 19.4 | 18.26 | 15.8 | 3.4 | 14.6 | 0 | 38.8 | 38.8 |
| N - 12 | 0.31 | 0.80 | 4.0 | 1.2 | 5.2 | 5.2 | 0.2 | 1.3 | 0.2 | | | | | 18.57 | | | | | | |
| N - 13 | 0.32 | 0.80 | 4.0 | 1.2 | 5.2 | 5.2 | 0.3 | 1.3 | 0.5 | | | | | 18.89 | | | | | | |
| N - 14 | 0.74 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.9 | 1.1 | | | | | 19.63 | | | | | | |
| N - 15 | 2.21 | 0.80 | 4.0 | 2.8 | 6.7 | 4.8 | 1.8 | 8.5 | 2.9 | | | | | 21.84 | | | | | | |
| N - 16 | 1.05 | 0.80 | 4.0 | 1.6 | 5.6 | 5.1 | 0.8 | 4.3 | 3.7 | 2.2 | | | | 22.89 | | | | | | |
| N - 17 | 1.54 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.2 | 6.0 | 4.9 | 1.7 | 10.7 | 4.1 | 20.1 | 24.43 | 18.4 | 3.2 | 19.5 | 0 | 51.6 | 51.6 |
| N - 18 | 0.47 | 0.80 | 4.0 | 2.0 | 6.0 | 5.0 | 0.4 | 1.9 | 0.4 | | | | | 24.90 | | | | | | |
| N - 19 | 0.33 | 0.80 | 4.0 | 1.4 | 5.4 | 5.2 | 0.3 | 1.4 | 0.6 | | | | | 25.23 | | | | | | |
| N - 20 | 0.78 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 3.0 | 1.3 | | | | | 26.01 | | | | | | |
| N - 21 | 2.70 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 2.2 | 10.0 | 3.4 | 0.8 | | | | 28.71 | | | | | | |
| N - 22 | 0.58 | 0.80 | 4.0 | 1.2 | 5.2 | 5.2 | 0.5 | 2.4 | 3.9 | 1.6 | | | | 29.29 | | | | | | |
| N - 23 | 1.36 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.1 | 5.3 | 5.0 | 1.6 | 10.5 | 4.1 | 20.4 | 30.65 | 21.0 | 3.0 | 24.5 | 0 | 63.0 | 63.0 |

25% of the bypass on basins N - 3 & N - 6 spill east due to the grade of the road

The 40% East spill over at basin T - 2 is added to the total Q at basin N - 6

The existing storm sewers are at capacity and cannot accept additional runoff from the Nevada Street basin.

NEVADA RATIONAL METHOD

## 100-YEAR RATIONAL

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL TIME OF CONCENTRATION | TRAVEL TIME | BASIN TIME OF CONCENTRATION | RAINFALL INTENSITY | C*A | SUB-BASIN "Q" | SUM C*A | TRAVEL TIME BETWEEN BASINS | TOTAL Tc | TOTAL RAINFALL INTENSITY | SUMMATION OF "Q" | SUMMATION OF AREA | CUMULATIVE $T_c$ | CUMULATIVE INTENSITY | CUMULATIVE SUM C*A | EXIT THROUGH PIPE FLOW | TOTAL "Q" | BYPASS "Q" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Ti | Tt | Tc | I | CA | Q | Σ CA | ΔT | Σ Tc | Σ I | Σ Q | ΣA | | | | $X_P$ | TQ | BQ |
| N - 1 | 0.73 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 0.6 | 5.3 | 0.6 | | | | | 0.7 | | | | | | |
| N - 2 | 0.74 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 5.7 | 1.3 | | | | | 1.5 | | | | | | |
| N - 3 | 4.71 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 4.1 | 36.1 | 5.4 | 4.0 | 9.5 | 7.3 | 39.6 | 6.2 | 9.5 | 7.3 | 5.4 | 9 | 39.6 | 23.0 |
| N - 4 | 0.75 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 0.7 | 5.5 | 0.7 | | | | | 6.9 | | | | | | |
| N - 5 | 0.70 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.6 | 5.4 | 1.3 | | | | | 7.6 | | | | | | |
| N - 6 | 4.72 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 4.2 | 36.2 | 5.4 | 4.0 | 9.5 | 7.3 | 39.6 | 12.4 | 12.1 | 6.6 | 10.9 | 0 | 70.0 | 52.5 |
| N - 7 | 0.78 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 0.7 | 5.7 | 0.7 | | | | | 13.1 | | | | | | |
| N - 8 | 0.70 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.6 | 5.4 | 1.3 | | | | | 13.8 | | | | | | |
| N - 9 | 2.41 | 0.88 | 2.9 | 3.4 | 6.3 | 8.4 | 2.1 | 17.8 | 3.4 | 0.8 | | | | 16.2 | | | | | | |
| N - 10 | 0.67 | 0.88 | 2.9 | 1.3 | 4.2 | 9.4 | 0.6 | 5.5 | 4.0 | 1.6 | | | | 16.9 | | | | | | |
| N - 11 | 1.35 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.2 | 10.4 | 5.2 | 1.6 | 9.5 | 7.3 | 37.9 | 18.3 | 14.7 | 6.0 | 16.1 | 0 | 79.6 | 79.6 |
| N - 12 | 0.31 | 0.88 | 2.9 | 1.2 | 4.1 | 9.4 | 0.3 | 2.6 | 0.3 | | | | | 18.6 | | | | | | |
| N - 13 | 0.32 | 0.88 | 2.9 | 1.2 | 4.1 | 9.4 | 0.3 | 2.6 | 0.6 | | | | | 18.9 | | | | | | |
| N - 14 | 0.74 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 5.7 | 1.2 | | | | | 19.6 | | | | | | |
| N - 15 | 2.21 | 0.88 | 2.9 | 2.8 | 5.7 | 8.6 | 1.9 | 16.8 | 3.2 | | | | | 21.8 | | | | | | |
| N - 16 | 1.05 | 0.88 | 2.9 | 1.6 | 4.5 | 9.2 | 0.9 | 8.5 | 4.1 | 2.2 | | | | 22.9 | | | | | | |
| N - 17 | 1.54 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.4 | 11.8 | 5.4 | 1.7 | 9.7 | 7.2 | 39.3 | 24.4 | 17.3 | 5.6 | 21.5 | 0 | 103.9 | 103.9 |
| N - 18 | 0.47 | 0.88 | 2.9 | 2.0 | 4.9 | 9.0 | 0.4 | 3.7 | 0.4 | | | | | 24.9 | | | | | | |
| N - 19 | 0.33 | 0.88 | 2.9 | 1.4 | 4.3 | 9.3 | 0.3 | 2.7 | 0.7 | | | | | 25.2 | | | | | | |
| N - 20 | 0.78 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 6.0 | 1.4 | | | | | 26.0 | | | | | | |
| N - 21 | 2.70 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 2.4 | 19.8 | 3.8 | 0.8 | | | | 28.7 | | | | | | |
| N - 22 | 0.58 | 0.88 | 2.9 | 1.2 | 4.1 | 9.4 | 0.5 | 4.8 | 4.3 | 1.6 | | | | 29.3 | | | | | | |
| N - 23 | 1.36 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.2 | 10.4 | 5.5 | 1.6 | 9.5 | 7.3 | 39.9 | 30.7 | 19.9 | 5.2 | 27.0 | 0 | 125.1 | 125.1 |

25% of the bypass on basins N - 3 & N - 6 spill east due to the grade of the road

The 40% East spill over at basin T - 2 is added to the total Q at basin N - 6

The existing storm sewers are at capacity and cannot accept additional runoff from the Nevada Street basin.

## 5-year Time of Concentration

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL LENGTH | INITIAL SLOPE | INITIAL VELOCITY (FPS) | INITIAL TIME OF CONCENTRATION | TRAVEL LENGTH STREET | STREET SLOPE | STREET VELOCITY | STREET TIME (Tt) | SUB-BASIN TIME OF CONCENTRATION | STREET CHANNEL LENGTH | STREET CHANNEL SLOPE | PIPE DIAMETER | STREET VELOCITY | STREET TIME BETWEEN BASINS | BASIN TIME OF CONCENTRATION | BASIN $T_c$ | BYPASS TOTAL $T_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Til | Tis | Tiv | Ti | Ttl | Tts | Ttv | Tt | Tc | | | | | ΔT | $T_b$ | | |
| B - 1 | 17.1 | 0.80 | | | | | | | | | 29.2 | | | | | | 29.2 | 29.2 | 29.2 |
| T - 1 | 0.8 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| T - 2 | 5.47 | 0.80 | 50 | 1 | 0.2 | 4.0 | 950 | 0.7 | 2.5 | 6.3 | 10.3 | 500 | 0.5 | | 2.1 | 4.0 | 10.5 | 10.5 | 31.8 |
| T - 3 | 0.62 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | | | | | | 7.5 | | |
| T - 4 | 0.73 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| T - 5 | 1.47 | 0.80 | 50 | 1 | 0.2 | 4.0 | 380 | 0.5 | 2.1 | 3.0 | 7.0 | 160 | 0.5 | | 2.1 | 1.3 | 7.8 | | |
| T - 6 | 1.93 | 0.80 | 50 | 1 | 0.2 | 4.0 | 420 | 0.5 | 2.1 | 3.3 | 7.3 | 180 | 0.5 | | 2.1 | 1.4 | 9.3 | | |
| T - 7 | 1.74 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 160 | 0.5 | | 2.1 | 1.3 | 10.5 | 10.5 | 34.4 |
| T - 8 | 0.52 | 0.80 | 50 | 1 | 0.2 | 4.0 | 280 | 0.5 | 2.1 | 2.2 | 6.2 | | | | | | 6.2 | | |
| T - 9 | 0.31 | 0.80 | 50 | 1 | 0.2 | 4.0 | 130 | 0.5 | 2.1 | 1.0 | 5.0 | | | | | | 5.0 | | |
| T - 10 | 0.75 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| T - 11 | 1.19 | 0.80 | 50 | 1 | 0.2 | 4.0 | 350 | 0.5 | 2.1 | 2.8 | 6.7 | 180 | 0.5 | | 2.1 | 1.4 | 8.0 | | |
| T -12 | 1.48 | 0.80 | 50 | 1 | 0.2 | 4.0 | 350 | 0.5 | 2.1 | 2.8 | 6.7 | 150 | 0.5 | | 2.1 | 1.2 | 9.2 | | |
| T - 13 | 1.71 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 170 | 0.5 | | 2.1 | 1.3 | 10.5 | 10.5 | 37.0 |
| T - 14 | 0.33 | 0.80 | 50 | 1 | 0.2 | 4.0 | 150 | 0.5 | 2.1 | 1.2 | 5.2 | | | | | | 5.2 | | |
| T - 15 | 0.32 | 0.80 | 50 | 1 | 0.2 | 4.0 | 150 | 0.5 | 2.1 | 1.2 | 5.2 | | | | | | 5.2 | | |
| T - 16 | 0.74 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| T - 17 | 2.32 | 0.80 | 50 | 1 | 0.2 | 4.0 | 380 | 0.5 | 2.1 | 3.0 | 7.0 | | | | | | 7.0 | | |
| T - 18 | 1.03 | 0.80 | 50 | 1 | 0.2 | 4.0 | 100 | 0.5 | 2.1 | 0.8 | 4.8 | 320 | 0.5 | | 2.1 | 2.5 | 9.5 | | |
| T - 19 | 1.39 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 180 | 0.5 | | 2.1 | 1.4 | 11.0 | 11.0 | 39.7 |
| T - 20 | 0.78 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | | | | | | 7.5 | | |
| T - 21 | 0.73 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| T - 22 | 2.82 | 0.80 | 50 | 1 | 0.2 | 4.0 | 380 | 0.5 | 2.1 | 3.0 | 7.0 | 320 | 0.5 | | 2.1 | 2.5 | 9.1 | | |
| T - 23 | 1.77 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 180 | 0.5 | | 2.1 | 1.4 | 10.5 | 10.5 | 42.3 |

* Calculations assume the Boulder Street Storm Sewer has NOT been installed. The calculations also assume the small East - West Storm Drains are full and peak flow calculations are controlled by street time and not pipe time.

## 100-year Time of Concentration

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL LENGTH | INITIAL SLOPE | INITIAL VELOCITY (FPS) | INITIAL TIME OF CONCENTRATION | TRAVEL LENGTH STREET | STREET SLOPE | STREET VELOCITY | STREET TIME (Tt) | SUB-BASIN TIME OF CONCENTRATION | STREET CHANNEL LENGTH | STREET CHANNEL SLOPE | PIPE DIAMETER | STREET VELOCITY | STREET TIME BETWEEN BASINS | BASIN TIME OF CONCENTRATION | BASIN $T_c$ | BYPASS TOTAL $T_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Til | Tis | Tiv | Ti | Ttl | Tts | Ttv | Tt | Tc | | | | | ΔT | $T_b$ | | |
| B - 1 | 17.1 | 0.88 | | | | | | | | | 29.2 | | | | | | 29.2 | 29.2 | 29.2 |
| T - 1 | 0.77 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| T - 2 | 5.47 | 0.88 | 50 | 1 | 0.3 | 2.9 | 950 | 0.7 | 2.5 | 6.3 | 9.2 | 500 | 0.5 | | 2.1 | 4.0 | 9.5 | 9.5 | 31.8 |
| T - 3 | 0.62 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | | | | | | 6.5 | | |
| T - 4 | 0.73 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| T - 5 | 1.47 | 0.88 | 50 | 1 | 0.3 | 2.9 | 380 | 0.5 | 2.1 | 3.0 | 5.9 | 160 | 0.5 | | 2.1 | 1.3 | 6.8 | | |
| T - 6 | 1.93 | 0.88 | 50 | 1 | 0.3 | 2.9 | 420 | 0.5 | 2.1 | 3.3 | 6.2 | 180 | 0.5 | | 2.1 | 1.4 | 8.2 | | |
| T - 7 | 1.74 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 160 | 0.5 | | 2.1 | 1.3 | 9.5 | 9.5 | 34.4 |
| T - 8 | 0.52 | 0.88 | 50 | 1 | 0.3 | 2.9 | 280 | 0.5 | 2.1 | 2.2 | 5.1 | | | | | | 5.1 | | |
| T - 9 | 0.31 | 0.88 | 50 | 1 | 0.3 | 2.9 | 130 | 0.5 | 2.1 | 1.0 | 3.9 | | | | | | 3.9 | | |
| T - 10 | 0.75 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| T - 11 | 1.19 | 0.88 | 50 | 1 | 0.3 | 2.9 | 350 | 0.5 | 2.1 | 2.8 | 5.7 | 180 | 0.5 | | 2.1 | 1.4 | 7.0 | | |
| T -12 | 1.48 | 0.88 | 50 | 1 | 0.3 | 2.9 | 350 | 0.5 | 2.1 | 2.8 | 5.7 | 150 | 0.5 | | 2.1 | 1.2 | 8.1 | | |
| T - 13 | 1.71 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 170 | 0.5 | | 2.1 | 1.3 | 9.5 | 9.5 | 37.0 |
| T - 14 | 0.33 | 0.88 | 50 | 1 | 0.3 | 2.9 | 150 | 0.5 | 2.1 | 1.2 | 4.1 | | | | | | 4.1 | | |
| T - 15 | 0.32 | 0.88 | 50 | 1 | 0.3 | 2.9 | 150 | 0.5 | 2.1 | 1.2 | 4.1 | | | | | | 4.1 | | |
| T - 16 | 0.74 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| T - 17 | 2.32 | 0.88 | 50 | 1 | 0.3 | 2.9 | 380 | 0.5 | 2.1 | 3.0 | 5.9 | | | | | | 5.9 | | |
| T - 18 | 1.03 | 0.88 | 50 | 1 | 0.3 | 2.9 | 100 | 0.5 | 2.1 | 0.8 | 3.7 | 320 | 0.5 | | 2.1 | 2.5 | 8.5 | | |
| T - 19 | 1.39 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 180 | 0.5 | | 2.1 | 1.4 | 9.9 | 9.9 | 39.7 |
| T - 20 | 0.78 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | | | | | | 6.5 | | |
| T - 21 | 0.73 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| T - 22 | 2.82 | 0.88 | 50 | 1 | 0.3 | 2.9 | 380 | 0.5 | 2.1 | 3.0 | 5.9 | 320 | 0.5 | | 2.1 | 2.5 | 8.1 | | |
| T - 23 | 1.77 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 180 | 0.5 | | 2.1 | 1.4 | 9.5 | 9.5 | 42.3 |

* Calculations assume the Boulder Street Storm Sewer has NOT been installed. The calculations also assume the small East - West Storm Drains are full and peak flow calculations are controlled by street time and not pipe time.

## 5-year Time of Concentration

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL LENGTH | INITIAL SLOPE | INITIAL VELOCITY (FPS) | INITIAL TIME OF CONCENTRATION | TRAVEL LENGTH STREET | STREET SLOPE | STREET VELOCITY | STREET TIME (Tt) | SUB-BASIN TIME OF CONCENTRATION | STREET CHANNEL LENGTH | STREET CHANNEL SLOPE | PIPE DIAMETER | STREET CHANNEL VELOCITY | STREET TIME BETWEEN BASINS | BASIN TIME OF CONCENTRATION | BASIN $T_c$ | BYPASS TOTAL $T_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Til | Tis | Tiv | Ti | Ttl | Tts | Ttv | Tt | Tc | | | | | ΔT | $T_b$ | | * |
| B - 1 | 11.40 | 0.80 | | | | | | | | | 29.2 | | | | | | 29.2 | 29.2 | 29.2 |
| N - 1 | 0.73 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | | | | | | 7.5 | | |
| N - 2 | 0.74 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| N - 3 | 4.71 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 500 | 0.5 | | 2.1 | 4.0 | 10.5 | 10.5 | 31.8 |
| N - 4 | 0.75 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | | | | | | 7.5 | | |
| N - 5 | 0.70 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| N - 6 | 4.72 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 500 | 0.5 | | 2.1 | 4.0 | 10.5 | 10.5 | 34.4 |
| N - 7 | 0.78 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | | | | | | 7.5 | | |
| N - 8 | 0.70 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| N - 9 | 2.41 | 0.80 | 50 | 1 | 0.2 | 4.0 | 430 | 0.5 | 2.1 | 3.4 | 7.4 | 100 | 0.5 | | 2.1 | 0.8 | 7.4 | | |
| N - 10 | 0.67 | 0.80 | 50 | 1 | 0.2 | 4.0 | 160 | 0.5 | 2.1 | 1.3 | 5.2 | 200 | 0.5 | | 2.1 | 1.6 | 9.0 | | |
| N - 11 | 1.35 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 200 | 0.5 | | 2.1 | 1.6 | 10.5 | 10.5 | 37.0 |
| N - 12 | 0.31 | 0.80 | 50 | 1 | 0.2 | 4.0 | 150 | 0.5 | 2.1 | 1.2 | 5.2 | | | | | | 5.2 | | |
| N - 13 | 0.32 | 0.80 | 50 | 1 | 0.2 | 4.0 | 150 | 0.5 | 2.1 | 1.2 | 5.2 | | | | | | 5.2 | | |
| N - 14 | 0.74 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| N - 15 | 2.21 | 0.80 | 50 | 1 | 0.2 | 4.0 | 350 | 0.5 | 2.1 | 2.8 | 6.7 | | | | | | 6.7 | | |
| N - 16 | 1.05 | 0.80 | 50 | 1 | 0.2 | 4.0 | 200 | 0.5 | 2.1 | 1.6 | 5.6 | 280 | 0.5 | | 2.1 | 2.2 | 9.0 | | |
| N - 17 | 1.54 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 220 | 0.5 | | 2.1 | 1.7 | 10.7 | 10.7 | 39.7 |
| N - 18 | 0.47 | 0.80 | 50 | 1 | 0.2 | 4.0 | 250 | 0.5 | 2.1 | 2.0 | 6.0 | | | | | | 6.0 | | |
| N - 19 | 0.33 | 0.80 | 50 | 1 | 0.2 | 4.0 | 180 | 0.5 | 2.1 | 1.4 | 5.4 | | | | | | 5.4 | | |
| N - 20 | 0.78 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | | | | | | 6.6 | | |
| N - 21 | 2.70 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.5 | 2.1 | 3.6 | 7.5 | 100 | 0.5 | | 2.1 | 0.8 | 7.4 | | |
| N - 22 | 0.58 | 0.80 | 50 | 1 | 0.2 | 4.0 | 150 | 0.5 | 2.1 | 1.2 | 5.2 | 200 | 0.5 | | 2.1 | 1.6 | 9.0 | | |
| N - 23 | 1.36 | 0.80 | 50 | 1 | 0.2 | 4.0 | 450 | 0.9 | 2.9 | 2.6 | 6.6 | 200 | 0.5 | | 2.1 | 1.6 | 10.5 | 10.5 | 42.3 |

* Calculations assume the Boulder Street Storm Sewer has NOT been installed. The calculations also assume the small East - West Storm Drains are full and peak flow calculations are controlled by street time and not pipe time.

## 100-year Time of Concentration

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL LENGTH | INITIAL SLOPE | INITIAL VELOCITY (FPS) | INITIAL TIME OF CONCENTRATION | TRAVEL LENGTH STREET | STREET SLOPE | STREET VELOCITY | STREET TIME (Tt) | SUB-BASIN TIME OF CONCENTRATION | STREET CHANNEL LENGTH | STREET CHANNEL SLOPE | PIPE DIAMETER | STREET CHANNEL VELOCITY | STREET TIME BETWEEN BASINS | BASIN TIME OF CONCENTRATION | BASIN $T_c$ | BYPASS TOTAL $T_c$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Til | Tis | Tiv | Ti | Ttl | Tts | Ttv | Tt | Tc | | | | | ΔT | ΣTc | | |
| B - 1 | 11.4 | 0.88 | | | | | | | | | 29.2 | | | | | | 29.2 | 29.2 | 29.2 |
| N - 1 | 0.73 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | | | | | | 6.5 | | |
| N - 2 | 0.74 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| N - 3 | 4.71 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 500 | 0.5 | | 2.1 | 4.0 | 9.5 | 9.5 | 31.8 |
| N - 4 | 0.75 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | | | | | | 6.5 | | |
| N - 5 | 0.7 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| N - 6 | 4.72 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 500 | 0.5 | | 2.1 | 4.0 | 9.5 | 9.5 | 34.4 |
| N - 7 | 0.78 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | | | | | | 6.5 | | |
| N - 8 | 0.7 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| N - 9 | 2.41 | 0.88 | 50 | 1 | 0.3 | 2.9 | 430 | 0.5 | 2.1 | 3.4 | 6.3 | 100 | 0.5 | | 2.1 | 0.8 | 6.3 | | |
| N - 10 | 0.67 | 0.88 | 50 | 1 | 0.3 | 2.9 | 160 | 0.5 | 2.1 | 1.3 | 4.2 | 200 | 0.5 | | 2.1 | 1.6 | 7.9 | | |
| N - 11 | 1.35 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 200 | 0.5 | | 2.1 | 1.6 | 9.5 | 9.5 | 37.0 |
| N - 12 | 0.31 | 0.88 | 50 | 1 | 0.3 | 2.9 | 150 | 0.5 | 2.1 | 1.2 | 4.1 | | | | | | 4.1 | | |
| N - 13 | 0.32 | 0.88 | 50 | 1 | 0.3 | 2.9 | 150 | 0.5 | 2.1 | 1.2 | 4.1 | | | | | | 4.1 | | |
| N - 14 | 0.74 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| N - 15 | 2.21 | 0.88 | 50 | 1 | 0.3 | 2.9 | 350 | 0.5 | 2.1 | 2.8 | 5.7 | | | | | | 5.7 | | |
| N - 16 | 1.05 | 0.88 | 50 | 1 | 0.3 | 2.9 | 200 | 0.5 | 2.1 | 1.6 | 4.5 | 280 | 0.5 | | 2.1 | 2.2 | 7.9 | | |
| N - 17 | 1.54 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 220 | 0.5 | | 2.1 | 1.7 | 9.7 | 9.7 | 39.7 |
| N - 18 | 0.47 | 0.88 | 50 | 1 | 0.3 | 2.9 | 250 | 0.5 | 2.1 | 2.0 | 4.9 | | | | | | 4.9 | | |
| N - 19 | 0.33 | 0.88 | 50 | 1 | 0.3 | 2.9 | 180 | 0.5 | 2.1 | 1.4 | 4.3 | | | | | | 4.3 | | |
| N - 20 | 0.78 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | | | | | | 5.5 | | |
| N - 21 | 2.70 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.5 | 2.1 | 3.6 | 6.5 | 100 | 0.5 | | 2.1 | 0.8 | 6.3 | | |
| N - 22 | 0.58 | 0.88 | 50 | 1 | 0.3 | 2.9 | 150 | 0.5 | 2.1 | 1.2 | 4.1 | 200 | 0.5 | | 2.1 | 1.6 | 7.9 | | |
| N - 23 | 1.36 | 0.88 | 50 | 1 | 0.3 | 2.9 | 450 | 0.9 | 2.9 | 2.6 | 5.5 | 200 | 0.5 | | 2.1 | 1.6 | 9.5 | 9.5 | 42.3 |

* Calculations assume the Boulder Street Storm Sewer has NOT been installed. The calculations also assume the small East - West Storm Drains are full and peak flow calculations are controlled by street time and not pipe time.

TEJON RATIONAL METHOD BOULDER

## 5-YEAR RATIONAL

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL TIME OF CONCENTRATION | TRAVEL TIME | SUBBASIN TIME OF CONCENTRATION | RAINFALL INTENSITY | C*A | SUB-BASIN "Q" | SUM C*A | TRAVEL TIME BETWEEN BASINS | TOTAL Tc | TOTAL RAINFALL INTENSITY | SUMMATION OF "Q" | SUMMATION OF AREA | CUMULATIVE $T_c$ | CUMULATIVE INTENSITY | CUMULATIVE SUM C*A | EXIT THROUGH PIPE FLOW | TOTAL "Q" | BYPASS "Q" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Ti | Tt | Tc | I | CA | Q | Σ CA | ΔT | Σ Tc | Σ I | Σ Q | ΣA | | | | $X_P$ | TQ | BQ |
| B - 1 | 17.1 | 0.80 | | | | 2.5 | 13.7 | 33.8 | 13.7 | | 29.2 | 2.5 | 33.8 | 17.1 | 29.2 | 2.5 | 13.7 | | 33.8 | 16.9 |
| T - 1 | 0.77 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 3.0 | 0.6 | | | | | 17.9 | | | | | | |
| T - 2 | 5.47 | 0.80 | 4.0 | 6.3 | 10.3 | 4.1 | 4.4 | 18.1 | 5.0 | 4.0 | 10.5 | 4.1 | 20.5 | 23.3 | 31.8 | 2.3 | 18.7 | 7 | 27.8 | 12.5 |
| T - 3 | 0.62 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 0.5 | 2.3 | 0.5 | | | | | 24.0 | | | | | | |
| T - 4 | 0.73 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.8 | 1.1 | | | | | 24.7 | | | | | | |
| T - 5 | 1.47 | 0.80 | 4.0 | 3.0 | 7.0 | 4.8 | 1.2 | 5.6 | 2.3 | 1.3 | | | | 26.2 | | | | | | |
| T - 6 | 1.93 | 0.80 | 4.0 | 3.3 | 7.3 | 4.7 | 1.5 | 7.3 | 3.8 | 1.4 | | | | 28.1 | | | | | | |
| T - 7 | 1.74 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.4 | 6.8 | 5.2 | 1.3 | 10.5 | 4.1 | 21.3 | 29.8 | 34.4 | 2.2 | 23.9 | 7 | 23.5 | 16.5 |
| T - 8 | 0.52 | 0.80 | 4.0 | 2.2 | 6.2 | 5.0 | 0.4 | 2.1 | 0.4 | | | | | 30.4 | | | | | | |
| T - 9 | 0.31 | 0.80 | 4.0 | 1.0 | 5.0 | 5.3 | 0.2 | 1.3 | 0.7 | | | | | 30.7 | | | | | | |
| T - 10 | 0.75 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.9 | 1.3 | | | | | 31.4 | | | | | | |
| T - 11 | 1.19 | 0.80 | 4.0 | 2.8 | 6.7 | 4.8 | 1.0 | 4.6 | 2.2 | 1.4 | | | | 32.6 | | | | | | |
| T -12 | 1.48 | 0.80 | 4.0 | 2.8 | 6.7 | 4.8 | 1.2 | 5.7 | 3.4 | 1.2 | | | | 34.1 | | | | | | |
| T - 13 | 1.71 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.4 | 6.6 | 4.8 | 1.3 | 10.5 | 4.1 | 19.6 | 35.8 | 37.0 | 2.1 | 28.6 | 7 | 26.0 | 19.0 |
| T - 14 | 0.33 | 0.80 | 4.0 | 1.2 | 5.2 | 5.2 | 0.3 | 1.4 | 0.3 | | | | | 36.1 | | | | | | |
| T - 15 | 0.32 | 0.80 | 4.0 | 1.2 | 5.2 | 5.2 | 0.3 | 1.3 | 0.5 | | | | | 36.4 | | | | | | |
| T - 16 | 0.74 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.9 | 1.1 | | | | | 37.2 | | | | | | |
| T - 17 | 2.32 | 0.80 | 4.0 | 3.0 | 7.0 | 4.8 | 1.9 | 8.9 | 3.0 | | | | | 39.5 | | | | | | |
| T - 18 | 1.03 | 0.80 | 4.0 | 0.8 | 4.8 | 5.3 | 0.8 | 4.4 | 3.8 | 2.5 | | | | 40.5 | | | | | | |
| T - 19 | 1.39 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.1 | 5.4 | 4.9 | 1.4 | 11.0 | 4.0 | 19.8 | 41.9 | 39.7 | 2.1 | 33.5 | 7 | 28.3 | 21.3 |
| T - 20 | 0.78 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 0.6 | 2.9 | 0.6 | | | | | 42.7 | | | | | | |
| T - 21 | 0.73 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.8 | 1.2 | | | | | 43.4 | | | | | | |
| T - 22 | 2.82 | 0.80 | 4.0 | 3.0 | 7.0 | 4.8 | 2.3 | 10.7 | 3.5 | 2.5 | | | | 46.3 | | | | | | |
| T - 23 | 1.77 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.4 | 6.9 | 4.9 | 1.4 | 10.5 | 4.1 | 20.0 | 48.0 | 42.3 | 2.0 | 38.4 | 3 | 30.1 | 27.1 |

* BYPASS AT BASIN B-1 IS SPLIT 50 /50 BETWEEN BASINS T - 2 AND N - 2.

** BYPASS AT T-2 IS SPLIT 60 / 40 BETWEEN BASINS T - 7 AND N - 4, WHERE THE 60% GOES TO BASIN T - 7

TEJON RATIONAL METHOD BOULDER

## 100-YEAR RATIONAL

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL TIME OF CONCENTRATION | TRAVEL TIME | SUBBASIN TIME OF CONCENTRATION | RAINFALL INTENSITY | C*A | SUB-BASIN "Q" | SUM C*A | TRAVEL TIME BETWEEN BASINS | TOTAL Tc | TOTAL RAINFALL INTENSITY | SUMMATION OF "Q" | SUMMATION OF AREA | CUMULATIVE $T_c$ | CUMULATIVE INTENSITY | CUMULATIVE SUM C*A | EXIT THROUGH PIPE FLOW | TOTAL "Q" | BYPASS "Q" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Ti | Tt | Tc | I | CA | Q | Σ CA | ΔT | Σ Tc | Σ I | Σ Q | ΣA | | | | $X_p$ | TQ | BQ |
| B - 1 | 17.1 | 0.88 | 4 | | 25.2 | 4.21 | 15.0 | 63.4 | 15.0 | | 29.2 | 4.2 | 63.3 | 17.1 | 29.2 | 4.2 | 15.0 | | 63.3 | 31.7 |
| T - 1 | 0.77 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 5.9 | 0.7 | | | | | 17.9 | | | | | | |
| T - 2 | 5.47 | 0.88 | 2.9 | 6.3 | 9.2 | 7.4 | 4.8 | 35.4 | 5.5 | 4.0 | 9.5 | 7.3 | 40.0 | 23.3 | 31.8 | 4.0 | 20.5 | 7 | 52.1 | 27.0 |
| T - 3 | 0.62 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 0.5 | 4.5 | 0.5 | | | | | 24.0 | | | | | | |
| T - 4 | 0.73 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.6 | 5.6 | 1.2 | | | | | 24.7 | | | | | | |
| T - 5 | 1.47 | 0.88 | 2.9 | 3.0 | 5.9 | 8.5 | 1.3 | 11.1 | 2.5 | 1.3 | | | | 26.2 | | | | | | |
| T - 6 | 1.93 | 0.88 | 2.9 | 3.3 | 6.2 | 8.4 | 1.7 | 14.3 | 4.2 | 1.4 | | | | 28.1 | | | | | | |
| T - 7 | 1.74 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.5 | 13.3 | 5.7 | 1.3 | 9.5 | 7.3 | 41.6 | 29.8 | 34.4 | 3.8 | 26.3 | 7 | 47.6 | 40.6 |
| T - 8 | 0.52 | 0.88 | 2.9 | 2.2 | 5.1 | 8.9 | 0.5 | 4.1 | 0.5 | | | | | 30.4 | | | | | | |
| T - 9 | 0.31 | 0.88 | 2.9 | 1.0 | 3.9 | 9.5 | 0.3 | 2.6 | 0.7 | | | | | 30.7 | | | | | | |
| T - 10 | 0.75 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 5.8 | 1.4 | | | | | 31.4 | | | | | | |
| T - 11 | 1.19 | 0.88 | 2.9 | 2.8 | 5.7 | 8.6 | 1.0 | 9.1 | 2.4 | 1.4 | | | | 32.6 | | | | | | |
| T -12 | 1.48 | 0.88 | 2.9 | 2.8 | 5.7 | 8.6 | 1.3 | 11.3 | 3.7 | 1.2 | | | | 34.1 | | | | | | |
| T - 13 | 1.71 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.5 | 13.1 | 5.2 | 1.3 | 9.5 | 7.3 | 38.2 | 35.8 | 37.0 | 3.6 | 31.5 | 7 | 57.9 | 50.9 |
| T - 14 | 0.33 | 0.88 | 2.9 | 1.2 | 4.1 | 9.4 | 0.3 | 2.7 | 0.3 | | | | | 36.1 | | | | | | |
| T - 15 | 0.32 | 0.88 | 2.9 | 1.2 | 4.1 | 9.4 | 0.3 | 2.6 | 0.6 | | | | | 36.4 | | | | | | |
| T - 16 | 0.74 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 5.7 | 1.2 | | | | | 37.2 | | | | | | |
| T - 17 | 2.32 | 0.88 | 2.9 | 3.0 | 5.9 | 8.5 | 2.0 | 17.4 | 3.3 | | | | | 39.5 | | | | | | |
| T - 18 | 1.03 | 0.88 | 2.9 | 0.8 | 3.7 | 9.6 | 0.9 | 8.7 | 4.2 | 2.5 | | | | 40.5 | | | | | | |
| T - 19 | 1.39 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.2 | 10.7 | 5.4 | 1.4 | 9.9 | 7.2 | 38.7 | 41.9 | 39.7 | 3.5 | 36.9 | 7 | 67.6 | 60.6 |
| T - 20 | 0.78 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 0.7 | 5.7 | 0.7 | | | | | 42.7 | | | | | | |
| T - 21 | 0.73 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.6 | 5.6 | 1.3 | | | | | 43.4 | | | | | | |
| T - 22 | 2.82 | 0.88 | 2.9 | 3.0 | 5.9 | 8.5 | 2.5 | 21.2 | 3.8 | 2.5 | | | | 46.3 | | | | | | |
| T - 23 | 1.77 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.6 | 13.6 | 5.4 | 1.4 | 9.5 | 7.3 | 39.1 | 48.0 | 42.3 | 3.4 | 42.3 | 3 | 76.3 | 73.3 |

* BYPASS AT BASIN B-1 IS SPLIT 50 /50 BETWEEN BASINS T - 2 AND N - 2.

** BYPASS AT T-2 IS SPLIT 60 / 40 BETWEEN BASINS T - 7 AND N - 4, WHERE THE 60% GOES TO BASIN T - 7

NEVADA RATIONAL METHOD BOULDER

## 5-YEAR RATIONAL

| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL TIME OF CONCENTRATION | TRAVEL TIME | BASIN TIME OF CONCENTRATION | RAINFALL INTENSITY | C*A | SUB-BASIN "Q" | SUM C*A | TRAVEL TIME BETWEEN BASINS | TOTAL Tc | TOTAL RAINFALL INTENSITY | SUMMATION OF "Q" | SUMMATION OF AREA | CUMULATIVE $T_c$ | CUMULATIVE INTENSITY | CUMULATIVE SUM C*A | EXIT THROUGH PIPE FLOW | TOTAL "Q" | BYPASS "Q" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Ti | Tt | Tc | I | CA | Q | Σ CA | ΔT | Σ Tc | Σ I | Σ Q | ΣA | | | | $X_P$ | TQ | BQ |
| B - 1 | 11.40 | 0.80 | | | | 2.47 | 9.1 | 22.5 | 9.1 | | 29.20 | 2.47 | 22.5 | 11.40 | 29.20 | 2.47 | 9.1 | | 22.5 | 22.5 |
| N - 1 | 0.73 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 0.6 | 2.7 | 0.6 | | | | | 12.13 | | | | | | |
| N - 2 | 0.74 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.9 | 1.2 | | | | | 12.87 | | | | | | |
| N - 3 | 4.71 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 3.8 | 18.3 | 4.9 | 4.0 | 10.5 | 4.1 | 20.3 | 17.58 | 31.8 | 2.3 | 4.9 | 9 | 49.9 | 30.7 |
| N - 4 | 0.75 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 0.6 | 2.8 | 0.6 | | | | | 18.33 | | | | | | |
| N - 5 | 0.70 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.7 | 1.2 | | | | | 19.03 | | | | | | |
| N - 6 | 4.72 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 3.8 | 18.3 | 4.9 | 4.0 | 10.5 | 4.1 | 20.3 | 23.75 | 34.4 | 2.2 | 9.9 | 0 | 48.6 | 36.5 |
| N - 7 | 0.78 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 0.6 | 2.9 | 0.6 | | | | | 24.53 | | | | | | |
| N - 8 | 0.70 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.7 | 1.2 | | | | | 25.23 | | | | | | |
| N - 9 | 2.41 | 0.80 | 4.0 | 3.4 | 7.4 | 4.7 | 1.9 | 9.0 | 3.1 | 0.8 | | | | 27.64 | | | | | | |
| N - 10 | 0.67 | 0.80 | 4.0 | 1.3 | 5.2 | 5.2 | 0.5 | 2.8 | 3.6 | 1.6 | | | | 28.31 | | | | | | |
| N - 11 | 1.35 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.1 | 5.2 | 4.7 | 1.6 | 10.5 | 4.1 | 19.4 | 29.66 | 37.0 | 2.1 | 14.6 | 0 | 45.0 | 45.0 |
| N - 12 | 0.31 | 0.80 | 4.0 | 1.2 | 5.2 | 5.2 | 0.2 | 1.3 | 0.2 | | | | | 29.97 | | | | | | |
| N - 13 | 0.32 | 0.80 | 4.0 | 1.2 | 5.2 | 5.2 | 0.3 | 1.3 | 0.5 | | | | | 30.29 | | | | | | |
| N - 14 | 0.74 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 2.9 | 1.1 | | | | | 31.03 | | | | | | |
| N - 15 | 2.21 | 0.80 | 4.0 | 2.8 | 6.7 | 4.8 | 1.8 | 8.5 | 2.9 | | | | | 33.24 | | | | | | |
| N - 16 | 1.05 | 0.80 | 4.0 | 1.6 | 5.6 | 5.1 | 0.8 | 4.3 | 3.7 | 2.2 | | | | 34.29 | | | | | | |
| N - 17 | 1.54 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.2 | 6.0 | 4.9 | 1.7 | 10.7 | 4.1 | 20.1 | 35.83 | 39.7 | 2.1 | 19.5 | 0 | 53.3 | 53.3 |
| N - 18 | 0.47 | 0.80 | 4.0 | 2.0 | 6.0 | 5.0 | 0.4 | 1.9 | 0.4 | | | | | 36.30 | | | | | | |
| N - 19 | 0.33 | 0.80 | 4.0 | 1.4 | 5.4 | 5.2 | 0.3 | 1.4 | 0.6 | | | | | 36.63 | | | | | | |
| N - 20 | 0.78 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 0.6 | 3.0 | 1.3 | | | | | 37.41 | | | | | | |
| N - 21 | 2.70 | 0.80 | 4.0 | 3.6 | 7.5 | 4.6 | 2.2 | 10.0 | 3.4 | 0.8 | | | | 40.11 | | | | | | |
| N - 22 | 0.58 | 0.80 | 4.0 | 1.2 | 5.2 | 5.2 | 0.5 | 2.4 | 3.9 | 1.6 | | | | 40.69 | | | | | | |
| N - 23 | 1.36 | 0.80 | 4.0 | 2.6 | 6.6 | 4.9 | 1.1 | 5.3 | 5.0 | 1.6 | 10.5 | 4.1 | 20.4 | 42.05 | 42.3 | 2.0 | 24.5 | 0 | 61.0 | 61.0 |

25% of the bypass on basins N - 3 & N - 6 spill east due to the grade of the road

The 40% East spill over at basin T - 2 is added to the total Q at basin N - 6  50% of the bypass at basin B - 1 in North Tejon is collected in N - 3.

The existing storm sewers are at capacity and cannot accept additional runoff from the Nevada Street basin.

NEVADA RATIONAL METHOD BOULDER

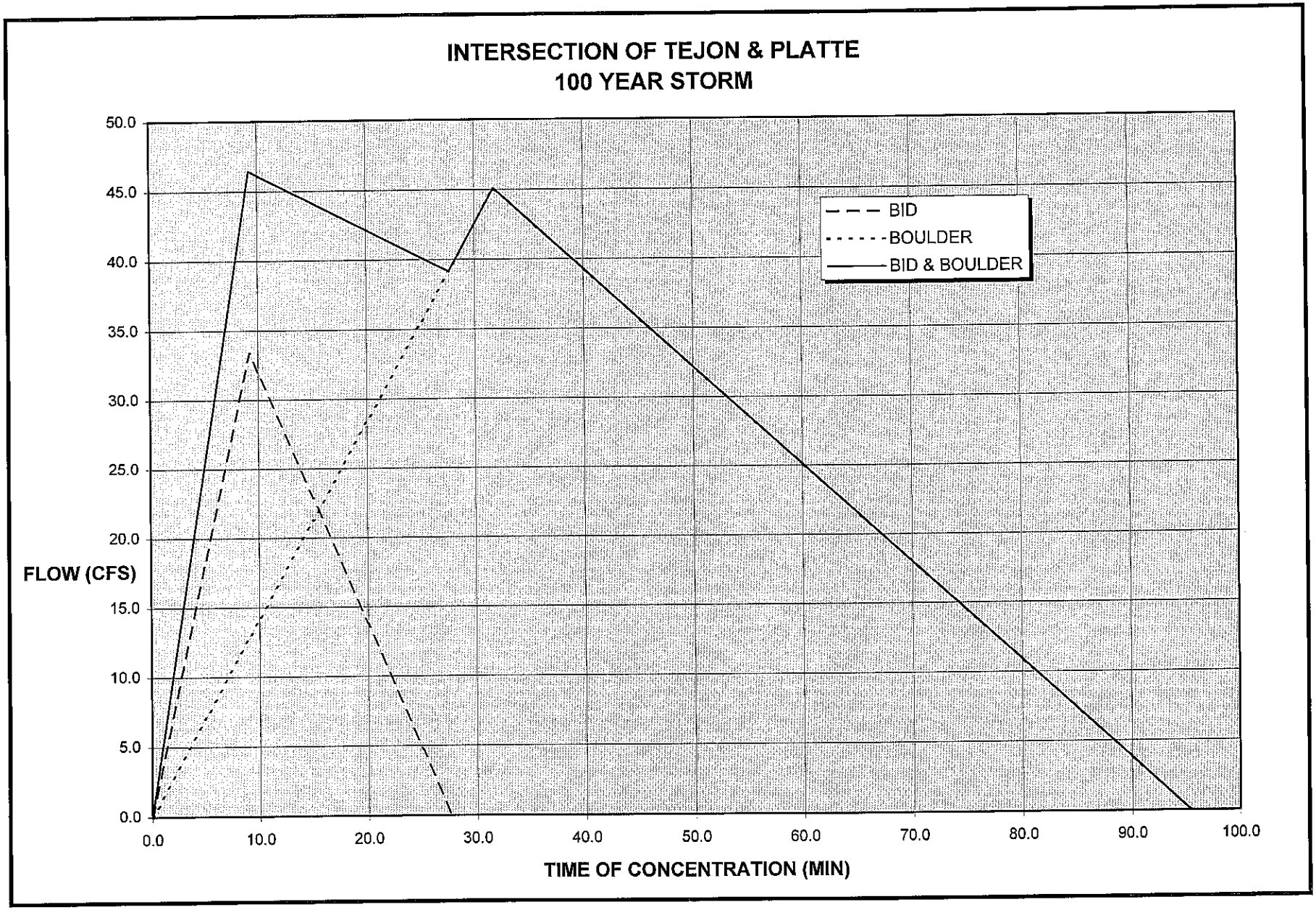
## 100-YEAR RATIONAL

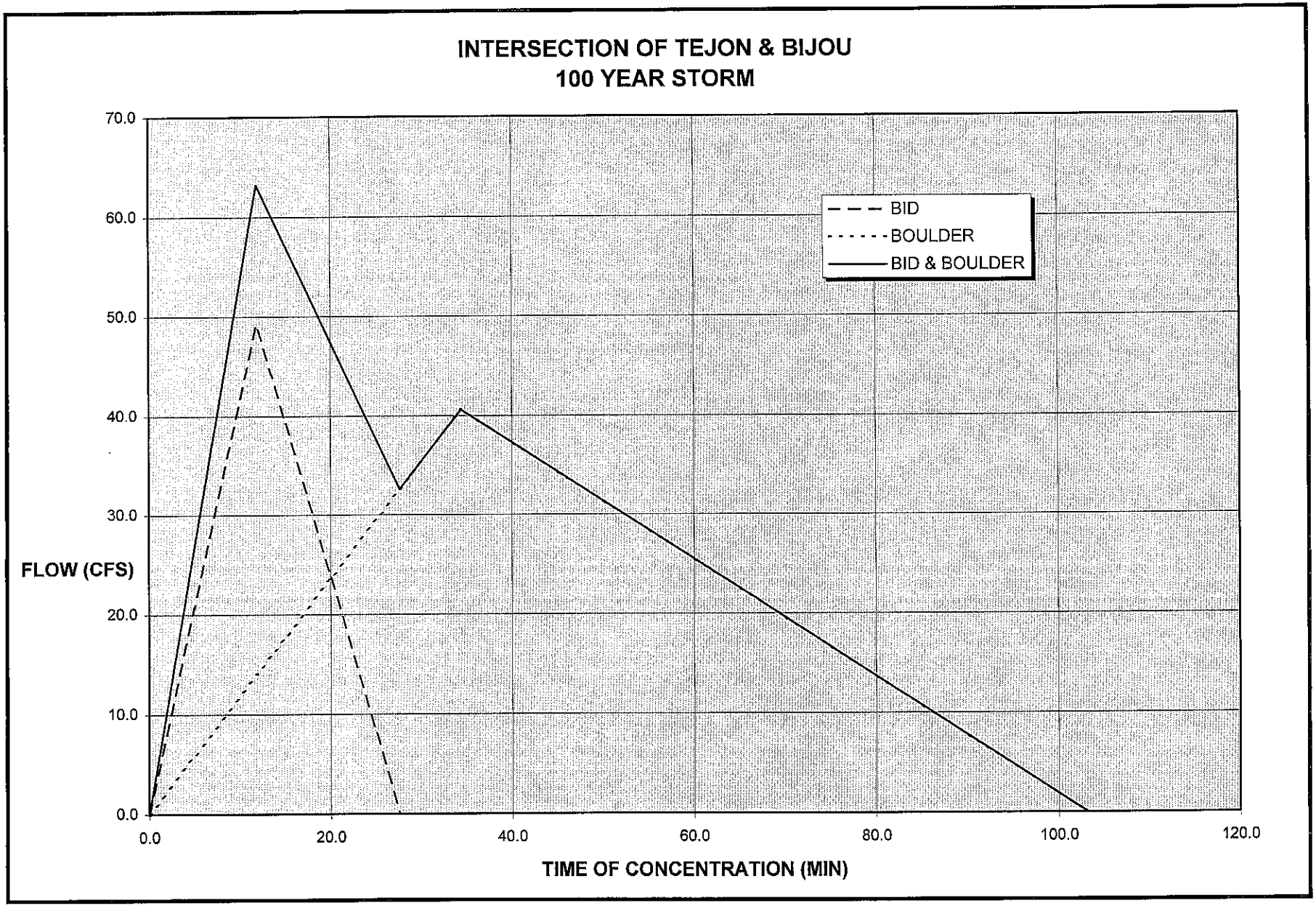
| BASIN | AREA (ACRES) | "C" FACTOR | INITIAL TIME OF CONCENTRATION | TRAVEL TIME | BASIN TIME OF CONCENTRATION | RAINFALL INTENSITY | C*A | SUB-BASIN "Q" | SUM C*A | TRAVEL TIME BETWEEN BASINS | TOTAL Tc | TOTAL RAINFALL INTENSITY | SUMMATION OF "Q" | SUMMATION OF AREA | CUMULATIVE $T_c$ | CUMULATIVE INTENSITY | CUMULATIVE SUM C*A | EXIT THROUGH PIPE FLOW | TOTAL "Q" | BYPASS "Q" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASIN | AREA | C | Ti | Tt | Tc | I | CA | Q | Σ CA | ΔT | Σ Tc | Σ I | Σ Q | ΣA | | | | $X_P$ | TQ | BQ |
| B -1 | 11.40 | 0.88 | | | | 4.21 | 10.0 | 42.2 | 10.0 | | 29.20 | 4.21 | 42.2 | 11.40 | 29.20 | 4.21 | 10.0 | | 42.2 | 42.2 |
| N - 1 | 0.73 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 0.6 | 5.3 | 0.6 | | | | | 0.7 | | | | | | |
| N - 2 | 0.74 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 5.7 | 1.3 | | | | | 1.5 | | | | | | |
| N - 3 | 4.71 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 4.1 | 36.1 | 5.4 | 4.0 | 9.5 | 7.3 | 39.6 | 6.2 | 31.8 | 4.0 | 5.4 | 9 | 93.6 | 63.4 |
| N - 4 | 0.75 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 0.7 | 5.5 | 0.7 | | | | | 6.9 | | | | | | |
| N - 5 | 0.70 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.6 | 5.4 | 1.3 | | | | | 7.6 | | | | | | |
| N - 6 | 4.72 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 4.2 | 36.2 | 5.4 | 4.0 | 9.5 | 7.3 | 39.6 | 12.4 | 34.4 | 3.8 | 10.9 | 0 | 99.2 | 74.4 |
| N - 7 | 0.78 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 0.7 | 5.7 | 0.7 | | | | | 13.1 | | | | | | |
| N - 8 | 0.70 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.6 | 5.4 | 1.3 | | | | | 13.8 | | | | | | |
| N - 9 | 2.41 | 0.88 | 2.9 | 3.4 | 6.3 | 8.4 | 2.1 | 17.8 | 3.4 | 0.8 | | | | 16.2 | | | | | | |
| N - 10 | 0.67 | 0.88 | 2.9 | 1.3 | 4.2 | 9.4 | 0.6 | 5.5 | 4.0 | 1.6 | | | | 16.9 | | | | | | |
| N - 11 | 1.35 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.2 | 10.4 | 5.2 | 1.6 | 9.5 | 7.3 | 37.9 | 18.3 | 37.0 | 3.6 | 16.1 | 0 | 90.1 | 90.1 |
| N - 12 | 0.31 | 0.88 | 2.9 | 1.2 | 4.1 | 9.4 | 0.3 | 2.6 | 0.3 | | | | | 18.6 | | | | | | |
| N - 13 | 0.32 | 0.88 | 2.9 | 1.2 | 4.1 | 9.4 | 0.3 | 2.6 | 0.6 | | | | | 18.9 | | | | | | |
| N - 14 | 0.74 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 5.7 | 1.2 | | | | | 19.6 | | | | | | |
| N - 15 | 2.21 | 0.88 | 2.9 | 2.8 | 5.7 | 8.6 | 1.9 | 16.8 | 3.2 | | | | | 21.8 | | | | | | |
| N - 16 | 1.05 | 0.88 | 2.9 | 1.6 | 4.5 | 9.2 | 0.9 | 8.5 | 4.1 | 2.2 | | | | 22.9 | | | | | | |
| N - 17 | 1.54 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.4 | 11.8 | 5.4 | 1.7 | 9.7 | 7.2 | 39.3 | 24.4 | 39.7 | 3.5 | 21.5 | 0 | 105.3 | 105.3 |
| N - 18 | 0.47 | 0.88 | 2.9 | 2.0 | 4.9 | 9.0 | 0.4 | 3.7 | 0.4 | | | | | 24.9 | | | | | | |
| N - 19 | 0.33 | 0.88 | 2.9 | 1.4 | 4.3 | 9.3 | 0.3 | 2.7 | 0.7 | | | | | 25.2 | | | | | | |
| N - 20 | 0.78 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 0.7 | 6.0 | 1.4 | | | | | 26.0 | | | | | | |
| N - 21 | 2.70 | 0.88 | 2.9 | 3.6 | 6.5 | 8.3 | 2.4 | 19.8 | 3.8 | 0.8 | | | | 28.7 | | | | | | |
| N - 22 | 0.58 | 0.88 | 2.9 | 1.2 | 4.1 | 9.4 | 0.5 | 4.8 | 4.3 | 1.6 | | | | 29.3 | | | | | | |
| N - 23 | 1.36 | 0.88 | 2.9 | 2.6 | 5.5 | 8.7 | 1.2 | 10.4 | 5.5 | 1.6 | 9.5 | 7.3 | 39.9 | 30.7 | 42.3 | 3.4 | 27.0 | 0 | 119.5 | 119.5 |

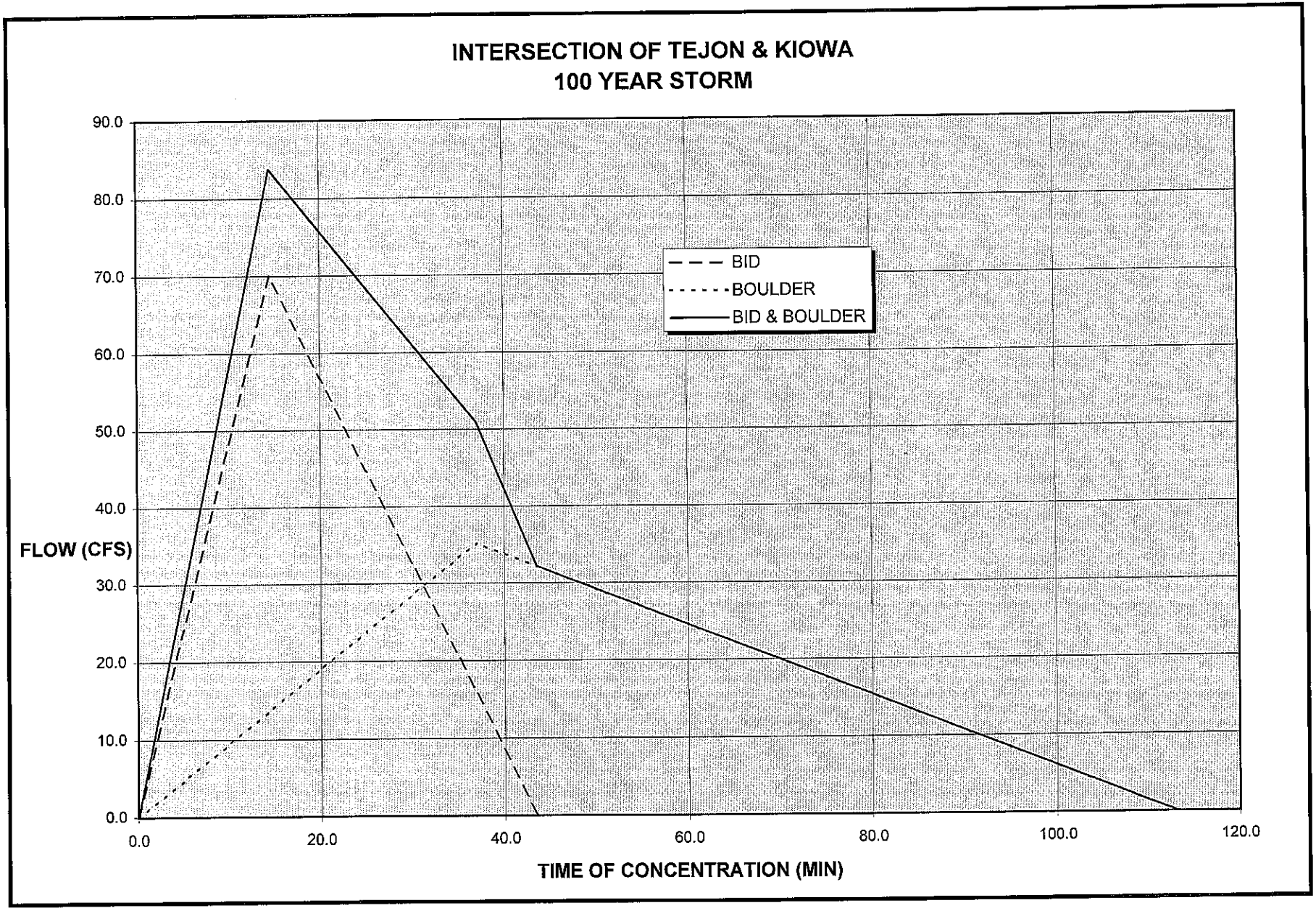
25% of the bypass on basins N - 3 & N - 6 spill east due to the grade of the road

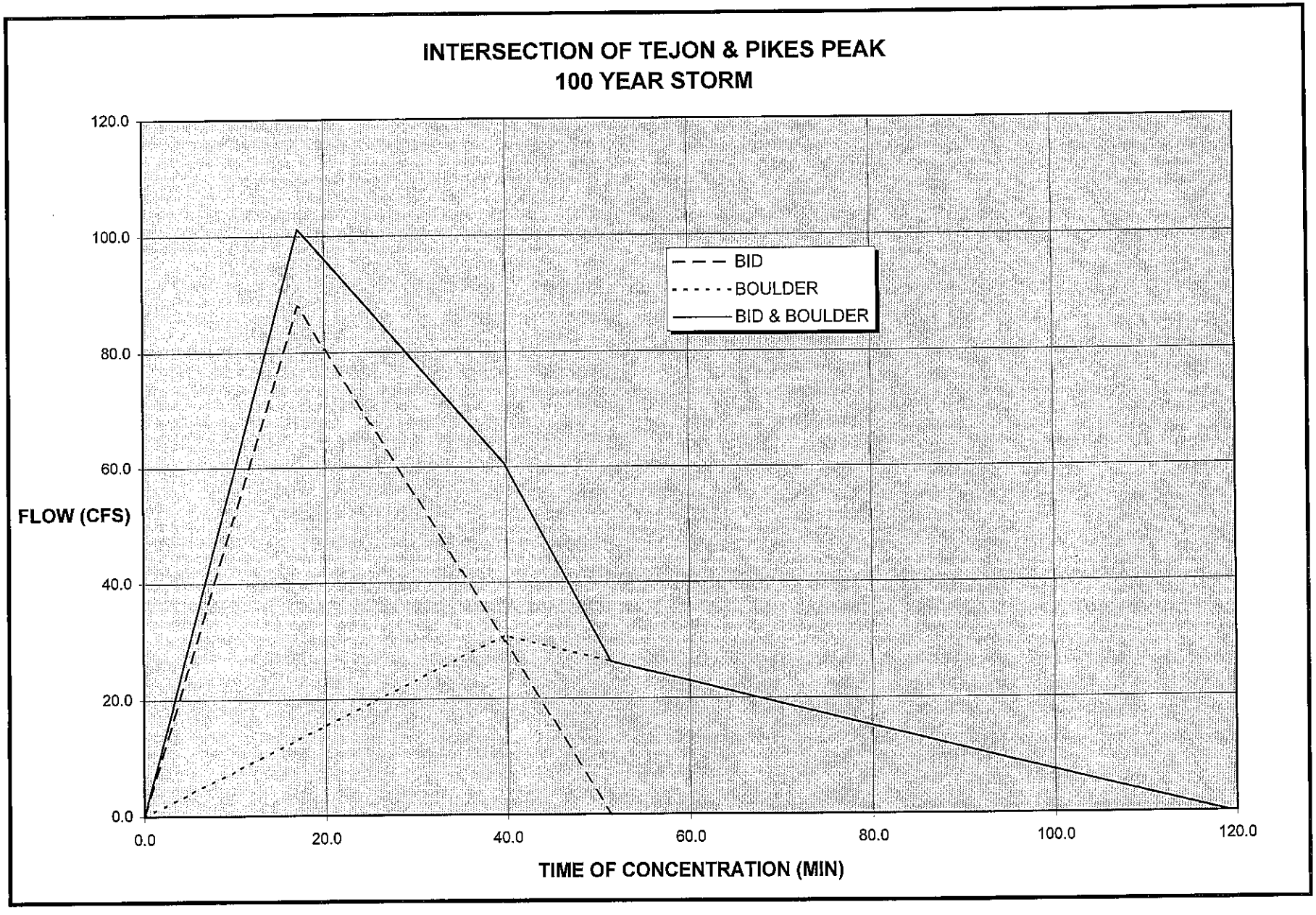
The 40% East spill over at basin T - 2 is added to the total Q at basin N - 6 50% of the bypass at basin B - 1 in North Tejon is collected in N - 3.

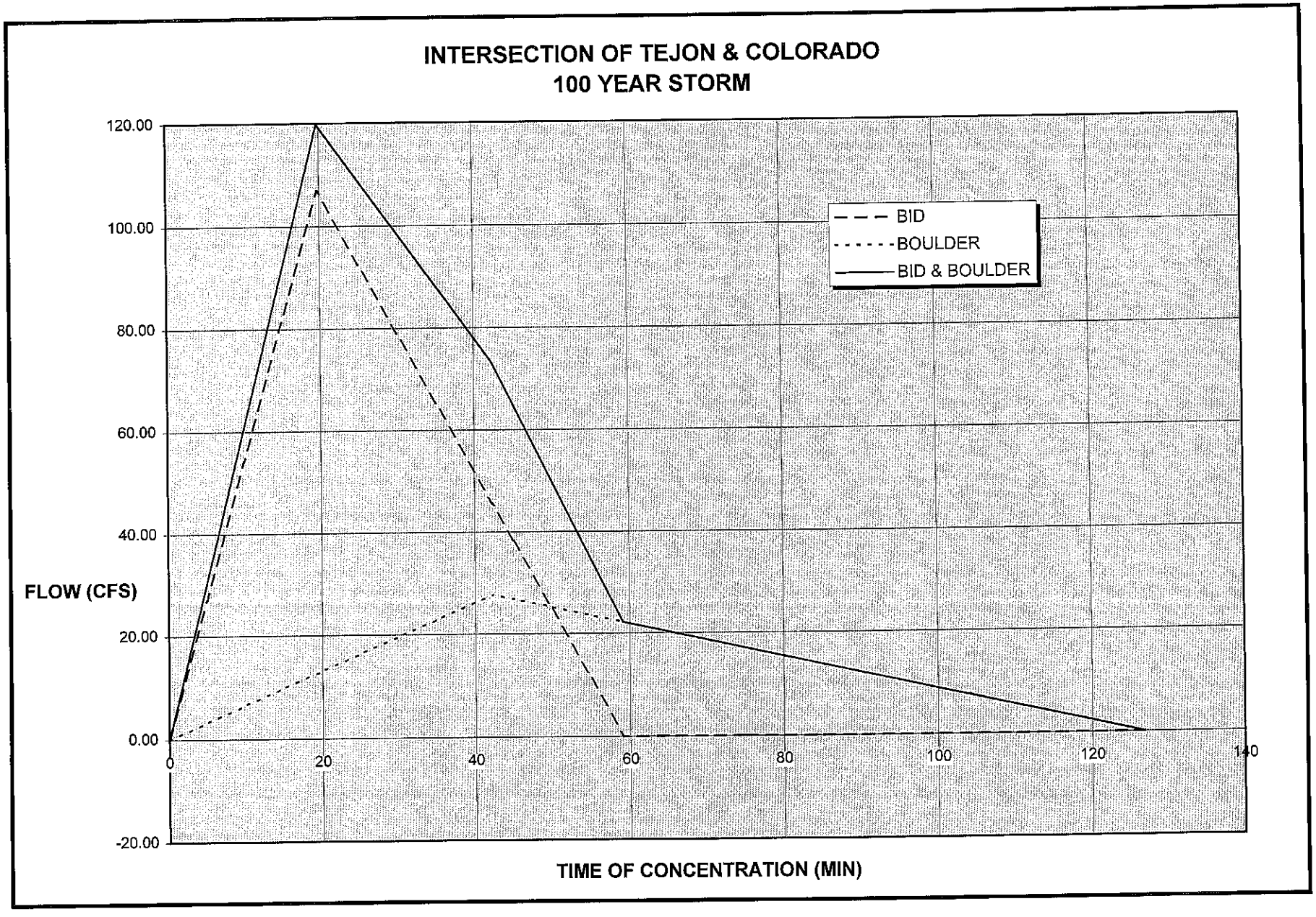
The existing storm sewers are at capacity and cannot accept additional runoff from the Nevada Street basin.

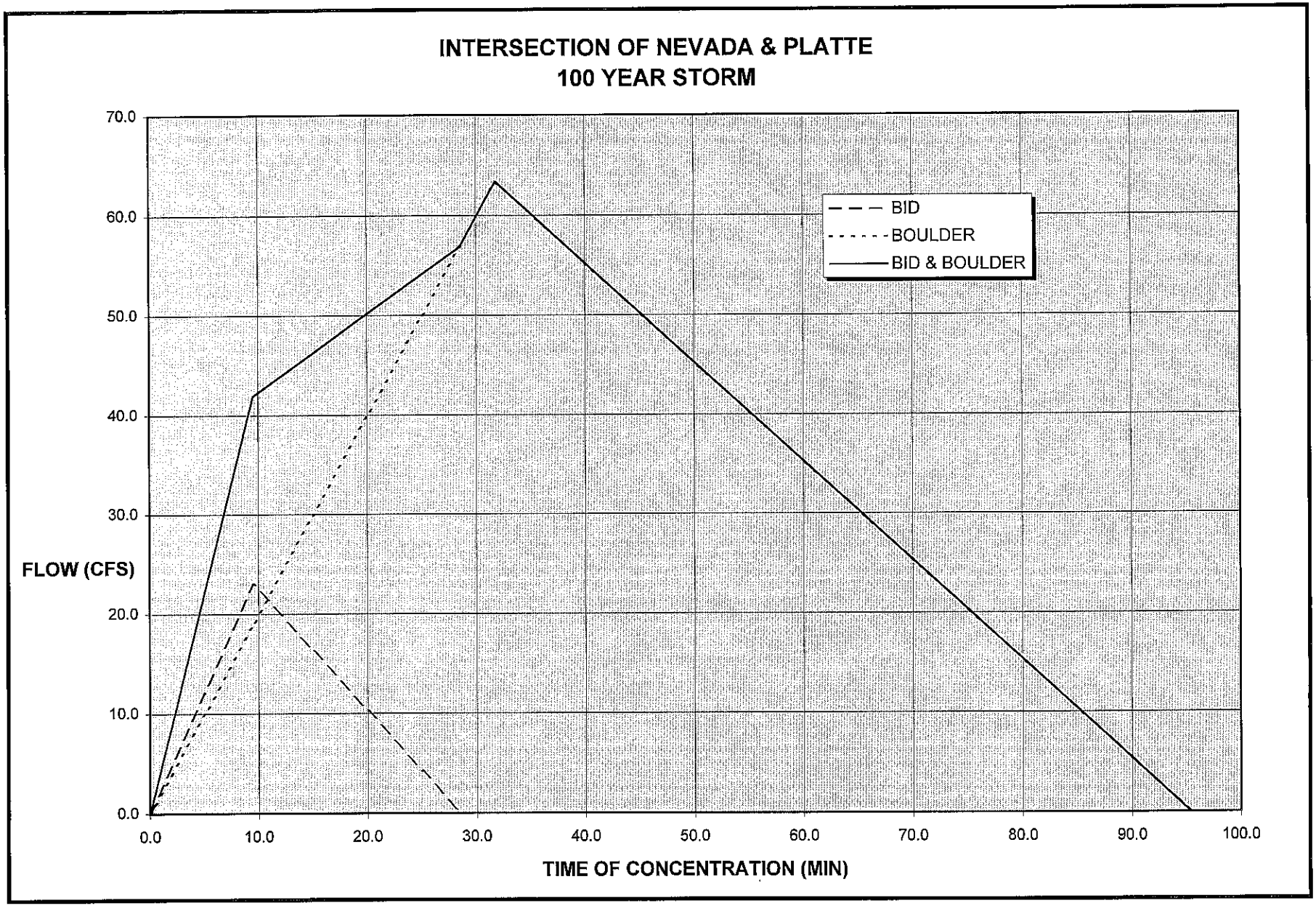

INTERSECTION OF TEJON & PLATTE
100 YEAR STORM
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
FLOW (CFS)
BID
BOULDER
BID & BOULDER
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
TIME OF CONCENTRATION (MIN)

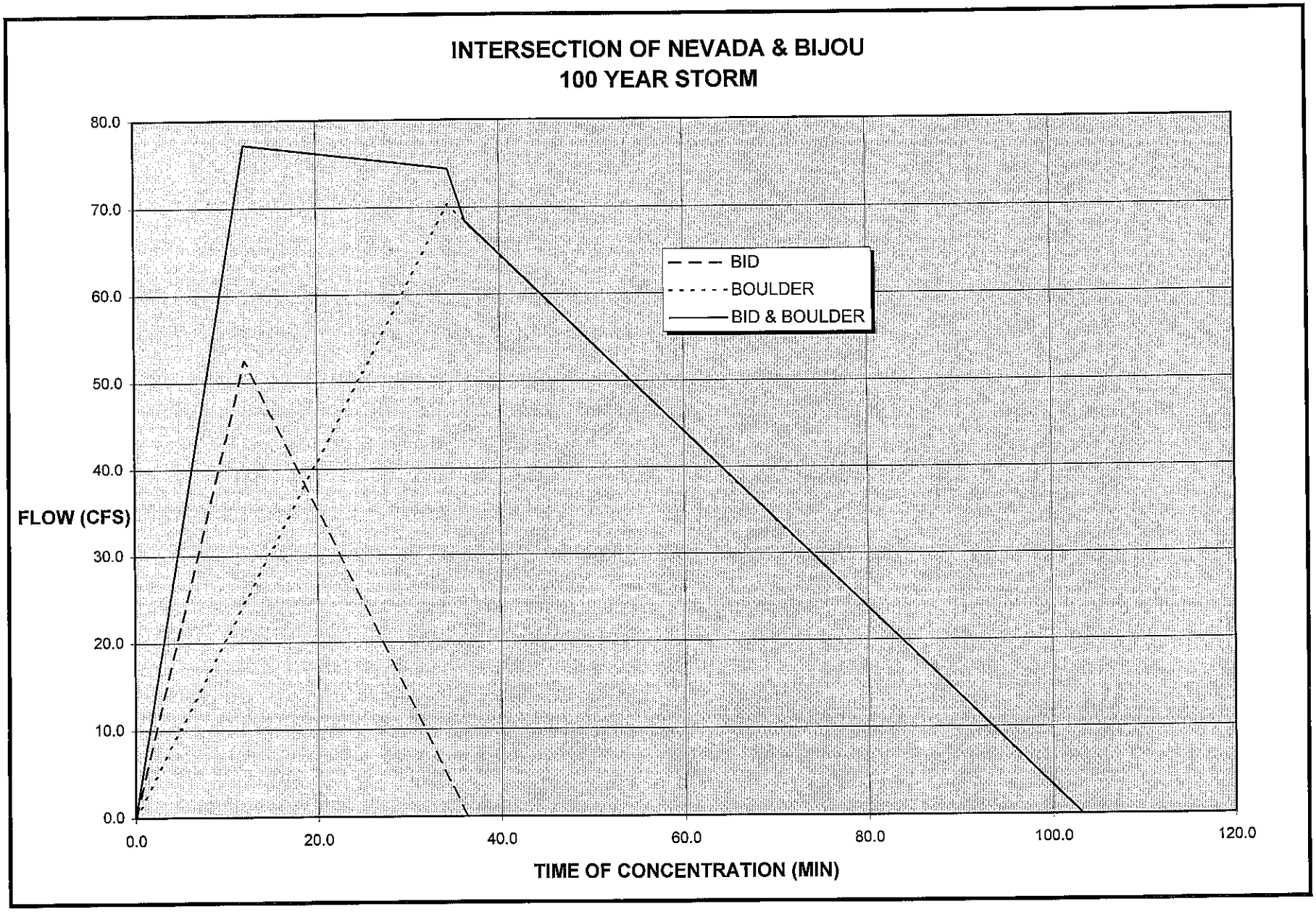

INTERSECTION OF TEJON & BIJOU
100 YEAR STORM
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
FLOW (CFS)
BID
BOULDER
BID & BOULDER
0.0
20.0
40.0
60.0
80.0
100.0
120.0
TIME OF CONCENTRATION (MIN)

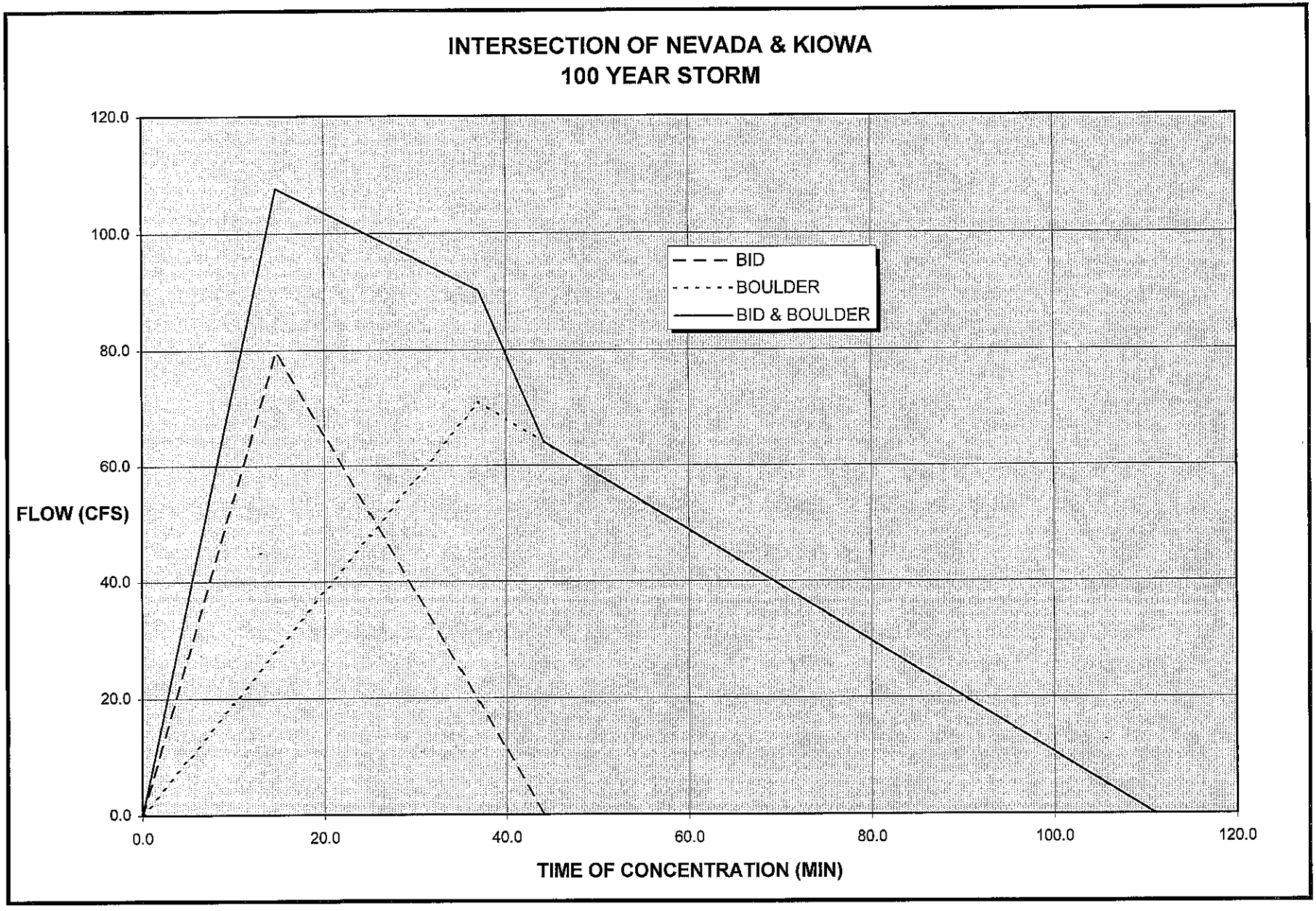

INTERSECTION OF TEJON & KIOWA
100 YEAR STORM
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
FLOW (CFS)
BID
BOULDER
BID & BOULDER
0.0
20.0
40.0
60.0
80.0
100.0
120.0
TIME OF CONCENTRATION (MIN)

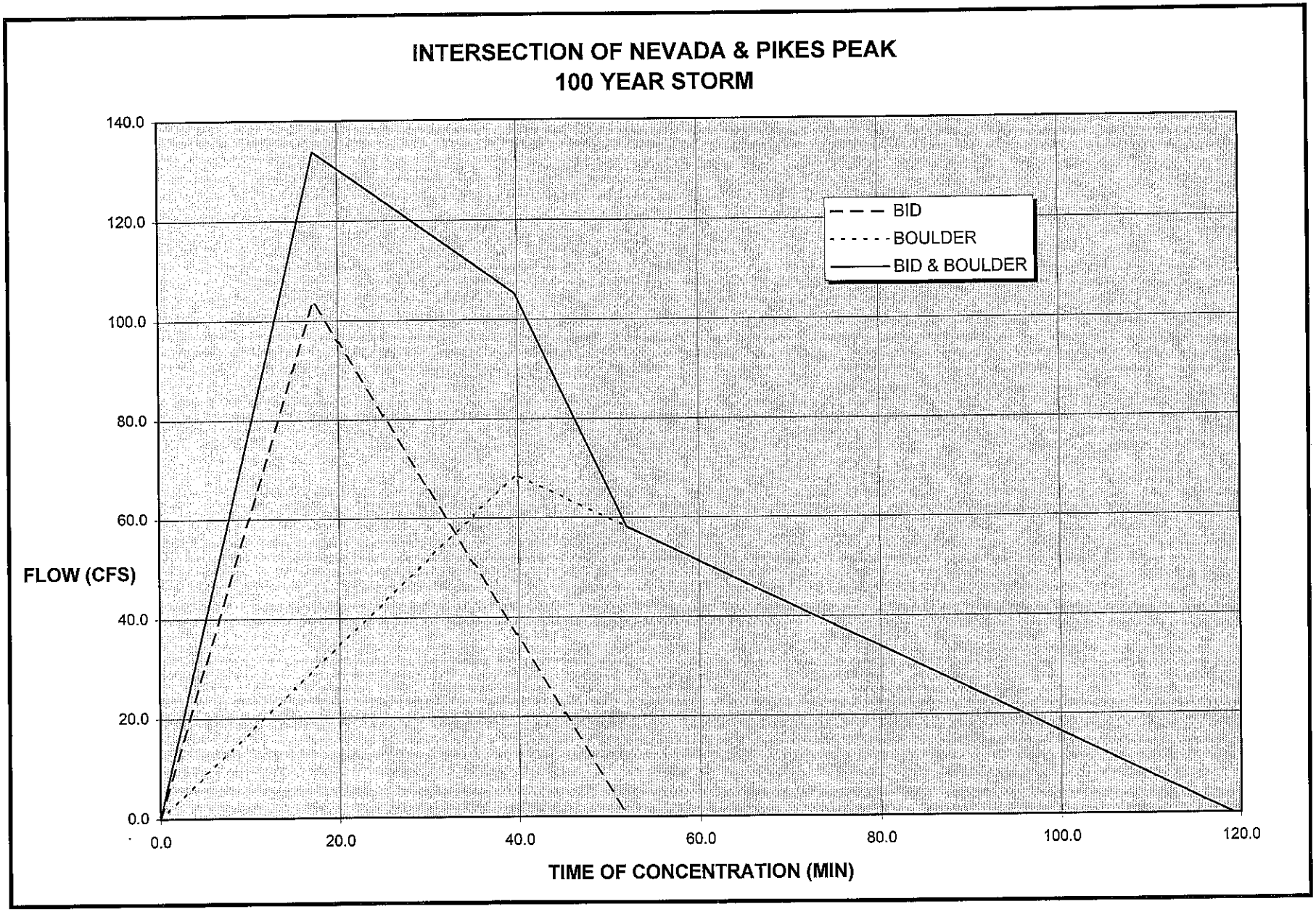

INTERSECTION OF TEJON & PIKES PEAK
100 YEAR STORM
120.0
100.0
80.0
60.0
40.0
20.0
0.0
FLOW (CFS)
BID
BOULDER
BID & BOULDER
0.0
20.0
40.0
60.0
80.0
100.0
120.0
TIME OF CONCENTRATION (MIN)

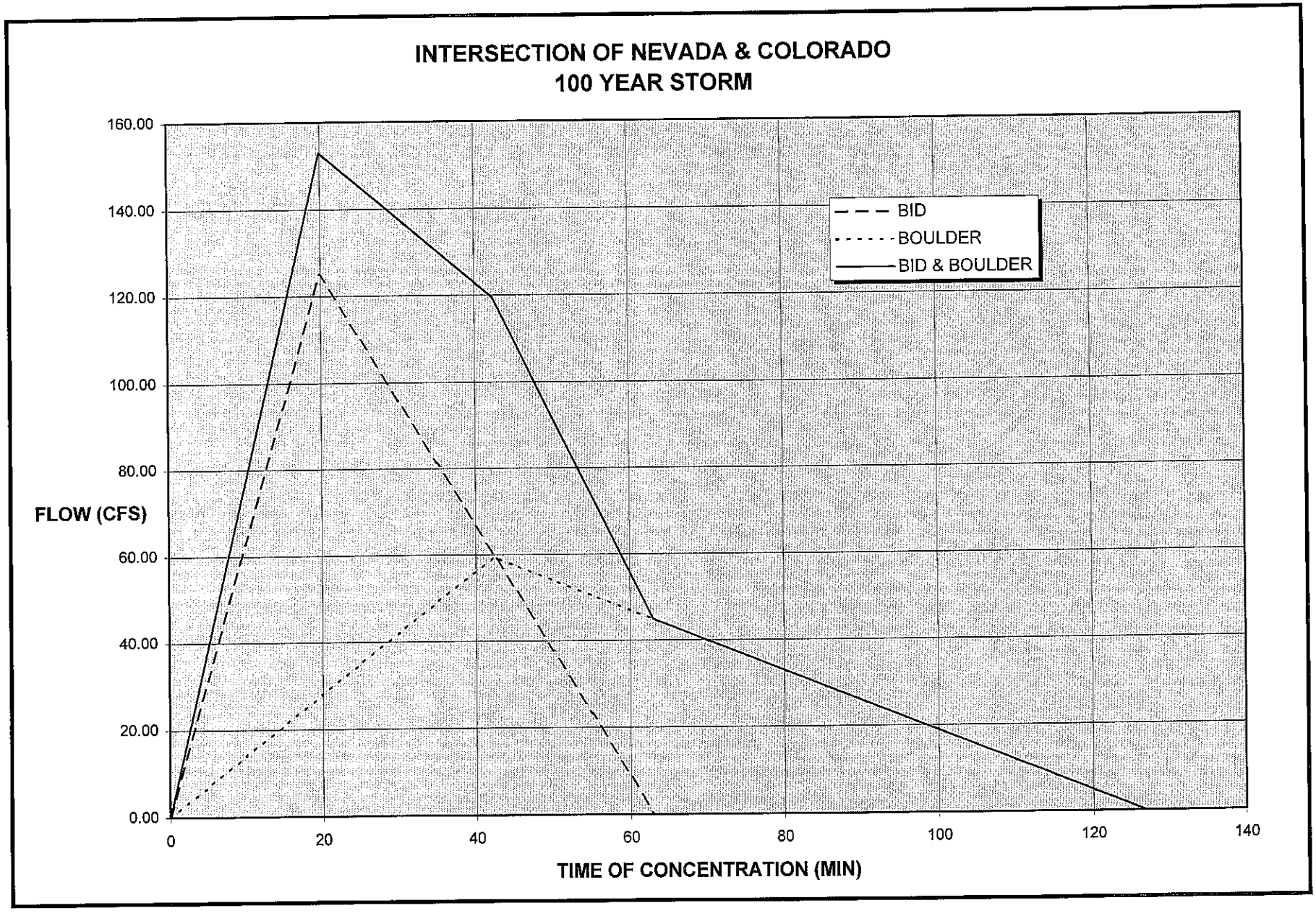

INTERSECTION OF TEJON & COLORADO
100 YEAR STORM
120.00
100.00
80.00
60.00
40.00
20.00
0.00
-20.00
FLOW (CFS)
0
20
40
60
80
100
120
140
TIME OF CONCENTRATION (MIN)
BID
BOULDER
BID & BOULDER


INTERSECTION OF NEVADA & PLATTE
100 YEAR STORM
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
FLOW (CFS)
BID
BOULDER
BID & BOULDER
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
TIME OF CONCENTRATION (MIN)


INTERSECTION OF NEVADA & BIJOU
100 YEAR STORM
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
FLOW (CFS)
BID
BOULDER
BID & BOULDER
0.0
20.0
40.0
60.0
80.0
100.0
120.0
TIME OF CONCENTRATION (MIN)


INTERSECTION OF NEVADA & KIOWA
100 YEAR STORM
120.0
100.0
80.0
60.0
40.0
20.0
0.0
FLOW (CFS)
BID
BOULDER
BID & BOULDER
0.0
20.0
40.0
60.0
80.0
100.0
120.0
TIME OF CONCENTRATION (MIN)


INTERSECTION OF NEVADA & PIKES PEAK
100 YEAR STORM
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
FLOW (CFS)
BID
BOULDER
BID & BOULDER
0.0
20.0
40.0
60.0
80.0
100.0
120.0
TIME OF CONCENTRATION (MIN)


INTERSECTION OF NEVADA & COLORADO
100 YEAR STORM
160.00
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
FLOW (CFS)
0
20
40
60
80
100
120
140
TIME OF CONCENTRATION (MIN)
BID
BOULDER
BID & BOULDER

# Intersection of Kiowa & Nevada
## Worksheet for Irregular Channel

w/ Boulder Storm Drain
5 year

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 3 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | | | |
|---|---|---|---|---|
| Channel Slope | 0.009000 ft/ft | | | |
| Elevation range: 6,008.40 ft to 6,011.00 ft. | | | | |
| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
| 0.00 | 6,011.00 | 0.00 | 69.00 | 0.023 |
| 0.00 | 6,009.52 | | | |
| 19.00 | 6,009.18 | | | |
| 19.00 | 6,008.40 | | | |
| 69.00 | 6,010.16 | | | |
| Discharge | 30.00 cfs | | | |

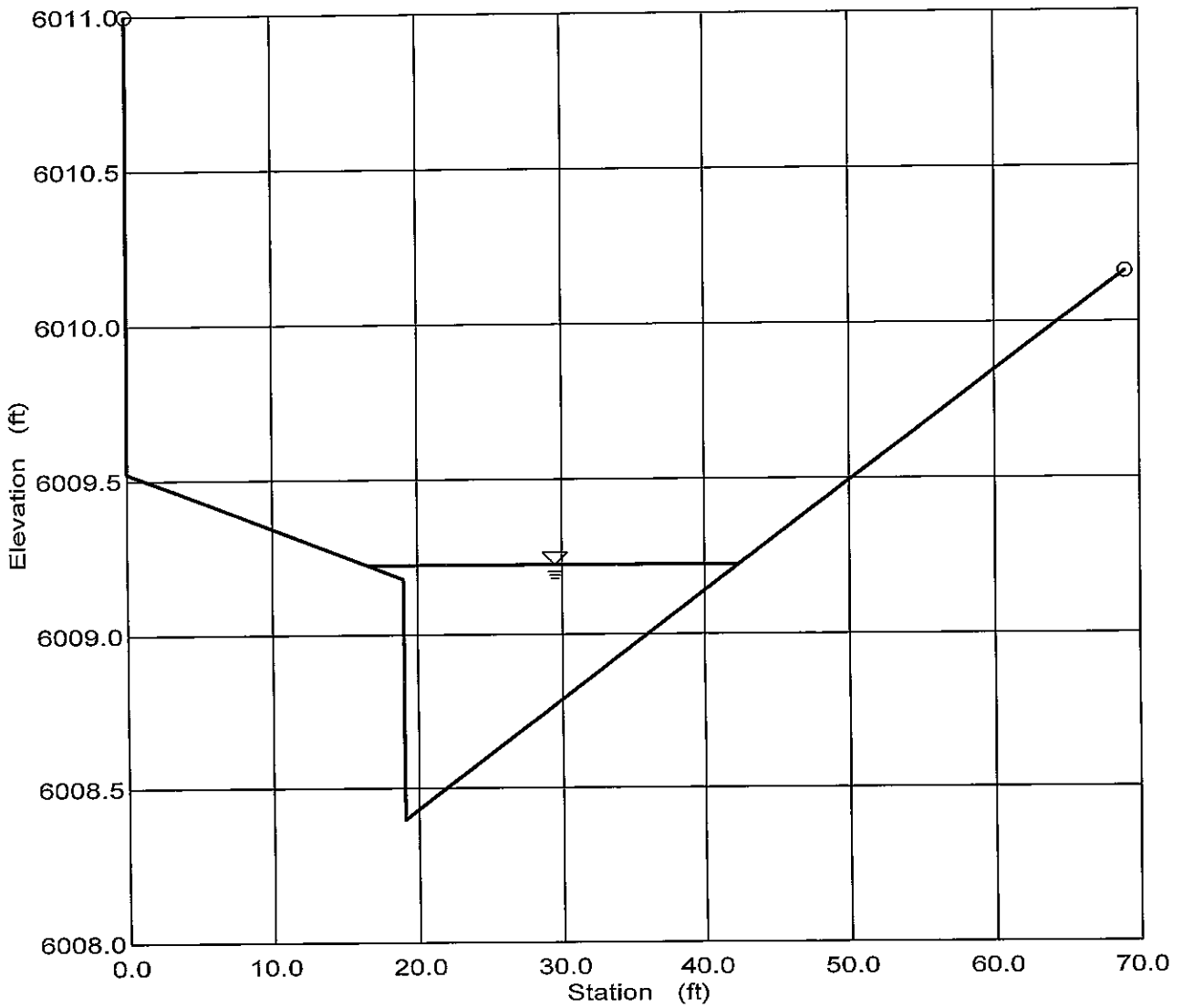
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,009.22 | ft |
| Flow Area | 9.59 | ft² |
| Wetted Perimeter | 26.31 | ft |
| Top Width | 25.52 | ft |
| Height | 0.82 | ft |
| Critical Depth | 6,009.17 | ft |
| Critical Slope | 0.011087 | ft/ft |
| Velocity | 3.13 | ft/s |
| Velocity Head | 0.15 | ft |
| Specific Energy | 6,009.37 | ft |
| Froude Number | 0.90 | |
| Flow is subcritical. | | |

NO FLOODING

# Cross Section Kiowa & Nevada
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 3 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,009.22 | ft |
| Discharge | 30.00 | cfs |



# Intersection of Kiowa & Nevada
## Worksheet for Irregular Channel

W/ BOULDER STORM DRAIN
100 YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 3 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | | | |
|---|---|---|---|---|
| Channel Slope | 0.009000 ft/ft | | | |
| Elevation range: 6,008.40 ft to 6,011.00 ft. | | | | |
| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
| 0.00 | 6,011.00 | 0.00 | 69.00 | 0.023 |
| 0.00 | 6,009.52 | | | |
| 19.00 | 6,009.18 | | | |
| 19.00 | 6,008.40 | | | |
| 69.00 | 6,010.16 | | | |
| Discharge | 80.00 cfs | | | |

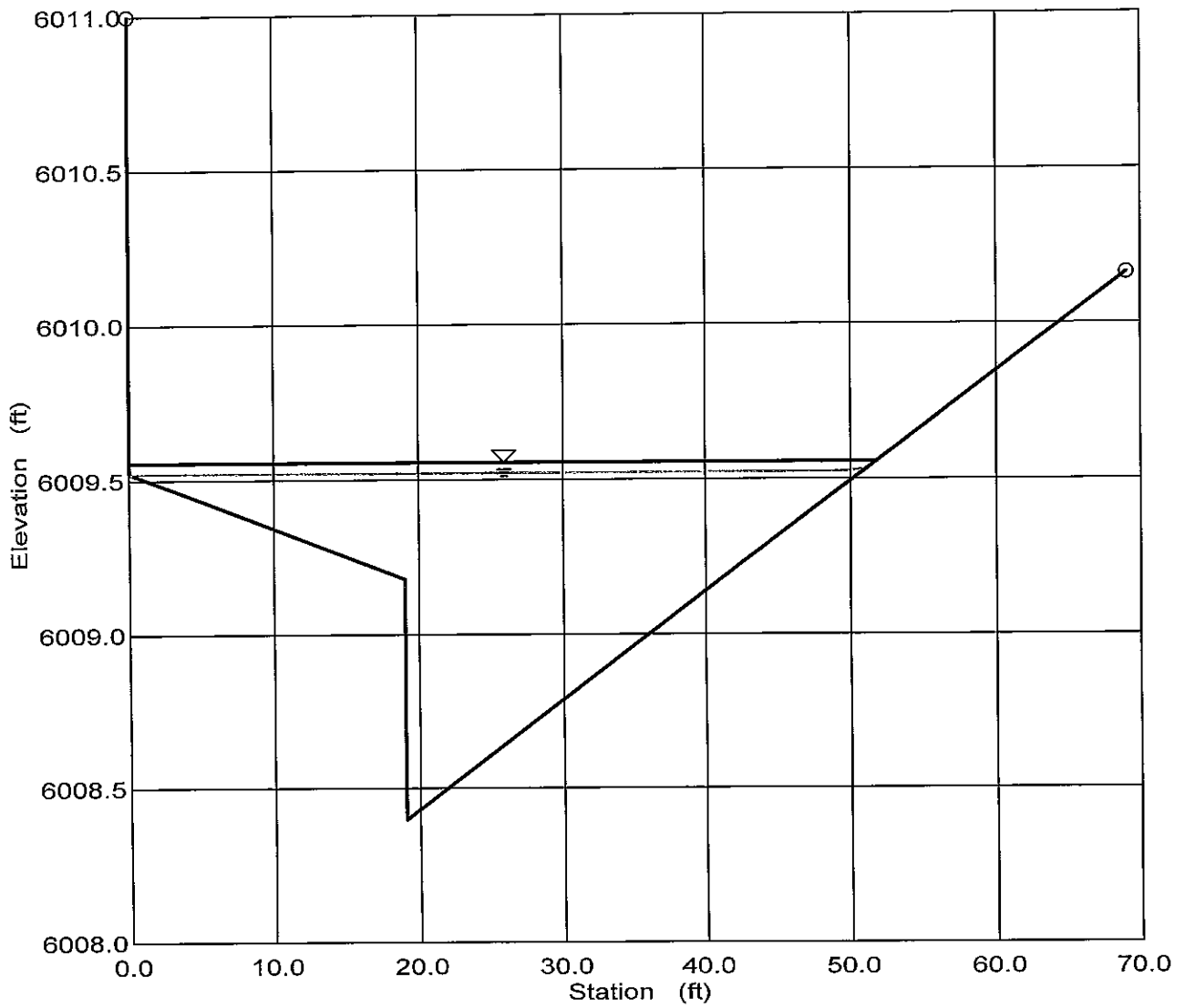
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,009.55 | ft |
| Flow Area | 22.80 | ft² |
| Wetted Perimeter | 52.62 | ft |
| Top Width | 51.79 | ft |
| Height | 1.15 | ft |
| Critical Depth | 6,009.53 | ft |
| Critical Slope | 0.010483 | ft/ft |
| Velocity | 3.51 | ft/s |
| Velocity Head | 0.19 | ft |
| Specific Energy | 6,009.75 | ft |
| Froude Number | 0.93 | |
| Flow is subcritical. | | |

.03' FLOODING

# Cross Section Kiowa & Nevada
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 3 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,009.55 | ft |
| Discharge | 80.00 | cfs |



# Intersection of Kiowa & Nevada
## Worksheet for Irregular Channel

w/o BOULDER STORM DRAIN
5 YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 3 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | |
|---|---|---|
| Channel Slope | 0.009000 | ft/ft |

Elevation range: 6,008.40 ft to 6,011.00 ft.

| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
|---|---|---|---|---|
| 0.00 | 6,011.00 | 0.00 | 69.00 | 0.023 |
| 0.00 | 6,009.52 | | | |
| 19.00 | 6,009.18 | | | |
| 19.00 | 6,008.40 | | | |
| 69.00 | 6,010.16 | | | |

| Discharge | 60.00 | cfs |
|---|---|---|

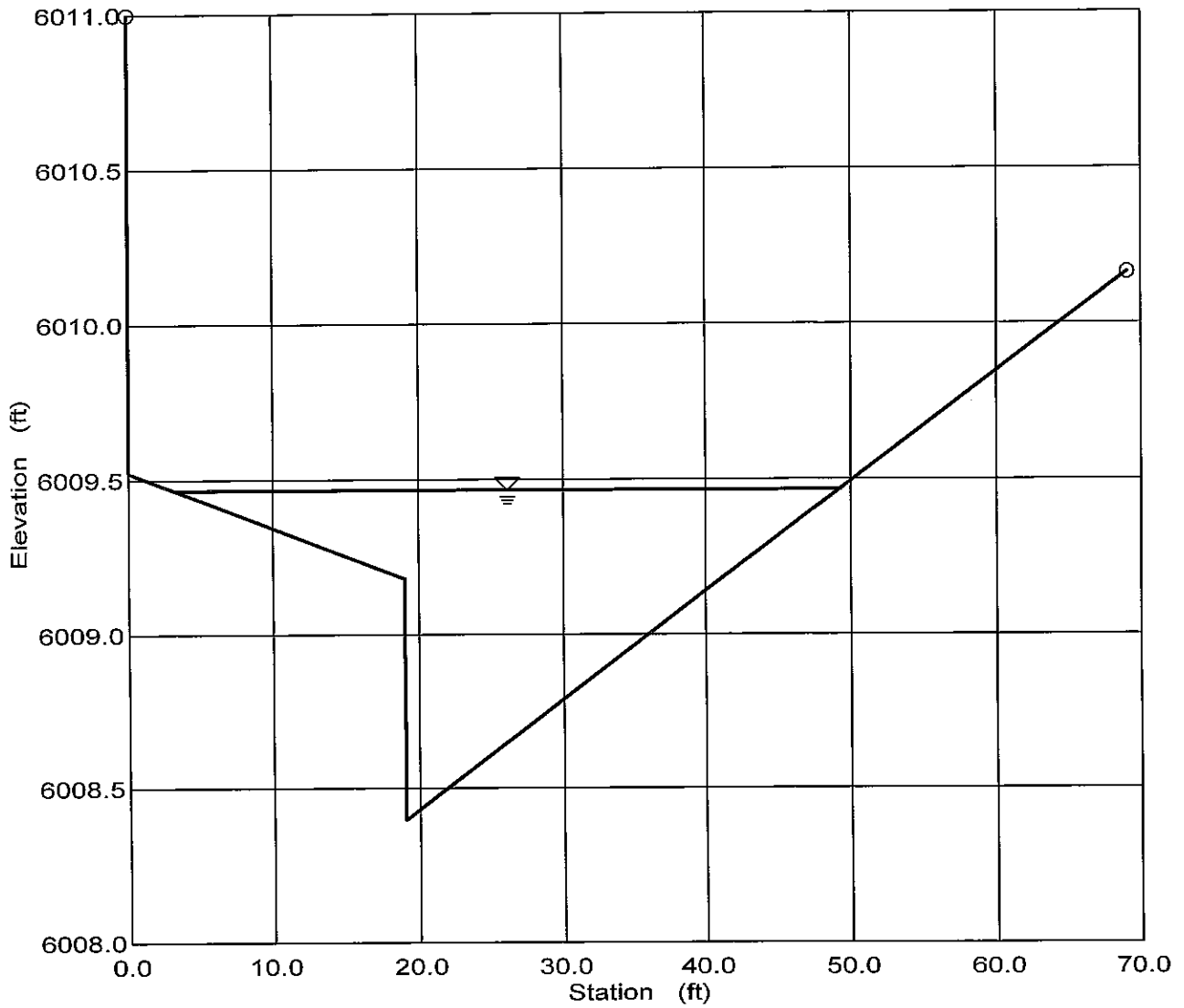
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,009.46 | ft |
| Flow Area | 18.31 | ft² |
| Wetted Perimeter | 46.86 | ft |
| Top Width | 46.06 | ft |
| Height | 1.06 | ft |
| Critical Depth | 6,009.43 | ft |
| Critical Slope | 0.010813 | ft/ft |
| Velocity | 3.28 | ft/s |
| Velocity Head | 0.17 | ft |
| Specific Energy | 6,009.63 | ft |
| Froude Number | 0.92 | |
| Flow is subcritical. | | |

NO FLOODING

# Cross Section Kiowa & Nevada
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 3 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,009.46 | ft |
| Discharge | 60.00 | cfs |



# Intersection of Kiowa & Nevada
## Worksheet for Irregular Channel

w/o BOULDER STORM DRAIN
100 YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 3 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | |
|---|---|---|
| Channel Slope | 0.009000 | ft/ft |
| Elevation range: 6,008.40 ft to 6,011.00 ft. | | |
| Discharge | 112.00 | cfs |

| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
|---|---|---|---|---|
| 0.00 | 6,011.00 | 0.00 | 69.00 | 0.023 |
| 0.00 | 6,009.52 | | | |
| 19.00 | 6,009.18 | | | |
| 19.00 | 6,008.40 | | | |
| 69.00 | 6,010.16 | | | |

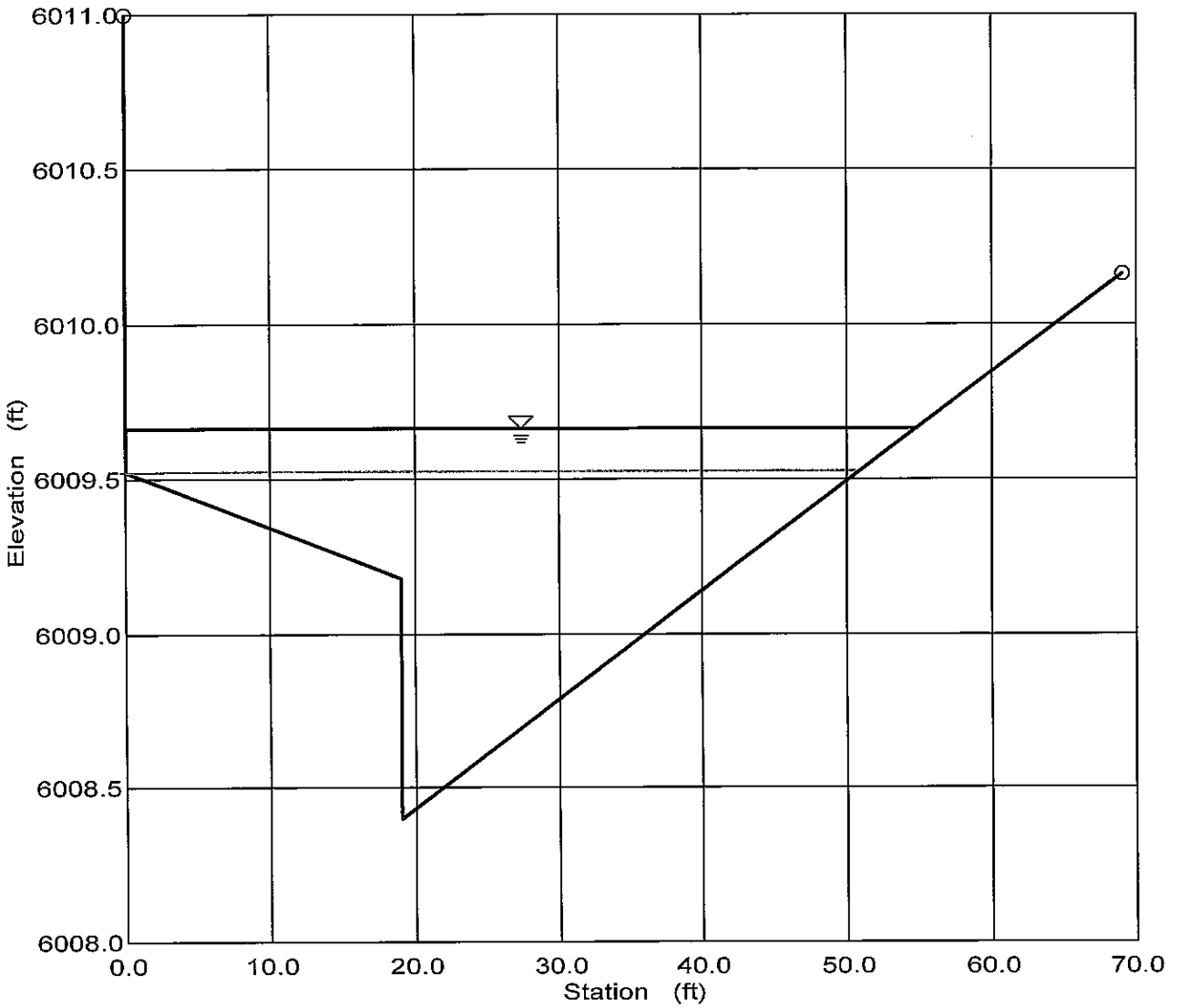
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,009.66 | ft |
| Flow Area | 28.56 | ft² |
| Wetted Perimeter | 55.80 | ft |
| Top Width | 54.86 | ft |
| Height | 1.26 | ft |
| Critical Depth | 6,009.65 | ft |
| Critical Slope | 0.009877 | ft/ft |
| Velocity | 3.92 | ft/s |
| Velocity Head | 0.24 | ft |
| Specific Energy | 6,009.90 | ft |
| Froude Number | 0.96 | |
| Flow is subcritical. | | |

.14' FLOODING

# Cross Section Kiowa & Nevada
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 3 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,009.66 | ft |
| Discharge | 112.00 | cfs |



# Intersection Tejon & Colorado
## Worksheet for Irregular Channel

W/ Boulder Storm Drain
5 YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 2 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | | | |
|---|---|---|---|---|
| Channel Slope | 0.009000 ft/ft | | | |
| Elevation range: 6,000.44 ft to 6,004.00 ft. | | | | |
| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
| 0.00 | 6,004.00 | 0.00 | 48.00 | 0.023 |
| 0.00 | 6,001.64 | | | |
| 15.00 | 6,000.95 | | | |
| 15.00 | 6,000.44 | | | |
| 48.00 | 6,001.86 | | | |
| Discharge | 44.20 cfs | | | |

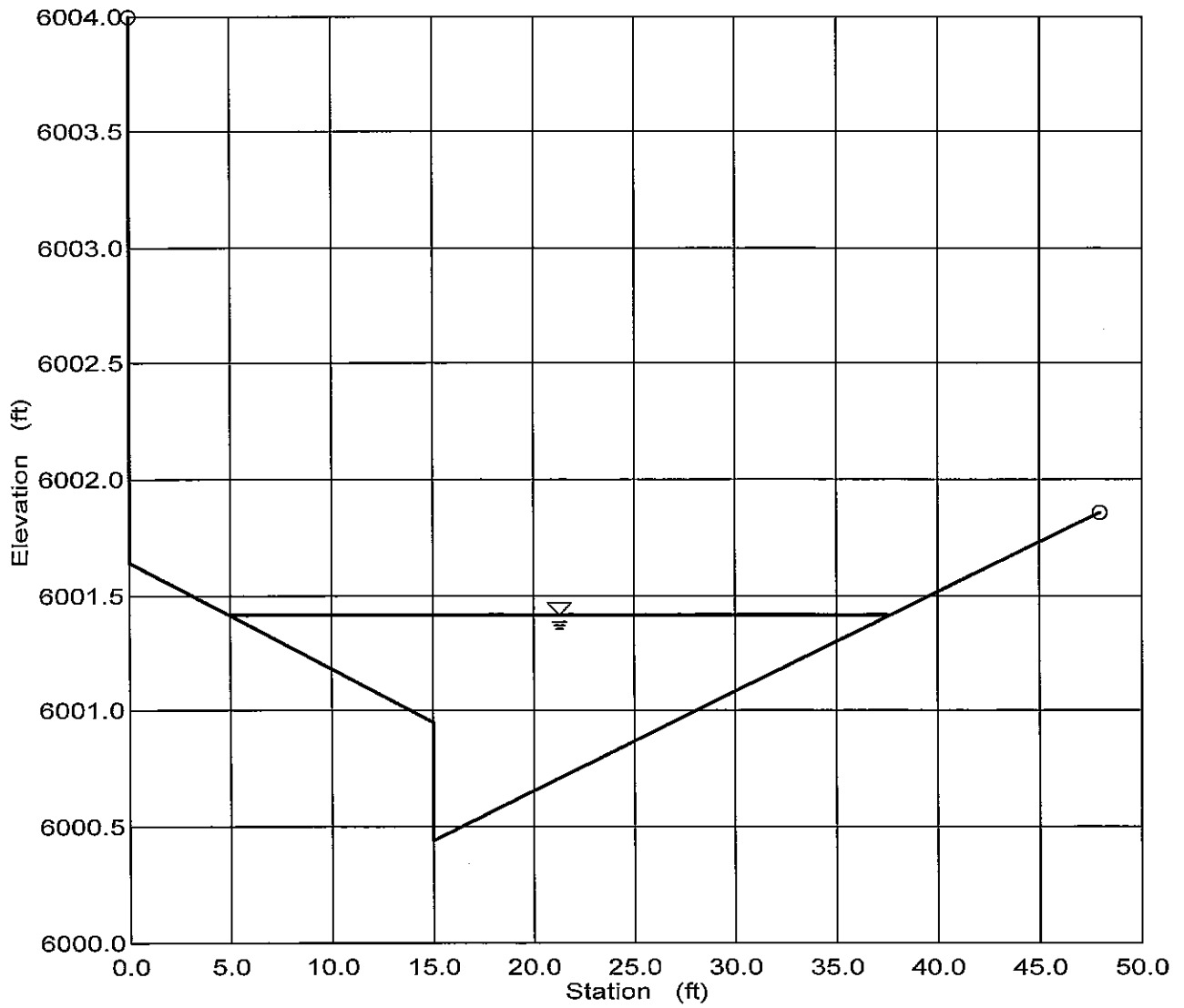
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,001.41 | ft |
| Flow Area | 13.27 | ft² |
| Wetted Perimeter | 33.14 | ft |
| Top Width | 32.60 | ft |
| Height | 0.97 | ft |
| Critical Depth | 6,001.38 | ft |
| Critical Slope | 0.010746 | ft/ft |
| Velocity | 3.33 | ft/s |
| Velocity Head | 0.17 | ft |
| Specific Energy | 6,001.58 | ft |
| Froude Number | 0.92 | |
| Flow is subcritical. | | |

NO FLOODING

# Cross Section Colorado & Tejon
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 2 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,001.41 | ft |
| Discharge | 44.20 | cfs |



# Intersection Tejon & Colorado
## Worksheet for Irregular Channel

W/ BOULDER STORM DRAIN
100 YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 2 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | | | |
|---|---|---|---|---|
| Channel Slope | 0.009000 ft/ft | | | |
| Elevation range: 6,000.44 ft to 6,004.00 ft. | | | | |
| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
| 0.00 | 6,004.00 | 0.00 | 48.00 | 0.023 |
| 0.00 | 6,001.64 | | | |
| 15.00 | 6,000.95 | | | |
| 15.00 | 6,000.44 | | | |
| 48.00 | 6,001.86 | | | |
| Discharge | 106.90 cfs | | | |

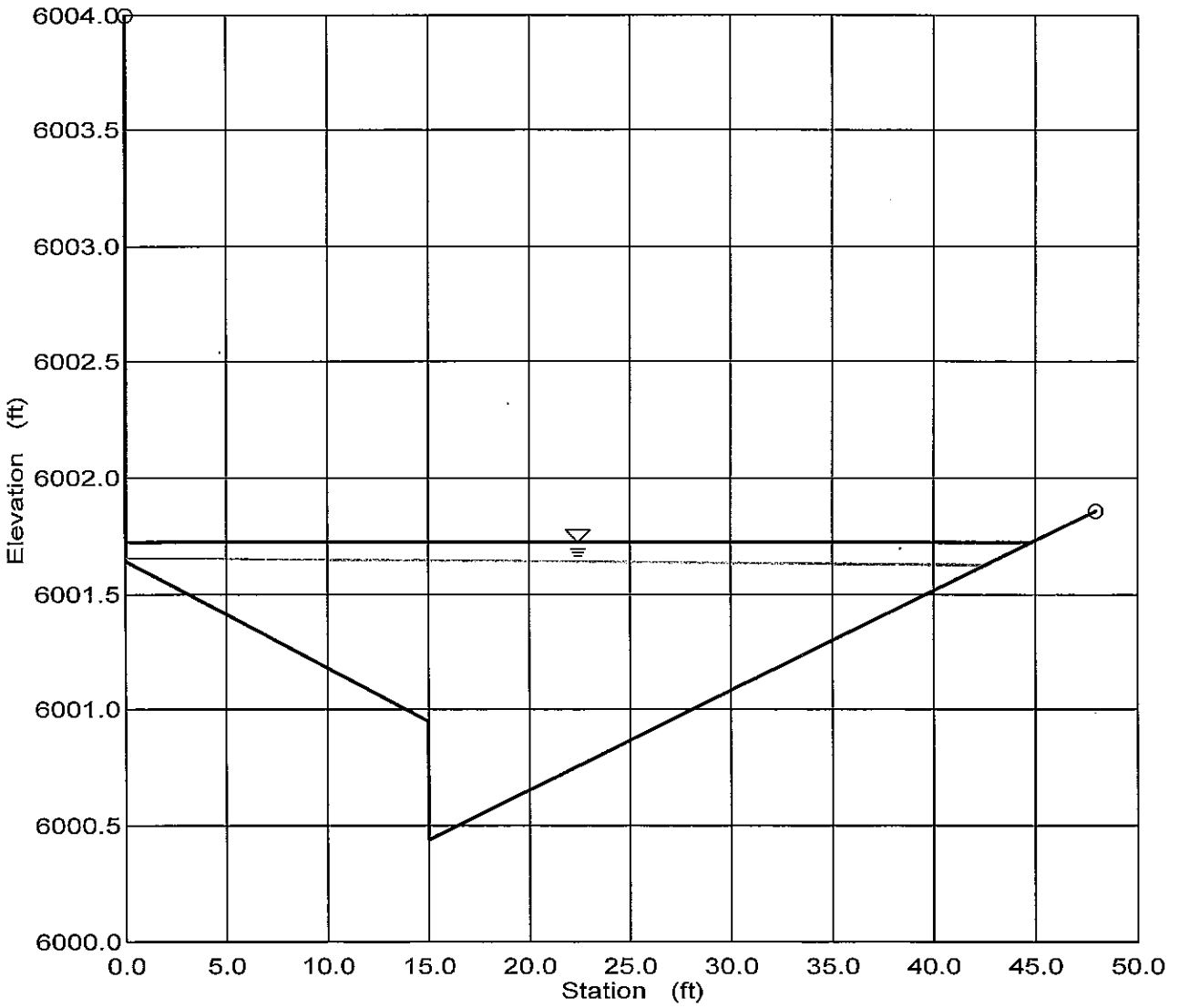
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,001.72 | ft |
| Flow Area | 25.59 | ft² |
| Wetted Perimeter | 45.48 | ft |
| Top Width | 44.84 | ft |
| Height | 1.28 | ft |
| Critical Depth | 6,001.71 | ft |
| Critical Slope | 0.009510 | ft/ft |
| Velocity | 4.18 | ft/s |
| Velocity Head | 0.27 | ft |
| Specific Energy | 6,002.00 | ft |
| Froude Number | 0.97 | |
| Flow is subcritical. | | |

.08' FLOODING

# Cross Section Colorado & Tejon
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 2 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,001.72 | ft |
| Discharge | 106.90 | cfs |



# Intersection Tejon & Colorado
## Worksheet for Irregular Channel

w/o Boulder Storm Drain
5 YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 2 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | |
|---|---|---|
| Channel Slope | 0.009000 | ft/ft |

Elevation range: 6,000.44 ft to 6,004.00 ft.

| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
|---|---|---|---|---|
| 0.00 | 6,004.00 | 0.00 | 48.00 | 0.023 |
| 0.00 | 6,001.64 | | | |
| 15.00 | 6,000.95 | | | |
| 15.00 | 6,000.44 | | | |
| 48.00 | 6,001.86 | | | |

| Discharge | 70.00 | cfs |
|---|---|---|

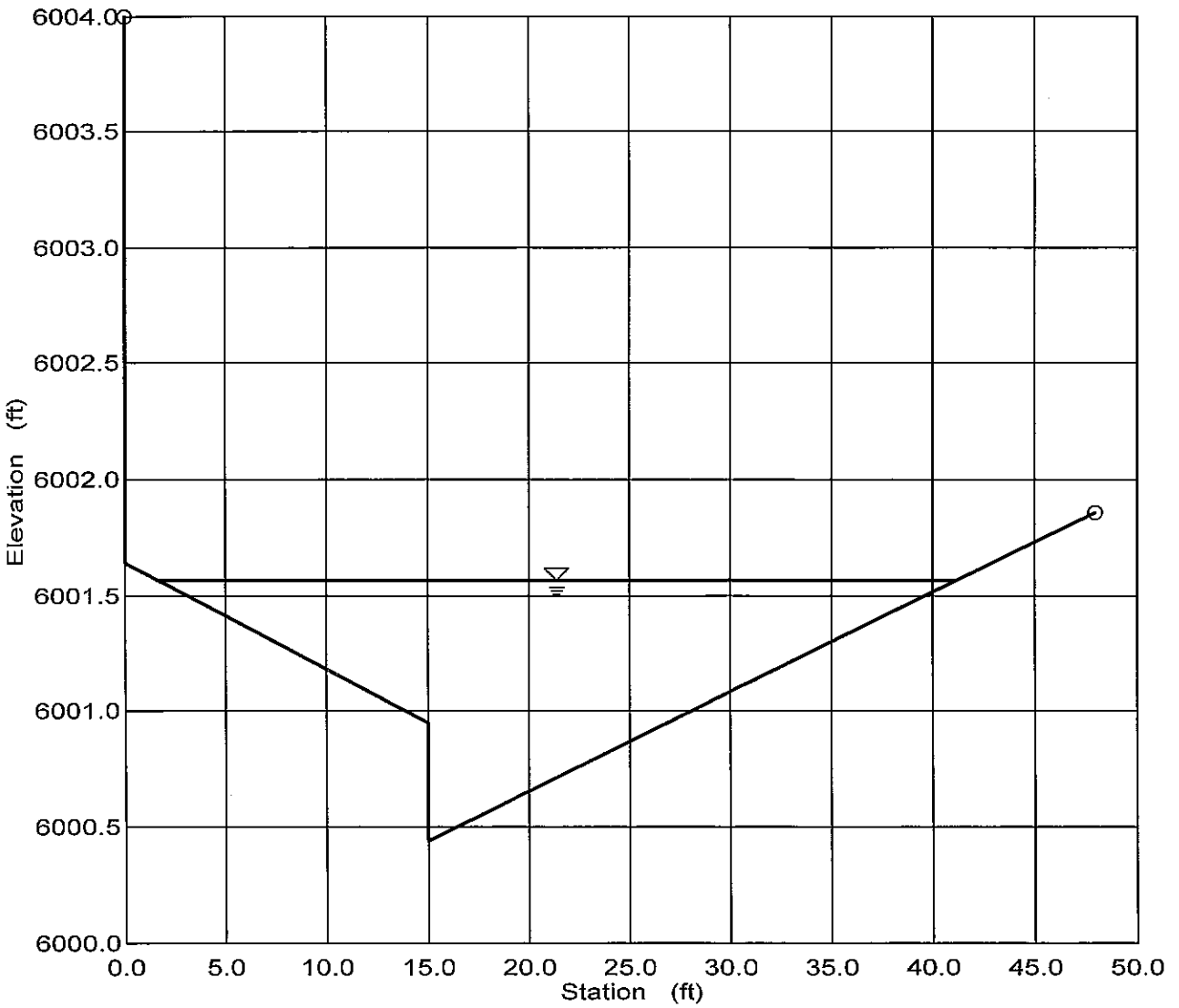
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,001.57 | ft |
| Flow Area | 18.88 | ft² |
| Wetted Perimeter | 40.14 | ft |
| Top Width | 39.59 | ft |
| Height | 1.13 | ft |
| Critical Depth | 6,001.55 | ft |
| Critical Slope | 0.010122 | ft/ft |
| Velocity | 3.71 | ft/s |
| Velocity Head | 0.21 | ft |
| Specific Energy | 6,001.78 | ft |
| Froude Number | 0.95 | |
| Flow is subcritical. | | |

NO FLOODING

# Cross Section Colorado & Tejon
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 2 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,001.57 | ft |
| Discharge | 70.00 | cfs |



# Intersection Tejon & Colorado
## Worksheet for Irregular Channel

W/O BOULDER STORM DRAIN
100 YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 2 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | |
|---|---|---|
| Channel Slope | 0.009000 | ft/ft |
| Elevation range: 6,000.44 ft to 6,004.00 ft. | | |

| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
|---|---|---|---|---|
| 0.00 | 6,004.00 | 0.00 | 48.00 | 0.023 |
| 0.00 | 6,001.64 | | | |
| 15.00 | 6,000.95 | | | |
| 15.00 | 6,000.44 | | | |
| 48.00 | 6,001.86 | | | |

| Discharge | 135.00 | cfs |
|---|---|---|

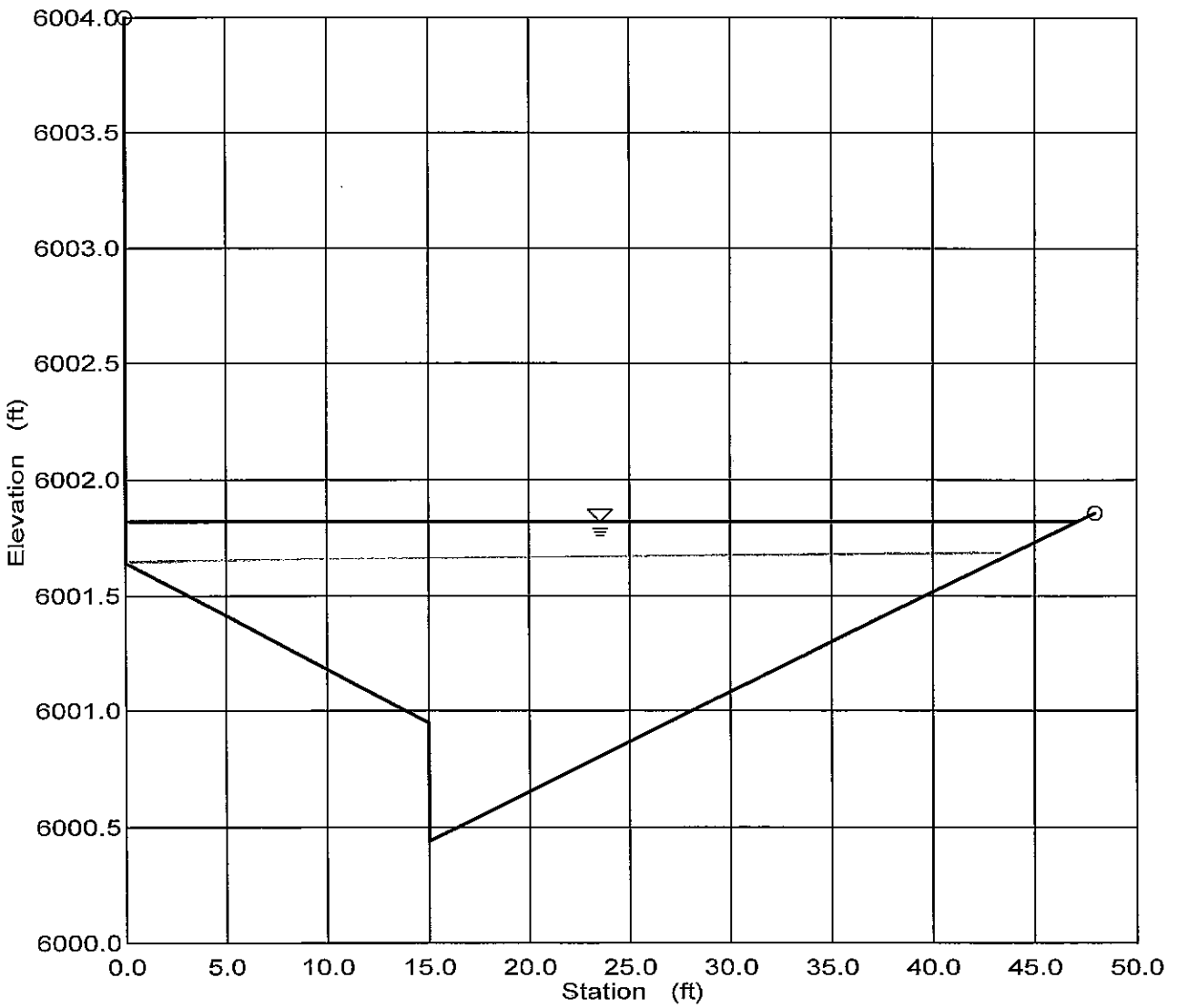
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,001.82 | ft |
| Flow Area | 30.03 | ft² |
| Wetted Perimeter | 47.82 | ft |
| Top Width | 47.09 | ft |
| Height | 1.38 | ft |
| Critical Depth | 6,001.82 | ft |
| Critical Slope | 0.009153 | ft/ft |
| Velocity | 4.49 | ft/s |
| Velocity Head | 0.31 | ft |
| Specific Energy | 6,002.13 | ft |
| Froude Number | 0.99 | |
| Flow is subcritical. | | |

~18' FLOODING

# Cross Section Colorado & Tejon
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Section 2 |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,001.82 | ft |
| Discharge | 135.00 | cfs |



# Intersection of Nevada & Colorado
## Worksheet for Irregular Channel

w/ BOULDER STORM DRAIN
5 YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Sections |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | |
|---|---|---|
| Channel Slope | 0.009000 | ft/ft |

Elevation range: 5,999.43 ft to 6,004.00 ft.

| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
|---|---|---|---|---|
| 0.00 | 6,004.00 | 0.00 | 72.11 | 0.023 |
| 0.00 | 6,000.28 | | | |
| 10.52 | 5,999.97 | | | |
| 10.52 | 5,999.43 | | | |
| 72.11 | 6,000.82 | | | |

| Discharge | 63.00 | cfs |
|---|---|---|

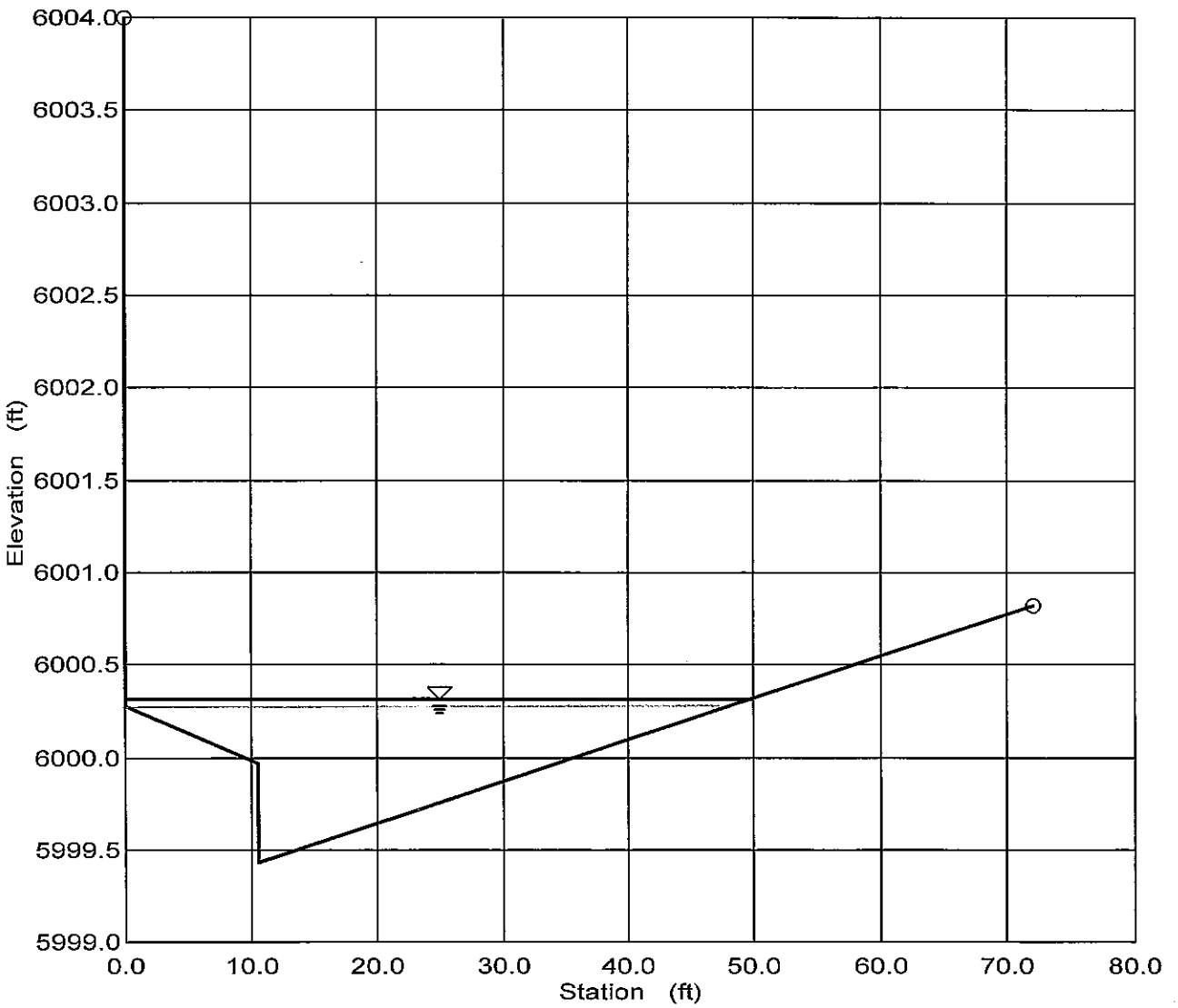
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,000.32 | ft |
| Flow Area | 19.41 | ft² |
| Wetted Perimeter | 50.38 | ft |
| Top Width | 49.79 | ft |
| Height | 0.89 | ft |
| Critical Depth | 6,000.29 | ft |
| Critical Slope | 0.010870 | ft/ft |
| Velocity | 3.25 | ft/s |
| Velocity Head | 0.16 | ft |
| Specific Energy | 6,000.48 | ft |
| Froude Number | 0.92 | |
| Flow is subcritical. | | |

.04' FLOODING

# Cross Section Colorado & Nevada
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Sections |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,000.32 | ft |
| Discharge | 63.00 | cfs |



# Intersection of Nevada & Colorado
## Worksheet for Irregular Channel

w/ BOULDER STORM DRAIN
100 YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Sections |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | | | |
|---|---|---|---|---|
| Channel Slope | 0.009000 ft/ft | | | |
| Elevation range: 5,999.43 ft to 6,004.00 ft. | | | | |
| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
| 0.00 | 6,004.00 | 0.00 | 72.11 | 0.023 |
| 0.00 | 6,000.28 | | | |
| 10.52 | 5,999.97 | | | |
| 10.52 | 5,999.43 | | | |
| 72.11 | 6,000.82 | | | |
| Discharge | 125.00 cfs | | | |

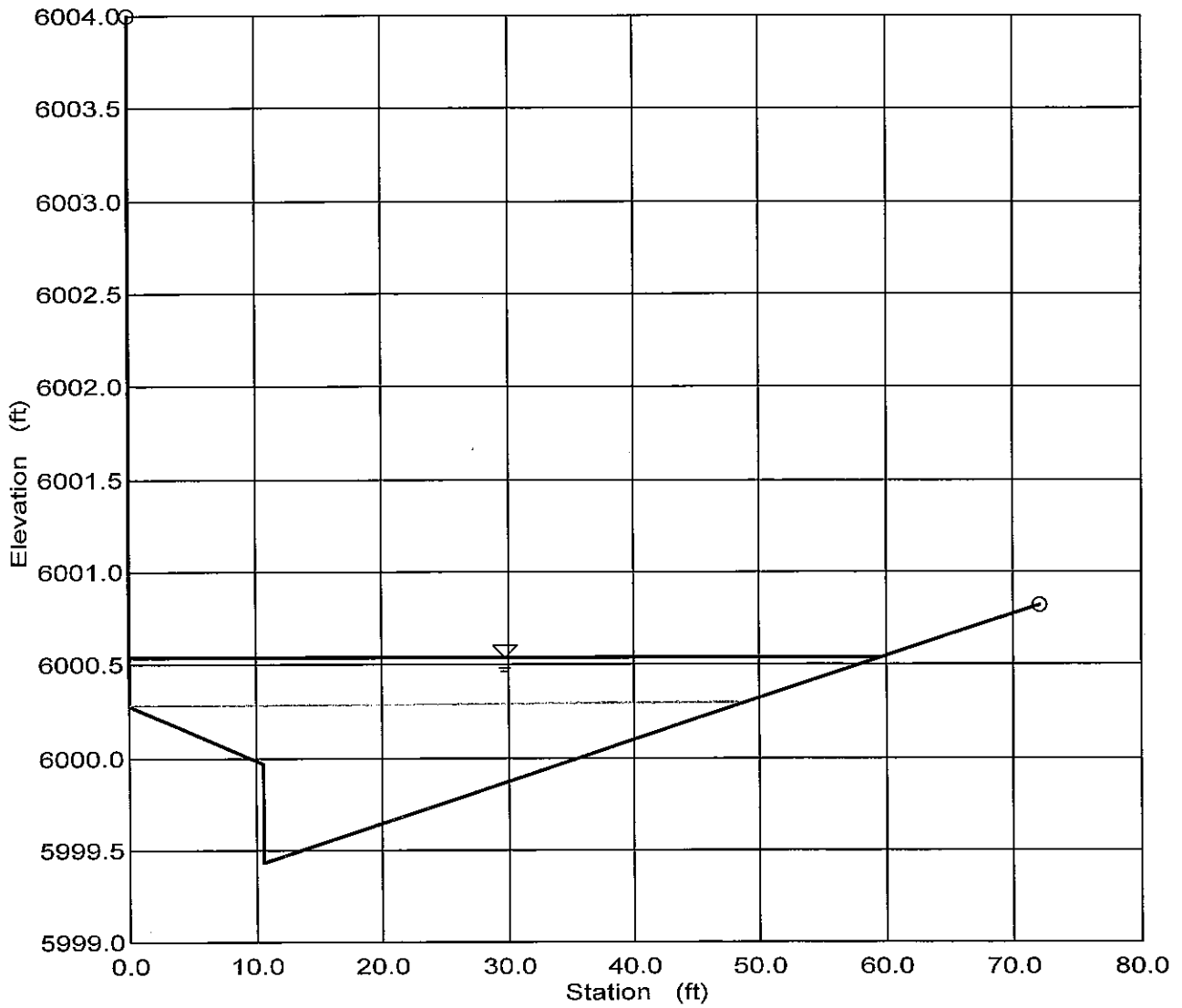
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,000.54 | ft |
| Flow Area | 31.48 | ft² |
| Wetted Perimeter | 60.38 | ft |
| Top Width | 59.57 | ft |
| Height | 1.11 | ft |
| Critical Depth | 6,000.52 | ft |
| Critical Slope | 0.009765 | ft/ft |
| Velocity | 3.97 | ft/s |
| Velocity Head | 0.24 | ft |
| Specific Energy | 6,000.78 | ft |
| Froude Number | 0.96 | |
| Flow is subcritical. | | |

.26' FLOODING

# Cross Section Colorado & Nevada
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Sections |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,000.54 | ft |
| Discharge | 125.00 | cfs |



# Intersection of Nevada & Colorado
## Worksheet for Irregular Channel

w/o Boulder Storm Drain
5YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Sections |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | | | |
|---|---|---|---|---|
| Channel Slope | 0.009000 ft/ft | | | |
| Elevation range: 5,999.43 ft to 6,004.00 ft. | | | | |
| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
| 0.00 | 6,004.00 | 0.00 | 72.11 | 0.023 |
| 0.00 | 6,000.28 | | | |
| 10.52 | 5,999.97 | | | |
| 10.52 | 5,999.43 | | | |
| 72.11 | 6,000.82 | | | |
| Discharge | 97.00 cfs | | | |

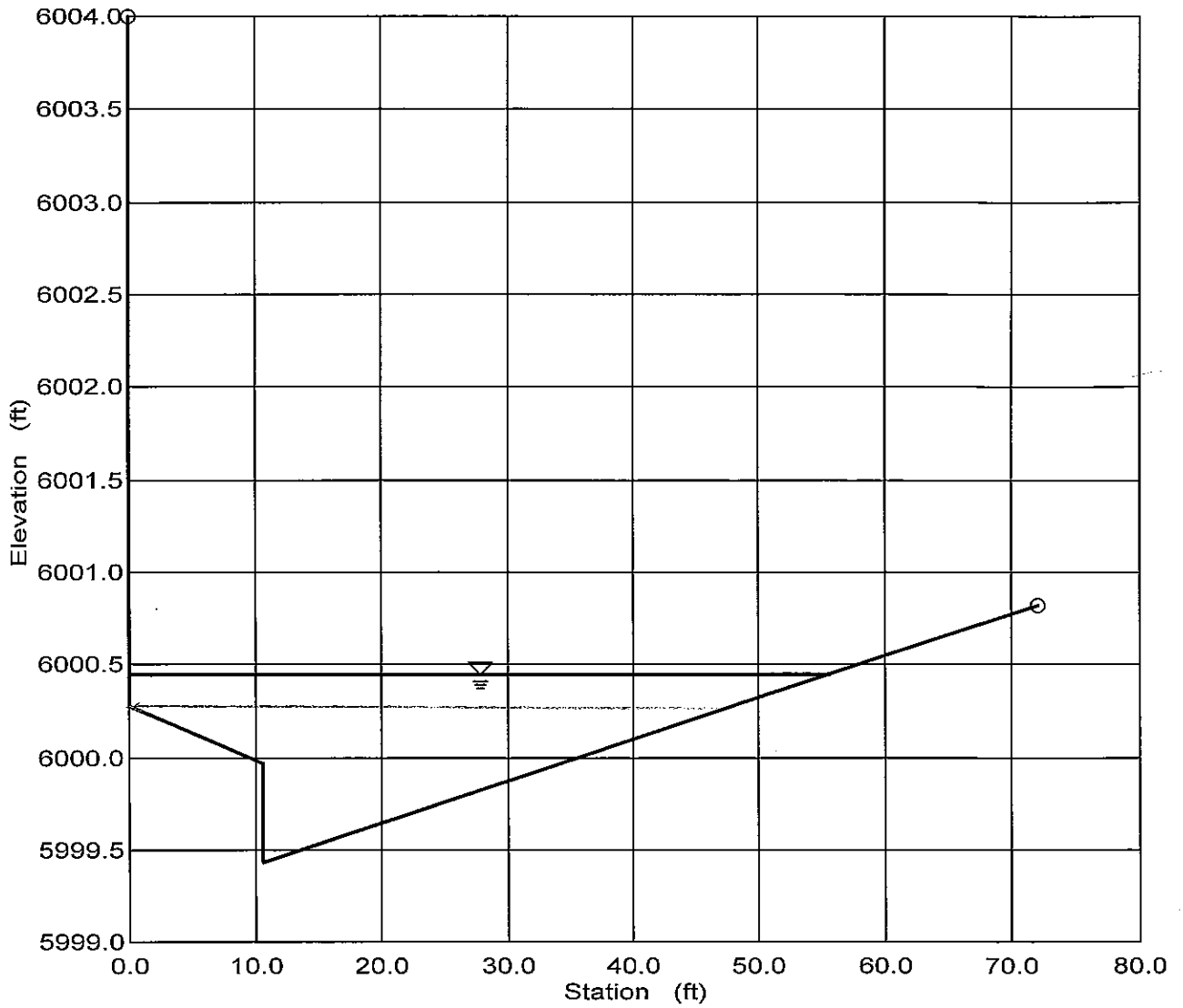
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,000.45 | ft |
| Flow Area | 26.29 | ft² |
| Wetted Perimeter | 56.30 | ft |
| Top Width | 55.57 | ft |
| Height | 1.02 | ft |
| Critical Depth | 6,000.43 | ft |
| Critical Slope | 0.010153 | ft/ft |
| Velocity | 3.69 | ft/s |
| Velocity Head | 0.21 | ft |
| Specific Energy | 6,000.66 | ft |
| Froude Number | 0.95 | |
| Flow is subcritical. | | |

.17' FLOODING

# Cross Section Colorado & Nevada
## Cross Section for Irregular Channel

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Sections |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,000.45 | ft |
| Discharge | 97.00 | cfs |



# Intersection of Nevada & Colorado
## Worksheet for Irregular Channel

W/O BOULDER STORM DRAIN
100 YEAR

| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Sections |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

| Input Data | | |
|---|---|---|
| Channel Slope | 0.009000 | ft/ft |

Elevation range: 5,999.43 ft to 6,004.00 ft.

| Station (ft) | Elevation (ft) | Start Station | End Station | Roughness |
|---|---|---|---|---|
| 0.00 | 6,004.00 | 0.00 | 72.11 | 0.023 |
| 0.00 | 6,000.28 | | | |
| 10.52 | 5,999.97 | | | |
| 10.52 | 5,999.43 | | | |
| 72.11 | 6,000.82 | | | |

| Discharge | 157.00 | cfs |
|---|---|---|

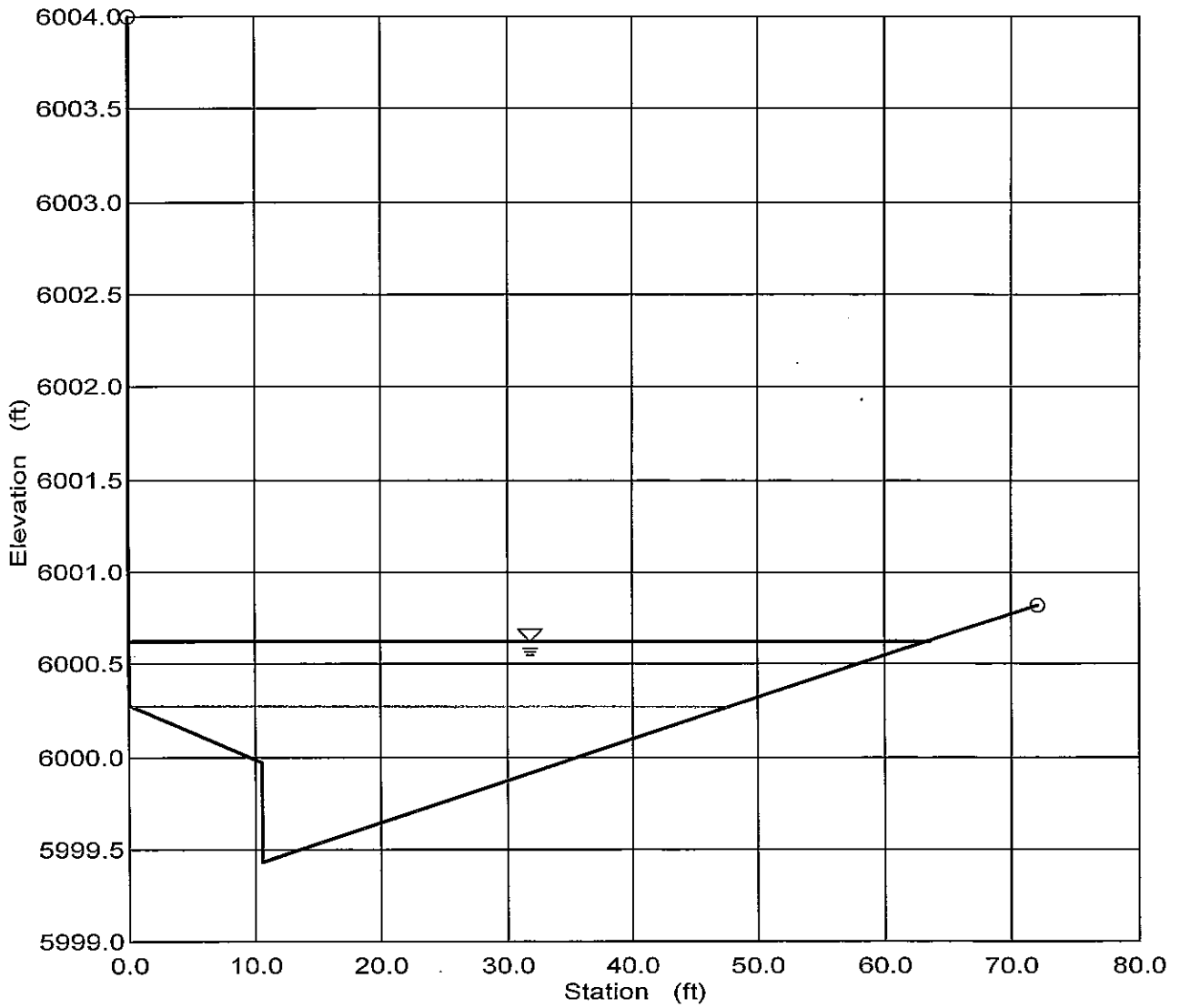
| Results | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Water Surface Elevation | 6,000.63 | ft |
| Flow Area | 37.06 | ft² |
| Wetted Perimeter | 64.49 | ft |
| Top Width | 63.58 | ft |
| Height | 1.20 | ft |
| Critical Depth | 6,000.62 | ft |
| Critical Slope | 0.009435 | ft/ft |
| Velocity | 4.24 | ft/s |
| Velocity Head | 0.28 | ft |
| Specific Energy | 6,000.91 | ft |
| Froude Number | 0.98 | |
| Flow is subcritical. | | |

.35' FLOODING

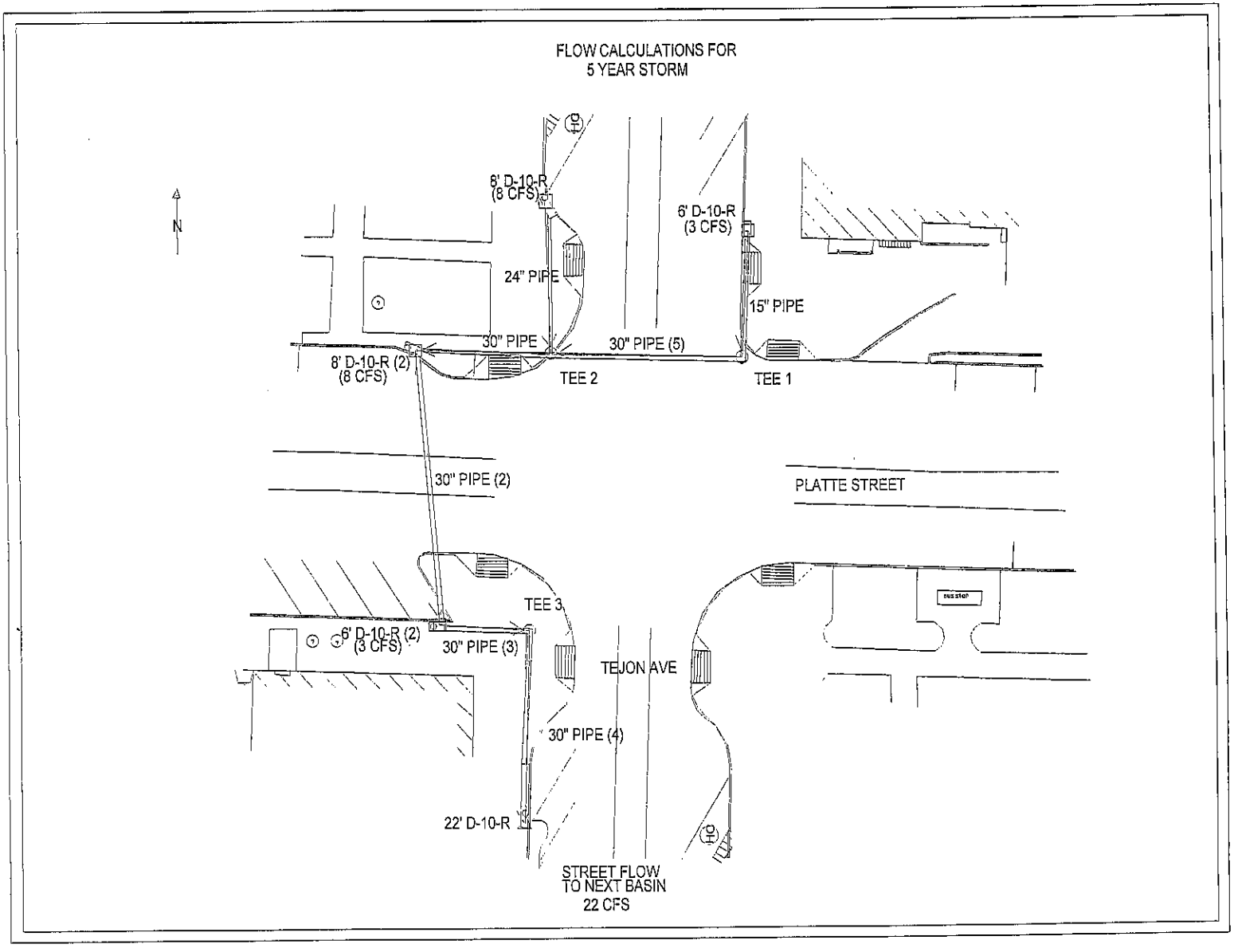
# Cross Section Colorado & Nevada
## Cross Section for Irregular Channel

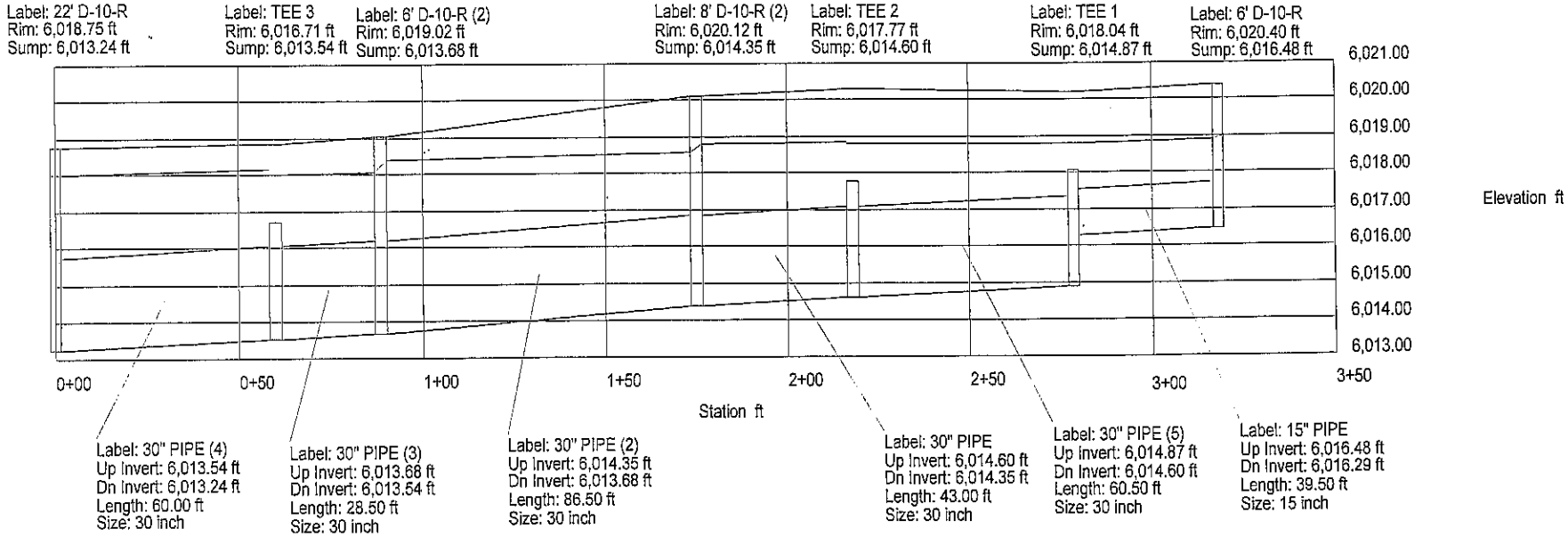
| Project Description | |
|---|---|
| Project File | q:\haestad\fmw\cros@nev.fm2 |
| Worksheet | Cross Sections |
| Flow Element | Irregular Channel |
| Method | Manning's Formula |
| Solve For | Water Elevation |

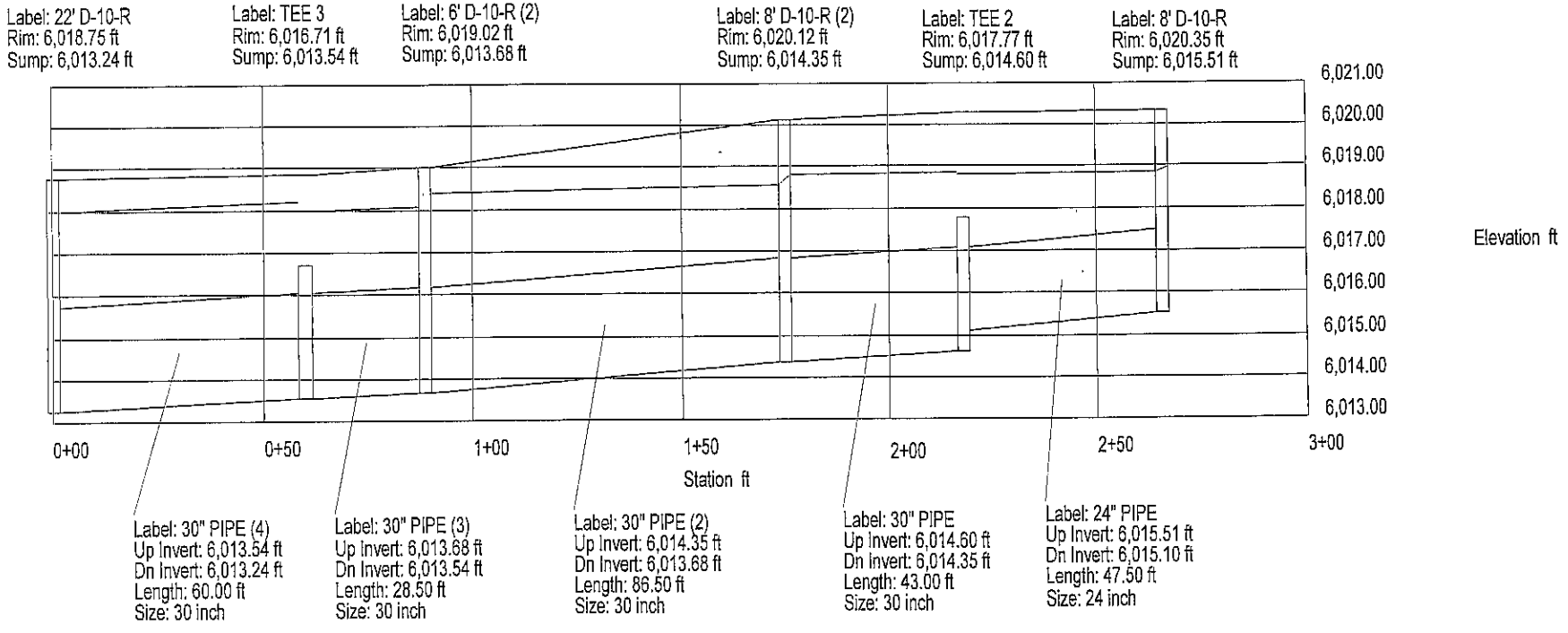
| Section Data | | |
|---|---|---|
| Wtd. Mannings Coefficient | 0.023 | |
| Channel Slope | 0.009000 | ft/ft |
| Water Surface Elevation | 6,000.63 | ft |
| Discharge | 157.00 | cfs |



FLOW CALCULATIONS FOR
5 YEAR STORM




Label: 22' D-10-R
Rim: 6,018.75 ft
Sump: 6,013.24 ft
Label: TEE 3
Rim: 6,016.71 ft
Sump: 6,013.54 ft
Label: 6' D-10-R (2)
Rim: 6,019.02 ft
Sump: 6,013.68 ft
Label: 8' D-10-R (2)
Rim: 6,020.12 ft
Sump: 6,014.35 ft
Label: TEE 2
Rim: 6,017.77 ft
Sump: 6,014.60 ft
Label: TEE 1
Rim: 6,018.04 ft
Sump: 6,014.87 ft
Label: 6' D-10-R
Rim: 6,020.40 ft
Sump: 6,016.48 ft
6,021.00
6,020.00
6,019.00
6,018.00
6,017.00
6,016.00
6,015.00
6,014.00
6,013.00
Elevation ft
0+00
0+50
1+00
1+50
2+00
2+50
3+00
3+50
Station ft
Label: 30" PIPE (4)
Up Invert: 6,013.54 ft
Dn Invert: 6,013.24 ft
Length: 60.00 ft
Size: 30 inch
Label: 30" PIPE (3)
Up Invert: 6,013.68 ft
Dn Invert: 6,013.54 ft
Length: 28.50 ft
Size: 30 inch
Label: 30" PIPE (2)
Up Invert: 6,014.35 ft
Dn Invert: 6,013.68 ft
Length: 86.50 ft
Size: 30 inch
Label: 30" PIPE
Up Invert: 6,014.60 ft
Dn Invert: 6,014.35 ft
Length: 43.00 ft
Size: 30 inch
Label: 30" PIPE (5)
Up Invert: 6,014.87 ft
Dn Invert: 6,014.60 ft
Length: 60.50 ft
Size: 30 inch
Label: 15" PIPE
Up Invert: 6,016.48 ft
Dn Invert: 6,016.29 ft
Length: 39.50 ft
Size: 15 inch


Label: 22' D-10-R
Rim: 6,018.75 ft
Sump: 6,013.24 ft
Label: TEE 3
Rim: 6,016.71 ft
Sump: 6,013.54 ft
Label: 6' D-10-R (2)
Rim: 6,019.02 ft
Sump: 6,013.68 ft
Label: 8' D-10-R (2)
Rim: 6,020.12 ft
Sump: 6,014.35 ft
Label: TEE 2
Rim: 6,017.77 ft
Sump: 6,014.60 ft
Label: 8' D-10-R
Rim: 6,020.35 ft
Sump: 6,015.51 ft
6,021.00
6,020.00
6,019.00
6,018.00
6,017.00
6,016.00
6,015.00
6,014.00
6,013.00
Elevation ft
0+00
0+50
1+00
1+50
2+00
2+50
3+00
Station ft
Label: 30" PIPE (4)
Up Invert: 6,013.54 ft
Dn Invert: 6,013.24 ft
Length: 60.00 ft
Size: 30 inch
Label: 30" PIPE (3)
Up Invert: 6,013.68 ft
Dn Invert: 6,013.54 ft
Length: 28.50 ft
Size: 30 inch
Label: 30" PIPE (2)
Up Invert: 6,014.35 ft
Dn Invert: 6,013.68 ft
Length: 86.50 ft
Size: 30 inch
Label: 30" PIPE
Up Invert: 6,014.60 ft
Dn Invert: 6,014.35 ft
Length: 43.00 ft
Size: 30 inch
Label: 24" PIPE
Up Invert: 6,015.51 ft
Dn Invert: 6,015.10 ft
Length: 47.50 ft
Size: 24 inch

# Combined Pipe/Node Report

| Pipe | Upstream Node | Downstream Node | Length (ft) | Inlet Area (acres) | Inlet C Coefficient | Inlet CA (acres) | Total CA (acres) | Inlet Discharge (cfs) | Section Size | Capacity (cfs) | Average Velocity (ft/s) | Upstream Invert Elevation (ft) | Downstream Invert Elevation (ft) | Constructed Slope (ft/ft) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15" PIPE | 6' D-10-R | TEE 1 | 39.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15 inch | 4.48 | 2.44 | ,016.48 | 6,016.29 | 0.004810 | |
| 24" PIPE | 8' D-10-R | TEE 2 | 47.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 24 inch | 21.02 | 2.55 | ,015.51 | 6,015.10 | 0.008632 | |
| 30" PIPE (5 | TEE 1 | TEE 2 | 60.50 | N/A | N/A | N/A | 0.00 | N/A | 30 inch | 27.40 | 0.61 | ,014.87 | 6,014.60 | 0.004463 | |
| 30" PIPE | TEE 2 | 8' D-10-R (2 | 43.00 | N/A | N/A | N/A | 0.00 | N/A | 30 inch | 31.27 | 2.24 | ,014.60 | 6,014.35 | 0.005814 | |
| 30" PIPE (2 | 8' D-10-R (2 | 6' D-10-R (2 | 86.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 30 inch | 36.10 | 3.87 | ,014.35 | 6,013.68 | 0.007746 | |
| 30" PIPE (3 | 6' D-10-R (2 | TEE 3 | 28.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 30 inch | 28.75 | 4.48 | ,013.68 | 6,013.54 | 0.004912 | |
| 30" PIPE (4 | TEE 3 | 22' D-10-R | 60.00 | N/A | N/A | N/A | 0.00 | N/A | 30 inch | 29.00 | 4.48 | ,013.54 | 6,013.24 | 0.005000 | |

# DOT Report

| Pipe | -Node- Upstream Downstream | Inlet Area (acres) | Inlet CA (acres) | Total CA (acres) | -Ground- Upstream (ft) Downstream | -HGL- Upstream (ft) Downstream | -Slope- Energy Constructed (ft/ft) | -Section- Discharge Capacity (cfs) | -Section- Shape Size | Length (ft) | Average Velocity (ft/s) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15" PIPE | 6' D-10-R | 0.00 | 0.00 | 0.00 | 6,020.40 | 6,018.91 | 0.002386 | 3.00 | Circular | 39.50 | 2.44 | |
| | TEE 1 | | | | 6,020.20 | 6,018.81 | 0.004810 | 4.48 | 15 inch | | | |
| 24" PIPE | 8' D-10-R | 0.00 | 0.00 | 0.00 | 6,020.35 | 6,018.87 | 0.001251 | 8.00 | Circular | 47.50 | 2.55 | |
| | TEE 2 | | | | 6,020.30 | 6,018.81 | 0.008632 | 21.02 | 24 inch | | | |
| 30" PIPE (5 | TEE 1 | N/A | N/A | 0.00 | 6,020.20 | 6,018.82 | 0.000054 | 3.00 | Circular | 60.50 | 0.61 | |
| | TEE 2 | | | | 6,020.30 | 6,018.81 | 0.004463 | 27.40 | 30 inch | | | |
| 30" PIPE | TEE 2 | N/A | N/A | 0.00 | 6,020.30 | 6,018.84 | 0.000719 | 11.00 | Circular | 43.00 | 2.24 | |
| | 8' D-10-R (2 | | | | 6,020.12 | 6,018.81 | 0.005814 | 31.27 | 30 inch | | | |
| 30" PIPE (2 | 8' D-10-R (2 | 0.00 | 0.00 | 0.00 | 6,020.12 | 6,018.58 | 0.002146 | 19.00 | Circular | 86.50 | 3.87 | |
| | 6' D-10-R (2 | | | | 6,019.02 | 6,018.39 | 0.007746 | 36.10 | 30 inch | | | |
| 30" PIPE (3 | 6' D-10-R (2 | 0.00 | 0.00 | 0.00 | 6,019.02 | 6,018.08 | 0.002877 | 22.00 | Circular | 28.50 | 4.48 | |
| | TEE 3 | | | | 6,018.87 | 6,018.00 | 0.004912 | 28.75 | 30 inch | | | |
| 30" PIPE (4 | TEE 3 | N/A | N/A | 0.00 | 6,018.87 | 6,018.17 | 0.002877 | 22.00 | Circular | 60.00 | 4.48 | |
| | 22' D-10-R | | | | 6,018.75 | 6,018.00 | 0.005000 | 29.00 | 30 inch | | | |

# Detailed Report for 6' D-10-R

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 3.00 cfs | Known Flow | 3.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,019.00 ft | HGL Out | 6,018.91 ft |
| Ground Elevation | 6,020.40 ft | Rim Elevation | 6,020.40 ft |
| Sump Elevation | 6,016.48 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,839.11 ft | Y | 1,366,831.34 ft |
| Velocity | 2.44 ft/s | Headloss | 0.09 ft |
| Headloss Coefficient | 1.00 | Station | 3+18 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 6' D-10-R (2)

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 22.00 cfs | Known Flow | 11.00 cfs |
| Upstream Additional + Carryover | 8.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 3.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 2.61 min | Upstream Flow Time | 2.61 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,018.39 ft | HGL Out | 6,018.08 ft |
| Ground Elevation | 6,019.02 ft | Rim Elevation | 6,019.02 ft |
| Sump Elevation | 6,013.68 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,740.17 ft | Y | 1,366,708.27 ft |
| Velocity | 4.48 ft/s | Headloss | 0.31 ft |
| Headloss Coefficient | 1.00 | Station | 0+89 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 8' D-10-R

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 8.00 cfs | Known Flow | 8.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,018.97 ft | HGL Out | 6,018.87 ft |
| Ground Elevation | 6,020.35 ft | Rim Elevation | 6,020.35 ft |
| Sump Elevation | 6,015.51 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,774.99 ft | Y | 1,366,840.65 ft |
| Velocity | 2.55 ft/s | Headloss | 0.10 ft |
| Headloss Coefficient | 1.00 | Station | 2+66 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 8' D-10-R (2)

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 19.00 cfs | Known Flow | 11.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 8.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 2.24 min | Upstream Flow Time | 2.24 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,018.81 ft | HGL Out | 6,018.58 ft |
| Ground Elevation | 6,020.12 ft | Rim Elevation | 6,020.12 ft |
| Sump Elevation | 6,014.35 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,733.27 ft | Y | 1,366,794.45 ft |
| Velocity | 3.87 ft/s | Headloss | 0.23 ft |
| Headloss Coefficient | 1.00 | Station | 1+75 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for Pipe 15" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 15 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 3.00 | cfs | Capacity | 4.48 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.09 | ft |
| Length | 39.50 | ft | Energy Slope | 0.002386 | ft/ft |
| Constructed Slope | 0.004810 | ft/ft | Upstream Velocity | 2.44 | ft/s |
| Upstream Flow Time | 0.00 | min | Average Velocity | 2.44 | ft/s |
| Pipe Flow Time | 0.27 | min | Downstream Velocity | 2.44 | ft/s |
| System Flow Time | 0.27 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,016.48 | 6,020.40 | 6,017.73 | 2.67 | 2.43 | 6,018.91 | 6,019.00 |
| Downstream | 6,016.29 | 6,020.20 | 6,017.54 | 2.66 | 2.52 | 6,018.81 | 6,018.91 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end

# Detailed Report for 22' D-10-R

| Flows | | | |
|---|---|---|---|
| Total Discharge | 22.00 cfs | Known Flow | 11.00 cfs |
| Upstream Additional + Carryover | 11.00 cfs | Total Watershed (CIA) | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 2.94 min | Upstream Flow Time | 2.94 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,018.00 ft | HGL Out | 6,018.00 ft |
| Ground Elevation | 6,018.75 ft | Rim Elevation | 6,018.75 ft |
| Sump Elevation | 6,013.24 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,766.37 ft | Y | 1,366,646.21 ft |
| Velocity | 0.00 ft/s | Headloss | 0.00 ft |
| Headloss Coefficient | 0.00 | Station | 0+00 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |

# Detailed Report for Pipe 24" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 24 inch
Number Sections: 1

| Pipe | | | |
|---|---|---|---|
| Discharge | 8.00 cfs | Capacity | 21.02 cfs |
| Mannings Coefficient | 0.013 | Hydraulic Drop | 0.06 ft |
| Length | 47.50 ft | Energy Slope | 0.001251 ft/ft |
| Constructed Slope | 0.008632 ft/ft | Upstream Velocity | 2.55 ft/s |
| Upstream Flow Time | 0.00 min | Average Velocity | 2.55 ft/s |
| Pipe Flow Time | 0.31 min | Downstream Velocity | 2.55 ft/s |
| System Flow Time | 0.31 min | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,015.51 | 6,020.35 | 6,017.51 | 2.84 | 3.36 | 6,018.87 | 6,018.97 |
| Downstream | 6,015.10 | 6,020.30 | 6,017.10 | 3.20 | 3.71 | 6,018.81 | 6,018.91 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end



 Nolte & Associates
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# Detailed Report for Pipe 30" PIPE (2)

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 19.00 | cfs | Capacity | 36.10 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.19 | ft |
| Length | 86.50 | ft | Energy Slope | 0.002146 | ft/ft |
| Constructed Slope | 0.007746 | ft/ft | Upstream Velocity | 3.87 | ft/s |
| Upstream Flow Time | 2.24 | min | Average Velocity | 3.87 | ft/s |
| Pipe Flow Time | 0.37 | min | Downstream Velocity | 3.87 | ft/s |
| System Flow Time | 2.61 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,014.35 | 6,020.12 | 6,016.85 | 3.27 | 4.23 | 6,018.58 | 6,018.81 |
| Downstream | 6,013.68 | 6,019.02 | 6,016.18 | 2.84 | 4.71 | 6,018.39 | 6,018.63 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end

# Detailed Report for Pipe 30" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 11.00 | cfs | Capacity | 31.27 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.03 | ft |
| Length | 43.00 | ft | Energy Slope | 0.000719 | ft/ft |
| Constructed Slope | 0.005814 | ft/ft | Upstream Velocity | 2.24 | ft/s |
| Upstream Flow Time | 1.92 | min | Average Velocity | 2.24 | ft/s |
| Pipe Flow Time | 0.32 | min | Downstream Velocity | 2.24 | ft/s |
| System Flow Time | 2.24 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,014.60 | 6,020.30 | 6,017.10 | 3.20 | 4.24 | 6,018.84 | 6,018.92 |
| Downstream | 6,014.35 | 6,020.12 | 6,016.85 | 3.27 | 4.46 | 6,018.81 | 6,018.89 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end

# Detailed Report for Pipe 30" PIPE (3)

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | |
|---|---|---|---|
| Discharge | 22.00 cfs | Capacity | 28.75 cfs |
| Mannings Coefficient | 0.013 | Hydraulic Drop | 0.08 ft |
| Length | 28.50 ft | Energy Slope | 0.002877 ft/ft |
| Constructed Slope | 0.004912 ft/ft | Upstream Velocity | 4.48 ft/s |
| Upstream Flow Time | 2.61 min | Average Velocity | 4.48 ft/s |
| Pipe Flow Time | 0.11 min | Downstream Velocity | 4.48 ft/s |
| System Flow Time | 2.72 min | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,013.68 | 6,019.02 | 6,016.18 | 2.84 | 4.40 | 6,018.08 | 6,018.39 |
| Downstream | 6,013.54 | 6,018.87 | 6,016.04 | 2.83 | 4.46 | 6,018.00 | 6,018.31 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end




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# Detailed Report for Pipe 30" PIPE (5)

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 3.00 | cfs | Capacity | 27.40 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.32e-2 | ft |
| Length | 60.50 | ft | Energy Slope | 0.000054 | ft/ft |
| Constructed Slope | 0.004463 | ft/ft | Upstream Velocity | 0.61 | ft/s |
| Upstream Flow Time | 0.27 | min | Average Velocity | 0.61 | ft/s |
| Pipe Flow Time | 1.65 | min | Downstream Velocity | 0.61 | ft/s |
| System Flow Time | 1.92 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,014.87 | 6,020.20 | 6,017.37 | 2.83 | 3.95 | 6,018.82 | 6,018.82 |
| Downstream | 6,014.60 | 6,020.30 | 6,017.10 | 3.20 | 4.21 | 6,018.81 | 6,018.82 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end

# Detailed Report for Pipe 30" PIPE (4)

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 22.00 | cfs | Capacity | 29.00 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.17 | ft |
| Length | 60.00 | ft | Energy Slope | 0.002877 | ft/ft |
| Constructed Slope | 0.005000 | ft/ft | Upstream Velocity | 4.48 | ft/s |
| Upstream Flow Time | 2.72 | min | Average Velocity | 4.48 | ft/s |
| Pipe Flow Time | 0.22 | min | Downstream Velocity | 4.48 | ft/s |
| System Flow Time | 2.94 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,013.54 | 6,018.87 | 6,016.04 | 2.83 | 4.63 | 6,018.17 | 6,018.48 |
| Downstream | 6,013.24 | 6,018.75 | 6,015.74 | 3.01 | 4.76 | 6,018.00 | 6,018.31 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end

# Detailed Report for TEE 1

| Flows | | | |
|---|---|---|---|
| Total Discharge | 3.00 cfs | Known Flow | 3.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.27 min | Upstream Flow Time | 0.27 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,018.82 ft | HGL Out | 6,018.82 ft |
| Ground Elevation | 6,020.20 ft | Rim Elevation | 6,018.04 ft |
| Sump Elevation | 6,014.87 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,836.70 ft | Y | 1,366,791.70 ft |
| Velocity | 0.61 ft/s | Headloss | 0.01 ft |
| Headloss Coefficient | 1.00 | Station | 2+79 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |

# Detailed Report for TEE 2

| Flows | | | |
|---|---|---|---|
| Total Discharge | 11.00 cfs | Known Flow | 11.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 1.92 min | Upstream Flow Time | 1.92 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,018.81 ft | HGL Out | 6,018.81 ft |
| Ground Elevation | 6,020.30 ft | Rim Elevation | 6,017.77 ft |
| Sump Elevation | 6,014.60 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,776.28 ft | Y | 1,366,793.31 ft |
| Velocity | 2.24 ft/s | Headloss | 0.08 ft |
| Headloss Coefficient | 1.00 | Station | 2+18 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: The hydraulic grade exceeds the Rim/Ground elevatio |
| Information: Flooding condition. |
| Information: Known flow propagated from upstream junctions. |

# Detailed Report for TEE 3

| Flows | | | |
|---|---|---|---|
| Total Discharge | 22.00 cfs | Known Flow | 11.00 cfs |
| Upstream Additional + Carryover | 11.00 cfs | Total Watershed (CIA) | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 2.72 min | Upstream Flow Time | 2.72 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,018.00 ft | HGL Out | 6,018.00 ft |
| Ground Elevation | 6,018.87 ft | Rim Elevation | 6,016.71 ft |
| Sump Elevation | 6,013.54 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,768.44 ft | Y | 1,366,706.20 ft |
| Velocity | 4.48 ft/s | Headloss | 0.31 ft |
| Headloss Coefficient | 1.00 | Station | 0+60 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: The hydraulic grade exceeds the Rim/Ground elevatio |
| Information: Flooding condition. |
| Information: Known flow propagated from upstream junctions. |

**NOLTE and ASSOCIATES, Inc.**
Engineers / Planners / Surveyors
PLATTE & TEJON

JOB NO. C50275
DATE 10/16/98
DESIGNED BY RICH RIDDLE JR
CHECKED BY

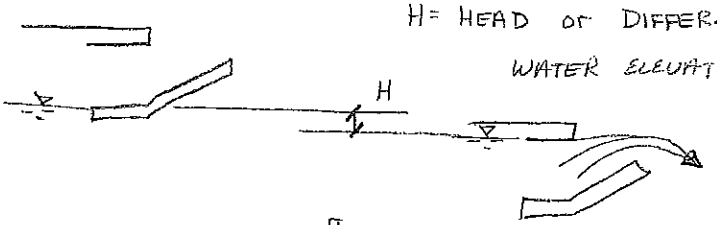
SUBJECT CALCULATIONS CHECKS BY WIER & ORIFICE EQUATIONS.

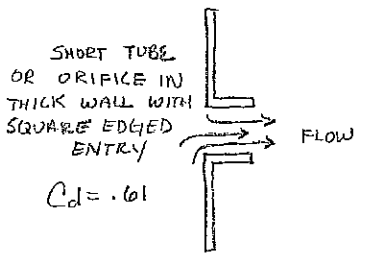
✓ if outlet has EXIT CAPACITY

GIVEN: EXIT Q = 23 cfs.
WILL 22' INLET WORK AS BUBBLER.?

## ORIFICE

H = HEAD or DIFFERENCE BETWEEN WATER ELEVATIONS.




ORIFICE EQUATION

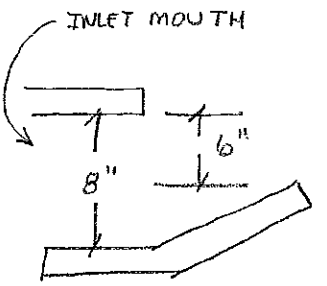
$Q = C_d A \sqrt{2gH}$

$A = (22')(6''/12'')$

$A = 11$ sq ft

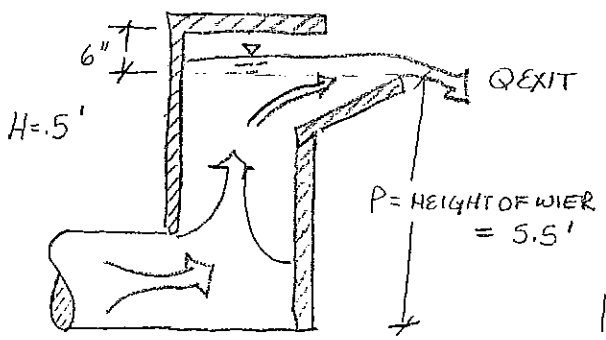
$g = 32.2$ ft/sec$^2$

$H = .20$




$Q = 24.08$ cfs ✓

## WIER

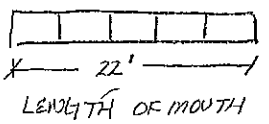



BAZIN'S FORMULA

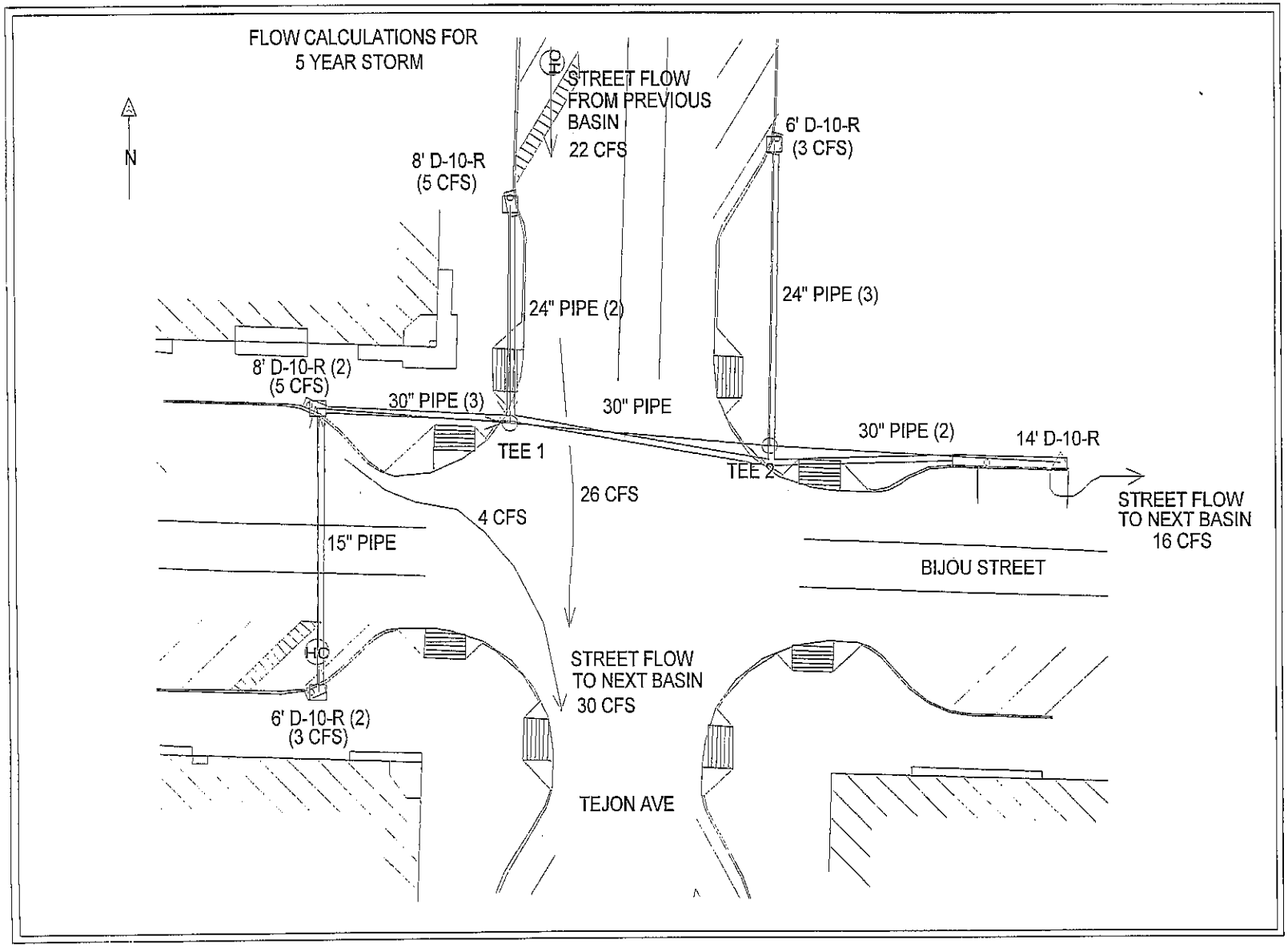
$$Q = \left(0.405 + \frac{.00984}{H}\right)\left[1 + 0.55\frac{H^2}{(P+H)^2}\right] L H \sqrt{2gH}$$

$$Q = \left(0.405 + \frac{.00984}{.5}\right)\left(1 + .55\frac{(.5)^2}{(5.5+.5)^2}\right) 22(.5)\sqrt{2(32.2)(.5)}$$

$Q = 26.61$ CFS ✓




22' INLET WILL WORK AS BUBBLER.

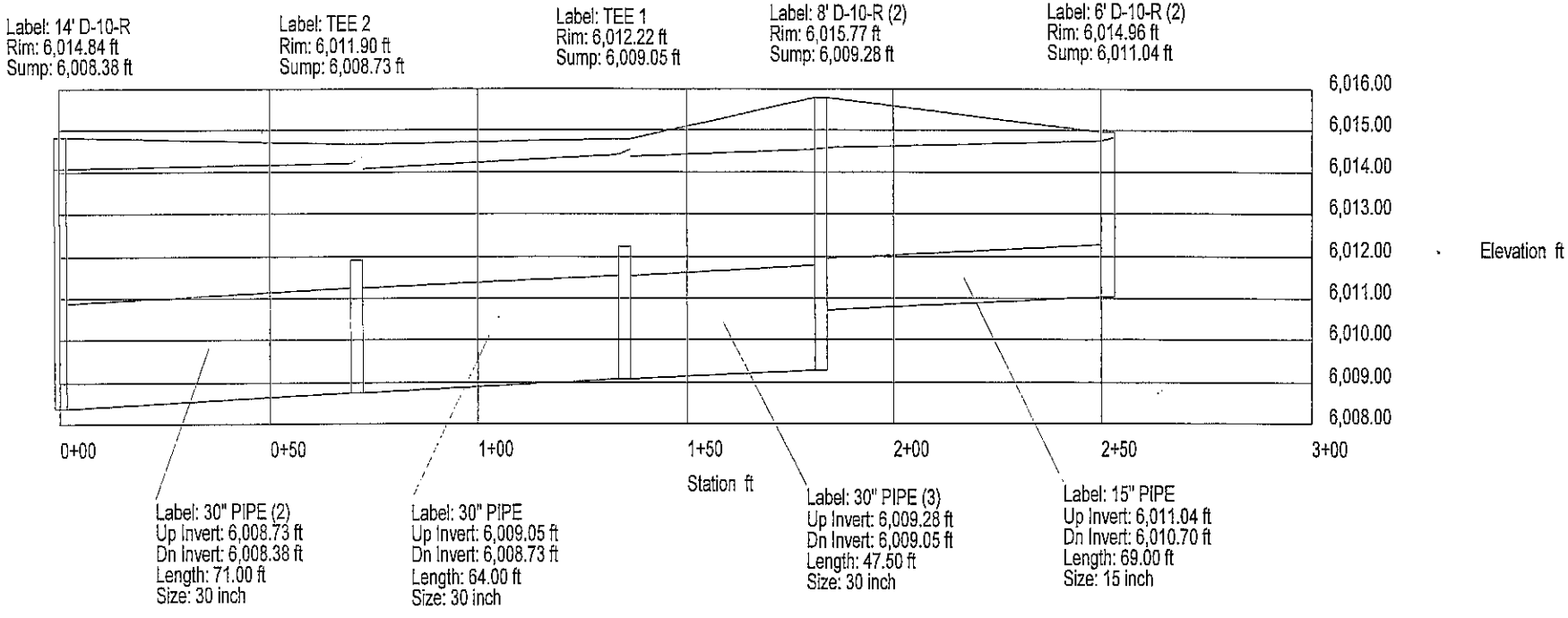



Project Title: Bijou & Tejon
c:\haestad\stmc\bijou.stm
10/29/98 10:42:56 AM

Nolte & Associates

 37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

Project Engineer: Nolte and Associates Inc.
StormCAD v1.5 [158]

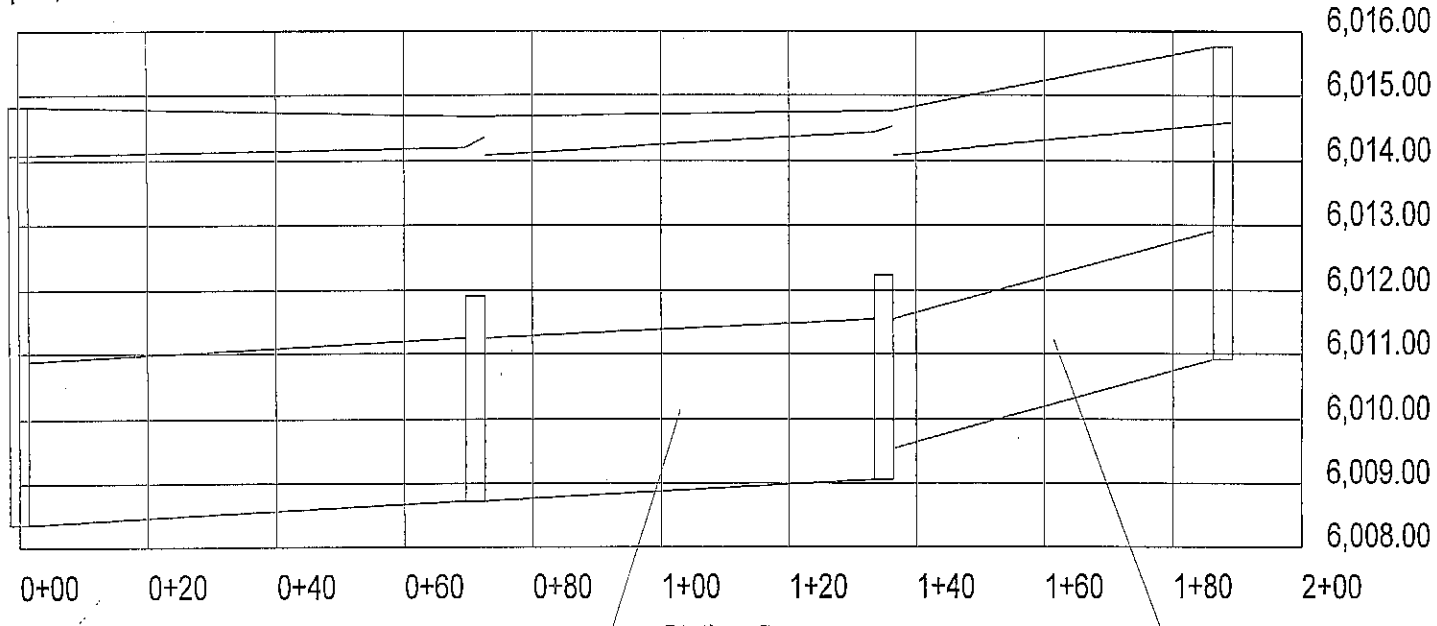

Label: 14' D-10-R
Rim: 6,014.84 ft
Sump: 6,008.38 ft
Label: TEE 2
Rim: 6,011.90 ft
Sump: 6,008.73 ft
Label: TEE 1
Rim: 6,012.22 ft
Sump: 6,009.05 ft
Label: 8' D-10-R (2)
Rim: 6,015.77 ft
Sump: 6,009.28 ft
Label: 6' D-10-R (2)
Rim: 6,014.96 ft
Sump: 6,011.04 ft
6,016.00
6,015.00
6,014.00
6,013.00
6,012.00
6,011.00
6,010.00
6,009.00
6,008.00
Elevation ft
0+00
0+50
1+00
1+50
2+00
2+50
3+00
Station ft
Label: 30" PIPE (2)
Up Invert: 6,008.73 ft
Dn Invert: 6,008.38 ft
Length: 71.00 ft
Size: 30 inch
Label: 30" PIPE
Up Invert: 6,009.05 ft
Dn Invert: 6,008.73 ft
Length: 64.00 ft
Size: 30 inch
Label: 30" PIPE (3)
Up Invert: 6,009.28 ft
Dn Invert: 6,009.05 ft
Length: 47.50 ft
Size: 30 inch
Label: 15" PIPE
Up Invert: 6,011.04 ft
Dn Invert: 6,010.70 ft
Length: 69.00 ft
Size: 15 inch

Label: 14' D-10-R
Rim: 6,014.84 ft
Sump: 6,008.38 ft

Label: TEE 2
Rim: 6,011.90 ft
Sump: 6,008.73 ft

Label: TEE 1
Rim: 6,012.22 ft
Sump: 6,009.05 ft

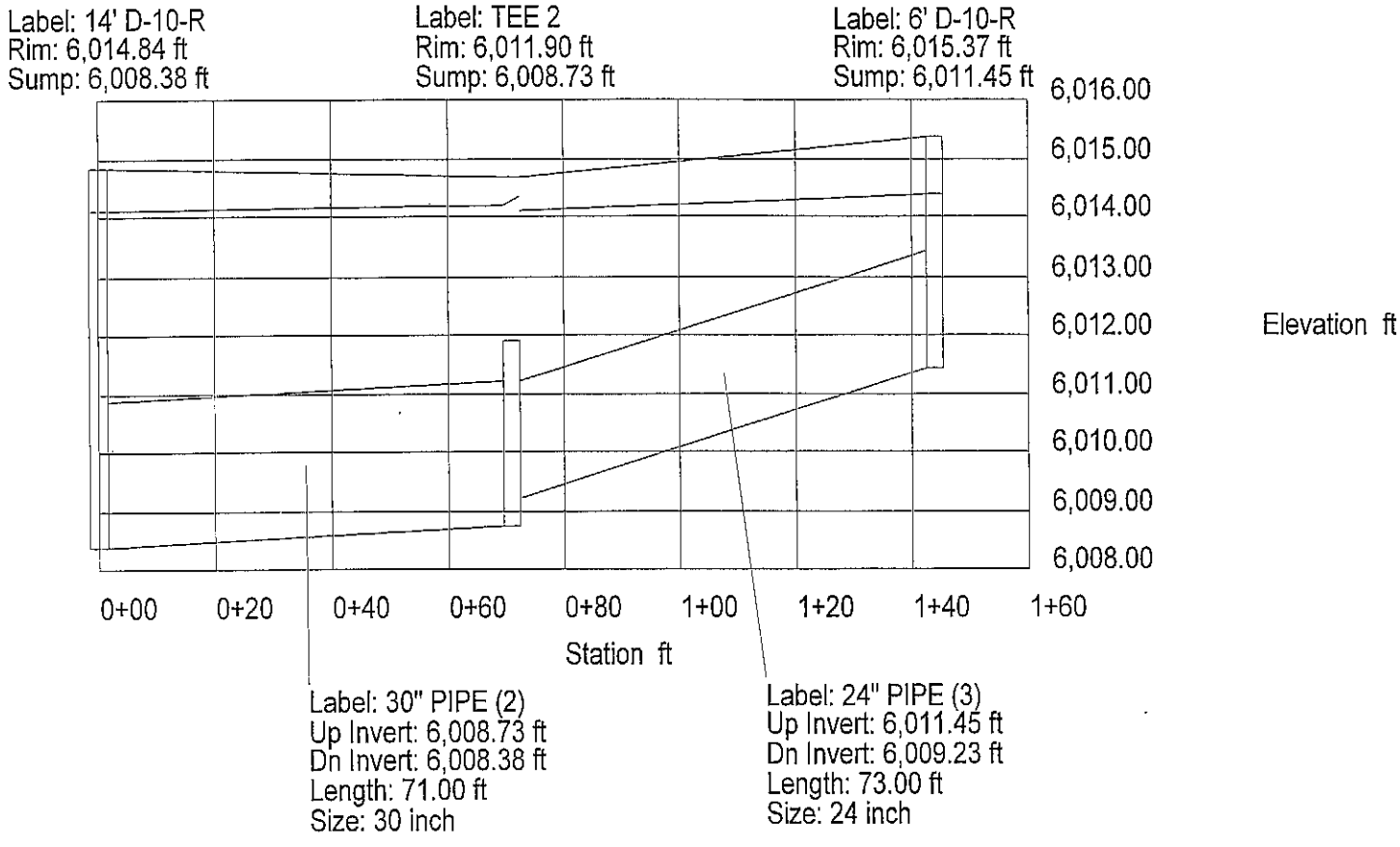
Label: 8' D-10-R
Rim: 6,015.75 ft
Sump: 6,010.91 ft




Label: 30" PIPE (2)
Up Invert: 6,008.73 ft
Dn Invert: 6,008.38 ft
Length: 71.00 ft
Size: 30 inch

Label: 30" PIPE
Up Invert: 6,009.05 ft
Dn Invert: 6,008.73 ft
Length: 64.00 ft
Size: 30 inch

Label: 24" PIPE (2)
Up Invert: 6,010.91 ft
Dn Invert: 6,009.54 ft
Length: 53.00 ft
Size: 24 inch


Label: 14' D-10-R
Rim: 6,014.84 ft
Sump: 6,008.38 ft
Label: TEE 2
Rim: 6,011.90 ft
Sump: 6,008.73 ft
Label: 6' D-10-R
Rim: 6,015.37 ft
Sump: 6,011.45 ft
6,016.00
6,015.00
6,014.00
6,013.00
6,012.00
6,011.00
6,010.00
6,009.00
6,008.00
Elevation ft
0+00
0+20
0+40
0+60
0+80
1+00
1+20
1+40
1+60
Station ft
Label: 30" PIPE (2)
Up Invert: 6,008.73 ft
Dn Invert: 6,008.38 ft
Length: 71.00 ft
Size: 30 inch
Label: 24" PIPE (3)
Up Invert: 6,011.45 ft
Dn Invert: 6,009.23 ft
Length: 73.00 ft
Size: 24 inch

# Combined Pipe/Node Report

| Pipe | Upstream Node | Downstream Node | Length (ft) | Inlet Area (acres) | Inlet C Coefficient | Inlet CA (acres) | Total CA (acres) | Inlet Discharge (cfs) | Section Size | Capacity (cfs) | Average Velocity (ft/s) | Upstream Invert Elevation (ft) | Downstream Invert Elevation (ft) | Constructed Slope (ft/ft) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15" PIPE | 6' D-10-R ( | 28' D-10-R ( | 269.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15 inch | 4.53 | 2.44 | ,011.04 | 6,010.70 | 0.004928 | |
| 30" PIPE ( | 38' D-10-R ( | 2TEE 1 | 47.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 30 inch | 28.54 | 1.63 | ,009.28 | 6,009.05 | 0.004842 | |
| 24" PIPE ( | 28' D-10-R | TEE 1 | 53.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 24 inch | 36.37 | 1.59 | ,010.91 | 6,009.54 | 0.025849 | |
| 30" PIPE | TEE 1 | TEE 2 | 64.00 | N/A | N/A | N/A | 0.00 | N/A | 30 inch | 29.00 | 2.65 | ,009.05 | 6,008.73 | 0.005000 | |
| 24" PIPE ( | 36' D-10-R | TEE 2 | 73.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 24 inch | 39.45 | 0.95 | ,011.45 | 6,009.23 | 0.030411 | |
| 30" PIPE ( | 2TEE 2 | 14' D-10-R | 71.00 | N/A | N/A | N/A | 0.00 | N/A | 30 inch | 28.80 | 3.26 | ,008.73 | 6,008.38 | 0.004930 | |

# DOT Report

| Pipe | -Node- Upstream Downstream | Inlet Area (acres) | Inlet CA (acres) | Total CA (acres) | -Ground- Upstream (ft) Downstream | -HGL- Upstream (ft) Downstream | -Slope- Energy Constructed (ft/ft) | -Section- Discharge Capacity (cfs) | -Section- Shape Size | Length (ft) | Average Velocity (ft/s) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15" PIPE | 6' D-10-R (2 | 0.00 | 0.00 | 0.00 | 6,014.96 | 6,014.74 | 0.002157 | 3.00 | Circular | 69.00 | 2.44 | |
| | 8' D-10-R (2 | | | | 6,015.77 | 6,014.60 | 0.004928 | 4.53 | 15 inch | | | |
| 30" PIPE (3 | 8' D-10-R (2 | 0.00 | 0.00 | 0.00 | 6,015.77 | 6,014.55 | 0.004029 | 8.00 | Circular | 47.50 | 1.63 | |
| | TEE 1 | | | | 6,014.78 | 6,014.36 | 0.004842 | 28.54 | 30 inch | | | |
| 24" PIPE (2 | 8' D-10-R | 0.00 | 0.00 | 0.00 | 6,015.75 | 6,014.56 | 0.008912 | 5.00 | Circular | 53.00 | 1.59 | |
| | TEE 1 | | | | 6,014.78 | 6,014.09 | 0.025849 | 36.37 | 24 inch | | | |
| 30" PIPE | TEE 1 | N/A | N/A | 0.00 | 6,014.78 | 6,014.43 | 0.005273 | 13.00 | Circular | 64.00 | 2.65 | |
| | TEE 2 | | | | 6,014.67 | 6,014.09 | 0.005000 | 29.00 | 30 inch | | | |
| 24" PIPE (3 | 6' D-10-R | 0.00 | 0.00 | 0.00 | 6,015.37 | 6,014.38 | 0.003918 | 3.00 | Circular | 73.00 | 0.95 | |
| | TEE 2 | | | | 6,014.67 | 6,014.09 | 0.030411 | 39.45 | 24 inch | | | |
| 30" PIPE (2 | TEE 2 | N/A | N/A | 0.00 | 6,014.67 | 6,014.20 | 0.001522 | 16.00 | Circular | 71.00 | 3.26 | |
| | 14' D-10-R | | | | 6,014.84 | 6,014.09 | 0.004930 | 28.80 | 30 inch | | | |

# Detailed Report for 6' D-10-R

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 3.00 cfs | Known Flow | 3.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,014.39 ft | HGL Out | 6,014.38 ft |
| Ground Elevation | 6,015.37 ft | Rim Elevation | 6,015.37 ft |
| Sump Elevation | 6,011.45 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,821.00 ft | Y | 1,366,341.51 ft |
| Velocity | 0.95 ft/s | Headloss | 0.01 ft |
| Headloss Coefficient | 1.00 | Station | 1+44 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 6' D-10-R (2)

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 3.00 cfs | Known Flow | 3.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,014.84 ft | HGL Out | 6,014.74 ft |
| Ground Elevation | 6,014.96 ft | Rim Elevation | 6,014.96 ft |
| Sump Elevation | 6,011.04 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,708.32 ft | Y | 1,366,208.81 ft |
| Velocity | 2.44 ft/s | Headloss | 0.09 ft |
| Headloss Coefficient | 1.00 | Station | 2+52 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 8' D-10-R

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 5.00 cfs | Known Flow | 5.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,014.60 ft | HGL Out | 6,014.56 ft |
| Ground Elevation | 6,015.75 ft | Rim Elevation | 6,015.75 ft |
| Sump Elevation | 6,010.91 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,756.04 ft | Y | 1,366,327.04 ft |
| Velocity | 1.59 ft/s | Headloss | 0.04 ft |
| Headloss Coefficient | 1.00 | Station | 1+88 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 8' D-10-R (2)

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 8.00 cfs | Known Flow | 3.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 5.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.47 min | Upstream Flow Time | 0.47 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,014.60 ft | HGL Out | 6,014.55 ft |
| Ground Elevation | 6,015.77 ft | Rim Elevation | 6,015.77 ft |
| Sump Elevation | 6,009.28 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,708.62 ft | Y | 1,366,277.77 ft |
| Velocity | 1.63 ft/s | Headloss | 0.04 ft |
| Headloss Coefficient | 1.00 | Station | 1+83 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 14' D-10-R

| Flows | | | | | |
|---|---|---|---|---|---|
| Total Discharge | 16.00 | cfs | Known Flow | 11.00 | cfs |
| Upstream Additional + Carryover | 5.00 | cfs | Total Watershed (CIA) | 0.00 | cfs |

| Watershed Data | | | | | |
|---|---|---|---|---|---|
| System Intensity | 0.00 | in/hr | Upstream CA | 0.00 | acres |
| Total CA | 0.00 | acres | | | |

| Flow Times | | | | | |
|---|---|---|---|---|---|
| System Flow Time | 1.72 | min | Upstream Flow Time | 1.72 | min |

| Elevations | | | | | |
|---|---|---|---|---|---|
| HGL In | 6,014.09 | ft | HGL Out | 6,014.09 | ft |
| Ground Elevation | 6,014.84 | ft | Rim Elevation | 6,014.84 | ft |
| Sump Elevation | 6,008.38 | ft | | | |

| Other Properties | | | | | |
|---|---|---|---|---|---|
| X | 3,192,890.28 | ft | Y | 1,366,264.23 | ft |
| Velocity | 0.00 | ft/s | Headloss | 0.00 | ft |
| Headloss Coefficient | 0.00 | | Station | 0+00 | ft |
| External Flow | 0.00 | cfs | | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |

# Detailed Report for Pipe 15" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 15 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 3.00 | cfs | Capacity | 4.53 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.15 | ft |
| Length | 69.00 | ft | Energy Slope | 0.002157 | ft/ft |
| Constructed Slope | 0.004928 | ft/ft | Upstream Velocity | 2.44 | ft/s |
| Upstream Flow Time | 0.00 | min | Average Velocity | 2.44 | ft/s |
| Pipe Flow Time | 0.47 | min | Downstream Velocity | 2.44 | ft/s |
| System Flow Time | 0.47 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,011.04 | 6,014.96 | 6,012.29 | 2.67 | 3.70 | 6,014.74 | 6,014.84 |
| Downstream | 6,010.70 | 6,015.77 | 6,011.95 | 3.82 | 3.90 | 6,014.60 | 6,014.69 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.

# Detailed Report for Pipe 24" PIPE (2)

Section Material: Concrete
Section Shape: Circular
Section Size: 24 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 5.00 | cfs | Capacity | 36.37 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.47 | ft |
| Length | 53.00 | ft | Energy Slope | 0.008912 | ft/ft |
| Constructed Slope | 0.025849 | ft/ft | Upstream Velocity | 1.59 | ft/s |
| Upstream Flow Time | 0.00 | min | Average Velocity | 1.59 | ft/s |
| Pipe Flow Time | 0.56 | min | Downstream Velocity | 1.59 | ft/s |
| System Flow Time | 0.56 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,010.91 | 6,015.75 | 6,012.91 | 2.84 | 3.65 | 6,014.56 | 6,014.60 |
| Downstream | 6,009.54 | 6,014.78 | 6,011.54 | 3.24 | 4.55 | 6,014.09 | 6,014.13 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.

# Detailed Report for Pipe 24" PIPE (3)

Section Material: Concrete
Section Shape: Circular
Section Size: 24 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 3.00 | cfs | Capacity | 39.45 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.29 | ft |
| Length | 73.00 | ft | Energy Slope | 0.003918 | ft/ft |
| Constructed Slope | 0.030411 | ft/ft | Upstream Velocity | 0.95 | ft/s |
| Upstream Flow Time | 0.00 | min | Average Velocity | 0.95 | ft/s |
| Pipe Flow Time | 1.27 | min | Downstream Velocity | 0.95 | ft/s |
| System Flow Time | 1.27 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,011.45 | 6,015.37 | 6,013.45 | 1.92 | 2.93 | 6,014.38 | 6,014.39 |
| Downstream | 6,009.23 | 6,014.67 | 6,011.23 | 3.44 | 4.86 | 6,014.09 | 6,014.10 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.

# Detailed Report for Pipe 30" PIPE (2)

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 16.00 | cfs | Capacity | 28.80 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.11 | ft |
| Length | 71.00 | ft | Energy Slope | 0.001522 | ft/ft |
| Constructed Slope | 0.004930 | ft/ft | Upstream Velocity | 3.26 | ft/s |
| Upstream Flow Time | 1.36 | min | Average Velocity | 3.26 | ft/s |
| Pipe Flow Time | 0.36 | min | Downstream Velocity | 3.26 | ft/s |
| System Flow Time | 1.72 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,008.73 | 6,014.67 | 6,011.23 | 3.44 | 5.47 | 6,014.20 | 6,014.36 |
| Downstream | 6,008.38 | 6,014.84 | 6,010.88 | 3.96 | 5.71 | 6,014.09 | 6,014.26 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.




Nolte & Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

# Detailed Report for Pipe 30" PIPE (3)

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 8.00 | cfs | Capacity | 28.54 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.19 | ft |
| Length | 47.50 | ft | Energy Slope | 0.004029 | ft/ft |
| Constructed Slope | 0.004842 | ft/ft | Upstream Velocity | 1.63 | ft/s |
| Upstream Flow Time | 0.47 | min | Average Velocity | 1.63 | ft/s |
| Pipe Flow Time | 0.49 | min | Downstream Velocity | 1.63 | ft/s |
| System Flow Time | 0.96 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,009.28 | 6,015.77 | 6,011.78 | 3.99 | 5.27 | 6,014.55 | 6,014.60 |
| Downstream | 6,009.05 | 6,014.78 | 6,011.55 | 3.23 | 5.31 | 6,014.36 | 6,014.40 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.



 Nolte & Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

# Detailed Report for Pipe 30" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 13.00 | cfs | Capacity | 29.00 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.34 | ft |
| Length | 64.00 | ft | Energy Slope | 0.005273 | ft/ft |
| Constructed Slope | 0.005000 | ft/ft | Upstream Velocity | 2.65 | ft/s |
| Upstream Flow Time | 0.96 | min | Average Velocity | 2.65 | ft/s |
| Pipe Flow Time | 0.40 | min | Downstream Velocity | 2.65 | ft/s |
| System Flow Time | 1.36 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,009.05 | 6,014.78 | 6,011.55 | 3.23 | 5.38 | 6,014.43 | 6,014.54 |
| Downstream | 6,008.73 | 6,014.67 | 6,011.23 | 3.44 | 5.36 | 6,014.09 | 6,014.20 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.

# Detailed Report for TEE 1

| Flows | | | |
|---|---|---|---|
| Total Discharge | 13.00 cfs | Known Flow | 8.00 cfs |
| Upstream Additional + Carryover | 5.00 cfs | Total Watershed (CIA) | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.96 min | Upstream Flow Time | 0.96 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,014.54 ft | HGL Out | 6,014.43 ft |
| Ground Elevation | 6,014.78 ft | Rim Elevation | 6,012.22 ft |
| Sump Elevation | 6,009.05 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,755.73 ft | Y | 1,366,273.96 ft |
| Velocity | 2.65 ft/s | Headloss | 0.11 ft |
| Headloss Coefficient | 1.00 | Station | 1+35 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |





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# Detailed Report for TEE 2

| Flows | | | |
|---|---|---|---|
| Total Discharge | 16.00 cfs | Known Flow | 11.00 cfs |
| Upstream Additional + Carryover | 5.00 cfs | Total Watershed (CIA) | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 1.36 min | Upstream Flow Time | 1.36 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,014.36 ft | HGL Out | 6,014.20 ft |
| Ground Elevation | 6,014.67 ft | Rim Elevation | 6,011.90 ft |
| Sump Elevation | 6,008.73 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,819.44 ft | Y | 1,366,268.56 ft |
| Velocity | 3.26 ft/s | Headloss | 0.17 ft |
| Headloss Coefficient | 1.00 | Station | 0+71 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |



 Nolte & Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

**NOLTE and ASSOCIATES, Inc.**
Engineers / Planners / Surveyors
BIJOU & TEJON

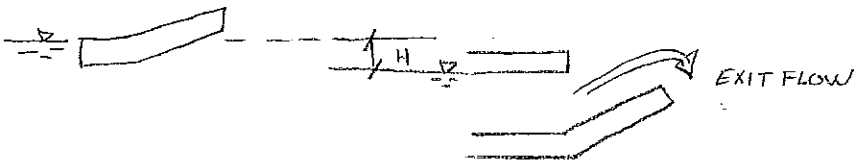
JOB NO. C50275
DATE 10/17/98
DESIGNED BY RICH RIDDLE JR.
CHECKED BY

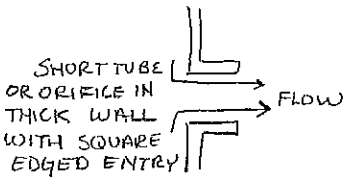
SUBJECT CALCULATION CHECKS BY WIER & ORIFICE EQUATIONS

✓ IF OUTET HAS EXIT CAPABILITY

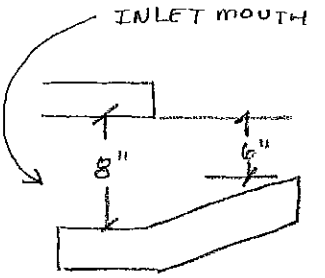
GIVEN : EXIT Q = 16 CFS
WILL 14' INLET WORK AS BUBBLER ?

ORIFICE




$C_d = .61$




ORIFICE EQUATION

$Q = C_d A \sqrt{2gH}$

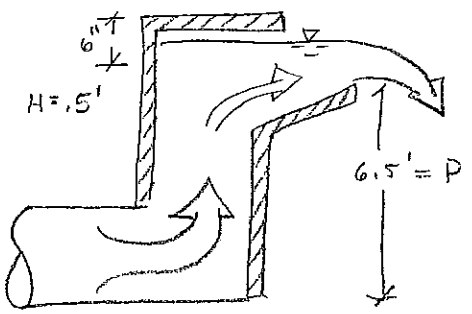
$A = (14)(6"/12"/1')$

$g = 32.2 \text{ ft/sec}^2$

$H = .4'$

$Q = 21.67 \text{ cfs}$ ✓

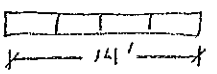
WIER



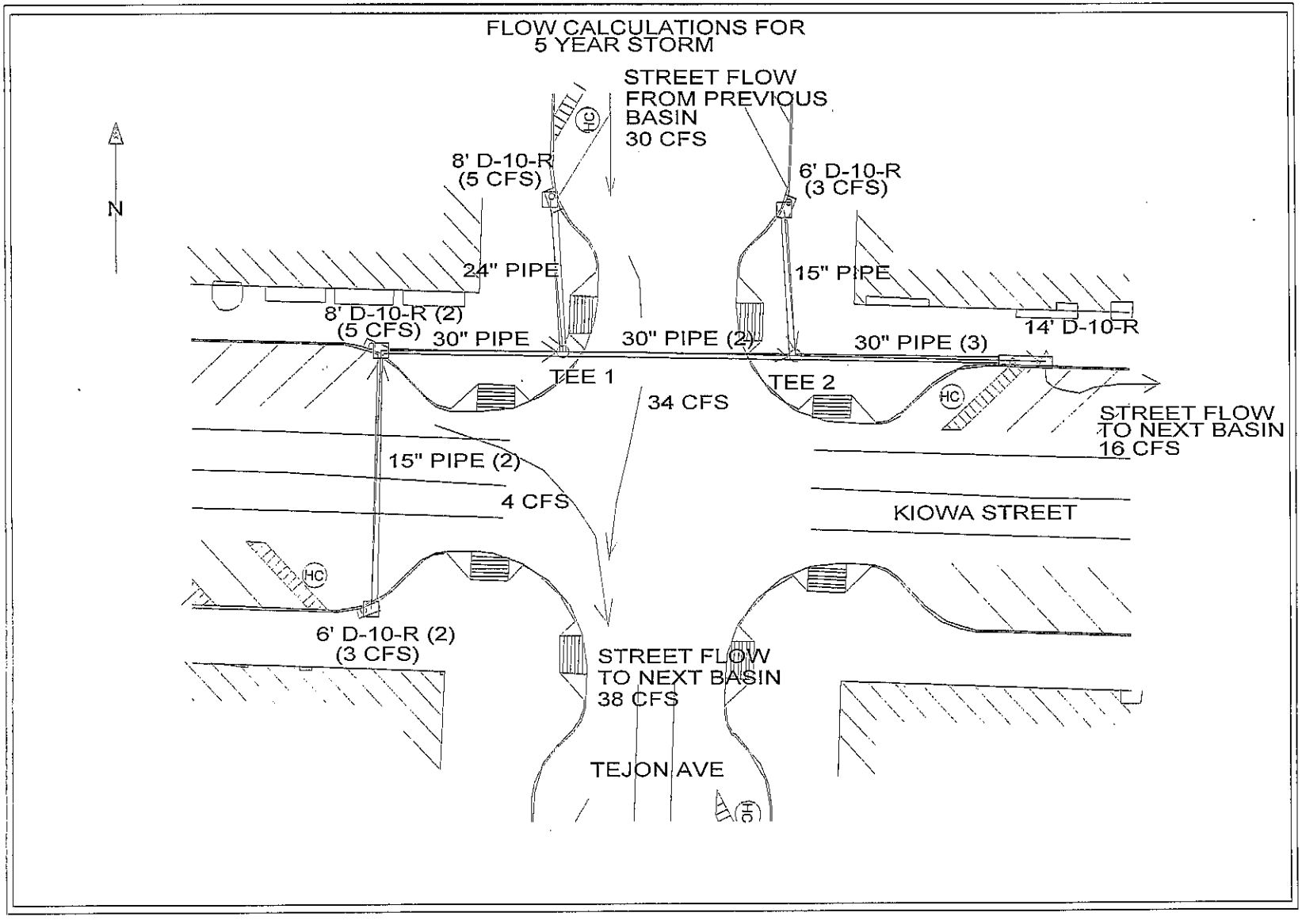

BAZIN'S EQUATION

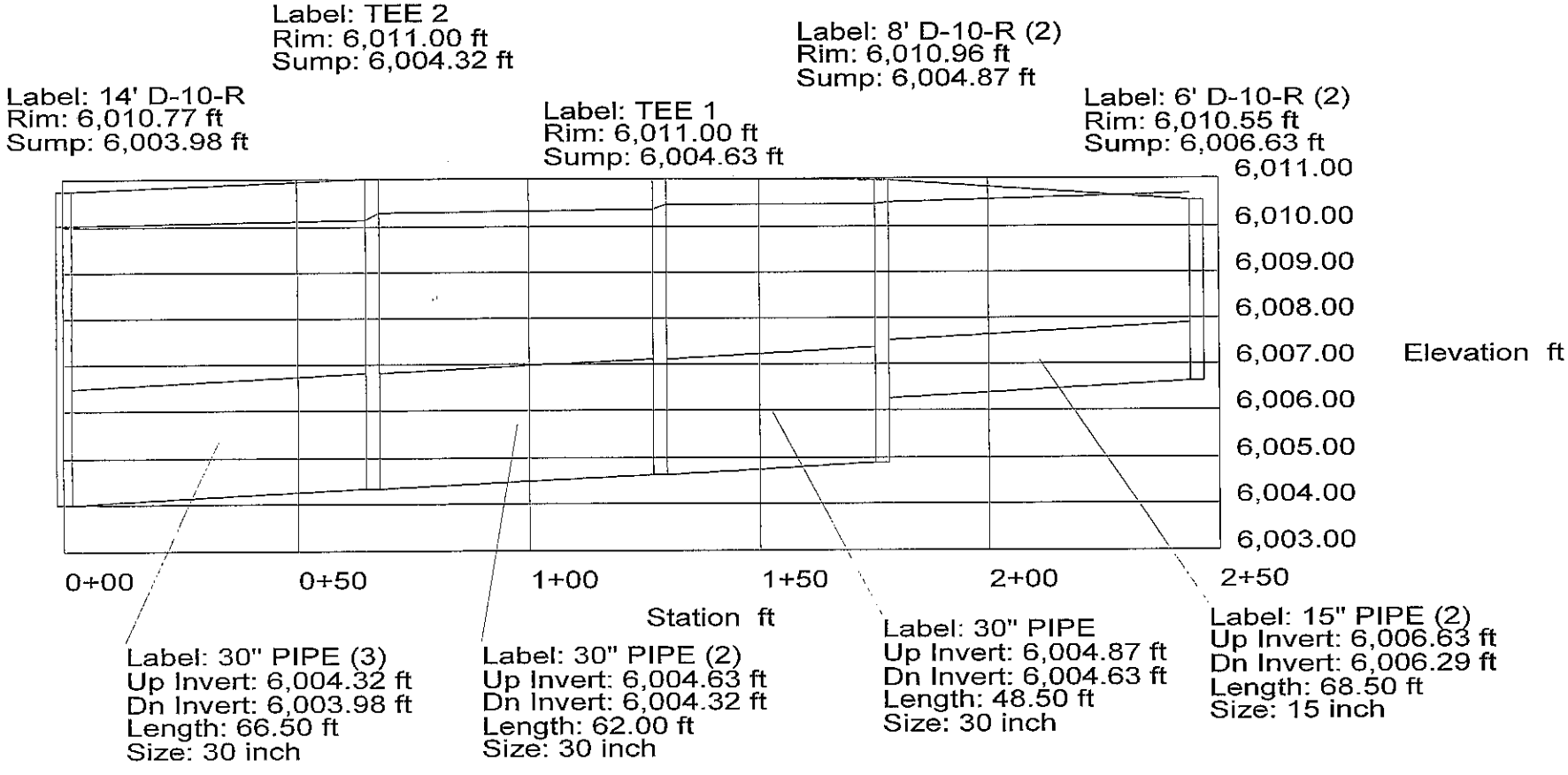
$$Q = \left(0.405 + \frac{.00984}{H}\right)\left(1 + .55\frac{H^2}{(P+H)^2}\right) L H \sqrt{2gH}$$

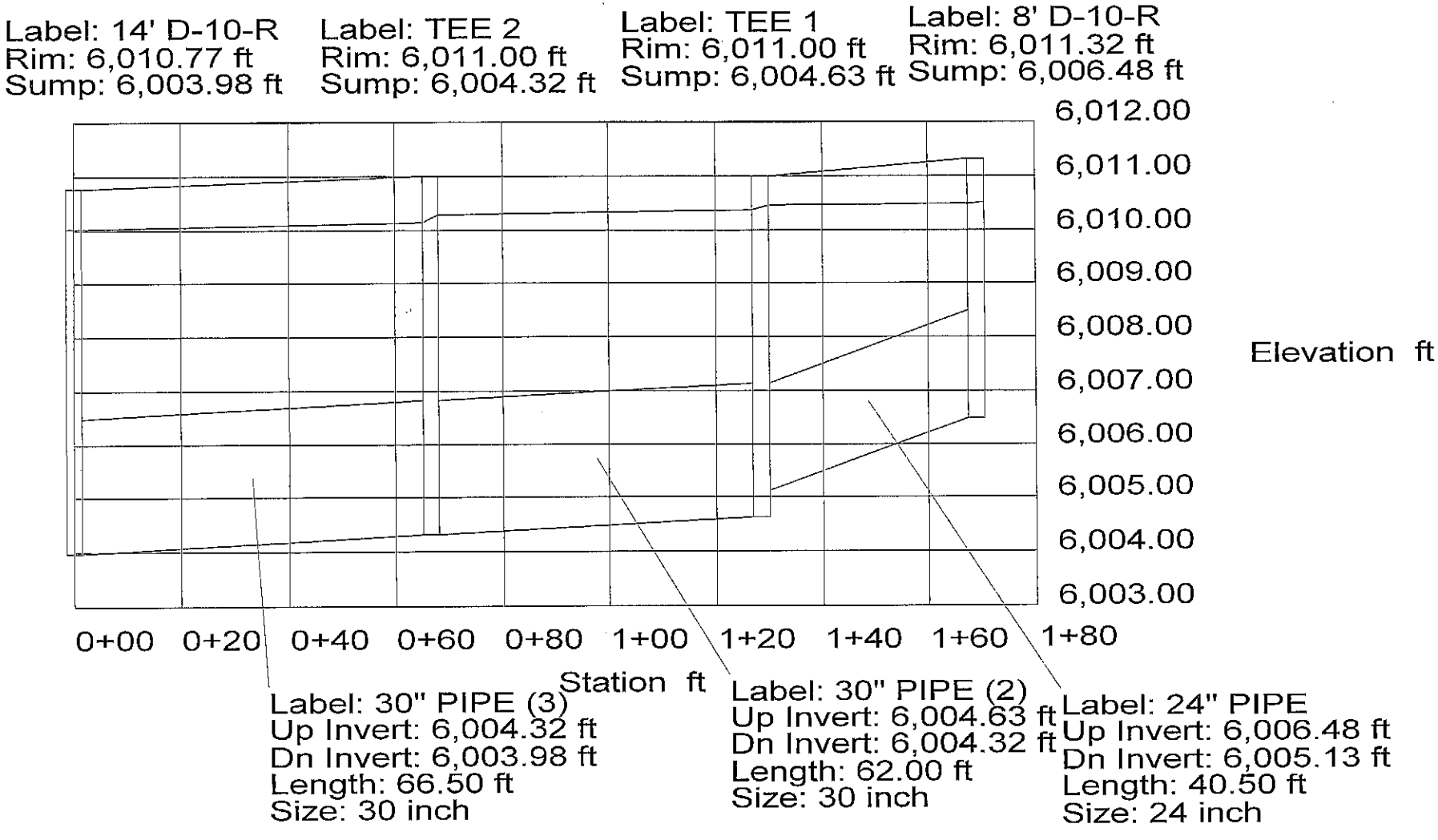
$Q = 16.92 \text{ cfs}$ ✓




14' INLET WILL WORK AS BUBBELER.


FLOW CALCULATIONS FOR
5 YEAR STORM
STREET FLOW
FROM PREVIOUS
BASIN
30 CFS
8' D-10-R
(5 CFS)
6' D-10-R
(3 CFS)
N
24" PIPE
15" PIPE
8' D-10-R (2)
(5 CFS)
30" PIPE
30" PIPE (2)
30" PIPE (3)
14' D-10-R
TEE 1
TEE 2
34 CFS
STREET FLOW
TO NEXT BASIN
16 CFS
15" PIPE (2)
4 CFS
KIOWA STREET
6' D-10-R (2)
(3 CFS)
STREET FLOW
TO NEXT BASIN
38 CFS
TEJON AVE

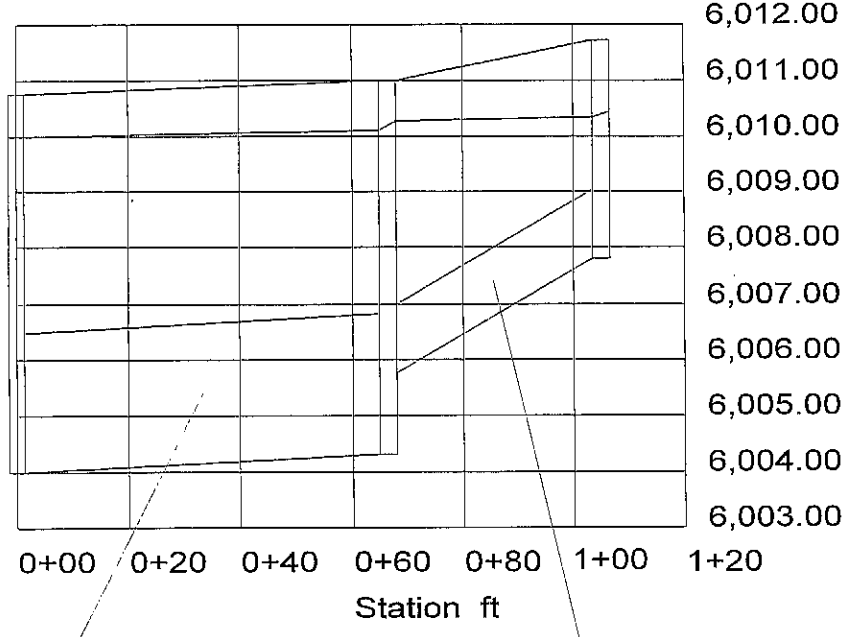

Label: TEE 2
Rim: 6,011.00 ft
Sump: 6,004.32 ft
Label: 8' D-10-R (2)
Rim: 6,010.96 ft
Sump: 6,004.87 ft
Label: 14' D-10-R
Rim: 6,010.77 ft
Sump: 6,003.98 ft
Label: TEE 1
Rim: 6,011.00 ft
Sump: 6,004.63 ft
Label: 6' D-10-R (2)
Rim: 6,010.55 ft
Sump: 6,006.63 ft
6,011.00
6,010.00
6,009.00
6,008.00
6,007.00
6,006.00
6,005.00
6,004.00
6,003.00
Elevation ft
0+00
0+50
1+00
1+50
2+00
2+50
Station ft
Label: 30" PIPE (3)
Up Invert: 6,004.32 ft
Dn Invert: 6,003.98 ft
Length: 66.50 ft
Size: 30 inch
Label: 30" PIPE (2)
Up Invert: 6,004.63 ft
Dn Invert: 6,004.32 ft
Length: 62.00 ft
Size: 30 inch
Label: 30" PIPE
Up Invert: 6,004.87 ft
Dn Invert: 6,004.63 ft
Length: 48.50 ft
Size: 30 inch
Label: 15" PIPE (2)
Up Invert: 6,006.63 ft
Dn Invert: 6,006.29 ft
Length: 68.50 ft
Size: 15 inch


Label: 14' D-10-R
Rim: 6,010.77 ft
Sump: 6,003.98 ft
Label: TEE 2
Rim: 6,011.00 ft
Sump: 6,004.32 ft
Label: TEE 1
Rim: 6,011.00 ft
Sump: 6,004.63 ft
Label: 8' D-10-R
Rim: 6,011.32 ft
Sump: 6,006.48 ft
6,012.00
6,011.00
6,010.00
6,009.00
6,008.00
6,007.00
6,006.00
6,005.00
6,004.00
6,003.00
Elevation ft
0+00
0+20
0+40
0+60
0+80
1+00
1+20
1+40
1+60
1+80
Station ft
Label: 30" PIPE (3)
Up Invert: 6,004.32 ft
Dn Invert: 6,003.98 ft
Length: 66.50 ft
Size: 30 inch
Label: 30" PIPE (2)
Up Invert: 6,004.63 ft
Dn Invert: 6,004.32 ft
Length: 62.00 ft
Size: 30 inch
Label: 24" PIPE
Up Invert: 6,006.48 ft
Dn Invert: 6,005.13 ft
Length: 40.50 ft
Size: 24 inch

Label: 14' D-10-R
Rim: 6,010.77 ft
Sump: 6,003.98 ft

Label: TEE 2
Rim: 6,011.00 ft
Sump: 6,004.32 ft

Label: 6' D-10-R
Rim: 6,011.72 ft
Sump: 6,007.80 ft




Label: 30" PIPE (3)
Up Invert: 6,004.32 ft
Dn Invert: 6,003.98 ft
Length: 66.50 ft
Size: 30 inch

Label: 15" PIPE
Up Invert: 6,007.80 ft
Dn Invert: 6,005.74 ft
Length: 38.50 ft
Size: 15 inch

# Combined Pipe/Node Report

| Pipe | Upstream Node | Downstream Node | Length (ft) | Inlet Area (acres) | Inlet C Coefficient | Inlet CA (acres) | Total CA (acres) | Inlet Discharge (cfs) | Section Size | Capacity (cfs) | Average Velocity (ft/s) | Upstream Invert Elevation (ft) | Downstream Invert Elevation (ft) | Constructed Slope (ft/ft) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15" PIPE (2 | 6' D-10-R (2 | 8' D-10-R (2 | 68.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15 inch | 4.55 | 2.44 | ,006.63 | 6,006.29 | 0.004964 | |
| 30" PIPE | 8' D-10-R (2 | TEE 1 | 48.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 30 inch | 28.85 | 1.63 | ,004.87 | 6,004.63 | 0.004948 | |
| 24" PIPE | 8' D-10-R | TEE 1 | 40.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 24 inch | 41.30 | 1.59 | ,006.48 | 6,005.13 | 0.033333 | |
| 15" PIPE | 6' D-10-R | TEE 2 | 38.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 15 inch | 14.94 | 2.44 | ,007.80 | 6,005.74 | 0.053506 | |
| 30" PIPE (2 | TEE 1 | TEE 2 | 62.00 | N/A | N/A | N/A | 0.00 | N/A | 30 inch | 29.00 | 2.65 | ,004.63 | 6,004.32 | 0.005000 | |
| 30" PIPE (3 | TEE 2 | 14' D-10-R | 66.50 | N/A | N/A | N/A | 0.00 | N/A | 30 inch | 29.33 | 3.26 | ,004.32 | 6,003.98 | 0.005113 | |

# DOT Report

| Pipe | -Node- Upstream Downstream | Inlet Area (acres) | Inlet CA (acres) | Total CA (acres) | -Ground- Upstream (ft) Downstream | -HGL- Upstream (ft) Downstream | -Slope- Energy Constructed (ft/ft) | -Section- Discharge Capacity (cfs) | -Section- Shape Size | Length (ft) | Average Velocity (ft/s) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15" PIPE (2 | 6' D-10-R (2 | 0.00 | 0.00 | 0.00 | 6,010.55 | 6,010.67 | 0.002157 | 3.00 | Circular | 68.50 | 2.44 | |
| | 8' D-10-R (2 | | | | 6,010.96 | 6,010.52 | 0.004964 | 4.55 | 15 inch | | | |
| 30" PIPE | 8' D-10-R (2 | 0.00 | 0.00 | 0.00 | 6,010.96 | 6,010.48 | 0.000380 | 8.00 | Circular | 48.50 | 1.63 | |
| | TEE 1 | | | | 6,011.00 | 6,010.46 | 0.004948 | 28.85 | 30 inch | | | |
| 24" PIPE | 8' D-10-R | 0.00 | 0.00 | 0.00 | 6,011.32 | 6,010.48 | 0.000489 | 5.00 | Circular | 40.50 | 1.59 | |
| | TEE 1 | | | | 6,011.00 | 6,010.46 | 0.033333 | 41.30 | 24 inch | | | |
| 15" PIPE | 6' D-10-R | 0.00 | 0.00 | 0.00 | 6,011.72 | 6,010.37 | 0.002157 | 3.00 | Circular | 38.50 | 2.44 | |
| | TEE 2 | | | | 6,011.00 | 6,010.29 | 0.053506 | 14.94 | 15 inch | | | |
| 30" PIPE (2 | TEE 1 | N/A | N/A | 0.00 | 6,011.00 | 6,010.35 | 0.001005 | 13.00 | Circular | 62.00 | 2.65 | |
| | TEE 2 | | | | 6,011.00 | 6,010.29 | 0.005000 | 29.00 | 30 inch | | | |
| 30" PIPE (3 | TEE 2 | N/A | N/A | 0.00 | 6,011.00 | 6,010.12 | 0.001522 | 16.00 | Circular | 66.50 | 3.26 | |
| | 14' D-10-R | | | | 6,010.77 | 6,010.02 | 0.005113 | 29.33 | 30 inch | | | |

# Detailed Report for 6' D-10-R (2)

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 3.00 cfs | Known Flow | 3.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,010.55 ft | HGL Out | 6,010.55 ft |
| Ground Elevation | 6,010.55 ft | Rim Elevation | 6,010.55 ft |
| Sump Elevation | 6,006.63 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,691.75 ft | Y | 1,365,708.39 ft |
| Velocity | 2.44 ft/s | Headloss | 0.09 ft |
| Headloss Coefficient | 1.00 | Station | 2+46 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: The hydraulic grade exceeds the Rim/Ground elevatio |
| Information: Flooding condition. |

# Detailed Report for 6' D-10-R

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 3.00 cfs | Known Flow | 3.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,010.46 ft | HGL Out | 6,010.37 ft |
| Ground Elevation | 6,011.72 ft | Rim Elevation | 6,011.72 ft |
| Sump Elevation | 6,007.80 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,801.80 ft | Y | 1,365,813.44 ft |
| Velocity | 2.44 ft/s | Headloss | 0.09 ft |
| Headloss Coefficient | 1.00 | Station | 1+05 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 8' D-10-R (2)

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 8.00 cfs | Known Flow | 3.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 5.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.47 min | Upstream Flow Time | 0.47 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,010.52 ft | HGL Out | 6,010.48 ft |
| Ground Elevation | 6,010.96 ft | Rim Elevation | 6,010.96 ft |
| Sump Elevation | 6,004.87 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,694.25 ft | Y | 1,365,776.64 ft |
| Velocity | 1.63 ft/s | Headloss | 0.04 ft |
| Headloss Coefficient | 1.00 | Station | 1+77 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 8' D-10-R

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 5.00 cfs | Known Flow | 5.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,010.52 ft | HGL Out | 6,010.48 ft |
| Ground Elevation | 6,011.32 ft | Rim Elevation | 6,011.32 ft |
| Sump Elevation | 6,006.48 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,739.63 ft | Y | 1,365,816.30 ft |
| Velocity | 1.59 ft/s | Headloss | 0.04 ft |
| Headloss Coefficient | 1.00 | Station | 1+69 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 14' D-10-R

| Flows | | | | | |
|---|---|---|---|---|---|
| Total Discharge | 16.00 | cfs | Known Flow | 11.00 | cfs |
| Upstream Additional + Carryover | 5.00 | cfs | Total Watershed (CIA) | 0.00 | cfs |

| Watershed Data | | | | | |
|---|---|---|---|---|---|
| System Intensity | 0.00 | in/hr | Upstream CA | 0.00 | acres |
| Total CA | 0.00 | acres | | | |

| Flow Times | | | | | |
|---|---|---|---|---|---|
| System Flow Time | 1.69 | min | Upstream Flow Time | 1.69 | min |

| Elevations | | | | | |
|---|---|---|---|---|---|
| HGL In | 6,010.02 | ft | HGL Out | 6,010.02 | ft |
| Ground Elevation | 6,010.77 | ft | Rim Elevation | 6,010.77 | ft |
| Sump Elevation | 6,003.98 | ft | | | |

| Other Properties | | | | | |
|---|---|---|---|---|---|
| X | 3,192,871.12 | ft | Y | 1,365,773.42 | ft |
| Velocity | 0.00 | ft/s | Headloss | 0.00 | ft |
| Headloss Coefficient | 0.00 | | Station | 0+00 | ft |
| External Flow | 0.00 | cfs | | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |





Nolte & Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

# Detailed Report for Pipe 15" PIPE (2)

Section Material: Concrete
Section Shape: Circular
Section Size: 15 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 3.00 | cfs | Capacity | 4.55 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.15 | ft |
| Length | 68.50 | ft | Energy Slope | 0.002157 | ft/ft |
| Constructed Slope | 0.004964 | ft/ft | Upstream Velocity | 2.44 | ft/s |
| Upstream Flow Time | 0.00 | min | Average Velocity | 2.44 | ft/s |
| Pipe Flow Time | 0.47 | min | Downstream Velocity | 2.44 | ft/s |
| System Flow Time | 0.47 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,006.63 | 6,010.55 | 6,007.88 | 2.67 | 4.04 | 6,010.67 | 6,010.76 |
| Downstream | 6,006.29 | 6,010.96 | 6,007.54 | 3.42 | 4.23 | 6,010.52 | 6,010.61 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end

# Detailed Report for Pipe 15" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 15 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 3.00 | cfs | Capacity | 14.94 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.08 | ft |
| Length | 38.50 | ft | Energy Slope | 0.002157 | ft/ft |
| Constructed Slope | 0.053506 | ft/ft | Upstream Velocity | 2.44 | ft/s |
| Upstream Flow Time | 0.00 | min | Average Velocity | 2.44 | ft/s |
| Pipe Flow Time | 0.26 | min | Downstream Velocity | 2.44 | ft/s |
| System Flow Time | 0.26 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,007.80 | 6,011.72 | 6,009.05 | 2.67 | 2.57 | 6,010.37 | 6,010.46 |
| Downstream | 6,005.74 | 6,011.00 | 6,006.99 | 4.01 | 4.55 | 6,010.29 | 6,010.38 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at upstream end

# Detailed Report for Pipe 24" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 24 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 5.00 | cfs | Capacity | 41.30 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.02 | ft |
| Length | 40.50 | ft | Energy Slope | 0.000489 | ft/ft |
| Constructed Slope | 0.033333 | ft/ft | Upstream Velocity | 1.59 | ft/s |
| Upstream Flow Time | 0.00 | min | Average Velocity | 1.59 | ft/s |
| Pipe Flow Time | 0.42 | min | Downstream Velocity | 1.59 | ft/s |
| System Flow Time | 0.42 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,006.48 | 6,011.32 | 6,008.48 | 2.84 | 4.00 | 6,010.48 | 6,010.52 |
| Downstream | 6,005.13 | 6,011.00 | 6,007.13 | 3.87 | 5.33 | 6,010.46 | 6,010.50 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end





Nolte & Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

# Detailed Report for Pipe 30" PIPE (2)

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 13.00 | cfs | Capacity | 29.00 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.06 | ft |
| Length | 62.00 | ft | Energy Slope | 0.001005 | ft/ft |
| Constructed Slope | 0.005000 | ft/ft | Upstream Velocity | 2.65 | ft/s |
| Upstream Flow Time | 0.96 | min | Average Velocity | 2.65 | ft/s |
| Pipe Flow Time | 0.39 | min | Downstream Velocity | 2.65 | ft/s |
| System Flow Time | 1.35 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,004.63 | 6,011.00 | 6,007.13 | 3.87 | 5.72 | 6,010.35 | 6,010.46 |
| Downstream | 6,004.32 | 6,011.00 | 6,006.82 | 4.18 | 5.97 | 6,010.29 | 6,010.40 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at upstream end

# Detailed Report for Pipe 30" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 8.00 | cfs | Capacity | 28.85 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.02 | ft |
| Length | 48.50 | ft | Energy Slope | 0.000380 | ft/ft |
| Constructed Slope | 0.004948 | ft/ft | Upstream Velocity | 1.63 | ft/s |
| Upstream Flow Time | 0.47 | min | Average Velocity | 1.63 | ft/s |
| Pipe Flow Time | 0.50 | min | Downstream Velocity | 1.63 | ft/s |
| System Flow Time | 0.96 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,004.87 | 6,010.96 | 6,007.37 | 3.59 | 5.61 | 6,010.48 | 6,010.52 |
| Downstream | 6,004.63 | 6,011.00 | 6,007.13 | 3.87 | 5.83 | 6,010.46 | 6,010.50 |

Message List

Profile: Pressure profile.
Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end



 Nolte & Associates
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# Detailed Report for Pipe 30" PIPE (3)

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 16.00 | cfs | Capacity | 29.33 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.10 | ft |
| Length | 66.50 | ft | Energy Slope | 0.001522 | ft/ft |
| Constructed Slope | 0.005113 | ft/ft | Upstream Velocity | 3.26 | ft/s |
| Upstream Flow Time | 1.35 | min | Average Velocity | 3.26 | ft/s |
| Pipe Flow Time | 0.34 | min | Downstream Velocity | 3.26 | ft/s |
| System Flow Time | 1.69 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 6,004.32 | 6,011.00 | 6,006.82 | 4.18 | 5.80 | 6,010.12 | 6,010.29 |
| Downstream | 6,003.98 | 6,010.77 | 6,006.48 | 4.29 | 6.04 | 6,010.02 | 6,010.19 |

| Message List |
|---|
| Profile: Pressure profile. |
| Information: Surcharged condition |




Nolte & Associates
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

# Detailed Report for TEE 1

| Flows | | | |
|---|---|---|---|
| Total Discharge | 13.00 cfs | Known Flow | 8.00 cfs |
| Upstream Additional + Carryover | 5.00 cfs | Total Watershed (CIA) | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.96 min | Upstream Flow Time | 0.96 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,010.46 ft | HGL Out | 6,010.35 ft |
| Ground Elevation | 6,011.00 ft | Rim Elevation | 6,011.00 ft |
| Sump Elevation | 6,004.63 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,742.84 ft | Y | 1,365,775.92 ft |
| Velocity | 2.65 ft/s | Headloss | 0.11 ft |
| Headloss Coefficient | 1.00 | Station | 1+29 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |





Nolte & Associates
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# Detailed Report for TEE 2

| Flows | | | |
|---|---|---|---|
| Total Discharge | 16.00 cfs | Known Flow | 11.00 cfs |
| Upstream Additional + Carryover | 5.00 cfs | Total Watershed (CIA) | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 1.35 min | Upstream Flow Time | 1.35 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,010.29 ft | HGL Out | 6,010.12 ft |
| Ground Elevation | 6,011.00 ft | Rim Elevation | 6,011.00 ft |
| Sump Elevation | 6,004.32 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,804.66 ft | Y | 1,365,774.85 ft |
| Velocity | 3.26 ft/s | Headloss | 0.17 ft |
| Headloss Coefficient | 1.00 | Station | 0+67 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |

**NOLTE and ASSOCIATES, Inc.**
Engineers / Planners / Surveyors
KIOWA & TEJON

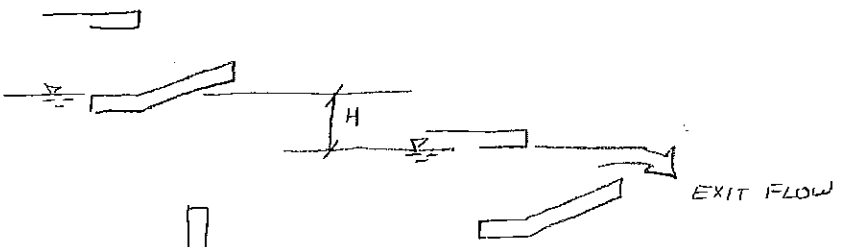
JOB NO. C50275
DATE 10/16/98
DESIGNED BY RICH BIDDLE JR
CHECKED BY

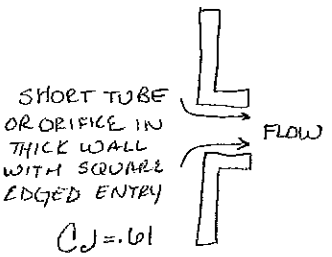
SUBJECT CALCULATION CHECKS BY WIER & ORIFICE EQUATIONS

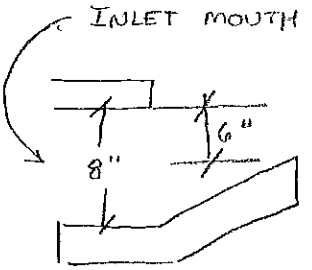
✓ if outlet has EXIT CAPACITY

GIVEN: EXIT Q = 16 cfs
WILL 14' INLET WORK AS BUBBLER?

## ORIFICE




ORIFICE EQUATION

$Q = C_d A \sqrt{2gH}$

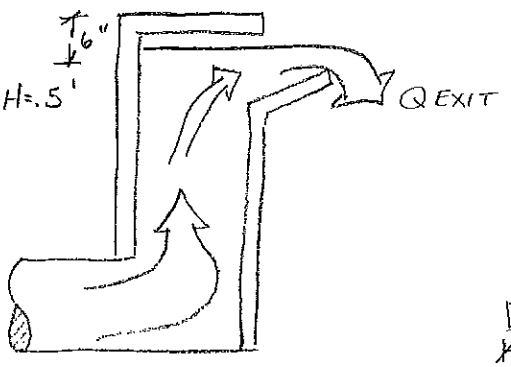
$A = (14')(6"/12"/1')$

$g = 32.2\ ft/sec^2$

$H = .5$

$Q = 24.23$ cfs ✓

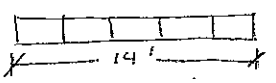
## WIER



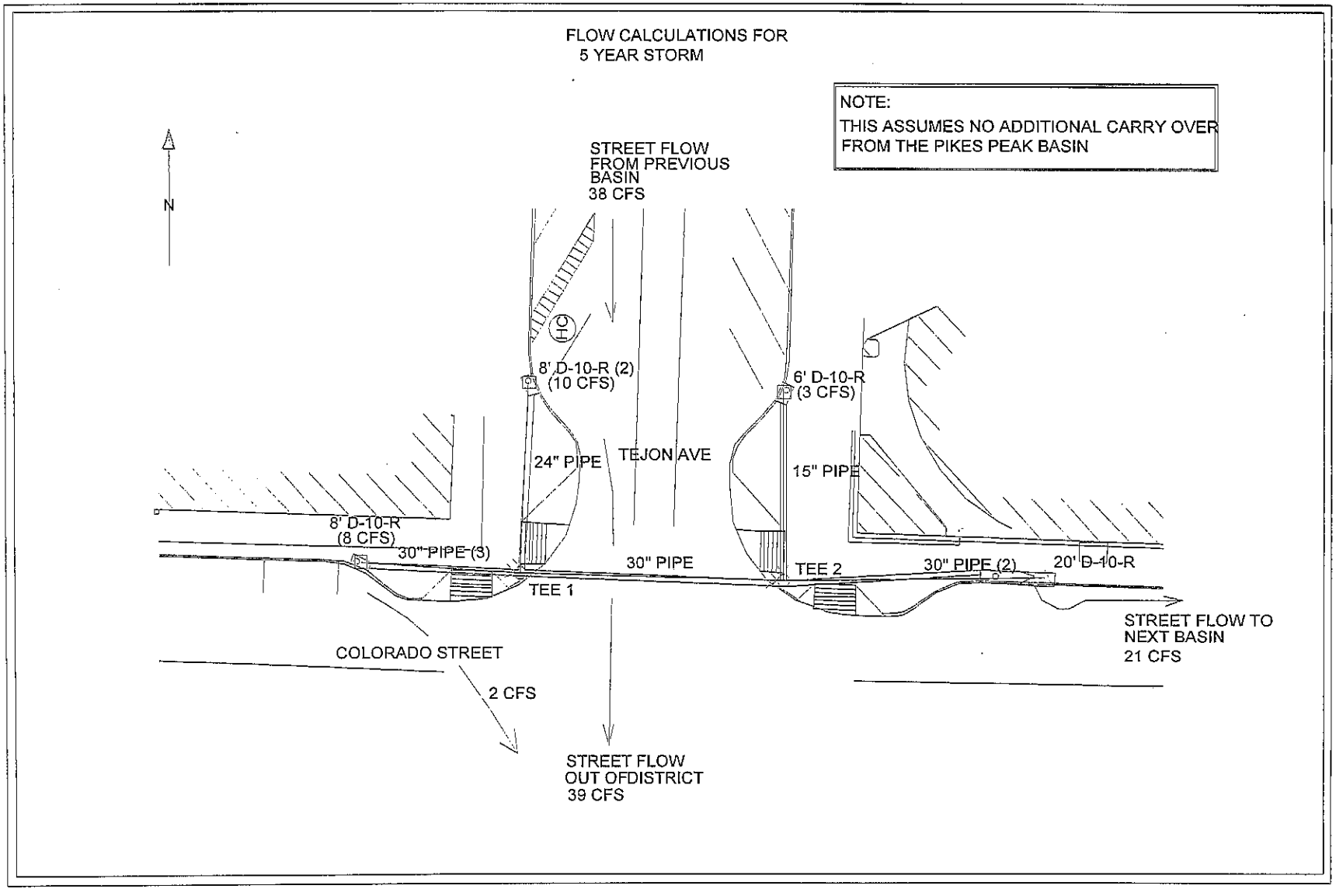

BAZIN'S FORMULA

$$Q = \left(.405 + \frac{.00984}{H}\right)\left[1 + \frac{.55\,H^2}{(P+H)^2}\right] L H \sqrt{2gH}$$

Q = 16.92 cfs ✓




14' INLET WILL WORK AS BUBBLER.

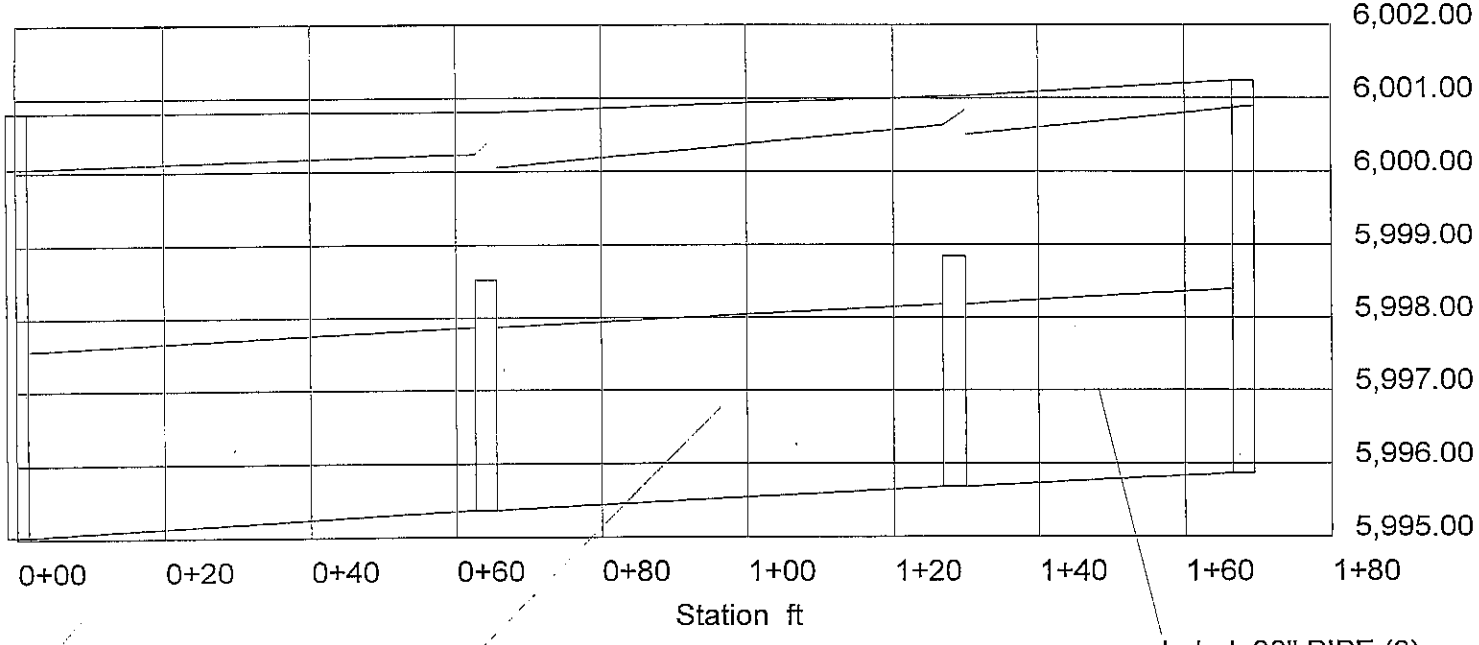

FLOW CALCULATIONS FOR
5 YEAR STORM
NOTE:
THIS ASSUMES NO ADDITIONAL CARRY OVER
FROM THE PIKES PEAK BASIN
N
STREET FLOW
FROM PREVIOUS
BASIN
38 CFS
HC
8' D-10-R (2)
(10 CFS)
6' D-10-R
(3 CFS)
24" PIPE
TEJON AVE
15" PIPE
8' D-10-R
(8 CFS)
30" PIPE (3)
30" PIPE
TEE 2
30" PIPE (2)
20' D-10-R
TEE 1
STREET FLOW TO
NEXT BASIN
21 CFS
COLORADO STREET
2 CFS
STREET FLOW
OUT OFDISTRICT
39 CFS

Label: 20' D-10-R
Rim: 6,000.80 ft
Sump: 5,995.04 ft

Label: TEE 2
Rim: 5,998.53 ft
Sump: 5,995.36 ft

Label: TEE 1
Rim: 5,998.85 ft
Sump: 5,995.68 ft

Label: 8' D-10-R
Rim: 6,001.22 ft
Sump: 5,995.88 ft




Label: 30" PIPE (2)
Up Invert: 5,995.36 ft
Dn Invert: 5,995.04 ft
Length: 64.00 ft
Size: 30 inch

Label: 30" PIPE
Up Invert: 5,995.68 ft
Dn Invert: 5,995.36 ft
Length: 64.50 ft
Size: 30 inch

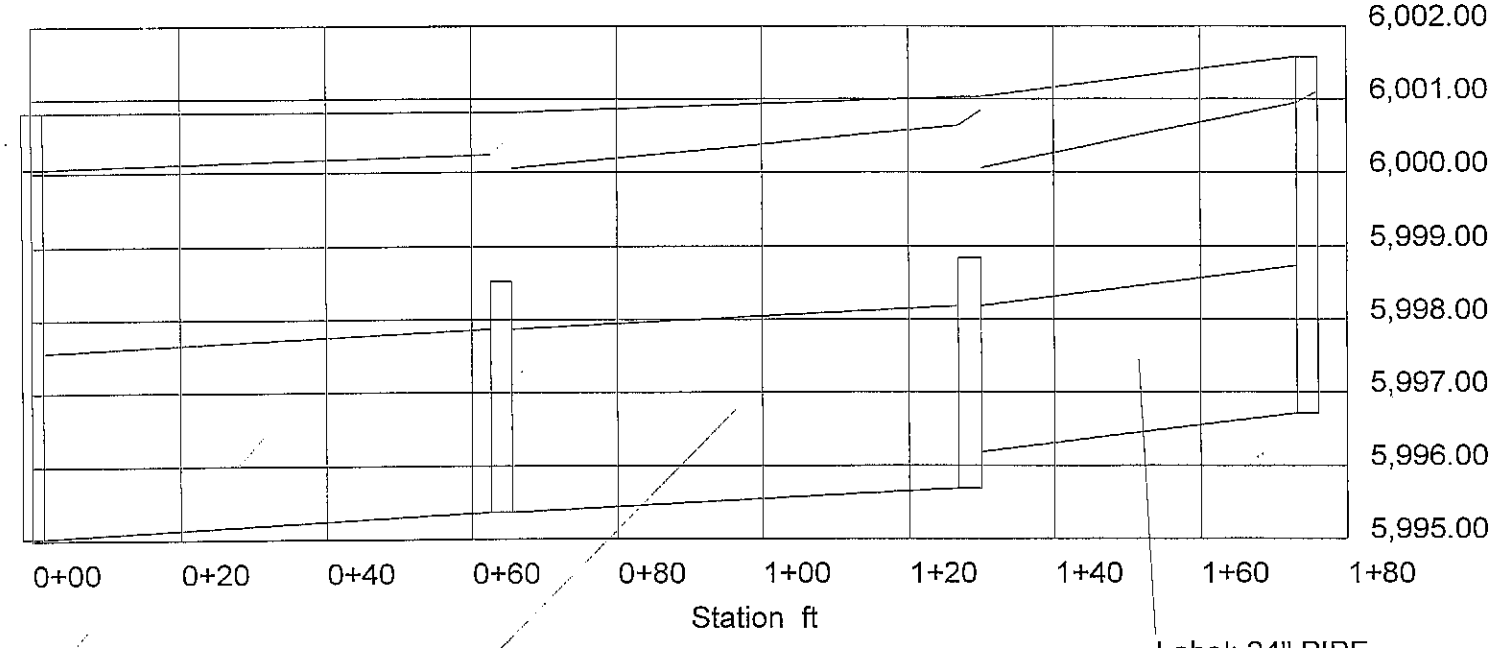
Label: 30" PIPE (3)
Up Invert: 5,995.88 ft
Dn Invert: 5,995.68 ft
Length: 39.50 ft
Size: 30 inch

Label: 20' D-10-R
Rim: 6,000.80 ft
Sump: 5,995.04 ft

Label: TEE 2
Rim: 5,998.53 ft
Sump: 5,995.36 ft

Label: TEE 1
Rim: 5,998.85 ft
Sump: 5,995.68 ft

Label: 8' D-10-R (2)
Rim: 6,001.56 ft
Sump: 5,996.72 ft




Label: 30" PIPE (2)
Up Invert: 5,995.36 ft
Dn Invert: 5,995.04 ft
Length: 64.00 ft
Size: 30 inch

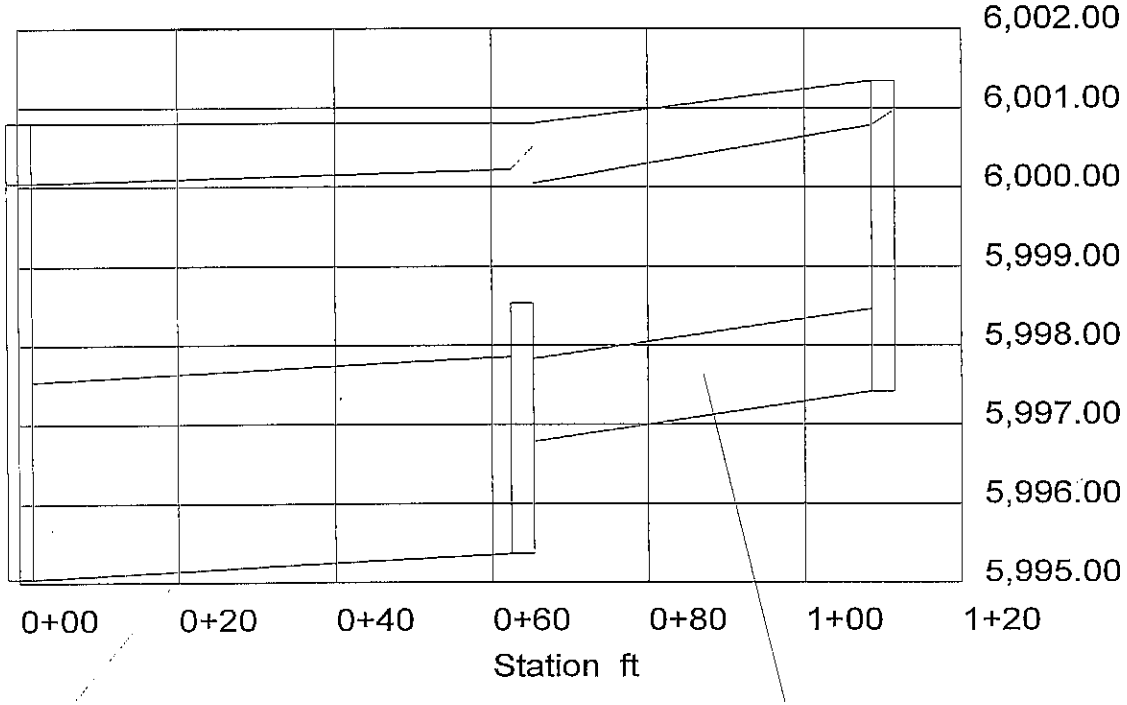
Label: 30" PIPE
Up Invert: 5,995.68 ft
Dn Invert: 5,995.36 ft
Length: 64.50 ft
Size: 30 inch

Label: 24" PIPE
Up Invert: 5,996.72 ft
Dn Invert: 5,996.18 ft
Length: 46.00 ft
Size: 24 inch

Label: 20' D-10-R
Rim: 6,000.80 ft
Sump: 5,995.04 ft

Label: TEE 2
Rim: 5,998.53 ft
Sump: 5,995.36 ft

Label: 6' D-10-R
Rim: 6,001.34 ft
Sump: 5,997.42 ft




Label: 30" PIPE (2)
Up Invert: 5,995.36 ft
Dn Invert: 5,995.04 ft
Length: 64.00 ft
Size: 30 inch

Label: 15" PIPE
Up Invert: 5,997.42 ft
Dn Invert: 5,996.78 ft
Length: 46.00 ft
Size: 12 inch

# Combined Pipe/Node Report

| Pipe | Upstream Node | Downstream Node | Length (ft) | Inlet Area (acres) | Inlet C Coefficient | Inlet CA (acres) | Total CA (acres) | Inlet Discharge (cfs) | Section Size | Capacity (cfs) | Average Velocity (ft/s) | Upstream Invert Elevation (ft) | Downstream Invert Elevation (ft) | Constructed Slope (ft/ft) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24" PIPE | 8' D-10-R (2 | TEE 1 | 46.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 24 inch | 24.51 | 3.18 | ,996.72 | 5,996.18 | 0.011739 | |
| 30" PIPE (3 | 8' D-10-R | TEE 1 | 39.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 30 inch | 29.18 | 1.63 | ,995.88 | 5,995.68 | 0.005063 | |
| 30" PIPE | TEE 1 | TEE 2 | 64.50 | N/A | N/A | N/A | 0.00 | N/A | 30 inch | 28.89 | 3.67 | ,995.68 | 5,995.36 | 0.004961 | |
| 15" PIPE | 6' D-10-R | TEE 2 | 46.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12 inch | 4.69 | 3.52 | ,997.42 | 5,996.78 | 0.013913 | |
| 30" PIPE (2 | TEE 2 | 20' D-10-R | 64.00 | N/A | N/A | N/A | 0.00 | N/A | 30 inch | 29.00 | 4.28 | ,995.36 | 5,995.04 | 0.005000 | |

# DOT Report

| Pipe | -Node- Upstream Downstream | Inlet Area (acres) | Inlet CA (acres) | Total CA (acres) | -Ground- Upstream (ft) Downstream | -HGL- Upstream (ft) Downstream | -Slope- Energy Constructed (ft/ft) | -Section- Discharge Capacity (cfs) | -Section- Shape Size | Length (ft) | Average Velocity (ft/s) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24" PIPE | 8' D-10-R (2 | 0.00 | 0.00 | 0.00 | 6,001.56 | 6,000.93 | 0.019028 | 10.00 | Circular | 46.00 | 3.18 | |
| | TEE 1 | | | | 6,001.02 | 6,000.05 | 0.011739 | 24.51 | 24 inch | | | |
| 30" PIPE (3 | 8' D-10-R | 0.00 | 0.00 | 0.00 | 6,001.22 | 6,000.85 | 0.008816 | 8.00 | Circular | 39.50 | 1.63 | |
| | TEE 1 | | | | 6,001.02 | 6,000.50 | 0.005063 | 29.18 | 30 inch | | | |
| 30" PIPE | TEE 1 | N/A | N/A | 0.00 | 6,001.02 | 6,000.63 | 0.008937 | 18.00 | Circular | 64.50 | 3.67 | |
| | TEE 2 | | | | 6,000.81 | 6,000.05 | 0.004961 | 28.89 | 30 inch | | | |
| 15" PIPE | 6' D-10-R | 0.00 | 0.00 | 0.00 | 6,001.34 | 6,000.76 | 0.015534 | 3.00 | Circular | 46.00 | 3.52 | |
| | TEE 2 | | | | 6,000.81 | 6,000.05 | 0.013913 | 4.69 | 12 inch | | | |
| 30" PIPE (2 | TEE 2 | N/A | N/A | 0.00 | 6,000.81 | 6,000.22 | 0.002622 | 21.00 | Circular | 64.00 | 4.28 | |
| | 20' D-10-R | | | | 6,000.80 | 6,000.05 | 0.005000 | 29.00 | 30 inch | | | |

# Detailed Report for 6' D-10-R

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 3.00 cfs | Known Flow | 3.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,000.96 ft | HGL Out | 6,000.76 ft |
| Ground Elevation | 6,001.34 ft | Rim Elevation | 6,001.34 ft |
| Sump Elevation | 5,997.42 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,767.49 ft | Y | 1,364,782.61 ft |
| Velocity | 3.52 ft/s | Headloss | 0.19 ft |
| Headloss Coefficient | 1.00 | Station | 1+10 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 8' D-10-R

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 8.00 cfs | Known Flow | 8.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,000.89 ft | HGL Out | 6,000.85 ft |
| Ground Elevation | 6,001.22 ft | Rim Elevation | 6,001.22 ft |
| Sump Elevation | 5,995.88 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,663.49 ft | Y | 1,364,741.45 ft |
| Velocity | 1.63 ft/s | Headloss | 0.04 ft |
| Headloss Coefficient | 1.00 | Station | 1+68 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for 8' D-10-R (2)

Watershed Information

No watershed data entered for this inlet.

| Flows | | | |
|---|---|---|---|
| Total Discharge | 10.00 cfs | Known Flow | 10.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |
| Carryover | 0.00 cfs | Additional Flow | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | Inlet CA | 0.00 acres |
| External CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.00 min | Upstream Flow Time | 0.00 min |
| Inlet TC | 0.00 min | External TC | 0.00 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,001.08 ft | HGL Out | 6,000.93 ft |
| Ground Elevation | 6,001.56 ft | Rim Elevation | 6,001.56 ft |
| Sump Elevation | 5,996.72 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,704.90 ft | Y | 1,364,784.83 ft |
| Velocity | 3.18 ft/s | Headloss | 0.16 ft |
| Headloss Coefficient | 1.00 | Station | 1+75 ft |
| External Flow | 0.00 cfs | | |

# Detailed Report for Pipe 15" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 12 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 3.00 | cfs | Capacity | 4.69 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.71 | ft |
| Length | 46.00 | ft | Energy Slope | 0.015534 | ft/ft |
| Constructed Slope | 0.013913 | ft/ft | Upstream Velocity | 3.52 | ft/s |
| Upstream Flow Time | 0.00 | min | Average Velocity | 3.52 | ft/s |
| Pipe Flow Time | 0.22 | min | Downstream Velocity | 3.52 | ft/s |
| System Flow Time | 0.22 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 5,997.42 | 6,001.34 | 5,998.46 | 2.88 | 3.34 | 6,000.76 | 6,000.96 |
| Downstream | 5,996.78 | 6,000.81 | 5,997.82 | 2.99 | 3.27 | 6,000.05 | 6,000.24 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.

# Detailed Report for 20' D-10-R

| Flows | | | |
|---|---|---|---|
| Total Discharge | 21.00 cfs | Known Flow | 21.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.95 min | Upstream Flow Time | 0.95 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,000.05 ft | HGL Out | 6,000.05 ft |
| Ground Elevation | 6,000.80 ft | Rim Elevation | 6,000.80 ft |
| Sump Elevation | 5,995.04 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,831.08 ft | Y | 1,364,737.75 ft |
| Velocity | 0.00 ft/s | Headloss | 0.00 ft |
| Headloss Coefficient | 0.00 | Station | 0+00 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |

# Detailed Report for Pipe 24" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 24 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 10.00 | cfs | Capacity | 24.51 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.88 | ft |
| Length | 46.00 | ft | Energy Slope | 0.019028 | ft/ft |
| Constructed Slope | 0.011739 | ft/ft | Upstream Velocity | 3.18 | ft/s |
| Upstream Flow Time | 0.00 | min | Average Velocity | 3.18 | ft/s |
| Pipe Flow Time | 0.24 | min | Downstream Velocity | 3.18 | ft/s |
| System Flow Time | 0.24 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 5,996.72 | 6,001.56 | 5,998.72 | 2.84 | 4.21 | 6,000.93 | 6,001.08 |
| Downstream | 5,996.18 | 6,001.02 | 5,998.18 | 2.84 | 3.87 | 6,000.05 | 6,000.21 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.

# Detailed Report for Pipe 30" PIPE

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 18.00 | cfs | Capacity | 28.89 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.58 | ft |
| Length | 64.50 | ft | Energy Slope | 0.008937 | ft/ft |
| Constructed Slope | 0.004961 | ft/ft | Upstream Velocity | 3.67 | ft/s |
| Upstream Flow Time | 0.40 | min | Average Velocity | 3.67 | ft/s |
| Pipe Flow Time | 0.29 | min | Downstream Velocity | 3.67 | ft/s |
| System Flow Time | 0.70 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 5,995.68 | 6,001.02 | 5,998.18 | 2.84 | 4.95 | 6,000.63 | 6,000.84 |
| Downstream | 5,995.36 | 6,000.81 | 5,997.86 | 2.95 | 4.69 | 6,000.05 | 6,000.26 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.

# Detailed Report for Pipe 30" PIPE (2)

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | |
|---|---|---|---|
| Discharge | 21.00 cfs | Capacity | 29.00 cfs |
| Mannings Coefficient | 0.013 | Hydraulic Drop | 0.17 ft |
| Length | 64.00 ft | Energy Slope | 0.002622 ft/ft |
| Constructed Slope | 0.005000 ft/ft | Upstream Velocity | 4.28 ft/s |
| Upstream Flow Time | 0.70 min | Average Velocity | 4.28 ft/s |
| Pipe Flow Time | 0.25 min | Downstream Velocity | 4.28 ft/s |
| System Flow Time | 0.95 min | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 5,995.36 | 6,000.81 | 5,997.86 | 2.95 | 4.86 | 6,000.22 | 6,000.50 |
| Downstream | 5,995.04 | 6,000.80 | 5,997.54 | 3.26 | 5.01 | 6,000.05 | 6,000.33 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.

# Detailed Report for Pipe 30" PIPE (3)

Section Material: Concrete
Section Shape: Circular
Section Size: 30 inch
Number Sections: 1

| Pipe | | | | | |
|---|---|---|---|---|---|
| Discharge | 8.00 | cfs | Capacity | 29.18 | cfs |
| Mannings Coefficient | 0.013 | | Hydraulic Drop | 0.35 | ft |
| Length | 39.50 | ft | Energy Slope | 0.008816 | ft/ft |
| Constructed Slope | 0.005063 | ft/ft | Upstream Velocity | 1.63 | ft/s |
| Upstream Flow Time | 0.00 | min | Average Velocity | 1.63 | ft/s |
| Pipe Flow Time | 0.40 | min | Downstream Velocity | 1.63 | ft/s |
| System Flow Time | 0.40 | min | | | |

**Grade Elevations**

| Location | Invert (ft) | Ground (ft) | Crown (ft) | Cover (ft) | Depth (ft) | HGL (ft) | EGL (ft) |
|---|---|---|---|---|---|---|---|
| Upstream | 5,995.88 | 6,001.22 | 5,998.38 | 2.84 | 4.97 | 6,000.85 | 6,000.89 |
| Downstream | 5,995.68 | 6,001.02 | 5,998.18 | 2.84 | 4.82 | 6,000.50 | 6,000.54 |

Message List

Information: Surcharged condition
Violation: does not meet minimum cover constraint at downstream end
Profile: Pressure profile.

# Detailed Report for TEE 1

| Flows | | | | | |
|---|---|---|---|---|---|
| Total Discharge | 18.00 | cfs | Known Flow | 18.00 | cfs |
| Upstream Additional + Carryover | 0.00 | cfs | Total Watershed (CIA) | 0.00 | cfs |

| Watershed Data | | | | | |
|---|---|---|---|---|---|
| System Intensity | 0.00 | in/hr | Upstream CA | 0.00 | acres |
| Total CA | 0.00 | acres | | | |

| Flow Times | | | | | |
|---|---|---|---|---|---|
| System Flow Time | 0.40 | min | Upstream Flow Time | 0.40 | min |

| Elevations | | | | | |
|---|---|---|---|---|---|
| HGL In | 6,000.84 | ft | HGL Out | 6,000.63 | ft |
| Ground Elevation | 6,001.02 | ft | Rim Elevation | 5,998.85 | ft |
| Sump Elevation | 5,995.68 | ft | | | |

| Other Properties | | | | | |
|---|---|---|---|---|---|
| X | 3,192,702.68 | ft | Y | 1,364,738.74 | ft |
| Velocity | 3.67 | ft/s | Headloss | 0.21 | ft |
| Headloss Coefficient | 1.00 | | Station | 1+29 | ft |
| External Flow | 0.00 | cfs | | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |

# Detailed Report for TEE 2

| Flows | | | |
|---|---|---|---|
| Total Discharge | 21.00 cfs | Known Flow | 21.00 cfs |
| Upstream Additional + Carryover | 0.00 cfs | Total Watershed (CIA) | 0.00 cfs |

| Watershed Data | | | |
|---|---|---|---|
| System Intensity | 0.00 in/hr | Upstream CA | 0.00 acres |
| Total CA | 0.00 acres | | |

| Flow Times | | | |
|---|---|---|---|
| System Flow Time | 0.70 min | Upstream Flow Time | 0.70 min |

| Elevations | | | |
|---|---|---|---|
| HGL In | 6,000.50 ft | HGL Out | 6,000.22 ft |
| Ground Elevation | 6,000.81 ft | Rim Elevation | 5,998.53 ft |
| Sump Elevation | 5,995.36 ft | | |

| Other Properties | | | |
|---|---|---|---|
| X | 3,192,767.25 ft | Y | 1,364,736.77 ft |
| Velocity | 4.28 ft/s | Headloss | 0.28 ft |
| Headloss Coefficient | 1.00 | Station | 0+64 ft |
| External Flow | 0.00 cfs | | |

| Message List |
|---|
| Information: Known flow propagated from upstream junctions |

NOLTE and ASSOCIATES, Inc.
Engineers / Planners / Surveyors
COLORADO & TEJON)

JOB NO. C90275
DATE 10/16/98
DESIGNED BY RICH RIDDLE JR
CHECKED BY

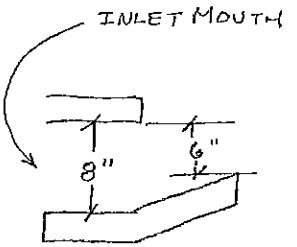
SUBJECT CALCULATIONS CHECKS BY WIER & ORIFICE EQUATIONS

✓ IF OUTLET HAS EXIT CAPACITY

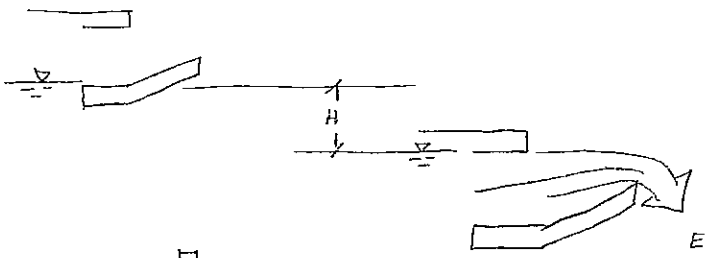
GIVEN: EXIT = 21 cfs

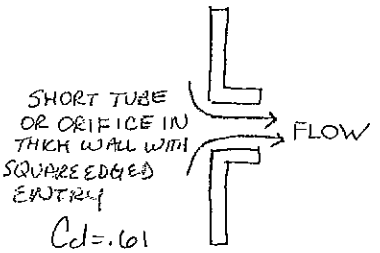
WILL 20' INLET WORK AS BUBBLER?

INLET MOUTH




ORIFICE




ORIFICE EQUATION

$Q = Cd\, A \sqrt{2gH}$

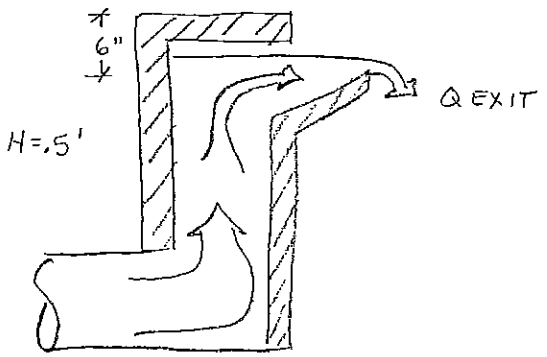
$A = (20')(6"/12"/1')$

$g = 32.2\ ft/sec^2$

$H = .5'$

$Q = 34.6\ cfs$ ✓

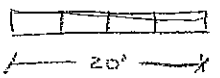
WIER




BAZIN'S FORMULA

$$Q = \left(.405 + \frac{.00984}{H}\right)\left[1 + \frac{.55H^2}{(P+H)^2}\right] L H \sqrt{2gH}$$

$Q = 24.21\ cfs$ ✓




20' INLET WILL WORK AS BUBBLER.