PRELIMINARY DRAINAGE STUDY
for
AVENTINE AT SWEETWATER SPRINGS

APN'S 505-580-07-00, 505-580-08-00, 505-580-09-00, 505-580-10-00

Preparation/Revision Date:
December 21, 2018

PDS2018-SPA-18-002

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Declaration of Responsible Charge

I hereby declare that I am the engineer of work for this project, that I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with current standards.

I understand that the check of project drawings and specifications by the County of San Diego is confined to a review only and does not relieve me, as engineer of work, of my responsibilities for project design.

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Alisa S. Vialpando, R.C.E. 47945 Date
Vice President

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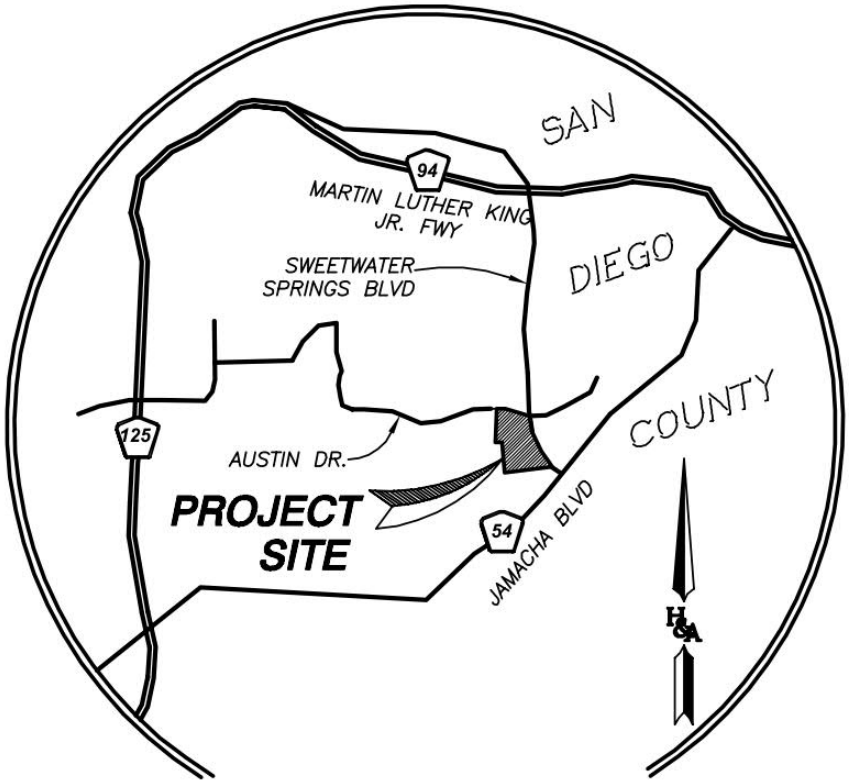
CHAPTER 1 EXECUTIVE SUMMARY

1.1 Introduction

The Aventine at Sweetwater Springs project is located at the southwest corner of the intersection of Austin Drive and Sweetwater Springs Blvd within Spring Valley in San Diego County, California. The development proposes a multi-family community with 92 detached homes within 10.57 acres. The site will also include an active rec area, a tot lot, open spaces, a water quality treatment area, sidewalks, and access road and driveways. The lots are connected by private drives which are accessible via Austin Drive or Sweetwater Springs Blvd.



VICINITY MAP

NTS

This report will analyze both the existing and proposed hydrologic conditions relative to development of the site. Proposed stormwater facilities include storm drain, curb inlets, catch basins, a water quality/ hydromodification basin, brow ditches, and energy dissipation devices. The proposed basin for the site will not only act to address water quality, but will also address flow control hydromodification concerns. A separate report has been prepared which details the proposed treatment and flow control features for the project. Refer to the *Stormwater Quality Management Plan (SWQMP) for the Aventine at Sweetwater Springs* prepared by Hunsaker & Associates San Diego, Inc. (December 2018).

Summary of Existing Conditions

The existing condition hydrology map (Exhibit 1) is located in Chapter 5. The site is currently the site of a vacant shopping center and consist of eight buildings, parking lot, sidewalks, and small pervious/landscaped areas. The sites drainage area is 11.11 acres. The elevation-range of the watershed is between 499 feet to 467 feet. The site has six access driveways; three from Austin Drive and three from Sweetwater Springs Blvd. The average slope across the site from the northwest corner to the southeast corner is approximately 2.6%. The imperviousness of the site in its existing condition is approximately 90% due to the extent of paving, roof area, and sidewalk associated with the previous land use as a shopping center.

Runoff from the project site is conveyed via overland flow to several surface gutters within the parking lot. These flows are drained via surface flow to the southeast corner of the project site, discharging to the existing curb and gutter within the adjacent Sweetwater Springs Blvd.

Table 1 below summarizes the 100-year existing condition peak flow at the downstream project boundary. A runoff coefficient of 0.82 was used per the Table 3-1 of the San Diego County Hydrology Manual. This coefficient generally corresponds to commercial site with about 90% of impervious surface. Supporting calculations for the data presented in Table 1 is located in Chapter 3 of this report. The corresponding hydrology map (Exhibit 1) is located in Chapter 5.

TABLE 1 - Summary of Existing Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	100-Year Peak Flow (cfs)
1	12	SEC of site	11.11	56.17

Summary of Developed Conditions

The post-developed condition of the site will consist of improvements consistent of a multi-family residential development including housing units, driveways, access roads, sidewalks, and landscaped open spaces. The site also proposes an active rec area and a tot lot as well as an open space dedicated for a water quality basin facility. The water quality basin will treat onsite runoff, attenuate peak flows and aid in addressing flow control hydromodification. For additional discussion on the proposed water quality features of the site, refer to the *Stormwater Quality Management Plan for the Aventine at Sweetwater Springs* (December 2018) prepared by Hunsaker & Associates San Diego, Inc. The infrastructure will include streets and associated utilities including a storm drain system (pipes, inlets, cleanouts) necessary to collect and convey site runoff through the project area. The site will not place housing within a 100-year flood hazard area. The site is located within an unmapped area per the FEMA website and will therefore not require a letter of map revision.

The proposed condition hydrology Exhibit 2 in Chapter 5 shows the developed site with its subareas to each inlet location. Street grades throughout the site vary between 1% and 2.0%. The general direction of flows for the subareas is relatively consistent with the existing condition. Runoff will be directed towards the proposed water quality basin located at the southeast corner of the site. The table below summarizes the Q100 flow at the discharge point.

TABLE 2 - Summary of Developed Flows

Exhibit	Node Number on Exhibit	Discharge Location	Drainage Area (ac)	100-Year Peak Flow (cfs)	Detained 100-Year Peak Flow (cfs)
2	113	SEC of site	11.1	38.07	18.84

The proposed site was found to be 65% impervious per the *Stormwater Quality Management Plan for the Aventine at Sweetwater Springs.* Therefore, a correlating runoff coefficient of 0.71 per Table 3-1 of the San Diego County Hydrology Manual was used. A runoff coefficient of 0.35 was used for all landscaped areas.

Supporting calculations for the data presented in Table 2 is located in Chapter 3. The reduced flows at the discharge point can be attributed to the reduction in runoff coefficient compared to existing condition. The corresponding hydrology map (Exhibit 2) is located in Chapter 5.

Summary of Results

Conveyance of the Q100 runoff flows through the site will require storm drain pipe with estimated sizes between 18" to 30" HDPE and/or RCP pipe. Eight inlets are proposed with sizes ranging between 5' and 15' in length. The on-grade inlets were sized using the HEC-22 while the sump inlets were sized using the City of San Diego nomogram for 'Curb Inlet at Sag'. This nomogram provides conservative results compared to the methodology per San Diego County. See Chapter 4 for preliminary inlet size calculations.

The proposed basin located at the southeast corner of the site will treat stormwater runoff prior to exiting the site. The basin will be constructed with an upper engineered soil layer to aid in the removal of pollutants generated by the site. In addition, the basin will be constructed with a lower gravel section which will be utilized for detention storage to help in addressing flow control hydromodification. The outlet structure for the basin will consist of a riser box with a top opening and side orifices sized to moderate flow outlet to meet flow control requirements.

Due to the reduction of runoff coefficient compared with the existing condition, the peak flows generated from the site will be reduced. Therefore, attenuation of peak flows is not required. However, peak flows will be attenuated within the detention basin to minimize the flows being generated from the site. Project flows will exit the site at the southeast corner and discharge through a series of Type A curb outlets along Sweetwater Springs Blvd.

The table below summarizes the comparison between the existing and proposed flow rates from the site.

TABLE 3 – Existing Condition vs. Proposed Condition

Discharge Location	Existing Condition Area (ac)	Proposed Condition Area (ac)	Existing: 100-Year Peak Flow (cfs)	Proposed: 100-Year Peak Flow (cfs)	Q100 Flow Difference (cfs)
SEC of site	11.1	11.1	56.17	18.84	-37.33

Rip rap is proposed at the storm drain discharge location at the basin will aid in dissipating outlet velocities. A brow ditch is proposed to collect and convey slope runoff from the southwest corner of the site. The brow ditch will continue along the southern project boundary and empty into a proposed catch basin which will connect to the onsite storm drain system before exiting the site. Design calculations for this brow ditch as well as the storm drain hydraulics will be conducted as part of the final engineering drainage study.

Redevelopment of this site will not alter the existing condition drainage patterns. The proposed development will drain/convey its runoff towards the southeast corner of the site similar to existing conditions. However, the site will include a basin which will provide the added benefit of water quality treatment, flow control (HMP) measures, and peak flow attenuation. These benefits will provide improvements over the existing condition relative to erosion potential at the existing downstream discharge point.

Existing Sweetwater Springs Blvd Storm Drain System

Per the "Plans for the improvement of storm drain in Sweetwater Village Unit No. 4", TM. 2891-4 dated 4/7/1972 (provided in Chapter 5 of this report) the storm drain system within Sweetwater Springs Blvd consists of a 66-inch RCP near the intersection of Austin Drive and Sweetwater Springs Blvd that then drains along Sweetwater Springs Blvd in a southerly direction adjacent to the project site. This 66-inch storm drain then connects to a 54-inch RCP storm drain approximately 450 feet south of the intersection with Austin Drive. The 54-inch RCP storm drain then discharges to a natural drainage channel.

Runoff from the existing project site is conveyed via surface flow and discharged to the existing curb and gutter system within the adjacent Sweetwater Springs Blvd. These flows then drain in a southerly direction towards the intersection of Calle Marinero and Sweetwater Springs Blvd where an existing 10-ft on grade curb inlet is located. Bypass flows drain to a localized low point at the intersection of Calle Marinero and Sweetwater Springs Blvd where additional flows are intercepted by a secondary curb inlet. It is conservatively estimated that these inlets intercept approximately 15 cfs. Flows intercepted by these inlets drain to the existing 54-inch RCP storm drain and discharged to an existing natural drainage channel approximately 100ft south west of the curb inlet location.

The remaining flow from the project site that bypasses the inlets are then conveyed in a southerly direction by the curb and gutter along Sweetwater Springs Blvd, draining via curb outlets to the aforementioned natural drainage channel.

In developed conditions, the project proposes to outlet flows through a series of Type A curb outlets at the south-east corner of the project site adjacent to Sweetwater Springs Blvd. These flows will then drain in a southerly direction along Sweetwater Springs Blvd where they will enter one of the two aforementioned inlets. The developed onsite flow is 18.84 cfs, thus the existing storm drain system will experience a decrease in flows due to the development of the project sit

Conclusion

The proposed development of the Aventine at Sweetwater Springs can be roughly graded and improved with storm drain to accommodate the ultimate expected flows from development. In addition, with the proposed drainage facilities such as curb inlets, storm drain, rip rap dissipation, water quality- hydromodification basins, and brow ditches, runoff can be mitigated to acceptable San Diego County standards.

References

San Diego County Hydrology Manual, County of San Diego Department of Public Works Flood Control Division, June 2003.

San Diego County Hydraulic Design Manual, County of San Diego Department of Public Works Flood Control Division, September 2014

San Diego County Drainage Design Manual, County of San Diego Department of Public Works Flood Control Division, July 2005

County of San Diego San Diego SUSMP, County of San Diego, January 2011

Standard Drawings, City of San Diego, 2012.

Stormwater Quality Management Plan for the Aventine at Sweetwater Springs, Hunsaker & Associates San Diego, Inc., December 2018.

CHAPTER 2
METHODOLOGY

CHAPTER 2 METHODOLOGY

Modified Rational Method Hydrologic Analysis

Computer Software Package – AES-2015

Design Storm - 100- year return interval

Land Use – Multi-family Residential, Active Rec Area, Open Space

Soil Type – Hydrologic soil group D was assumed for all areas. Group D soils have very slow infiltration rates when thoroughly wetted. Consisting chiefly of clay soils with a high swelling potential, soils with a high permanent water table, soils with clay pan or clay layer at or near the surface, and shallow soils over nearly impervious materials, Group D soils have a very slow rate of water transmission.

Runoff Coefficient - In accordance with the County of San Diego standards, runoff coefficients were based on land use and slope per San Diego County Hydrology Manual.

Rainfall Intensity- The rainfall intensity is determined per the San Diego County Hydrology Manual based on 6-hour precipitation amounts and calculated time of concentrations. Six-hour precipitations are taken from the San Diego County Hydrology Manual isopluvials.

Method of Analysis – The Rational Method is the most widely used hydrologic model for estimating peak runoff rates. Applied to small urban and semi-urban areas with drainage areas less than 0.5 square miles, the Rational Method relates storm rainfall intensity, a runoff coefficient, and drainage area to peak runoff rate. This relationship is expressed by the equation:

Q = CIA, where:

- Q = The peak runoff rate in cubic feet per second at the point of analysis.
- C = A runoff coefficient representing the area - averaged ratio of runoff to rainfall intensity.
- I = The time-averaged rainfall intensity in inches per hour corresponding to the time of concentration.
- A = The drainage basin area in acres.

To perform a node-link study, the total watershed area is divided into subareas which discharge at designated nodes.

The procedure for the subarea summation model is as follows:

(1) Subdivide the watershed into subareas with the initial subarea being less than 10 acres in size (generally 1 lot will do), and subsequent subareas gradually increasing in size. Assign upstream and downstream nodal numbers to each subarea to correlate calculations to the watershed map.

(2) Estimate an initial T_c by using the appropriate nomograph or overland flow velocity estimation.

(3) Using the initial T_c, determine the corresponding values of I. Then Q = CIA.

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to the particular channel or conduit linking the two nodes. Then, repeat the calculation for Q based on the revised intensity (which is a function of the revised time of concentration)

The nodes are joined together by links, which may be street gutter flows, drainage swales, drainage ditches, pipe flow, or various channel flows. The AES-2003 computer subarea menu is as follows:

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial subarea analysis (including time of concentration calculation).
3. Pipeflow travel time (computer estimated).
4. Pipeflow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through subarea.
7. User - specified information at node.
8. Addition of subarea runoff to main line.
9. V-gutter flow through area.
10. Copy main stream data to memory bank
11. Confluence main stream data with a memory bank
12. Clear a memory bank

At the confluence point of two or more basins, the following procedure is used to combine peak flow rates to account for differences in the basin's times of concentration. This adjustment is based on the assumption that each basin's hydrographs are triangular in shape.

(1). If the collection streams have the same times of concentration, then the Q values are directly summed,

$$Q_p = Q_a + Q_b;\ T_p = T_a = T_b$$

(2). If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:

(i). The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by the ratio of rainfall intensities.

$Q_p = Q_a + Q_b \ (I_a/I_b)$; $T_p = T_a$

(ii). In some cases, the collection stream with the shorter time of concentration has the larger Q. Then the smaller Q is adjusted by a ratio of the T values.

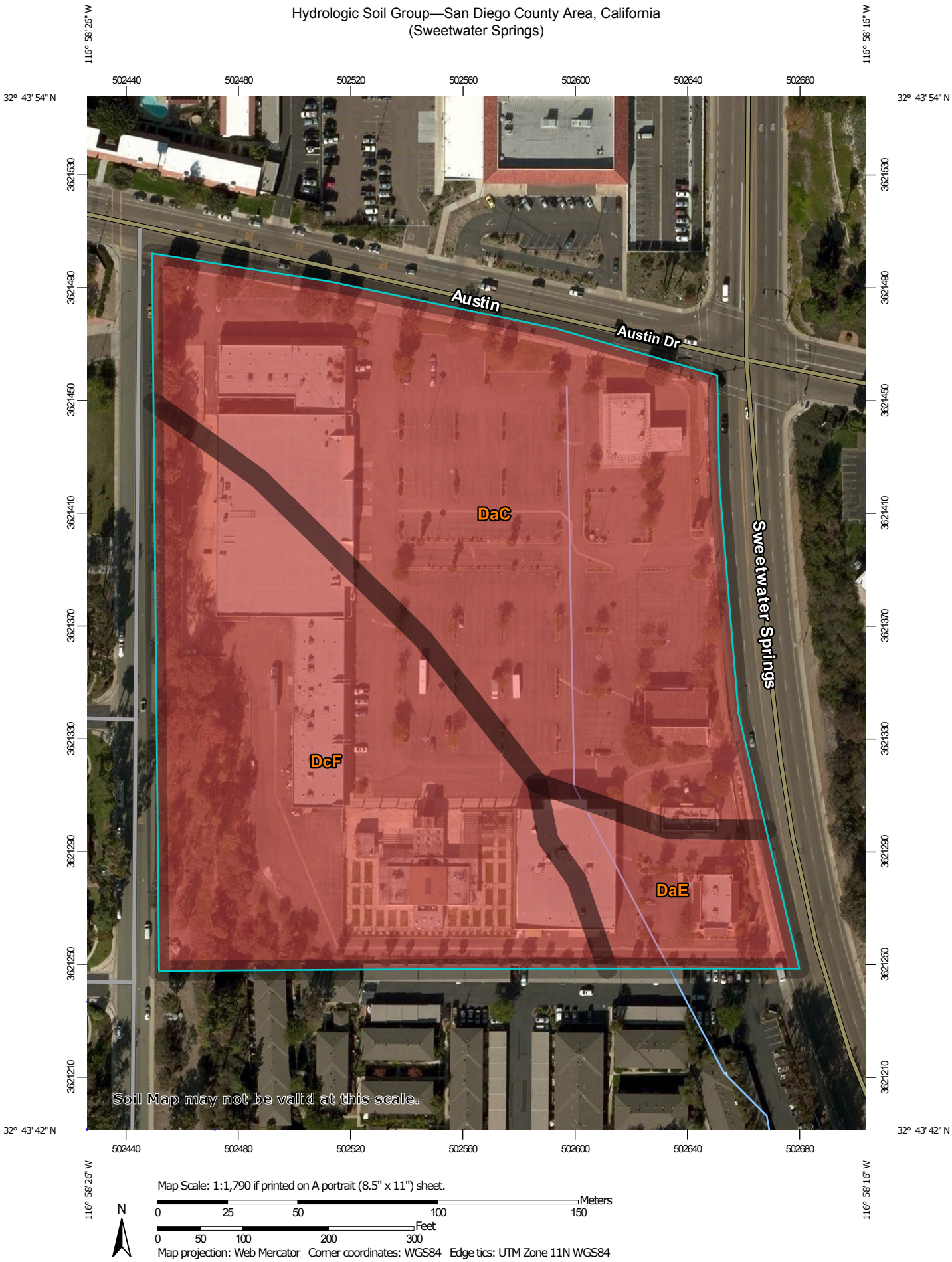
$Q_p = Q_b + Q_a \ (T_b/T_a)$; $T_p = T_b$

Underground storm drains are analyzed in a similar way. Flow data obtained from the surface model for inlets and collection points are input into the nodes representing those structures. Design grades and lengths are used to compute the capacity of the storm drains and to model the downstream travel times.

Inlet Length Determination

Length of inlets which are located on a continuous grade were determined using 50 year return intervals per the *San Diego County Hydraulic Design Manual* (September 2014). Inlets that are 'on-grade' are calculated using the Hydraulic Engineering Circular No. 22. Inlets lengths in sump areas are determined using the City of San Diego nomogram for curb inlet in sag and based on 100 year return intervals. The City nomogram provides more conservative inlet length results compared to the County's methodology.

Hydrologic Soil Group—San Diego County Area, California
(Sweetwater Springs)



Map Scale: 1:1,790 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 12, Sep 13, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
DaC	Diablo clay, 2 to 9 percent slopes	D	6.3	51.4%
DaE	Diablo clay, 15 to 30 percent slopes	D	1.0	8.0%
DcF	Diablo-Urban land complex, 15 to 50 percent slopes	D	4.9	40.6%
Totals for Area of Interest			**12.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

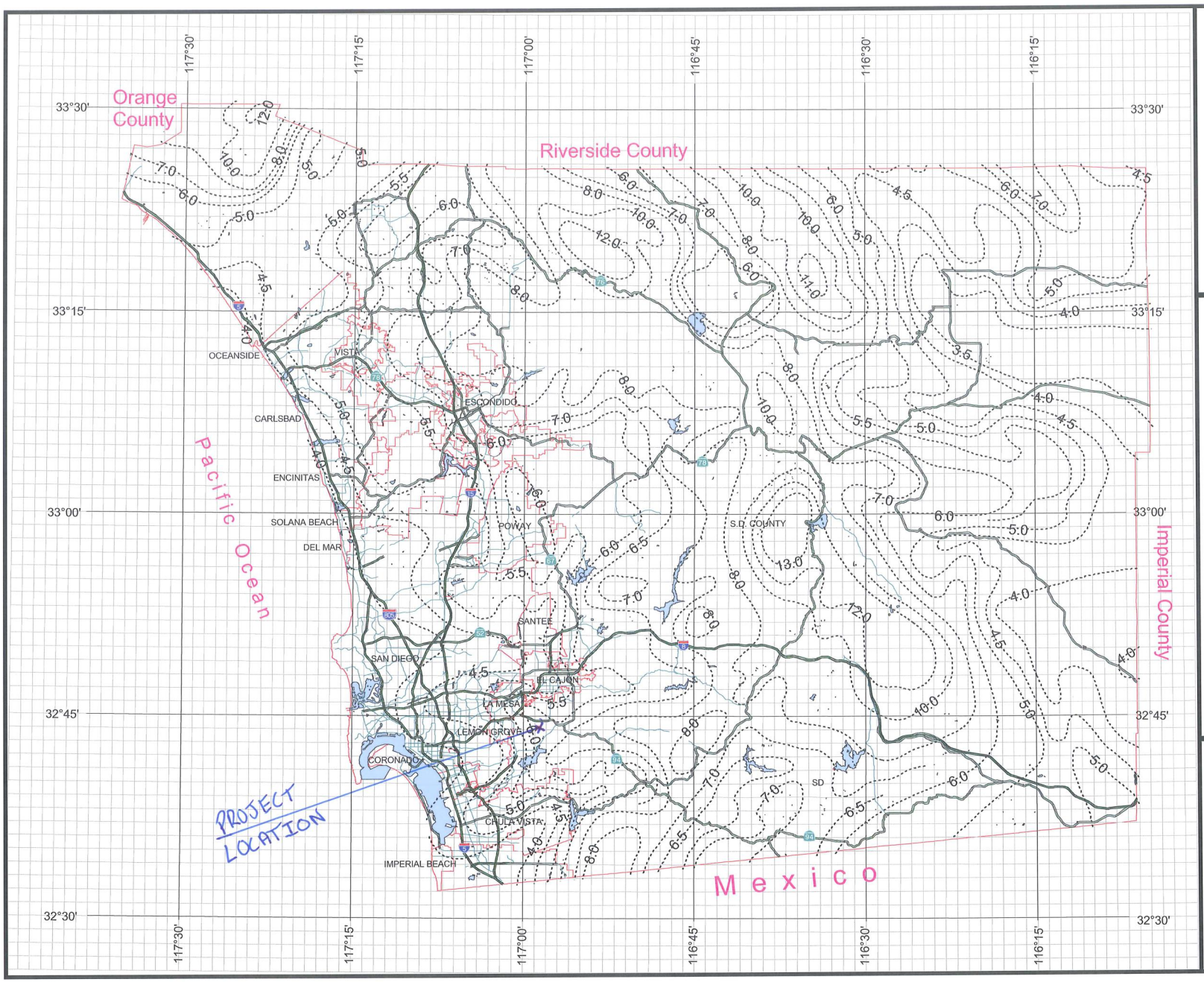
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

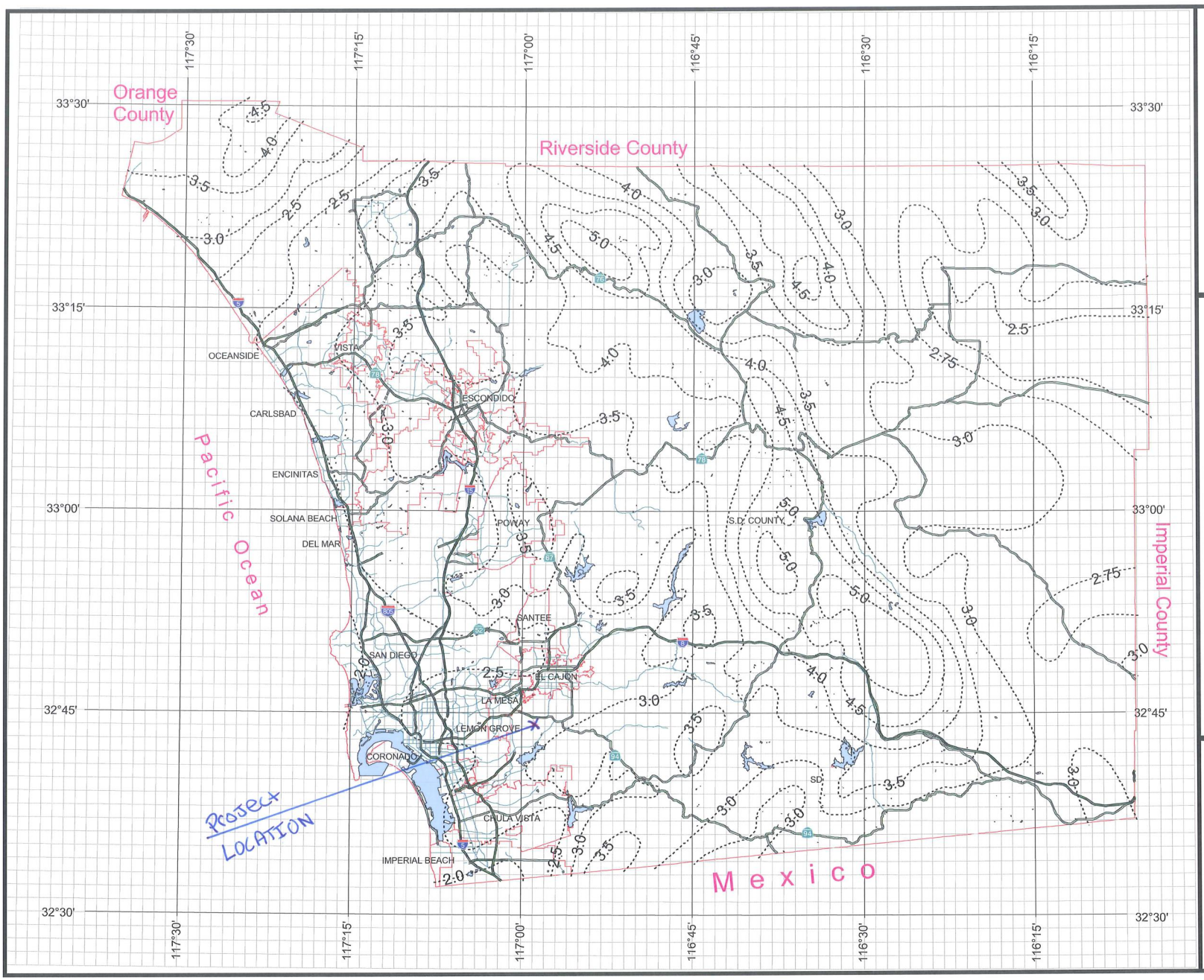
$Q(100)\ P_{24} = 6.2$

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

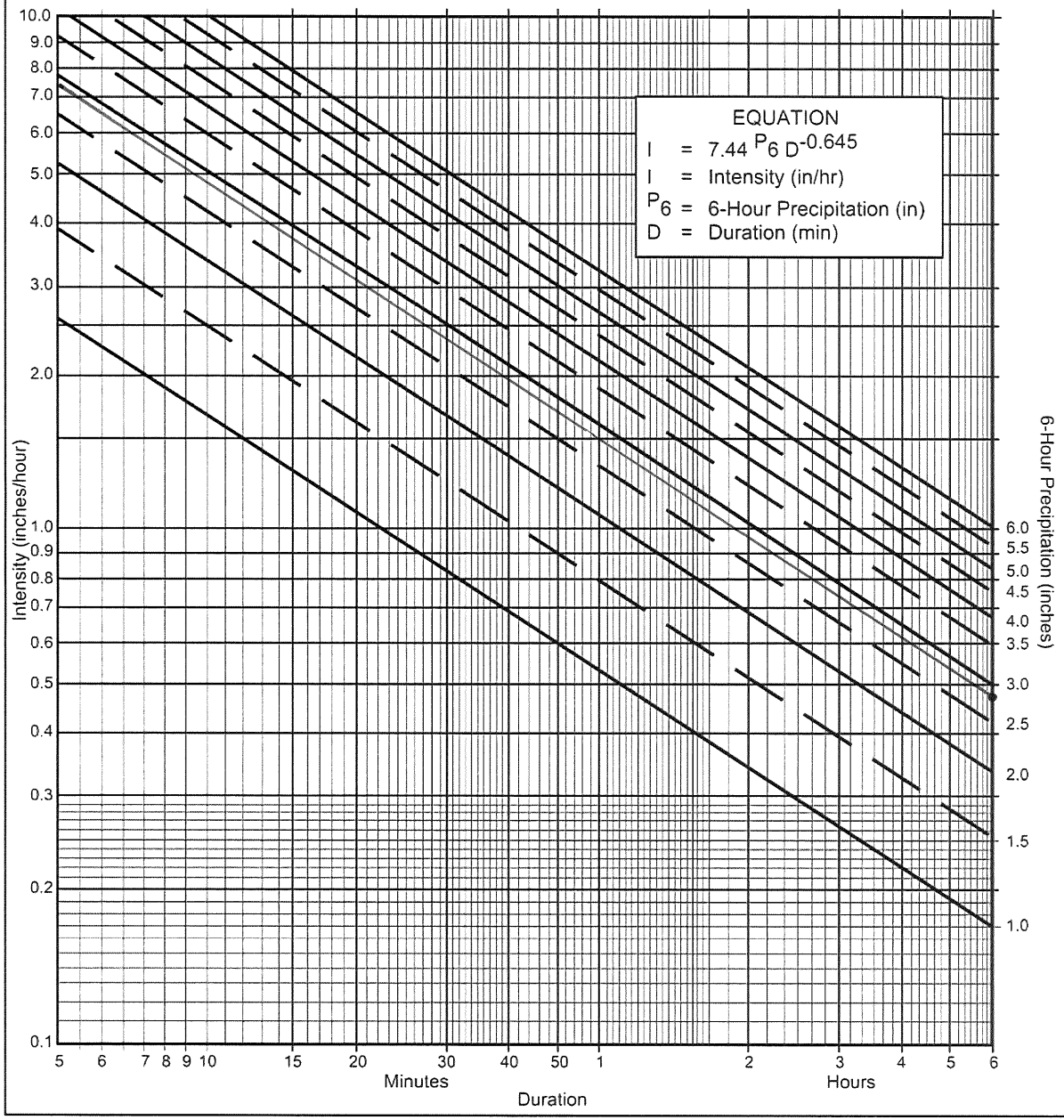
$Q(100)^{P_6} = 2.8$

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.8 in., P_{24} = 6.2, $\frac{P_6}{P_{24}}$ = 45.2 %(2)

(c) Adjusted $P_6^{(2)}$ = 2.8 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6 / Duration	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

CHAPTER 3
HYDROLOGIC ANALYSIS
100 – Year Design Storm

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            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1239

                            Analysis prepared by:

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                              San Diego   CA   92121


 ************************* DESCRIPTION OF STUDY *************************
* SWEET WATER HYDROLOGIC ANALYSIS                                       *
* 100-YEAR CONDITION, DLN 1249, W.O.# 0025-0364                         *
* BY: ADAM BROOKS                                                       *
 ************************************************************************

  FILE NAME: R:\1249\HYD\CALCS\100.DAT
  TIME/DATE OF STUDY: 15:28 12/20/2018
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
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  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.800
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   16.0      8.0    0.020/0.020/0.020   0.50    2.00 0.0312 0.125 0.0150
  2   12.0      6.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0130
  3   12.0      6.0    0.020/0.020/0.020   0.33    1.00 0.0125 0.083 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

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  FLOW PROCESS FROM NODE     10.00 TO NODE     11.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    88.00
  UPSTREAM ELEVATION(FEET) =    499.00
  DOWNSTREAM ELEVATION(FEET) =    496.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.033
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    82.05
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.03
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Q100 Existing Condition

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  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      1.03

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  495.00  DOWNSTREAM ELEVATION(FEET) =  467.00
  STREET LENGTH(FEET) =  1080.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      30.30
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.46
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    5.69
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.61
  STREET FLOW TRAVEL TIME(MIN.) =   3.16   Tc(MIN.) =    6.20
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.423
  *USER SPECIFIED(SUBAREA):
  GENERAL INDUSTRIAL RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.820
  SUBAREA AREA(ACRES) =   10.94      SUBAREA RUNOFF(CFS) =   57.62
  TOTAL AREA(ACRES) =       11.1        PEAK FLOW RATE(CFS) =      58.51

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.57   HALFSTREET FLOOD WIDTH(FEET) =  15.29
  FLOW VELOCITY(FEET/SEC.) =  7.20   DEPTH*VELOCITY(FT*FT/SEC.) =   4.08
  *NOTE: INITIAL SUBAREA NOMOGRAPH WITH SUBAREA PARAMETERS,
         AND L = 1080.0 FT WITH ELEVATION-DROP =  28.0 FT, IS   66.2 CFS,
         WHICH EXCEEDS THE TOP-OF-CURB STREET CAPACITY AT NODE     12.00
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     12.00 =    1168.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     51.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    498.50
  DOWNSTREAM ELEVATION(FEET) =    497.00
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.131
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.255
  SUBAREA RUNOFF(CFS) =      0.72
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.72

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
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Q100 Proposed Condition

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==========================================================================
  UPSTREAM ELEVATION(FEET) =  497.00  DOWNSTREAM ELEVATION(FEET) =  492.00
  STREET LENGTH(FEET) =     0.99   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.17
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.13
    HALFSTREET FLOOD WIDTH(FEET) =    2.76
    AVERAGE FLOW VELOCITY(FEET/SEC.) =   26.39
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    3.45
  STREET FLOW TRAVEL TIME(MIN.) =   0.00   Tc(MIN.) =    5.13
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.255
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.95      SUBAREA RUNOFF(CFS) =    4.89
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       5.61

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.15   HALFSTREET FLOOD WIDTH(FEET) =   3.85
  FLOW VELOCITY(FEET/SEC.) = 29.19   DEPTH*VELOCITY(FT*FT/SEC.) =   4.45
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     52.00 =     100.99 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     53.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   492.50  DOWNSTREAM(FEET) =   490.50
  FLOW LENGTH(FEET) =   137.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.83
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.61
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    5.47
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     53.00 =     237.99 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     53.00 TO NODE     53.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    5.47
  RAINFALL INTENSITY(INCH/HR) =   6.97
  TOTAL STREAM AREA(ACRES) =     1.09
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.61

****************************************************************************
  FLOW PROCESS FROM NODE     56.00 TO NODE     57.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    92.00
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  UPSTREAM ELEVATION(FEET) =    498.00
  DOWNSTREAM ELEVATION(FEET) =    496.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.037
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    71.30
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.343
  SUBAREA RUNOFF(CFS) =      0.52
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.52

****************************************************************************
  FLOW PROCESS FROM NODE     57.00 TO NODE     58.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  496.50  DOWNSTREAM ELEVATION(FEET) =  483.00
  STREET LENGTH(FEET) =   435.00   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.74
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    8.67
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.45
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.86
  STREET FLOW TRAVEL TIME(MIN.) =   2.10   Tc(MIN.) =    7.14
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.863
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    1.06      SUBAREA RUNOFF(CFS) =    4.41
  TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       4.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =  10.83
  FLOW VELOCITY(FEET/SEC.) =  3.97   DEPTH*VELOCITY(FT*FT/SEC.) =   1.16
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     58.00 =     527.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     58.00 TO NODE     53.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   491.40  DOWNSTREAM(FEET) =   490.50
  FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.11
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.83
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    7.34
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     53.00 =     602.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     53.00 TO NODE     53.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
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```
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.34
  RAINFALL INTENSITY(INCH/HR) =   5.76
  TOTAL STREAM AREA(ACRES) =     1.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.83

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        5.61     5.47        6.965          1.09
      2        4.83     7.34        5.757          1.16

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        9.21     5.47       6.965
      2        9.47     7.34       5.757

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.47   Tc(MIN.) =    7.34
  TOTAL AREA(ACRES) =        2.2
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     53.00 =     602.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     53.00 TO NODE     59.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   490.50  DOWNSTREAM(FEET) =   488.00
  FLOW LENGTH(FEET) =   187.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.44
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.47
  PIPE TRAVEL TIME(MIN.) =   0.42    Tc(MIN.) =    7.76
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     59.00 =     789.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     59.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.76
  RAINFALL INTENSITY(INCH/HR) =   5.55
  TOTAL STREAM AREA(ACRES) =     2.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.47

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     63.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =    495.50
  DOWNSTREAM ELEVATION(FEET) =    494.10
  ELEVATION DIFFERENCE(FEET) =      1.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.152
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    69.74
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          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.237
  SUBAREA RUNOFF(CFS) =      0.57
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.57

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     64.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  494.10  DOWNSTREAM ELEVATION(FEET) =  480.30
  STREET LENGTH(FEET) =   456.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0130
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0700

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.82
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.73
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.94
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.11
  STREET FLOW TRAVEL TIME(MIN.) =   1.93   Tc(MIN.) =    7.08
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.894
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    1.07      SUBAREA RUNOFF(CFS) =    4.48
  TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       4.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =   9.89
  FLOW VELOCITY(FEET/SEC.) =  4.50   DEPTH*VELOCITY(FT*FT/SEC.) =   1.46
  LONGEST FLOWPATH FROM NODE     62.00 TO NODE     64.00 =     551.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     64.00 TO NODE     59.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   488.50  DOWNSTREAM(FEET) =   488.30
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.42
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.94
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    7.10
  LONGEST FLOWPATH FROM NODE     62.00 TO NODE     59.00 =     561.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     59.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.10
  RAINFALL INTENSITY(INCH/HR) =   5.88
  TOTAL STREAM AREA(ACRES) =     1.18
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  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.94

****************************************************************************
  FLOW PROCESS FROM NODE     67.00 TO NODE     68.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    495.00
  DOWNSTREAM ELEVATION(FEET) =    493.40
  ELEVATION DIFFERENCE(FEET) =      1.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.885
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    73.82
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.377
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.58

****************************************************************************
  FLOW PROCESS FROM NODE     68.00 TO NODE     69.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  494.00  DOWNSTREAM ELEVATION(FEET) =  489.00
  STREET LENGTH(FEET) =   438.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.35
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    9.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.34
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.74
  STREET FLOW TRAVEL TIME(MIN.) =   3.12   Tc(MIN.) =    8.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.446
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.91      SUBAREA RUNOFF(CFS) =    3.52
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       3.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  11.77
  FLOW VELOCITY(FEET/SEC.) =  2.63   DEPTH*VELOCITY(FT*FT/SEC.) =   0.95
  LONGEST FLOWPATH FROM NODE     67.00 TO NODE     69.00 =     523.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     69.00 TO NODE     59.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   489.00  DOWNSTREAM(FEET) =   488.50
  FLOW LENGTH(FEET) =    15.00   MANNING'S N =  0.013
```

```
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.38
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.94
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.03
  LONGEST FLOWPATH FROM NODE     67.00 TO NODE     59.00 =     538.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     59.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.03
  RAINFALL INTENSITY(INCH/HR) =   5.43
  TOTAL STREAM AREA(ACRES) =     1.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.94

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        9.47     7.76        5.555          2.25
      2        4.94     7.10        5.882          1.18
      3        3.94     8.03        5.433          1.02

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       17.37     7.10       5.882
      2       17.94     7.76       5.555
      3       17.77     8.03       5.433

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      17.94   Tc(MIN.) =    7.76
  TOTAL AREA(ACRES) =        4.4
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     59.00 =     789.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     70.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   488.50  DOWNSTREAM(FEET) =   484.20
  FLOW LENGTH(FEET) =   253.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.46
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.94
  PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =    8.21
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     70.00 =    1042.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     73.00 TO NODE     74.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   150.00
  UPSTREAM ELEVATION(FEET) =    495.00
  DOWNSTREAM ELEVATION(FEET) =    492.00
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.280
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    75.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.951
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE     74.00 TO NODE     75.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    496.00  DOWNSTREAM(FEET) =    489.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   397.00   CHANNEL SLOPE =  0.0176
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.081
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.04
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   3.24
  Tc(MIN.) =   12.52
  SUBAREA AREA(ACRES) =     0.23       SUBAREA RUNOFF(CFS) =    0.33
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       0.43

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   2.44
  LONGEST FLOWPATH FROM NODE     73.00 TO NODE     75.00 =     547.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     75.00 TO NODE     76.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   488.00  DOWNSTREAM(FEET) =   486.00
  FLOW LENGTH(FEET) =   190.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   2.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.92
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.43
  PIPE TRAVEL TIME(MIN.) =   1.09    Tc(MIN.) =   13.61
  LONGEST FLOWPATH FROM NODE     73.00 TO NODE     76.00 =     737.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     76.00 TO NODE     76.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     81.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    74.00
```

```
  UPSTREAM ELEVATION(FEET) =    494.00
  DOWNSTREAM ELEVATION(FEET) =    493.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.256
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    68.51
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.144
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE     81.00 TO NODE     82.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  493.00  DOWNSTREAM ELEVATION(FEET) =  480.90
  STREET LENGTH(FEET) =   197.00   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.87
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.20
    HALFSTREET FLOOD WIDTH(FEET) =    6.42
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.09
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.83
  STREET FLOW TRAVEL TIME(MIN.) =   0.80   Tc(MIN.) =    6.06
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.518
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.63      SUBAREA RUNOFF(CFS) =    2.92
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.29

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   8.11
  FLOW VELOCITY(FEET/SEC.) =  4.68   DEPTH*VELOCITY(FT*FT/SEC.) =   1.11
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     82.00 =     271.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     82.00 TO NODE     82.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.06
  RAINFALL INTENSITY(INCH/HR) =   6.52
  TOTAL STREAM AREA(ACRES) =     0.71
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.29

****************************************************************************
  FLOW PROCESS FROM NODE     77.00 TO NODE     78.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    494.00
  DOWNSTREAM ELEVATION(FEET) =    493.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   10.900
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    72.65
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.463
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE     78.00 TO NODE     82.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   493.00  DOWNSTREAM(FEET) =   489.00
  FLOW LENGTH(FEET) =    89.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   0.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.13
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.11
  PIPE TRAVEL TIME(MIN.) =   0.47    Tc(MIN.) =   11.37
  LONGEST FLOWPATH FROM NODE     77.00 TO NODE     82.00 =     174.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     78.00 TO NODE     82.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.342
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.11   SUBAREA RUNOFF(CFS) =    0.17
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.27
  TC(MIN.) =   11.37

****************************************************************************
  FLOW PROCESS FROM NODE     82.00 TO NODE     82.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.37
  RAINFALL INTENSITY(INCH/HR) =   4.34
  TOTAL STREAM AREA(ACRES) =     0.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.27

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.29     6.06        6.518          0.71
      2        0.27    11.37        4.342          0.18

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        3.43     6.06       6.518
      2        2.46    11.37       4.342
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.43   Tc(MIN.) =    6.06
  TOTAL AREA(ACRES) =        0.9
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     82.00 =     271.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     82.00 TO NODE     76.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   488.50  DOWNSTREAM(FEET) =   485.00
  FLOW LENGTH(FEET) =   119.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.70
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.43
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    6.32
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     76.00 =     390.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     76.00 TO NODE     76.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 3 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        3.43     6.32       6.345        0.89
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE     76.00 =     390.00 FEET.

  ** MEMORY BANK #  3 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.43    13.61       3.867        0.30
  LONGEST FLOWPATH FROM NODE     73.00 TO NODE     76.00 =     737.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       3.63       6.32        6.345
      2       2.52      13.61        3.867

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.63   Tc(MIN.) =    6.32
  TOTAL AREA(ACRES) =        1.2

****************************************************************************
  FLOW PROCESS FROM NODE     76.00 TO NODE     76.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 3 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     76.00 TO NODE     83.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   486.00  DOWNSTREAM(FEET) =   485.00
  FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.56
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.63
  PIPE TRAVEL TIME(MIN.) =   0.55    Tc(MIN.) =    6.86
  LONGEST FLOWPATH FROM NODE     73.00 TO NODE     83.00 =     887.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     83.00 TO NODE     83.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.86
  RAINFALL INTENSITY(INCH/HR) =   6.01
  TOTAL STREAM AREA(ACRES) =     1.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.63

****************************************************************************
  FLOW PROCESS FROM NODE     86.00 TO NODE     87.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    82.00
  UPSTREAM ELEVATION(FEET) =    494.00
  DOWNSTREAM ELEVATION(FEET) =    493.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.386
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    67.20
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.032
  SUBAREA RUNOFF(CFS) =      0.40
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.40

****************************************************************************
  FLOW PROCESS FROM NODE     87.00 TO NODE     88.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  493.00  DOWNSTREAM ELEVATION(FEET) =  484.50
  STREET LENGTH(FEET) =   446.00   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.08
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    8.58
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.67
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.66
  STREET FLOW TRAVEL TIME(MIN.) =   2.78   Tc(MIN.) =    8.17
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.376
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    0.87      SUBAREA RUNOFF(CFS) =    3.32
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       3.63

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =  10.64
  FLOW VELOCITY(FEET/SEC.) =  3.08   DEPTH*VELOCITY(FT*FT/SEC.) =   0.89
  LONGEST FLOWPATH FROM NODE     86.00 TO NODE     88.00 =     528.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     88.00 TO NODE     83.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   484.50  DOWNSTREAM(FEET) =   484.30
  FLOW LENGTH(FEET) =    13.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.19
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.63
  PIPE TRAVEL TIME(MIN.) =   0.03    Tc(MIN.) =    8.20
  LONGEST FLOWPATH FROM NODE     86.00 TO NODE     83.00 =     541.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     83.00 TO NODE     83.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.20
  RAINFALL INTENSITY(INCH/HR) =   5.36
  TOTAL STREAM AREA(ACRES) =     0.95
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.63

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.63     6.86        6.013          1.19
      2        3.63     8.20        5.361          0.95

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        6.67     6.86       6.013
      2        6.86     8.20       5.361

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.86   Tc(MIN.) =    8.20
  TOTAL AREA(ACRES) =        2.1
  LONGEST FLOWPATH FROM NODE     73.00 TO NODE     83.00 =     887.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     83.00 TO NODE     70.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   484.50  DOWNSTREAM(FEET) =   484.20
  FLOW LENGTH(FEET) =    40.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.54
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.86
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    8.32
  LONGEST FLOWPATH FROM NODE     73.00 TO NODE     70.00 =     927.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================
```

```
  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        6.86     8.32       5.311        2.14
  LONGEST FLOWPATH FROM NODE     73.00 TO NODE     70.00 =     927.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       17.94     8.21       5.358        4.45
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     70.00 =    1042.00 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      24.71       8.21        5.358
      2      24.65       8.32        5.311

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      24.71   Tc(MIN.) =    8.21
  TOTAL AREA(ACRES) =        6.6

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     70.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     89.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   484.20  DOWNSTREAM(FEET) =   483.90
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.47
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.71
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    8.27
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     89.00 =    1072.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     89.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.27
  RAINFALL INTENSITY(INCH/HR) =   5.33
  TOTAL STREAM AREA(ACRES) =     6.59
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     24.71

****************************************************************************
  FLOW PROCESS FROM NODE     92.00 TO NODE     93.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    489.50
  DOWNSTREAM ELEVATION(FEET) =    489.00
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.079
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    52.65
           (Reference: Table 3-1B of Hydrology Manual)
```

```
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.504
 SUBAREA RUNOFF(CFS) =      0.32
 TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
 FLOW PROCESS FROM NODE     93.00 TO NODE     94.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  489.00  DOWNSTREAM ELEVATION(FEET) =  484.00
 STREET LENGTH(FEET) =   375.00   CURB HEIGHT(INCHES) =  4.0
 STREET HALFWIDTH(FEET) = 12.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.03
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.29
   HALFSTREET FLOOD WIDTH(FEET) =   10.64
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.57
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.74
 STREET FLOW TRAVEL TIME(MIN.) =   2.43   Tc(MIN.) =    8.51
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.236
 *USER SPECIFIED(SUBAREA):
 RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
 SUBAREA AREA(ACRES) =    1.44      SUBAREA RUNOFF(CFS) =    5.35
 TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       5.61

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =  12.00
 FLOW VELOCITY(FEET/SEC.) =  2.79   DEPTH*VELOCITY(FT*FT/SEC.) =   0.88
 LONGEST FLOWPATH FROM NODE     92.00 TO NODE     94.00 =     460.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     94.00 TO NODE     89.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   484.00  DOWNSTREAM(FEET) =   483.50
 FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
 DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.71
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.61
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.52
 LONGEST FLOWPATH FROM NODE     92.00 TO NODE     89.00 =     470.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE     89.00 TO NODE     89.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.52
 RAINFALL INTENSITY(INCH/HR) =   5.23
 TOTAL STREAM AREA(ACRES) =     1.51
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.61
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     97.00 TO NODE     98.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =    491.60
  DOWNSTREAM ELEVATION(FEET) =    491.00
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.808
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    59.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.697
  SUBAREA RUNOFF(CFS) =      0.38
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.38

****************************************************************************
  FLOW PROCESS FROM NODE     98.00 TO NODE     99.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  491.00  DOWNSTREAM ELEVATION(FEET) =  484.00
  STREET LENGTH(FEET) =   424.00   CURB HEIGHT(INCHES) =  4.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   6.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.02
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =   10.17
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.80
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.78
  STREET FLOW TRAVEL TIME(MIN.) =   2.52   Tc(MIN.) =    8.33
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.308
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (24. DU/AC OR LESS) RUNOFF COEFFICIENT = .7100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.710
  SUBAREA AREA(ACRES) =    1.39      SUBAREA RUNOFF(CFS) =    5.24
  TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       5.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.10   DEPTH*VELOCITY(FT*FT/SEC.) =   0.98
  LONGEST FLOWPATH FROM NODE     97.00 TO NODE     99.00 =     499.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     99.00 TO NODE     89.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   484.00  DOWNSTREAM(FEET) =   483.50
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.3 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.99
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.54
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    8.35
  LONGEST FLOWPATH FROM NODE     97.00 TO NODE     89.00 =     511.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE     89.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.35
  RAINFALL INTENSITY(INCH/HR) =   5.30
  TOTAL STREAM AREA(ACRES) =     1.47
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.54

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       24.71     8.27        5.334          6.59
      2        5.61     8.52        5.230          1.51
      3        5.54     8.35        5.299          1.47

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       35.64     8.27       5.334
      2       35.59     8.35       5.299
      3       35.31     8.52       5.230

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      35.64   Tc(MIN.) =    8.27
  TOTAL AREA(ACRES) =        9.6
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE     89.00 =    1072.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     89.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   483.50  DOWNSTREAM(FEET) =   477.50
  FLOW LENGTH(FEET) =    24.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  31.31
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      35.64
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    8.28
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE    100.00 =    1096.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   477.00  DOWNSTREAM(FEET) =   470.00
  FLOW LENGTH(FEET) =   226.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.01
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      35.64
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    8.55
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE    106.00 =    1322.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.220
  *USER SPECIFIED(SUBAREA):
  URBAN NEWLY GRADED AREAS RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6753
  SUBAREA AREA(ACRES) =    0.49   SUBAREA RUNOFF(CFS) =    0.90
  TOTAL AREA(ACRES) =       10.1   TOTAL RUNOFF(CFS) =      35.64
  TC(MIN.) =    8.55
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    106.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  17.55   RAIN INTENSITY(INCH/HOUR) =  3.28
  TOTAL AREA(ACRES) =    10.10   TOTAL RUNOFF(CFS) =     17.69

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.55
  RAINFALL INTENSITY(INCH/HR) =   3.28
  TOTAL STREAM AREA(ACRES) =    10.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     17.69

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    85.00
  UPSTREAM ELEVATION(FEET) =    510.00
  DOWNSTREAM ELEVATION(FEET) =    508.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.358
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.924
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   500.00  DOWNSTREAM(FEET) =   470.00
  FLOW LENGTH(FEET) =   886.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   1.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.33
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.17
  PIPE TRAVEL TIME(MIN.) =   4.43    Tc(MIN.) =   13.79
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    112.00 =     971.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.835
  *USER SPECIFIED(SUBAREA):
  RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3500
  SUBAREA AREA(ACRES) =    0.90   SUBAREA RUNOFF(CFS) =    1.21
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       1.34
  TC(MIN.) =   13.79

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   570.00  DOWNSTREAM(FEET) =   569.50
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 18.000
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   3.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.08
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.34
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =   13.81
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    106.00 =     981.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   13.81
  RAINFALL INTENSITY(INCH/HR) =   3.83
  TOTAL STREAM AREA(ACRES) =     1.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.34

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       17.69    17.55        3.282         10.10
      2        1.34    13.81        3.830          1.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       15.27    13.81       3.830
      2       18.84    17.55       3.282

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      18.84   Tc(MIN.) =   17.55
  TOTAL AREA(ACRES) =       11.1
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE    106.00 =    1322.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    106.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   569.50  DOWNSTREAM(FEET) =   569.00
  FLOW LENGTH(FEET) =     8.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.83
```

```
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      18.84
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   17.56
  LONGEST FLOWPATH FROM NODE     56.00 TO NODE    113.00 =    1330.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       11.1  TC(MIN.) =     17.56
  PEAK FLOW RATE(CFS)   =      18.84
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 4
INLET LENGTH, STREET CAPACITY CALCULATIONS & CURB OUTLET CAPACITY CALCULATIONS

INLET LENGTH

Aventine at Sweetwater Springs

-Curb Inlet Design-

Node Number	Type	Design Storm Frequency	Peak Flow (CFS)	Street Grade (%)	Depth (Y) (FT)	Curb Inlet Length Required (FT)	Curb Inlet Length Specified (min.) (FT)
52	Sump	100	5.61	N/A	-	3.74	5
58	On-Grade	100	4.83	1.00	0.34	12.60	14
64	On-Grade	100	4.94	1.00	0.34	12.34	14
69	On-Grade	100	3.94	1.00	0.32	11.14	13
82	On-Grade	100	3.29	1.00	0.30	9.95	11
88	On-Grade	100	3.63	1.50	0.31	10.60	12
94	On-Grade	100	5.61	1.00	0.35	13.90	15
99	On-Grade	100	5.54	1.00%	0.35	13.79	15

100-year peak flows were used for all inlets located in a sump.
Inlets On-grade were sized using HEC -22 calculator.

SUMP INLETS CALC- AVENTINE AT SWEETWATER SPRINGS

Sump Curb Inlet Sizing- (Applies to Nodes 52)

Ponded depth in terms of height of opening (H/h)

H=10”
h=6”

H/h=10”/6”
H/h=1.7 Use 1.5 cfs/ft (conservative)

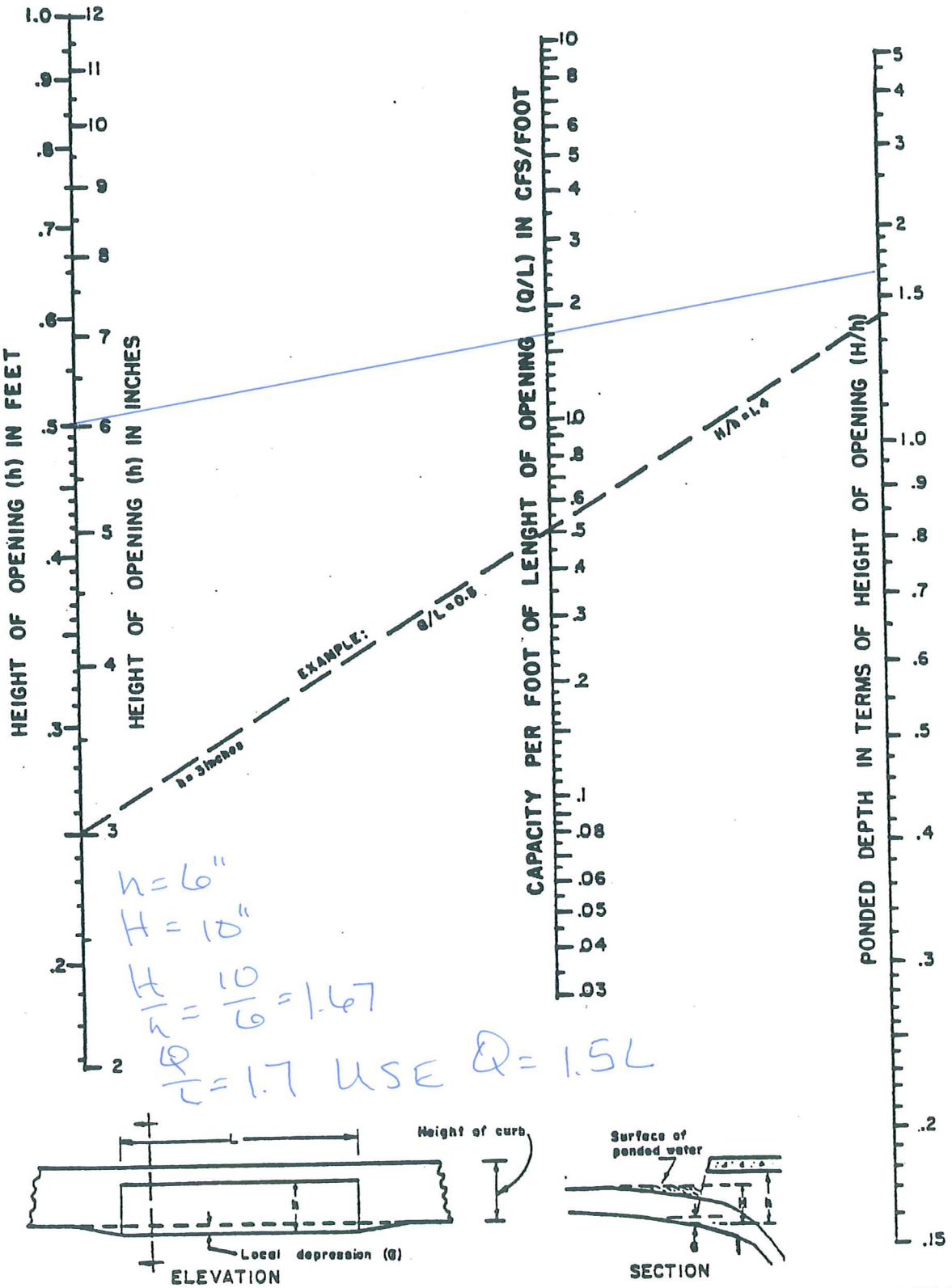
Since opening is 6” (h=6”) & capacity per foot of length of opening (Q/L) in cfs/ft is…

Q_{100}/L=1.5 cfs/foot

Then,

Node 52, Q100= 5.61, Lmin = 3.74’ à Use 5’ inlet

CHART I-103.6C



REV.		CITY OF SAN DIEGO - DESIGN GUIDE	SHT. NO.
		NOMOGRAM—CAPACITY, CURB INLET AT SAG	

User Name: ABrooks
Project: Spring Valley Commercial

Date: 12-21-18
Time: 09:54:03

Hec22 Calculation Report:

==========

Results:

Flow Intercepted:	4.83	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	12.66	ft → use 14'
Splash-over Velocity:	0.00	ft/s
Ponding Width:	12.22	ft
Depth at Curb:	0.34	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	4.83	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.015	
Pavement Cross Slope:	0.02	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	4.00	in
Gutter Width:	1.50	ft
Curb Opening Length:	12.66	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

64

User Name: ABrooks
Project: Spring Valley Commercial

Date: 12-21-18
Time: 09:54:19

Hec22 Calculation Report:

==========

Results:

Flow Intercepted:	4.94	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	12.84	ft → use 14'
Splash-over Velocity:	0.00	ft/s
Ponding Width:	12.34	ft
Depth at Curb:	0.34	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	4.94	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.015	
Pavement Cross Slope:	0.02	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	4.00	in
Gutter Width:	1.50	ft
Curb Opening Length:	12.84	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

User Name: ABrooks
Project: Spring Valley Commercial

Date: 12-21-18
Time: 09:54:40

Hec22 Calculation Report:

==========

Results:

Flow Intercepted:	3.94	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	11.14	ft → use 13'
Splash-over Velocity:	0.00	ft/s
Ponding Width:	11.25	ft
Depth at Curb:	0.32	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	3.94	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.015	
Pavement Cross Slope:	0.02	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	4.00	in
Gutter Width:	1.50	ft
Curb Opening Length:	11.14	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

(82)

User Name: ABrooks
Project: Spring Valley Commercial

Date: 12-21-18
Time: 09:55:05

Hec22 Calculation Report:

==========

Results:

Flow Intercepted:	3.29	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	9.95	ft → use 11'
Splash-over Velocity:	0.00	ft/s
Ponding Width:	10.44	ft
Depth at Curb:	0.30	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	3.29	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.015	
Pavement Cross Slope:	0.02	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	4.00	in
Gutter Width:	1.50	ft
Curb Opening Length:	9.95	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

User Name: ABrooks
Project: Spring Valley Commercial

Date: 12-07-17
Time: 15:18:58

Hec22 Calculation Report:

==========

Results:

Flow Intercepted:	3.64	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	10.60	ft → use 12'
Splash-over Velocity:	0.00	ft/s
Ponding Width:	10.89	ft
Depth at Curb:	0.31	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	3.64	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.015	
Pavement Cross Slope:	0.02	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	4.00	in
Gutter Width:	1.50	ft
Curb Opening Length:	10.60	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

(94)

User Name: ABrooks
Project: Spring Valley Commercial

Date: 12-21-18
Time: 09:55:22

Hec22 Calculation Report:

==========

Results:

Flow Intercepted:	5.61	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	13.90	ft → use 15'
Splash-over Velocity:	0.00	ft/s
Ponding Width:	12.99	ft
Depth at Curb:	0.35	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	5.61	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.015	
Pavement Cross Slope:	0.02	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	4.00	in
Gutter Width:	1.50	ft
Curb Opening Length:	13.90	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

User Name: ABrooks
Project: Spring Valley Commercial

Date: 12-21-18
Time: 09:55:41

Hec22 Calculation Report:

==========

Results:

Flow Intercepted:	5.54	cfs
Flow Bypassed:	0.00	cfs
Inlet Length:	13.79	ft → Use 15'
Splash-over Velocity:	0.00	ft/s
Ponding Width:	12.92	ft
Depth at Curb:	0.35	ft

Efficiency:

Curb	100.00	%
Grate	*	%
Slotted	*	%
Total:	100.00	%

Flow Data Input:

Input Method:	Known Flow	
Known Flow:	5.54	cfs

Inlet Parameters:

Computation Type:	Grade	
Inlet Type:	Curb	
Longitudinal Slope:	0.01	ft/ft
Manning's n:	0.015	
Pavement Cross Slope:	0.02	ft/ft
Gutter Cross Slope:	0.08	ft/ft
Local Depression:	4.00	in
Gutter Width:	1.50	ft
Curb Opening Length:	13.79	ft
Curb Throat Type:	Horizontal	
Inclined Throat Angle:	90.0000	deg
Inlet Opening Height:	0.50	in
Curb Weir Coefficient:	2.300	
Curb Orifice Coefficient:	0.670	

STREET CAPACITY CALCULATIONS

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Dec 8 2017

4 in Wedge Curb

User-defined

Invert Elev (ft)	= 0.13
Slope (%)	= 2.00
N-Value	= Composite

Calculations

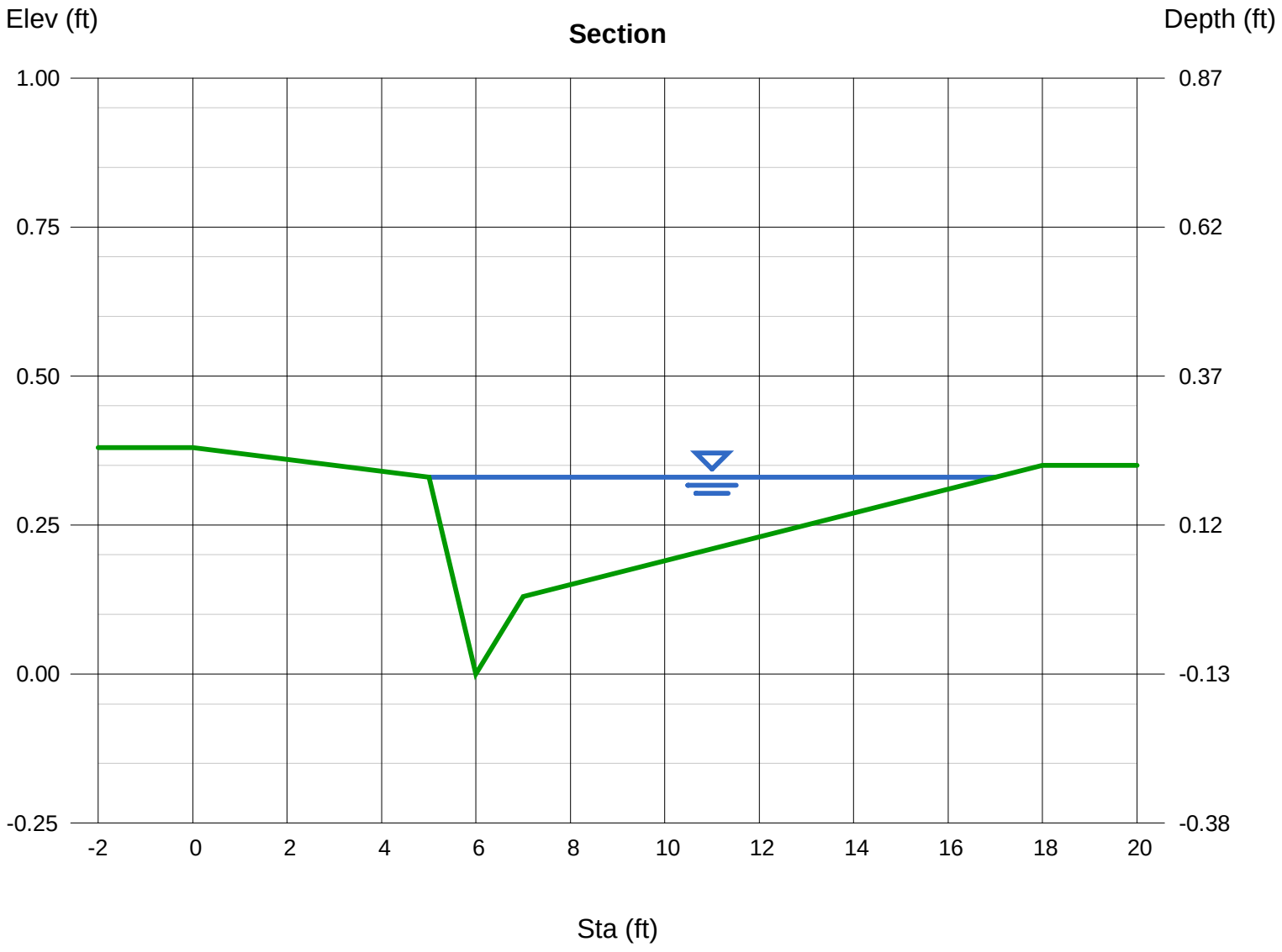
Compute by:	Q vs Depth
No. Increments	= 10

Highlighted

Depth (ft)	= 0.20
Q (cfs)	= 5.365
Area (sqft)	= 1.43
Velocity (ft/s)	= 3.75
Wetted Perim (ft)	= 12.06
Crit Depth, Yc (ft)	= 0.25
Top Width (ft)	= 12.00
EGL (ft)	= 0.42

(Sta, El, n)-(Sta, El, n)...

(0.00, 0.38) -(5.00, 0.33, 0.016) -(7.00, 0.13, 0.016) -(18.00, 0.35, 0.013)



CURB OUTLET CAPACITY CALCULATIONS

Standard D-25
Type A

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Oct 29 2018

<Name>

Rectangular

Bottom Width (ft)	= 3.00
Total Depth (ft)	= 0.25
Invert Elev (ft)	= 100.00
Slope (%)	= 2.00
N-Value	= 0.013

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.25

Highlighted

Depth (ft)	= 0.25
Q (cfs)	= 4.339
Area (sqft)	= 0.75
Velocity (ft/s)	= 5.79
Wetted Perim (ft)	= 3.50
Crit Depth, Yc (ft)	= 0.25
Top Width (ft)	= 3.00
EGL (ft)	= 0.77

Section

CHAPTER 5
DETENTION BASIN ANALYSIS

RATIONAL METHOD HYDROGRAPH PROGRAM
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Basin 1

RUN DATE 12/20/2018
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 9 MIN.
6 HOUR RAINFALL 2.8 INCHES
BASIN AREA 10.1 ACRES
RUNOFF COEFFICIENT 0.676
PEAK DISCHARGE 35.64 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 9	DISCHARGE (CFS) = 0
TIME (MIN) = 18	DISCHARGE (CFS) = 1.2
TIME (MIN) = 27	DISCHARGE (CFS) = 1.2
TIME (MIN) = 36	DISCHARGE (CFS) = 1.2
TIME (MIN) = 45	DISCHARGE (CFS) = 1.2
TIME (MIN) = 54	DISCHARGE (CFS) = 1.3
TIME (MIN) = 63	DISCHARGE (CFS) = 1.3
TIME (MIN) = 72	DISCHARGE (CFS) = 1.4
TIME (MIN) = 81	DISCHARGE (CFS) = 1.4
TIME (MIN) = 90	DISCHARGE (CFS) = 1.5
TIME (MIN) = 99	DISCHARGE (CFS) = 1.5
TIME (MIN) = 108	DISCHARGE (CFS) = 1.6
TIME (MIN) = 117	DISCHARGE (CFS) = 1.6
TIME (MIN) = 126	DISCHARGE (CFS) = 1.7
TIME (MIN) = 135	DISCHARGE (CFS) = 1.8
TIME (MIN) = 144	DISCHARGE (CFS) = 1.9
TIME (MIN) = 153	DISCHARGE (CFS) = 2
TIME (MIN) = 162	DISCHARGE (CFS) = 2.2
TIME (MIN) = 171	DISCHARGE (CFS) = 2.3
TIME (MIN) = 180	DISCHARGE (CFS) = 2.5
TIME (MIN) = 189	DISCHARGE (CFS) = 2.7
TIME (MIN) = 198	DISCHARGE (CFS) = 3.1
TIME (MIN) = 207	DISCHARGE (CFS) = 3.3
TIME (MIN) = 216	DISCHARGE (CFS) = 4.1
TIME (MIN) = 225	DISCHARGE (CFS) = 4.6
TIME (MIN) = 234	DISCHARGE (CFS) = 6.8
TIME (MIN) = 243	DISCHARGE (CFS) = 8.5
TIME (MIN) = 252	DISCHARGE (CFS) = 35.64
TIME (MIN) = 261	DISCHARGE (CFS) = 5.5
TIME (MIN) = 270	DISCHARGE (CFS) = 3.7
TIME (MIN) = 279	DISCHARGE (CFS) = 2.9
TIME (MIN) = 288	DISCHARGE (CFS) = 2.4
TIME (MIN) = 297	DISCHARGE (CFS) = 2.1
TIME (MIN) = 306	DISCHARGE (CFS) = 1.9
TIME (MIN) = 315	DISCHARGE (CFS) = 1.7
TIME (MIN) = 324	DISCHARGE (CFS) = 1.6
TIME (MIN) = 333	DISCHARGE (CFS) = 1.4
TIME (MIN) = 342	DISCHARGE (CFS) = 1.4
TIME (MIN) = 351	DISCHARGE (CFS) = 1.3
TIME (MIN) = 360	DISCHARGE (CFS) = 1.2
TIME (MIN) = 369	DISCHARGE (CFS) = 0

Outlet structure for Discharge of Basin 1

Discharge vs Elevation Table

Low orifice	1.000 "	Lower slot		Lower Weir		*Note: h = head above the invert of the lowest surface discharge opening. In this case h = 0 ft refers to 0.5' from the top of the mulch layer.
Number of orif:	0	Number of slots:	1	Number of weirs:	0	
Cg-low:	0.62	Invert:	0.00 ft	Invert:	0.00	
		B	2.500 ft	B:	0.00	
Middle orifice	1 "	h_{slot}	0.250 ft			
Number of orif:	0					
Cg-middle:	0.62	Upper slot		Emergency weir		
invert elev:	1.750 ft	Number of slots:	0	Invert:	1.500 ft	
		Invert:	0.00 ft	W:	12.00 ft	
		B:	0.00 ft			
		h_{slot}	0.000 ft			

h* (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qweir (cfs)	Qemerg (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.042	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.066	0.000	0.000	0.000	0.066
0.083	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.186	0.000	0.000	0.000	0.186
0.125	1.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.343	0.000	0.000	0.000	0.343
0.167	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.527	0.000	0.000	0.000	0.527
0.208	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.737	0.000	0.000	0.000	0.737
0.250	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.969	0.000	0.000	0.000	0.969
0.292	3.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.221	0.000	0.000	0.000	1.221
0.333	4.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.396	0.000	0.000	0.000	1.396
0.375	4.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.530	0.000	0.000	0.000	1.530
0.417	5.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.652	0.000	0.000	0.000	1.652
0.458	5.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.766	0.000	0.000	0.000	1.766
0.500	6.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.874	0.000	0.000	0.000	1.874
0.542	6.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.975	0.000	0.000	0.000	1.975
0.583	7.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.071	0.000	0.000	0.000	2.071
0.625	7.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.163	0.000	0.000	0.000	2.163
0.667	8.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.252	0.000	0.000	0.000	2.252
0.708	8.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.337	0.000	0.000	0.000	2.337
0.750	9.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.419	0.000	0.000	0.000	2.419
0.792	9.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.498	0.000	0.000	0.000	2.498
0.833	10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.575	0.000	0.000	0.000	2.575
0.875	10.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.650	0.000	0.000	0.000	2.650
0.917	11.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.722	0.000	0.000	0.000	2.722

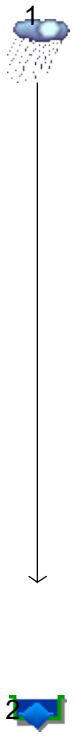
0.958	11.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.793	0.000	0.000	0.000	2.793
1.000	12.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.862	0.000	0.000	0.000	2.862
1.042	12.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.929	0.000	0.000	0.000	2.929
1.083	13.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.995	0.000	0.000	0.000	2.995
1.125	13.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.060	0.000	0.000	0.000	3.060
1.167	14.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.123	0.000	0.000	0.000	3.123
1.208	14.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.184	0.000	0.000	0.000	3.184
1.250	15.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.245	0.000	0.000	0.000	3.245
1.292	15.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.305	0.000	0.000	0.000	3.305
1.333	16.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.363	0.000	0.000	0.000	3.363
1.375	16.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.421	0.000	0.000	0.000	3.421
1.417	17.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.477	0.000	0.000	0.000	3.477
1.458	17.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.533	0.000	0.000	0.000	3.533
1.500	18.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.588	0.000	0.000	0.000	3.588
1.542	18.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.642	0.000	0.000	0.316	3.958
1.583	19.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.695	0.000	0.000	0.895	4.590
1.625	19.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.747	0.000	0.000	1.644	5.391
1.667	20.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.799	0.000	0.000	2.531	6.330
1.708	20.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.850	0.000	0.000	3.537	7.387
1.750	21.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.900	0.000	0.000	4.650	8.550
1.792	21.500	0.500	0.000	0.000	0.000	0.000	0.000	0.000	3.950	0.000	0.000	5.860	9.809
1.833	22.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	3.999	0.000	0.000	7.159	11.158
1.875	22.500	1.500	0.000	0.000	0.000	0.000	0.000	0.000	4.047	0.000	0.000	8.543	12.590
1.917	23.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	4.095	0.000	0.000	10.005	14.100
1.958	23.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	4.143	0.000	0.000	11.543	15.686
2.000	24.000	3.000	0.000	0.000	0.000	0.000	0.000	0.000	4.189	0.000	0.000	13.152	17.342
2.042	24.500	3.500	0.000	0.000	0.000	0.000	0.000	0.000	4.236	0.000	0.000	14.830	19.066
2.083	25.000	4.000	0.000	0.000	0.000	0.000	0.000	0.000	4.282	0.000	0.000	16.574	20.855
2.125	25.500	4.500	0.000	0.000	0.000	0.000	0.000	0.000	4.327	0.000	0.000	18.381	22.708
2.167	26.000	5.000	0.000	0.000	0.000	0.000	0.000	0.000	4.372	0.000	0.000	20.249	24.621
2.208	26.500	5.500	0.000	0.000	0.000	0.000	0.000	0.000	4.416	0.000	0.000	22.177	26.593
2.250	27.000	6.000	0.000	0.000	0.000	0.000	0.000	0.000	4.460	0.000	0.000	24.162	28.622
2.292	27.500	6.500	0.000	0.000	0.000	0.000	0.000	0.000	4.503	0.000	0.000	26.203	30.707
2.333	28.000	7.000	0.000	0.000	0.000	0.000	0.000	0.000	4.547	0.000	0.000	28.299	32.846
2.375	28.500	7.500	0.000	0.000	0.000	0.000	0.000	0.000	4.589	0.000	0.000	30.448	35.037
2.417	29.000	8.000	0.000	0.000	0.000	0.000	0.000	0.000	4.632	0.000	0.000	32.648	37.280
2.458	29.500	8.500	0.000	0.000	0.000	0.000	0.000	0.000	4.673	0.000	0.000	34.899	39.573
2.500	30.000	9.000	0.000	0.000	0.000	0.000	0.000	0.000	4.715	0.000	0.000	37.200	41.915
2.542	30.500	9.500	0.000	0.000	0.000	0.000	0.000	0.000	4.756	0.000	0.000	39.549	44.305
2.583	31.000	10.000	0.000	0.000	0.000	0.000	0.000	0.000	4.797	0.000	0.000	41.946	46.743
2.625	31.500	10.500	0.000	0.000	0.000	0.000	0.000	0.000	4.838	0.000	0.000	44.389	49.226

2.667	32.000	11.000	0.000	0.000	0.000	0.000	0.000	0.000	4.878	0.000	0.000	46.877	51.755
2.708	32.500	11.500	0.000	0.000	0.000	0.000	0.000	0.000	4.917	0.000	0.000	48.429	53.347
2.750	33.000	12.000	0.000	0.000	0.000	0.000	0.000	0.000	4.957	0.000	0.000	49.257	54.214
2.792	33.500	12.500	0.000	0.000	0.000	0.000	0.000	0.000	4.996	0.000	0.000	50.071	55.068
2.833	34.000	13.000	0.000	0.000	0.000	0.000	0.000	0.000	5.035	0.000	0.000	50.873	55.908
2.875	34.500	13.500	0.000	0.000	0.000	0.000	0.000	0.000	5.074	0.000	0.000	51.661	56.735
2.917	35.000	14.000	0.000	0.000	0.000	0.000	0.000	0.000	5.112	0.000	0.000	52.438	57.550
2.958	35.500	14.500	0.000	0.000	0.000	0.000	0.000	0.000	5.150	0.000	0.000	53.204	58.354
3.000	36.000	15.000	0.000	0.000	0.000	0.000	0.000	0.000	5.188	0.000	0.000	53.959	59.146
3.042	36.500	15.500	0.000	0.000	0.000	0.000	0.000	0.000	5.225	0.000	0.000	54.703	59.928
3.083	37.000	16.000	0.000	0.000	0.000	0.000	0.000	0.000	5.262	0.000	0.000	55.437	60.700
3.125	37.500	16.500	0.000	0.000	0.000	0.000	0.000	0.000	5.299	0.000	0.000	56.162	61.461
3.167	38.000	17.000	0.000	0.000	0.000	0.000	0.000	0.000	5.336	0.000	0.000	56.877	62.213
3.208	38.500	17.500	0.000	0.000	0.000	0.000	0.000	0.000	5.372	0.000	0.000	57.584	62.956
3.250	39.000	18.000	0.000	0.000	0.000	0.000	0.000	0.000	5.409	0.000	0.000	58.282	63.690
3.292	39.500	18.500	0.000	0.000	0.000	0.000	0.000	0.000	5.444	0.000	0.000	58.972	64.416
3.333	40.000	19.000	0.000	0.000	0.000	0.000	0.000	0.000	5.480	0.000	0.000	59.654	65.134
3.375	40.500	19.500	0.000	0.000	0.000	0.000	0.000	0.000	5.516	0.000	0.000	60.328	65.843
3.417	41.000	20.000	0.000	0.000	0.000	0.000	0.000	0.000	5.551	0.000	0.000	60.994	66.545
3.458	41.500	20.500	0.000	0.000	0.000	0.000	0.000	0.000	5.586	0.000	0.000	61.654	67.240
3.500	42.000	21.000	0.000	0.000	0.000	0.000	0.000	0.000	5.621	0.000	0.000	62.306	67.927
3.542	42.500	21.500	0.000	0.000	0.000	0.000	0.000	0.000	5.655	0.000	0.000	62.952	68.607
3.583	43.000	22.000	0.000	0.000	0.000	0.000	0.000	0.000	5.690	0.000	0.000	63.591	69.281
3.625	43.500	22.500	0.000	0.000	0.000	0.000	0.000	0.000	5.724	0.000	0.000	64.224	69.947
3.667	44.000	23.000	0.000	0.000	0.000	0.000	0.000	0.000	5.758	0.000	0.000	64.850	70.608
3.708	44.500	23.500	0.000	0.000	0.000	0.000	0.000	0.000	5.792	0.000	0.000	65.471	71.262
3.750	45.000	24.000	0.000	0.000	0.000	0.000	0.000	0.000	5.825	0.000	0.000	66.086	71.911
3.792	45.500	24.500	0.000	0.000	0.000	0.000	0.000	0.000	5.859	0.000	0.000	66.695	72.553
3.833	46.000	25.000	0.000	0.000	0.000	0.000	0.000	0.000	5.892	0.000	0.000	67.298	73.190
3.875	46.500	25.500	0.000	0.000	0.000	0.000	0.000	0.000	5.925	0.000	0.000	67.896	73.821
3.917	47.000	26.000	0.000	0.000	0.000	0.000	0.000	0.000	5.958	0.000	0.000	68.489	74.447
3.958	47.500	26.500	0.000	0.000	0.000	0.000	0.000	0.000	5.990	0.000	0.000	69.077	75.068
4.000	48.000	27.000	0.000	0.000	0.000	0.000	0.000	0.000	6.023	0.000	0.000	69.660	75.683
4.042	48.500	27.500	0.000	0.000	0.000	0.000	0.000	0.000	6.055	0.000	0.000	70.238	76.293
4.083	49.000	28.000	0.000	0.000	0.000	0.000	0.000	0.000	6.087	0.000	0.000	70.812	76.899
4.125	49.500	28.500	0.000	0.000	0.000	0.000	0.000	0.000	6.119	0.000	0.000	71.381	77.500
4.167	50.000	29.000	0.000	0.000	0.000	0.000	0.000	0.000	6.151	0.000	0.000	71.945	78.096
4.208	50.500	29.500	0.000	0.000	0.000	0.000	0.000	0.000	6.182	0.000	0.000	72.505	78.687
4.250	51.000	30.000	0.000	0.000	0.000	0.000	0.000	0.000	6.214	0.000	0.000	73.060	79.274

Hydraflow Table of Contents

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Legend

Hyd.	Origin	Description
1	Manual	Sweetwater Site Runoff
2	Reservoir	Sweetwater BF-1-1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

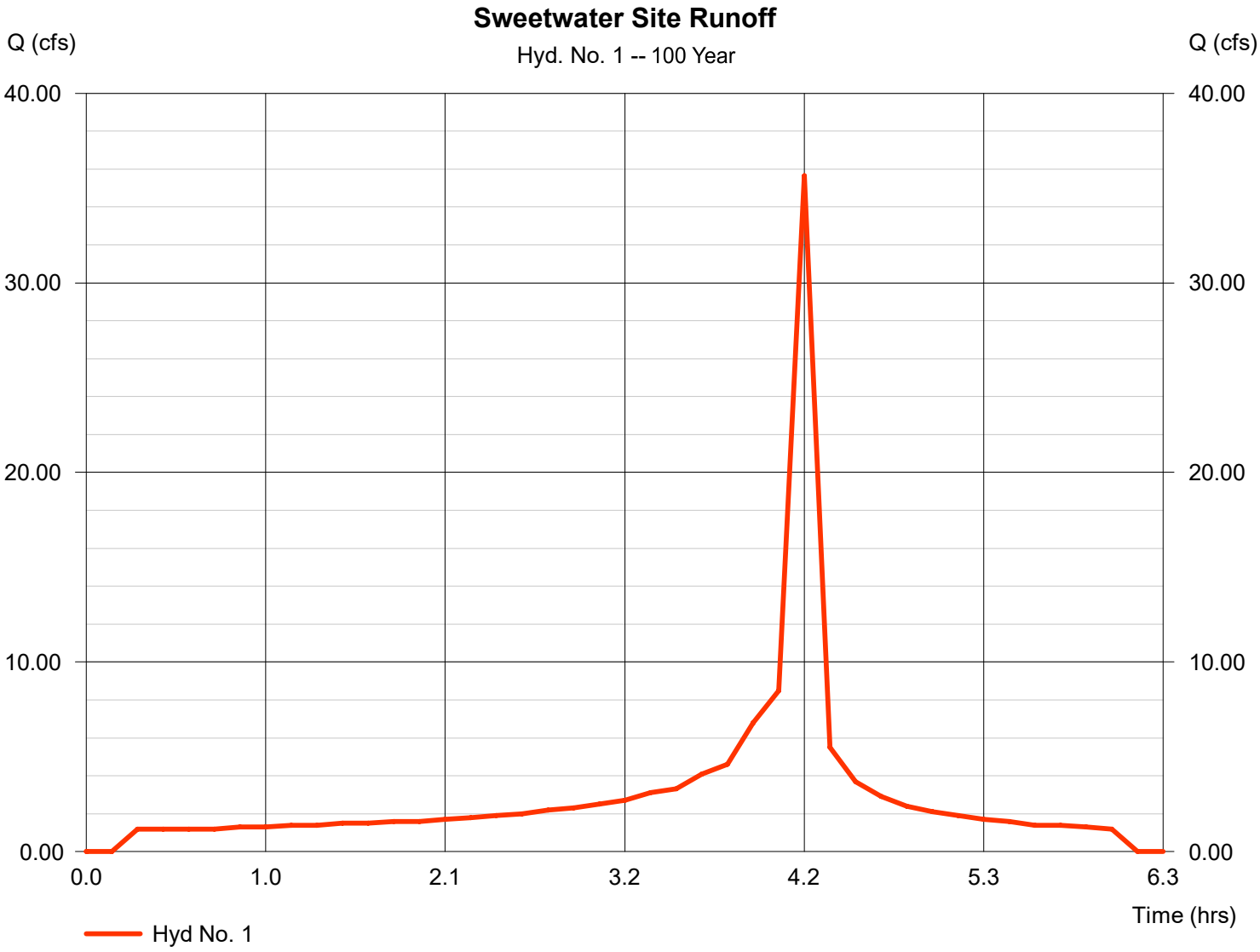
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Manual	35.64	9	252	68,386	------	------	------	Sweetwater Site Runoff
2	Reservoir	17.69	9	261	62,637	1	479.95	35,437	Sweetwater BF-1-1

Hydrograph Report

Hyd. No. 1

Sweetwater Site Runoff

Hydrograph type	= Manual	Peak discharge	= 35.64 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.20 hrs
Time interval	= 9 min	Hyd. volume	= 68,386 cuft



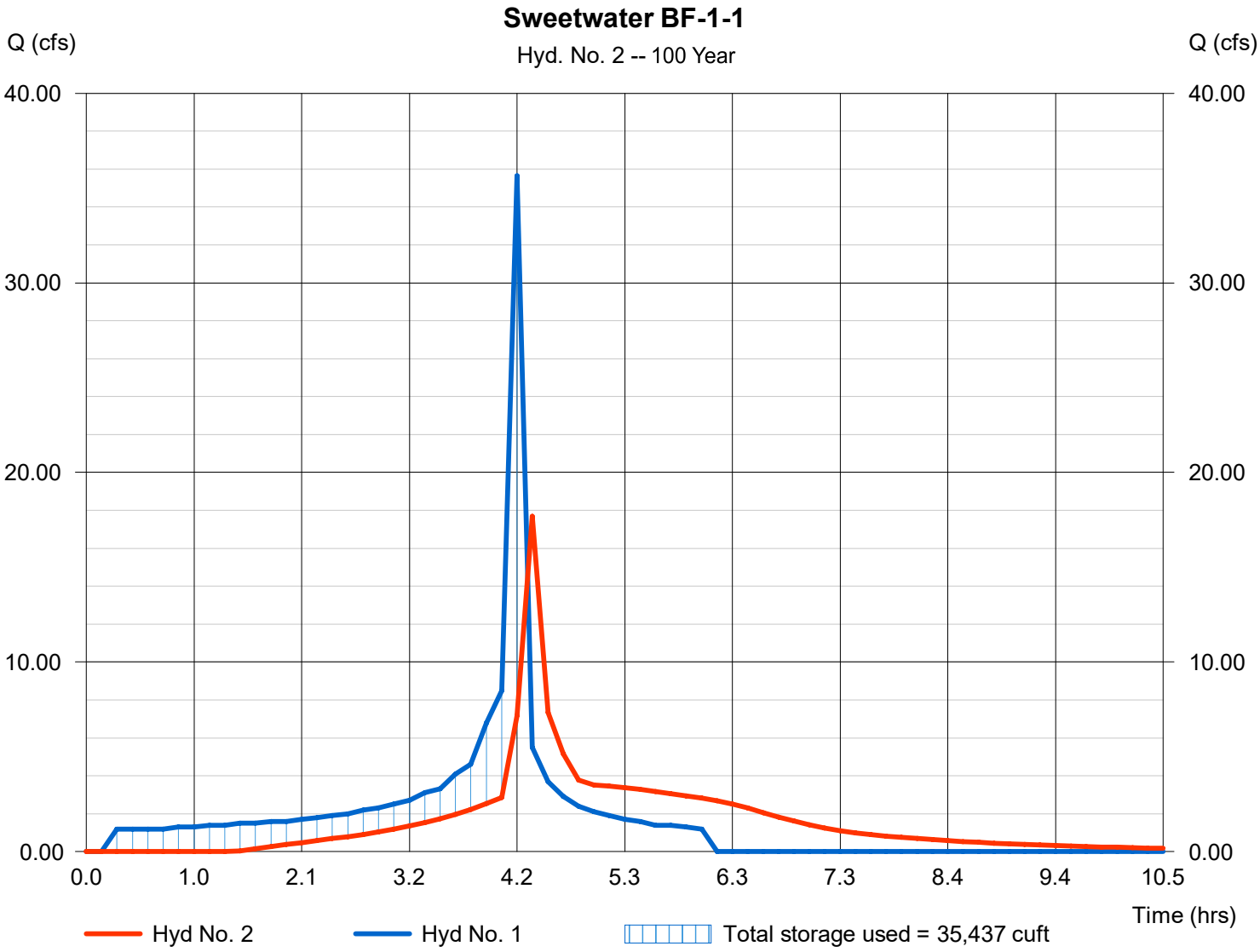
Hydrograph Report

Hyd. No. 2

Sweetwater BF-1-1

Hydrograph type	= Reservoir	Peak discharge	= 17.69 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.35 hrs
Time interval	= 9 min	Hyd. volume	= 62,637 cuft
Inflow hyd. No.	= 1 - Sweetwater Site Runoff	Max. Elevation	= 479.95 ft
Reservoir name	= Sweetwater Detention Basin BF-1-1	Max. Storage	= 35,437 cuft

Storage Indication method used.



Pond No. 1 - Sweetwater Detention Basin BF-1-1

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 477.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	477.00	11,162	0	0
0.50	477.50	11,805	5,742	5,742
1.00	478.00	12,466	6,068	11,810
1.50	478.50	13,145	6,403	18,212
2.00	479.00	13,842	6,747	24,959
2.25	479.25	14,125	3,496	28,455
2.50	479.50	14,557	3,585	32,040
3.00	480.00	15,289	7,462	39,502
3.50	480.50	16,040	7,832	47,334
4.00	481.00	16,809	8,212	55,546
4.50	481.50	17,596	8,601	64,147
5.00	482.00	18,401	8,999	73,147

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	Inactive	Inactive	Inactive
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	Inactive	Inactive	Inactive	Inactive
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

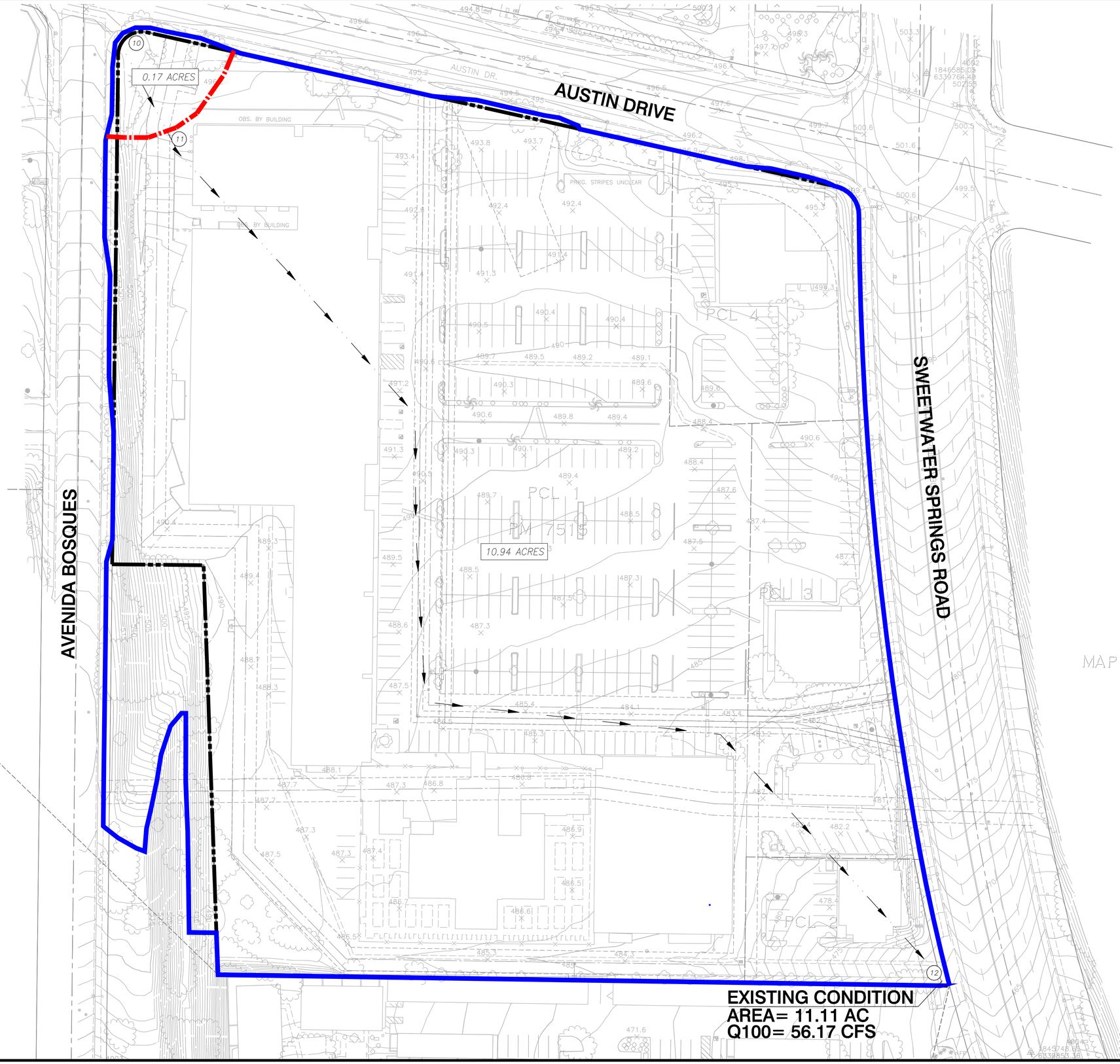
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	477.00	---	---	---	---	---	---	---	---	---	---	0.000
0.50	5,742	477.50	---	---	---	---	---	---	---	---	---	---	0.000
1.00	11,810	478.00	---	---	---	---	---	---	---	---	---	0.969	0.969
1.50	18,212	478.50	---	---	---	---	---	---	---	---	---	2.419	2.419
2.00	24,959	479.00	---	---	---	---	---	---	---	---	---	3.245	3.245
2.25	28,455	479.25	---	---	---	---	---	---	---	---	---	3.588	3.588
2.50	32,040	479.50	---	---	---	---	---	---	---	---	---	8.550	8.550
3.00	39,502	480.00	---	---	---	---	---	---	---	---	---	28.62	28.62
3.50	47,334	480.50	---	---	---	---	---	---	---	---	---	54.21	54.21
4.00	55,546	481.00	---	---	---	---	---	---	---	---	---	63.69	63.69
4.50	64,147	481.50	---	---	---	---	---	---	---	---	---	71.91	71.91
5.00	73,147	482.00	---	---	---	---	---	---	---	---	---	79.27	79.27

CHAPTER 6
HYDROLOGY MAPS



LEGEND

PROJECT BOUNDARY

DRAINAGE BOUNDARY

INITIAL SUBAREA

FLOW DIRECTION

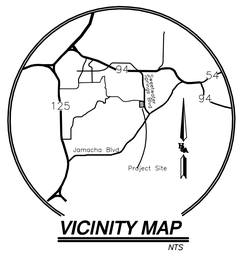
NODE # (22)

SUBAREA ACREAGE 0.20 ACRES

H&A

20 0 20 40 60

SCALE 1" = 20'



VICINITY MAP

NTS

PREPARED BY:

HUNSAKER & ASSOCIATES SAN DIEGO, INC

PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500· FX(858)558-1414

EXISTING CONDITION HYDROLOGY EXHIBIT FOR:

THE ENCLAVE @ Sweetwater Springs

COUNTY OF SAN DIEGO, CALIFORNIA

SHEET 1 OF 2

W.O.# 107-275

R:\1249\Hyd\ACAD\TM\HYDRO\1249- ENCLAVE SWEETWATER- HYDRO-EX.dwg[] Jul-21-2018:11:18

LEGEND

PROJECT BOUNDARY
DRAINAGE BOUNDARY
INITIAL SUBAREA
FLOW DIRECTION
NODE #
SUBAREA ACREAGE 0.20 ACRES

SCALE 1" = 40'

VICINITY MAP
NTS

AUSTIN DRIVE
EX. 66" RCP
SWEETWATER SPRINGS ROAD
AVENIDA BOSQUES
PRIVATE DR 'E'
PRIVATE DR 'F'
PRIVATE DR 'G'
PRIVATE DR 'D'
PRIVATE DR 'B'
PRIVATE DR 'A'
PRIVATE DR 'C'
PASEO
BASIN ACCESS ROAD
NEW BROW DITCH
0.1 ACRES
0.14 ACRES
0.99 ACRES
0.9 ACRES
1.06 ACRES
0.11 ACRES
0.07 ACRES
0.23 ACRES
0.63 ACRES
0.08 ACRES
0.11 ACRES
0.07 ACRES
1.44 ACRES
0.87 ACRES
0.91 ACRES
1.07 ACRES
1.39 ACRES
0.08 ACRES
0.49 ACRES
WATER QUALITY / HYDROMOD BASIN BOTTOM: 477.0
6,240 SF TOT LOT
AREA = 11.11 AC
Q100 =18.84 CFS
PROP. DISCHARGE LOCATION
Q100 EXISTING = 56.17 CFS

PREPARED BY:
HUNSAKER & ASSOCIATES SAN DIEGO, INC
PLANNING 9707 Waples Street
ENGINEERING San Diego, Ca 92121
SURVEYING PH(858)558-4500 · FX(858)558-1414

PROPOSED CONDITION HYDROLOGY EXHIBIT FOR:

THE ENCLAVE
@ Sweetwater Springs
COUNTY OF SAN DIEGO, CALIFORNIA

SHEET 2 OF 2

W.O.# 107-275

CHAPTER 7
REFERENCE INFORMATION
(Reports, Plans, Etc.)

National Flood Hazard Layer FIRMette

FEMA

32°43'57.76"N

116°58'34.12"W

116°57'56.66"W

32°43'27.49"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

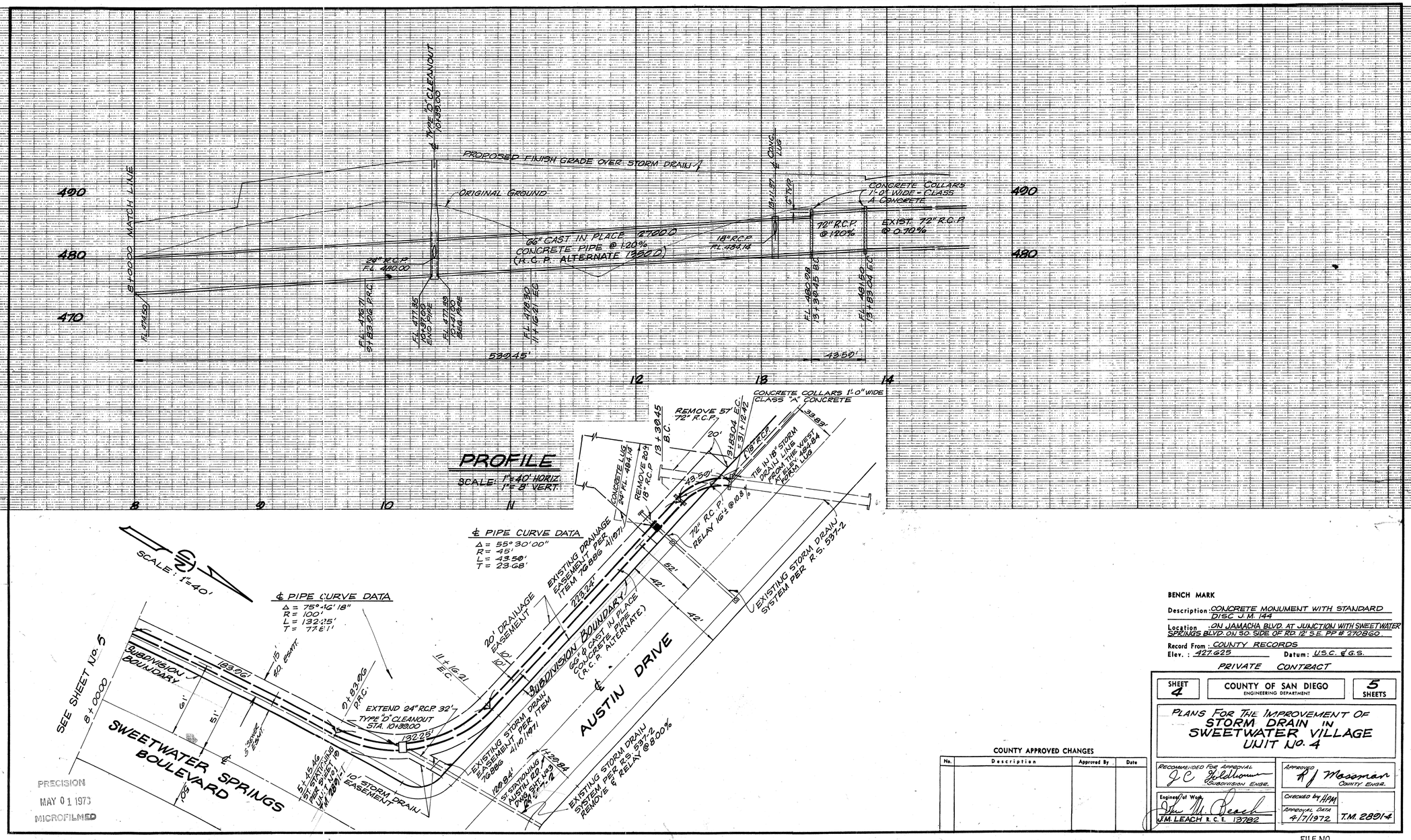
N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/21/2018 at 2:30:27 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



BENCH MARK

Description: CONCRETE MONUMENT WITH STANDARD DISC J.M. 144

Location: ON JAMACHA BLVD. AT JUNCTION WITH SWEETWATER SPRINGS BLVD. ON SO. SIDE OF RD. 12 S.E. PP # 2708GO.

Record From: COUNTY RECORDS

Elev.: 427.625 Datum: U.S.C. & G.S.

PRIVATE CONTRACT

COUNTY APPROVED CHANGES

No.	Description	Approved By	Date

SHEET 4 — COUNTY OF SAN DIEGO, ENGINEERING DEPARTMENT — 5 SHEETS

PLANS FOR THE IMPROVEMENT OF STORM DRAIN IN SWEETWATER VILLAGE UNIT NO. 4

RECOMMENDED FOR APPROVAL: J.C. Hildebrand, SUBDIVISION ENGR.

APPROVED: A.J. Mossman, COUNTY ENGR.

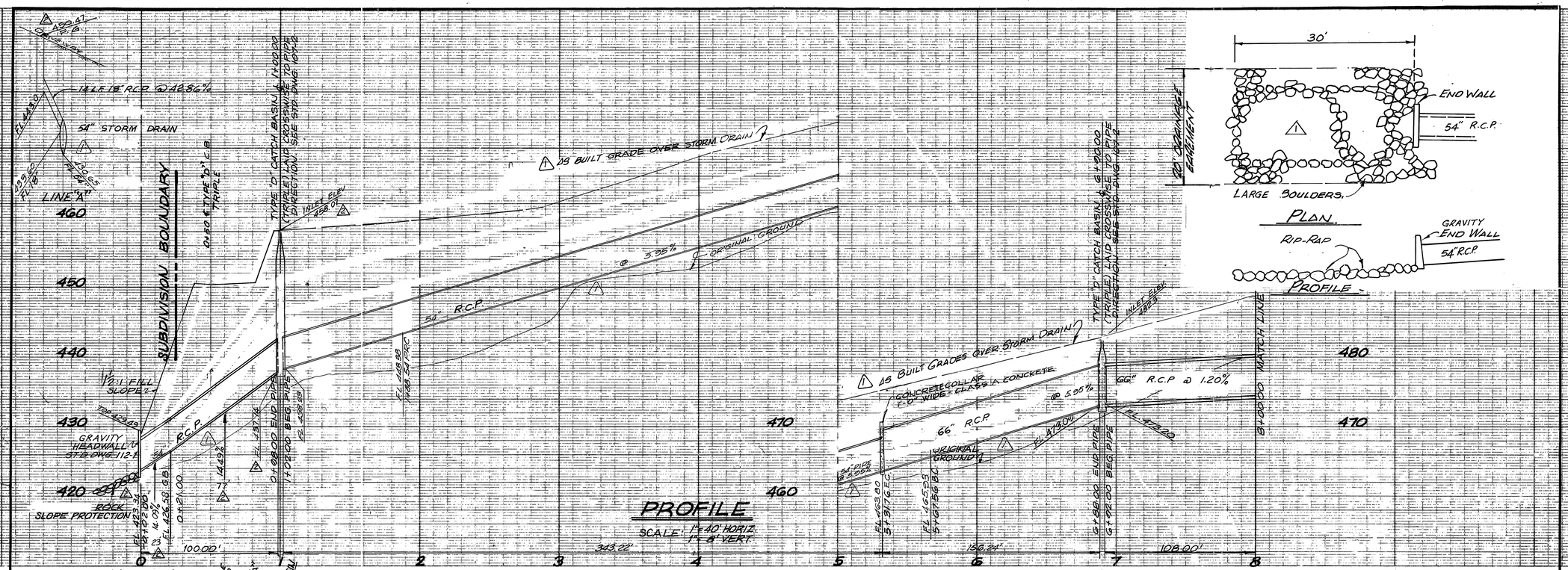
ENGINEER OF WORK: John M. Leach, J.M. LEACH R.C.E. 13782

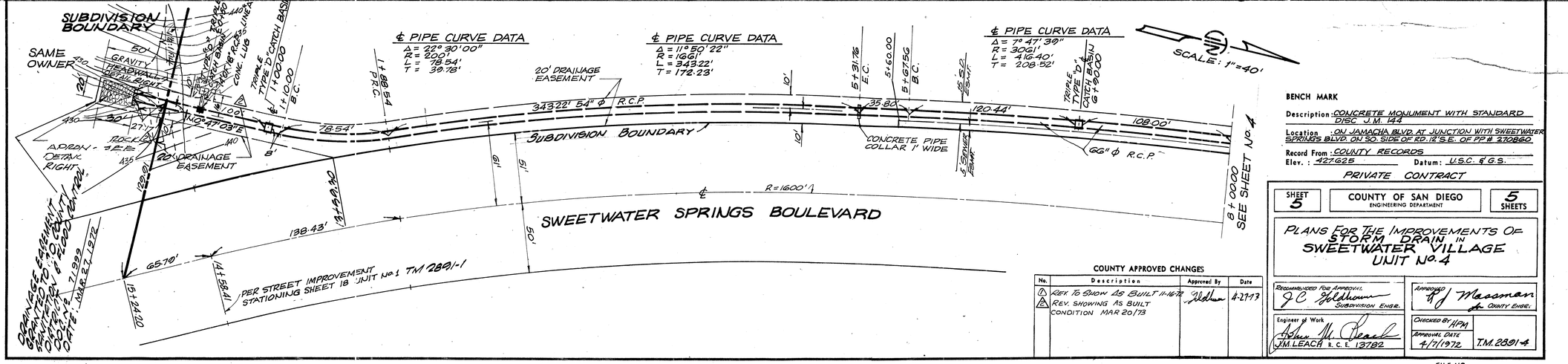
CHECKED BY H/P/M

APPROVAL DATE: 4/7/1972

T.M. 2891-4

FILE NO





BENCH MARK

Description: CONCRETE MONUMENT WITH STANDARD DISC J.M. 144

Location: ON JAMACHA BLVD. AT JUNCTION WITH SWEETWATER SPRINGS BLVD. ON SO. SIDE OF RD. 12 S.E. OF PP # 270860

Record From: COUNTY RECORDS

Elev.: 427.628 Datum: U.S.C. & G.S.

PRIVATE CONTRACT

SHEET 5	COUNTY OF SAN DIEGO ENGINEERING DEPARTMENT	5 SHEETS

PLANS FOR THE IMPROVEMENTS OF STORM DRAIN IN SWEETWATER VILLAGE UNIT No. 4

COUNTY APPROVED CHANGES

No.	Description	Approved By	Date
1	REV. TO SHOW AS BUILT 11-16-72	Holdsworth	4-27-73
2	REV. SHOWING AS BUILT CONDITION MAR 20/73		

Recommended For Approval: J.C. Holdsworth, Subdivision Engr.

Approved: R.J. Massman, County Engr.

Engineer of Work: John M. Leach, J.M. LEACH R.C.E. 13782

Checked By: H.P.M.

Approval Date: 4/7/1972

T.M. 2891-4

FILE NO.