DRAINAGE STUDY

GAMBLE LANE
TENTATIVE PARCEL MAP
CITY OF ESCONDIDO

Prepared for:

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September 24, 2021

W.O. 909-1511-400 BR

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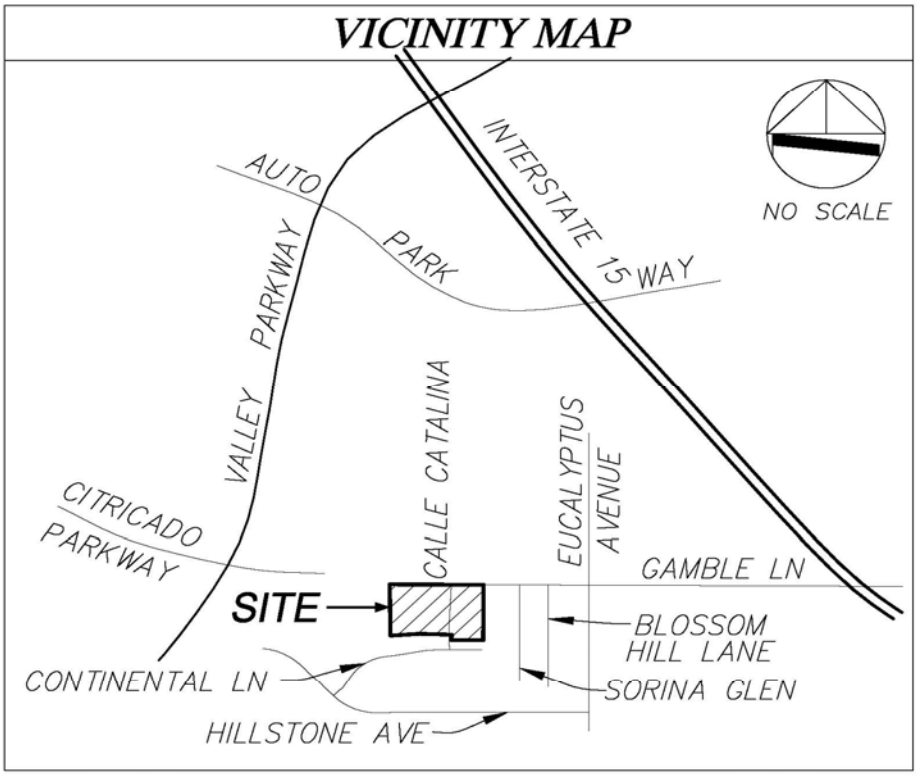
CHAPTER 1 – DISCUSSION

1.1 VICINITY MAP



1.2 PURPOSE AND SCOPE

The purpose of this report is to publish the results of hydrology and hydraulic computer analysis for the development of the Gamble Lane Tentative Parcel Map project in the City of Escondido. The scope of this study is to analyze the results of existing and developed condition hydrology calculations and provide recommendations as to the design and size of various hydraulic systems considered as mitigation of any potential adverse effects of the proposed project. The mitigation measures proposed will include runoff interception ditches, specific routing and bypassing of runoff from areas that will remain in their natural condition, and detention calculations and sizing to attenuate the effects of development on storm water discharge. The 100-year storm frequency will be analyzed. Information contained in this report will be referred to for the purpose of sizing storm water treatment facilities as proposed in the associated Storm Water Quality Management Plan.

1.3 PROJECT DESCRIPTION

A Tentative Parcel Map (TPM) is being proposed with three (3) parcels for the Gamble Lane project. Each parcel will have a single family residential dwelling unit. Un-improved Calle Catalina will be improved onsite and will connect to Gamble Lane along the northerly project boundary.

Storm water facilities will be constructed to collect runoff from new and existing impervious surfaces prior to discharging offsite onto Calle Catalina and Gamble Lane. Drainage from the site is conveyed to three separate Points of Compliances (POCs).

Treatment of storm water runoff from the site has been addressed in a separate report - "Priority Development Project (PDP) Storm Water Quality Management Plan (SWQMP) for Gamble Lane Tentative Parcel Map" by BHA. Hydromodification (HMP) analysis has also been presented within the SWQMP.

Per County of San Diego drainage criteria, the Modified Rational Method should be used to determine peak flowrates when the contributing drainage area is less than 1.0 square mile.

Hydraulic Modified-Puls detention basin routing of the aforementioned modified rational method hydrology was performed using the Army Corps of Engineers HEC-HMS 4.8 software.

1.4 PRE – DEVELOPMENT CONDITIONS

The existing site comprises of previously cleared and partially graded site. The site is a u-shaped property with Gamble Lane to the north, and single family residential developments on the east, south and west sides of the project. There is a lot with a single family residential building, concrete driveway and accessory improvements separating the west and east portions of the property. An existing public emergency access and public utilities easement, Calle Catalina, traverses the property in a south to north direction beginning where the improved portion of Calle Catalina ends along the southerly boundary. Unimproved Calle Catalina extends northerly to Gamble Lane. Drainage from the site is conveyed to three separate Points of Compliances (POCs).

Drainage Basin A, 0.84 acres, drains to POC A. POC A is generally described as the southwest portion of the property that drains southeasterly to Calle Catalina. Drainage sheet flows to an existing concrete brow ditch along the southerly boundary where it discharges onto Calle Catalina. A portion of the offsite lot with a single family residential building and accessory improvements drains onsite towards Calle Catalina. Total discharge at POC A is 2.15 cfs.

Drainage Basin B, 0.96 acres, drains to POC B. POC B is generally described as the northwest portion of the property. Drainage is conveyed toward the northwest corner of the property and discharged onto Gamble Lane. A portion of the offsite lot with a single family residential building, concrete driveway and accessory improvements drains onsite towards Calle Catalina. A portion of the offsite existing single family residential dwelling drains northerly onto Gamble Lane. Total discharge at POC B is 2.80 cfs.

Drainage Basin C, 2.29 acres, drains to POC C. POC C is generally described as the easterly half of the property. Drainage is conveyed from the easterly edge of Calle Catalina toward the northeasterly corner of the project. A portion of the offsite lot with a single family residential building, concrete driveway and accessory improvements drains onto Gamble Lane and confluences with onsite flows at northeasterly corner of the project. Total discharge at POC C is 5.25 cfs.

Per the National Resources Conservation Service (NRCS) Web Survey the hydrologic Soil Type is Type C. Type C soils have a slow infiltration rate when thoroughly wet.

Table 1 summarizes the existing condition runoff information from the site. Please refer to the Existing Condition Hydrology Map for drainage patterns and areas.

Table 1 – Summary of Existing Condition Runoff

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)
POC A	0.84	2.15
POC B	0.96	2.80
POC C	2.29	5.25

1.5 POST-DEVELOPMENT CONDITIONS

Storm water facilities will be constructed to collect runoff from new and existing impervious surfaces prior to discharging offsite onto Calle Catalina and Gamble Lane. The project site drains to three (3) separate POCs. POC A, POC B and POC C.

Drainage Basin A, 0.88 acres, drains to POC A. Drainage Basin A, encompasses runoff from Parcel 1 graded pad, permeable paver driveway serving Parcel 1 from Calle Catalina and a portion of the offsite lot with a single family residential building and accessory improvements drains onsite. Runoff from the graded pad will be conveyed into a biofiltration basin for pollutant control treatment, hydromodification (flow control) and mitigation of the 100-year runoff. The outlets from the biofiltration basin and permeable pavers will be discharged into an existing concrete brow ditch along the southerly boundary. The permeable pavers will provide pollutant control treatment and flow control for onsite pervious areas and runoff from the existing offsite lot with a single family residential building and accessory improvements that drains onto the site. Total discharge at POC A (Node 40) after mitigation of the 100-year runoff is 3.24 cfs.

Drainage Basin B, 0.81 acres, drains to POC B. Drainage Basin B, encompasses runoff from the rear slopes of Parcel 1 graded pad and a portion the offsite lot with a single family residential building and accessory improvements. No stormwater BMPs are being proposed for DMA B. Total discharge at POC B (Node 70) is 2.32 cfs.

Drainage Basin C, 2.35 acres, drains to POC C. Drainage Basin C, encompasses runoff from Parcel 2, Parcel 3, portion of Calle Catalina, and a portion of the offsite lot with a single family residential building and accessory improvements that drains onto Gamble Lane. Runoff from Parcel 2 and Parcel 3 will be discharged into the biofiltration basin via separate yard drains. Runoff from Gamble Lane will be intercepted by a curb inlet and discharged into the biofiltration basin via a storm drain. The biofiltraton basin will provide pollutant control treatment, flow control and to mitigate the 100-year runoff. The outlet form the biofiltration basin will be discharged onto Gamble Lane via a curb outlet. Total discharge at POC C (confluence of Nodes 200 and 220) is 7.45 cfs.

Per 2003 County of San Diego criteria, runoff coefficients were assumed respectively for the post developed project site dependent upon hydrologic soil class and surface land use.

Table 2 below summarizes the Post Developed Undetained Condition Peak Flows for each POC.

Table 2 – Post Developed Undetained Condition Runoff

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)
POC A	0.88	2.70
POC B	0.81	2.52
POC C	2.35	7.81

Prior to discharging runoff from the site at POC A the first flush runoff will be treated by a Biofiltration Basin (BMP A1) and Permeable Pavers (BMP A2).

Prior to discharging runoff from the site at POC C the first flush runoff will be treated by a Biofiltration Basin (BMP C).

Both biofiltration basins will have a total depth of 24-inches including freeboard. The BMP is comprised of 6-inches of ponding, 3-inches of non-floatable mulch, an 18-inch layer of amended soil (a highly sandy, organic rich compost with an infiltration capacity of at least 5 in/hr), 6-inches of pea gravel, and a 12-inch reservoir layer of gravel for additional detention, and to accommodate the French drain system. Below the reservoir layer, the basin will include 3-inches of saturated storage. Flows will discharge from the basin via a low-flow orifice outlet within the gravel layer to the receiving storm drain system. A riser structure will also be constructed within the BMP with an emergency overflow, such that peak flows can be safely discharged downstream. See dimensions in Tables 3 and 4. A typical cross section of the basins is provided in Chapter 4.3.

Table 3 – Summary of Post Developed Dual Purpose BMPs:

Biofiltration BMP	Tributary Area (Ac)	DIMENSIONS					
		BMP Area[1] (ft^2)	Underdrain Orifice,	Total Media Depth	Total Gravel Depth[3]	Riser Invert Elev,	Total Surface Depth,
BMPA	0.28	342	1.00	18	12	12	24
BMP C	2.03	1,623	1.50	18	12	12	24

Notes: (1): Area of amended soil = area of gravel = area of BMP.

(2): Diameter of the orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold (10%Q2).

(3): Does not include gravel below pipe invert.

(4): Depth from bottom of pond to invert of emergency overflow weir.

(5): Total surface ponding depth from the bottom of the pond to the top of the pond berm (pond spill crest).

Table 4 – Summary of HMP Riser Surface Discharge Structures:

POC 1	Lower Orifice Dimensions			Middle Orifice Dimensions			Emergency Weir		
	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width [3]	Outlet Type[1]	Invert Elev, HL[2] (in)	Dimensions (#) - height x width [3]	Riser Type	Riser Invert Elev,	Weir Perimeter Length (ft)
BMP A	Diameter	6	(4) - 1"	Slot	7	(1) 1" x 16"	Type G CB	12	11.84
BMP C	Slot	6	(1) - 2" x 6"	Slot	8	(1) - 2" x 22"	Type G CB	12	11.84

Notes: (1): Shape of orifice opening in riser structure.

(2): Depth from bottom of pond to invert of orifice or weir.

(3): Number of orifices - dimensions of orifice. For example for Basin C: one (1) slot orifice, slot height (hs) = 2", slot width (bs) = 6", invert at 6".

(4): Depth from bottom of pond to invert of emergency overflow weir.

1.6 STUDY METHOD

The method of analysis was based on the Rational Method according to the San Diego County Hydrology Manual (SD HM). The Hydrology and Hydraulic Analysis were done on Hydro Soft by Advanced Engineering Software (AES) 2014. The study considers the runoff for a 100-year storm frequency.

Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with criteria set forth in the "2003 County of San Diego Drainage Design Manual." A more detailed explanation of methodology used for this analysis is listed in Chapter 6 – References of this report.

Drainage basin areas were determined from the proposed grades shown on the Tentative Parcel

Map for Gamble Lane.

The Rational Method provided the following variable coefficients:

Rainfall Intensity – Initial time of concentration (T_c) values based on Table 3-2 of the SD HM. Rainfall Isopluvial Maps from the SD HM were used to determine P_6 for 100-year storm, see References.

Rainfall Intensity = $I = 7.44x(P_6)x(T_c)^{-0.645}$

P_6 for 100 year storm = 3.15 inches
Soil Type – The site consists of soils in hydrologic soil groups of Type-C, see Web Soil Survey in the References section of this report.

Runoff Coefficient – In accordance with the County of San Diego standards, runoff coefficients were based on land use and soil type. Based on the Web Soil Survey site soil quality is predominately Type D. An appropriate runoff coefficient (C) for each type of land use in the subarea was selected from Table 3-1 of SD HM and multiplied by the percentage of total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient ($\sum$[CA]).

For all of the landscaped areas, a runoff coefficient assuming 0% impervious was used based on the under-lying soil type, 0.35 for Type C soils.

The Proposed Condition Hydrology Map shows the offsite area, proposed on-site drainage system, on-site subareas, and nodal points. Tables 5 and 6 summarizes the weighted runoff coefficient calculations calculated in the existing and proposed conditions.

Table 5 – Weighted Pre-Developed Runoff Coefficient Calculations By Node

UP NODE	DOWN NODE	TOTAL AREA (AC)	C_1	$A_{1\,(AC)}$	C_2	A_2 (AC)	CC
10	*20*	*0.201*	*0.30*	*0.201*	*0.87*	*0.000*	*0.30*
20	*30*	*0.639*	*0.30*	*0.510*	*0.87*	*0.129*	*0.42*
40	*50*	*0.168*	*0.30*	*0.168*	*0.87*	*0.000*	*0.30*
50	*60*	*0.794*	*0.30*	*0.497*	*0.87*	*0.296*	*0.51*
70	*80*	*0.301*	*0.30*	*0.060*	*0.87*	*0.242*	*0.76*
80	*90*	*0.520*	*0.30*	*0.473*	*0.87*	*0.048*	*0.35*
90	*130*	*0.084*	*0.30*	*0.037*	*0.87*	*0.047*	*0.62*
100	*110*	*0.218*	*0.30*	*0.218*	*0.87*	*0.000*	*0.30*
110	*120*	*0.992*	*0.30*	*0.992*	*0.87*	*0.000*	*0.30*
120	*120*	*0.173*	*0.30*	*0.173*	*0.87*	*0.000*	*0.30*

Table 6 – Weighted Developed Runoff Coefficient Calculations By Node

UP NODE	DOWN NODE	TOTAL AREA (AC)	C_1	$A_{1\,(AC)}$	C_2	A_2 (AC)	CC
10	*20*	*0.286*	*0.30*	*0.186*	*0.87*	*0.100*	*0.50*
30	*40*	*0.595*	*0.30*	*0.466*	*0.87*	*0.129*	*0.42*
40	*40*	*0.093*	*0.30*	*0.045*	*0.87*	*0.048*	*0.59*
50	*60*	*0.104*	*0.30*	*0.104*	*0.87*	*0.000*	*0.30*
60	*70*	*0.709*	*0.30*	*0.413*	*0.87*	*0.296*	*0.54*
80	*90*	*0.301*	*0.30*	*0.059*	*0.87*	*0.242*	*0.76*
90	*100*	*0.448*	*0.30*	*0.272*	*0.87*	*0.175*	*0.52*
100	*170*	*0.096*	*0.30*	*0.057*	*0.87*	*0.039*	*0.53*
110	*120*	*0.158*	*0.30*	*0.083*	*0.87*	*0.075*	*0.57*
130	*130*	*0.257*	*0.30*	*0.178*	*0.87*	*0.079*	*0.48*
140	*141*	*0.099*	*0.30*	*0.062*	*0.87*	*0.037*	*0.51*
141	*142*	*0.267*	*0.30*	*0.159*	*0.87*	*0.107*	*0.53*
150	*150*	*0.416*	*0.30*	*0.416*	*0.87*	*0.000*	*0.30*
190	*190*	*0.023*	*0.30*	*0.006*	*0.87*	*0.018*	*0.73*
190	*190*	*0.189*	*0.30*	*0.189*	*0.87*	*0.000*	*0.30*
200	*210*	*0.023*	*0.30*	*0.014*	*0.87*	*0.009*	*0.52*
210	*220*	*0.067*	*0.30*	*0.025*	*0.87*	*0.042*	*0.66*

Notes: C-values taken from Table 3-1 of San Diego County Hydrology Manual, consistent with on-site existing soil types from the USDA Web Soil Survey. See References.

The outlet structure for the biofiltration facilities have been designed based on results from the Hydromodification (HMP) analysis presented within the "Storm Water Quality Management Plan for Gamble Lane Tentative Parcel Map" by BHA. SWMM analyses were prepared for the pre and post-developed conditions at the site in order to determine if the proposed LID biofiltration facilities meet the Hydromodification Management Plan (HMP) requirements. The Rational Method study provided herein incorporates the outlet structure design in the Hydromodification Management Plan, and is meant to enhance the SWMM study to show the site can sufficiently convey the 100-year storm event. See basin outlet details in Chapter 4.3 for the outlet structure design.

The post developed condition peak flows calculated using modified rational method were then routed through the detention facilities on the project site in HEC-HMS. The Modified-Puls detention routing analyzes pre-developed and post developed condition 100-year peak flowrates at the two (2) biofiltration basins, and ensures that post-development peak flow is less than or equal to pre-development peak flow for the 6-hour 100-year storm event at the project's point of compliances (POC A and POC C). The Modified-Puls results are summarized in Table 7.

Table 7 – Summary of Detention Basin Routing

TABLE 7 - SUMMARY OF DETENTION BASIN ROUTING

HMP-BMP	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)	Peak Water Surface Elevation (inches)[(1)]	Minimum Freeboard provided
BMP A	0.91	0.46	12.0	12.0
BMP C	6.27	3.53	12.0	12.0

Notes: (1): Biofiltration layer included as part of basin depth - volume reduced by voids accordingly

HEC-HMS allows for hydrology input time steps of 1, 2, 3, 4, 5, 10, 15 & 20 minutes. Rational Method analysis input was used to determine an inflow hydrograph using the 2/3's 1/3 distribution as detailed on pages 4-2 and 4-3 of the 2003 County of San Diego Hydrology Manual. The time of concentration (Tc) used for the construction of these hydrographs was rounded to the nearest time interval that HEC-HMS could accept. The peak flow remains as per the modified rational method analysis and is not reduced (or increased) from this hydrograph development accordingly.

Additionally, as the detention facilities are multiple purpose water quality and hydromodification BMPs, there is available storage provided in the biofiltration layers of the basin– namely the engineered fill soil layer and the underlying gravel base layer. As HEC-HMS uses an elevation-storage-discharge function to model the basin volume (stage-storage) and basin discharge (stage-discharge) relationships, the available storage volume provided by these aforementioned sub-layers is accounted for by reducing the total sub-basin volume by the corresponding void ratio for each layer (0.4 for gravel and 0.2 for soil respectively).

Rational method hydrographs, stage-storage, stage-discharge relationships and HEC-HMS model output is provided in Chapter 4 of this report.

1.7 CONCLUSION

Table 8 summarizes pre-developed and post developed drainage areas and resultant 100-year peak flow rates at POC A, POC B and POC C for the Gamble Lane project.

Table 8 – Summary of Pre-Developed and Post Developed Detained Runoff

Discharge Location	Pre-Developed 100-Year Peak Flow (cfs)	Post Developed Detained 100-Year Peak Flow (cfs)
POC A	2.15	1.81
POC B	2.80	2.52
POC C	5.25	4.12

As shown in the above table, the development of the Gamble Lane Tentative Parcel Map will result in a net decrease of peak flow discharged at each POC for the project. The proposed drainage basins match the existing drainage basins in terms of overall area and drainage conditions to the maximum extent possible.

The Majority of developed runoff will receive water quality treatment in accordance with the site specific SWQMP. Additionally, POC A and POC C are HMP compliant as analyzed in the SWQMP.

Peak flow rates listed above were generated based on criteria set forth in "San Diego County Hydrology Manual" (methodology presented in Chapter 5 of this report). Rational method output is located in Chapter 3 and 4. The hydraulic calculations show that the proposed storm drain facilities can sufficiently convey the anticipated Q_{100} flowrate without any adverse effects. Based on this conclusion, runoff released from the proposed project site will be unlikely to cause any adverse impact to downstream water bodies or existing habitat integrity. Based on this conclusion, runoff released from the proposed project site will be unlikely to cause any adverse impact to downstream water bodies or existing habitat integrity. Sediment will likely be reduced upon site development.

1.8 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 City of Escondido is confined to a review only and does not relieve me, as Engineer of Work, of my responsibilities for project design.

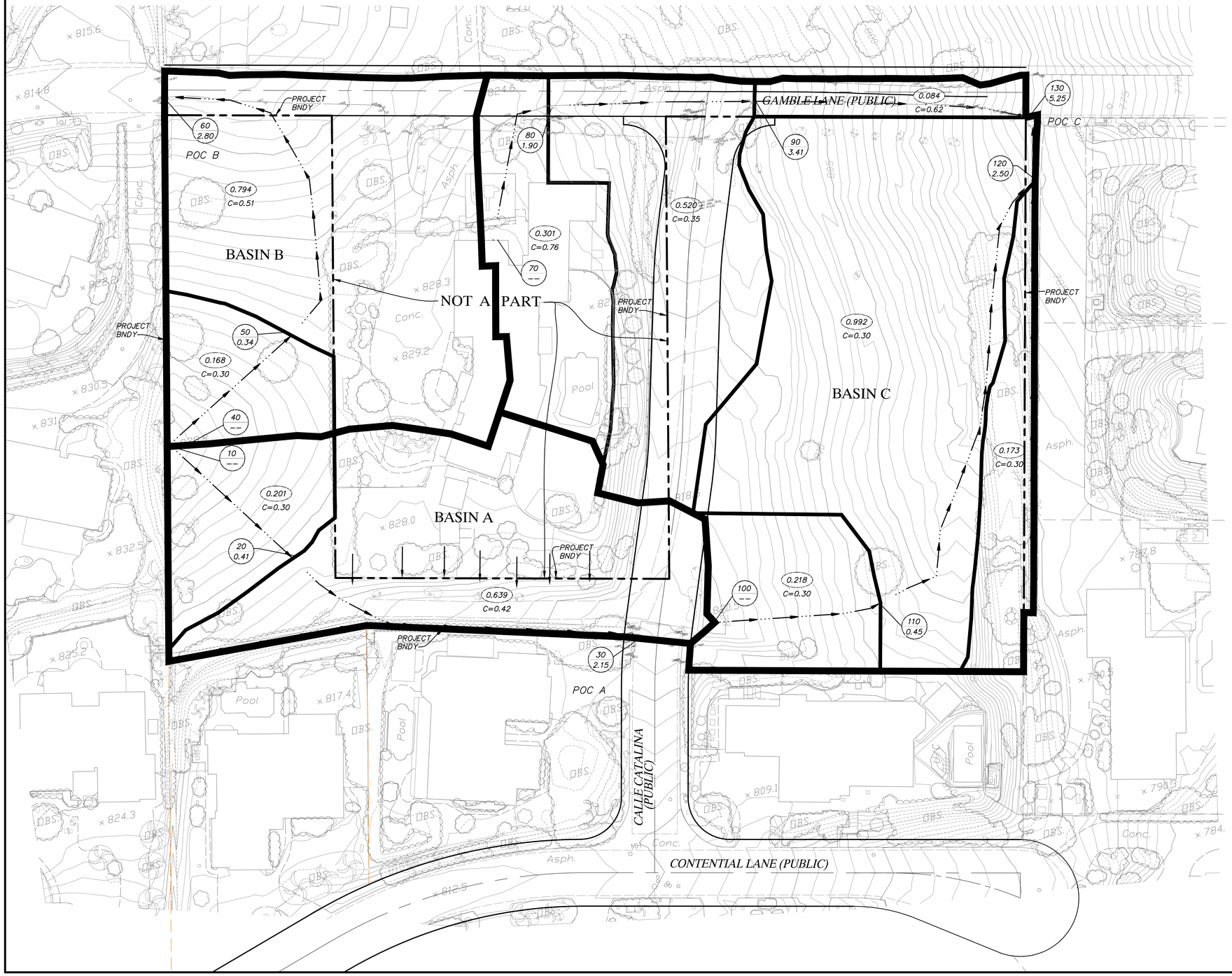
Ronald L. Holloway R.C.E. 29271 — Date 12-6-21

CHAPTER 2

EXHIBITS

Predevelopment Condition Hydrology Map
&
Post Development Condition Hydrology Map

LEGEND	SYMBOL
SURFACE NODE	20
SURFACE FLOW, 100-YEAR	0.41
BASIN AREA	(0.201)
RUNOFF COEFFICIENT	C=0.30
BASIN BOUNDARY/SUB-BOUNDARY	
PROPERTY LINE	
FLOW PATH	
PROPOSED CONCRETE SIDEWALK	



30' 15' 0' 30' 60' 90'

SCALE: 1" = 30'

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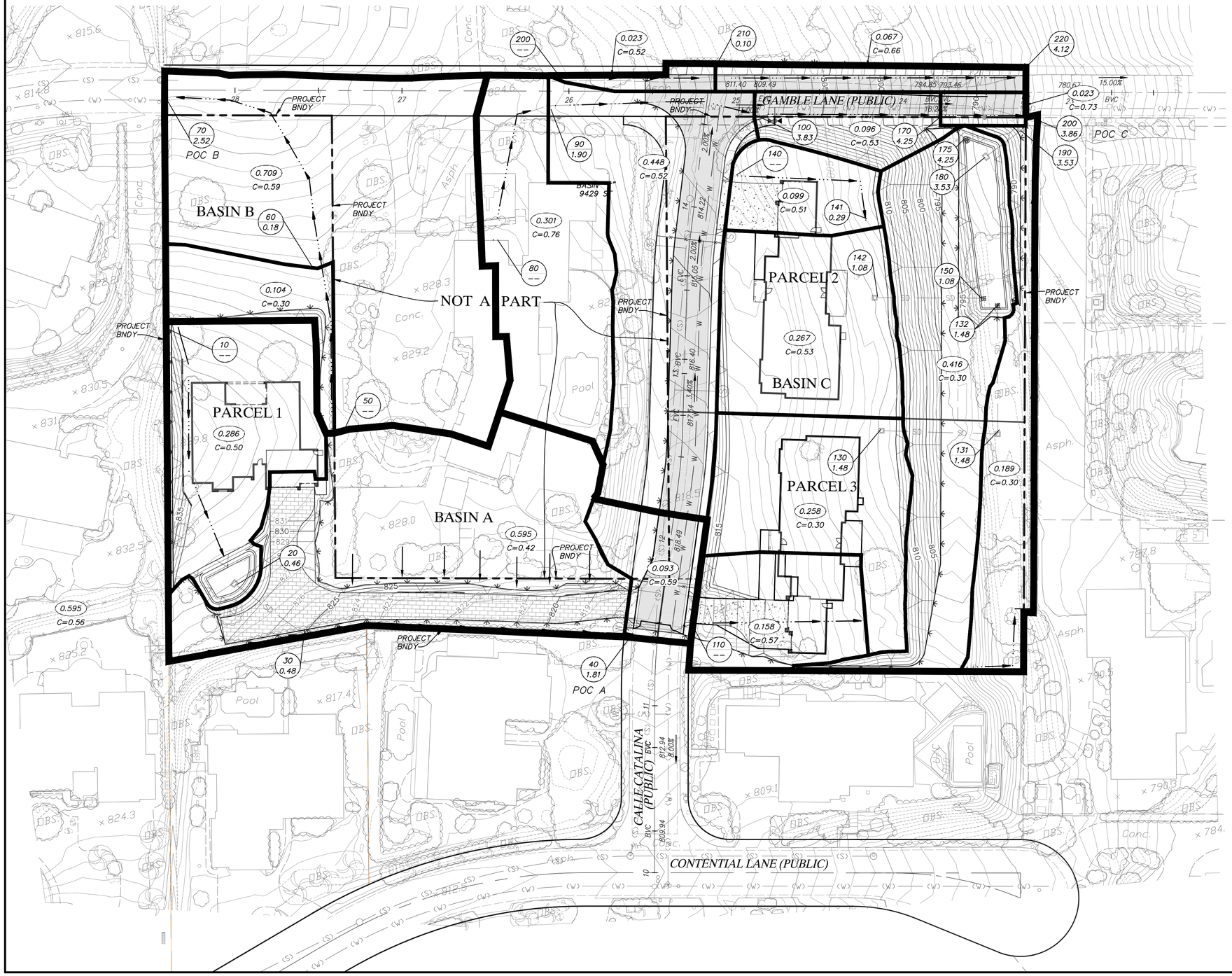
EXISTING CONDITION HYDROLOGY MAP GAMBLE LANE TPM ESCONDIDO, CA

SHEET 1 OF 1

K:\Civil 3D\1511\DWG\HYDRO\1511-Exist Hydro.dwg, 12/2/2021 7:45:04 AM

LEGEND	SYMBOL
SURFACE NODE	20
SURFACE FLOW, 100-YEAR	0.36
BASIN AREA	0.07
RUNOFF COEFFICIENT	C=0.73
BASIN BOUNDARY/SUB-BOUNDARY	
PROPERTY LINE	
FLOW PATH	
PROPOSED CONCRETE SIDEWALK	
PROPOSED ASPHALT PAVEMENT	



30' 15' 0' 30' 60' 90'

SCALE: 1" = 30'

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PROPOSED CONDITION HYDROLOGY MAP GAMBLE LANE TPM ESCONDIDO, CA

SHEET 1 OF 1

CHAPTER 3

CALCULATIONS

3.1 – Predeveloped Condition Hydrology Calculations

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            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2014 Advanced Engineering Software (aes)
              Ver. 21.0 Release Date: 06/01/2014  License ID 1459

                              Analysis prepared by:

                                      BHA INC.
                                5115 AVENIDA ENCINAS, SUITE L
                                     CARLSBAD, CA 92008


 ************************* DESCRIPTION OF STUDY *************************
* PRE-DEVELOPED HYDROLOGY                                                 *
*                                                                         *
*                                                                         *
 ***************************************************************************

  FILE NAME: K:\HYDRO\1511\1511E100.DAT
  TIME/DATE OF STUDY: 13:51 09/15/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.150
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 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.*

+---------------------------------------------------------------------------+
| BEGIN POC A                                                               |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    839.50
  DOWNSTREAM ELEVATION(FEET) =    829.00
  ELEVATION DIFFERENCE(FEET) =     10.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.684
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.882
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.20   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    829.00  DOWNSTREAM(FEET) =    816.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   217.00   CHANNEL SLOPE =  0.0567
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.250
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.547
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4200
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.29
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.73
  AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   0.54
  Tc(MIN.) =    7.22
  SUBAREA AREA(ACRES) =     0.64       SUBAREA RUNOFF(CFS) =    1.76
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.391
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.48   FLOW VELOCITY(FEET/SEC.) =   7.60
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     317.00 FEET.

+--------------------------------------------------------------------------+
| END POC A                                                                |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

+--------------------------------------------------------------------------+
| BEGIN POC B                                                              |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     50.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    839.50
  DOWNSTREAM ELEVATION(FEET) =    830.00
  ELEVATION DIFFERENCE(FEET) =      9.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.800
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.807
```

```
  SUBAREA RUNOFF(CFS) =      0.34
  TOTAL AREA(ACRES) =      0.17   TOTAL RUNOFF(CFS) =      0.34

+----------------------------------------------------------------------+
| END POC B                                                            |
|                                                                      |
|                                                                      |
+----------------------------------------------------------------------+

**********************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  51
----------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
======================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    830.00  DOWNSTREAM(FEET) =    816.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   212.00   CHANNEL SLOPE =  0.0637
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.141
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.58
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.00
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   1.18
  Tc(MIN.) =    7.98
  SUBAREA AREA(ACRES) =     0.79       SUBAREA RUNOFF(CFS) =    2.49
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.473
  TOTAL AREA(ACRES) =        1.0         PEAK FLOW RATE(CFS) =       2.80

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.31   FLOW VELOCITY(FEET/SEC.) =   3.54
  LONGEST FLOWPATH FROM NODE     40.00 TO NODE     60.00 =     312.00 FEET.

+----------------------------------------------------------------------+
| BEGIN POC C                                                          |
|                                                                      |
|                                                                      |
+----------------------------------------------------------------------+

**********************************************************************
  FLOW PROCESS FROM NODE     70.00 TO NODE     80.00 IS CODE =  21
----------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
======================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    827.80
  DOWNSTREAM ELEVATION(FEET) =    822.30
  ELEVATION DIFFERENCE(FEET) =      5.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.467
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.90
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      1.90

**********************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  51
----------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    822.30  DOWNSTREAM(FEET) =    809.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =    52.00   CHANNEL SLOPE =  0.2385
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.65
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.56
  AVERAGE FLOW DEPTH(FEET) =   0.22   TRAVEL TIME(MIN.) =   0.16
  Tc(MIN.) =    3.62
  SUBAREA AREA(ACRES) =     0.52       SUBAREA RUNOFF(CFS) =    1.51
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.500
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       3.41

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   5.86
  LONGEST FLOWPATH FROM NODE     70.00 TO NODE     90.00 =     152.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    130.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    809.90  DOWNSTREAM(FEET) =    784.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   165.00   CHANNEL SLOPE =  0.1539
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  25.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6200
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.63
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.64
  AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   0.41
  Tc(MIN.) =    4.04
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.43
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.511
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       3.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   6.85
  LONGEST FLOWPATH FROM NODE     70.00 TO NODE    130.00 =     317.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 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.) =    4.04
  RAINFALL INTENSITY(INCH/HR) =   8.30
  TOTAL STREAM AREA(ACRES) =     0.90
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.84
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    110.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    820.40
  DOWNSTREAM ELEVATION(FEET) =    808.30
  ELEVATION DIFFERENCE(FEET) =     12.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.684
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.882
  SUBAREA RUNOFF(CFS) =      0.45
  TOTAL AREA(ACRES) =      0.22   TOTAL RUNOFF(CFS) =      0.45

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    120.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    808.30  DOWNSTREAM(FEET) =    784.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   286.00   CHANNEL SLOPE =  0.0850
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.022
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.10
  AVERAGE FLOW DEPTH(FEET) =   0.21   TRAVEL TIME(MIN.) =   1.54
  Tc(MIN.) =    8.22
  SUBAREA AREA(ACRES) =     0.99       SUBAREA RUNOFF(CFS) =    1.79
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       2.19

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.25   FLOW VELOCITY(FEET/SEC.) =   3.58
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    120.00 =     386.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    120.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.022
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3000
  SUBAREA AREA(ACRES) =    0.17   SUBAREA RUNOFF(CFS) =    0.31
  TOTAL AREA(ACRES) =        1.4   TOTAL RUNOFF(CFS) =       2.50
  TC(MIN.) =    8.22

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    784.00  DOWNSTREAM(FEET) =    783.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    36.00   CHANNEL SLOPE =  0.0278
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  10.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.50
  FLOW VELOCITY(FEET/SEC.) =   4.10   FLOW DEPTH(FEET) =   0.25
  TRAVEL TIME(MIN.) =   0.15   Tc(MIN.) =    8.37
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    130.00 =     422.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 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.) =    8.37
  RAINFALL INTENSITY(INCH/HR) =   5.95
  TOTAL STREAM AREA(ACRES) =     1.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.50

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.84     4.04        8.299          0.90
      2        2.50     8.37        5.954          1.38

  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        5.05     4.04       8.299
      2        5.25     8.37       5.954

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.25   Tc(MIN.) =    8.37
  TOTAL AREA(ACRES) =        2.3
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    130.00 =     422.00 FEET.

+--------------------------------------------------------------------------+
| END POC C                                                                |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.3  TC(MIN.) =      8.37
  PEAK FLOW RATE(CFS)   =       5.25
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 3

CALCULATIONS

3.2 – Post Developed Condition Hydrology Calculations – Undetained

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2014 Advanced Engineering Software (aes)
              Ver. 21.0 Release Date: 06/01/2014  License ID 1459

                              Analysis prepared by:

                                     BHA INC.
                               5115 AVENIDA ENCINAS, SUITE L
                                    CARLSBAD, CA 92008


 ************************* DESCRIPTION OF STUDY *************************
* POST-DEVELOPED HYDROLOGY DETAINED                                      *
*                                                                        *
*                                                                        *
 **************************************************************************

  FILE NAME: K:\HYDRO\1511\1511P100.DAT
  TIME/DATE OF STUDY: 10:50 10/04/2021
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.150
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 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.*

+------------------------------------------------------------------------+
| BEGIN POC A                                                            |
|                                                                        |
|                                                                        |
+------------------------------------------------------------------------+

**************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
```

```
  UPSTREAM ELEVATION(FEET) =    831.50
  DOWNSTREAM ELEVATION(FEET) =    828.50
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.489
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.396
  SUBAREA RUNOFF(CFS) =      0.91
  TOTAL AREA(ACRES) =      0.29   TOTAL RUNOFF(CFS) =      0.91

+---------------------------------------------------------------------------+
| ENTER/EXIT BASIN A1                                                       |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   824.50  DOWNSTREAM(FEET) =   824.00
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.66
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.91
  PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    7.67
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    824.00  DOWNSTREAM(FEET) =    816.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   198.00   CHANNEL SLOPE =  0.0369
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.250
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.028
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4200
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.67
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   6.09
  AVERAGE FLOW DEPTH(FEET) =   0.47   TRAVEL TIME(MIN.) =   0.54
  Tc(MIN.) =    8.21
  SUBAREA AREA(ACRES) =     0.60       SUBAREA RUNOFF(CFS) =    1.51
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.446
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       2.37

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.53   FLOW VELOCITY(FEET/SEC.) =   6.71
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =     348.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
```

```
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.028
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4597
  SUBAREA AREA(ACRES) =    0.09   SUBAREA RUNOFF(CFS) =    0.33
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       2.70
  TC(MIN.) =    8.21

+--------------------------------------------------------------------------+
|                                                                          |
| END POC A                                                                |
|                                                                          |
+--------------------------------------------------------------------------+

+--------------------------------------------------------------------------+
| BEGIN POC B                                                              |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    831.40
  DOWNSTREAM ELEVATION(FEET) =    826.50
  ELEVATION DIFFERENCE(FEET) =      4.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.479
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.904
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    826.50  DOWNSTREAM(FEET) =    816.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   212.00   CHANNEL SLOPE =  0.0472
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.599
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.88
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   0.72
```

```
  Tc(MIN.) =    9.20
  SUBAREA AREA(ACRES) =     0.71       SUBAREA RUNOFF(CFS) =    2.34
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.553
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.52

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   5.81
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     70.00 =     312.00 FEET.

+----------------------------------------------------------------------------+
| END POC B                                                                  |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

+----------------------------------------------------------------------------+
| BEGIN POC C                                                                |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    827.80
  DOWNSTREAM ELEVATION(FEET) =    822.30
  ELEVATION DIFFERENCE(FEET) =      5.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.467
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.90
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      1.90

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  822.30  DOWNSTREAM ELEVATION(FEET) =  809.90
  STREET LENGTH(FEET) =    54.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 10.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  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) =   0.0140
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200
```

```
    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.87
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.69
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    8.47
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.86
  STREET FLOW TRAVEL TIME(MIN.) =   0.11   Tc(MIN.) =    3.57
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.616
  SUBAREA AREA(ACRES) =    0.45      SUBAREA RUNOFF(CFS) =    1.93
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   5.57
  FLOW VELOCITY(FEET/SEC.) =  8.94   DEPTH*VELOCITY(FT*FT/SEC.) =   2.13
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    100.00 =     154.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    170.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  809.90  DOWNSTREAM ELEVATION(FEET) =  794.20
  STREET LENGTH(FEET) =   110.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  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) =   0.0140
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.04
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.53
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.43
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.91
  STREET FLOW TRAVEL TIME(MIN.) =   0.25   Tc(MIN.) =    3.82
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.607
  SUBAREA AREA(ACRES) =    0.10      SUBAREA RUNOFF(CFS) =    0.42
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       4.25

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.72
```

```
  FLOW VELOCITY(FEET/SEC.) =  7.46   DEPTH*VELOCITY(FT*FT/SEC.) =   1.94
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    170.00 =     264.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    175.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   790.00  DOWNSTREAM(FEET) =   789.50
  FLOW LENGTH(FEET) =    19.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.71
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.25
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    3.86
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    175.00 =     283.00 FEET.

+--------------------------------------------------------------------------+
| ENTER BASIN C                                                            |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 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.) =    3.86
  RAINFALL INTENSITY(INCH/HR) =   8.30
  TOTAL STREAM AREA(ACRES) =     0.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.25

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    818.00
  DOWNSTREAM ELEVATION(FEET) =    814.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.010
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.371
  SUBAREA RUNOFF(CFS) =      0.66
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.66

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   812.00  DOWNSTREAM(FEET) =   810.80
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.38
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.66
  PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =    6.60
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    130.00 =     220.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.938
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5143
  SUBAREA AREA(ACRES) =    0.26   SUBAREA RUNOFF(CFS) =    0.86
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.48
  TC(MIN.) =    6.60

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   810.00  DOWNSTREAM(FEET) =   790.40
  FLOW LENGTH(FEET) =    68.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.52
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.48
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    6.68
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    131.00 =     288.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   790.40  DOWNSTREAM(FEET) =   789.50
  FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.45
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.48
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    6.96
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    132.00 =     363.00 FEET.

+--------------------------------------------------------------------------+
| ENTER BASIN C                                                            |
|                                                                          |
```

```
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 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.) =    6.96
  RAINFALL INTENSITY(INCH/HR) =   6.70
  TOTAL STREAM AREA(ACRES) =     0.42
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.48

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    814.00
  DOWNSTREAM ELEVATION(FEET) =    813.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.885
  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) =  5.728
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   811.00  DOWNSTREAM(FEET) =   810.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.77
  GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.29
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    9.08
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =     145.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.647
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .5300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5246
  SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    0.80
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.08
  TC(MIN.) =    9.08

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   810.00  DOWNSTREAM(FEET) =   789.50
  FLOW LENGTH(FEET) =    62.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.98
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.08
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.16
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    150.00 =     207.00 FEET.

+--------------------------------------------------------------------------+
| 1                                                                        |
| ENTER BASIN C                                                            |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.617
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4051
  SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    0.70
  TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       1.78
  TC(MIN.) =    9.16

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 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.) =    9.16
  RAINFALL INTENSITY(INCH/HR) =   5.62
  TOTAL STREAM AREA(ACRES) =     0.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.78

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
```

```
      1        4.25     3.86        8.299          0.85
      2        1.48     6.96        6.705          0.42
      3        1.78     9.16        5.617          0.78

  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        5.83     3.86       8.299
      2        6.27     6.96       6.705
      3        5.90     9.16       5.617

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.27   Tc(MIN.) =    6.96
  TOTAL AREA(ACRES) =        2.0
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    180.00 =     363.00 FEET.

+-------------------------------------------------------------------------+
| EXIT BASIN C                                                            |
|                                                                         |
|                                                                         |
+-------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    190.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   785.50  DOWNSTREAM(FEET) =   785.16
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.98
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.27
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    7.01
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    190.00 =     388.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    200.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    785.16  DOWNSTREAM(FEET) =    785.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =     8.00   CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.014   MAXIMUM DEPTH(FEET) =   0.25

        ==>>WARNING: FLOW IN CHANNEL EXCEEDS CHANNEL
            CAPACITY( NORMAL DEPTH EQUAL TO SPECIFIED MAXIMUM
            ALLOWABLE DEPTH).
            AS AN APPROXIMATION, FLOWDEPTH IS SET AT MAXIMUM
            ALLOWABLE DEPTH AND IS USED FOR TRAVELTIME CALCULATIONS.
```

```
  CHANNEL FLOW THRU SUBAREA(CFS) =       6.27
  FLOW VELOCITY(FEET/SEC.) =   8.36   FLOW DEPTH(FEET) =   0.25
  TRAVEL TIME(MIN.) =   0.02   Tc(MIN.) =    7.03
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    200.00 =     396.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.663
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5131
  SUBAREA AREA(ACRES) =    0.02   SUBAREA RUNOFF(CFS) =    0.11
  TOTAL AREA(ACRES) =        2.1   TOTAL RUNOFF(CFS) =       7.06
  TC(MIN.) =    7.03

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.663
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4953
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.38
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       7.44
  TC(MIN.) =    7.03

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 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.) =    7.03
  RAINFALL INTENSITY(INCH/HR) =   6.66
  TOTAL STREAM AREA(ACRES) =     2.25
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.44

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5300
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    822.60
  DOWNSTREAM ELEVATION(FEET) =    813.00
  ELEVATION DIFFERENCE(FEET) =      9.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.828
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 SUBAREA RUNOFF(CFS) =      0.10
 TOTAL AREA(ACRES) =      0.02   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
 FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  61
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  813.00  DOWNSTREAM ELEVATION(FEET) =  785.30
 STREET LENGTH(FEET) =   185.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 15.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
 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) =   0.0140
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.28
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.16
   HALFSTREET FLOOD WIDTH(FEET) =    1.50
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.82
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.22
 STREET FLOW TRAVEL TIME(MIN.) =   0.39   Tc(MIN.) =    5.22
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.070
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .6600
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.627
 SUBAREA AREA(ACRES) =    0.07      SUBAREA RUNOFF(CFS) =    0.36
 TOTAL AREA(ACRES) =        0.1        PEAK FLOW RATE(CFS) =       0.46

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.16   HALFSTREET FLOOD WIDTH(FEET) =   1.50
 FLOW VELOCITY(FEET/SEC.) =  7.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.22
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    220.00 =     285.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 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.) =    5.22
 RAINFALL INTENSITY(INCH/HR) =   8.07
 TOTAL STREAM AREA(ACRES) =     0.09
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.46

 ** CONFLUENCE DATA **
```

```
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.44     7.03        6.663          2.25
      2        0.46     5.22        8.070          0.09

  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        6.60     5.22       8.070
      2        7.81     7.03       6.663

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       7.81   Tc(MIN.) =    7.03
  TOTAL AREA(ACRES) =        2.3
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    220.00 =     396.00 FEET.

+----------------------------------------------------------------------------+
| END POC C                                                                  |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.3  TC(MIN.) =      7.03
  PEAK FLOW RATE(CFS)   =       7.81
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 3

CALCULATIONS

3.3 – Post Developed Condition Hydrology Calculations – Detained

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2014 Advanced Engineering Software (aes)
              Ver. 21.0 Release Date: 06/01/2014  License ID 1459

                              Analysis prepared by:

                                     BHA INC.
                               5115 AVENIDA ENCINAS, SUITE L
                                    CARLSBAD, CA 92008


 ************************* DESCRIPTION OF STUDY ************************
* POST-DEVELOPED HYDROLOGY DETAINED                                      *
*                                                                        *
*                                                                        *
 ************************************************************************

  FILE NAME: K:\HYDRO\1511\1511D100.DAT
  TIME/DATE OF STUDY: 11:07 10/04/2021
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.150
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 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.*

+----------------------------------------------------------------------+
| BEGIN POC A                                                          |
|                                                                      |
|                                                                      |
+----------------------------------------------------------------------+

**************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     20.00 IS CODE =  21
------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    831.50
  DOWNSTREAM ELEVATION(FEET) =    828.50
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.489
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.396
  SUBAREA RUNOFF(CFS) =      0.91
  TOTAL AREA(ACRES) =      0.29   TOTAL RUNOFF(CFS) =      0.91

+------------------------------------------------------------------------+
| ENTER/EXIT BASIN A1                                                    |
|                                                                        |
|                                                                        |
+------------------------------------------------------------------------+

********************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =   7
--------------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
================================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  12.00   RAIN INTENSITY(INCH/HOUR) =  4.72
  TOTAL AREA(ACRES) =     0.29   TOTAL RUNOFF(CFS) =      0.46

********************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     30.00 IS CODE =  41
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   824.50  DOWNSTREAM(FEET) =   824.00
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   4.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.06
  GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.46
  PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =   12.27
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     30.00 =     150.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE     30.00 TO NODE     40.00 IS CODE =  51
--------------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    824.00  DOWNSTREAM(FEET) =    816.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   198.00   CHANNEL SLOPE =  0.0369
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =   1.250
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.509
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4200
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.02
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.49
  AVERAGE FLOW DEPTH(FEET) =   0.39   TRAVEL TIME(MIN.) =   0.60
  Tc(MIN.) =   12.87
  SUBAREA AREA(ACRES) =     0.60       SUBAREA RUNOFF(CFS) =    1.13
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.394
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       1.57

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.45   FLOW VELOCITY(FEET/SEC.) =   6.06
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     40.00 =     348.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     40.00 TO NODE     40.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.509
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4130
  SUBAREA AREA(ACRES) =    0.09   SUBAREA RUNOFF(CFS) =    0.25
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       1.81
  TC(MIN.) =   12.87

+--------------------------------------------------------------------------+
|                                                                          |
| END POC A                                                                |
|                                                                          |
+--------------------------------------------------------------------------+

+--------------------------------------------------------------------------+
| BEGIN POC B                                                              |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     50.00 TO NODE     60.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    831.40
  DOWNSTREAM ELEVATION(FEET) =    826.50
  ELEVATION DIFFERENCE(FEET) =      4.90
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.479
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.904
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.18

****************************************************************************
  FLOW PROCESS FROM NODE     60.00 TO NODE     70.00 IS CODE =  51
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    826.50  DOWNSTREAM(FEET) =    816.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   212.00   CHANNEL SLOPE =  0.0472
  CHANNEL BASE(FEET) =    1.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.599
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.35
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.88
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   0.72
  Tc(MIN.) =    9.20
  SUBAREA AREA(ACRES) =     0.71       SUBAREA RUNOFF(CFS) =    2.34
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.553
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       2.52

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   5.81
  LONGEST FLOWPATH FROM NODE     50.00 TO NODE     70.00 =     312.00 FEET.

+-------------------------------------------------------------------------+
| END POC B                                                               |
|                                                                         |
|                                                                         |
+-------------------------------------------------------------------------+

+-------------------------------------------------------------------------+
| BEGIN POC C                                                             |
|                                                                         |
|                                                                         |
+-------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     80.00 TO NODE     90.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    827.80
  DOWNSTREAM ELEVATION(FEET) =    822.30
  ELEVATION DIFFERENCE(FEET) =      5.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.467
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.90
  TOTAL AREA(ACRES) =      0.30   TOTAL RUNOFF(CFS) =      1.90

****************************************************************************
  FLOW PROCESS FROM NODE     90.00 TO NODE    100.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
```

```
==========================================================================
  UPSTREAM ELEVATION(FEET) =  822.30  DOWNSTREAM ELEVATION(FEET) =  809.90
  STREET LENGTH(FEET) =    54.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 10.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  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) =   0.0140
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.87
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.22
    HALFSTREET FLOOD WIDTH(FEET) =    4.69
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    8.47
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.86
  STREET FLOW TRAVEL TIME(MIN.) =   0.11   Tc(MIN.) =    3.57
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5200
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.616
  SUBAREA AREA(ACRES) =    0.45      SUBAREA RUNOFF(CFS) =    1.93
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       3.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   5.57
  FLOW VELOCITY(FEET/SEC.) =  8.94   DEPTH*VELOCITY(FT*FT/SEC.) =   2.13
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    100.00 =     154.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    170.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
==========================================================================
  UPSTREAM ELEVATION(FEET) =  809.90  DOWNSTREAM ELEVATION(FEET) =  794.20
  STREET LENGTH(FEET) =   110.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  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) =   0.0140
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.04
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.53
```

```
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.43
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.91
  STREET FLOW TRAVEL TIME(MIN.) =   0.25   Tc(MIN.) =    3.82
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.607
  SUBAREA AREA(ACRES) =    0.10      SUBAREA RUNOFF(CFS) =    0.42
  TOTAL AREA(ACRES) =        0.8        PEAK FLOW RATE(CFS) =       4.25

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   6.72
  FLOW VELOCITY(FEET/SEC.) =  7.46   DEPTH*VELOCITY(FT*FT/SEC.) =   1.94
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    170.00 =     264.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    175.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   790.00  DOWNSTREAM(FEET) =   789.50
  FLOW LENGTH(FEET) =    19.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.71
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.25
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    3.86
  LONGEST FLOWPATH FROM NODE     80.00 TO NODE    175.00 =     283.00 FEET.

+--------------------------------------------------------------------------+
| ENTER BASIN C                                                            |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 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.) =    3.86
  RAINFALL INTENSITY(INCH/HR) =   8.30
  TOTAL STREAM AREA(ACRES) =     0.85
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.25

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    120.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5700
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    818.00
  DOWNSTREAM ELEVATION(FEET) =    814.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.010
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.371
  SUBAREA RUNOFF(CFS) =      0.66
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.66

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    130.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   812.00  DOWNSTREAM(FEET) =   810.80
  FLOW LENGTH(FEET) =   120.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.38
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.66
  PIPE TRAVEL TIME(MIN.) =   0.59    Tc(MIN.) =    6.60
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    130.00 =     220.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.938
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5143
  SUBAREA AREA(ACRES) =    0.26   SUBAREA RUNOFF(CFS) =    0.86
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.48
  TC(MIN.) =    6.60

****************************************************************************
  FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   810.00  DOWNSTREAM(FEET) =   790.40
  FLOW LENGTH(FEET) =    68.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.52
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.48
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    6.68
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    131.00 =     288.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   790.40  DOWNSTREAM(FEET) =   789.50
  FLOW LENGTH(FEET) =    75.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.45
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.48
  PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    6.96
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    132.00 =     363.00 FEET.

+--------------------------------------------------------------------------+
| ENTER BASIN C                                                            |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 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.) =    6.96
  RAINFALL INTENSITY(INCH/HR) =   6.70
  TOTAL STREAM AREA(ACRES) =     0.42
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.48

****************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    814.00
  DOWNSTREAM ELEVATION(FEET) =    813.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.885
  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) =  5.728
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    141.00 TO NODE    142.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   811.00  DOWNSTREAM(FEET) =   810.00
  FLOW LENGTH(FEET) =    45.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.77
  GIVEN PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.29
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    9.08
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    142.00 =     145.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    142.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.647
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5246
  SUBAREA AREA(ACRES) =    0.27   SUBAREA RUNOFF(CFS) =    0.80
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       1.08
  TC(MIN.) =    9.08

****************************************************************************
  FLOW PROCESS FROM NODE    142.00 TO NODE    150.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   810.00  DOWNSTREAM(FEET) =   789.50
  FLOW LENGTH(FEET) =    62.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   2.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.98
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.08
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    9.16
  LONGEST FLOWPATH FROM NODE    140.00 TO NODE    150.00 =     207.00 FEET.

+--------------------------------------------------------------------------+
| 1                                                                        |
| ENTER BASIN C                                                            |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.617
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4051
  SUBAREA AREA(ACRES) =    0.42   SUBAREA RUNOFF(CFS) =    0.70
  TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       1.78
  TC(MIN.) =    9.16

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 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.) =    9.16
  RAINFALL INTENSITY(INCH/HR) =   5.62
  TOTAL STREAM AREA(ACRES) =     0.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.78

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.25     3.86        8.299          0.85
      2        1.48     6.96        6.705          0.42
      3        1.78     9.16        5.617          0.78

  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        5.83     3.86       8.299
      2        6.27     6.96       6.705
      3        5.90     9.16       5.617

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.27   Tc(MIN.) =    6.96
  TOTAL AREA(ACRES) =        2.0
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    180.00 =     363.00 FEET.

+----------------------------------------------------------------------------+
| EXIT BASIN C                                                               |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    180.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  12.00   RAIN INTENSITY(INCH/HOUR) =  4.72
  TOTAL AREA(ACRES) =     2.02   TOTAL RUNOFF(CFS) =      3.53

****************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    190.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   785.50  DOWNSTREAM(FEET) =   785.16
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.67
```

```
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.53
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   12.07
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    190.00 =     388.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    200.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    785.16  DOWNSTREAM(FEET) =    785.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =     8.00   CHANNEL SLOPE =  0.0200
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.013   MAXIMUM DEPTH(FEET) =   0.25
  CHANNEL FLOW THRU SUBAREA(CFS) =       3.53
  FLOW VELOCITY(FEET/SEC.) =   5.39   FLOW DEPTH(FEET) =   0.22
  TRAVEL TIME(MIN.) =   0.02   Tc(MIN.) =   12.10
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    200.00 =     396.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.694
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3744
  SUBAREA AREA(ACRES) =    0.02   SUBAREA RUNOFF(CFS) =    0.08
  TOTAL AREA(ACRES) =        2.0   TOTAL RUNOFF(CFS) =       3.59
  TC(MIN.) =   12.10

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.694
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.3681
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.27
  TOTAL AREA(ACRES) =        2.2   TOTAL RUNOFF(CFS) =       3.86
  TC(MIN.) =   12.10

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 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.) =   12.10
  RAINFALL INTENSITY(INCH/HR) =   4.69
  TOTAL STREAM AREA(ACRES) =     2.23
```

```
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.86

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    210.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5300
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    822.60
  DOWNSTREAM ELEVATION(FEET) =    813.00
  ELEVATION DIFFERENCE(FEET) =      9.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.828
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.299
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.02   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    220.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  813.00  DOWNSTREAM ELEVATION(FEET) =  785.30
  STREET LENGTH(FEET) =   185.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 15.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  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) =   0.0140
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.28
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.16
    HALFSTREET FLOOD WIDTH(FEET) =    1.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    7.82
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.22
  STREET FLOW TRAVEL TIME(MIN.) =   0.39   Tc(MIN.) =    5.22
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.070
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .6600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.627
  SUBAREA AREA(ACRES) =    0.07      SUBAREA RUNOFF(CFS) =    0.36
  TOTAL AREA(ACRES) =        0.1        PEAK FLOW RATE(CFS) =       0.46

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.16   HALFSTREET FLOOD WIDTH(FEET) =   1.50
  FLOW VELOCITY(FEET/SEC.) =  7.82   DEPTH*VELOCITY(FT*FT/SEC.) =   1.22
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    220.00 =     285.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    220.00 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.) =    5.22
  RAINFALL INTENSITY(INCH/HR) =   8.07
  TOTAL STREAM AREA(ACRES) =     0.09
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.46

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.86    12.10        4.694          2.23
      2        0.46     5.22        8.070          0.09

  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        2.12     5.22       8.070
      2        4.12    12.10       4.694

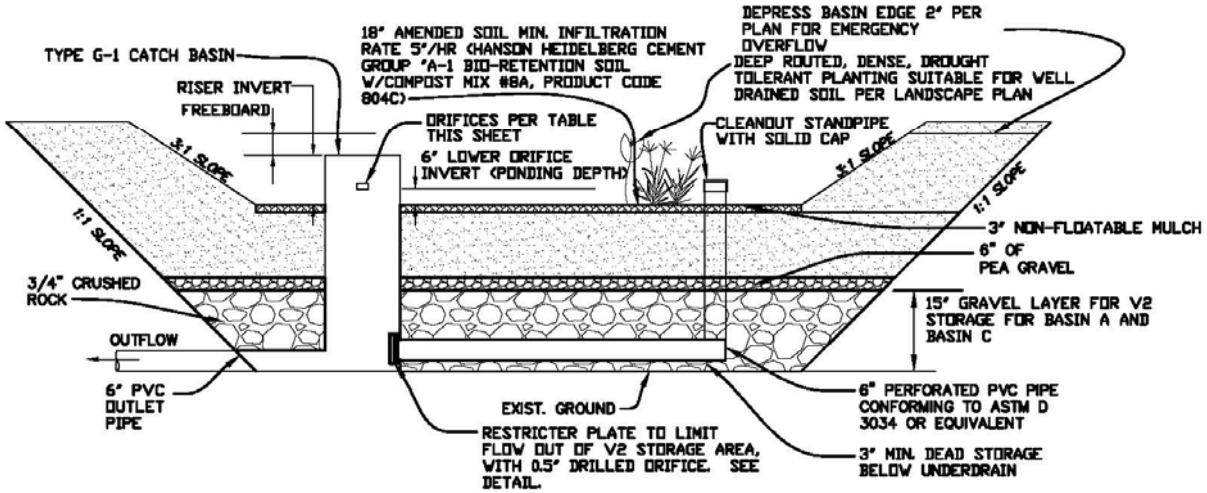
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.12   Tc(MIN.) =   12.10
  TOTAL AREA(ACRES) =        2.3
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    220.00 =     396.00 FEET.

+--------------------------------------------------------------------------+
| END POC C                                                                |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.3  TC(MIN.) =     12.10
  PEAK FLOW RATE(CFS)   =       4.12
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 4

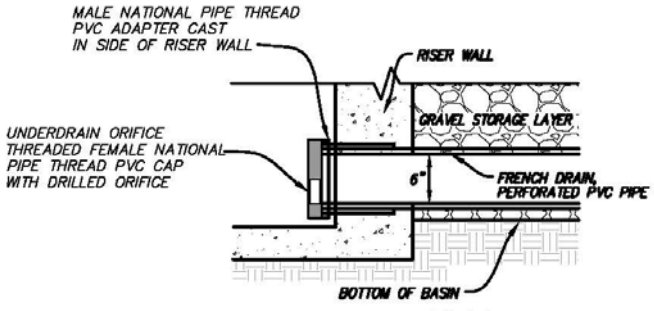
DETENTION ROUTING

4.1 – HEC-HMS Modified-Puls Routing Results DETAILS



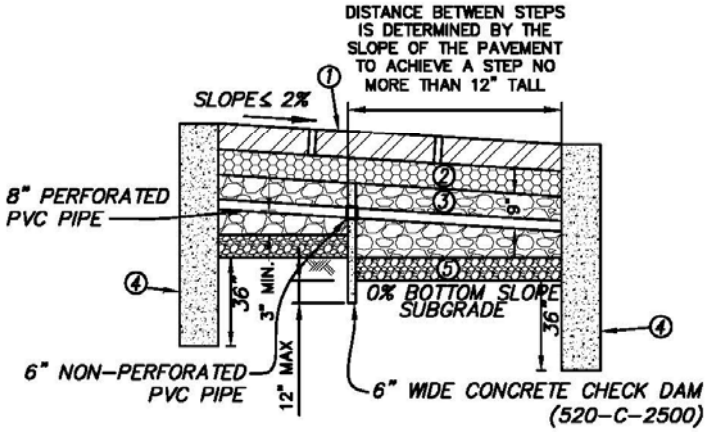
BIOFILTRATION BASIN DETAIL, BMP A & C

NOT TO SCALE



RESTRICTOR CAP DETAIL

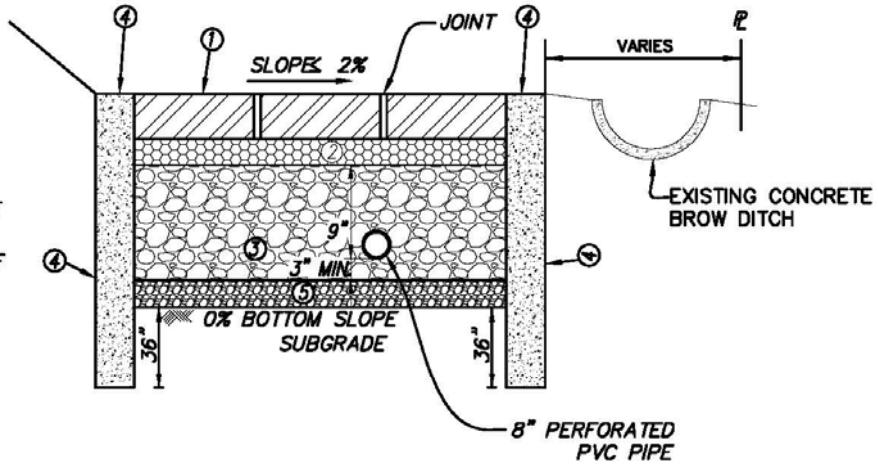
NOT TO SCALE



PERMEABLE PAVERS

LONGITUDINAL/TERRACED SLOPE
NOT TO SCALE

① 3-1/8" PERMEABLE CONCRETE PAVER.
② 2" BEDDING LAYER. #4 AGGREGATE (ASTM NO. 8 STONE)
③ 12" RESERVOIR/SATURATED STORAGE LAYER 1-1/2" AGGREGATE BASE (ASTM NO. 57 STONE)
④ 6" THICK CONCRETE SLURRY CUTOFF WALL 36" BELOW SUBGRADE
⑤ 6" COMPACTED AGGREGATE BASE 1-1/2" (ASTM NO. 57 STONE)



PERMEABLE PAVERS

NOT TO SCALE

HYDROGRAPH - BMP A1

Q_{100yr} = .91 cfs

T_c = 6 min

$P_{6\ 100yr}$ = 3.15 in

C = 0.50

A = 0.286

I = $7.44*P_6*D^{-0.645}$

VOL = I*D/60

ΔVOL = $V_1 - V_0$

I (incr) = ΔVOL/T

Q = CIA

VOL = $C*P_6*A$

N	D (min)	I (in/hr)	VOL in	ΔVOL (in)	I (incr) (in\hr)	Q (cfs)	VOL (cf)	(Re-0rdered) Ordinate Sum =
0	0	0	0	0.74	7.38	0.9100	328	0.0000
1	6	7.38	0.74	0.21	2.06	0.2944	106	0.0269
2	12	4.72	0.94	0.15	1.46	0.2089	75	0.0271
3	18	3.63	1.09	0.12	1.17	0.1676	60	0.0278
4	24	3.02	1.21	0.10	1.00	0.1423	51	0.0281
5	30	2.61	1.31	0.09	0.87	0.1249	45	0.0288
6	36	2.32	1.39	0.08	0.78	0.1121	40	0.0291
7	42	2.10	1.47	0.07	0.71	0.1022	37	0.0298
8	48	1.93	1.54	0.07	0.66	0.0943	34	0.0302
9	54	1.79	1.61	0.06	0.61	0.0877	32	0.0311
10	60	1.67	1.67	0.06	0.58	0.0822	30	0.0315
11	66	1.57	1.73	0.05	0.54	0.0775	28	0.0324
12	72	1.49	1.78	0.05	0.51	0.0735	26	0.0329
13	78	1.41	1.83	0.05	0.49	0.0699	25	0.0339
14	84	1.35	1.88	0.05	0.47	0.0668	24	0.0344
15	90	1.29	1.93	0.04	0.45	0.0640	23	0.0356
16	96	1.23	1.97	0.04	0.43	0.0614	22	0.0362
17	102	1.19	2.02	0.04	0.41	0.0591	21	0.0375
18	108	1.14	2.06	0.04	0.40	0.0571	21	0.0382
19	114	1.10	2.10	0.04	0.39	0.0551	20	0.0397
20	120	1.07	2.14	0.04	0.37	0.0534	19	0.0405
21	126	1.04	2.17	0.04	0.36	0.0518	19	0.0422
22	132	1.00	2.21	0.04	0.35	0.0503	18	0.0432
23	138	0.98	2.25	0.03	0.34	0.0489	18	0.0452
24	144	0.95	2.28	0.03	0.33	0.0476	17	0.0464

25	150	0.93	2.31	0.03	0.32	0.0464	17	0.0489
26	156	0.90	2.35	0.03	0.32	0.0452	16	0.0503
27	162	0.88	2.38	0.03	0.31	0.0442	16	0.0534
28	168	0.86	2.41	0.03	0.30	0.0432	16	0.0551
29	174	0.84	2.44	0.03	0.30	0.0422	15	0.0591
30	180	0.82	2.47	0.03	0.29	0.0413	15	0.0614
31	186	0.81	2.50	0.03	0.28	0.0405	15	0.0668
32	192	0.79	2.53	0.03	0.28	0.0397	14	0.0699
33	198	0.77	2.55	0.03	0.27	0.0389	14	0.0775
34	204	0.76	2.58	0.03	0.27	0.0382	14	0.0822
35	210	0.74	2.61	0.03	0.26	0.0375	13	0.0943
36	216	0.73	2.63	0.03	0.26	0.0368	13	0.1022
37	222	0.72	2.66	0.03	0.25	0.0362	13	0.1249
38	228	0.71	2.68	0.02	0.25	0.0356	13	0.1423
39	234	0.69	2.71	0.02	0.24	0.0350	13	0.2089
40	240	0.68	2.73	0.02	0.24	0.0344	12	0.2944
41	246	0.67	2.76	0.02	0.24	0.0339	12	0.9100
42	252	0.66	2.78	0.02	0.23	0.0334	12	0.1676
43	258	0.65	2.80	0.02	0.23	0.0329	12	0.1121
44	264	0.64	2.83	0.02	0.23	0.0324	12	0.0877
45	270	0.63	2.85	0.02	0.22	0.0319	11	0.0735
46	276	0.62	2.87	0.02	0.22	0.0315	11	0.0640
47	282	0.62	2.89	0.02	0.22	0.0311	11	0.0571
48	288	0.61	2.92	0.02	0.21	0.0306	11	0.0518
49	294	0.60	2.94	0.02	0.21	0.0302	11	0.0476
50	300	0.59	2.96	0.02	0.21	0.0298	11	0.0442
51	306	0.58	2.98	0.02	0.21	0.0295	11	0.0413
52	312	0.58	3.00	0.02	0.20	0.0291	10	0.0389
53	318	0.57	3.02	0.02	0.20	0.0288	10	0.0368
54	324	0.56	3.04	0.02	0.20	0.0284	10	0.0350
55	330	0.56	3.06	0.02	0.20	0.0281	10	0.0334
56	336	0.55	3.08	0.02	0.19	0.0278	10	0.0319
57	342	0.54	3.10	0.02	0.19	0.0275	10	0.0306
58	348	0.54	3.12	0.02	0.19	0.0271	10	0.0295
59	354	0.53	3.14	0.02	0.19	0.0269	10	0.0284
60	360	0.53	3.16	0.00	0.00	0.0000	0	0.0000

HYDROGRAPH - BMP C

Q_{100yr} = 6.27 cfs

T_c = 6 min

$P_{6\ 100yr}$ = 3.15 in

C = 0.51

A = 2.040

I = $7.44*P_6*D^{-0.645}$

VOL = I*D/60

ΔVOL = $V_1 - V_0$

I (incr) = ΔVOL/T

Q = CIA

VOL = $C*P_6*A$

N	D (min)	I (in/hr)	VOL in	ΔVOL (in)	I (incr) (in\hr)	Q (cfs)	VOL (cf)	(Re-Ordered) Ordinate Sum =
0	0	0	0	0.74	7.38	6.2700	2257	0.0000
1	6	7.38	0.74	0.21	2.06	2.1417	771	0.1954
2	12	4.72	0.94	0.15	1.46	1.5200	547	0.1975
3	18	3.63	1.09	0.12	1.17	1.2192	439	0.2020
4	24	3.02	1.21	0.10	1.00	1.0352	373	0.2043
5	30	2.61	1.31	0.09	0.87	0.9089	327	0.2092
6	36	2.32	1.39	0.08	0.78	0.8157	294	0.2118
7	42	2.10	1.47	0.07	0.71	0.7436	268	0.2172
8	48	1.93	1.54	0.07	0.66	0.6858	247	0.2200
9	54	1.79	1.61	0.06	0.61	0.6382	230	0.2259
10	60	1.67	1.67	0.06	0.58	0.5983	215	0.2290
11	66	1.57	1.73	0.05	0.54	0.5642	203	0.2356
12	72	1.49	1.78	0.05	0.51	0.5346	192	0.2391
13	78	1.41	1.83	0.05	0.49	0.5087	183	0.2465
14	84	1.35	1.88	0.05	0.47	0.4858	175	0.2504
15	90	1.29	1.93	0.04	0.45	0.4653	168	0.2587
16	96	1.23	1.97	0.04	0.43	0.4469	161	0.2631
17	102	1.19	2.02	0.04	0.41	0.4302	155	0.2726
18	108	1.14	2.06	0.04	0.40	0.4151	149	0.2777
19	114	1.10	2.10	0.04	0.39	0.4012	144	0.2886
20	120	1.07	2.14	0.04	0.37	0.3885	140	0.2945
21	126	1.04	2.17	0.04	0.36	0.3767	136	0.3072
22	132	1.00	2.21	0.04	0.35	0.3658	132	0.3141
23	138	0.98	2.25	0.03	0.34	0.3557	128	0.3292
24	144	0.95	2.28	0.03	0.33	0.3463	125	0.3375

25	150	0.93	2.31	0.03	0.32	0.3375	121	0.3557
26	156	0.90	2.35	0.03	0.32	0.3292	119	0.3658
27	162	0.88	2.38	0.03	0.31	0.3214	116	0.3885
28	168	0.86	2.41	0.03	0.30	0.3141	113	0.4012
29	174	0.84	2.44	0.03	0.30	0.3072	111	0.4302
30	180	0.82	2.47	0.03	0.29	0.3006	108	0.4469
31	186	0.81	2.50	0.03	0.28	0.2945	106	0.4858
32	192	0.79	2.53	0.03	0.28	0.2886	104	0.5087
33	198	0.77	2.55	0.03	0.27	0.2830	102	0.5642
34	204	0.76	2.58	0.03	0.27	0.2777	100	0.5983
35	210	0.74	2.61	0.03	0.26	0.2726	98	0.6858
36	216	0.73	2.63	0.03	0.26	0.2678	96	0.7436
37	222	0.72	2.66	0.03	0.25	0.2631	95	0.9089
38	228	0.71	2.68	0.02	0.25	0.2587	93	1.0352
39	234	0.69	2.71	0.02	0.24	0.2545	92	1.5200
40	240	0.68	2.73	0.02	0.24	0.2504	90	2.1417
41	246	0.67	2.76	0.02	0.24	0.2465	89	6.2700
42	252	0.66	2.78	0.02	0.23	0.2427	87	1.2192
43	258	0.65	2.80	0.02	0.23	0.2391	86	0.8157
44	264	0.64	2.83	0.02	0.23	0.2356	85	0.6382
45	270	0.63	2.85	0.02	0.22	0.2323	84	0.5346
46	276	0.62	2.87	0.02	0.22	0.2290	82	0.4653
47	282	0.62	2.89	0.02	0.22	0.2259	81	0.4151
48	288	0.61	2.92	0.02	0.21	0.2229	80	0.3767
49	294	0.60	2.94	0.02	0.21	0.2200	79	0.3463
50	300	0.59	2.96	0.02	0.21	0.2172	78	0.3214
51	306	0.58	2.98	0.02	0.21	0.2144	77	0.3006
52	312	0.58	3.00	0.02	0.20	0.2118	76	0.2830
53	318	0.57	3.02	0.02	0.20	0.2092	75	0.2678
54	324	0.56	3.04	0.02	0.20	0.2067	74	0.2545
55	330	0.56	3.06	0.02	0.20	0.2043	74	0.2427
56	336	0.55	3.08	0.02	0.19	0.2020	73	0.2323
57	342	0.54	3.10	0.02	0.19	0.1997	72	0.2229
58	348	0.54	3.12	0.02	0.19	0.1975	71	0.2144
59	354	0.53	3.14	0.02	0.19	0.1954	70	0.2067
60	360	0.53	3.16	0.00	0.00	0.0000	0	0.0000

Stage-Storage & Stage-Discharge Relationship for Biofiltration BMP A1

Discharge vs. Elevation Table

HMP orifice

No. of orif:	1
Dia:	**1** "
Area:	0.0055 ft^2
Cg-low:	0.62

Basin Dimensions

Area:	**342** ft^2	
Perimeter	**78** ft	
Gravel Depth	**1.00** ft	
Soil Depth	**1.50** ft	
Mulch Depth	0.25 ft	
Total Subsurface Depth	2.75 ft	

Gravel Porosity	0.4
Soil Porositiy	0.2

Basin Depth (ft)	$Q_{HMP\ orifice}$ (cfs)
0.000	0.045
0.083	0.045
0.167	0.046
0.250	0.047
0.333	0.047
0.417	0.048
0.500	0.049
0.583	0.049
0.667	0.050
0.750	0.050
0.833	0.051
0.917	0.052
1.000	0.052
1.083	0.053
1.167	0.053
1.250	0.054
1.333	0.055
1.417	0.055
1.500	0.056
1.583	0.056
1.667	0.057
1.750	0.057
1.833	0.058
1.917	0.058
2.000	0.059
2.083	0.059
2.167	0.060
2.250	0.060
2.333	0.061
2.417	0.061
2.500	0.062

Basin Elev.	Volume (ft^3)	Basin Depth (ft)	Volume (acre-ft)	Q_{total} (cfs)
407.500	239	0.000	0.0055	0.0447
407.583	268	0.083	0.0062	0.0453
407.667	299	0.167	0.0069	0.0460
407.750	330	0.250	0.0076	0.0467
407.833	362	0.333	0.0083	0.0473
407.917	395	0.417	0.0091	0.0480
408.000	430	0.500	0.0099	0.0486
408.083	465	0.583	0.0107	0.0806
408.167	502	0.667	0.0115	0.2531
408.250	540	0.750	0.0124	0.3295
408.333	579	0.833	0.0133	0.3890
408.417	618	0.917	0.0142	0.4396
408.500	659	1.000	0.0151	0.4844
408.583	701	1.083	0.0161	1.4081
408.667	745	1.167	0.0171	3.0600
408.750	789	1.250	0.0181	5.1856
408.833	834	1.333	0.0191	7.6942
408.917	880	1.417	0.0202	10.5335
409.000	928	1.500	0.0213	13.6682
409.083	976	1.583	0.0224	17.0725
409.167	1,026	1.667	0.0236	20.7262
409.250	1,077	1.750	0.0247	24.6133
409.333	1,129	1.833	0.0259	28.7205
409.417	1,181	1.917	0.0271	33.0363
409.500	1,235	2.000	0.0284	37.5512
409.583	1,290	2.083	0.0296	42.2567
409.667	1,347	2.167	0.0309	47.1452
409.750	1,404	2.250	0.0322	52.2103
409.833	1,462	2.333	0.0336	57.4458
409.917	1,521	2.417	0.0349	62.8465
410.000	1,582	2.500	0.0363	68.4073

Stage-Storage & Stage-Discharge Relationship for Biofiltration BMP C

Discharge vs. Elevation Table

HMP orifice

No. of orif:	1
Dia:	**1.5** "
Area:	0.0123 ft^2
Cg-low:	0.62

Basin Dimensions

Area:	**1,623** ft^2	Gravel Porosity 0.4
Perimeter	**231** ft	Soil Porositiy 0.2
Gravel Depth	**1.00** ft	
Soil Depth	**1.50** ft	
Mulch Depth	0.25 ft	
Total Subsurface Depth	2.75 ft	

Basin Depth (ft)	$Q_{HMP\ orifice}$ (cfs)
0.000	0.100
0.083	0.102
0.167	0.103
0.250	0.105
0.333	0.106
0.417	0.108
0.500	0.109
0.583	0.110
0.667	0.112
0.750	0.113
0.833	0.115
0.917	0.116
1.000	0.117
1.083	0.119
1.167	0.120
1.250	0.121
1.333	0.122
1.417	0.124
1.500	0.125
1.583	0.126
1.667	0.127
1.750	0.129
1.833	0.130
1.917	0.131
2.000	0.132
2.083	0.133
2.167	0.135
2.250	0.136
2.333	0.137
2.417	0.138
2.500	0.139

Basin Elev.	Volume (ft^3)	Basin Depth (ft)	Volume (acre-ft)	Q_{total} (cfs)
407.500	1,136	0.000	0.0261	0.1001
407.583	1,273	0.083	0.0292	0.1016
407.667	1,413	0.167	0.0324	0.1032
407.750	1,556	0.250	0.0357	0.1046
407.833	1,703	0.333	0.0391	0.1061
407.917	1,852	0.417	0.0425	0.1076
408.000	2,005	0.500	0.0460	0.1090
408.083	2,161	0.583	0.0496	1.5467
408.167	2,321	0.667	0.0533	2.1431
408.250	2,483	0.750	0.0570	2.6009
408.333	2,649	0.833	0.0608	2.9872
408.417	2,818	0.917	0.0647	3.3276
408.500	2,990	1.000	0.0686	3.6354
408.583	3,165	1.083	0.0727	4.8016
408.667	3,344	1.167	0.0768	6.6797
408.750	3,526	1.250	0.0809	9.0180
408.833	3,711	1.333	0.0852	11.7281
408.917	3,899	1.417	0.0895	14.7592
409.000	4,090	1.500	0.0939	18.0772
409.083	4,285	1.583	0.0984	21.6575
409.167	4,483	1.667	0.1029	25.4807
409.250	4,684	1.750	0.1075	29.5313
409.333	4,888	1.833	0.1122	33.7967
409.417	5,095	1.917	0.1170	38.2660
409.500	5,306	2.000	0.1218	42.9299
409.583	5,520	2.083	0.1267	47.7803
409.667	5,737	2.167	0.1317	52.8102
409.750	5,957	2.250	0.1368	58.0130
409.833	6,181	2.333	0.1419	63.3831
409.917	6,407	2.417	0.1471	68.9154
410.000	6,637	2.500	0.1524	74.6050

4.2 – HEC-HMS Modified-Puls Routing Results

BMP A1

Summary Results for Reservoir "BASIN A"

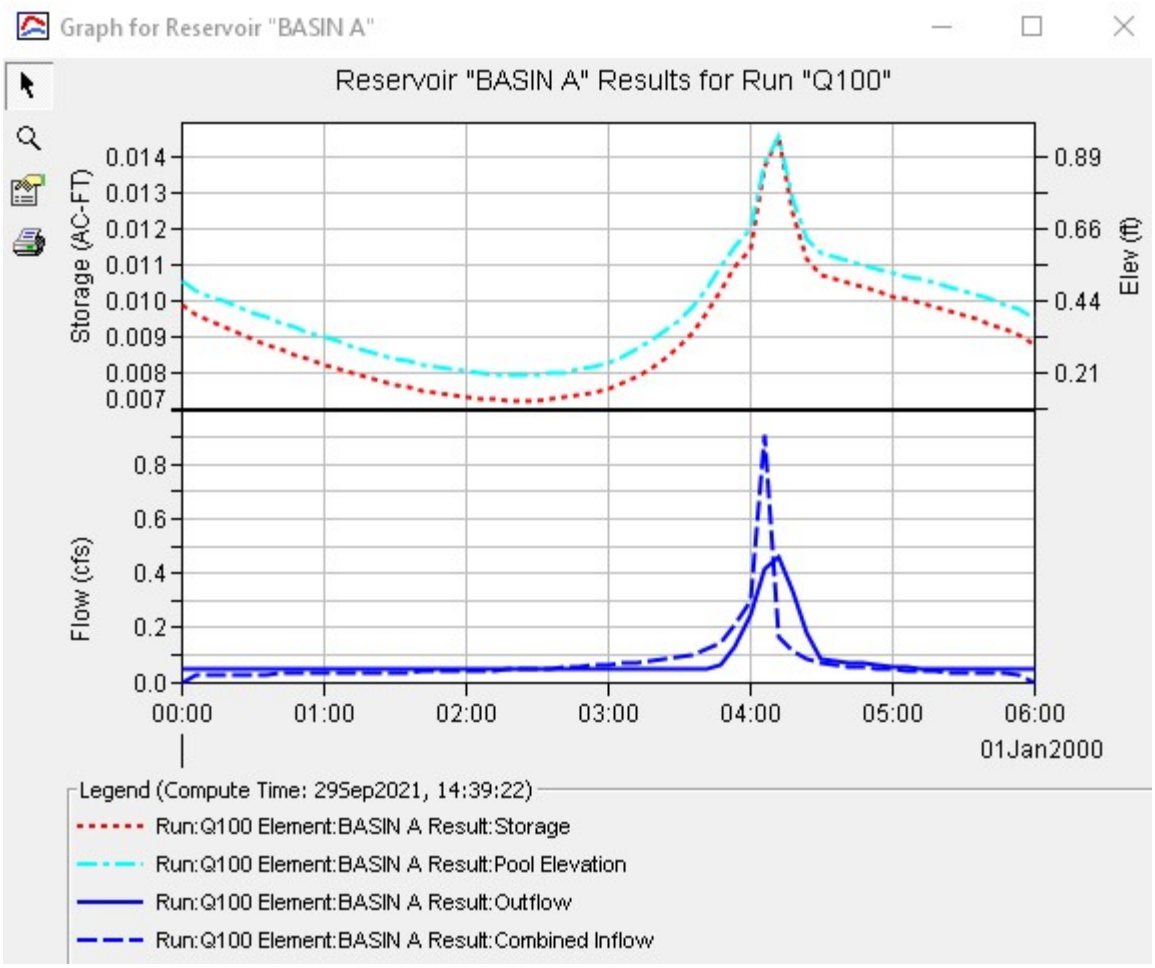
Project: BASIN_A Simulation Run: Q100
Reservoir: BASIN A

Start of Run:	01Jan2000, 00:00	Basin Model:	Post_Dev
End of Run:	01Jan2000, 06:00	Meteorologic Model:	Met 1
Compute Time:	29Sep2021, 14:39:22	Control Specifications:	Control 1

Volume Units: (•) IN ( ) ACRE-FT

Computed Results

Peak Inflow:	0.91 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 04:06
Peak Discharge:	0.46 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:12
Inflow Volume:	n/a	Peak Storage:	0.01 (ACRE-FT)
Discharge Volume:	n/a	Peak Elevation:	0.95 (FT)



BMP C

Summary Results for Reservoir "BASIN A"

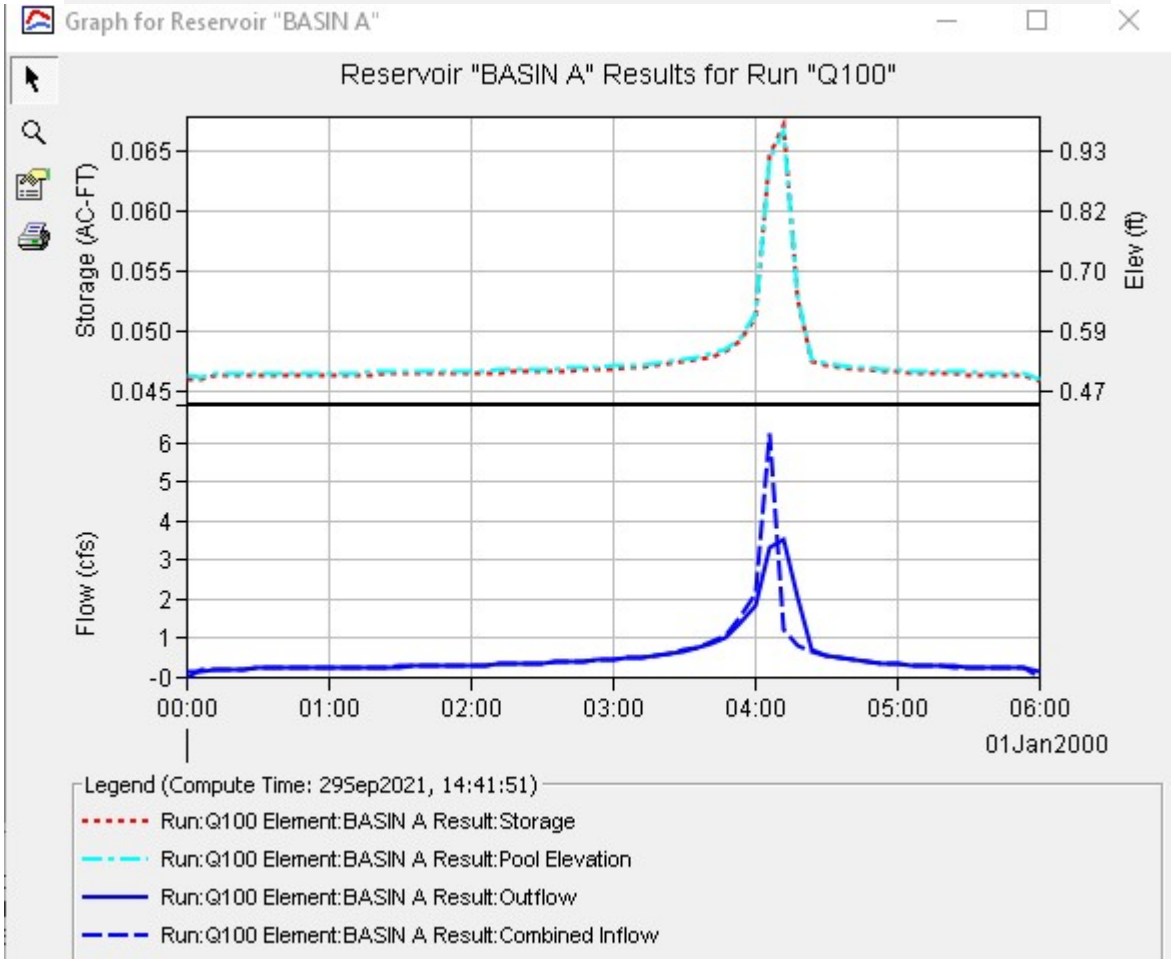
Project: BASIN_C Simulation Run: Q100
Reservoir: BASIN A

Start of Run:	01Jan2000, 00:00	Basin Model:	Post_Dev
End of Run:	01Jan2000, 06:00	Meteorologic Model:	Met 1
Compute Time:	29Sep2021, 14:41:51	Control Specifications:	Control 1

Volume Units: (•) IN ( ) ACRE-FT

Computed Results

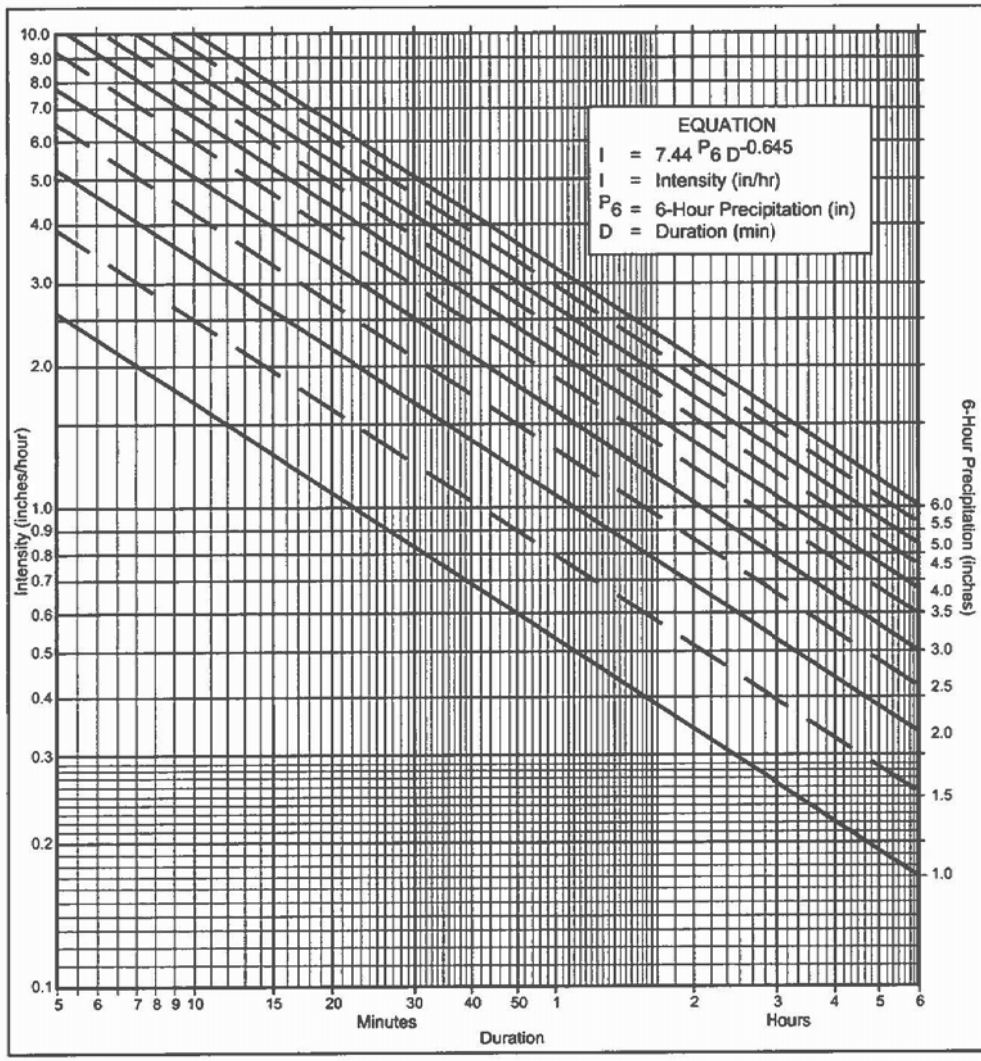
Peak Inflow:	6.27 (CFS)	Date/Time of Peak Inflow:	01Jan2000, 04:06
Peak Discharge:	3.53 (CFS)	Date/Time of Peak Discharge:	01Jan2000, 04:12
Inflow Volume:	n/a	Peak Storage:	0.07 (ACRE-FT)
Discharge Volume:	n/a	Peak Elevation:	0.97 (FT)



CHAPTER 5

REFERENCES

5.1 – Methodology – Rational Method Peak Flow Determination



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 = 3.15 in., P_{24} = 5.9 $\frac{P_6}{P_{24}}$ = 53 %(2)

(c) Adjusted P_6(2) = _____ in.

(d) t_x = _____ min.

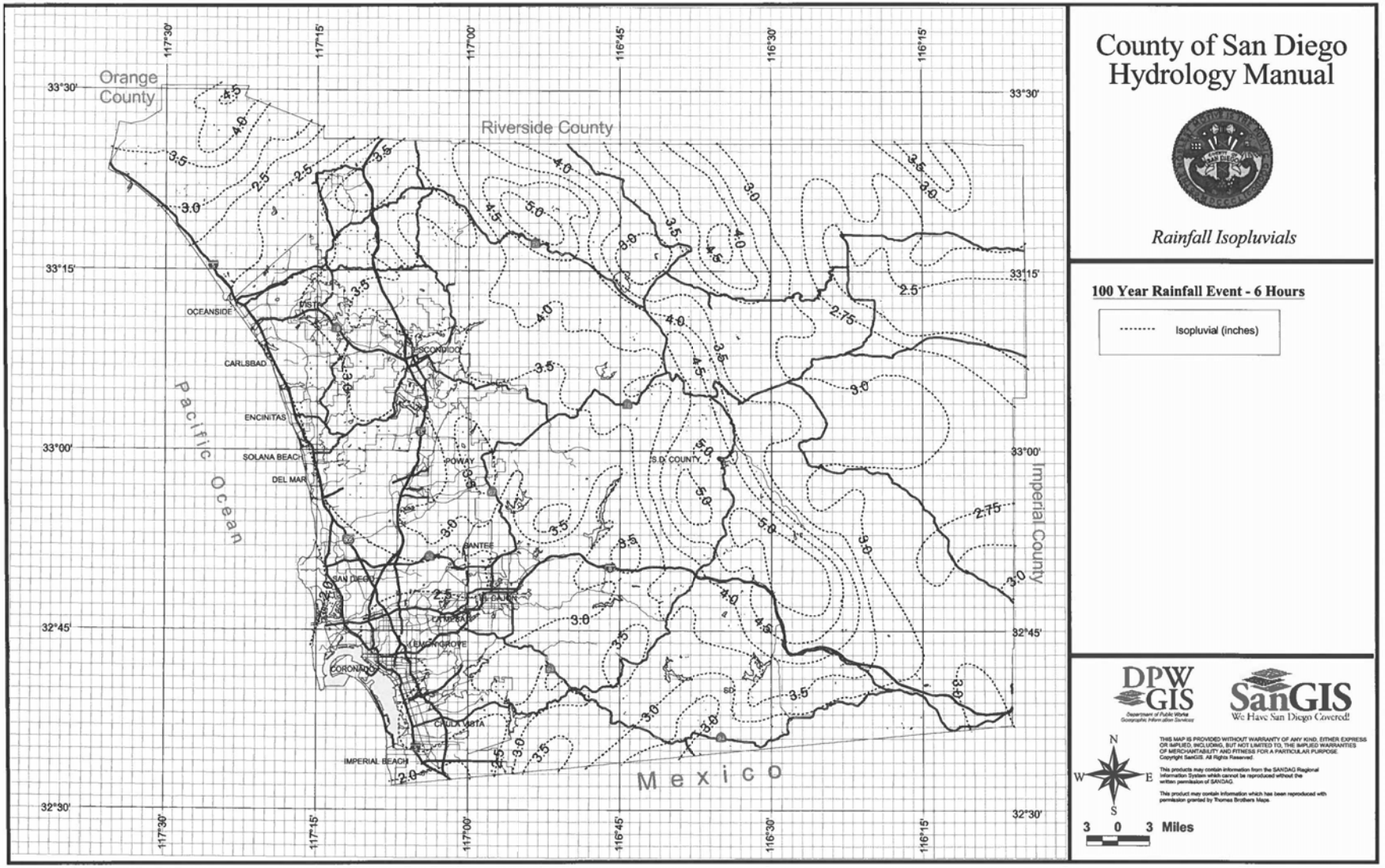
(e) I = _____ in./hr.

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
	I	I	I	I	I	I	I	I	I	I	I
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



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

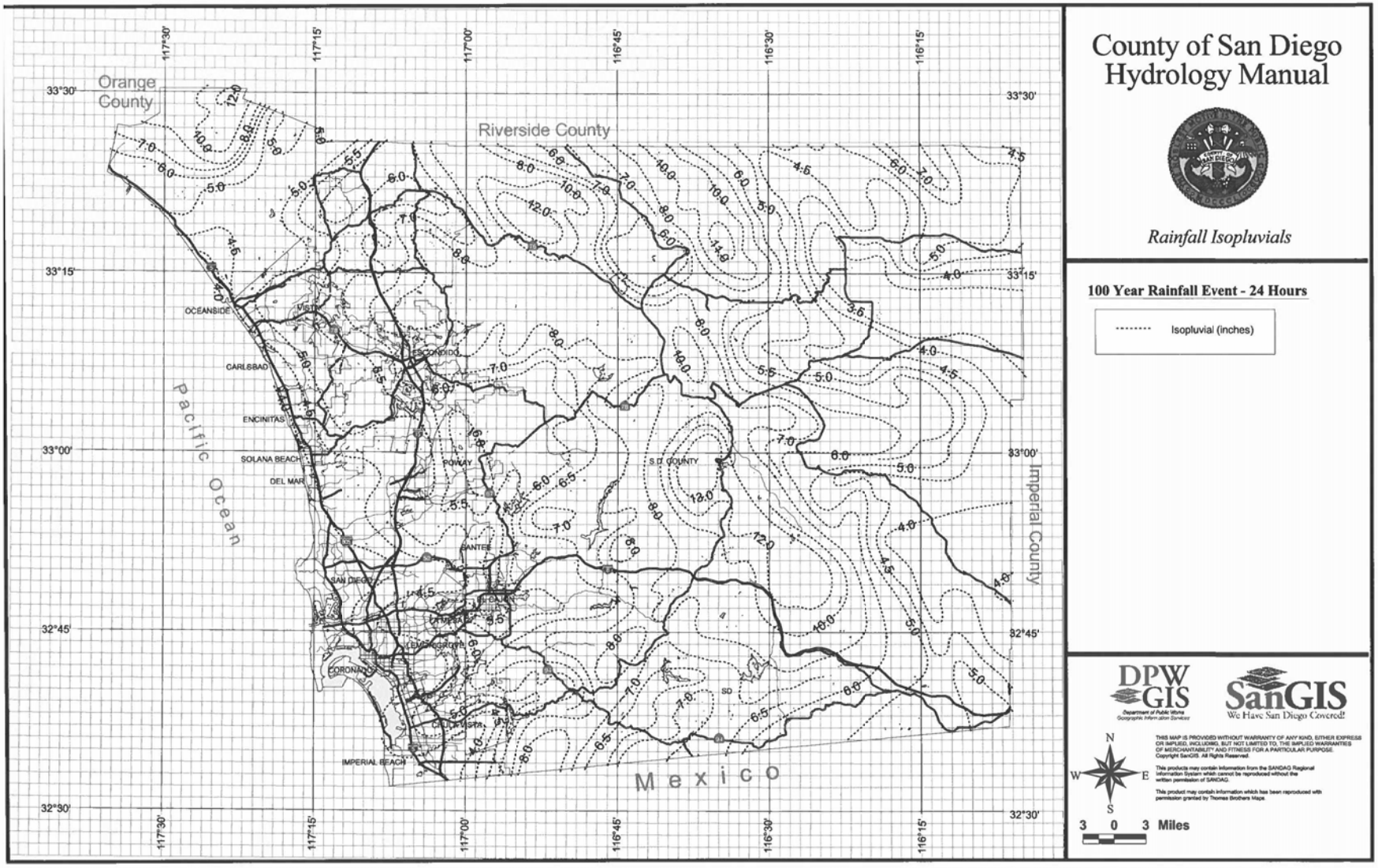
Isopluvial (inches)

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 - 24 Hours

Isopluvial (inches)

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N W E S

3 0 3 Miles

NOAA Atlas 14, Volume 6, Version 2
Location name: Escondido, California, USA*
Latitude: 33.0953°, Longitude: -117.1009°
Elevation: 831.72 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.117 (0.099-0.141)	0.147 (0.124-0.176)	0.187 (0.157-0.225)	0.220 (0.183-0.268)	0.267 (0.214-0.336)	0.303 (0.238-0.390)	0.341 (0.261-0.451)	0.381 (0.283-0.519)	0.437 (0.310-0.622)	0.481 (0.329-0.711)
10-min	0.168 (0.142-0.201)	0.211 (0.177-0.253)	0.268 (0.225-0.323)	0.316 (0.263-0.383)	0.382 (0.307-0.481)	0.435 (0.341-0.560)	0.489 (0.374-0.646)	0.546 (0.405-0.744)	0.626 (0.444-0.891)	0.689 (0.471-1.02)
15-min	0.203 (0.171-0.244)	0.255 (0.214-0.306)	0.324 (0.272-0.390)	0.382 (0.317-0.464)	0.462 (0.371-0.582)	0.526 (0.412-0.677)	0.591 (0.452-0.782)	0.661 (0.490-0.900)	0.757 (0.537-1.08)	0.834 (0.570-1.23)
30-min	0.282 (0.238-0.338)	0.354 (0.298-0.425)	0.450 (0.378-0.542)	0.530 (0.441-0.644)	0.642 (0.515-0.808)	0.730 (0.573-0.940)	0.821 (0.627-1.09)	0.917 (0.680-1.25)	1.05 (0.746-1.50)	1.16 (0.791-1.71)
60-min	0.440 (0.371-0.528)	0.552 (0.464-0.663)	0.702 (0.589-0.845)	0.827 (0.688-1.00)	1.00 (0.803-1.26)	1.14 (0.893-1.47)	1.28 (0.979-1.69)	1.43 (1.06-1.95)	1.64 (1.16-2.34)	1.81 (1.24-2.67)
2-hr	0.636 (0.536-0.762)	0.795 (0.669-0.954)	1.01 (0.847-1.22)	1.19 (0.990-1.45)	1.45 (1.16-1.82)	1.65 (1.29-2.12)	1.86 (1.42-2.46)	2.08 (1.54-2.84)	2.40 (1.70-3.42)	2.65 (1.81-3.92)
3-hr	0.775 (0.653-0.929)	0.968 (0.814-1.16)	1.23 (1.03-1.48)	1.45 (1.21-1.76)	1.76 (1.41-2.22)	2.01 (1.58-2.59)	2.27 (1.74-3.00)	2.55 (1.89-3.47)	2.94 (2.09-4.19)	3.26 (2.23-4.82)
6-hr	1.07 (0.903-1.29)	1.34 (1.13-1.61)	1.70 (1.43-2.05)	2.01 (1.67-2.44)	2.44 (1.96-3.08)	2.79 (2.19-3.59)	3.15 (2.41-4.17)	3.54 (2.63-4.83)	4.09 (2.90-5.83)	4.54 (3.10-6.70)
12-hr	1.47 (1.24-1.77)	1.85 (1.55-2.22)	2.35 (1.97-2.83)	2.77 (2.31-3.37)	3.37 (2.70-4.24)	3.84 (3.01-4.95)	4.34 (3.31-5.73)	4.86 (3.60-6.62)	5.60 (3.97-7.97)	6.19 (4.23-9.14)
24-hr	1.82 (1.60-2.10)	2.29 (2.02-2.65)	2.92 (2.57-3.39)	3.45 (3.01-4.03)	4.19 (3.54-5.06)	4.78 (3.96-5.88)	5.39 (4.36-6.78)	6.03 (4.76-7.80)	6.93 (5.26-9.32)	7.65 (5.62-10.6)
2-day	2.21 (1.95-2.56)	2.82 (2.48-3.26)	3.63 (3.19-4.21)	4.31 (3.76-5.04)	5.26 (4.45-6.35)	6.02 (4.99-7.41)	6.81 (5.52-8.57)	7.64 (6.03-9.88)	8.81 (6.69-11.8)	9.74 (7.16-13.5)
3-day	2.48 (2.19-2.87)	3.19 (2.81-3.70)	4.15 (3.65-4.82)	4.96 (4.33-5.80)	6.10 (5.15-7.36)	7.00 (5.80-8.61)	7.94 (6.44-10.0)	8.94 (7.06-11.6)	10.3 (7.85-13.9)	11.5 (8.43-15.9)
4-day	2.71 (2.40-3.14)	3.51 (3.10-4.07)	4.59 (4.04-5.33)	5.50 (4.80-6.44)	6.78 (5.74-8.18)	7.80 (6.47-9.60)	8.87 (7.18-11.2)	10.00 (7.89-12.9)	11.6 (8.79-15.6)	12.9 (9.45-17.9)
7-day	3.17 (2.80-3.66)	4.12 (3.63-4.76)	5.40 (4.75-6.27)	6.48 (5.65-7.58)	7.99 (6.76-9.64)	9.20 (7.63-11.3)	10.5 (8.48-13.2)	11.8 (9.31-15.3)	13.7 (10.4-18.4)	15.2 (11.2-21.1)
10-day	3.51 (3.10-4.06)	4.58 (4.04-5.30)	6.02 (5.29-6.99)	7.23 (6.31-8.46)	8.94 (7.56-10.8)	10.3 (8.53-12.7)	11.7 (9.49-14.7)	13.2 (10.4-17.1)	15.3 (11.6-20.6)	17.0 (12.5-23.6)
20-day	4.32 (3.81-4.99)	5.68 (5.01-6.58)	7.53 (6.62-8.74)	9.08 (7.92-10.6)	11.3 (9.52-13.6)	13.0 (10.8-16.0)	14.8 (12.0-18.7)	16.7 (13.2-21.7)	19.5 (14.8-26.2)	21.7 (15.9-30.1)
30-day	5.18 (4.57-5.99)	6.85 (6.04-7.93)	9.12 (8.02-10.6)	11.0 (9.63-12.9)	13.7 (11.6-16.6)	15.9 (13.2-19.6)	18.2 (14.7-22.9)	20.6 (16.2-26.6)	24.0 (18.2-32.2)	26.7 (19.6-37.1)
45-day	6.11 (5.39-7.07)	8.11 (7.15-9.39)	10.8 (9.54-12.6)	13.2 (11.5-15.4)	16.4 (13.9-19.8)	19.1 (15.8-23.5)	21.8 (17.7-27.5)	24.8 (19.6-32.1)	29.0 (22.0-39.0)	32.4 (23.8-45.1)
60-day	7.09 (6.25-8.19)	9.40 (8.29-10.9)	12.6 (11.1-14.6)	15.3 (13.3-17.9)	19.2 (16.2-23.1)	22.3 (18.5-27.4)	25.6 (20.8-32.3)	29.2 (23.0-37.7)	34.3 (26.0-46.1)	38.5 (28.2-53.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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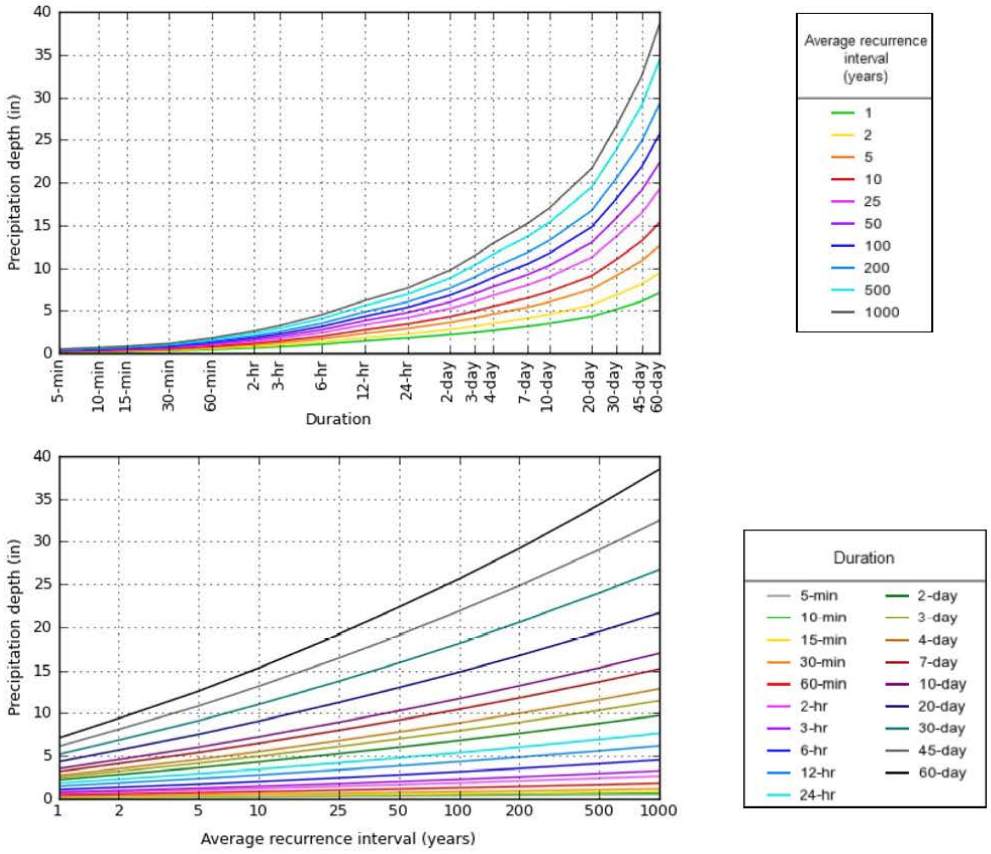
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 33.0953°, Longitude: -117.1009°



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Created (GMT): Wed Sep 15 15:29:59 2021

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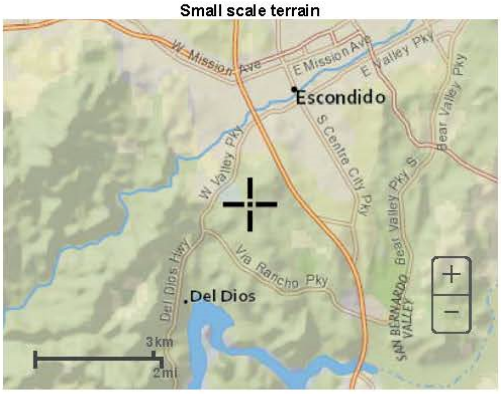
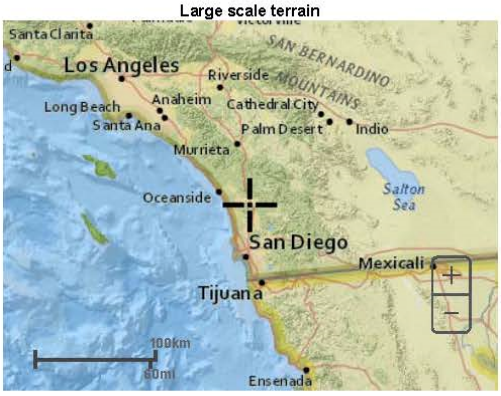
Maps & aerials

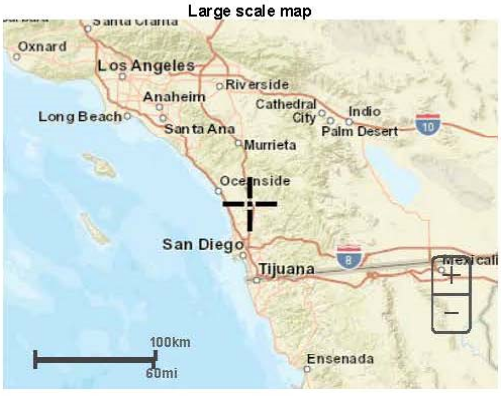
Small scale terrain



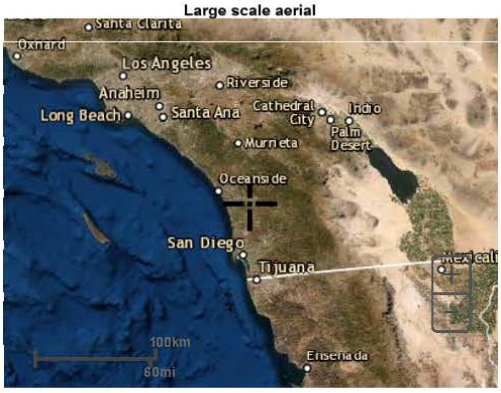
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

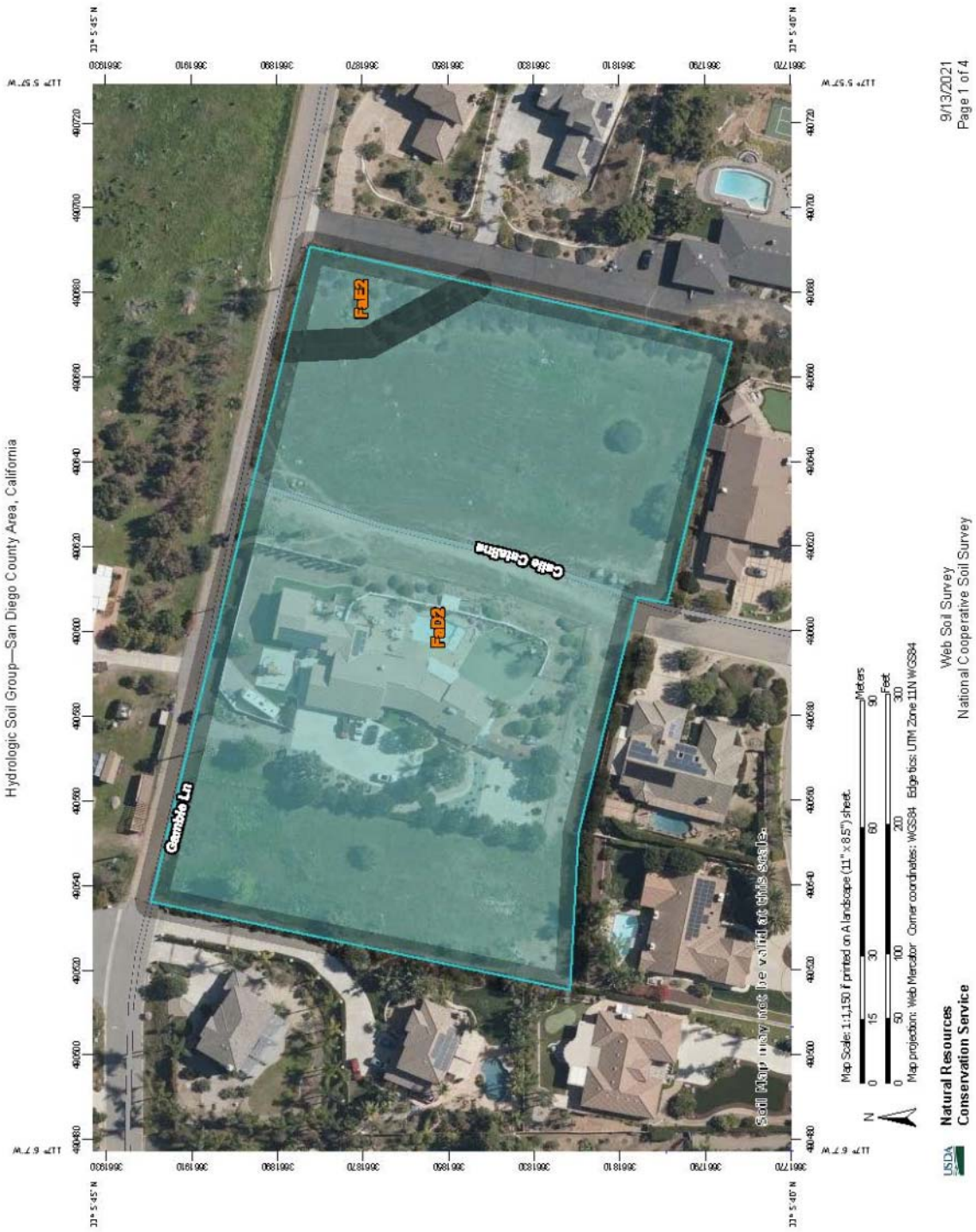
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description


Hydrologic Soil Group—San Diego County Area, California
Gamble Ln
Cable Cir
FeE2
FeD2
Soil Map may not be valid at this scale.
Map Scale: 1:1,150 if printed on A landscape (11" x 8.5") sheet.
Meters
Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84
Web Soil Survey
National Cooperative Soil Survey
Natural Resources
Conservation Service
9/13/2021
Page 1 of 4

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 15, May 27, 2020

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

Date(s) aerial images were photographed: Jan 23, 2020—Feb 13, 2020

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
FaD2	Fallbrook sandy loam, 9 to 15 percent slopes, eroded	C	3.7	96.1%
FaE2	Fallbrook sandy loam, 15 to 30 percent slopes, eroded	C	0.1	3.9%
Totals for Area of Interest			**3.8**	**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