2023

DRAINAGE STUDY

ARMORLITE LOFTS
ARMORLITE DRIVE
SAN MARCOS, CALIFORNIA 92069

MAY 26, 2023

PRJ SP23-0001
DRAWING NO. XXXXX-D
APN: 219-162-57

Contact: Gio Posillico
Phone: (858)751-0633
Email: gio.posillico@latitude33.com

PREPARED BY: latitude 33 PLANNING & ENGINEERING

PREPARED FOR: City of San Marcos

JOB NUMBER: 1900.00

DRAINAGE STUDY

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SAN MARCOS, CALIFORNIA

PRJ NO. SP23-0001
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MAY 26, 2023

Prepared For:

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(619) 981 - 0579

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Gio Posillico, PE
R.C.E. 66332

Prepared By: DN
Checked By: RD

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 SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

10/22/2024

Gio Posillico R.C.E. 66332 DATE

REGISTERED CIVIL ENGINEER

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2. PROJECT DESCRIPTION

1.1 Project Location

The proposed project is a 4-story mixed-use residential/commercial development above a one-story podium garage with an associated outdoor parking lot. The parcel is a 2.44 acre undeveloped lot located near the intersection of N Las Posas Road and Armorlite Drive.

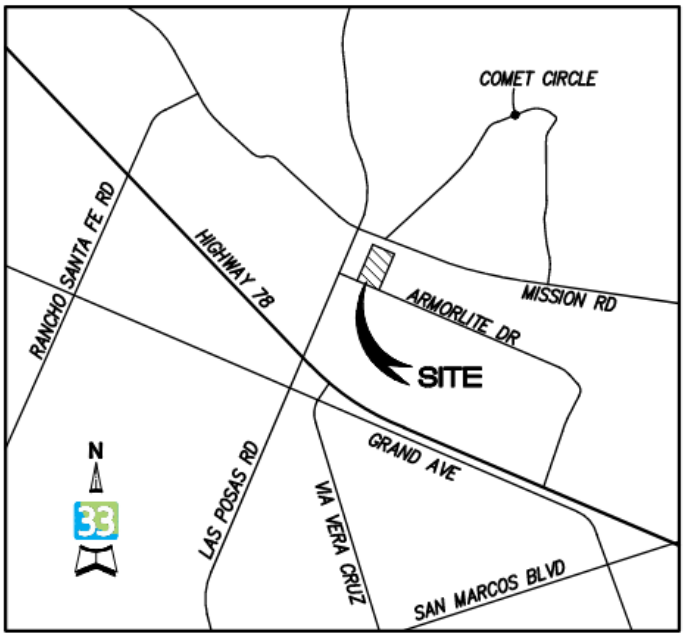


Figure 1: Vicinity Map

1.2 Existing Condition

The existing site is an undeveloped lot with waist high vegetation. There is a high point central to the site, with drainage flowing in all directions which does not become concentrated on the property.

Regulation Information:
Determined by the size, location, and type of project, the proposed project will not require approval from the Regional Water Quality Board for Federal Clean Water Act (CWA) section 401/ 404.

Because the excavation depth is shallower than the water table, this project does not expect to encounter ground water. Therefore, approval for discharging groundwater was not obtained.

1.3 Proposed Condition

Post construction drainage will sheet flow to 2 designated low points located in the surface parking lot and be treated and detained within proprietary treatment facilities (i.e. Modular Wetland System or approved equal) and an underground storage vault located beneath the parking lot. Runoff is then discharged into the existing storm drain system (POC 1) located along

Armorlite Drive. The proposed building roof surface area will be collected via a roof drain system and piped directly into the Modular Wetland System located in the planting area on the west side of the drive aisle, before ultimately discharging to POC1. In the existing condition, the Q100 to POC1 was calculated to be 1.69 cfs. In the proposed condition after proprietary treatment, the Q100 peak flow will be 1.58 cfs; therefore causing no increase to the existing drainage system.

Exhibits for Proposed and Existing Conditions are located in Appendix A for reference.

1.4 Hydrologic Context Watershed Contribution

The project is located within the Carlsbad Hydrologic Unit (904.52) as defined by the Water Quality Control Plan for the San Diego Basin. San Marcos Creek is the receiving water body, and discharges into the Pacific Ocean, 14.6 miles away, via Batiquitos Lagoon.

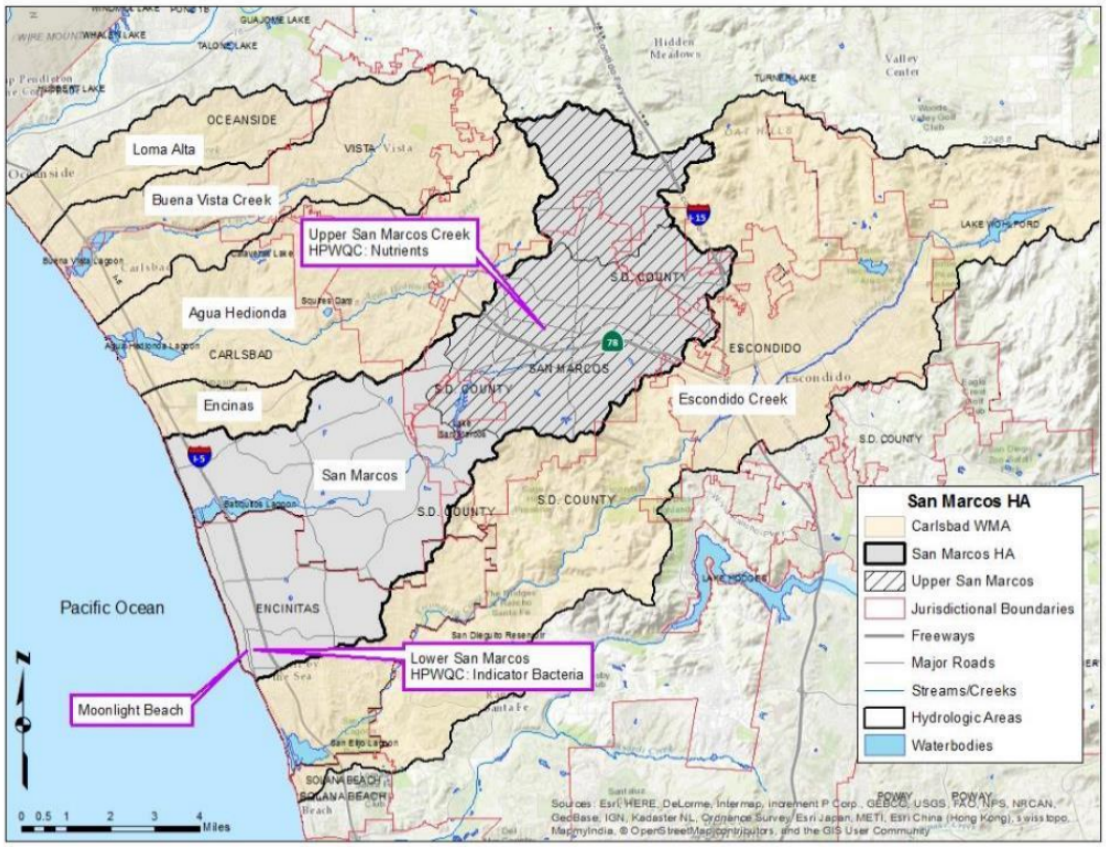


Figure 2: San Marcos Hydrologic Area

2. METHODOLOGY

The estimate of the existing and proposed drainage flows has been performed in general conformance with the County of San Diego guidelines. Drainage basins are less than one square mile and therefore the Rational Method was utilized to estimate runoff. The 100-year storm event has been used for runoff estimates. Rational Method parameters were determined as follows.

Runoff Coefficient:

The runoff coefficient is dependent only upon land use and soil type. The County of San Diego has developed a table of Runoff Coefficients for Urban Areas which is located within the County of San Diego Table 3-1. The table categorizes the land use, associated development density (dwelling units per acre) and percentage of impervious area. Each of the categories listed has an associated runoff coefficient, C, for each soil type class. AES utilizes this same table, and land use is user-specified for applicable node to node connections. The land use is chosen based on the individual percentages of imperviousness of associated sub-basins, which can be found in Appendix G of this report.

Time of Concentration:

Time of concentration was calculated per Section 3.1.4 of the San Diego County Hydrology Manual.

Initial time of concentration values were computed using the Overland Time of Flow Nomograph, as shown on Figure 3-3, included in Appendix F. Overland flow length used for the calculation of initial travel time was restricted to the maximum values per Table 3-2.

Travel time was computed as the sum of the following items:

- For watersheds with flow in natural or pervious areas beyond the initial time of concentration length, the Kirpich Nomograph (Figure 3-4) was utilized.
- For flow paths in the street, the Gutter and Roadway Discharge - Velocity Chart (Figure 3-6) was utilized. An initial Q was assumed based on the area and C-value of the sub-basin, as well as an intensity calculated from the initial time of concentration. The assumed initial Q and the street grade were used to determine the flow velocity for concentrated flows in curb and gutters. Travel times were then determined by dividing the flow distance by the velocity of flow.
- For flow paths in ditches, Manning's Equation (Figure 3-7) was utilized to determine the velocity. As in the gutter velocity calculation, an initial Q was assumed based on the initial time of concentration. Travel times were then determined by dividing the flow distance by the velocity of flow.

Final times of concentration values for each basin were calculated by adding the initial and final travel times; with a minimum time of 5 minutes. Time of concentration calculations are shown in Appendix B.

Rainfall Intensity:

The rainfall intensity was obtained from the "Intensity-Duration Design Chart" as shown in Figure 3-1 of the County of San Diego Guidelines, based on the 100-year P_6 and P_{24} isopluvial maps, all included in Appendix F.

Drainage Areas:

The existing condition drainage basins were delineated from the base topographic map as shown on the Existing Hydrology Exhibit provided in Appendix A. The proposed condition drainage basins were delineated using the proposed grading plan as show on the Proposed Hydrology Exhibit also provided in Appendix A. Both the existing and proposed exhibits encompass the whole project area and comparison of flows were done at discharge points.

AES Computer Analysis

AES was utilized to model the 100-year storm with the Modified Rational Method parameters described above for overland flow as well as pipe flow through the proposed storm drain system. At each structure that combines independent drainage systems, junction analysis will be used by using confluence data. This allows for an accurate peak flow calculation as it models the timing of flows across the sub-basins and through the storm drain system. The analysis input parameters and results are provided in Appendices C and D.

Bentley Pondpack Computer Analysis

Bentley PondPack was used to model the 6 hour time series for our BMP mitigation. In the Proposed-Mitigated PondPack Model, the stormwater detention vault is modeled as a storage node with a proposed volume. The storage node is connected to a weir and a low-flow orifice. The outflow of water leaving the vault is mitigated through the low-flow orifice resulting in a reduction of flow rate, which decreases the total flow of its corresponding outfall location. The value of the mitigated flow is entered back into AES as the flow that is leaving the stormwater detention vault. The storage calculations for this concept are displayed in Appendix D. Calculations are provided for each basin with an increase in peak flow from the existing condition to the proposed unmitigated condition. The following method was then utilized to show that enough storage is provided in the basins to mitigate the increase in peak flow.

Bentley PondPack was also utilized to calculate the detention volume required to utilize the stormwater detention vault as a conjunctive use facility to mitigate the increase in peak flow from the existing to proposed condition. Section 6 of the San Diego Hydrology Manual was referenced for the creation of the 6 Hour Hydrographs.

3. CONCLUSIONS AND RECOMMENDATIONS

Current Condition: The following flows were obtained for the drainage subbasins shown in the attached Drainage Site Plan Exhibits for the existing and proposed conditions (see **Appendix A**).

Table 3-1: Existing Conditions

OUTFALL NUMBER	AREA (acres)	Impervious Area (acres)	Pervious Area (acres)	C	I (in/hr)	Q (cfs)
Out-01	1.20	0 (0%)	1.20 (100%)	0.30	4.69	1.69
Out-02	0.76	0 (0%)	0.76 (100%)	0.30	5.04	1.15
Out-03	0.48	0 (0%)	0.48 (100%)	0.30	4.23	0.61
					Total =	**3.45**

Table 3-2: Proposed Conditions (Unmitigated)

OUTFALL NUMBER	AREA (acres)	Impervious Area (acres)	Pervious Area (acres)	C (avg)	I (in/hr)	Q (cfs)
Out-01	2.44	2.10(86%)	0.34 (14%)	0.78	7.50	14.27
					Total =	**14.27**

Table 3-3: Proposed Conditions (Mitigated)

OUTFALL NUMBER	AREA (acres)	Impervious Area (acres)	Pervious Area (acres)	C (avg)	I (in/hr)	Q (cfs)
Out-01	2.44	2.10 (86%)	0.34 (14%)	0.78	0.83	1.58
					Total =	**1.58**

The Q calculated in AES accounts for flow routing, making the outfall lower than the sum of the Qpeak for each subbasins. The I is then determined from equation I = Q/CA.

Table 3-4: Site Hydrology Flow Delta

DISCHARGE POINT	Q (cfs)			DIFFERENCE
	EXISTING	PROPOSED (unmitigated)	PROPOSED (Mitigated)	
TOTAL	3.45	14.27	1.58	10.82 cfs Increase for unmitigated 1.87 cfs Decrease for mitigated

To account for the increase in CFS a stormwater detention vault will be sized for Q100 mitigation as well as Hydromodification (0.3Q2 to Q10). Per County of San Diego Hydrology Manual Chapter 6, required storage to mitigate for the 100-year storm is based on a 6hr storm Hydrograph.

As shown in Appendix B the proposed underground vault, with a detention volume of 15,075 CF, will be able to mitigate flows to be lower than existing conditions.

3.1 Conclusion/Summary

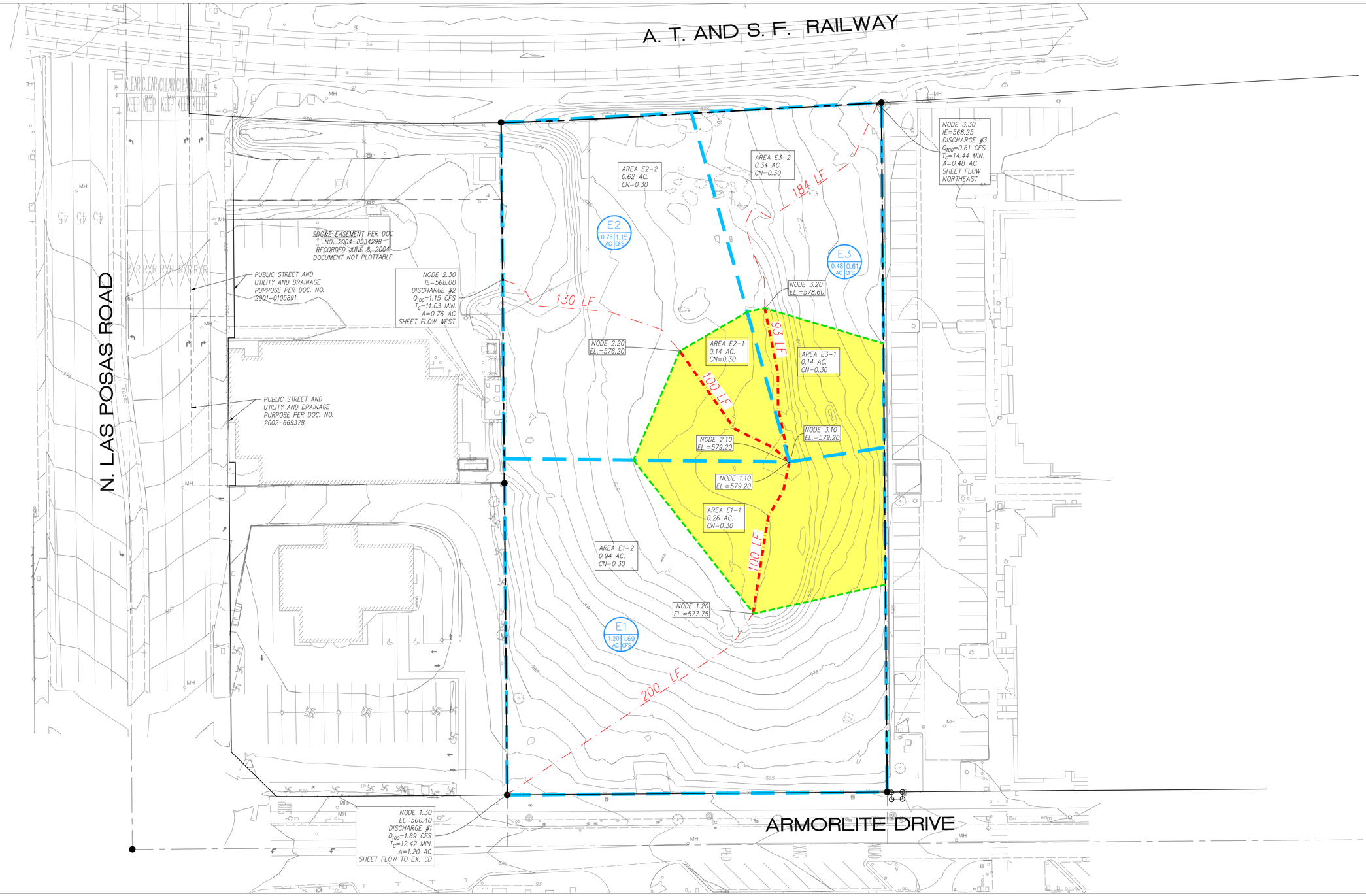
The hydrologic and hydraulic analysis confirms the proposed development and associated storm drain system effectively conveys the 100-yr storm event. In the existing condition, the project site releases a peak flow of 3.45 CFS of runoff. In the proposed condition, the site releases a peak flow of 1.58 CFS of runoff, resulting in a decrease in peak flow. This decrease is due to the proposed stormwater detention vault detaining and releasing with low flow orifices.

The project will not result in any impacts to potentially jurisdictional waters or wetlands subject to Section 404 or 401 of the Clean Water Act and therefore would not require approvals or permits from the Regional Water Quality Control Board.

In addition, the proposed improvements will not increase the volume and/or velocity of surface flows to the detriment of downstream landowners and/or facilities.

APPENDIX A

EXISTING AND PROPOSED
DRAINAGE EXHIBITS



LEGEND

- SUB-BASIN BOUNDARY
- FLOW DIRECTION
- ANALYZED FLOW PATH FOR TC
- SUB-BASIN INFORMATION (BASIN ID, AREA AC, Q_{100} CFS)
- EXISTING MAJOR CONTOUR 800
- EXISTING MINOR CONTOUR 798

DRAINAGE ANALYSIS NOTES

1. HYDROLOGY ANALYSIS COMPLIES WITH MODIFIED RATIONAL METHOD AS DESCRIBED IN SECTION 3 OF THE SAN DIEGO COUNTY HYDROLOGY MANUAL DATED JUNE 2003.
2. HYDROLOGY AND HYDRAULICS ANALYSES PERFORMED WITH ADVANCED ENGINEERING SOFTWARE (AES) RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE.
3. PEAK FLOWS AT DISCHARGE POINTS ARE NOT THE SUM OF THE SUB-BASIN FLOWS AS MODEL ACCOUNTS FOR ROUTING TIME.

N

0 15 30 60 90
(IN FEET)
1 inch = 30 ft.

DEVELOPER:
LAS POSAS VENTURES, LLC
705 B STREET, SUITE 3010
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PLANNING & ENGINEERING
9968 Hibert Street 2nd Floor, San Diego, CA 92131
Tel 858.751.0633

EXISTING DRAINAGE EXHIBIT

SCALE: 1"=30'
DATE: 8-10-2023
PREPARED BY: DN

A. T. AND S. F. RAILWAY

N. LAS POSAS ROAD

ARMORLITE DRIVE

NODE 1.30
EL.=568.95
IE.=565.00
IE.=565.00
IE.=564.75

NODE 1.20
EL.=575.10

NODE 1.10
EL.=577.50

NODE 4.10
EL.=572.90

NODE 3.10
EL.=629.00

NODE 1.40
EL.=571.25
IE.=564.40

NODE 2.10
EL.=573.50

NODE 2.20
EL.=569.40

NODE 3.20
EL.=628.00

NODE 4.20
EL.=570.15

NODE 1.50
EL.=565.50
IE.=563.20

NODE 1.60
EL.=564.95
IE.=563.00
IE.=563.00
IE.=561.00

NODE 3.30
EL.=626.00
IE.=563.60

NODE 1.70
IE.=558.50

NODE 4.30
RIM=563.25
IE.=562.75

NODE 4.50
RIM=558.83
IE=552.66
DISCHARGE #1
$Q_{100\ (Unmitigated)}$=14.27 CFS
$Q_{100\ (Mitigated)}$=1.58 CFS
T_C=19.02 MIN.
A=2.35 AC
PROP. MH

NODE 2.30
EL.=561.75

NODE 1.70
IE.=558.50
IE.=554.00
$Q_{100\ (Mitigated)}$=1.44 CFS

NODE 4.40
IE.=562.60

NODE 2.40
EL.=561.60
IE.=560.60

NODE 2.50
IE.=560.10
IE.=558.60

NODE 1.80
IE.=553.75

NODE 1.90
IE.=552.90

AREA P1-1
0.13 AC.
CN=0.58

AREA P1-2
0.22 AC.
CN=0.73

AREA P2-1
0.13 AC.
CN=0.78

AREA P2-2
0.44 AC.
CN=0.78

AREA P3-1
0.16 AC.
CN=0.90

AREA P3-2
1.27 AC.
CN=0.90

AREA P4-1
0.02 AC.
CN=0.34

AREA P4-2
0.07 AC.
CN=0.34

P1 0.35 AC 2.27 CFS

P2 0.57 AC 3.66 CFS

P3 1.43 AC 9.37 CFS

P4 0.09 AC 0.13 CFS

163 LF
100 LF
100 LF
100 LF
100 LF
791 LF
324 LF
286 LF
357 LF

576
574
572
570
568
566
564
562
560

PUBLIC STREET AND UTILITY AND DRAINAGE PURPOSE PER DOC. NO. 2001-0105891.

PUBLIC STREET AND UTILITY AND DRAINAGE PURPOSE PER DOC. NO. 2002-669378.

SDG&E EASEMENT PER DOC NO. 2004-0534298 RECORDED JUNE 8, 2004. DOCUMENT NOT PLOTTABLE.

LEGEND

- SUB-BASIN BOUNDARY
- FLOW DIRECTION
- ANALYZED FLOW PATH FOR TC
- SUB-BASIN INFORMATION (BASIN ID / AREA AC / Q_{100} CFS)
- EXISTING MAJOR CONTOUR 800
- EXISTING MINOR CONTOUR 798

DRAINAGE ANALYSIS NOTES

1. HYDROLOGY ANALYSIS COMPLIES WITH MODIFIED RATIONAL METHOD AS DESCRIBED IN SECTION 3 OF THE SAN DIEGO COUNTY HYDROLOGY MANUAL DATED JUNE 2003.
2. HYDROLOGY AND HYDRAULICS ANALYSES PERFORMED WITH ADVANCED ENGINEERING SOFTWARE (AES) RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE.
3. PEAK FLOWS AT DISCHARGE POINTS ARE NOT THE SUM OF THE SUB-BASIN FLOWS AS MODEL ACCOUNTS FOR ROUTING TIME.

N

0 15 30 60 90
(IN FEET)
1 inch = 30 ft.

DEVELOPER:
LAS POSAS VENTURES, LLC
705 B STREET, SUITE 3010
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CIVIL ENGINEER:
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Tel 858.751.0633

PROPOSED DRAINAGE EXHIBIT

SCALE: 1"=30'
DATE: 8-7-2023
PREPARED BY: DN

APPENDIX B

EXISTING HYDROLOGIC CALCULATIONS

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2013 Advanced Engineering Software (aes)
              Ver. 20.0 Release Date: 06/01/2013  License ID 1523

                              Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* ARMORLITE LOFTS                                    *
* 100-YR EXISTING CONDITION                                              *
* POC 1                                                                  *
 ************************************************************************

  FILE NAME: 1900EX1.DAT
  TIME/DATE OF STUDY: 23:46 08/09/2023
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  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.200
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   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)
  *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
   UPSTREAM TRIBUTARY PIPE.*

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

```
 FLOW PROCESS FROM NODE      1.10 TO NODE      1.20 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) =    579.20
 DOWNSTREAM ELEVATION(FEET) =    577.75
 ELEVATION DIFFERENCE(FEET) =      1.45
 SUBAREA OVERLAND TIME OF FLOW(MIN.) =   11.146
 WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
          THE MAXIMUM OVERLAND FLOW LENGTH =    76.75
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.027
 SUBAREA RUNOFF(CFS) =      0.39
 TOTAL AREA(ACRES) =      0.26   TOTAL RUNOFF(CFS) =      0.39

****************************************************************************
 FLOW PROCESS FROM NODE      1.20 TO NODE      1.30 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    577.75  DOWNSTREAM(FEET) =    560.40
 CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0867
 CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   1.250
 MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.688
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .3000
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.05
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.61
 AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   1.28
 Tc(MIN.) =   12.42
 SUBAREA AREA(ACRES) =     0.94       SUBAREA RUNOFF(CFS) =    1.32
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
 TOTAL AREA(ACRES) =        1.2         PEAK FLOW RATE(CFS) =       1.69

 END OF SUBAREA CHANNEL FLOW HYDRAULICS:
 DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   3.16
 LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.30 =     300.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        1.2  TC(MIN.) =     12.42
 PEAK FLOW RATE(CFS)   =       1.69
============================================================================
```

```
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2013 Advanced Engineering Software (aes)
              Ver. 20.0 Release Date: 06/01/2013  License ID 1523

                              Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* ARMORLITE LOFTS                                                      *
* 100-YR EXISTING CONDITION                                            *
* POC 2                                                                *
 ************************************************************************

  FILE NAME: 1900EX2.DAT
  TIME/DATE OF STUDY: 23:51 08/09/2023
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.200
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   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)
  *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
   UPSTREAM TRIBUTARY PIPE.*

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

```
  FLOW PROCESS FROM NODE      2.10 TO NODE      2.20 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) =    579.20
  DOWNSTREAM ELEVATION(FEET) =    576.20
  ELEVATION DIFFERENCE(FEET) =      3.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.985
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.397
  SUBAREA RUNOFF(CFS) =      0.23
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.23

****************************************************************************
  FLOW PROCESS FROM NODE      2.20 TO NODE      2.30 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    576.20  DOWNSTREAM(FEET) =    568.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   130.00   CHANNEL SLOPE =  0.0631
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   1.250
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.063
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.70
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.08
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   1.04
  Tc(MIN.) =   11.03
  SUBAREA AREA(ACRES) =     0.62       SUBAREA RUNOFF(CFS) =    0.94
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       1.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.09   FLOW VELOCITY(FEET/SEC.) =   2.55
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      2.30 =     230.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.8  TC(MIN.) =     11.03
  PEAK FLOW RATE(CFS)   =       1.15
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 20.0 Release Date: 06/01/2013  License ID 1523

                              Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* ARMORLITE LOFTS                                                      *
* 100-YR EXISTING CONDITION                                            *
* POC 3                                                                *
 ************************************************************************

  FILE NAME: 1900EX3.DAT
  TIME/DATE OF STUDY: 23:54 08/09/2023
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.200
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   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)
  *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
   UPSTREAM TRIBUTARY PIPE.*

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

```
  FLOW PROCESS FROM NODE      3.10 TO NODE      3.20 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) =    579.20
  DOWNSTREAM ELEVATION(FEET) =    578.60
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   12.546
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    54.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.658
  SUBAREA RUNOFF(CFS) =      0.20
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.20

****************************************************************************
  FLOW PROCESS FROM NODE      3.20 TO NODE      3.30 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    578.60  DOWNSTREAM(FEET) =    568.25
  CHANNEL LENGTH THRU SUBAREA(FEET) =   184.00   CHANNEL SLOPE =  0.0562
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   1.250
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.253
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.41
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.62
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   1.90
  Tc(MIN.) =   14.44
  SUBAREA AREA(ACRES) =     0.34       SUBAREA RUNOFF(CFS) =    0.43
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.300
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       0.61

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.89
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE      3.30 =     284.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =     14.44
  PEAK FLOW RATE(CFS)   =       0.61
============================================================================
```

```
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX C

PROPOSED HYDROLOGIC CALCULATIONS

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
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              Ver. 20.0 Release Date: 06/01/2013  License ID 1523

                              Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* ARMORLITE LOFTS                                                      *
* 100-YR PROPOSED CONDITION - UNMITIGATED                              *
* POC 1                                                                *
 ************************************************************************

  FILE NAME: 1900PR1U.DAT
  TIME/DATE OF STUDY: 00:00 08/10/2023
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.200
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  =====  ====== ===== =======
  1   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)
  *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
   UPSTREAM TRIBUTARY PIPE.*

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

```
  FLOW PROCESS FROM NODE      1.10 TO NODE      1.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    577.50
  DOWNSTREAM ELEVATION(FEET) =    575.10
  ELEVATION DIFFERENCE(FEET) =      2.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.214
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    79.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.328
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE      1.20 TO NODE      1.30 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  575.10  DOWNSTREAM ELEVATION(FEET) =  568.95
  STREET LENGTH(FEET) =   163.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.10
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    3.59
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.56
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.81
  STREET FLOW TRAVEL TIME(MIN.) =   0.76   Tc(MIN.) =    6.98
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.801
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.674
  SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    1.09
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.60

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   5.34
  FLOW VELOCITY(FEET/SEC.) =  3.58   DEPTH*VELOCITY(FT*FT/SEC.) =   0.92
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.30 =     263.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.30 TO NODE      1.40 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   565.00  DOWNSTREAM(FEET) =   564.40
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.54
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.60
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    7.17
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.40 =     316.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.40 TO NODE      1.50 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   564.40  DOWNSTREAM(FEET) =   563.20
  FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.57
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.60
  PIPE TRAVEL TIME(MIN.) =   0.93    Tc(MIN.) =    8.11
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.50 =     516.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.50 TO NODE      1.60 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   563.20  DOWNSTREAM(FEET) =   563.00
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.59
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       1.60
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    8.26
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.60 =     549.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.60 TO NODE      1.60 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.) =    8.26
  RAINFALL INTENSITY(INCH/HR) =   6.10
  TOTAL STREAM AREA(ACRES) =     0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.60

****************************************************************************
  FLOW PROCESS FROM NODE      3.10 TO NODE      3.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    629.00
  DOWNSTREAM ELEVATION(FEET) =    628.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.789
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.431
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.21
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      1.21

****************************************************************************
  FLOW PROCESS FROM NODE      3.20 TO NODE      3.30 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    628.00  DOWNSTREAM(FEET) =    626.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   191.00   CHANNEL SLOPE =  0.0105
  CHANNEL BASE(FEET) =  200.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.08
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.568
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.64
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.02
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   3.12
  Tc(MIN.) =    5.91
  SUBAREA AREA(ACRES) =     1.27       SUBAREA RUNOFF(CFS) =    8.65
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       9.74

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   1.19
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE      3.30 =     291.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.30 TO NODE      1.60 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   563.60  DOWNSTREAM(FEET) =   563.00
  FLOW LENGTH(FEET) =    62.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.40
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.74
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    5.99
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE      1.60 =     353.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.60 TO NODE      1.60 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.) =    5.99
  RAINFALL INTENSITY(INCH/HR) =   7.50
  TOTAL STREAM AREA(ACRES) =     1.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.74

  ** CONFLUENCE DATA **
  STREAM     RUNOFF        Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.60     8.26        6.100          0.35
      2        9.74     5.99        7.500          1.43

  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       10.90     5.99       7.500
      2        9.53     8.26       6.100

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.90   Tc(MIN.) =    5.99
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.60 =     549.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.60 TO NODE      1.70 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   561.00  DOWNSTREAM(FEET) =   558.50
  FLOW LENGTH(FEET) =    21.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.28
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.90
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    6.02
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.70 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.70 TO NODE      1.70 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.02
  RAINFALL INTENSITY(INCH/HR) =   7.48
  TOTAL STREAM AREA(ACRES) =     1.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.90

****************************************************************************
  FLOW PROCESS FROM NODE      2.10 TO NODE      2.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    573.50
```

```
  DOWNSTREAM ELEVATION(FEET) =    569.40
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.424
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    90.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.431
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.85
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.85

****************************************************************************
  FLOW PROCESS FROM NODE      2.20 TO NODE      2.30 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  569.40  DOWNSTREAM ELEVATION(FEET) =  561.75
  STREET LENGTH(FEET) =   324.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.27
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    7.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.06
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.92
  STREET FLOW TRAVEL TIME(MIN.) =   1.77   Tc(MIN.) =    5.19
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.230
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.780
  SUBAREA AREA(ACRES) =    0.44      SUBAREA RUNOFF(CFS) =    2.82
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       3.66

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =   9.97
  FLOW VELOCITY(FEET/SEC.) =  3.38   DEPTH*VELOCITY(FT*FT/SEC.) =   1.15
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      2.30 =     424.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      2.30 TO NODE      2.40 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    561.75  DOWNSTREAM(FEET) =    561.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =    15.00   CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   1.500
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.164
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.66
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.83
  AVERAGE FLOW DEPTH(FEET) =   0.28   TRAVEL TIME(MIN.) =   0.07
  Tc(MIN.) =    5.26
  SUBAREA AREA(ACRES) =     0.00       SUBAREA RUNOFF(CFS) =    0.00
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.779
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       3.66

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   3.83
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      2.40 =     439.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.40 TO NODE      2.50 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   560.60  DOWNSTREAM(FEET) =   560.10
  FLOW LENGTH(FEET) =     3.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.13
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.66
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    5.26
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      2.50 =     442.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.50 TO NODE      1.70 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   558.60  DOWNSTREAM(FEET) =   558.50
  FLOW LENGTH(FEET) =     6.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.36
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.66
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.28
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      1.70 =     448.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.70 TO NODE      1.70 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.) =    5.28
  RAINFALL INTENSITY(INCH/HR) =   8.14
  TOTAL STREAM AREA(ACRES) =     0.57
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.66

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       10.90     6.02        7.484          1.78
      2        3.66     5.28        8.145          0.57

  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       13.68     5.28       8.145
      2       14.27     6.02       7.484

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.27   Tc(MIN.) =    6.02
  TOTAL AREA(ACRES) =        2.4
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.70 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.70 TO NODE      1.80 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   554.00  DOWNSTREAM(FEET) =   553.75
  FLOW LENGTH(FEET) =    44.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.17
```

```
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.27
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    6.06
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.80 =     614.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.80 TO NODE      1.90 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   553.75  DOWNSTREAM(FEET) =   552.90
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.17
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.27
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    6.21
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.90 =     784.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.90 TO NODE      4.50 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   552.90  DOWNSTREAM(FEET) =   552.66
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  18.17
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.27
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    6.23
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      4.50 =     809.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.50 TO NODE      4.50 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.23
  RAINFALL INTENSITY(INCH/HR) =   7.31
  TOTAL STREAM AREA(ACRES) =     2.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.27
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      4.10 TO NODE      4.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    572.90
  DOWNSTREAM ELEVATION(FEET) =    570.15
  ELEVATION DIFFERENCE(FEET) =      2.75
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.869
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    82.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.826
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE      4.20 TO NODE      4.30 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    570.15  DOWNSTREAM(FEET) =    562.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =   286.00   CHANNEL SLOPE =  0.0259
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.870
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.68
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   2.84
  Tc(MIN.) =   11.71
  SUBAREA AREA(ACRES) =     0.03       SUBAREA RUNOFF(CFS) =    0.05
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.340
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   1.44
  LONGEST FLOWPATH FROM NODE      4.10 TO NODE      4.30 =     386.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.30 TO NODE      4.40 IS CODE =  41
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   562.75  DOWNSTREAM(FEET) =   562.60
  FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.04
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =   3.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.15
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   11.80
  LONGEST FLOWPATH FROM NODE      4.10 TO NODE      4.40 =     403.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.40 TO NODE      4.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    562.60  DOWNSTREAM(FEET) =    558.33
  CHANNEL LENGTH THRU SUBAREA(FEET) =   357.00   CHANNEL SLOPE =  0.0120
  CHANNEL BASE(FEET) =    1.50   "Z" FACTOR =  12.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.954
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   4.37
  Tc(MIN.) =   16.17
  SUBAREA AREA(ACRES) =     0.01       SUBAREA RUNOFF(CFS) =    0.04
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.396
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.16

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.28
  LONGEST FLOWPATH FROM NODE      4.10 TO NODE      4.50 =     760.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.50 TO NODE      4.50 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.) =   16.17
  RAINFALL INTENSITY(INCH/HR) =   3.95
  TOTAL STREAM AREA(ACRES) =     0.10
```

```
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.16

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1       14.27     6.23        7.313          2.35
     2        0.16    16.17        3.954          0.10

 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       14.33     6.23       7.313
     2        7.87    16.17       3.954

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      14.33   Tc(MIN.) =    6.23
 TOTAL AREA(ACRES) =        2.4
 LONGEST FLOWPATH FROM NODE      1.10 TO NODE      4.50 =     809.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        2.4  TC(MIN.) =      6.23
 PEAK FLOW RATE(CFS)   =      14.33
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2013 Advanced Engineering Software (aes)
              Ver. 20.0 Release Date: 06/01/2013  License ID 1523

                              Analysis prepared by:
```

```
 ************************* DESCRIPTION OF STUDY *************************
* ARMORLITE LOFTS                                                      *
* 100-YR PROPOSED CONDITION - MITIGATED                                *
* POC 1                                                                *
 ************************************************************************

  FILE NAME: 1900PR1.DAT
  TIME/DATE OF STUDY: 00:17 08/10/2023
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.200
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  18.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  =====  ====== ===== =======
  1   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)
  *PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
   UPSTREAM TRIBUTARY PIPE.*

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

```
  FLOW PROCESS FROM NODE      1.10 TO NODE      1.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    577.50
  DOWNSTREAM ELEVATION(FEET) =    575.10
  ELEVATION DIFFERENCE(FEET) =      2.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.214
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    79.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.328
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE      1.20 TO NODE      1.30 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  575.10  DOWNSTREAM ELEVATION(FEET) =  568.95
  STREET LENGTH(FEET) =   163.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.10
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    3.59
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.56
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.81
  STREET FLOW TRAVEL TIME(MIN.) =   0.76   Tc(MIN.) =    6.98
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.801
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7300
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.674
  SUBAREA AREA(ACRES) =    0.22      SUBAREA RUNOFF(CFS) =    1.09
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.60

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.26   HALFSTREET FLOOD WIDTH(FEET) =   5.34
  FLOW VELOCITY(FEET/SEC.) =  3.58   DEPTH*VELOCITY(FT*FT/SEC.) =   0.92
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.30 =     263.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.30 TO NODE      1.40 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   565.00  DOWNSTREAM(FEET) =   564.40
  FLOW LENGTH(FEET) =    53.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.54
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.60
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    7.17
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.40 =     316.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.40 TO NODE      1.50 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   564.40  DOWNSTREAM(FEET) =   563.20
  FLOW LENGTH(FEET) =   200.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.57
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.60
  PIPE TRAVEL TIME(MIN.) =   0.93    Tc(MIN.) =    8.11
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.50 =     516.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.50 TO NODE      1.60 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   563.20  DOWNSTREAM(FEET) =   563.00
  FLOW LENGTH(FEET) =    33.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.59
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
```

```
  PIPE-FLOW(CFS) =       1.60
  PIPE TRAVEL TIME(MIN.) =   0.15    Tc(MIN.) =    8.26
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.60 =     549.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.60 TO NODE      1.60 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.) =    8.26
  RAINFALL INTENSITY(INCH/HR) =   6.10
  TOTAL STREAM AREA(ACRES) =     0.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.60

****************************************************************************
  FLOW PROCESS FROM NODE      3.10 TO NODE      3.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    629.00
  DOWNSTREAM ELEVATION(FEET) =    628.00
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.789
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.431
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.21
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      1.21

****************************************************************************
  FLOW PROCESS FROM NODE      3.20 TO NODE      3.30 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    628.00  DOWNSTREAM(FEET) =    626.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   191.00   CHANNEL SLOPE =  0.0105
  CHANNEL BASE(FEET) =  200.00   "Z" FACTOR =   0.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.08
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.568
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.64
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.02
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   3.12
  Tc(MIN.) =    5.91
  SUBAREA AREA(ACRES) =     1.27       SUBAREA RUNOFF(CFS) =    8.65
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.900
  TOTAL AREA(ACRES) =        1.4         PEAK FLOW RATE(CFS) =       9.74

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   1.19
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE      3.30 =     291.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      3.30 TO NODE      1.60 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   563.60  DOWNSTREAM(FEET) =   563.00
  FLOW LENGTH(FEET) =    62.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =  12.40
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.74
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    5.99
  LONGEST FLOWPATH FROM NODE      3.10 TO NODE      1.60 =     353.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.60 TO NODE      1.60 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.) =    5.99
  RAINFALL INTENSITY(INCH/HR) =   7.50
  TOTAL STREAM AREA(ACRES) =     1.43
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.74

  ** CONFLUENCE DATA **
  STREAM     RUNOFF        Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.60     8.26        6.100          0.35
      2        9.74     5.99        7.500          1.43

  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       10.90     5.99       7.500
      2        9.53     8.26       6.100

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      10.90   Tc(MIN.) =    5.99
  TOTAL AREA(ACRES) =        1.8
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.60 =     549.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.60 TO NODE      1.70 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   561.00  DOWNSTREAM(FEET) =   558.50
  FLOW LENGTH(FEET) =    21.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.28
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.90
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    6.02
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.70 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.70 TO NODE      1.70 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.02
  RAINFALL INTENSITY(INCH/HR) =   7.48
  TOTAL STREAM AREA(ACRES) =     1.78
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.90

****************************************************************************
  FLOW PROCESS FROM NODE      2.10 TO NODE      2.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    573.50
```

```
  DOWNSTREAM ELEVATION(FEET) =    569.40
  ELEVATION DIFFERENCE(FEET) =      4.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.424
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    90.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.431
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.85
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.85

****************************************************************************
  FLOW PROCESS FROM NODE      2.20 TO NODE      2.30 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  569.40  DOWNSTREAM ELEVATION(FEET) =  561.75
  STREET LENGTH(FEET) =   324.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

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

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.27
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    7.84
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.06
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.92
  STREET FLOW TRAVEL TIME(MIN.) =   1.77   Tc(MIN.) =    5.19
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.230
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.780
  SUBAREA AREA(ACRES) =    0.44      SUBAREA RUNOFF(CFS) =    2.82
  TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       3.66

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =   9.97
  FLOW VELOCITY(FEET/SEC.) =  3.38   DEPTH*VELOCITY(FT*FT/SEC.) =   1.15
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      2.30 =     424.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE      2.30 TO NODE      2.40 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    561.75  DOWNSTREAM(FEET) =    561.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =    15.00   CHANNEL SLOPE =  0.0100
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   1.500
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.164
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.66
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.83
  AVERAGE FLOW DEPTH(FEET) =   0.28   TRAVEL TIME(MIN.) =   0.07
  Tc(MIN.) =    5.26
  SUBAREA AREA(ACRES) =     0.00       SUBAREA RUNOFF(CFS) =    0.00
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.779
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       3.66

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   3.83
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      2.40 =     439.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.40 TO NODE      2.50 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   560.60  DOWNSTREAM(FEET) =   560.10
  FLOW LENGTH(FEET) =     3.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  15.13
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.66
  PIPE TRAVEL TIME(MIN.) =   0.00    Tc(MIN.) =    5.26
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      2.50 =     442.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      2.50 TO NODE      1.70 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   558.60  DOWNSTREAM(FEET) =   558.50
  FLOW LENGTH(FEET) =     6.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.36
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.66
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.28
  LONGEST FLOWPATH FROM NODE      2.10 TO NODE      1.70 =     448.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.70 TO NODE      1.70 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.) =    5.28
  RAINFALL INTENSITY(INCH/HR) =   8.14
  TOTAL STREAM AREA(ACRES) =     0.57
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.66

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       10.90     6.02        7.484          1.78
      2        3.66     5.28        8.145          0.57

  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       13.68     5.28       8.145
      2       14.27     6.02       7.484

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.27   Tc(MIN.) =    6.02
  TOTAL AREA(ACRES) =        2.4
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.70 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.70 TO NODE      1.70 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  19.02   RAIN INTENSITY(INCH/HOUR) =  3.56
  TOTAL AREA(ACRES) =     2.35   TOTAL RUNOFF(CFS) =      1.44

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

```
  FLOW PROCESS FROM NODE      1.70 TO NODE      1.80 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   554.00  DOWNSTREAM(FEET) =   553.75
  FLOW LENGTH(FEET) =    44.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.42
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.44
  PIPE TRAVEL TIME(MIN.) =   0.21    Tc(MIN.) =   19.23
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.80 =     614.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.80 TO NODE      1.90 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   553.75  DOWNSTREAM(FEET) =   552.90
  FLOW LENGTH(FEET) =   170.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.25
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.44
  PIPE TRAVEL TIME(MIN.) =   0.87    Tc(MIN.) =   20.11
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      1.90 =     784.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      1.90 TO NODE      4.50 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   552.90  DOWNSTREAM(FEET) =   552.66
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.16
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.44
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =   20.21
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      4.50 =     809.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.50 TO NODE      4.50 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.) =   20.21
  RAINFALL INTENSITY(INCH/HR) =   3.43
  TOTAL STREAM AREA(ACRES) =     2.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.44

****************************************************************************
  FLOW PROCESS FROM NODE      4.10 TO NODE      4.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    572.90
  DOWNSTREAM ELEVATION(FEET) =    570.15
  ELEVATION DIFFERENCE(FEET) =      2.75
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.869
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    82.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.826
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE      4.20 TO NODE      4.30 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    570.15  DOWNSTREAM(FEET) =    562.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =   286.00   CHANNEL SLOPE =  0.0259
  CHANNEL BASE(FEET) =    3.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.870
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.14
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.68
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   2.84
  Tc(MIN.) =   11.71
  SUBAREA AREA(ACRES) =     0.03       SUBAREA RUNOFF(CFS) =    0.05
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.340
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.15

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
```

```
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   1.44
  LONGEST FLOWPATH FROM NODE      4.10 TO NODE      4.30 =     386.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.30 TO NODE      4.40 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   562.75  DOWNSTREAM(FEET) =   562.60
  FLOW LENGTH(FEET) =    17.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.04
  PIPE FLOW VELOCITY = (TOTAL FLOW)/(PIPE CROSS SECTION AREA)
  GIVEN PIPE DIAMETER(INCH) =   3.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.15
  PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =   11.80
  LONGEST FLOWPATH FROM NODE      4.10 TO NODE      4.40 =     403.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.40 TO NODE      4.50 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    562.60  DOWNSTREAM(FEET) =    558.33
  CHANNEL LENGTH THRU SUBAREA(FEET) =   357.00   CHANNEL SLOPE =  0.0120
  CHANNEL BASE(FEET) =    1.50   "Z" FACTOR =  12.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.954
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.36
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   4.37
  Tc(MIN.) =   16.17
  SUBAREA AREA(ACRES) =     0.01       SUBAREA RUNOFF(CFS) =    0.04
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.396
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.16

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.28
  LONGEST FLOWPATH FROM NODE      4.10 TO NODE      4.50 =     760.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE      4.50 TO NODE      4.50 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.) =   16.17
  RAINFALL INTENSITY(INCH/HR) =   3.95
  TOTAL STREAM AREA(ACRES) =     0.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.16

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.44    20.21        3.425          2.35
      2        0.16    16.17        3.954          0.10

  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        1.31    16.17       3.954
      2        1.58    20.21       3.425

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       1.58   Tc(MIN.) =   20.21
  TOTAL AREA(ACRES) =        2.4
  LONGEST FLOWPATH FROM NODE      1.10 TO NODE      4.50 =     809.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.4  TC(MIN.) =     20.21
  PEAK FLOW RATE(CFS)   =       1.58
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX D

PONDPACK ANALYSIS (DETAINED CALCULATIONS)

Project Summary	
Title	Armorlite Lofts
Engineer	DN
Company	Latitude 33 Planning & Engineering
Date	8/10/2023

Notes

Table of Contents

Subsection: User Notifications

User Notifications?	No user notifications generated.

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft³/s)
CM-1	Base	0	0.487	246.000	14.27

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft³/s)
O-1	Base	0	0.181	259.000	1.44

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
PO-1 (IN)	Base	0	0.487	246.000	14.27	(N/A)	(N/A)
PO-1 (OUT)	Base	0	0.181	259.000	1.44	558.39	0.338

Peak Discharge	14.27 ft³/s
Time to Peak	246.000 min
Hydrograph Volume	0.487 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 6.000 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.000	0.00	0.30	0.40	0.40	0.40
30.000	0.40	0.40	0.40	0.40	0.40
60.000	0.40	0.40	0.40	0.40	0.40
90.000	0.50	0.50	0.50	0.50	0.50
120.000	0.50	0.50	0.60	0.60	0.60
150.000	0.60	0.70	0.70	0.70	0.80
180.000	0.80	0.90	0.90	1.00	1.10
210.000	1.20	1.30	1.60	1.90	2.70
240.000	3.30	14.27	2.20	1.50	1.10
270.000	1.00	0.80	0.70	0.70	0.60
300.000	0.60	0.50	0.50	0.50	0.50
330.000	0.40	0.40	0.40	0.40	0.40
360.000	0.40	0.00	(N/A)	(N/A)	(N/A)

Summary for Hydrograph Addition at 'O-1'

Upstream Link	Upstream Node
Outlet-2	PO-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (min)	Flow (Peak) (ft^3/s)
Flow (From)	Outlet-2	0.181	259.000	1.44
Flow (In)	O-1	0.181	259.000	1.44

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Scenario: Base

Time vs. Elevation (ft)

Output Time increment = 1.000 min
Time on left represents time for first value in each row.

Time (min)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.000	554.00	554.00	554.00	554.00	554.01
5.000	554.01	554.02	554.02	554.03	554.03
10.000	554.04	554.05	554.05	554.06	554.07
15.000	554.07	554.08	554.09	554.09	554.10
20.000	554.11	554.11	554.12	554.13	554.13
25.000	554.14	554.15	554.15	554.16	554.17
30.000	554.17	554.18	554.19	554.19	554.20
35.000	554.21	554.21	554.22	554.23	554.23
40.000	554.24	554.24	554.25	554.26	554.26
45.000	554.27	554.28	554.28	554.29	554.29
50.000	554.30	554.31	554.31	554.32	554.32
55.000	554.33	554.34	554.34	554.35	554.35
60.000	554.36	554.37	554.37	554.38	554.38
65.000	554.39	554.39	554.40	554.41	554.41
70.000	554.42	554.42	554.43	554.43	554.44
75.000	554.44	554.45	554.46	554.46	554.47
80.000	554.47	554.48	554.48	554.49	554.49
85.000	554.50	554.50	554.51	554.52	554.52
90.000	554.53	554.54	554.54	554.55	554.56
95.000	554.57	554.57	554.58	554.59	554.59
100.000	554.60	554.61	554.61	554.62	554.63
105.000	554.63	554.64	554.65	554.66	554.66
110.000	554.67	554.68	554.68	554.69	554.70
115.000	554.70	554.71	554.72	554.72	554.73
120.000	554.74	554.74	554.75	554.76	554.76
125.000	554.77	554.78	554.78	554.79	554.80
130.000	554.80	554.81	554.82	554.83	554.84
135.000	554.85	554.85	554.86	554.87	554.88
140.000	554.89	554.89	554.90	554.91	554.92
145.000	554.93	554.94	554.94	554.95	554.96
150.000	554.97	554.98	554.98	554.99	555.00
155.000	555.01	555.02	555.03	555.04	555.05
160.000	555.06	555.07	555.08	555.09	555.10
165.000	555.11	555.12	555.13	555.14	555.15
170.000	555.16	555.17	555.18	555.19	555.20
175.000	555.21	555.22	555.23	555.24	555.26
180.000	555.27	555.28	555.29	555.30	555.31
185.000	555.33	555.34	555.35	555.36	555.38
190.000	555.39	555.40	555.42	555.43	555.44
195.000	555.46	555.47	555.48	555.50	555.51
200.000	555.53	555.54	555.56	555.57	555.59
205.000	555.61	555.62	555.64	555.66	555.67
210.000	555.69	555.71	555.73	555.75	555.76

Subsection: Time vs. Elevation
Label: PO-1 (OUT)

Scenario: Base

Time vs. Elevation (ft)

Output Time increment = 1.000 min
Time on left represents time for first value in each row.

Time (min)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
215.000	555.78	555.80	555.82	555.84	555.86
220.000	555.89	555.91	555.93	555.96	555.99
225.000	556.01	556.04	556.07	556.10	556.13
230.000	556.16	556.20	556.24	556.28	556.32
235.000	556.37	556.41	556.46	556.51	556.56
240.000	556.62	556.69	556.79	556.93	557.09
245.000	557.30	557.53	557.76	557.96	558.11
250.000	558.23	558.30	558.34	558.35	558.37
255.000	558.37	558.38	558.39	558.39	558.39
260.000	558.39	558.39	558.38	558.38	558.38
265.000	558.37	558.36	558.36	558.35	558.35
270.000	558.34	558.34	558.33	558.33	558.32
275.000	558.31	558.30	558.30	558.29	558.28
280.000	558.28	558.27	558.26	558.26	558.25
285.000	558.24	558.24	558.23	558.23	558.22
290.000	558.22	558.21	558.21	558.20	558.20
295.000	558.19	558.19	558.18	558.18	558.17
300.000	558.17	558.17	558.16	558.16	558.15
305.000	558.15	558.15	558.14	558.14	558.13
310.000	558.13	558.13	558.12	558.12	558.12
315.000	558.12	558.11	558.11	558.11	558.11
320.000	558.10	558.10	558.10	558.10	558.10
325.000	558.09	558.09	558.09	558.09	558.08
330.000	558.08	558.08	558.08	558.07	558.07
335.000	558.07	558.07	558.06	558.06	558.06
340.000	558.06	558.06	558.06	558.05	558.05
345.000	558.05	558.05	558.05	558.05	558.05
350.000	558.05	558.05	558.04	558.04	558.04
355.000	558.04	558.04	558.04	558.04	558.04
360.000	558.04	558.04	558.03	558.03	558.03
365.000	558.02	558.02	558.01	558.00	558.00
370.000	557.99	557.99	557.98	557.97	557.97

Subsection: Time vs. Volume
Label: PO-1

Scenario: Base

Time vs. Volume (ac-ft)

Output Time increment = 1.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.000	0.000	0.000	0.000	0.001
5.000	0.001	0.001	0.002	0.002	0.003
10.000	0.003	0.004	0.004	0.005	0.005
15.000	0.006	0.006	0.007	0.007	0.008
20.000	0.008	0.009	0.009	0.010	0.010
25.000	0.011	0.011	0.012	0.012	0.013
30.000	0.013	0.014	0.014	0.015	0.015
35.000	0.016	0.016	0.017	0.017	0.018
40.000	0.018	0.019	0.019	0.020	0.020
45.000	0.021	0.021	0.022	0.022	0.023
50.000	0.023	0.024	0.024	0.024	0.025
55.000	0.025	0.026	0.026	0.027	0.027
60.000	0.028	0.028	0.029	0.029	0.029
65.000	0.030	0.030	0.031	0.031	0.032
70.000	0.032	0.032	0.033	0.033	0.034
75.000	0.034	0.035	0.035	0.035	0.036
80.000	0.036	0.037	0.037	0.038	0.038
85.000	0.038	0.039	0.039	0.040	0.040
90.000	0.041	0.041	0.042	0.042	0.043
95.000	0.044	0.044	0.045	0.045	0.046
100.000	0.046	0.047	0.047	0.048	0.048
105.000	0.049	0.049	0.050	0.050	0.051
110.000	0.051	0.052	0.052	0.053	0.054
115.000	0.054	0.055	0.055	0.056	0.056
120.000	0.057	0.057	0.058	0.058	0.059
125.000	0.059	0.060	0.060	0.061	0.061
130.000	0.062	0.062	0.063	0.064	0.064
135.000	0.065	0.066	0.066	0.067	0.068
140.000	0.068	0.069	0.069	0.070	0.071
145.000	0.071	0.072	0.073	0.073	0.074
150.000	0.074	0.075	0.076	0.076	0.077
155.000	0.078	0.079	0.079	0.080	0.081
160.000	0.081	0.082	0.083	0.084	0.084
165.000	0.085	0.086	0.087	0.087	0.088
170.000	0.089	0.090	0.091	0.091	0.092
175.000	0.093	0.094	0.095	0.096	0.097
180.000	0.097	0.098	0.099	0.100	0.101
185.000	0.102	0.103	0.104	0.105	0.106
190.000	0.107	0.108	0.109	0.110	0.111
195.000	0.112	0.113	0.114	0.115	0.116
200.000	0.117	0.119	0.120	0.121	0.122
205.000	0.123	0.125	0.126	0.127	0.129
210.000	0.130	0.131	0.133	0.134	0.136

Time vs. Volume (ac-ft)

Output Time increment = 1.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
215.000	0.137	0.139	0.140	0.142	0.143
220.000	0.145	0.147	0.149	0.151	0.153
225.000	0.155	0.157	0.159	0.161	0.164
230.000	0.166	0.169	0.172	0.175	0.178
235.000	0.182	0.185	0.189	0.193	0.197
240.000	0.201	0.207	0.215	0.225	0.238
245.000	0.253	0.271	0.289	0.304	0.316
250.000	0.325	0.331	0.334	0.335	0.336
255.000	0.336	0.337	0.337	0.338	0.338
260.000	0.337	0.337	0.337	0.337	0.336
265.000	0.336	0.336	0.335	0.335	0.334
270.000	0.334	0.334	0.333	0.333	0.332
275.000	0.332	0.331	0.331	0.330	0.329
280.000	0.329	0.328	0.328	0.327	0.327
285.000	0.326	0.326	0.326	0.325	0.325
290.000	0.324	0.324	0.324	0.323	0.323
295.000	0.322	0.322	0.322	0.321	0.321
300.000	0.321	0.320	0.320	0.320	0.320
305.000	0.319	0.319	0.319	0.318	0.318
310.000	0.318	0.317	0.317	0.317	0.317
315.000	0.316	0.316	0.316	0.316	0.316
320.000	0.316	0.315	0.315	0.315	0.315
325.000	0.315	0.315	0.314	0.314	0.314
330.000	0.314	0.314	0.313	0.313	0.313
335.000	0.313	0.313	0.313	0.312	0.312
340.000	0.312	0.312	0.312	0.312	0.312
345.000	0.312	0.312	0.311	0.311	0.311
350.000	0.311	0.311	0.311	0.311	0.311
355.000	0.311	0.311	0.311	0.311	0.311
360.000	0.311	0.310	0.310	0.310	0.310
365.000	0.309	0.309	0.308	0.308	0.307
370.000	0.307	0.307	0.306	0.306	0.305

Subsection: Elevation-Area Volume Curve Scenario: Base

Label: PO-1

Elevation (ft)	Planimeter (ft²)	Area (ft²)	A1+A2+sqr (A1*A2) (ft²)	Volume (ac-ft)	Volume (Total) (ac-ft)
554.00	0.0	3,350.000	0.000	0.000	0.000
555.00	0.0	3,350.000	10,050.000	0.077	0.077
556.00	0.0	3,350.000	10,050.000	0.077	0.154
557.00	0.0	3,350.000	10,050.000	0.077	0.231
558.00	0.0	3,350.000	10,050.000	0.077	0.308
558.50	0.0	3,350.000	10,050.000	0.038	0.346

Pond Volume Equations
*** Incremental volume computed by the Conic Method for Reservoir Volumes.**

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Requested Pond Water Surface Elevations	
Minimum (Headwater)	554.00 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	558.50 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 2	Forward	TW	554.00	558.50
Rectangular Weir	Weir - 1	Forward	TW	558.00	558.50
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	554.00 ft
Orifice Diameter	2.5 in
Orifice Coefficient	0.600

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	558.00 ft
Weir Length	1.33 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Orifice - 2 (Orifice-Circular)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
554.00	0.00	(N/A)	0.00
554.50	0.10	(N/A)	0.00
555.00	0.16	(N/A)	0.00
555.50	0.19	(N/A)	0.00
556.00	0.23	(N/A)	0.00
556.50	0.25	(N/A)	0.00
557.00	0.28	(N/A)	0.00
557.50	0.30	(N/A)	0.00
558.00	0.32	(N/A)	0.00
558.50	0.34	(N/A)	0.00

Computation Messages
Upstream HW & DNstream TW < Inv.El
H =.40
H =.90
H =1.40
H =1.90
H =2.40
H =2.90
H =3.40
H =3.90
H =4.40

RATING TABLE FOR ONE OUTLET TYPE
Structure ID = Weir - 1 (Rectangular Weir)

Upstream ID = (Pond Water Surface)
Downstream ID = Tailwater (Pond Outfall)

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
554.00	0.00	(N/A)	0.00
554.50	0.00	(N/A)	0.00
555.00	0.00	(N/A)	0.00
555.50	0.00	(N/A)	0.00
556.00	0.00	(N/A)	0.00
556.50	0.00	(N/A)	0.00
557.00	0.00	(N/A)	0.00
557.50	0.00	(N/A)	0.00
558.00	0.00	(N/A)	0.00
558.50	1.41	(N/A)	0.00

Computation Messages
HW & TW below Inv.El.=558.000
HW & TW below Inv.El.=558.000
HW & TW below Inv.El.=558.000
HW & TW below Inv.El.=558.000
HW & TW below Inv.El.=558.000
HW & TW below Inv.El.=558.000
HW & TW below Inv.El.=558.000
HW & TW below Inv.El.=558.000
H=.00; Htw=.00; Qfree=.00;
H=.50; Htw=.00; Qfree=1.41;

Subsection: Composite Rating Curve
Label: Composite Outlet Structure - 1

Scenario: Base

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
554.00	0.00	(N/A)	0.00
554.50	0.10	(N/A)	0.00
555.00	0.16	(N/A)	0.00
555.50	0.19	(N/A)	0.00
556.00	0.23	(N/A)	0.00
556.50	0.25	(N/A)	0.00
557.00	0.28	(N/A)	0.00
557.50	0.30	(N/A)	0.00
558.00	0.32	(N/A)	0.00
558.50	1.75	(N/A)	0.00

Contributing Structures
None Contributing
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2
Orifice - 2 + Weir - 1
Orifice - 2 + Weir - 1

Peak Discharge	1.44 ft³/s
Time to Peak	259.000 min
Hydrograph Volume	0.181 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 1.000 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
3.000	0.00	0.00	0.00	0.00	0.00
8.000	0.01	0.01	0.01	0.01	0.01
13.000	0.01	0.01	0.02	0.02	0.02
18.000	0.02	0.02	0.02	0.02	0.03
23.000	0.03	0.03	0.03	0.03	0.03
28.000	0.03	0.03	0.04	0.04	0.04
33.000	0.04	0.04	0.04	0.04	0.05
38.000	0.05	0.05	0.05	0.05	0.05
43.000	0.05	0.05	0.06	0.06	0.06
48.000	0.06	0.06	0.06	0.06	0.06
53.000	0.07	0.07	0.07	0.07	0.07
58.000	0.07	0.07	0.07	0.08	0.08
63.000	0.08	0.08	0.08	0.08	0.08
68.000	0.08	0.08	0.09	0.09	0.09
73.000	0.09	0.09	0.09	0.09	0.09
78.000	0.10	0.10	0.10	0.10	0.10
83.000	0.10	0.10	0.10	0.10	0.10
88.000	0.10	0.11	0.11	0.11	0.11
93.000	0.11	0.11	0.11	0.11	0.11
98.000	0.11	0.11	0.11	0.11	0.12
103.000	0.12	0.12	0.12	0.12	0.12
108.000	0.12	0.12	0.12	0.12	0.12
113.000	0.12	0.12	0.12	0.13	0.13
118.000	0.13	0.13	0.13	0.13	0.13
123.000	0.13	0.13	0.13	0.13	0.13
128.000	0.13	0.13	0.13	0.14	0.14
133.000	0.14	0.14	0.14	0.14	0.14
138.000	0.14	0.14	0.14	0.14	0.15
143.000	0.15	0.15	0.15	0.15	0.15
148.000	0.15	0.15	0.15	0.15	0.15
153.000	0.15	0.16	0.16	0.16	0.16
158.000	0.16	0.16	0.16	0.16	0.16
163.000	0.16	0.16	0.16	0.16	0.17
168.000	0.17	0.17	0.17	0.17	0.17
173.000	0.17	0.17	0.17	0.17	0.17
178.000	0.17	0.17	0.18	0.18	0.18
183.000	0.18	0.18	0.18	0.18	0.18
188.000	0.18	0.18	0.19	0.19	0.19
193.000	0.19	0.19	0.19	0.19	0.19

Subsection: Diverted Hydrograph
Scenario: Base
Label: Outlet-2

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 1.000 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
198.000	0.19	0.19	0.20	0.20	0.20
203.000	0.20	0.20	0.20	0.20	0.20
208.000	0.20	0.20	0.21	0.21	0.21
213.000	0.21	0.21	0.21	0.21	0.21
218.000	0.22	0.22	0.22	0.22	0.22
223.000	0.22	0.23	0.23	0.23	0.23
228.000	0.23	0.23	0.24	0.24	0.24
233.000	0.24	0.24	0.25	0.25	0.25
238.000	0.25	0.26	0.26	0.26	0.27
243.000	0.28	0.28	0.29	0.30	0.31
248.000	0.32	0.65	0.98	1.19	1.29
253.000	1.34	1.37	1.40	1.42	1.43
258.000	1.44	1.44	1.44	1.43	1.42
263.000	1.41	1.40	1.38	1.37	1.35
268.000	1.34	1.32	1.30	1.29	1.27
273.000	1.25	1.24	1.22	1.20	1.18
278.000	1.16	1.14	1.12	1.10	1.08
283.000	1.06	1.04	1.02	1.01	0.99
288.000	0.98	0.96	0.95	0.93	0.92
293.000	0.90	0.89	0.88	0.86	0.85
298.000	0.84	0.82	0.81	0.80	0.79
303.000	0.78	0.77	0.76	0.74	0.73
308.000	0.72	0.71	0.70	0.69	0.68
313.000	0.67	0.66	0.65	0.65	0.64
318.000	0.63	0.62	0.62	0.61	0.61
323.000	0.60	0.60	0.59	0.59	0.58
328.000	0.57	0.56	0.56	0.55	0.54
333.000	0.53	0.53	0.52	0.52	0.51
338.000	0.50	0.50	0.49	0.49	0.48
343.000	0.48	0.48	0.47	0.47	0.47
348.000	0.46	0.46	0.46	0.45	0.45
353.000	0.45	0.45	0.44	0.44	0.44
358.000	0.44	0.44	0.43	0.43	0.42
363.000	0.41	0.40	0.39	0.37	0.35
368.000	0.33	0.32	0.32	0.32	0.32
373.000	0.32	0.32	(N/A)	(N/A)	(N/A)

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: Base
Label: PO-1

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	554.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
554.00	0.00	0.000	3,350.000	0.00	0.00	0.00
554.50	0.10	0.038	3,350.000	0.00	0.10	55.94
555.00	0.16	0.077	3,350.000	0.00	0.16	111.82
555.50	0.19	0.115	3,350.000	0.00	0.19	167.69
556.00	0.23	0.154	3,350.000	0.00	0.23	223.56
556.50	0.25	0.192	3,350.000	0.00	0.25	279.42
557.00	0.28	0.231	3,350.000	0.00	0.28	335.28
557.50	0.30	0.269	3,350.000	0.00	0.30	391.14
558.00	0.32	0.308	3,350.000	0.00	0.32	446.99
558.50	1.75	0.346	3,350.000	0.00	1.75	504.25

Infiltration	
Infiltration Method (Computed)	No Infiltration

Approximate Detention Times	
Time to Peak (Outflow + Infiltration, Peak to Peak Detention Time)	259.000 min
Time to Peak (Inflow, Peak to Peak Detention Time)	246.000 min
Detention Time (Peak to Peak)	13.000 min
Time to Centroid (Outflow)	263.252 min
Time to Centroid (Inflow)	213.100 min
Detention Time (Centroid to Centroid)	50.152 min
Weighted Average Plug Time	119.413 min
Maximum Plug Volume Plug Time	128.000 min
Maximum Inflow Plug Volume	0.018 ac-ft
Time (Maximum Plug Volume, Start)	245.000 min
Time (Maximum Plug Volume, End)	246.000 min

Subsection: Level Pool Pond Routing Summary
Label: PO-1 (IN)

Scenario: Base

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	554.00 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	1.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	14.27 ft³/s	Time to Peak (Flow, In)	246.000 min
Flow (Peak Outlet)	1.44 ft³/s	Time to Peak (Flow, Outlet)	259.000 min

Elevation (Water Surface, Peak)	558.39 ft
Volume (Peak)	0.338 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.000 ac-ft
Volume (Total Inflow)	0.487 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.181 ac-ft
Volume (Retained)	0.305 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.1 %

Subsection: Pond Routed Hydrograph (total out) Scenario: Base
Label: PO-1 (OUT)

Peak Discharge	1.44 ft³/s
Time to Peak	259.000 min
Hydrograph Volume	0.181 ac-ft

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 1.000 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
3.000	0.00	0.00	0.00	0.00	0.00
8.000	0.01	0.01	0.01	0.01	0.01
13.000	0.01	0.01	0.02	0.02	0.02
18.000	0.02	0.02	0.02	0.02	0.03
23.000	0.03	0.03	0.03	0.03	0.03
28.000	0.03	0.03	0.04	0.04	0.04
33.000	0.04	0.04	0.04	0.04	0.05
38.000	0.05	0.05	0.05	0.05	0.05
43.000	0.05	0.05	0.06	0.06	0.06
48.000	0.06	0.06	0.06	0.06	0.06
53.000	0.07	0.07	0.07	0.07	0.07
58.000	0.07	0.07	0.07	0.08	0.08
63.000	0.08	0.08	0.08	0.08	0.08
68.000	0.08	0.08	0.09	0.09	0.09
73.000	0.09	0.09	0.09	0.09	0.09
78.000	0.10	0.10	0.10	0.10	0.10
83.000	0.10	0.10	0.10	0.10	0.10
88.000	0.10	0.11	0.11	0.11	0.11
93.000	0.11	0.11	0.11	0.11	0.11
98.000	0.11	0.11	0.11	0.11	0.12
103.000	0.12	0.12	0.12	0.12	0.12
108.000	0.12	0.12	0.12	0.12	0.12
113.000	0.12	0.12	0.12	0.13	0.13
118.000	0.13	0.13	0.13	0.13	0.13
123.000	0.13	0.13	0.13	0.13	0.13
128.000	0.13	0.13	0.13	0.14	0.14
133.000	0.14	0.14	0.14	0.14	0.14
138.000	0.14	0.14	0.14	0.14	0.15
143.000	0.15	0.15	0.15	0.15	0.15
148.000	0.15	0.15	0.15	0.15	0.15
153.000	0.15	0.16	0.16	0.16	0.16
158.000	0.16	0.16	0.16	0.16	0.16
163.000	0.16	0.16	0.16	0.16	0.17
168.000	0.17	0.17	0.17	0.17	0.17
173.000	0.17	0.17	0.17	0.17	0.17
178.000	0.17	0.17	0.18	0.18	0.18
183.000	0.18	0.18	0.18	0.18	0.18
188.000	0.18	0.18	0.19	0.19	0.19
193.000	0.19	0.19	0.19	0.19	0.19

Subsection: Pond Routed Hydrograph (total out) Scenario: Base
Label: PO-1 (OUT)

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 1.000 min
Time on left represents time for first value in each row.

Time (min)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
198.000	0.19	0.19	0.20	0.20	0.20
203.000	0.20	0.20	0.20	0.20	0.20
208.000	0.20	0.20	0.21	0.21	0.21
213.000	0.21	0.21	0.21	0.21	0.21
218.000	0.22	0.22	0.22	0.22	0.22
223.000	0.22	0.23	0.23	0.23	0.23
228.000	0.23	0.23	0.24	0.24	0.24
233.000	0.24	0.24	0.25	0.25	0.25
238.000	0.25	0.26	0.26	0.26	0.27
243.000	0.28	0.28	0.29	0.30	0.31
248.000	0.32	0.65	0.98	1.19	1.29
253.000	1.34	1.37	1.40	1.42	1.43
258.000	1.44	1.44	1.44	1.43	1.42
263.000	1.41	1.40	1.38	1.37	1.35
268.000	1.34	1.32	1.30	1.29	1.27
273.000	1.25	1.24	1.22	1.20	1.18
278.000	1.16	1.14	1.12	1.10	1.08
283.000	1.06	1.04	1.02	1.01	0.99
288.000	0.98	0.96	0.95	0.93	0.92
293.000	0.90	0.89	0.88	0.86	0.85
298.000	0.84	0.82	0.81	0.80	0.79
303.000	0.78	0.77	0.76	0.74	0.73
308.000	0.72	0.71	0.70	0.69	0.68
313.000	0.67	0.66	0.65	0.65	0.64
318.000	0.63	0.62	0.62	0.61	0.61
323.000	0.60	0.60	0.59	0.59	0.58
328.000	0.57	0.56	0.56	0.55	0.54
333.000	0.53	0.53	0.52	0.52	0.51
338.000	0.50	0.50	0.49	0.49	0.48
343.000	0.48	0.48	0.47	0.47	0.47
348.000	0.46	0.46	0.46	0.45	0.45
353.000	0.45	0.45	0.44	0.44	0.44
358.000	0.44	0.44	0.43	0.43	0.42
363.000	0.41	0.40	0.39	0.37	0.35
368.000	0.33	0.32	0.32	0.32	0.32
373.000	0.32	0.32	(N/A)	(N/A)	(N/A)

Summary for Hydrograph Addition at 'PO-1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	CM-1

Node Inflows

Inflow Type	Element	Volume (ac-ft)	Time to Peak (min)	Flow (Peak) (ft^3/s)
Flow (From)	CM-1	0.487	246.000	14.27
Flow (In)	PO-1	0.487	246.000	14.27

Index

APPENDIX E

REFERENCE DRAWINGS

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Site P6=3.2 in

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

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)

Site P24=5.6 in

Orange County

Riverside County

Imperial County

Mexico

Pacific Ocean

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
POWAY
S.D. COUNTY
DEL MAR
SANTEE
SAN DIEGO
EL CAJON
LA MESA
LEMON GROVE
CORONADO
SD
CHULA VISTA
IMPERIAL BEACH

117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
33°30' 33°15' 33°00' 32°45' 32°30'

DPW GIS
Department of Public Works
Geographic Information Services

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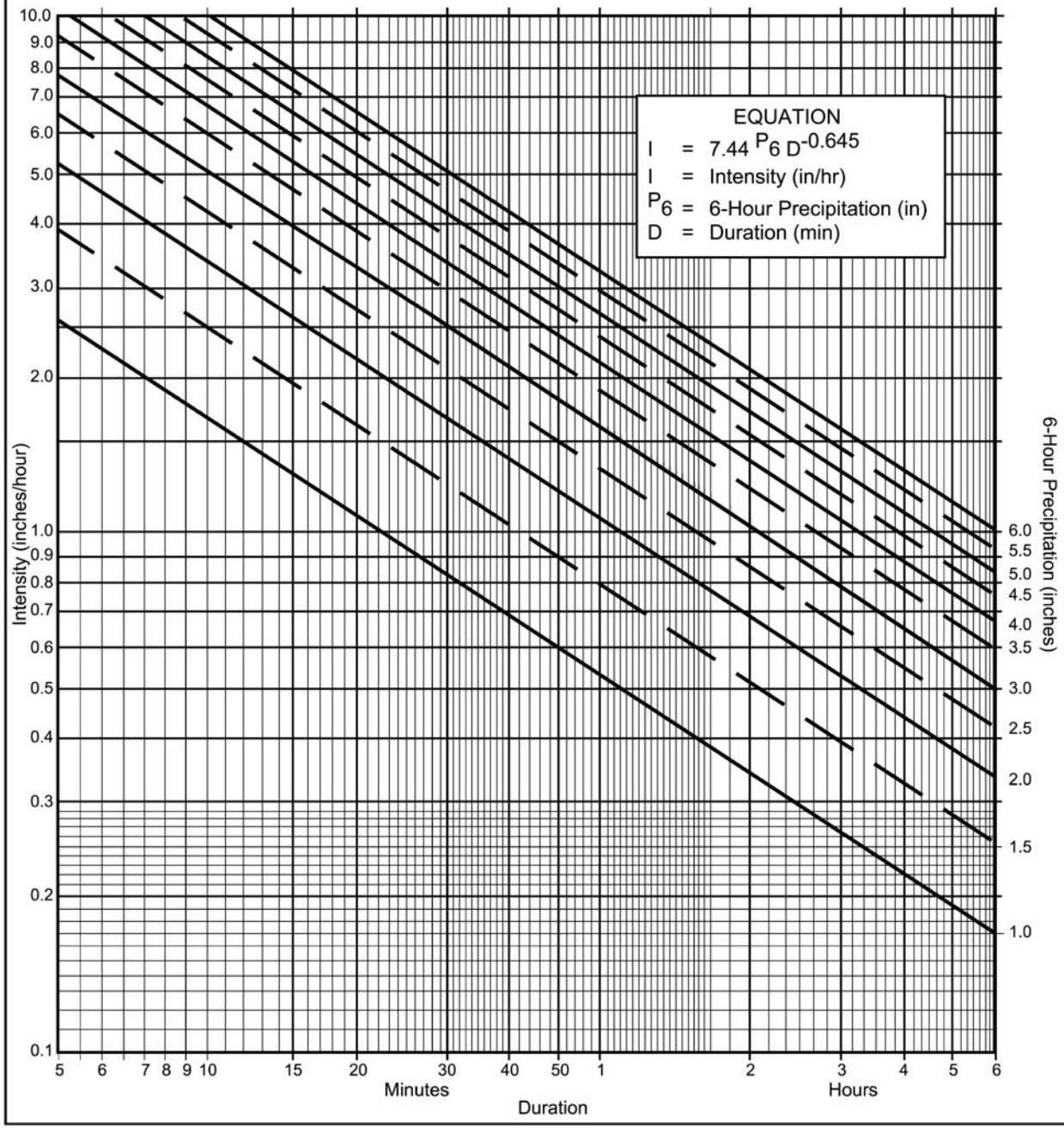
N W E S

3 0 3 Miles



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.2 in., P_{24} = 5.6, $\frac{P_6}{P_{24}}$ = 57 %(2)

(c) Adjusted P_6(2) = 3.2 in.

(d) t_x = SEE AES min.

(e) I = SEE AES in./hr.

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

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	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

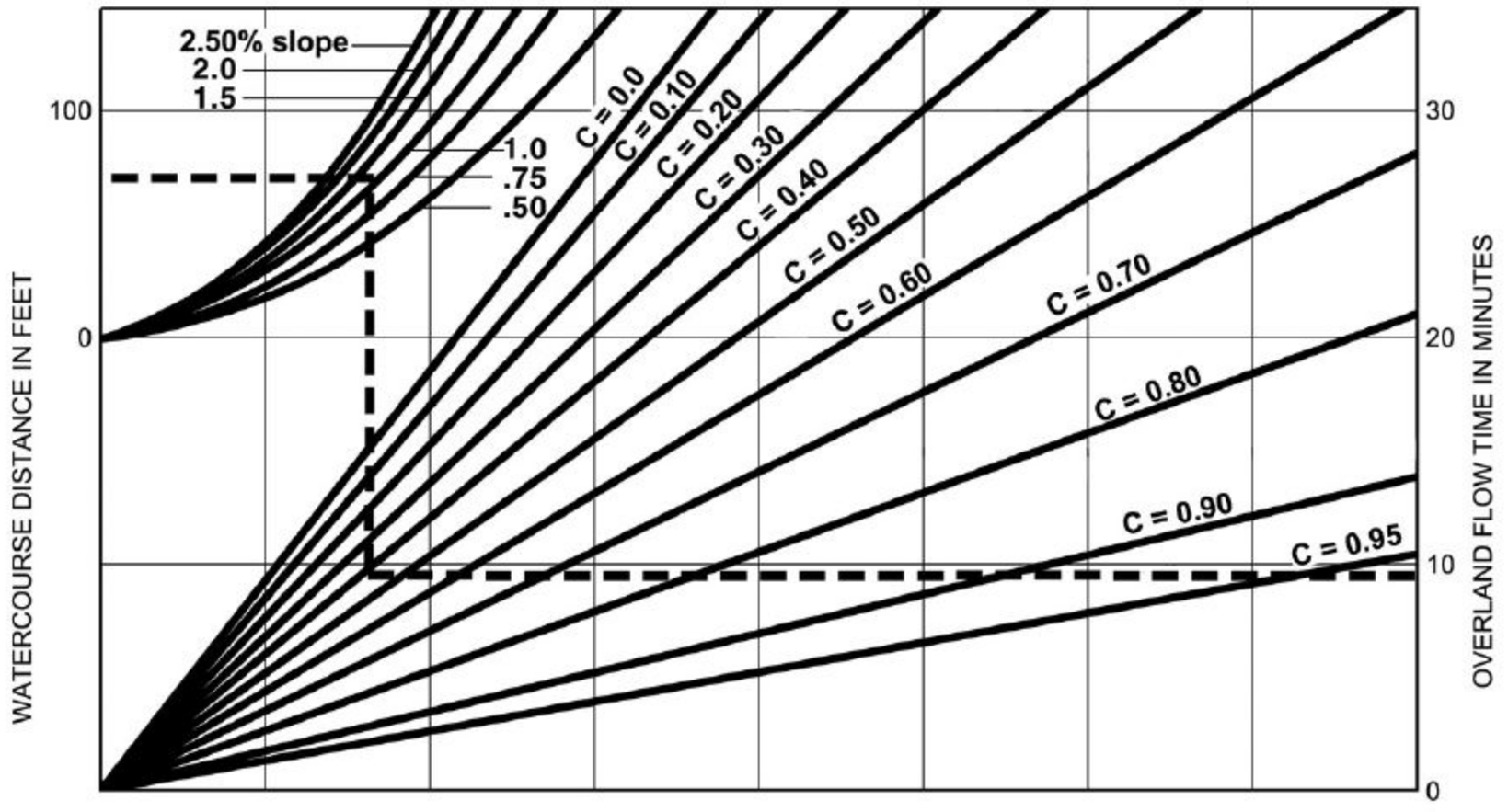
Intensity-Duration Design Chart - Template

FIGURE 3-1

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

Rational Formula - Overland Time of Flow Nomograph

3-3

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.

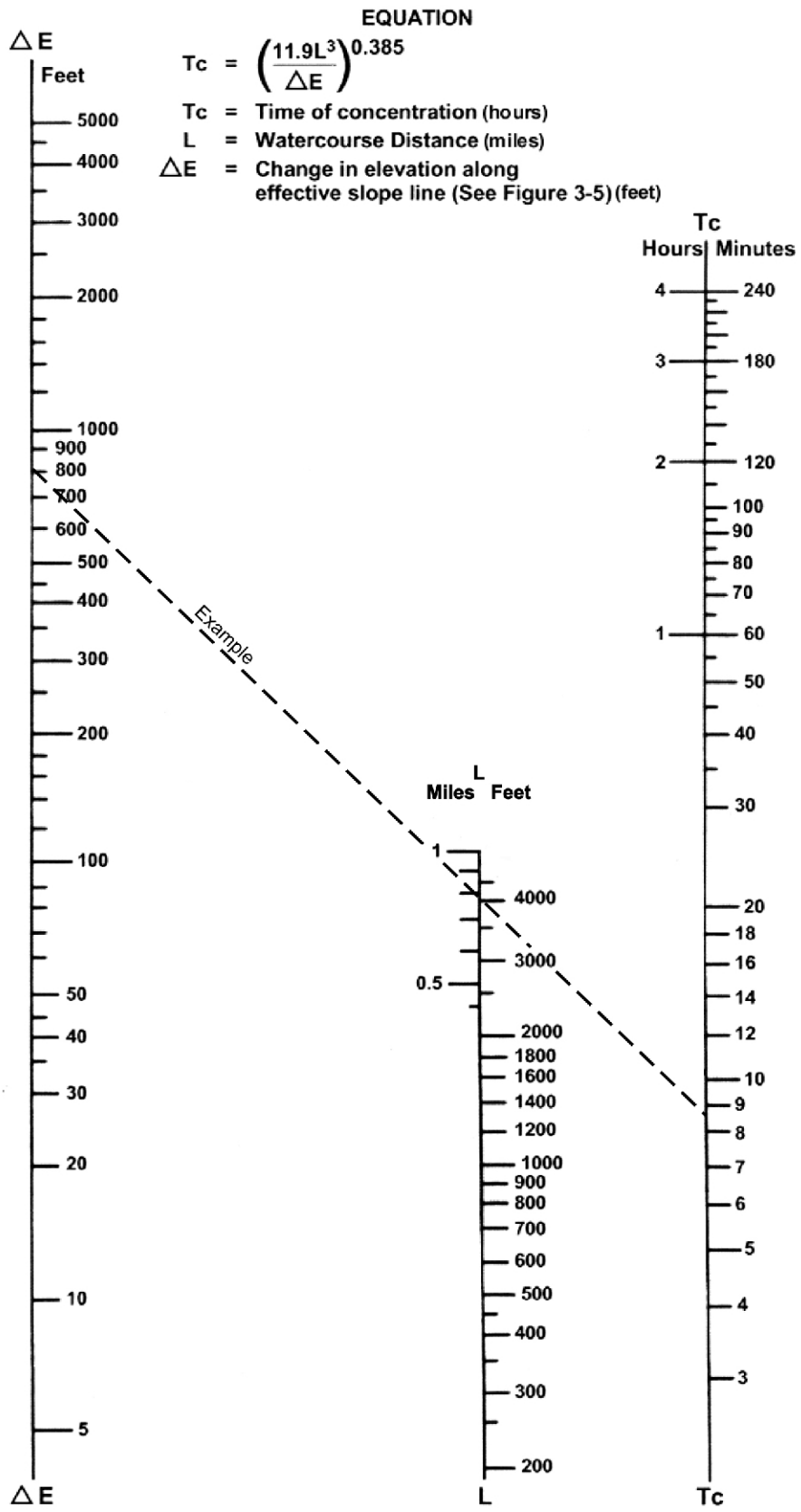
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved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

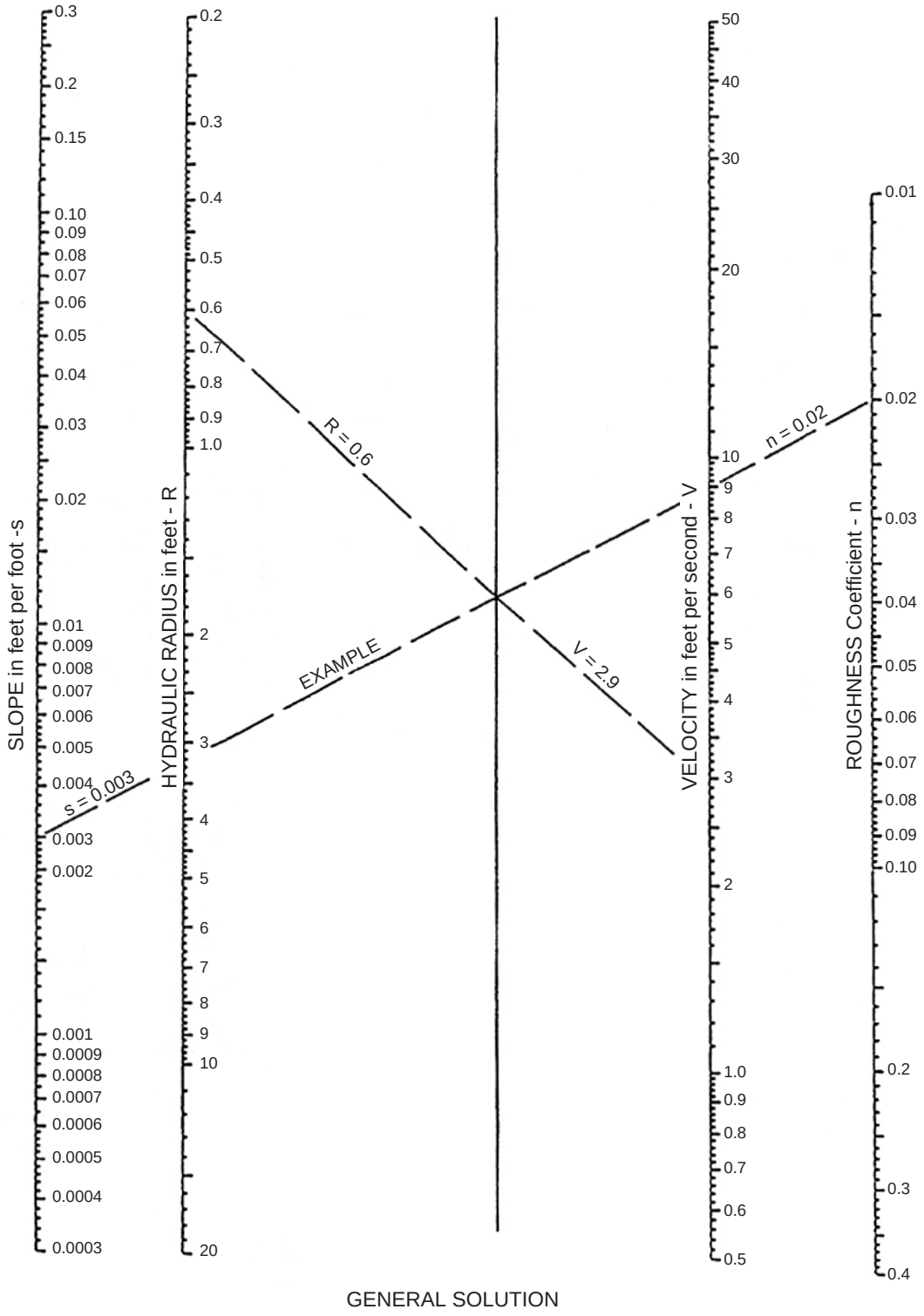


SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

EQUATION: $V = \frac{1.49}{n} R^{2/3} s^{1/2}$



SOURCE: USDOT, FHWA, HDS-3 (1961)

FIGURE

Manning's Equation Nomograph

3-7

Figure 2-4

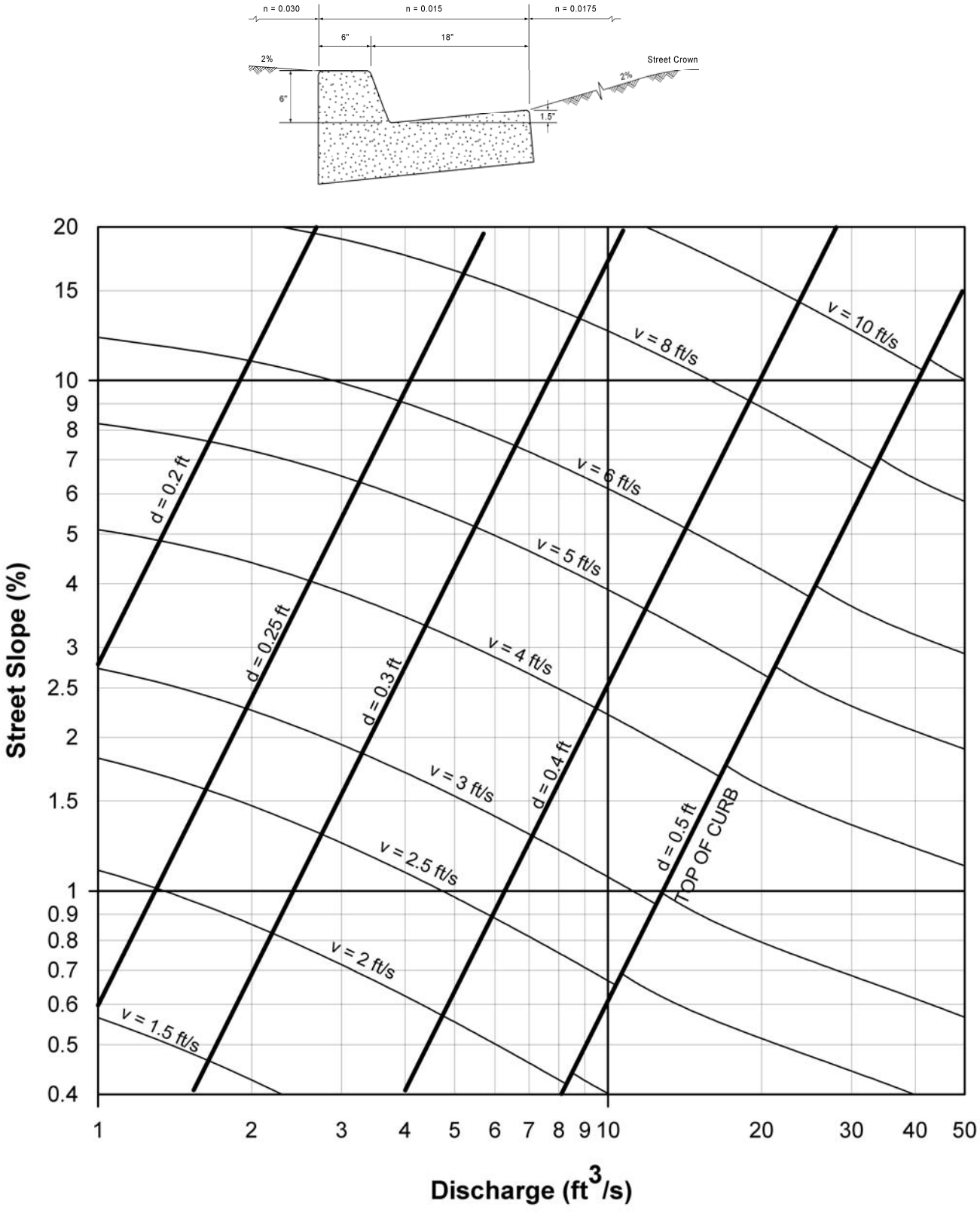


Figure 2-4 6-inch Gutter and Roadway Discharge-Velocity Chart