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HYDROLOGY & HYDRAULICS STUDY

FOR THE:
11011 TORREYANA RD.
SAN DIEGO, CA 92121
APN: 340-010-29

PREPARED FOR:
BRIDGEWEST GROUP
7310 MIRAMAR ROAD, SUITE 500
SAN DIEGO, CA 92126
858.412.2027

PREPARED BY:
WARE MALCOMB
3911 SORRENTO VALLEY BLVD.
SUITE 120
SAN DIEGO, CA 92121
858.638.7277
PROJECT NO: SG20-0111

DATE PREPARED:
10/15/2022

REVISION DATE(S):

TABLE OF CONTENTS

1.0 PROJECT DESCRIPTION

1.1 PURPOSE OF STUDY

The purpose of this study is to support the design and construction for the re-development of one of the industrial lots within the Torrey Pines Science Park.

The study will provide the following:

- Determine the 100-year onsite and offsite peak flows for pre-development and post development conditions.
- Confirm post-development peak flows does not exceed pre-development peak flows.
- Appropriately size all drainage structures throughout the proposed development.
- Ensure there are no negative impacts to the surrounding and downstream properties

1.2 PROJECT SETTING

The existing project site consists of 2.92 acres of industrial development and 7.30 acres of offsite vegetated area for a total of 10.24 acres. Located within the census-designated place (CDP) limits of the City of San Diego, the project is site is bounded by Torreyana Road to the west, existing industrial developments to the north and south, and natural vegetation to the east. The APN for the project site is 340-010-29 and has a designed land use of Industrial Park.

The proposed project intends to re-develop 3.50 acres of the parcel leaving 6.74 acres to remain as offsite vegetation. The re-development will include a new multi-story building, two (2) driveways, a parking lot, and two (2) underground storm water systems. The underground storm water system will be used for water quality and peak flow mitigation. Refer to the Vicinity Map below.

Figure 1: Vicinity Map

2.0 SITE DESCRIPTION

2.1 TOPOGRAPHY

Two points of compliance (POC)s have been identified for the existing project, POC1 and POC2. The existing topography for POC1 generally drains southeast to an existing storm system. Runoff captured in the existing storm system for POC1 is conveyed and discharged to the vegetated offsite area east of the proposed development. The existing topography for POC2 generally drains to the north to an existing catch basin near the northern property line of the project site. Runoff captured in the existing catch basin for POC2 is conveyed and discharged to the vegetated offsite area east of the proposed development.

2.2 PRECIPITATION

Precipitation values for the 6-hour and 24-hour hydrologic analysis were determined using the County of San Diego isopluvial maps. The 100-year 6-hour rainfall event has a precipitation of 2.3 in and the 100-year 24-hour rainfall event has a precipitation of 3.9 in. Refer to **Appendix A** for the County of San Diego isopluvial maps.

2.3 SOIL TYPES

The type of soil and soil conditions are major factors affecting infiltration and resultant storm water runoff. The Natural Resources Conservation Service (NRCS) has classified soils into four general hydrologic soil groups for comparing infiltration and runoff rates. The groups are based on properties that influence runoff, such as water infiltration rate, texture, natural discharge and moisture condition. The runoff potential is based on the amount of runoff at the end of a long duration storm that occurs after wetting and swelling of the soil not protected by vegetation.

Using the NRCS GIS soil data, this site was identified to have both Type B and D soils. Refer to **Appendix A** for NRCS Web Soil Survey Report.

2.4 FEMA MAPPING

The project site is covered by Map Number 06073C1338G of the FEMA Flood Insurance rate Map (FIRM) for the City of San Diego. The project is within a Zone X, which is not a Special Flood Hazard Area. A Zone X are areas determined to be outside the 0.2% annual chance floodplain. Refer to **Appendix A** for the FEMA FIRM Map.

3.0 METHODOLOGY

3.1 DESIGN STANDARD

The City of San Diego's 2017 Drainage Design Manual was used as guidance to design the drainage facilities for this project. The Drainage Design Manual will be referred to as the Hydrology Manual for this study.

3.2 WATERSHED LIMITS

Drainage Management Areas were delineated for the project site's existing and proposed drainage conditions. Existing elevations, slopes and flow paths were established from the topography available at the time of this drainage study. Proposed elevations, slopes and flow paths were based on the proposed site grading plan.

3.3 HYDROLOGY SOFTWARE

Surface topography and material are analyzed to determine the runoff produced by the proposed development. The values are then entered into the "Rational Hydrology Method, San Diego County (2003 Manual)" module of the CIVILCADD/CIVIL DESIGN Engineering software version 9.1 to determine the amount of runoff produced. For this study the Civil Design software will be referred to as CivilD. The software is also used to develop the hydrographs to assist in determining detention capacity of each proposed detention basin.

3.4 CALCULATE RUNOFF COEFFCIENT

The runoff coefficient is expressed as a percentage of rainfall which becomes surface runoff. The runoff coefficient is based on land use and soil type within the project site. For the City of San Diego, soil type D is used for all storm drainage conveyance design. The equation below is used to determine the C-value for the pre-developed and post-developed hydrologic conditions. Table 3-1 of the 2003 San Diego County Hydrology manual is used to identify the specific land use that will be utilized in CivilD. Refer to **Appendix C** for the C-Value calculations.

$$C = 0.90 * (\%Impervious) + C\_p * (1 - \%Impervious)$$

4.0 HYDROLOGIC ANALYSIS

4.1 PRE-DEVELOPED CONDITIONS

In POC1, the existing site is currently developed property, which includes existing paving and an existing building. POC1 generally slopes towards the southeast corner of the project site. Runoff generated from the site is conveyed via curb and gutter until it is captured by the existing two (2) catch basins onsite. Captured runoff is then conveyed via storm drain and discharged to the vegetated offsite area southeast of the project site.

In POC2, the existing site is currently developed property that includes existing paving and existing buildings. POC2 generally slopes toward the northern property line. Runoff generated from the existing site is conveyed via curb and gutter until it is captured by the existing catch basin. Captured runoff is then conveyed via storm drain and discharged to the vegetated offsite area northeast of the project site.

The offsite vegetated area was not analyzed as the area will not be disturbed.

See **Table** 1 below for the Pre-Development Conditions Hydrologic Summary Table. Refer to the Pre-Developed Hydrology Exhibit in **Appendix B**.

Table 1: Pre-Development Conditions Hydrologic Summary Table 100-Year Storm Event

POC ID	AREA (AC)	Q100 (CFS)	TC (MIN)	V100 (FPS)
POC1	1.20	5.84	4.20	15.47
POC2	1.72	8.22	4.08	16.07
OFFSITE	7.32	-	-	-

4.2 POST-DEVELOPED CONDITIONS

POC1 encompasses a portion of the proposed industrial building and paving in the project site. Runoff generated within POC1 will be conveyed via curb and gutter to the proposed modular wetlands system (MWS) near the southern boundary of the project site. Captured runoff is discharged to the underground detention system then treated in the adjacent MWS. The underground detention system is sized to bypass the 100-year storm event and will provide peak flow mitigation. Mitigated flows from the underground detention system will be conveyed via storm drain and ultimately discharged to the existing vegetated offsite area southeast of the project site. POC1 will maintain the same discharge location as in the existing conditions.

POC2 encompasses a portion of the proposed industrial building and paving in the project site. Runoff generated within POC2 will be conveyed via curb and gutter to two (2) catch basins; one located on the northern driveway and the other in the eastern parking lot. Captured runoff from both catch basins will discharge into the underground detention system then treated in the adjacent MWS. The underground detention system is sized to bypass the 100-year storm event and will provide peak flow mitigation. Mitigated flows from the underground detention system will be conveyed via storm drain and ultimately discharged to the existing vegetated offsite area northeast of the project site. POC2 will maintain the same discharge location as in the existing conditions.

The offsite vegetated area that was not disturbed were not analyzed as they remain the same condition as pre-development conditions.

See **Table 2** for the Post-Development Conditions Hydrologic Summary Table. Refer to **Appendix B** for the Post-Developed Hydrology Exhibit.

Table 2: Post-Development Conditions Hydrologic Summary Table 100-Year Storm Event

POC ID	AREA (AC)	UNMITIGATED			MITIGATED		
		Q100 (CFS)	TC (MIN)	V100 (FPS)	Q100 (CFS)	TC (MIN)	V100 (FPS)
POC1	1.64	8.13	3.52	11.53	5.09	4.72	5.84
POC2	1.87	9.29	5.03	7.88	6.17	7.43	6.13
OFFSITE	6.73	-	-	-	-	-	-

5.0 HYDRAULIC ANALYSIS

5.1 MANNINGS ROUGHNESS COEFFICIENT

Per Hydraulic Design Manual Appendix A, the average Manning Roughness Coefficient of 0.013 is used for smooth finish asphalt pavement and concrete lined channel. An average Manning Roughness Coefficient of 0.035 is assumed for the natural terrain. The average Manning Roughness Coefficient of 0.013 is used for the storm drain pipes.

5.2 PIPE DESIGN

The resulting peak flows from CivilD are used to verify the proposed storm drain system is sized accordingly. This study used the 2020 Hydraflow Express ACAD extension to determine the velocities and pipe capacity. Refer to **Appendix D** for the results of the Hydraflow Express analysis.

5.3 POND DESIGN

Resulting hydrographs from the hydrology software are used to determine the detention capacities for the underground detention chambers that will be used to mitigate peak flows and for hydromodification measures. This study used the 2020 Hydraflow Hydrograph ACAD extension to determine the peak discharge, time to peak, volume, maximum elevation, and maximum storage. Refer to **Appendix D** for the results of the Hydraflow Hydrograph analysis.

Table 3: Hydraflow Hydrograph Detention Summary

BASIN ID	BOTTOM ELEVATION (FT)	TOP ELEVATION (FT)	DEPTH (FT)	FOOTPRINT (SF)	STORAGE VOLUME (CF)	MAX WSE (FT)
POC1	325.50	329.50	4	1664	5867	329.20
POC2	325.50	329.50	4	1664	5867	329.47

Table 4: Detention Outlet Summary

BASIN ID	CIRCULAR ORIFICE	ORIFICE ELEVATION	RECTANGULAR WEIR	WEIR ELEVATION
POC1	1.25"	325.50	6" X 36"	328.50
POC2	1.25"	325.50	6" X 36"	328.50

6.0 CONCLUSION

Flood mitigated facilities will be utilized to mitigate the peak flow for all POCs. The resulting data from this study indicate that the project will significantly decrease the peak runoff for the 100-year storm event.

The project is not located within or discharges to navigable waters, water of the United States, or Federal jurisdictional wetlands, as defined by the Clean Water Act, no 401/404 permit is required.

In conclusion, the project has met the City of San Diego's minimum drainage requirements and there will be no negative impacts on the downstream storm drain facilities and properties.

7.0 REFERENCES

City of San Diego, Transportation & Storm Water Design Manuals, January 2018 Edition Drainage Design Manual

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

8.0 DECLARATION OF RESPONSIBLE CHARGE

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

I understand that the check of the 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.

ENGINEER OF WORK

WARE MALCOMB
3911 Sorrento Valley Blvd.
Suite 120
San Diego, CA 92121
Tel: 858.638.7277
Fax: 858.683.7277

Project Number: SDG20-0111

_____ _____

Samuel Bellomio, RCE 90818 Date
Registration Expire: December 31, 2022

9.0 APPENDIX

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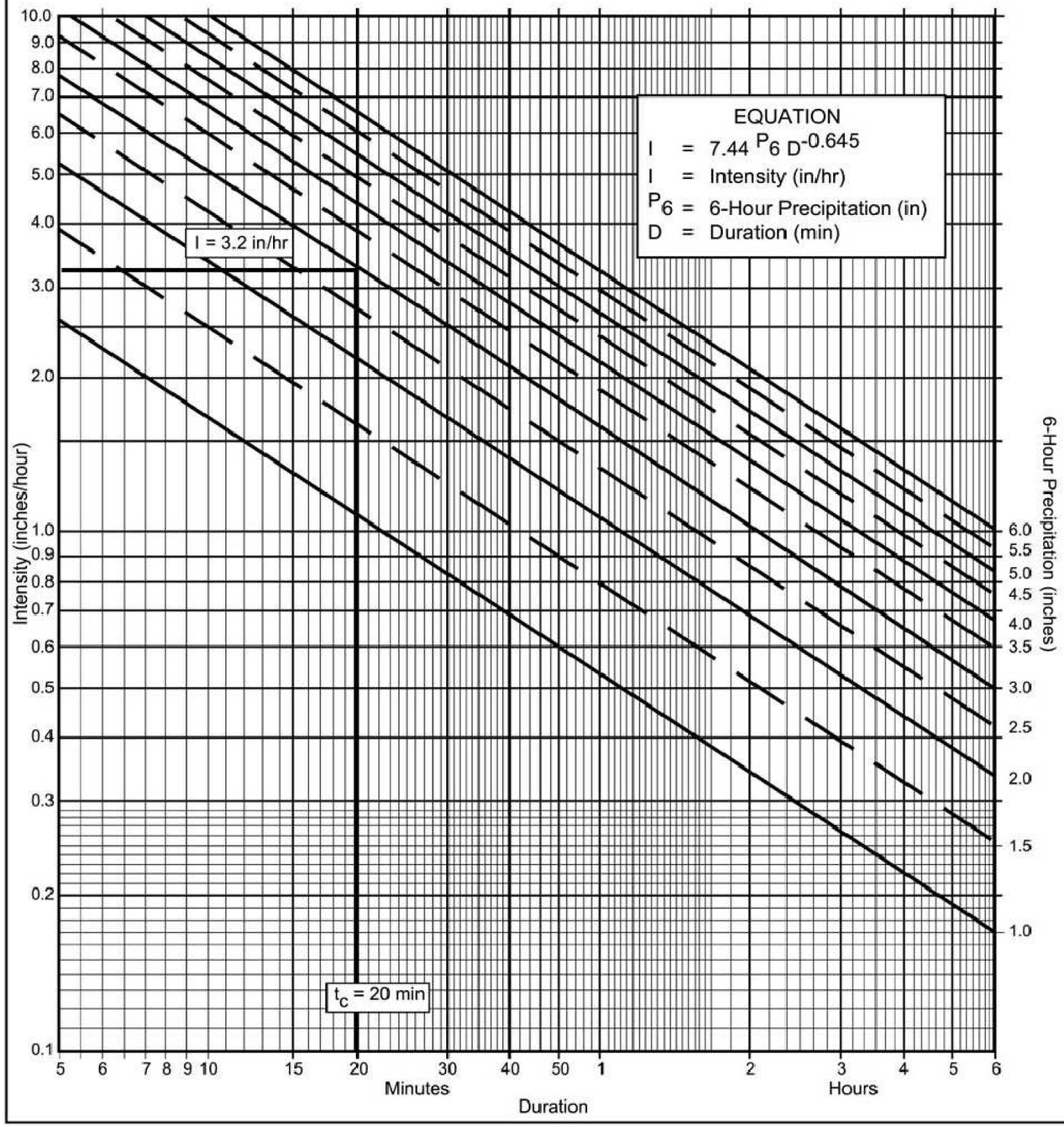
APPENDIX A
FIGURES & TABLES

3911 Sorrento Valley Blvd., Suite 120, San Diego, CA 92121 P 858.638.7277 F 858.638.75060



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.3 in., P_{24} = 3.9, $\frac{P_6}{P_{24}}$ = 59 %(2)

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

(d) t_x = _____ min.

(e) I = _____ in./hr.

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

P6	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

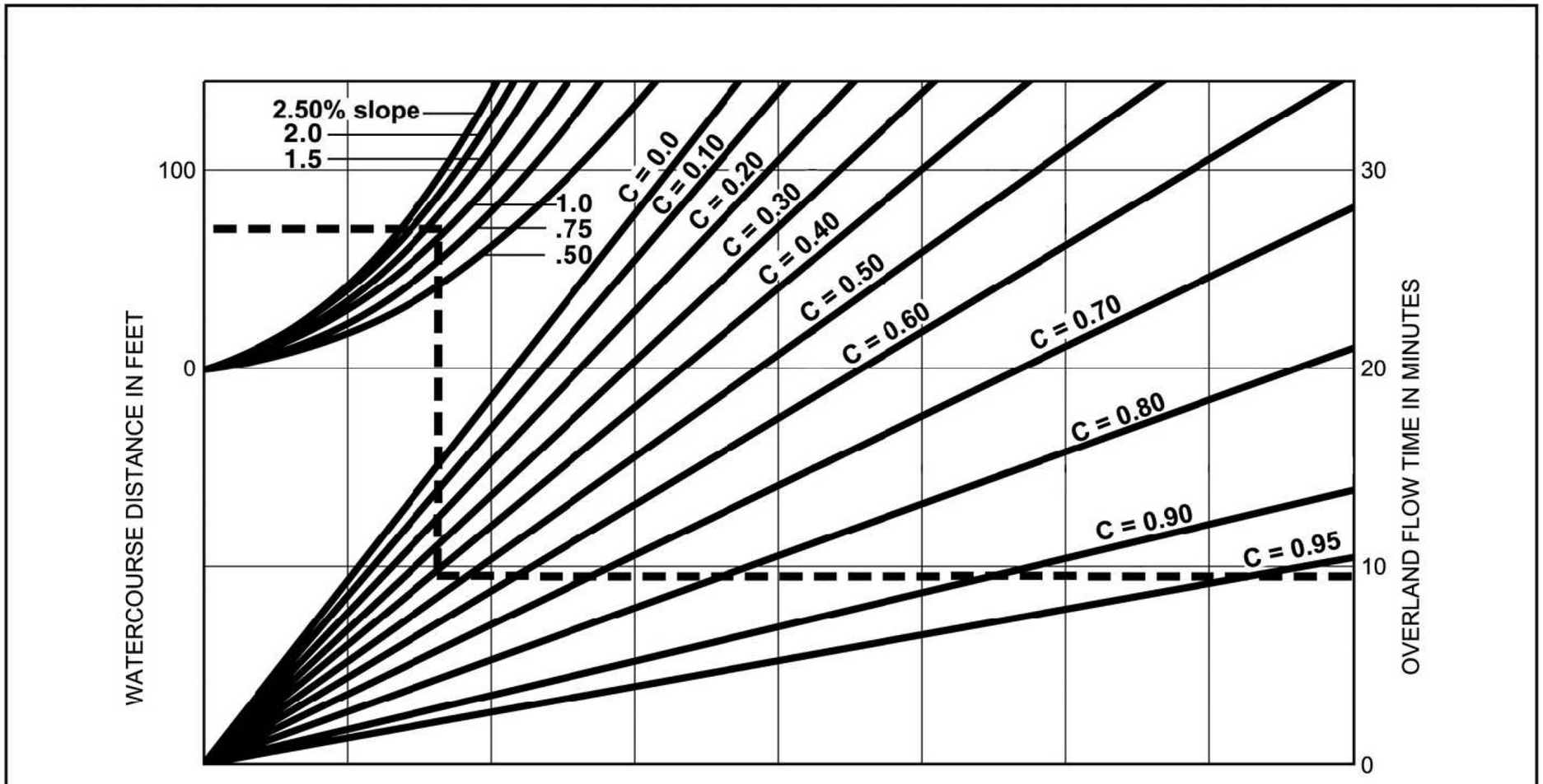
Intensity-Duration Design Chart - Example

FIGURE 3-2

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

Rational Formula - Overland Time of Flow Nomograph

FIGURE

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.

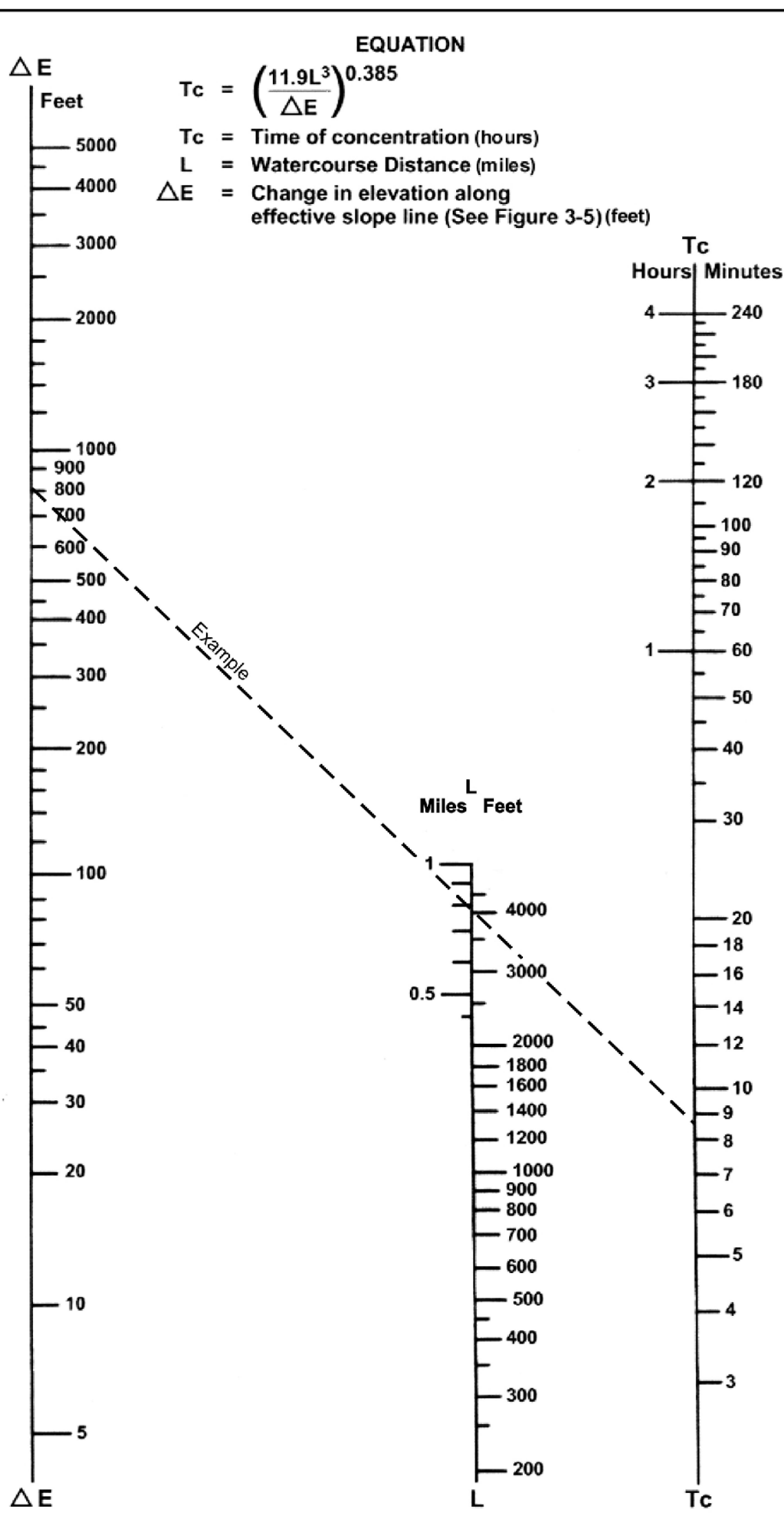
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved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

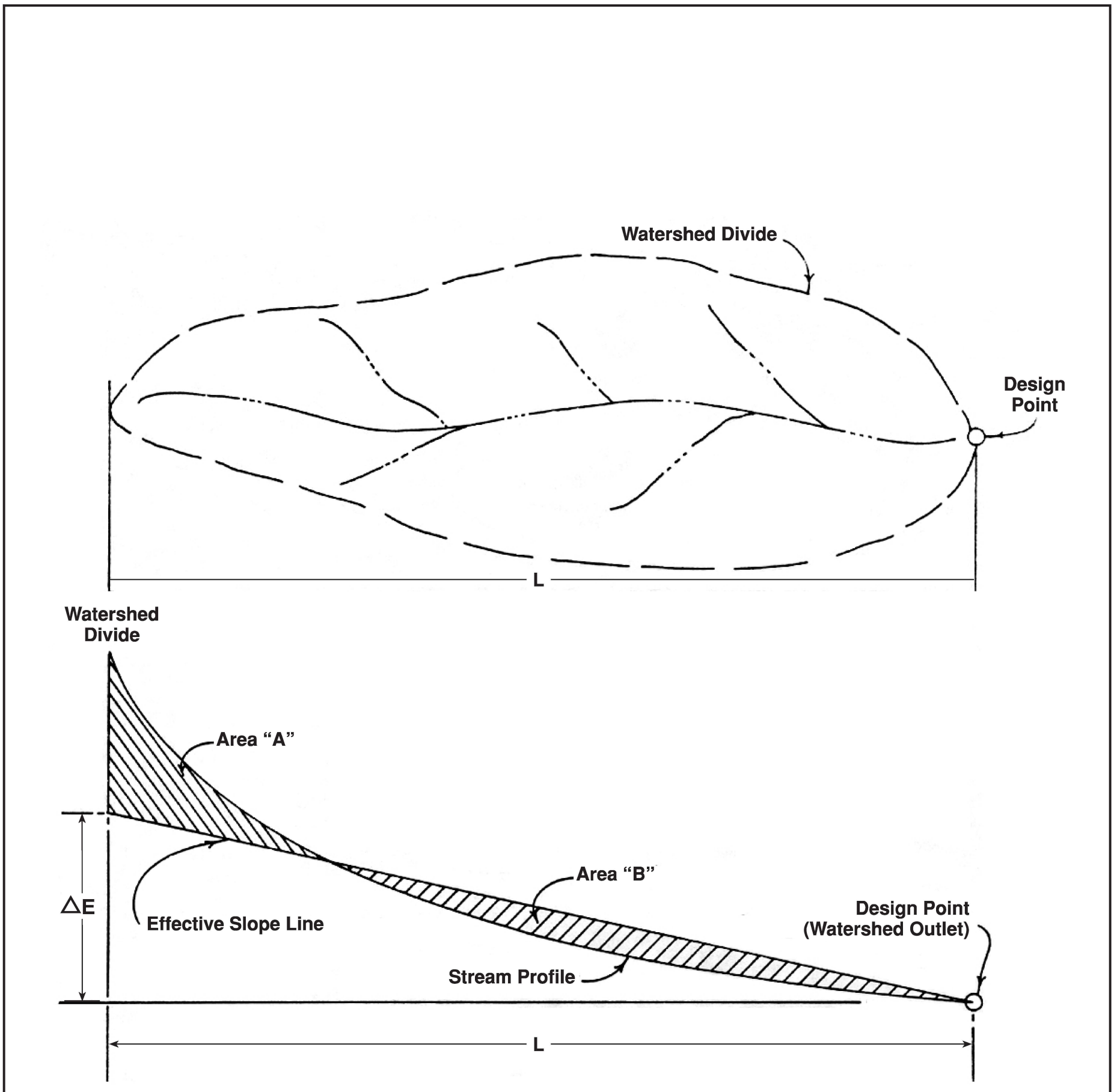
*See Table 3-1 for more detailed description



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



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

FIGURE 3-5

Computation of Effective Slope for Natural Watersheds

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Mexico

Pacific Ocean

Q2 P6 = 1.1

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'

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Department of Public Works
Geographic Information Services

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N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Mexico

Pacific Ocean

Q2 P24 = 1.7

OCEANSIDE
VISTA
CARLSBAD
ESCONDIDO
ENCINITAS
SOLANA BEACH
DEL MAR
POWAY
S.D. COUNTY
SANTEE
SAN DIEGO
EL CAJON
LA MESA
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117°30' 117°15' 117°00' 116°45' 116°30' 116°15'
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N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

Q100 P6 = 2.3

OCEANSIDE

CARLSBAD

ENCINITAS

SOLANA BEACH

DEL MAR

POWAY

S.D. COUNTY

SANTEE

SAN DIEGO

EL CAJON

LA MESA

LEMON GROVE

CORONADO

CHULA VISTA

IMPERIAL BEACH

SD

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

33°30' 33°15' 33°00' 32°45' 32°30'

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Geographic Information Services

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N W E S

3 0 3 Miles

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

Orange County

Riverside County

Imperial County

Pacific Ocean

Mexico

Q100 P24 = 3.9

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

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N W E S

3 0 3 Miles

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NINGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

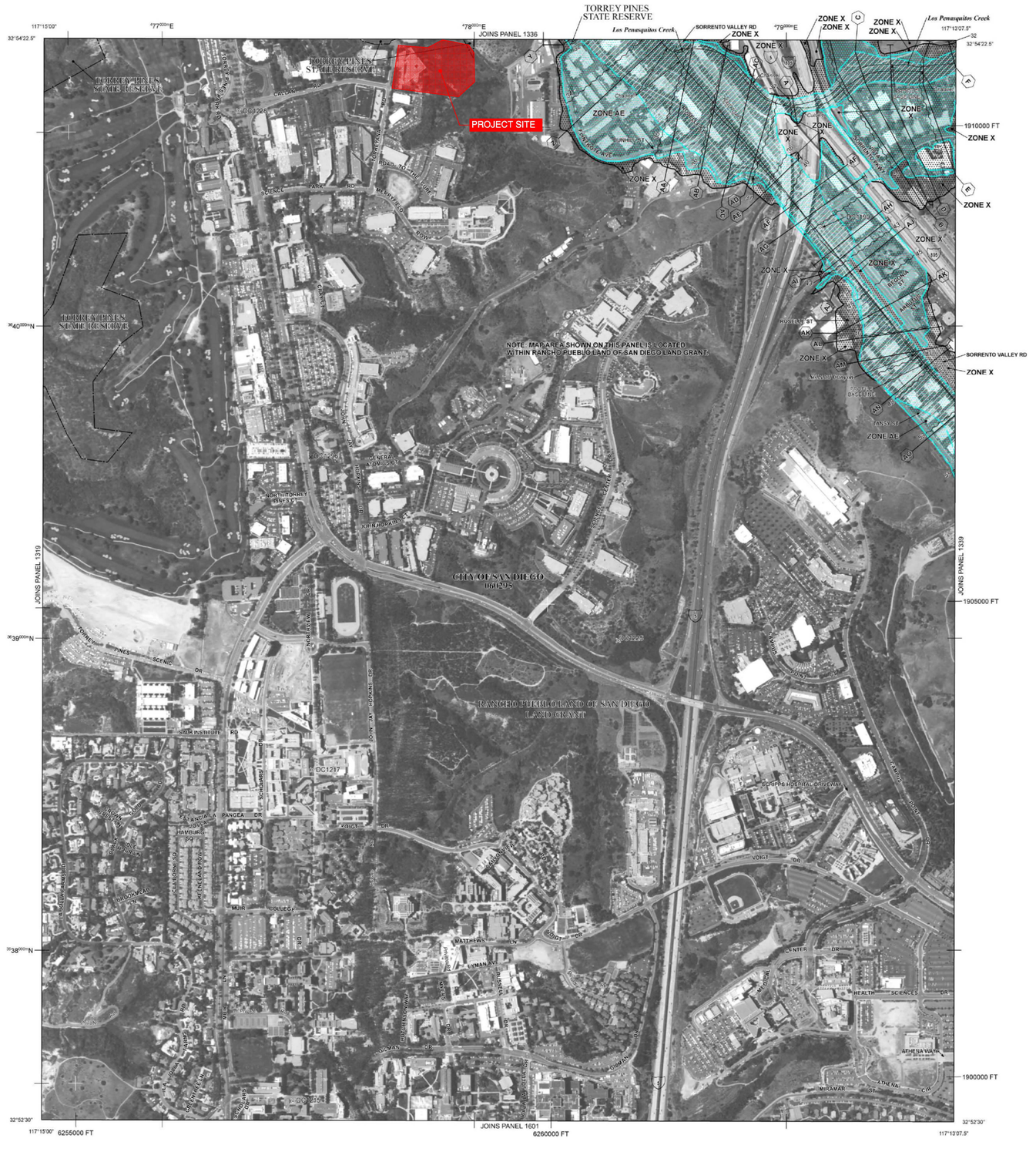
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-877-FEMA MAP (1-877-336-2627) for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 (EL 987) — Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A–A — Cross section line
- 23–23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4675000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 11
- 6000000 FT — 5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 – to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
100 0 100 200 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1338G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1338 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1338	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER 06073C1338G

MAP REVISED MAY 16, 2012

Federal Emergency Management Agency

Soil Map—San Diego County Area, California

Map Scale: 1:945 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 10 20 40 60

Feet: 0 45 90 180 270

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 16, Sep 13, 2021

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

Date(s) aerial images were photographed: Aug 22, 2018—Aug 31, 2018

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
LvF3	Loamy alluvial land-Huerhuero complex, 9 to 50 percent slopes, severely eroded	3.1	100.0%
Totals for Area of Interest		**3.1**	**100.0%**

San Diego County Area, California

LvF3—Loamy alluvial land-Huerhuero complex, 9 to 50 percent slopes, severely eroded

Map Unit Setting

National map unit symbol: hbdx
Elevation: 50 to 3,200 feet
Mean annual precipitation: 8 to 20 inches
Mean annual air temperature: 57 to 64 degrees F
Frost-free period: 150 to 280 days
Farmland classification: Not prime farmland

Map Unit Composition

Loamy alluvial land: 50 percent
Huerhuero and similar soils: 40 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Loamy Alluvial Land

Setting

Landform: Drainageways
Parent material: Alluvium derived from mixed sources

Typical profile

H1 - 0 to 60 inches: variable

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: R019XG905CA - Riparian
Hydric soil rating: No

Description of Huerhuero

Setting

Landform: Ridges
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Residuum weathered from calcareous sandstone and shale

Typical profile

H1 - 0 to 1 inches: loam
H2 - 1 to 40 inches: clay
H3 - 40 to 60 inches: stratified sand to sandy loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 20.0
Available water supply, 0 to 60 inches: Low (about 3.9 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: F019XG913CA - Loamy Hills <30"ppt
Hydric soil rating: No

Minor Components

Huerhuero

Percent of map unit: 3 percent
Hydric soil rating: No

Chesterton

Percent of map unit: 3 percent
Hydric soil rating: No

Carlsbad

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Landform: Drainageways
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 16, Sep 13, 2021

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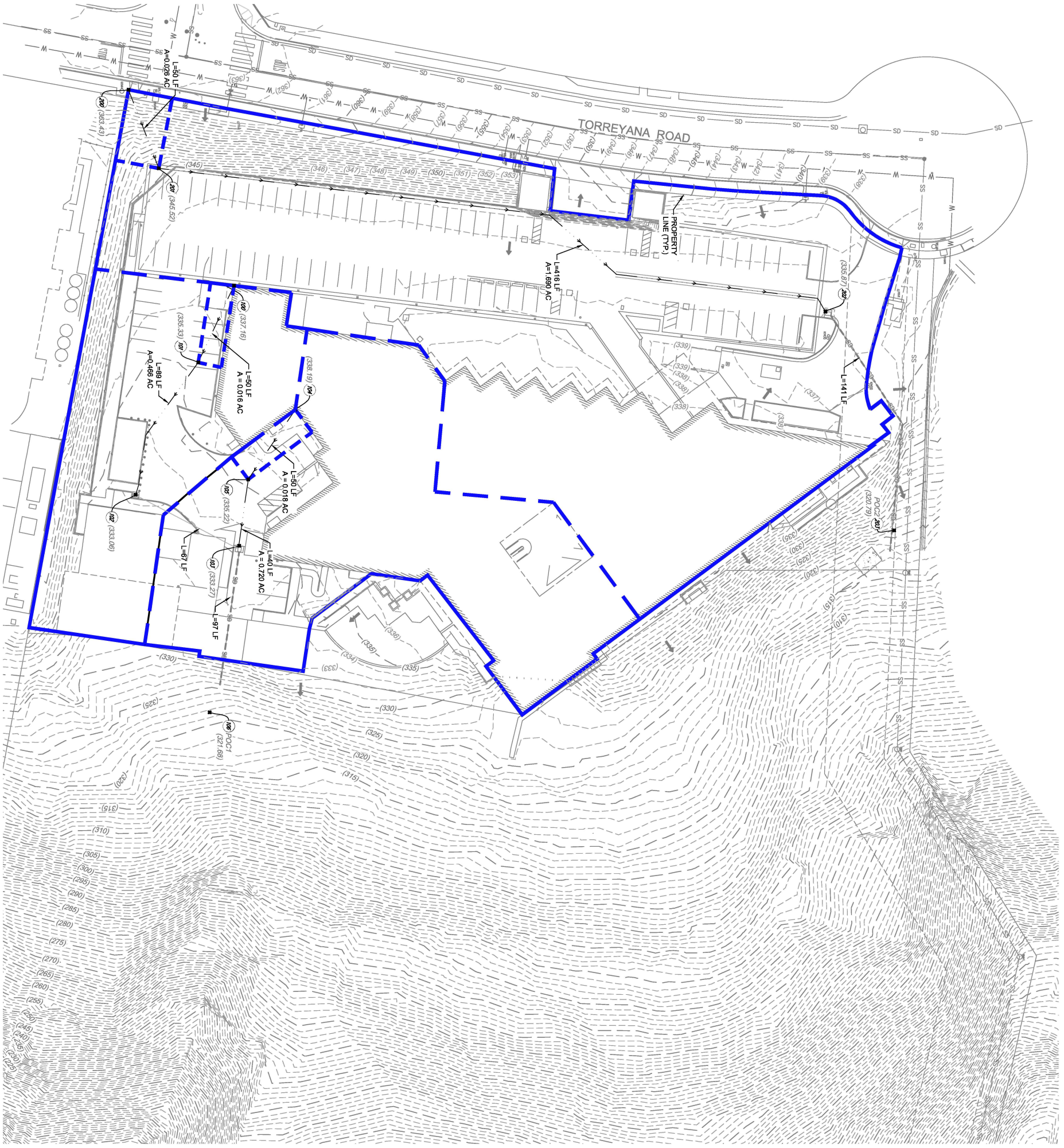
APPENDIX B
WATERSHED INFORMATION

3911 Sorrento Valley Blvd., Suite 120, San Diego, CA 92121 P 858.638.7277 F 858.638.75060



LEGEND

NAME	SYMBOL
NODE NUMBER & ELEVATION	101 XXX.XX
EXISTING MAJOR CONTOUR	
EXISTING MINOR CONTOUR	
ROUTING FLOW PATH	
BASIN DELINEATION	
SUB AREA DELINEATION	

HYDROLOGIC SUMMARY TABLE

POC ID	AREA (AC)	Q100 (CFS)	TC (MIN)	V100 (FPS)
POC1	1.20	5.84	4.20	15.47
POC2	1.72	8.22	4.08	16.07
OFFSITE	7.32	-	-	-

SCALE: 1" = 30'

CAUTION: IF THIS SHEET IS NOT 24"x36" IT IS A REDUCED PRINT

NO.	DATE	REMARKS
1		

EXISING HYDROLOGY EXHIBT
TORREYANA ROAD

FOR AND ON BEHALF OF WARE MALCOMB

3911 sorrento valley blvd.
suite 120
san diego, ca 92121
p 858.638.7277
waremalcomb.com

WARE MALCOMB
LEADING DESIGN FOR COMMERCIAL REAL ESTATE

JOB NO.: SDG20-0111
PA / PM: SB
DESIGNED: HS
DATE:
PLOT DATE: 10/25/22

SHEET
EX1
Sheet 1 of 1

NOT FOR CONSTRUCTION

CAUTION: IF THIS SHEET IS NOT 24"x36" IT IS A REDUCED PRINT

LEGEND

NAME	SYMBOL
NODE NUMBER & ELEVATION	XXX XXX.XX
EXISTING MAJOR CONTOUR	
EXISTING MINOR CONTOUR	
PROPOSED MAJOR CONTOUR	
PROPOSED MINOR CONTOUR	
ROUTING FLOW PATH	
BASIN DELINEATION	
SUB AREA DELINEATION	

HYDROLOGIC SUMMARY TABLE

POC ID	AREA (AC)	UNMITIGATED			MITIGATED		
		Q100 (CFS)	TC (MIN)	V100 (FPS)	Q100 (CFS)	TC (MIN)	V100 (FPS)
POC1	1.64	8.13	3.52	11.53	5.09	4.72	5.84
POC2	1.87	9.29	5.03	7.88	6.17	7.43	6.13
OFFSITE	6.73	-	-	-	-	-	-

UNDERGROUND DETENTION SUMMARY TABLE

BASIN ID	BOTTOM ELEVATION (FT)	TOP ELEVATION (FT)	DEPTH (FT)	FOOTPRINT (SF)	STORAGE VOLUME (CF)	MAX WSE (FT)
POC1	326.5	330.5	4	1664	5867	330.23
POC2	325.0	329.0	4	1664	5867	328.96

UNDERGROUND DETENTION OUTLET SUMMARY TABLE

BASIN ID	CIRCULAR ORIFICE	ORIFICE ELEVATION	RECTANGULAR WEIR	WEIR ELEVATION
POC1	1.25"	326.5	6" X 36"	329.5
POC2	1.25"	325.0	6" X 36"	328.0

WM

0 15 30 60

SCALE: 1" = 30'

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3911 sorrento valley blvd.
suite 120
san diego, ca 92121
p 858.638.7277
waremalcomb.com

FOR AND ON BEHALF OF WARE MALCOMB

PROPOSED HYDROLOGY EXHIBIT
TORREYANA ROAD

NO.	DATE	REMARKS
1		

JOB NO.:	SDG20-0111
PA / PM:	SB
DESIGNED:	HS
DATE:	
PLOT DATE:	10/25/22

SHEET
PR1
Sheet 1 of 1

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APPENDIX C
HYDROLOGIC ANALYSIS

3911 Sorrento Valley Blvd., Suite 120, San Diego, CA 92121 P 858.638.7277 F 858.638.75060

COMPOSITE C-VALUE CALCULATIONS

PROJECT NAME: TORREYANA
PROJECT NUMBER: SDG20-0111
DATE: 10/25/2022
BY: ALO

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EXISTING CONDITIONS								
TOTAL PROJECT AREA	IMPERVIOUS AREA	IMPERVIOUS RUNOFF FACTOR	SEMI-PERVIOUS AREA	SEMI-PERVIOUS RUNOFF FACTOR	PERVIOUS AREA	PERVIOUS RUNOFF FACTOR	PERCENT IMPERVIOUS	COMPOSITE C-VALUE
(SF)	(SF)		(SF)		(SF)		(%)	
127,875	101,253	0.90	0	0.70	26,622	0.35	79%	0.79
RUNOFF COEFFICIENT: NEIGHBORHOOD COMMERCIAL (SOIL TYPE D)								

PROPOSED CONDITIONS								
TOTAL PROJECT AREA	IMPERVIOUS AREA	IMPERVIOUS RUNOFF FACTOR	SEMI-PERVIOUS AREA	SEMI-PERVIOUS RUNOFF FACTOR	PERVIOUS AREA	PERVIOUS RUNOFF FACTOR	PERCENT IMPERVIOUS	COMPOSITE C-VALUE
(SF)	(SF)		(SF)		(SF)		(%)	
152,896	128,611	0.90	0	0.70	24,284	0.35	84%	0.81
RUNOFF COEFFICIENT: GENERAL COMMERCIAL (SOIL TYPE D)								

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study   Date: 04/08/22

PRE DEVELOPMENT - POC1
100 YEAR - RATIONAL METHOD ANALYSIS
BY WARE MALCOMB
file:EXPOC1.rsd3

 *********   Hydrology Study Control Information **********

Program License Serial Number 6491

Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.300
24 hour precipitation(inches) = 3.900
P6/P24 =   59.0%
San Diego hydrology manual 'C' values used

++
Process from Point/Station   100.000 to Point/Station   101.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type   ]
(Neighborhod Commercial)
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Initial subarea total flow distance =   50.000(Ft.)
Highest elevation = 337.160(Ft.)
Lowest elevation = 335.330(Ft.)
Elevation difference =   1.830(Ft.) Slope = 3.660 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   3.66 %, in a development type of
 Neighborhod Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.34 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7900)*(85.000^.5)/(3.660^(1/3)]=   3.34
Calculated TC of   3.338 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =   6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.790
Subarea runoff =   0.077(CFS)
Total initial stream area =   0.016(Ac.)

++
Process from Point/Station   101.000 to Point/Station   102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
!!Warning: Water is above left or right bank elevations
Estimated mean flow rate at midpoint of channel =   1.192(CFS)
Depth of flow =   6.505(Ft.), Average velocity =   2.813(Ft/s)

```
!!Warning: Water is above left or right bank elevations
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3              0.40             20.00
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      1.192(CFS)
  '     '       flow top width =      0.130(Ft.)
  '     '    velocity=    2.813(Ft/s)
  '     '       area =      0.424(Sq.Ft)
  '     '       Froude number =     0.275

Upstream point elevation =   335.330(Ft.)
Downstream point elevation =   333.060(Ft.)
Flow length =    89.000(Ft.)
Travel time  =    0.53 min.
Time of concentration =    3.87 min.
Depth of flow =   6.505(Ft.)
Average velocity =   2.813(Ft/s)
Total irregular channel flow =     1.192(CFS)
Irregular channel normal depth above invert elev. =   6.505(Ft.)
Average velocity of channel(s) =   2.813(Ft/s)
!!Warning: Water is above left or right bank elevations
 Adding area flow to channel
Calculated TC of    3.866 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.060(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                         ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Rainfall intensity =      6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.790  CA =      0.381
Subarea runoff =      2.231(CFS) for      0.466(Ac.)
Total runoff =      2.307(CFS)        Total area =       0.482(Ac.)
Depth of flow =   8.302(Ft.), Average velocity =   3.344(Ft/s)
!!Warning: Water is above left or right bank elevations


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   333.060(Ft.)
Downstream point/station elevation =   332.390(Ft.)
Pipe length  =    67.00(Ft.) Slope =   0.0100  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.307(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.307(CFS)
Normal flow depth in pipe =    7.03(In.)
Flow top width inside pipe =   11.82(In.)
Critical Depth =    7.80(In.)
Pipe flow velocity =      4.83(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =     4.10 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
```

```
In Main Stream number: 1
Stream flow area =      0.482(Ac.)
Runoff from this stream =      2.307(CFS)
Time of concentration =    4.10 min.
Rainfall intensity =     6.060(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      105.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  338.190(Ft.)
Lowest elevation =  335.220(Ft.)
Elevation difference =    2.970(Ft.) Slope =  5.940 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 95.00 (Ft)
for the top area slope value of   5.94 %, in a development type of
 Neighborhod Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.00 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7900)*(  95.000^.5)/(   5.940^(1/3)]=   3.00
Calculated TC of    3.003 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.790
Subarea runoff =      0.086(CFS)
Total initial stream area =        0.018(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      103.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      1.810(CFS)
Depth of flow =   0.124(Ft.), Average velocity =   3.937(Ft/s)
       ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             15.00              0.00
       3             30.00              0.50
Manning's 'N' friction factor =   0.013
----------------------------------------------------------------
Sub-Channel flow  =      1.810(CFS)
  '     '       flow top width =      7.427(Ft.)
  '     '    velocity=    3.937(Ft/s)
  '     '       area =      0.460(Sq.Ft)
  '     '       Froude number =     2.789

Upstream point elevation =   335.220(Ft.)
Downstream point elevation =   333.280(Ft.)
Flow length =    40.000(Ft.)
Travel time  =    0.17 min.
Time of concentration =    3.17 min.
Depth of flow =   0.124(Ft.)
Average velocity =   3.937(Ft/s)
Total irregular channel flow =     1.810(CFS)
Irregular channel normal depth above invert elev. =   0.124(Ft.)
Average velocity of channel(s) =   3.937(Ft/s)
```

```
 Adding area flow to channel
Calculated TC of    3.172 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.060(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                         ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Rainfall intensity =      6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.790  CA =      0.583
Subarea runoff =      3.447(CFS) for      0.720(Ac.)
Total runoff =      3.533(CFS)        Total area =       0.738(Ac.)
Depth of flow =   0.159(Ft.), Average velocity =   4.654(Ft/s)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.738(Ac.)
Runoff from this stream =      3.533(CFS)
Time of concentration =    3.17 min.
Rainfall intensity =     6.060(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        2.307      4.10               6.060
2        3.533      3.17               6.060
Qmax(1) =
          1.000 *    1.000 *     2.307) +
          1.000 *    1.000 *     3.533) + =       5.841
Qmax(2) =
          1.000 *    0.774 *     2.307) +
          1.000 *    1.000 *     3.533) + =       5.320

Total of 2 main streams to confluence:
Flow rates before confluence point:
       2.307       3.533
Maximum flow rates at confluence using above data:
        5.841        5.320
Area of streams before confluence:
        0.482        0.738

Results of confluence:
Total flow rate =      5.841(CFS)
Time of concentration =     4.097 min.
Effective stream area after confluence  =      1.220(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      106.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   333.280(Ft.)
Downstream point/station elevation =   321.680(Ft.)
Pipe length  =    97.00(Ft.) Slope =   0.1196  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.841(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.841(CFS)
Normal flow depth in pipe =    5.81(In.)
```

```
Flow top width inside pipe =   11.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.47(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     4.20 min.
End of computations, total study area =          1.220 (Ac.)
```

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study   Date: 04/08/22

PRE DEVELOPMENT - POC2
100 YEAR - RATIONAL METHOD ANALYSIS
BY WARE MALCOMB
file:EXPOC2.rsd3

 *********   Hydrology Study Control Information **********

Program License Serial Number 6491

Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.300
24 hour precipitation(inches) = 3.900
P6/P24 =   59.0%
San Diego hydrology manual 'C' values used

++
Process from Point/Station   200.000 to Point/Station   201.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type   ]
(Neighborhod Commercial)
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Initial subarea total flow distance =   50.000(Ft.)
Highest elevation = 363.430(Ft.)
Lowest elevation = 345.520(Ft.)
Elevation difference =   17.910(Ft.) Slope = 35.820 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 35.82 %, in a development type of
 Neighborhod Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   1.69 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7900)*(100.000^.5)/(35.820^(1/3)]=   1.69
Calculated TC of   1.693 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =   6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.790
Subarea runoff =   0.124(CFS)
Total initial stream area =   0.026(Ac.)

++
Process from Point/Station   201.000 to Point/Station   202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel =   4.170(CFS)
Depth of flow =   0.150(Ft.), Average velocity =   3.094(Ft/s)
       ******* Irregular Channel Data ***********

```
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2             30.00              0.00
       3             60.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      4.170(CFS)
  '     '       flow top width =     17.984(Ft.)
  '     '    velocity=    3.094(Ft/s)
  '     '       area =      1.348(Sq.Ft)
  '     '       Froude number =     1.992

Upstream point elevation =   345.520(Ft.)
Downstream point elevation =   335.870(Ft.)
Flow length =   416.000(Ft.)
Travel time  =    2.24 min.
Time of concentration =    3.93 min.
Depth of flow =   0.150(Ft.)
Average velocity =   3.094(Ft/s)
Total irregular channel flow =     4.170(CFS)
Irregular channel normal depth above invert elev. =   0.150(Ft.)
Average velocity of channel(s) =   3.094(Ft/s)
 Adding area flow to channel
Calculated TC of    3.934 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.060(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                         ]
(Neighborhod Commercial )
Impervious value, Ai = 0.800
Sub-Area C Value = 0.790
Rainfall intensity =      6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.790  CA =      1.356
Subarea runoff =      8.091(CFS) for      1.690(Ac.)
Total runoff =      8.215(CFS)       Total area =       1.716(Ac.)
Depth of flow =   0.193(Ft.), Average velocity =   3.666(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   335.870(Ft.)
Downstream point/station elevation =   320.790(Ft.)
Pipe length  =   141.00(Ft.) Slope =   0.1070  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.215(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     8.215(CFS)
Normal flow depth in pipe =    7.43(In.)
Flow top width inside pipe =   11.65(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.07(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     4.08 min.
End of computations, total study area =           1.716 (Ac.)
```

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2012 Version 7.9

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study   Date: 10/25/22

POST DEVELOPMENT - POC1
100 YEAR - RATIONAL METHOD ANALYSIS
BY WARE MALCOMB
file:PRPOC1.rsd3

 *********   Hydrology Study Control Information **********

Program License Serial Number 6312

Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.300
24 hour precipitation(inches) = 3.900
P6/P24 =   59.0%
San Diego hydrology manual 'C' values used

++
Process from Point/Station   100.000 to Point/Station   101.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type   ]
(General Commercial   )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance =   50.000(Ft.)
Highest elevation = 363.470(Ft.)
Lowest elevation = 359.080(Ft.)
Elevation difference =   4.390(Ft.) Slope = 8.780 %
Top of Initial Area Slope adjusted by User to 11.640 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 11.64 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.22 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(100.000^.5)/(11.640^(1/3)]=   2.22
Calculated TC of   2.224 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =   6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =   0.094(CFS)
Total initial stream area =   0.019(Ac.)

++
Process from Point/Station   101.000 to Point/Station   102.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel =   4.114(CFS)
Depth of flow =   0.172(Ft.), Average velocity =   5.591(Ft/s)

```
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             25.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      4.114(CFS)
  '     '       flow top width =      8.578(Ft.)
  '     '    velocity=    5.591(Ft/s)
  '     '       area =      0.736(Sq.Ft)
  '     '       Froude number =     3.364

Upstream point elevation =   359.080(Ft.)
Downstream point elevation =   332.710(Ft.)
Flow length =   406.000(Ft.)
Travel time  =    1.21 min.
Time of concentration =    3.43 min.
Depth of flow =   0.172(Ft.)
Average velocity =   5.591(Ft/s)
Total irregular channel flow =     4.114(CFS)
Irregular channel normal depth above invert elev. =   0.172(Ft.)
Average velocity of channel(s) =   5.591(Ft/s)
 Adding area flow to channel
Calculated TC of    3.434 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.060(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      1.342
Subarea runoff =      8.040(CFS) for      1.618(Ac.)
Total runoff =      8.134(CFS)       Total area =       1.637(Ac.)
Depth of flow =   0.222(Ft.), Average velocity =   6.630(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   329.000(Ft.)
Downstream point/station elevation =   326.500(Ft.)
Pipe length  =    57.00(Ft.) Slope =   0.0439  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.134(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.134(CFS)
Normal flow depth in pipe =    8.38(In.)
Flow top width inside pipe =   14.90(In.)
Critical Depth =   13.45(In.)
Pipe flow velocity =     11.53(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     3.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      103.000
**** 6 HOUR HYDROGRAPH ****
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003
```

Time of Concentration = 3.52
Basin Area = 1.64 Acres
6 Hour Rainfall = 2.300 Inches
Runoff Coefficient = 0.820
Peak Discharge = 8.13 CFS

Time (Min)	Discharge (CFS)
0	0.000
3	0.184
6	0.185
9	0.187
12	0.188
15	0.190
18	0.191
21	0.193
24	0.194
27	0.197
30	0.198
33	0.200
36	0.201
39	0.204
42	0.205
45	0.208
48	0.209
51	0.212
54	0.214
57	0.217
60	0.218
63	0.221
66	0.223
69	0.226
72	0.228
75	0.231
78	0.233
81	0.237
84	0.239
87	0.243
90	0.245
93	0.249
96	0.251
99	0.256
102	0.258
105	0.263
108	0.265
111	0.271
114	0.273
117	0.279
120	0.282
123	0.288
126	0.291
129	0.298
132	0.301
135	0.308
138	0.312
141	0.320
144	0.324
147	0.333
150	0.337
153	0.347
156	0.352
159	0.363
162	0.369
165	0.381
168	0.388
171	0.402
174	0.409
177	0.425
180	0.434
183	0.453
186	0.463
189	0.485
192	0.497

195	0.524
198	0.539
201	0.572
204	0.591
207	0.634
210	0.658
213	0.716
216	0.749
219	0.831
222	0.881
225	1.010
228	1.095
231	1.339
234	1.525
237	2.239
240	3.155
243	8.134
246	1.796
249	1.202
252	0.940
255	0.788
258	0.685
261	0.611
264	0.555
267	0.510
270	0.473
273	0.443
276	0.417
279	0.394
282	0.375
285	0.358
288	0.342
291	0.328
294	0.316
297	0.305
300	0.294
303	0.285
306	0.276
309	0.268
312	0.260
315	0.253
318	0.247
321	0.241
324	0.235
327	0.230
330	0.224
333	0.220
336	0.215
339	0.211
342	0.207
345	0.203
348	0.199
351	0.195
354	0.192
357	0.189
360	0.186
363	0.183

++

6 - H O U R S T O R M

R u n o f f H y d r o g r a p h

Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.0	4.1	6.1	8.1
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0001	0.06	Q	|	|	|	|
0+ 2	0.0003	0.12	Q	|	|	|	|
0+ 3	0.0005	0.18	Q	|	|	|	|
0+ 4	0.0008	0.18	Q	|	|	|	|

0+ 5	0.0010	0.18	Q	|	|	|	|
0+ 6	0.0013	0.18	Q	|	|	|	|
0+ 7	0.0015	0.19	Q	|	|	|	|
0+ 8	0.0018	0.19	Q	|	|	|	|
0+ 9	0.0020	0.19	Q	|	|	|	|
0+10	0.0023	0.19	Q	|	|	|	|
0+11	0.0026	0.19	Q	|	|	|	|
0+12	0.0028	0.19	Q	|	|	|	|
0+13	0.0031	0.19	Q	|	|	|	|
0+14	0.0033	0.19	Q	|	|	|	|
0+15	0.0036	0.19	Q	|	|	|	|
0+16	0.0039	0.19	Q	|	|	|	|
0+17	0.0041	0.19	Q	|	|	|	|
0+18	0.0044	0.19	Q	|	|	|	|
0+19	0.0046	0.19	Q	|	|	|	|
0+20	0.0049	0.19	Q	|	|	|	|
0+21	0.0052	0.19	Q	|	|	|	|
0+22	0.0054	0.19	Q	|	|	|	|
0+23	0.0057	0.19	Q	|	|	|	|
0+24	0.0060	0.19	Q	|	|	|	|
0+25	0.0062	0.19	QV	|	|	|	|
0+26	0.0065	0.20	QV	|	|	|	|
0+27	0.0068	0.20	QV	|	|	|	|
0+28	0.0071	0.20	QV	|	|	|	|
0+29	0.0073	0.20	QV	|	|	|	|
0+30	0.0076	0.20	QV	|	|	|	|
0+31	0.0079	0.20	QV	|	|	|	|
0+32	0.0081	0.20	QV	|	|	|	|
0+33	0.0084	0.20	QV	|	|	|	|
0+34	0.0087	0.20	QV	|	|	|	|
0+35	0.0090	0.20	QV	|	|	|	|
0+36	0.0093	0.20	QV	|	|	|	|
0+37	0.0095	0.20	QV	|	|	|	|
0+38	0.0098	0.20	QV	|	|	|	|
0+39	0.0101	0.20	|Q	|	|	|	|
0+40	0.0104	0.20	|Q	|	|	|	|
0+41	0.0107	0.20	|Q	|	|	|	|
0+42	0.0109	0.21	|Q	|	|	|	|
0+43	0.0112	0.21	|Q	|	|	|	|
0+44	0.0115	0.21	|Q	|	|	|	|
0+45	0.0118	0.21	|Q	|	|	|	|
0+46	0.0121	0.21	|Q	|	|	|	|
0+47	0.0124	0.21	|QV	|	|	|	|
0+48	0.0127	0.21	|QV	|	|	|	|
0+49	0.0129	0.21	|QV	|	|	|	|
0+50	0.0132	0.21	|QV	|	|	|	|
0+51	0.0135	0.21	|QV	|	|	|	|
0+52	0.0138	0.21	|QV	|	|	|	|
0+53	0.0141	0.21	|QV	|	|	|	|
0+54	0.0144	0.21	|QV	|	|	|	|
0+55	0.0147	0.21	|QV	|	|	|	|
0+56	0.0150	0.22	|QV	|	|	|	|
0+57	0.0153	0.22	|QV	|	|	|	|
0+58	0.0156	0.22	|QV	|	|	|	|
0+59	0.0159	0.22	|QV	|	|	|	|
1+ 0	0.0162	0.22	|QV	|	|	|	|
1+ 1	0.0165	0.22	|QV	|	|	|	|
1+ 2	0.0168	0.22	|QV	|	|	|	|
1+ 3	0.0171	0.22	|QV	|	|	|	|
1+ 4	0.0174	0.22	|QV	|	|	|	|
1+ 5	0.0177	0.22	|QV	|	|	|	|
1+ 6	0.0180	0.22	|QV	|	|	|	|
1+ 7	0.0183	0.22	|Q V	|	|	|	|
1+ 8	0.0186	0.22	|Q V	|	|	|	|
1+ 9	0.0190	0.23	|Q V	|	|	|	|
1+10	0.0193	0.23	|Q V	|	|	|	|
1+11	0.0196	0.23	|Q V	|	|	|	|
1+12	0.0199	0.23	|Q V	|	|	|	|
1+13	0.0202	0.23	|Q V	|	|	|	|
1+14	0.0205	0.23	|Q V	|	|	|	|
1+15	0.0208	0.23	|Q V	|	|	|	|

1+16	0.0212	0.23	|Q V	|	|	|	|
1+17	0.0215	0.23	|Q V	|	|	|	|
1+18	0.0218	0.23	|Q V	|	|	|	|
1+19	0.0221	0.23	|Q V	|	|	|	|
1+20	0.0225	0.24	|Q V	|	|	|	|
1+21	0.0228	0.24	|Q V	|	|	|	|
1+22	0.0231	0.24	|Q V	|	|	|	|
1+23	0.0234	0.24	|Q V	|	|	|	|
1+24	0.0238	0.24	|Q V	|	|	|	|
1+25	0.0241	0.24	|Q V	|	|	|	|
1+26	0.0244	0.24	|Q V	|	|	|	|
1+27	0.0248	0.24	|Q V	|	|	|	|
1+28	0.0251	0.24	|Q V	|	|	|	|
1+29	0.0254	0.24	|Q V	|	|	|	|
1+30	0.0258	0.24	|Q V	|	|	|	|
1+31	0.0261	0.25	|Q V	|	|	|	|
1+32	0.0264	0.25	|Q V	|	|	|	|
1+33	0.0268	0.25	|Q V	|	|	|	|
1+34	0.0271	0.25	|Q V	|	|	|	|
1+35	0.0275	0.25	|Q V	|	|	|	|
1+36	0.0278	0.25	|Q V	|	|	|	|
1+37	0.0282	0.25	|Q V	|	|	|	|
1+38	0.0285	0.25	|Q V	|	|	|	|
1+39	0.0289	0.26	|Q V	|	|	|	|
1+40	0.0292	0.26	|Q V	|	|	|	|
1+41	0.0296	0.26	|Q V	|	|	|	|
1+42	0.0299	0.26	|Q V	|	|	|	|
1+43	0.0303	0.26	|Q V	|	|	|	|
1+44	0.0307	0.26	|Q V	|	|	|	|
1+45	0.0310	0.26	|Q V	|	|	|	|
1+46	0.0314	0.26	|Q V	|	|	|	|
1+47	0.0317	0.26	|Q V	|	|	|	|
1+48	0.0321	0.27	|Q V	|	|	|	|
1+49	0.0325	0.27	|Q V	|	|	|	|
1+50	0.0328	0.27	|Q V	|	|	|	|
1+51	0.0332	0.27	|Q V	|	|	|	|
1+52	0.0336	0.27	|Q V	|	|	|	|
1+53	0.0340	0.27	|Q V	|	|	|	|
1+54	0.0343	0.27	|Q V	|	|	|	|
1+55	0.0347	0.28	|Q V	|	|	|	|
1+56	0.0351	0.28	|Q V	|	|	|	|
1+57	0.0355	0.28	|Q V	|	|	|	|
1+58	0.0359	0.28	|Q V	|	|	|	|
1+59	0.0363	0.28	|Q V	|	|	|	|
2+ 0	0.0367	0.28	|Q V	|	|	|	|
2+ 1	0.0370	0.28	|Q V	|	|	|	|
2+ 2	0.0374	0.29	|Q V	|	|	|	|
2+ 3	0.0378	0.29	|Q V	|	|	|	|
2+ 4	0.0382	0.29	|Q V	|	|	|	|
2+ 5	0.0386	0.29	|Q V	|	|	|	|
2+ 6	0.0390	0.29	|Q V	|	|	|	|
2+ 7	0.0394	0.29	|Q V	|	|	|	|
2+ 8	0.0398	0.30	|Q V	|	|	|	|
2+ 9	0.0403	0.30	|Q V	|	|	|	|
2+10	0.0407	0.30	|Q V	|	|	|	|
2+11	0.0411	0.30	|Q V	|	|	|	|
2+12	0.0415	0.30	|Q V	|	|	|	|
2+13	0.0419	0.30	|Q V	|	|	|	|
2+14	0.0423	0.31	|Q V	|	|	|	|
2+15	0.0428	0.31	|Q V	|	|	|	|
2+16	0.0432	0.31	|Q V	|	|	|	|
2+17	0.0436	0.31	|Q V	|	|	|	|
2+18	0.0440	0.31	|Q V	|	|	|	|
2+19	0.0445	0.31	|Q V	|	|	|	|
2+20	0.0449	0.32	|Q V	|	|	|	|
2+21	0.0453	0.32	|Q V	|	|	|	|
2+22	0.0458	0.32	|Q V	|	|	|	|
2+23	0.0462	0.32	|Q V	|	|	|	|
2+24	0.0467	0.32	|Q V	|	|	|	|
2+25	0.0471	0.33	|Q V	|	|	|	|
2+26	0.0476	0.33	|Q V	|	|	|	|

2+27	0.0480	0.33	|Q	V |	|	|	|
2+28	0.0485	0.33	|Q	V |	|	|	|
2+29	0.0490	0.34	|Q	V |	|	|	|
2+30	0.0494	0.34	|Q	V |	|	|	|
2+31	0.0499	0.34	|Q	V |	|	|	|
2+32	0.0504	0.34	|Q	V |	|	|	|
2+33	0.0509	0.35	|Q	V |	|	|	|
2+34	0.0513	0.35	|Q	V |	|	|	|
2+35	0.0518	0.35	|Q	V |	|	|	|
2+36	0.0523	0.35	|Q	V |	|	|	|
2+37	0.0528	0.36	|Q	V |	|	|	|
2+38	0.0533	0.36	|Q	V |	|	|	|
2+39	0.0538	0.36	|Q	V |	|	|	|
2+40	0.0543	0.37	|Q	V |	|	|	|
2+41	0.0548	0.37	|Q	V|	|	|	|
2+42	0.0553	0.37	|Q	V|	|	|	|
2+43	0.0558	0.37	|Q	V|	|	|	|
2+44	0.0563	0.38	|Q	V|	|	|	|
2+45	0.0569	0.38	|Q	V|	|	|	|
2+46	0.0574	0.38	|Q	V|	|	|	|
2+47	0.0579	0.39	|Q	V|	|	|	|
2+48	0.0585	0.39	|Q	V|	|	|	|
2+49	0.0590	0.39	|Q	V|	|	|	|
2+50	0.0595	0.40	|Q	V|	|	|	|
2+51	0.0601	0.40	|Q	V|	|	|	|
2+52	0.0607	0.40	|Q	V|	|	|	|
2+53	0.0612	0.41	|Q	V	|	|	|
2+54	0.0618	0.41	| Q	V	|	|	|
2+55	0.0623	0.41	| Q	V	|	|	|
2+56	0.0629	0.42	| Q	V	|	|	|
2+57	0.0635	0.43	| Q	V	|	|	|
2+58	0.0641	0.43	| Q	V	|	|	|
2+59	0.0647	0.43	| Q	V	|	|	|
3+ 0	0.0653	0.43	| Q	V	|	|	|
3+ 1	0.0659	0.44	| Q	V	|	|	|
3+ 2	0.0665	0.45	| Q	V	|	|	|
3+ 3	0.0671	0.45	| Q	|V	|	|	|
3+ 4	0.0678	0.46	| Q	|V	|	|	|
3+ 5	0.0684	0.46	| Q	|V	|	|	|
3+ 6	0.0690	0.46	| Q	|V	|	|	|
3+ 7	0.0697	0.47	| Q	|V	|	|	|
3+ 8	0.0703	0.48	| Q	|V	|	|	|
3+ 9	0.0710	0.48	| Q	|V	|	|	|
3+10	0.0717	0.49	| Q	|V	|	|	|
3+11	0.0724	0.49	| Q	|V	|	|	|
3+12	0.0730	0.50	| Q	| V	|	|	|
3+13	0.0737	0.51	| Q	| V	|	|	|
3+14	0.0744	0.52	| Q	| V	|	|	|
3+15	0.0752	0.52	| Q	| V	|	|	|
3+16	0.0759	0.53	| Q	| V	|	|	|
3+17	0.0766	0.53	| Q	| V	|	|	|
3+18	0.0774	0.54	| Q	| V	|	|	|
3+19	0.0781	0.55	| Q	| V	|	|	|
3+20	0.0789	0.56	| Q	| V	|	|	|
3+21	0.0797	0.57	| Q	| V	|	|	|
3+22	0.0805	0.58	| Q	| V	|	|	|
3+23	0.0813	0.58	| Q	| V	|	|	|
3+24	0.0821	0.59	| Q	| V	|	|	|
3+25	0.0829	0.61	| Q	| V	|	|	|
3+26	0.0838	0.62	| Q	| V	|	|	|
3+27	0.0847	0.63	| Q	| V	|	|	|
3+28	0.0856	0.64	| Q	| V	|	|	|
3+29	0.0865	0.65	| Q	| V	|	|	|
3+30	0.0874	0.66	| Q	| V	|	|	|
3+31	0.0883	0.68	| Q	| V	|	|	|
3+32	0.0893	0.70	| Q	| V	|	|	|
3+33	0.0902	0.72	| Q	| V	|	|	|
3+34	0.0912	0.73	| Q	| V	|	|	|
3+35	0.0923	0.74	| Q	| V	|	|	|
3+36	0.0933	0.75	| Q	| V	|	|	|
3+37	0.0944	0.78	| Q	| V	|	|	|

3+38	0.0955	0.80	Q	V			
3+39	0.0966	0.83	Q	V			
3+40	0.0978	0.85	Q	V			
3+41	0.0990	0.86	Q	V			
3+42	0.1002	0.88	Q	V			
3+43	0.1015	0.92	Q	V			
3+44	0.1028	0.97	Q	V			
3+45	0.1042	1.01	Q	V			
3+46	0.1056	1.04	Q	V			
3+47	0.1071	1.07	Q	V			
3+48	0.1086	1.10	Q	V			
3+49	0.1102	1.18	Q	V			
3+50	0.1119	1.26	Q	V			
3+51	0.1138	1.34	Q	V			
3+52	0.1157	1.40	Q	V			
3+53	0.1177	1.46	Q	V			
3+54	0.1198	1.53	Q	V			
3+55	0.1223	1.76	Q	V			
3+56	0.1250	2.00	Q	V			
3+57	0.1281	2.24	Q	V			
3+58	0.1316	2.54	Q	V			
3+59	0.1355	2.85	Q	V			
4+ 0	0.1399	3.16	Q	V			
4+ 1	0.1465	4.81	Q	V			
4+ 2	0.1554	6.47	Q	V			
4+ 3	0.1666	8.13	Q	V			
4+ 4	0.1749	6.02	Q	V			
4+ 5	0.1803	3.91	Q	V			
4+ 6	0.1828	1.80	Q	V			
4+ 7	0.1850	1.60	Q	V			
4+ 8	0.1869	1.40	Q	V			
4+ 9	0.1886	1.20	Q	V			
4+10	0.1901	1.11	Q	V			
4+11	0.1915	1.03	Q	V			
4+12	0.1928	0.94	Q	V			
4+13	0.1940	0.89	Q	V			
4+14	0.1952	0.84	Q	V			
4+15	0.1963	0.79	Q	V			
4+16	0.1973	0.75	Q	V			
4+17	0.1983	0.72	Q	V			
4+18	0.1993	0.69	Q	V			
4+19	0.2002	0.66	Q	V			
4+20	0.2010	0.64	Q	V			
4+21	0.2019	0.61	Q	V			
4+22	0.2027	0.59	Q	V			
4+23	0.2035	0.57	Q	V			
4+24	0.2043	0.55	Q	V			
4+25	0.2050	0.54	Q	V			
4+26	0.2057	0.53	Q	V			
4+27	0.2064	0.51	Q	V			
4+28	0.2071	0.50	Q	V			
4+29	0.2078	0.49	Q	V			
4+30	0.2084	0.47	Q	V			
4+31	0.2091	0.46	Q	V			
4+32	0.2097	0.45	Q	V			
4+33	0.2103	0.44	Q	V			
4+34	0.2109	0.43	Q	V			
4+35	0.2115	0.43	Q	V			
4+36	0.2121	0.42	Q	V			
4+37	0.2126	0.41	Q	V			
4+38	0.2132	0.40	Q	V			
4+39	0.2137	0.39	Q	V			
4+40	0.2143	0.39	Q	V			
4+41	0.2148	0.38	Q	V			
4+42	0.2153	0.37	Q	V			
4+43	0.2158	0.37	Q	V			
4+44	0.2163	0.36	Q	V			
4+45	0.2168	0.36	Q	V			
4+46	0.2173	0.35	Q	V			
4+47	0.2178	0.35	Q	V			
4+48	0.2182	0.34	Q	V			

4+49	0.2187	0.34	|Q	|	|	|	V |
4+50	0.2192	0.33	|Q	|	|	|	V |
4+51	0.2196	0.33	|Q	|	|	|	V |
4+52	0.2201	0.32	|Q	|	|	|	V |
4+53	0.2205	0.32	|Q	|	|	|	V |
4+54	0.2209	0.32	|Q	|	|	|	V |
4+55	0.2214	0.31	|Q	|	|	|	V |
4+56	0.2218	0.31	|Q	|	|	|	V |
4+57	0.2222	0.30	|Q	|	|	|	V |
4+58	0.2226	0.30	|Q	|	|	|	V |
4+59	0.2230	0.30	|Q	|	|	|	V |
5+ 0	0.2234	0.29	|Q	|	|	|	V |
5+ 1	0.2238	0.29	|Q	|	|	|	V |
5+ 2	0.2242	0.29	|Q	|	|	|	V |
5+ 3	0.2246	0.28	|Q	|	|	|	V |
5+ 4	0.2250	0.28	|Q	|	|	|	V |
5+ 5	0.2254	0.28	|Q	|	|	|	V |
5+ 6	0.2258	0.28	|Q	|	|	|	V |
5+ 7	0.2262	0.27	|Q	|	|	|	V |
5+ 8	0.2265	0.27	|Q	|	|	|	V |
5+ 9	0.2269	0.27	|Q	|	|	|	V |
5+10	0.2273	0.27	|Q	|	|	|	V |
5+11	0.2276	0.26	|Q	|	|	|	V |
5+12	0.2280	0.26	|Q	|	|	|	V |
5+13	0.2283	0.26	|Q	|	|	|	V |
5+14	0.2287	0.26	|Q	|	|	|	V |
5+15	0.2290	0.25	|Q	|	|	|	V |
5+16	0.2294	0.25	|Q	|	|	|	V |
5+17	0.2297	0.25	|Q	|	|	|	V |
5+18	0.2301	0.25	|Q	|	|	|	V |
5+19	0.2304	0.24	|Q	|	|	|	V |
5+20	0.2307	0.24	|Q	|	|	|	V |
5+21	0.2311	0.24	|Q	|	|	|	V |
5+22	0.2314	0.24	|Q	|	|	|	V |
5+23	0.2317	0.24	|Q	|	|	|	V |
5+24	0.2320	0.23	|Q	|	|	|	V |
5+25	0.2324	0.23	|Q	|	|	|	V |
5+26	0.2327	0.23	|Q	|	|	|	V |
5+27	0.2330	0.23	|Q	|	|	|	V |
5+28	0.2333	0.23	|Q	|	|	|	V |
5+29	0.2336	0.23	|Q	|	|	|	V |
5+30	0.2339	0.22	|Q	|	|	|	V |
5+31	0.2342	0.22	|Q	|	|	|	V |
5+32	0.2345	0.22	|Q	|	|	|	V |
5+33	0.2349	0.22	|Q	|	|	|	V |
5+34	0.2352	0.22	|Q	|	|	|	V |
5+35	0.2355	0.22	|Q	|	|	|	V |
5+36	0.2357	0.22	|Q	|	|	|	V |
5+37	0.2360	0.21	|Q	|	|	|	V |
5+38	0.2363	0.21	|Q	|	|	|	V |
5+39	0.2366	0.21	|Q	|	|	|	V |
5+40	0.2369	0.21	|Q	|	|	|	V |
5+41	0.2372	0.21	|Q	|	|	|	V|
5+42	0.2375	0.21	|Q	|	|	|	V|
5+43	0.2378	0.21	|Q	|	|	|	V|
5+44	0.2380	0.20	|Q	|	|	|	V|
5+45	0.2383	0.20	Q	|	|	|	V|
5+46	0.2386	0.20	Q	|	|	|	V|
5+47	0.2389	0.20	Q	|	|	|	V|
5+48	0.2392	0.20	Q	|	|	|	V|
5+49	0.2394	0.20	Q	|	|	|	V|
5+50	0.2397	0.20	Q	|	|	|	V|
5+51	0.2400	0.20	Q	|	|	|	V|
5+52	0.2402	0.19	Q	|	|	|	V|
5+53	0.2405	0.19	Q	|	|	|	V|
5+54	0.2408	0.19	Q	|	|	|	V|
5+55	0.2410	0.19	Q	|	|	|	V|
5+56	0.2413	0.19	Q	|	|	|	V|
5+57	0.2415	0.19	Q	|	|	|	V|
5+58	0.2418	0.19	Q	|	|	|	V|
5+59	0.2421	0.19	Q	|	|	|	V|

```
    6+ 0       0.2423      0.19  Q         |         |         |        V|
    6+ 1       0.2426      0.18  Q         |         |         |        V|
    6+ 2       0.2428      0.18  Q         |         |         |        V|
    6+ 3       0.2431      0.18  Q         |         |         |         V
-------------------------------------------------------------------------

        End of computations, total study area =          1.637 (Ac.)
```

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2012 Version 7.9

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
        Rational Hydrology Study   Date: 10/25/22

POST DEVELOPMENT - POC2
100 YEAR - RATIONAL METHOD ANALYSIS
BY WARE MALCOMB
file:PRPOC2.rsd3

 *********   Hydrology Study Control Information **********

Program License Serial Number 6312

Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.300
24 hour precipitation(inches) = 3.900
P6/P24 =   59.0%
San Diego hydrology manual 'C' values used

++
Process from Point/Station   200.000 to Point/Station   201.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type   ]
(General Commercial   )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance =   24.000(Ft.)
Highest elevation = 362.030(Ft.)
Lowest elevation = 356.710(Ft.)
Elevation difference =   5.320(Ft.) Slope = 22.167 %
Top of Initial Area Slope adjusted by User to 19.880 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 19.88 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   1.86 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(100.000^.5)/(19.880^(1/3)]=   1.86
Calculated TC of   1.860 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =   6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =   0.055(CFS)
Total initial stream area =   0.011(Ac.)

++
Process from Point/Station   201.000 to Point/Station   202.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____
Estimated mean flow rate at midpoint of channel =   1.948(CFS)
Depth of flow =   0.136(Ft.), Average velocity =   4.230(Ft/s)

```
       ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             25.00              0.50
Manning's 'N' friction factor =   0.013
-----------------------------------------------------------------
Sub-Channel flow  =      1.948(CFS)
  '     '       flow top width =      6.786(Ft.)
  '     '    velocity=    4.230(Ft/s)
  '     '       area =      0.461(Sq.Ft)
  '     '       Froude number =     2.861

Upstream point elevation =   356.710(Ft.)
Downstream point elevation =   330.900(Ft.)
Flow length =   508.000(Ft.)
Travel time  =    2.00 min.
Time of concentration =    3.86 min.
Depth of flow =   0.136(Ft.)
Average velocity =   4.230(Ft/s)
Total irregular channel flow =     1.948(CFS)
Irregular channel normal depth above invert elev. =   0.136(Ft.)
Average velocity of channel(s) =   4.230(Ft/s)
 Adding area flow to channel
Calculated TC of    3.862 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.060(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      0.634
Subarea runoff =      3.786(CFS) for      0.762(Ac.)
Total runoff =      3.841(CFS)       Total area =       0.773(Ac.)
Depth of flow =   0.175(Ft.), Average velocity =   5.012(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   328.000(Ft.)
Downstream point/station elevation =   325.000(Ft.)
Pipe length  =     5.00(Ft.) Slope =   0.6000  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.841(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     3.841(CFS)
Normal flow depth in pipe =    4.38(In.)
Flow top width inside pipe =    5.32(In.)
Critical depth could not be calculated.
Pipe flow velocity =     24.99(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =     3.87 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.773(Ac.)
Runoff from this stream =      3.841(CFS)
```

```
Time of concentration =    3.87 min.
Rainfall intensity =     6.060(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                        ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Initial subarea total flow distance  =   50.000(Ft.)
Highest elevation =  345.000(Ft.)
Lowest elevation =  344.000(Ft.)
Elevation difference =    1.000(Ft.) Slope =  2.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 75.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration =   3.46 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8200)*(  75.000^.5)/(   2.000^(1/3)]=   3.46
Calculated TC of    3.464 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.820
Subarea runoff =      0.045(CFS)
Total initial stream area =        0.009(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.755(CFS)
Depth of flow =   0.162(Ft.), Average velocity =   4.217(Ft/s)
       ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
       1              0.00              0.50
       2              0.00              0.00
       3             25.00              0.50
Manning's 'N' friction factor =   0.013
------------------------------------------------------------------
Sub-Channel flow  =      2.755(CFS)
  '     '       flow top width =      8.083(Ft.)
  '     '    velocity=    4.217(Ft/s)
  '     '       area =      0.653(Sq.Ft)
  '     '       Froude number =     2.614

Upstream point elevation =   344.000(Ft.)
Downstream point elevation =   331.280(Ft.)
Flow length =   318.000(Ft.)
Travel time  =    1.26 min.
Time of concentration =    4.72 min.
Depth of flow =   0.162(Ft.)
Average velocity =   4.217(Ft/s)
Total irregular channel flow =     2.755(CFS)
Irregular channel normal depth above invert elev. =   0.162(Ft.)
Average velocity of channel(s) =   4.217(Ft/s)
 Adding area flow to channel
Calculated TC of    4.721 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
```

```
Rainfall intensity (I) =      6.060(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[COMMERCIAL area type                         ]
(General Commercial    )
Impervious value, Ai = 0.850
Sub-Area C Value = 0.820
Rainfall intensity =      6.060(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.820  CA =      0.902
Subarea runoff =      5.421(CFS) for      1.091(Ac.)
Total runoff =      5.466(CFS)        Total area =       1.100(Ac.)
Depth of flow =   0.209(Ft.), Average velocity =   5.005(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   328.000(Ft.)
Downstream point/station elevation =   325.000(Ft.)
Pipe length  =   145.00(Ft.) Slope =   0.0207  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.466(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.466(CFS)
Normal flow depth in pipe =    8.27(In.)
Flow top width inside pipe =   14.92(In.)
Critical Depth =   11.37(In.)
Pipe flow velocity =      7.88(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =     5.03 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.100(Ac.)
Runoff from this stream =      5.466(CFS)
Time of concentration =    5.03 min.
Rainfall intensity =     6.038(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        3.841      3.87               6.060
2        5.466      5.03               6.038
Qmax(1) =
           1.000 *    1.000 *     3.841) +
           1.000 *    0.769 *     5.466) + =       8.044
Qmax(2) =
           0.996 *    1.000 *     3.841) +
           1.000 *    1.000 *     5.466) + =       9.293

Total of 2 main streams to confluence:
Flow rates before confluence point:
       3.841       5.466
Maximum flow rates at confluence using above data:
        8.044        9.293
Area of streams before confluence:
        0.773        1.100


Results of confluence:
Total flow rate =      9.293(CFS)
```

Time of concentration = 5.028 min.
Effective stream area after confluence = 1.873(Ac.)

++
Process from Point/Station 203.000 to Point/Station 203.000
**** 6 HOUR HYDROGRAPH ****
_____
++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 5.03
Basin Area = 1.87 Acres
6 Hour Rainfall = 2.300 Inches
Runoff Coefficient = 0.820
Peak Discharge = 9.29 CFS

Time (Min)	Discharge (CFS)
0	0.000
5	0.210
10	0.212
15	0.216
20	0.218
25	0.223
30	0.225
35	0.229
40	0.232
45	0.237
50	0.239
55	0.245
60	0.248
65	0.254
70	0.257
75	0.263
80	0.267
85	0.274
90	0.278
95	0.286
100	0.290
105	0.299
110	0.304
115	0.314
120	0.319
125	0.330
130	0.337
135	0.350
140	0.357
145	0.372
150	0.381
155	0.399
160	0.409
165	0.431
170	0.444
175	0.471
180	0.486
185	0.522
190	0.542
195	0.589
200	0.617
205	0.684
210	0.725
215	0.831
220	0.902
225	1.102
230	1.255
235	1.843
240	2.597
245	9.293
250	1.478
255	0.989
260	0.774

265	0.648
270	0.564
275	0.503
280	0.457
285	0.420
290	0.390
295	0.364
300	0.343
305	0.325
310	0.308
315	0.294
320	0.282
325	0.270
330	0.260
335	0.251
340	0.242
345	0.234
350	0.227
355	0.220
360	0.214
365	0.209

6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 1 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.3	4.6	7.0	9.3
0+ 0	0.0000	0.00	Q	|	|	|	|
0+ 1	0.0001	0.04	Q	|	|	|	|
0+ 2	0.0002	0.08	Q	|	|	|	|
0+ 3	0.0003	0.13	Q	|	|	|	|
0+ 4	0.0006	0.17	Q	|	|	|	|
0+ 5	0.0009	0.21	Q	|	|	|	|
0+ 6	0.0012	0.21	Q	|	|	|	|
0+ 7	0.0015	0.21	Q	|	|	|	|
0+ 8	0.0017	0.21	Q	|	|	|	|
0+ 9	0.0020	0.21	Q	|	|	|	|
0+10	0.0023	0.21	Q	|	|	|	|
0+11	0.0026	0.21	Q	|	|	|	|
0+12	0.0029	0.21	Q	|	|	|	|
0+13	0.0032	0.21	Q	|	|	|	|
0+14	0.0035	0.22	Q	|	|	|	|
0+15	0.0038	0.22	Q	|	|	|	|
0+16	0.0041	0.22	Q	|	|	|	|
0+17	0.0044	0.22	Q	|	|	|	|
0+18	0.0047	0.22	Q	|	|	|	|
0+19	0.0050	0.22	Q	|	|	|	|
0+20	0.0053	0.22	Q	|	|	|	|
0+21	0.0056	0.22	Q	|	|	|	|
0+22	0.0059	0.22	Q	|	|	|	|
0+23	0.0062	0.22	Q	|	|	|	|
0+24	0.0065	0.22	Q	|	|	|	|
0+25	0.0068	0.22	Q	|	|	|	|
0+26	0.0071	0.22	Q	|	|	|	|
0+27	0.0074	0.22	QV	|	|	|	|
0+28	0.0077	0.22	QV	|	|	|	|
0+29	0.0081	0.22	QV	|	|	|	|
0+30	0.0084	0.22	QV	|	|	|	|
0+31	0.0087	0.23	QV	|	|	|	|
0+32	0.0090	0.23	QV	|	|	|	|
0+33	0.0093	0.23	QV	|	|	|	|
0+34	0.0096	0.23	QV	|	|	|	|
0+35	0.0099	0.23	QV	|	|	|	|
0+36	0.0103	0.23	QV	|	|	|	|
0+37	0.0106	0.23	QV	|	|	|	|
0+38	0.0109	0.23	QV	|	|	|	|
0+39	0.0112	0.23	QV	|	|	|	|
0+40	0.0115	0.23	QV	|	|	|	|

0+41	0.0118	0.23	|Q	|	|	|	|
0+42	0.0122	0.23	|Q	|	|	|	|
0+43	0.0125	0.23	|Q	|	|	|	|
0+44	0.0128	0.24	|Q	|	|	|	|
0+45	0.0131	0.24	|Q	|	|	|	|
0+46	0.0135	0.24	|Q	|	|	|	|
0+47	0.0138	0.24	|Q	|	|	|	|
0+48	0.0141	0.24	|Q	|	|	|	|
0+49	0.0145	0.24	|Q	|	|	|	|
0+50	0.0148	0.24	|QV	|	|	|	|
0+51	0.0151	0.24	|QV	|	|	|	|
0+52	0.0154	0.24	|QV	|	|	|	|
0+53	0.0158	0.24	|QV	|	|	|	|
0+54	0.0161	0.24	|QV	|	|	|	|
0+55	0.0165	0.24	|QV	|	|	|	|
0+56	0.0168	0.25	|QV	|	|	|	|
0+57	0.0171	0.25	|QV	|	|	|	|
0+58	0.0175	0.25	|QV	|	|	|	|
0+59	0.0178	0.25	|QV	|	|	|	|
1+ 0	0.0182	0.25	|QV	|	|	|	|
1+ 1	0.0185	0.25	|QV	|	|	|	|
1+ 2	0.0188	0.25	|QV	|	|	|	|
1+ 3	0.0192	0.25	|QV	|	|	|	|
1+ 4	0.0195	0.25	|QV	|	|	|	|
1+ 5	0.0199	0.25	|QV	|	|	|	|
1+ 6	0.0202	0.25	|QV	|	|	|	|
1+ 7	0.0206	0.25	|QV	|	|	|	|
1+ 8	0.0209	0.26	|QV	|	|	|	|
1+ 9	0.0213	0.26	|QV	|	|	|	|
1+10	0.0216	0.26	|QV	|	|	|	|
1+11	0.0220	0.26	|Q V	|	|	|	|
1+12	0.0224	0.26	|Q V	|	|	|	|
1+13	0.0227	0.26	|Q V	|	|	|	|
1+14	0.0231	0.26	|Q V	|	|	|	|
1+15	0.0234	0.26	|Q V	|	|	|	|
1+16	0.0238	0.26	|Q V	|	|	|	|
1+17	0.0242	0.26	|Q V	|	|	|	|
1+18	0.0245	0.27	|Q V	|	|	|	|
1+19	0.0249	0.27	|Q V	|	|	|	|
1+20	0.0253	0.27	|Q V	|	|	|	|
1+21	0.0256	0.27	|Q V	|	|	|	|
1+22	0.0260	0.27	|Q V	|	|	|	|
1+23	0.0264	0.27	|Q V	|	|	|	|
1+24	0.0268	0.27	|Q V	|	|	|	|
1+25	0.0271	0.27	|Q V	|	|	|	|
1+26	0.0275	0.27	|Q V	|	|	|	|
1+27	0.0279	0.28	|Q V	|	|	|	|
1+28	0.0283	0.28	|Q V	|	|	|	|
1+29	0.0287	0.28	|Q V	|	|	|	|
1+30	0.0290	0.28	|Q V	|	|	|	|
1+31	0.0294	0.28	|Q V	|	|	|	|
1+32	0.0298	0.28	|Q V	|	|	|	|
1+33	0.0302	0.28	|Q V	|	|	|	|
1+34	0.0306	0.28	|Q V	|	|	|	|
1+35	0.0310	0.29	|Q V	|	|	|	|
1+36	0.0314	0.29	|Q V	|	|	|	|
1+37	0.0318	0.29	|Q V	|	|	|	|
1+38	0.0322	0.29	|Q V	|	|	|	|
1+39	0.0326	0.29	|Q V	|	|	|	|
1+40	0.0330	0.29	|Q V	|	|	|	|
1+41	0.0334	0.29	|Q V	|	|	|	|
1+42	0.0338	0.29	|Q V	|	|	|	|
1+43	0.0342	0.30	|Q V	|	|	|	|
1+44	0.0346	0.30	|Q V	|	|	|	|
1+45	0.0350	0.30	|Q V	|	|	|	|
1+46	0.0354	0.30	|Q V	|	|	|	|
1+47	0.0358	0.30	|Q V	|	|	|	|
1+48	0.0362	0.30	|Q V	|	|	|	|
1+49	0.0367	0.30	|Q V	|	|	|	|
1+50	0.0371	0.30	|Q V	|	|	|	|
1+51	0.0375	0.31	|Q V	|	|	|	|

1+52	0.0379	0.31	|Q V	|	|	|
1+53	0.0383	0.31	|Q V	|	|	|
1+54	0.0388	0.31	|Q V	|	|	|
1+55	0.0392	0.31	|Q V	|	|	|
1+56	0.0396	0.31	|Q V	|	|	|
1+57	0.0401	0.32	|Q V	|	|	|
1+58	0.0405	0.32	|Q V	|	|	|
1+59	0.0410	0.32	|Q V	|	|	|
2+ 0	0.0414	0.32	|Q V	|	|	|
2+ 1	0.0418	0.32	|Q V	|	|	|
2+ 2	0.0423	0.32	|Q V	|	|	|
2+ 3	0.0427	0.33	|Q V	|	|	|
2+ 4	0.0432	0.33	|Q V	|	|	|
2+ 5	0.0436	0.33	|Q V	|	|	|
2+ 6	0.0441	0.33	|Q V	|	|	|
2+ 7	0.0446	0.33	|Q V	|	|	|
2+ 8	0.0450	0.33	|Q V	|	|	|
2+ 9	0.0455	0.34	|Q V	|	|	|
2+10	0.0459	0.34	|Q V	|	|	|
2+11	0.0464	0.34	|Q V	|	|	|
2+12	0.0469	0.34	|Q V	|	|	|
2+13	0.0474	0.34	|Q V	|	|	|
2+14	0.0478	0.35	|Q V	|	|	|
2+15	0.0483	0.35	|Q V	|	|	|
2+16	0.0488	0.35	|Q V	|	|	|
2+17	0.0493	0.35	|Q V	|	|	|
2+18	0.0498	0.35	|Q V	|	|	|
2+19	0.0503	0.36	|Q V	|	|	|
2+20	0.0507	0.36	|Q V	|	|	|
2+21	0.0512	0.36	|Q V	|	|	|
2+22	0.0517	0.36	|Q V	|	|	|
2+23	0.0523	0.37	|Q V	|	|	|
2+24	0.0528	0.37	|Q V	|	|	|
2+25	0.0533	0.37	|Q V	|	|	|
2+26	0.0538	0.37	|Q V	|	|	|
2+27	0.0543	0.38	|Q V	|	|	|
2+28	0.0548	0.38	|Q V	|	|	|
2+29	0.0553	0.38	|Q V	|	|	|
2+30	0.0559	0.38	|Q V	|	|	|
2+31	0.0564	0.38	|Q V	|	|	|
2+32	0.0569	0.39	|Q V	|	|	|
2+33	0.0575	0.39	|Q V	|	|	|
2+34	0.0580	0.40	|Q V	|	|	|
2+35	0.0586	0.40	|Q V	|	|	|
2+36	0.0591	0.40	|Q V	|	|	|
2+37	0.0597	0.40	|Q V	|	|	|
2+38	0.0602	0.41	|Q V	|	|	|
2+39	0.0608	0.41	|Q V	|	|	|
2+40	0.0614	0.41	|Q V	|	|	|
2+41	0.0619	0.41	|Q V	|	|	|
2+42	0.0625	0.42	|Q V	|	|	|
2+43	0.0631	0.42	|Q V	|	|	|
2+44	0.0637	0.43	|Q V	|	|	|
2+45	0.0643	0.43	|Q V	|	|	|
2+46	0.0649	0.43	|Q V	|	|	|
2+47	0.0655	0.44	|Q V	|	|	|
2+48	0.0661	0.44	|Q V|	|	|	|
2+49	0.0667	0.44	|Q V|	|	|	|
2+50	0.0673	0.44	|Q V|	|	|	|
2+51	0.0679	0.45	|Q V|	|	|	|
2+52	0.0685	0.45	|Q V|	|	|	|
2+53	0.0692	0.46	|Q V|	|	|	|
2+54	0.0698	0.47	| Q V|	|	|	|
2+55	0.0705	0.47	| Q V|	|	|	|
2+56	0.0711	0.47	| Q V|	|	|	|
2+57	0.0718	0.48	| Q V|	|	|	|
2+58	0.0724	0.48	| Q V|	|	|	|
2+59	0.0731	0.48	| Q V|	|	|	|
3+ 0	0.0738	0.49	| Q V	|	|	|
3+ 1	0.0744	0.49	| Q V	|	|	|
3+ 2	0.0751	0.50	| Q V	|	|	|

```
3+ 3       0.0758      0.51  | Q       V         |         |         |
3+ 4       0.0765      0.51  | Q       V         |         |         |
3+ 5       0.0773      0.52  | Q       V         |         |         |
3+ 6       0.0780      0.53  | Q       V         |         |         |
3+ 7       0.0787      0.53  | Q       V         |         |         |
3+ 8       0.0794      0.53  | Q       V         |         |         |
3+ 9       0.0802      0.54  | Q       V         |         |         |
3+10       0.0809      0.54  | Q       |V        |         |         |
3+11       0.0817      0.55  | Q       |V        |         |         |
3+12       0.0825      0.56  | Q       |V        |         |         |
3+13       0.0833      0.57  | Q       |V        |         |         |
3+14       0.0841      0.58  | Q       |V        |         |         |
3+15       0.0849      0.59  | Q       |V        |         |         |
3+16       0.0857      0.59  | Q       |V        |         |         |
3+17       0.0865      0.60  | Q       |V        |         |         |
3+18       0.0873      0.61  | Q       |V        |         |         |
3+19       0.0882      0.61  | Q       | V       |         |         |
3+20       0.0890      0.62  | Q       | V       |         |         |
3+21       0.0899      0.63  | Q       | V       |         |         |
3+22       0.0908      0.64  | Q       | V       |         |         |
3+23       0.0917      0.66  | Q       | V       |         |         |
3+24       0.0926      0.67  | Q       | V       |         |         |
3+25       0.0936      0.68  | Q       | V       |         |         |
3+26       0.0945      0.69  | Q       | V       |         |         |
3+27       0.0955      0.70  |  Q      |  V      |         |         |
3+28       0.0965      0.71  |  Q      |  V      |         |         |
3+29       0.0974      0.72  |  Q      |  V      |         |         |
3+30       0.0984      0.73  |  Q      |  V      |         |         |
3+31       0.0995      0.75  |  Q      |  V      |         |         |
3+32       0.1005      0.77  |  Q      |  V      |         |         |
3+33       0.1016      0.79  |  Q      |  V      |         |         |
3+34       0.1027      0.81  |  Q      |   V     |         |         |
3+35       0.1039      0.83  |  Q      |   V     |         |         |
3+36       0.1050      0.85  |  Q      |   V     |         |         |
3+37       0.1062      0.86  |  Q      |   V     |         |         |
3+38       0.1074      0.87  |  Q      |   V     |         |         |
3+39       0.1086      0.89  |  Q      |   V     |         |         |
3+40       0.1099      0.90  |  Q      |   V     |         |         |
3+41       0.1112      0.94  |   Q     |    V    |         |         |
3+42       0.1125      0.98  |   Q     |    V    |         |         |
3+43       0.1139      1.02  |   Q     |    V    |         |         |
3+44       0.1154      1.06  |   Q     |    V    |         |         |
3+45       0.1169      1.10  |   Q     |    V    |         |         |
3+46       0.1185      1.13  |   Q     |     V   |         |         |
3+47       0.1201      1.16  |    Q    |     V   |         |         |
3+48       0.1217      1.19  |    Q    |     V   |         |         |
3+49       0.1234      1.22  |    Q    |     V   |         |         |
3+50       0.1251      1.26  |    Q    |      V  |         |         |
3+51       0.1270      1.37  |    Q    |      V  |         |         |
3+52       0.1291      1.49  |     Q   |      V  |         |         |
3+53       0.1313      1.61  |     Q   |      V  |         |         |
3+54       0.1337      1.73  |      Q  |       V |         |         |
3+55       0.1362      1.84  |      Q  |       V |         |         |
3+56       0.1390      1.99  |       Q |        V|         |         |
3+57       0.1419      2.14  |       Q |        V|         |         |
3+58       0.1451      2.30  |       Q |        V|         |         |
3+59       0.1485      2.45  |        Q|         V         |         |
4+ 0       0.1520      2.60  |         |Q        V         |         |
4+ 1       0.1574      3.94  |         |    Q    |V        |         |
4+ 2       0.1647      5.28  |         |         | Q       |         |
4+ 3       0.1738      6.61  |         |         |  V    Q |         |
4+ 4       0.1848      7.95  |         |         |    V    |   Q     |
4+ 5       0.1976      9.29  |         |         |     V   |        Q|
4+ 6       0.2082      7.73  |         |         |       V |  Q      |
4+ 7       0.2167      6.17  |         |         |     Q  V|         |
4+ 8       0.2231      4.60  |         |        Q|         V         |
4+ 9       0.2273      3.04  |         |  Q      |         V         |
4+10       0.2293      1.48  |     Q   |         |         |V        |
4+11       0.2312      1.38  |    Q    |         |         |V        |
4+12       0.2330      1.28  |    Q    |         |         |V        |
4+13       0.2346      1.18  |    Q    |         |         |V        |
```

4+14	0.2361	1.09	| Q	|	|	| V	|
4+15	0.2375	0.99	| Q	|	|	| V	|
4+16	0.2388	0.95	| Q	|	|	| V	|
4+17	0.2400	0.90	| Q	|	|	| V	|
4+18	0.2412	0.86	| Q	|	|	| V	|
4+19	0.2423	0.82	| Q	|	|	| V	|
4+20	0.2434	0.77	| Q	|	|	| V	|
4+21	0.2444	0.75	| Q	|	|	| V	|
4+22	0.2454	0.72	| Q	|	|	| V	|
4+23	0.2464	0.70	| Q	|	|	| V	|
4+24	0.2473	0.67	| Q	|	|	| V	|
4+25	0.2482	0.65	| Q	|	|	| V	|
4+26	0.2491	0.63	| Q	|	|	| V	|
4+27	0.2499	0.61	| Q	|	|	| V	|
4+28	0.2507	0.60	| Q	|	|	| V	|
4+29	0.2515	0.58	| Q	|	|	| V	|
4+30	0.2523	0.56	| Q	|	|	| V	|
4+31	0.2531	0.55	| Q	|	|	| V	|
4+32	0.2538	0.54	| Q	|	|	| V	|
4+33	0.2545	0.53	| Q	|	|	| V	|
4+34	0.2552	0.52	| Q	|	|	| V	|
4+35	0.2559	0.50	| Q	|	|	| V	|
4+36	0.2566	0.49	| Q	|	|	| V	|
4+37	0.2573	0.48	| Q	|	|	| V	|
4+38	0.2579	0.48	| Q	|	|	| V	|
4+39	0.2586	0.47	| Q	|	|	| V	|
4+40	0.2592	0.46	|Q	|	|	| V	|
4+41	0.2598	0.45	|Q	|	|	| V	|
4+42	0.2604	0.44	|Q	|	|	| V	|
4+43	0.2610	0.43	|Q	|	|	| V	|
4+44	0.2616	0.43	|Q	|	|	| V	|
4+45	0.2622	0.42	|Q	|	|	| V	|
4+46	0.2628	0.41	|Q	|	|	| V	|
4+47	0.2633	0.41	|Q	|	|	| V	|
4+48	0.2639	0.40	|Q	|	|	| V	|
4+49	0.2644	0.40	|Q	|	|	| V	|
4+50	0.2650	0.39	|Q	|	|	| V	|
4+51	0.2655	0.38	|Q	|	|	| V	|
4+52	0.2660	0.38	|Q	|	|	| V	|
4+53	0.2665	0.37	|Q	|	|	| V	|
4+54	0.2670	0.37	|Q	|	|	| V	|
4+55	0.2675	0.36	|Q	|	|	| V	|
4+56	0.2680	0.36	|Q	|	|	| V	|
4+57	0.2685	0.36	|Q	|	|	| V	|
4+58	0.2690	0.35	|Q	|	|	| V	|
4+59	0.2695	0.35	|Q	|	|	| V	|
5+ 0	0.2700	0.34	|Q	|	|	| V	|
5+ 1	0.2704	0.34	|Q	|	|	| V	|
5+ 2	0.2709	0.34	|Q	|	|	| V	|
5+ 3	0.2714	0.33	|Q	|	|	| V	|
5+ 4	0.2718	0.33	|Q	|	|	| V	|
5+ 5	0.2723	0.32	|Q	|	|	| V	|
5+ 6	0.2727	0.32	|Q	|	|	| V	|
5+ 7	0.2731	0.32	|Q	|	|	| V	|
5+ 8	0.2736	0.31	|Q	|	|	| V	|
5+ 9	0.2740	0.31	|Q	|	|	| V	|
5+10	0.2744	0.31	|Q	|	|	| V	|
5+11	0.2748	0.31	|Q	|	|	| V	|
5+12	0.2753	0.30	|Q	|	|	| V	|
5+13	0.2757	0.30	|Q	|	|	| V	|
5+14	0.2761	0.30	|Q	|	|	| V	|
5+15	0.2765	0.29	|Q	|	|	| V	|
5+16	0.2769	0.29	|Q	|	|	| V	|
5+17	0.2773	0.29	|Q	|	|	| V	|
5+18	0.2777	0.29	|Q	|	|	| V	|
5+19	0.2781	0.28	|Q	|	|	| V	|
5+20	0.2785	0.28	|Q	|	|	| V	|
5+21	0.2788	0.28	|Q	|	|	| V	|
5+22	0.2792	0.28	|Q	|	|	| V	|
5+23	0.2796	0.27	|Q	|	|	| V	|
5+24	0.2800	0.27	|Q	|	|	| V	|

5+25	0.2804	0.27	|Q	|	|	|	V |
5+26	0.2807	0.27	|Q	|	|	|	V |
5+27	0.2811	0.27	|Q	|	|	|	V |
5+28	0.2815	0.26	|Q	|	|	|	V |
5+29	0.2818	0.26	|Q	|	|	|	V |
5+30	0.2822	0.26	|Q	|	|	|	V |
5+31	0.2825	0.26	|Q	|	|	|	V |
5+32	0.2829	0.26	|Q	|	|	|	V |
5+33	0.2832	0.25	|Q	|	|	|	V |
5+34	0.2836	0.25	|Q	|	|	|	V |
5+35	0.2839	0.25	|Q	|	|	|	V |
5+36	0.2843	0.25	|Q	|	|	|	V |
5+37	0.2846	0.25	|Q	|	|	|	V |
5+38	0.2849	0.25	|Q	|	|	|	V |
5+39	0.2853	0.24	|Q	|	|	|	V |
5+40	0.2856	0.24	|Q	|	|	|	V |
5+41	0.2859	0.24	|Q	|	|	|	V |
5+42	0.2863	0.24	|Q	|	|	|	V|
5+43	0.2866	0.24	|Q	|	|	|	V|
5+44	0.2869	0.24	|Q	|	|	|	V|
5+45	0.2873	0.23	|Q	|	|	|	V|
5+46	0.2876	0.23	|Q	|	|	|	V|
5+47	0.2879	0.23	Q	|	|	|	V|
5+48	0.2882	0.23	Q	|	|	|	V|
5+49	0.2885	0.23	Q	|	|	|	V|
5+50	0.2888	0.23	Q	|	|	|	V|
5+51	0.2891	0.23	Q	|	|	|	V|
5+52	0.2895	0.22	Q	|	|	|	V|
5+53	0.2898	0.22	Q	|	|	|	V|
5+54	0.2901	0.22	Q	|	|	|	V|
5+55	0.2904	0.22	Q	|	|	|	V|
5+56	0.2907	0.22	Q	|	|	|	V|
5+57	0.2910	0.22	Q	|	|	|	V|
5+58	0.2913	0.22	Q	|	|	|	V|
5+59	0.2916	0.22	Q	|	|	|	V|
6+ 0	0.2919	0.21	Q	|	|	|	V|
6+ 1	0.2922	0.21	Q	|	|	|	V|
6+ 2	0.2925	0.21	Q	|	|	|	V|
6+ 3	0.2927	0.21	Q	|	|	|	V|
6+ 4	0.2930	0.21	Q	|	|	|	V|
6+ 5	0.2933	0.21	Q	|	|	|	V

End of computations, total study area = 1.873 (Ac.)

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APPENDIX D
HYDRAULIC ANALYSIS

3911 Sorrento Valley Blvd., Suite 120, San Diego, CA 92121 P 858.638.7277 F 858.638.75060

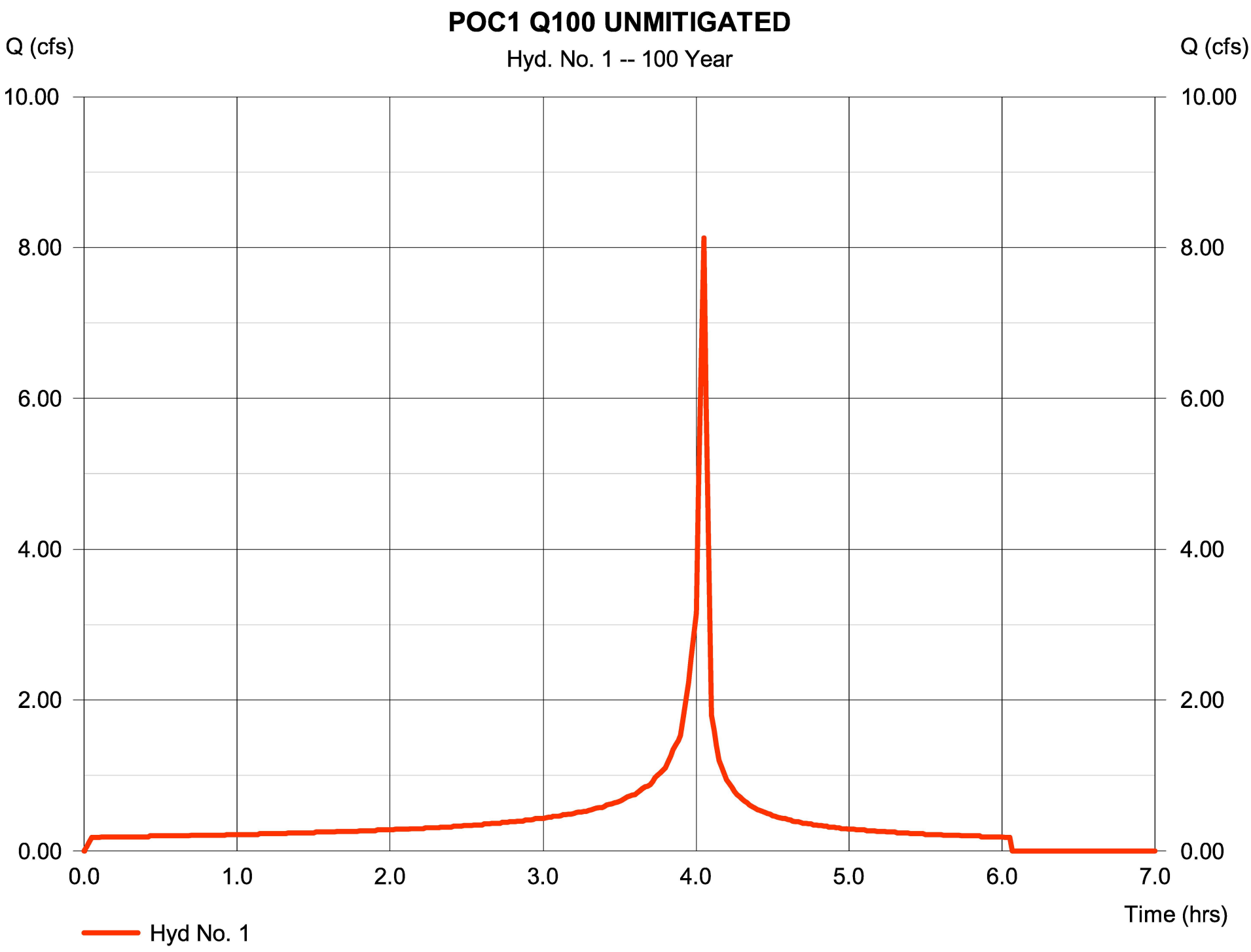
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Tuesday, 10 / 25 / 2022

Hyd. No. 1

POC1 Q100 UNMITIGATED

Hydrograph type	= Manual	Peak discharge	= 8.130 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.05 hrs
Time interval	= 1 min	Hyd. volume	= 10,587 cuft



Hydrograph Report

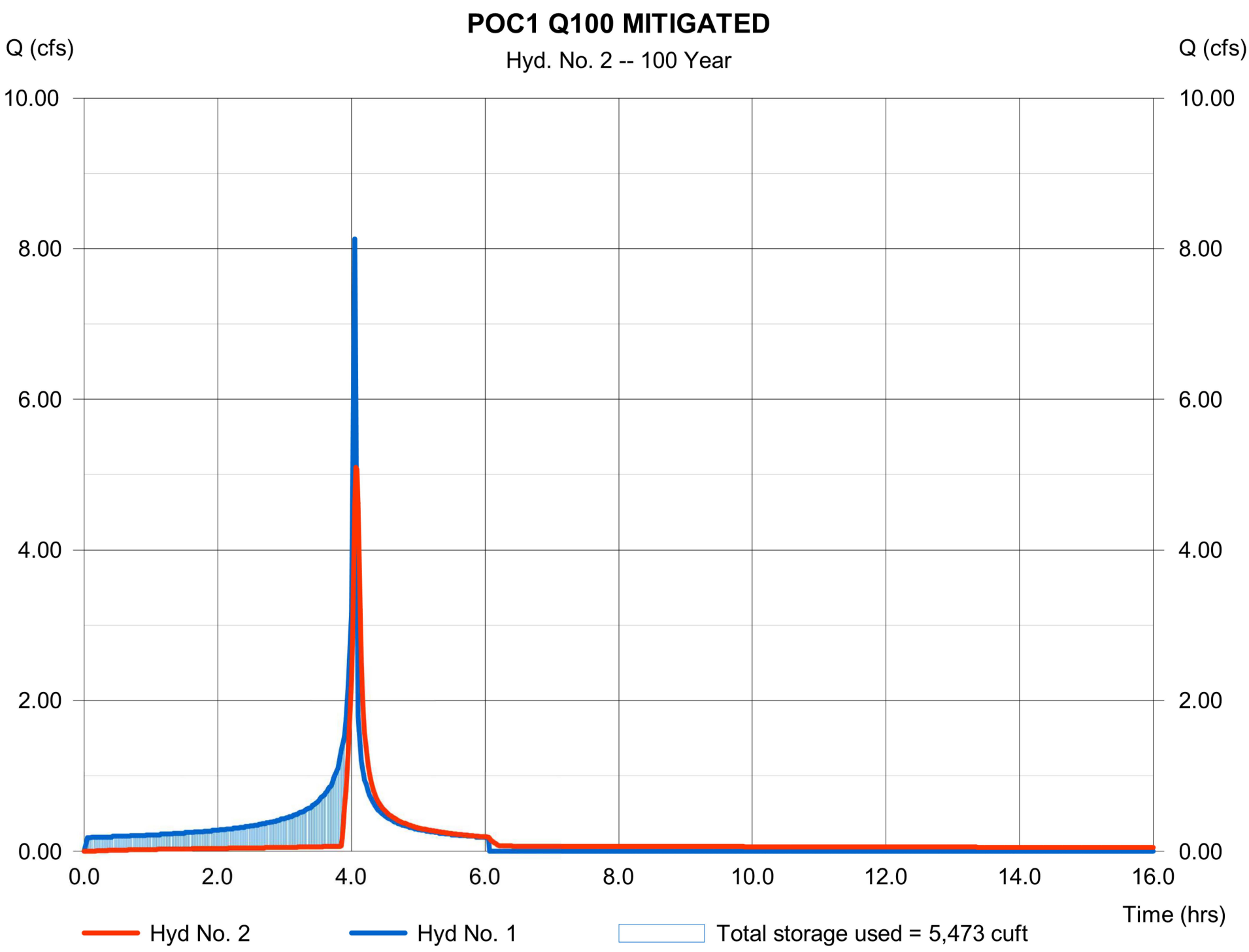
Hyd. No. 2

POC1 Q100 MITIGATED

POC1 MITIGATED PEAK FLOW

Hydrograph type	=	Reservoir	Peak discharge	=	5.094 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.07 hrs
Time interval	=	1 min	Hyd. volume	=	10,558 cuft
Inflow hyd. No.	=	1 - POC1 Q100 UNMITIGATED	Max. Elevation	=	103.73 ft
Reservoir name	=	BMP1	Max. Storage	=	5,473 cuft

Storage Indication method used.

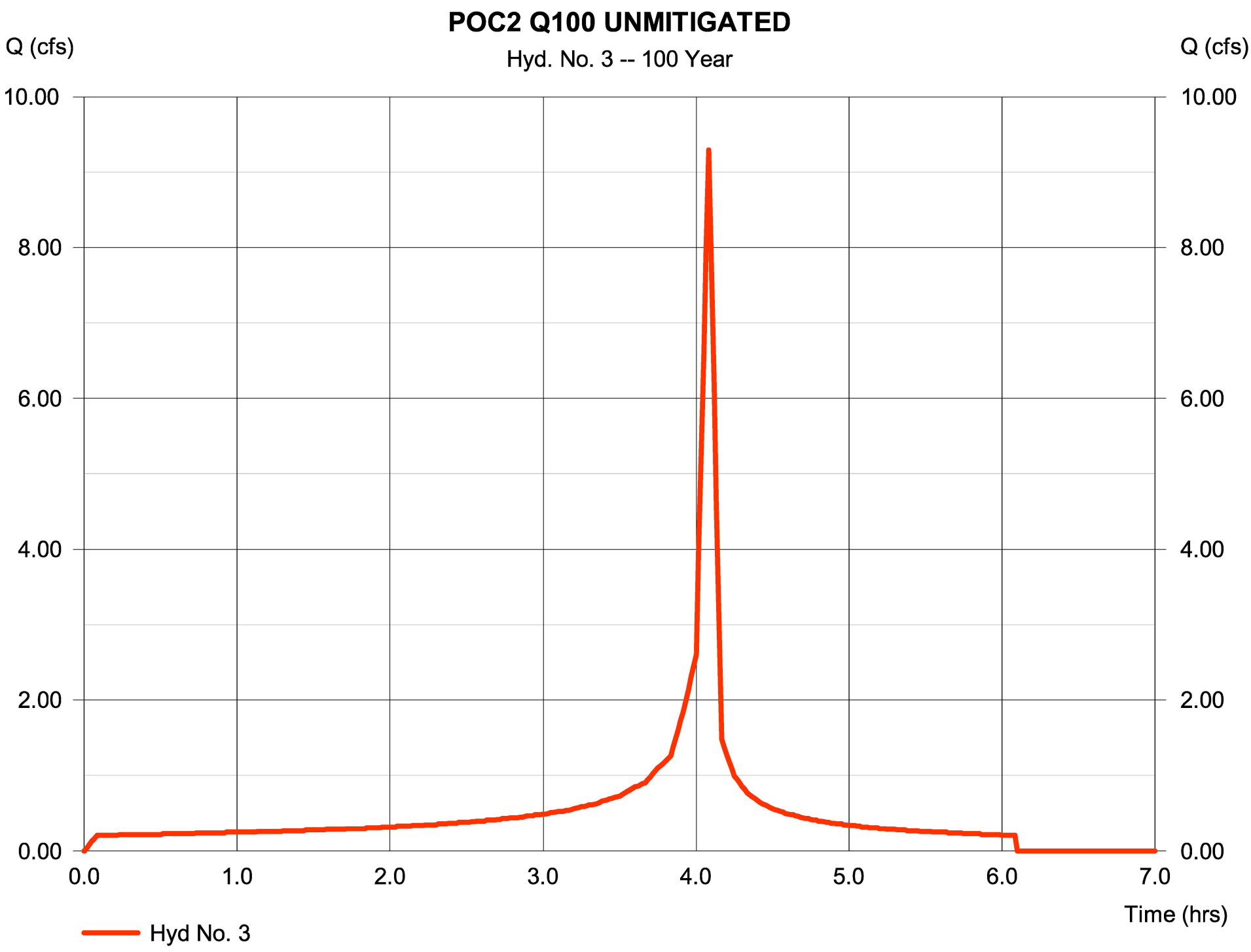


Hydrograph Report

Hyd. No. 3

POC2 Q100 UNMITIGATED

Hydrograph type	= Manual	Peak discharge	= 9.290 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.08 hrs
Time interval	= 1 min	Hyd. volume	= 12,774 cuft



Hydrograph Report

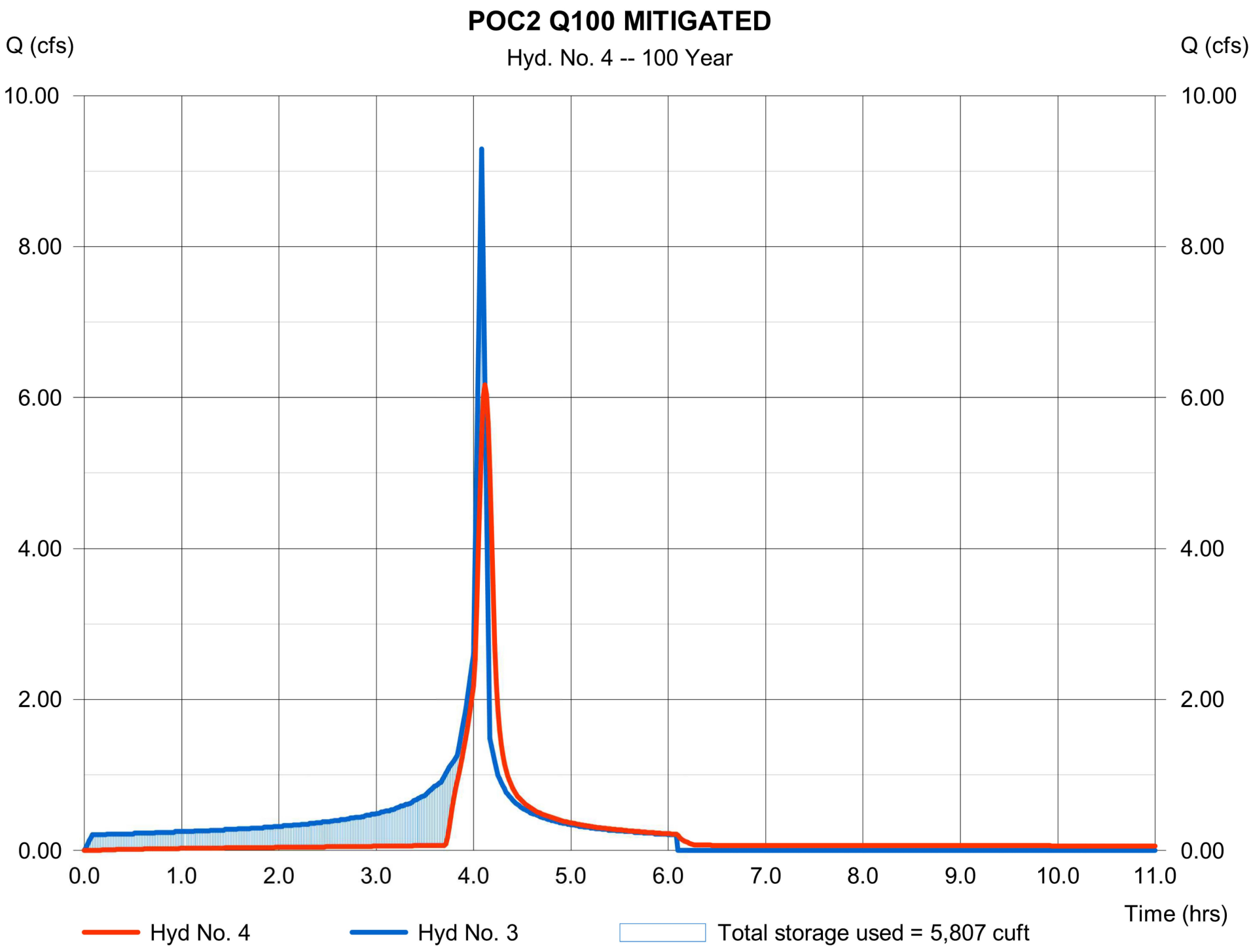
Hyd. No. 4

POC2 Q100 MITIGATED

POC2 MITIGATED PEAK FLOW

Hydrograph type	=	Reservoir	Peak discharge	=	6.168 cfs
Storm frequency	=	100 yrs	Time to peak	=	4.12 hrs
Time interval	=	1 min	Hyd. volume	=	12,745 cuft
Inflow hyd. No.	=	3 - POC2 Q100 UNMITIGATED	Max. Elevation	=	103.96 ft
Reservoir name	=	BMP2	Max. Storage	=	5,807 cuft

Storage Indication method used.



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 25 2022

POC1 - NODE 102 TO 103

Circular

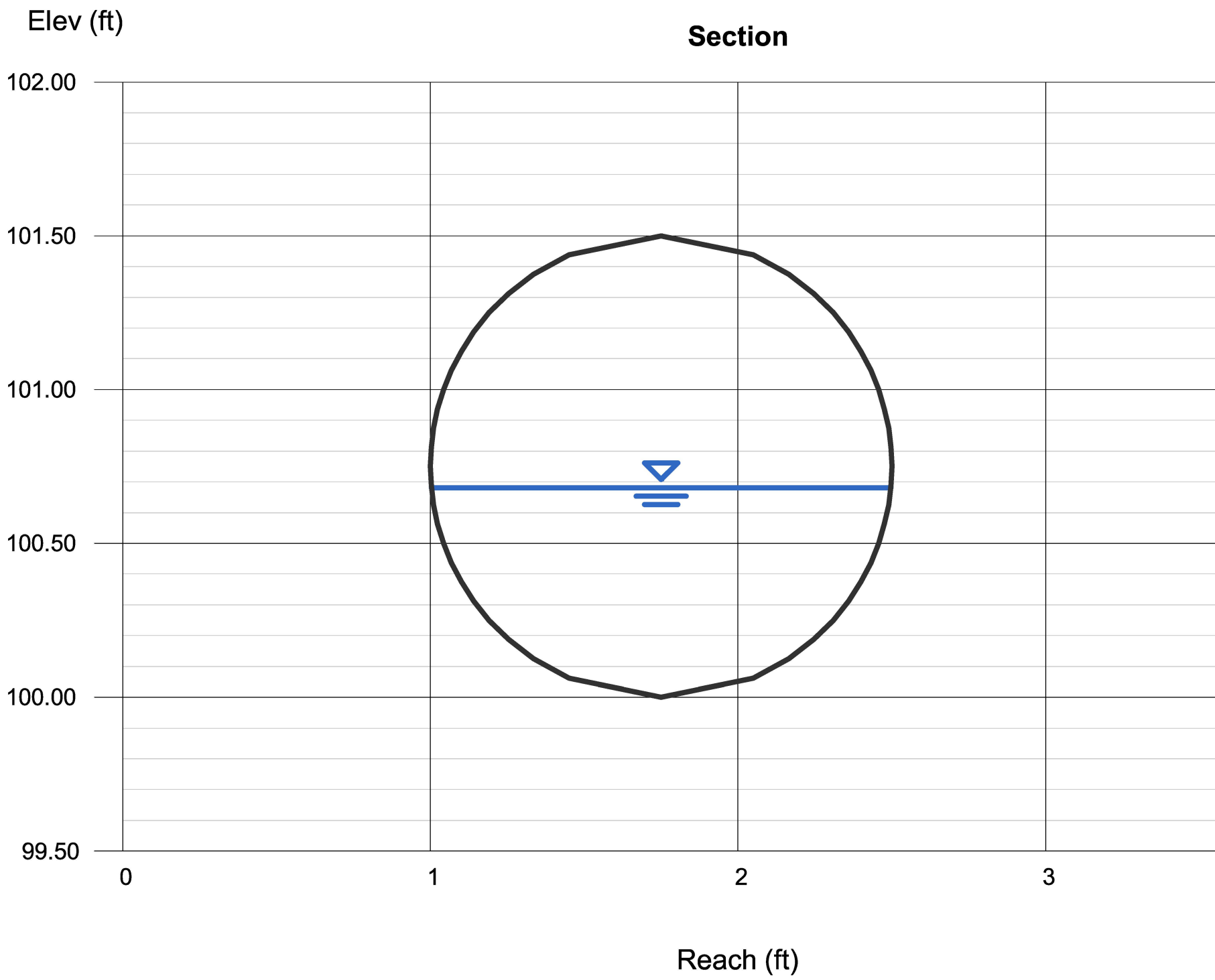
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 3.50
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 8.13

Highlighted

Depth (ft)	= 0.68
Q (cfs)	= 8.130
Area (sqft)	= 0.78
Velocity (ft/s)	= 10.40
Wetted Perim (ft)	= 2.22
Crit Depth, Yc (ft)	= 1.11
Top Width (ft)	= 1.49
EGL (ft)	= 2.36



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 25 2022

POC1 OUTLET - NODE 103 TO 104

Circular

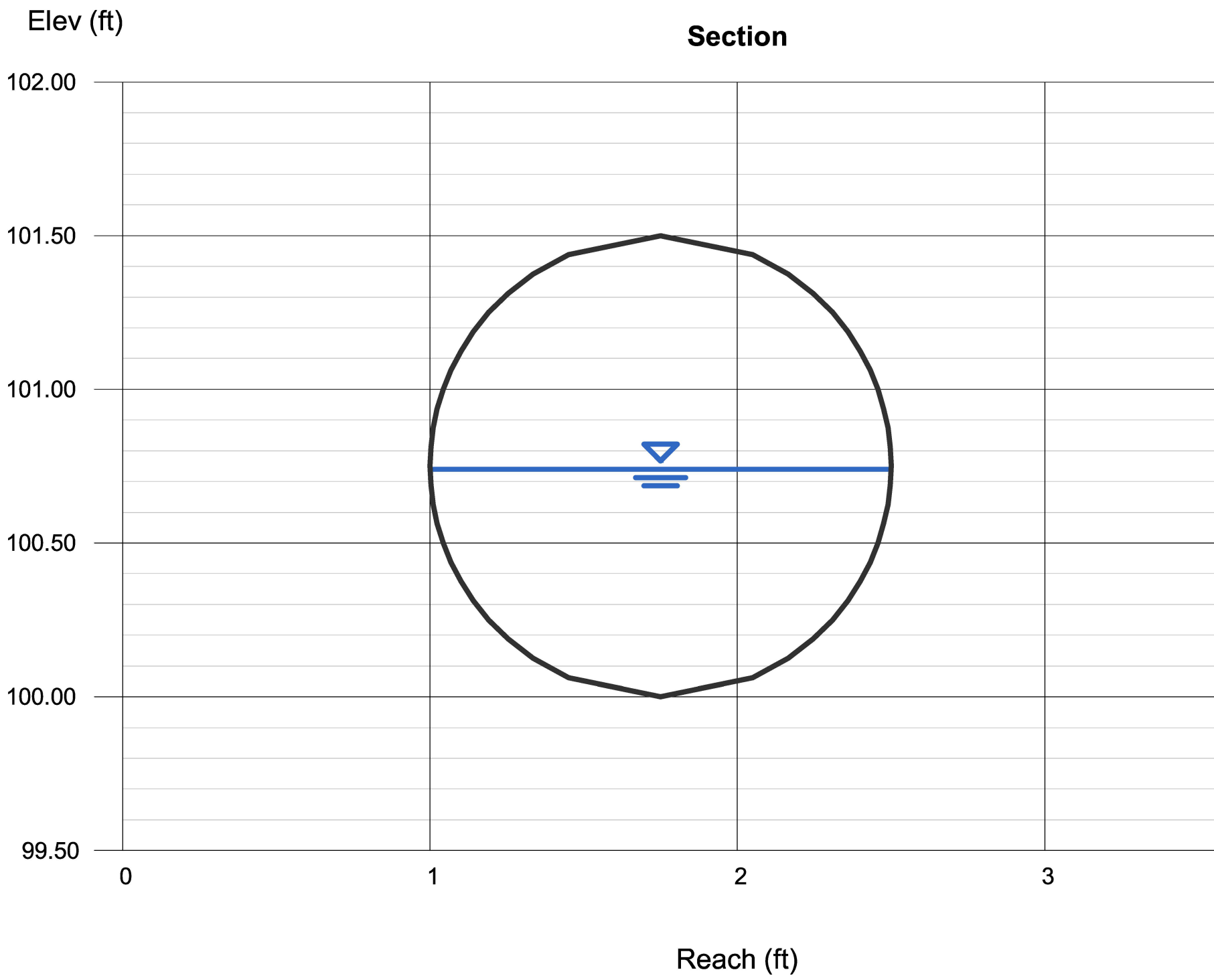
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.09

Highlighted

Depth (ft)	= 0.74
Q (cfs)	= 5.090
Area (sqft)	= 0.87
Velocity (ft/s)	= 5.84
Wetted Perim (ft)	= 2.34
Crit Depth, Yc (ft)	= 0.87
Top Width (ft)	= 1.50
EGL (ft)	= 1.27



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 25 2022

POC2 - NODE 202 TO 203

Circular

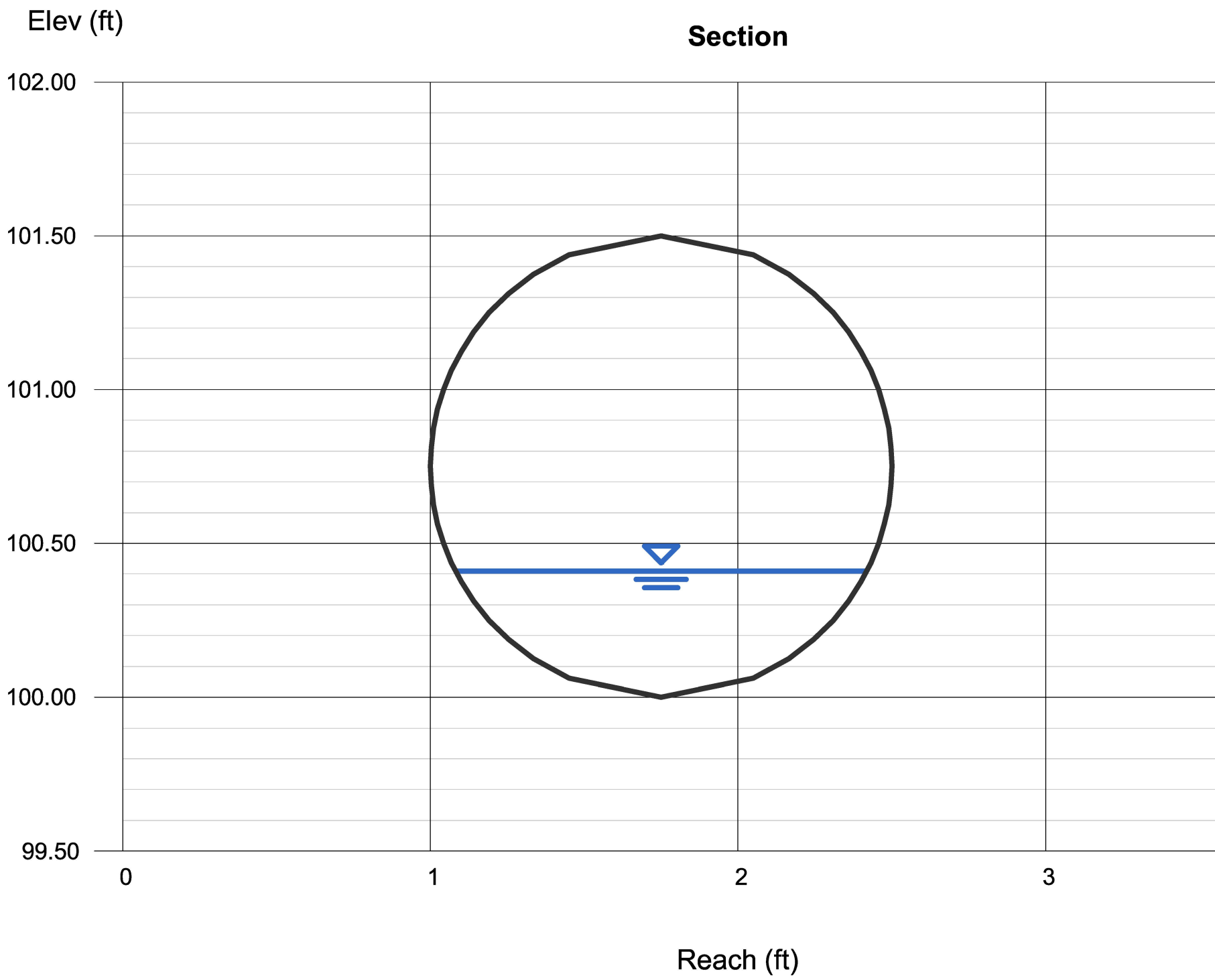
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 5.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 3.81

Highlighted

Depth (ft)	= 0.41
Q (cfs)	= 3.810
Area (sqft)	= 0.40
Velocity (ft/s)	= 9.63
Wetted Perim (ft)	= 1.66
Crit Depth, Yc (ft)	= 0.75
Top Width (ft)	= 1.34
EGL (ft)	= 1.85



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 25 2022

POC2 - NODE 206 TO 203

Circular

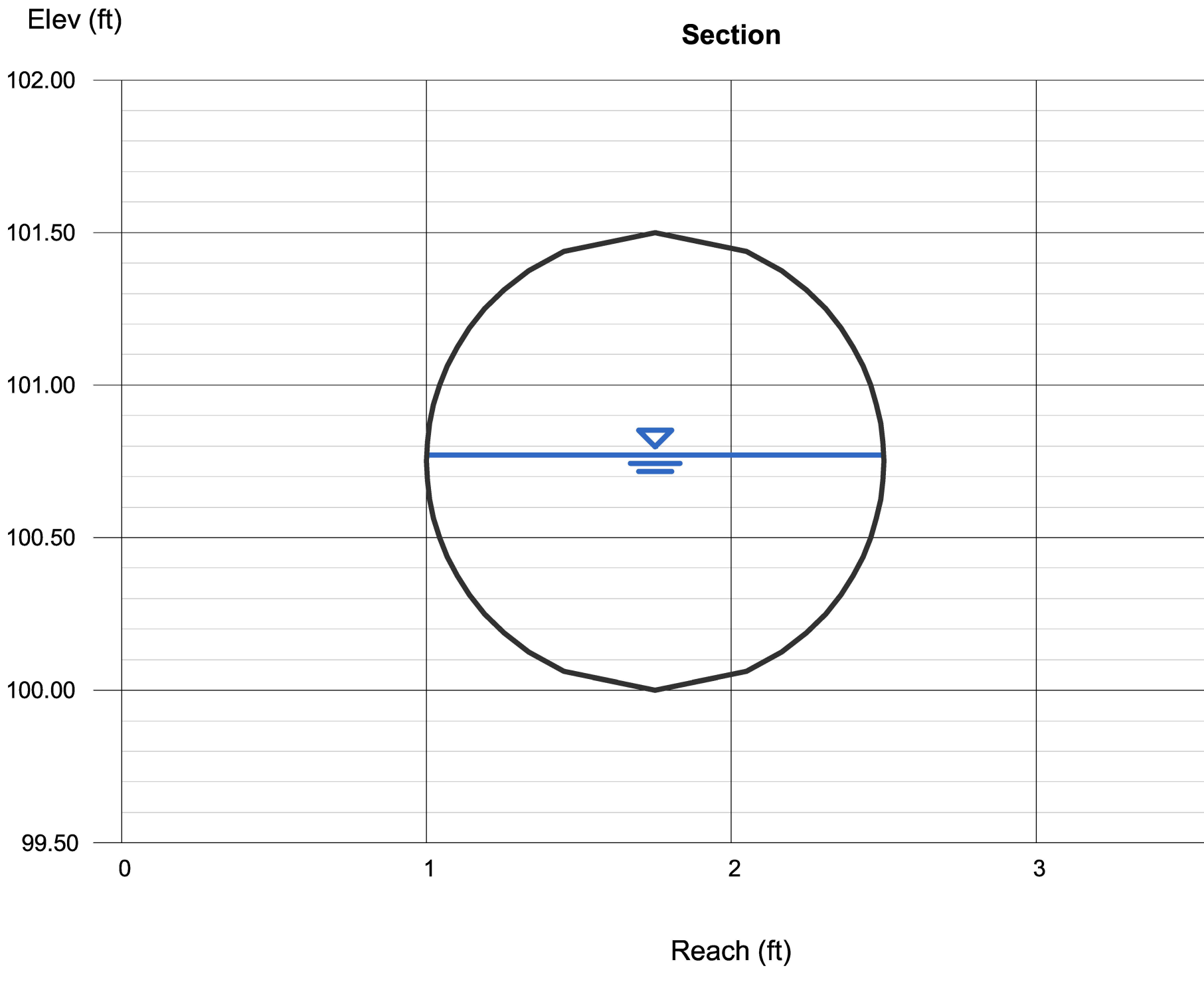
Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 5.47

Highlighted

Depth (ft)	= 0.77
Q (cfs)	= 5.470
Area (sqft)	= 0.92
Velocity (ft/s)	= 5.97
Wetted Perim (ft)	= 2.40
Crit Depth, Yc (ft)	= 0.90
Top Width (ft)	= 1.50
EGL (ft)	= 1.32



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 25 2022

POC2 OUTLET - NODE 203 TO 207

Circular

Diameter (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.013

Calculations

Compute by:	Known Q
Known Q (cfs)	= 6.17

Highlighted

Depth (ft)	= 0.83
Q (cfs)	= 6.170
Area (sqft)	= 1.01
Velocity (ft/s)	= 6.13
Wetted Perim (ft)	= 2.52
Crit Depth, Yc (ft)	= 0.96
Top Width (ft)	= 1.49
EGL (ft)	= 1.41