Son-Engineering

PRELIMINARY HYDROLOGY/DRAINAGE STUDY

FOR

ROMERO DRIVE TENTATIVE MAP

6850 Country Club Drive
La Jolla, CA 92037
Portion of Parcel 3 of PM 21506, APN: 352-300-11

City of San Diego
SDP No. 1050407 / Tentative Plan No. 1050354 / CDP No. 1050394
PRJ-1063767

Applicant/Developer:
La Jolla Reserve, LLC
10452 Coyote Hill Lane
Escondido, CA 92026
(619) 446-5000

PREPARED BY:
Son-Engineering
civil engineers
P.O. Box 1707
Alpine, CA 91903
(619) 770-9339, son@soncivil.com
SON2307-03

Dated: December 17, 2023

DECLARATION OF RESPONSIBLE CHARGE

I, HEREBY DECLARE THAT I AM THE CIVIL ENGINEER OF WORK FOR THIS PROJECT, THAT I HAVE EXERCISED RESPONSIBLE CHARGE OVER THE DESIGN OF THE PROJECT AS DEFINED IN SECTION 6703 OF THE BUSINESS AND PROFESSIONS CODE, AND THAT THE DESIGN IS CONSISTENT WITH CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITY FOR PROJECT DESIGN.

Son P. Nguyen

SON P. NGUYEN
R.C.E. 86249
EXP. 03-31-25

12-17-2023
DATE

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PRELIMINARY HYDROLOGY AND HYDRAULIC CALCULATIONS
FOR
ROMERO DRIVE TENTATIVE MAP

The project is located at 6850 Country Club Drive with Assessor's Parcel Nos. 352-300-11. The project proposes to grade approximately 3.74 acres for the construction of 5 proposed residences and an access concrete driveway that will connect to an existing concrete driveway. The following hydrology calculations were prepared utilizing the rational method with Hydraflow Hydrographs software and the 2017 City of San Diego Drainage Design Manual criteria. The manual allows for a weighted C value based on the actual percentage area of impervious surface. See the enclosed runoff factor calculations for determination of C factors for each of the pre- and post-development drainage basins.

PRE-DEVELOPMENT CONDITIONS: The existing site currently is a golf course with an existing concrete paved driveway along the middle portion of the site which is accessed via Romero Drive near the northwest corner of the site. The existing drainage within the site is divided up into two drainage basins (refer to Pre-Development Drainage Map located in this report). Drainage Basin A consists of natural sheet flow in the general east direction that is directed toward an existing detention basin. The peak 100-year storm event discharge for Drainage Basin A is 0.77 cfs. Drainage Basin B consists of natural sheet flows in a general southeasterly direction that is directed towards an existing biofiltration basin. The peak 100-year storm event discharge for Drainage Basin B is 4.42 cfs. The total pre-development 100-year peak discharge from the proposed development site (Basin A + Basin B) is 5.19 cfs.

POST-DEVELOPMENT CONDITIONS:
Drainage Basin A will not be developed and will discharge similar to the pre-development condition, where runoff from this area will sheet flow into the existing detention basin. As part of the proposed project, the site will go through a coastal development permit process to adjust the property lot lines to create five separate single-family residential lots in Drainage Basin B. Each newly created lot will accommodate a new single-family residence and its appurtenances. The proposed development will maintain similar drainage patterns as in the existing condition, and will consist of five drainage basins (refer to the enclosed Post-Development Drainage Map). Drainage basin B is comprised of five sub-basins: B1-A, B1-B, B2, B3, B4, B5, and B6. Basins B1 through B5 consists of runoff from the proposed main residence and its adjacent landscape areas. Runoff from the house rooftop will be directed through roof gutters onto the adjacent landscape areas prior to entering a proposed storm drain system that will direct runoff into a proposed biofiltration with partial retention basin which will provide some mitigation of the 100-year peak discharge. Sub-basin B6 is the graded slope outside basins B1-B5 and is sheet flow through the natural vegetated Parcel C then off site. Sub-basins B1-B5 consist of graded slopes and any peak flows exceeding the low flow threshold in the biofiltration basin will be collected in the overflow inlets and conveyed through Lots 2 to 5 and discharging onto an energy dissipater prior flowing downstream at the northerly boundary of Lot 5. The peak 100-year discharge of Drainage Basin B is 5.00 cfs. The total post-development peak 100-year discharge from the proposed development site (Drainage Basin A + B) after mitigation is approximately 5.77 cfs.

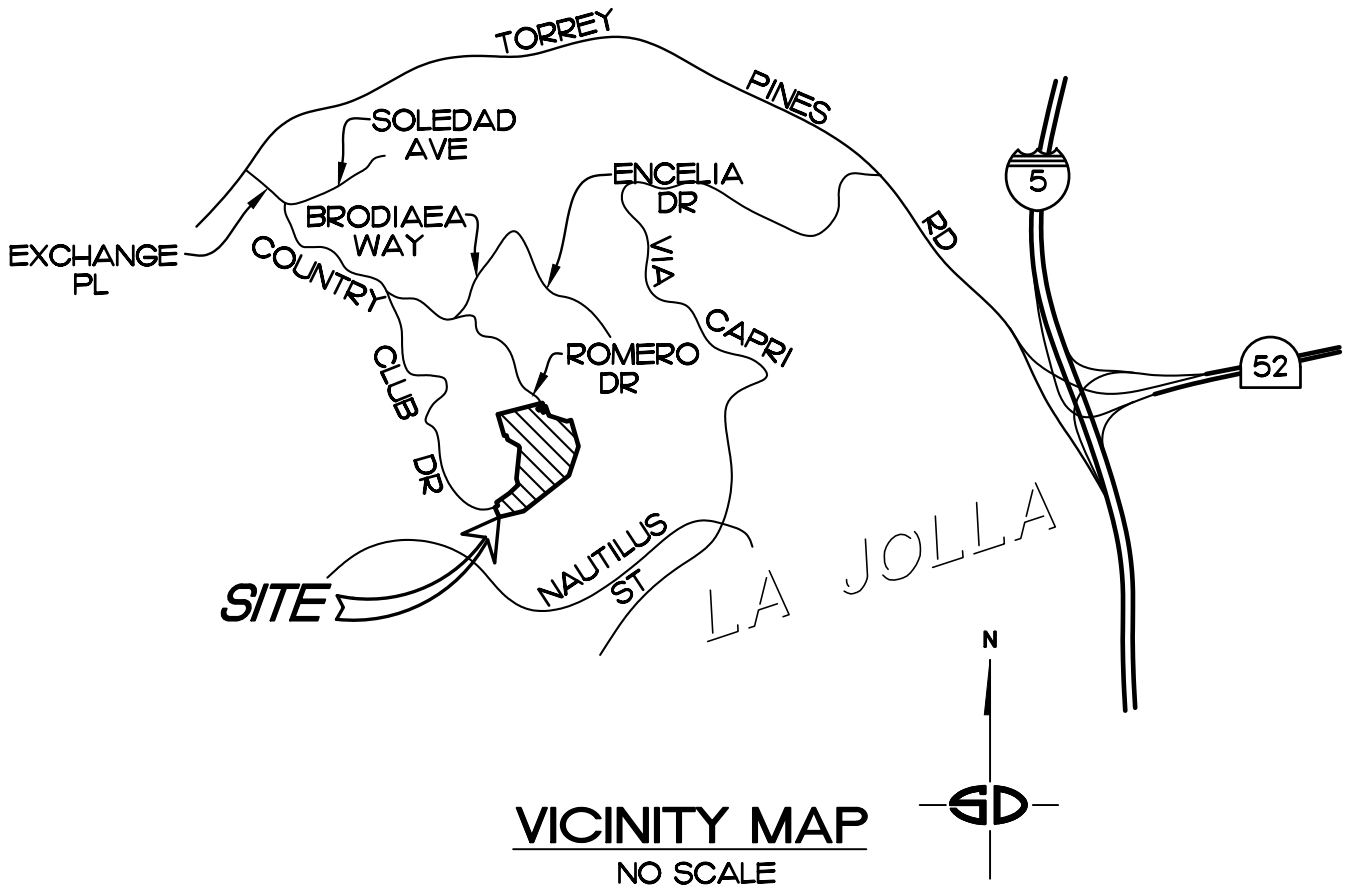
The following table is a summary of the 100-year peak discharges for the pre- and post-development conditions:

PRE & POST DEVELOPMENT 100-YR. PEAK DISCHARGES							
PRE-DEVELOPMENT			POST-DEVELOPMENT			POST-DEVELOPMENT WITH MITIGATION	
BASIN ID	AREA A (IN ACRES)	DISCHARGE Q_{100} (IN CFS)	SUB-BASIN ID	AREA A (IN ACRES)	DISCHARGE Q_{100} (IN CFS)	AREA A (IN ACRES)	DISCHARGE Q_{100} (IN CFS)
A	0.53	0.77	A	0.53	0.77	0.53	0.77
B	3.84	4.42	B1-A	0.24	1.03	0.24	0.60
			B1-B	0.06	0.14	0.06	0.06
			B2	0.64	1.06	0.64	0.35
			B3	0.59	1.75	0.59	0.95
			B4	0.58	1.08	0.58	0.40
			B5	0.98	3.24	0.98	1.70
			B6	0.65	0.94	0.65	0.94
TOTAL	4.37 AC.	5.19 CFS		4.27 AC.	10.01 CFS	4.27 AC.	5.77 CFS

SUMMARY OF 100-YEAR, 6-HOUR STORM EVENT

CONCLUSION:

- The peak 100-year discharge from the post-development after mitigation will be less than the discharge in the pre-development condition.
- There will be no negative impacts to downstream and/or adjacent properties / drainage facilities due to the construction of the proposed development.
- The project site does not impact waters of the U.S., therefore it is not subject to CWA 401/404 regulations.



VICINITY MAP

NO SCALE

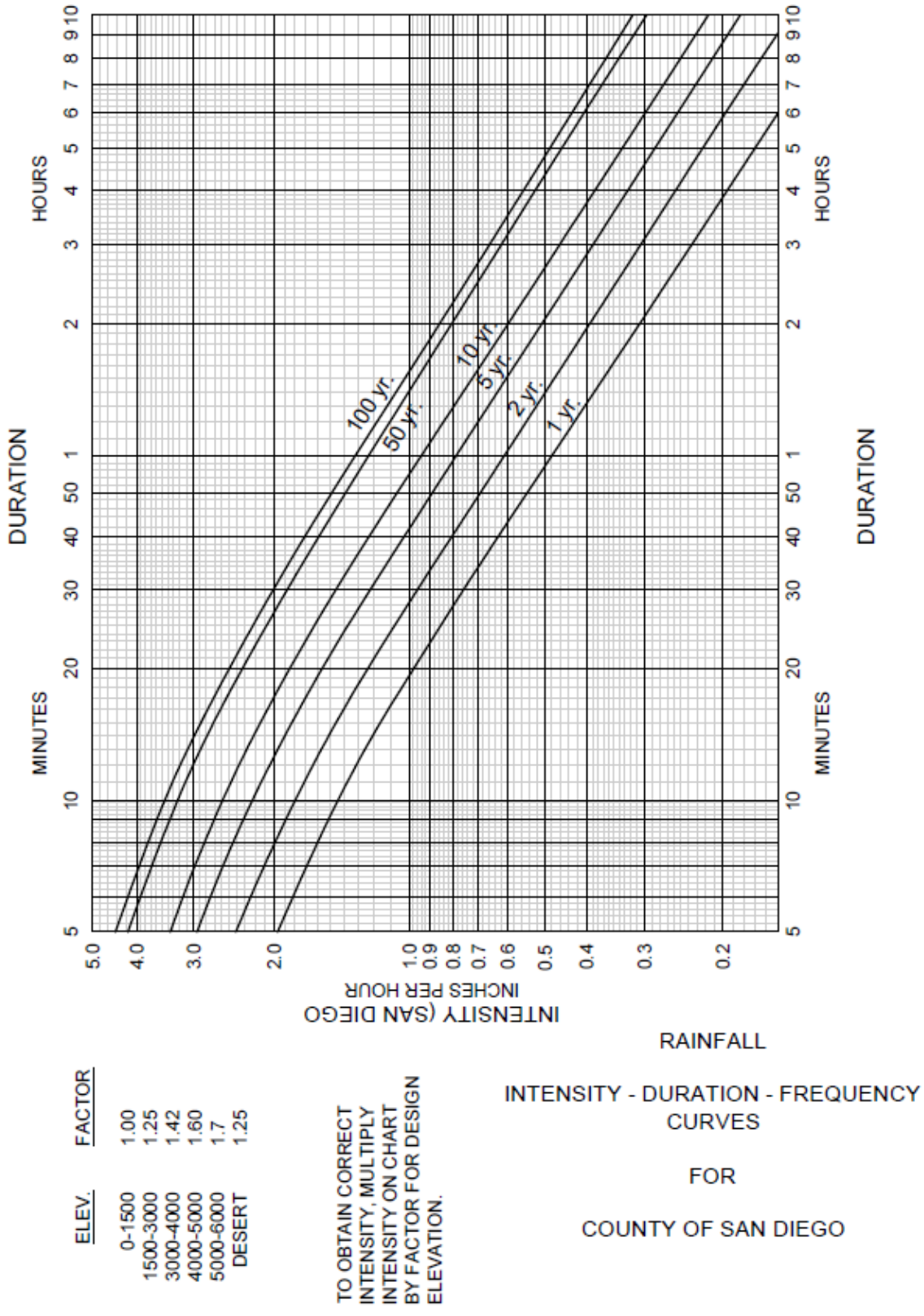


Figure A-1. Intensity-Duration-Frequency Design Chart

SOIL TYPE
ROMERO DRIVE TM

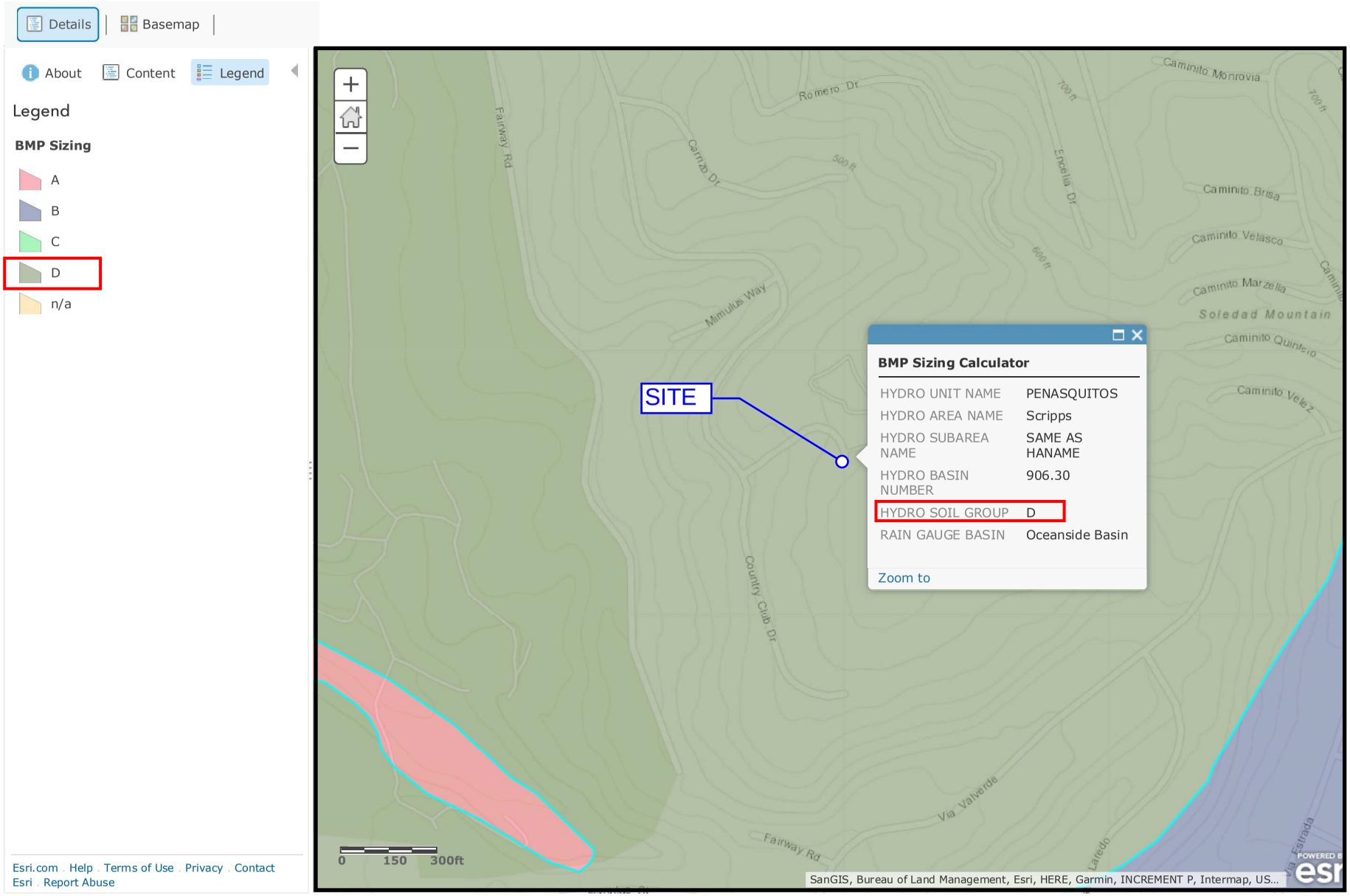


Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C) Soil Type [1]
Residential:	
Single Family (Assumed 50% Imperviousness)	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:

[1] Type D soil to be used for all areas.

[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness	=	60%
Tabulated imperviousness (For Single-Family)	=	50%
Revised C = (60/50) x 0.55	=	0.66

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

Pre-Development - Romero Drive TM

Basin	A	B
Impervious Area (SF)	7,841	19,858
Total Basin Area (SF)	23,087	125,017
Actual imperviousness **(AI)** = Imp. Area/Total Area	34%	16%
Tabulated imperviousness =	45%	45%
For Single-Family: Revised C = (**AI**/50) x 0.55, 0.50 Minimum **For Rural:** C = 0.45	0.42	0.19
Use	**0.50**	**0.50**

APPENDIX A: RATIONAL METHOD AND MODIFIED RATIONAL METHOD

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C) Soil Type [1]
Residential:	
Single Family (Assumed 50% Imperviousness)	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:

[1] Type D soil to be used for all areas.

[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

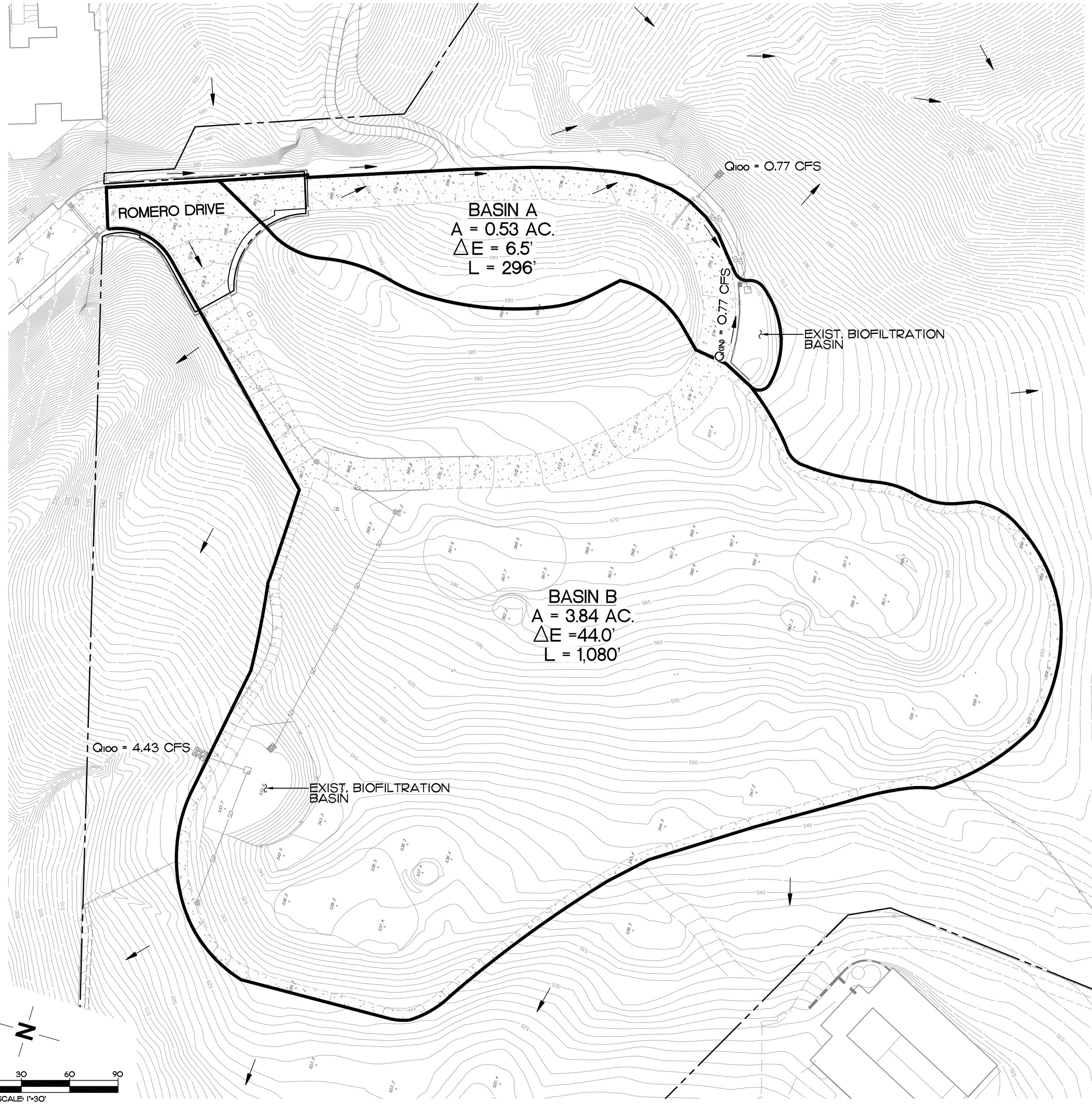
Actual imperviousness	=	60%
Tabulated imperviousness (For Single-Family)	=	50%
Revised C = (60/50) x 0.55	=	0.66

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

Post-Development Romero Drive TM

Basin	B1-A	B1-B	B2	B3	B4	B5	A
Impervious Area (SF)	9,160	1,611	11,799	16,122	12,631	30,069	7,841
(Acres)	0.210	0.037	0.271	0.370	0.290	0.690	0.180
Total Basin Area (SF)	10,314	2,765	27,817	25,793	25,384	42,829	23,087
(Acres)	0.237	0.063	0.639	0.592	0.583	0.983	0.530
0.71	89%	58%	42%	63%	50%	70%	34%
Tabulated imperviousness =	50%	50%	50%	50%	50%	50%	50%
For Single-Family: Revised C = (**AI**/50) x 0.55, 0.50 Minimum **For Rural:** C = 0.45	0.98	0.64	0.47	0.69	0.55	0.77	0.37
Use	**0.98**	**0.64**	**0.50**	**0.69**	**0.55**	**0.77**	**0.50**

DRAINAGE MAPS



LEGEND

BASIN ID NO. . . . . A

DRAINAGE BASIN BOUNDARY. . . . . ——

DIRECTION OF FLOW. . . . . →

PRE & POST DEVELOPMENT 100-YR. PEAK DISCHARGES

PRE-DEVELOPMENT			POST-DEVELOPMENT			POST-DEVELOPMENT WITH MITIGATION	
BASIN ID	AREA A (IN ACRES)	DISCHARGE Q100 (IN CFS)	SUB-BASIN ID	AREA A (IN ACRES)	DISCHARGE Q100 (IN CFS)	AREA A (IN ACRES)	DISCHARGE Q100 (IN CFS)
A	0.53	0.77	*A*	0.53	0.77	0.53	0.77
B	3.84	4.42	*B1-A*	0.24	1.03	0.24	0.60
			B1-B	0.06	0.14	0.06	0.06
			B2	0.64	1.06	0.64	0.35
			B3	0.59	1.75	0.59	0.95
			B4	0.58	1.08	0.58	0.40
			B5	0.98	3.24	0.98	1.70
			B6	0.65	0.94	0.65	0.94
TOTAL	4.37 AC.	5.19 CFS		4.27 AC.	10.01 CFS	4.27 AC.	5.77 CFS

NOTES:

1. REDUCTION IN POST-DEVELOPMENT AREA DUE TO PROPOSED POOLS ON LOTS B1 THRU B5

N

30 15 0 30 60 90

SCALE: 1"=30'

ENGINEER OF WORK

SON–Engineering
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SON P. NGUYEN R.C.E. 86249
EXPIRES 03–31–25

REGISTERED PROFESSIONAL ENGINEER · SON P. NGUYEN · C 86249 · Exp. 03-31-25 · CIVIL · STATE OF CALIFORNIA

ROMERO DRIVE TM
PRELIMINARY PRE-DEVELOPMENT DRAINAGE MAP

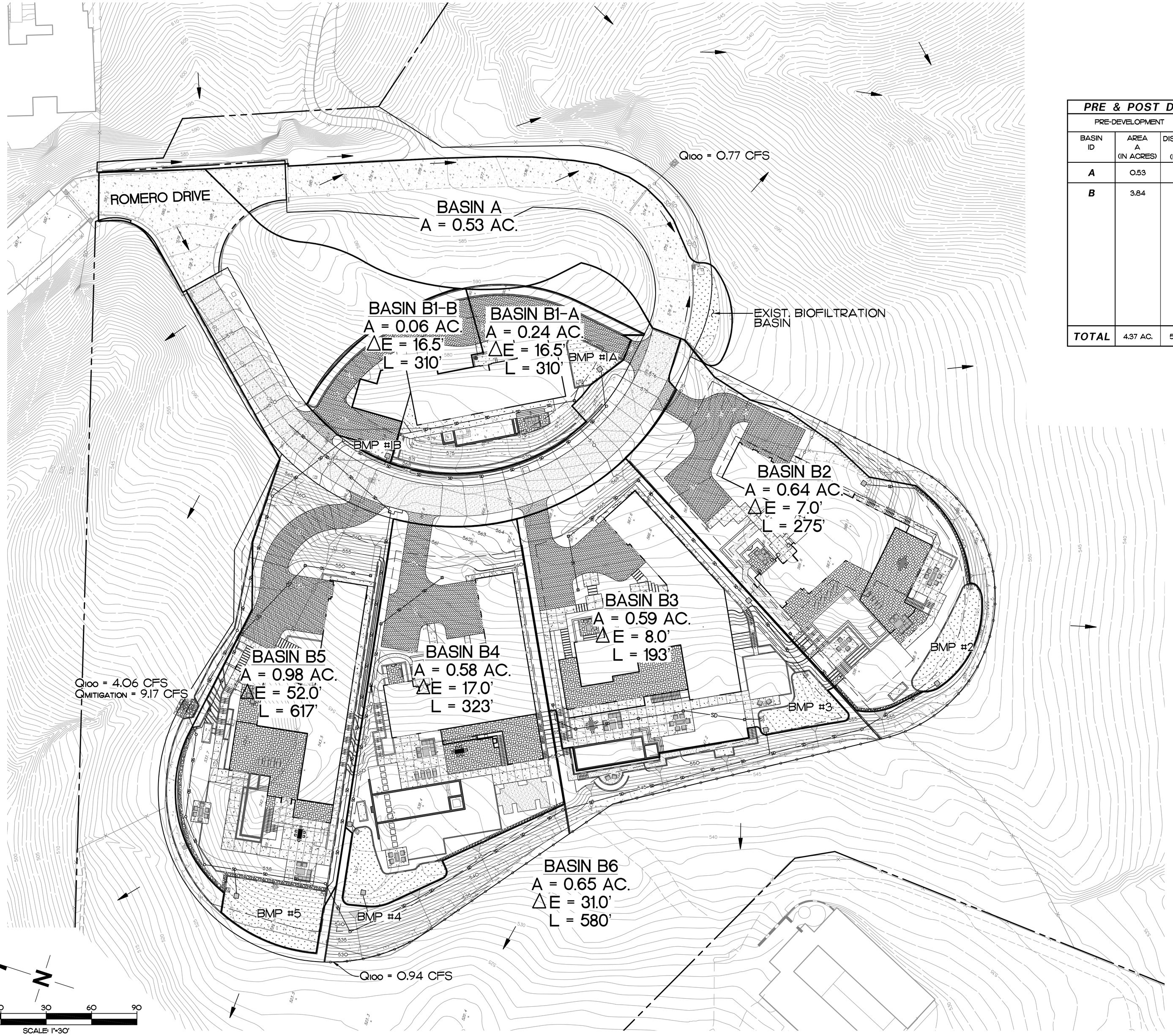
NO	DATE	REVISION DESCRIPTION	BY
1	03/09/2023	REVISIONS PER 1ST REVIEW COMMENTS	SDA
2	12/17/2023	UPDATES PER UPDATED SITE PLAN	SDN

DESIGNER NP
DRAWN JGF
CHECKED SPN
DATE 06-17-2022

SHEET TITLE: PRELIMINARY PRE-CONSTRUCTION DRAINAGE MAP
JOB NAME: ROMERO DRIVE TM
6850 COUNTRY CLUB DRIVE
LA JOLLA, CA 92037

SHEET 1 OF 1 SHEETS
JOB NO. LJ4736

SNIPES–DYE ASSOCIATES 8348 CENTER DRIVE, SUITE G, LA MESA, CA 91942–2910 (619) 697–9234, FAX (619) 460–2033



LEGEND

BASIN ID NO. . . . . A

DRAINAGE BASIN BOUNDARY. . . . . ———

DIRECTION OF FLOW. . . . . → →

PRE & POST DEVELOPMENT 100-YR. PEAK DISCHARGES

PRE-DEVELOPMENT			POST-DEVELOPMENT			POST-DEVELOPMENT WITH MITIGATION	
BASIN ID	AREA A (IN ACRES)	DISCHARGE Q100 (IN CFS)	SUB-BASIN ID	AREA A (IN ACRES)	DISCHARGE Q100 (IN CFS)	AREA A (IN ACRES)	DISCHARGE Q100 (IN CFS)
A	0.53	0.77	*A*	0.53	0.77	0.53	0.77
B	3.84	4.42	*B1-A*	0.24	1.03	0.24	0.60
			B1-B	0.06	0.14	0.06	0.06
			B2	0.64	1.06	0.64	0.35
			B3	0.59	1.75	0.59	0.95
			B4	0.58	1.08	0.58	0.40
			B5	0.98	3.24	0.98	1.70
			B6	0.65	0.94	0.65	0.94
TOTAL	4.37 AC.	5.19 CFS		4.27 AC.	10.01 CFS	4.27 AC.	5.77 CFS

NOTES:

1. REDUCTION IN POST-DEVELOPMENT AREA DUE TO PROPOSED POOLS ON LOTS B1 THRU B5

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EXPIRES 03–31–25

REGISTERED PROFESSIONAL ENGINEER
SON P. NGUYEN
C 86249
Exp. 03–31–25
CIVIL
STATE OF CALIFORNIA

ROMERO DRIVE TM
PRELIMINARY POST-DEVELOPMENT DRAINAGE MAP

NO	DATE	REVISION DESCRIPTION	BY
1	03/08/2023	REVISIONS PER 1ST REVIEW COMMENTS	SDA
2	12/17/2023	UPDATES PER REVISED SITE PLAN	SON

DESIGNER ND
DRAWN JGF
CHECKED SPN
DATE 06-17-2022

SHEET TITLE: *PRELIMINARY POST-CONSTRUCTION DRAINAGE MAP*
JOB NAME: *ROMERO DRIVE TM*
6850 COUNTRY CLUB DRIVE
LA JOLLA, CA 92037

SON–ENGINEERING *P.O. BOX 1707, ALPINE, CA 91903* *(619) 770–9339* *SON@SONCIVIL.COM*

SHEET 1 OF 1 SHEETS
JOB NO. LJ4736

PRE-DEVELOPMENT DRAINAGE CALCULATIONS

PRE-DEVELOPMENT PEAK 100-YEAR DISCHARGES (Q)

BASIN A: Q_{100}

COMBINED RUNOFF COEFFICIENT (C):

Land Use	Coefficient (C)	Tributary Area
Rural (Lots greater than 1/2 acre)	0.45	0.53 AC

City of San Diego Drainage Design Manual - January 2017 Edition
Table A-1: Runoff Coefficient for Rational Method. (See Enclosed Calculations)

C= Runoff Factor = **0.50**

RAINFALL INTENSITY (I):

ΔE= Change in elevation along the Effective Slope = 6.5 Feet

D= Water Course Distance = 296 Feet

S= Slope = (ΔE/D) X 100% = 2.20 %

Tc = Time of Concentration

T_c= [1.8(1.1-C)(D^1/2)]/[S^(1/3)] = 14.30 Minutes

Use 5 Minutes Minimum

Urban Areas Overland Time of Flow Curves Pg. A-8
City of San Diego- Drainage Design Manual 2017

Intensity = Intensity-Duration-Frequency Curves Pg. A-4 = 2.90 Inches/Hour
City of San Diego- Drainage Design Manual 2017

PEAK DISCHARGES (Q):

A = Area of the basin = 0.53 Acres

Q = CIA = 0.77 ft^3/sec

PRE-DEVELOPMENT PEAK 100-YEAR DISCHARGES (Q)

BASIN B: Q_{100}

COMBINED RUNOFF COEFFICIENT (C):

Land Use	Coefficient (C)	Tributary Area
Rural (Lots greater than 1/2 acre)	0.45	3.84 AC

City of San Diego Drainage Design Manual - January 2017 Edition
Table A-1: Runoff Coefficient for Rational Method. (See Enclosed Calculations)

C= Runoff Factor = **0.50**

RAINFALL INTENSITY (I):

ΔE= Change in elevation along the Effective Slope = 44 Feet

D= Water Course Distance = 1080 Feet

S= Slope = (ΔE/D) X 100% = 4.07 %

Tc = Time of Concentration

T_c= [1.8(1.1-C)(D^1/2)]/[S^(1/3)] = = 22.22 Minutes

Urban Areas Overland Time of Flow Curves Pg. A-8
City of San Diego- Drainage Design Manual 2017

Intensity = Intensity-Duration-Frequency Curves Pg. A-4 = 2.30 Inches/Hour
City of San Diego- Drainage Design Manual 2017

PEAK DISCHARGES (Q):

A = Area of the basin = 3.84 Acres

Q = CIA = 4.42 ft^3/sec

POST-DEVELOPMENT DRAINAGE CALCULATIONS

POST-DEVELOPMENT PEAK 100-YEAR DISCHARGES (Q)

BASIN LOT B1-A: Q_{100}

COMBINED RUNOFF COEFFICIENT (C):

Land Use	Coefficient (C)	Tributary Area	
Single Family	0.98	0.24	AC

City of San Diego Drainage Design Manual - January 2017 Edition
Table A-1: Runoff Coefficient for Rational Method. (See Enclosed Calculations)

C= Runoff Factor = **0.98**

RAINFALL INTENSITY (I):

ΔE= Change in elevation along the Effective Slope = 16.5 Feet

D= Water Course Distance = 310 Feet

S= Slope = (ΔE/D) X 100% = 5.32 %

Tc = Time of Concentration

T_c= [1.8(1.1-C)(D^1/2)]/[S^(1/3)] = 2.18 Minutes

Use 5 Minutes Minimum

Urban Areas Overland Time of Flow Curves Pg. A-8
City of San Diego- Drainage Design Manual 2017

Intensity = Intensity-Duration-Frequency Curves Pg. A-4 = 4.40 Inches/Hour
City of San Diego- Drainage Design Manual 2017

PEAK DISCHARGES (Q):

A = Area of the basin = 0.24 Acres

Q = CIA = 1.03 ft^3/sec

Hydrograph Report

Project Name: Romero Dr TM

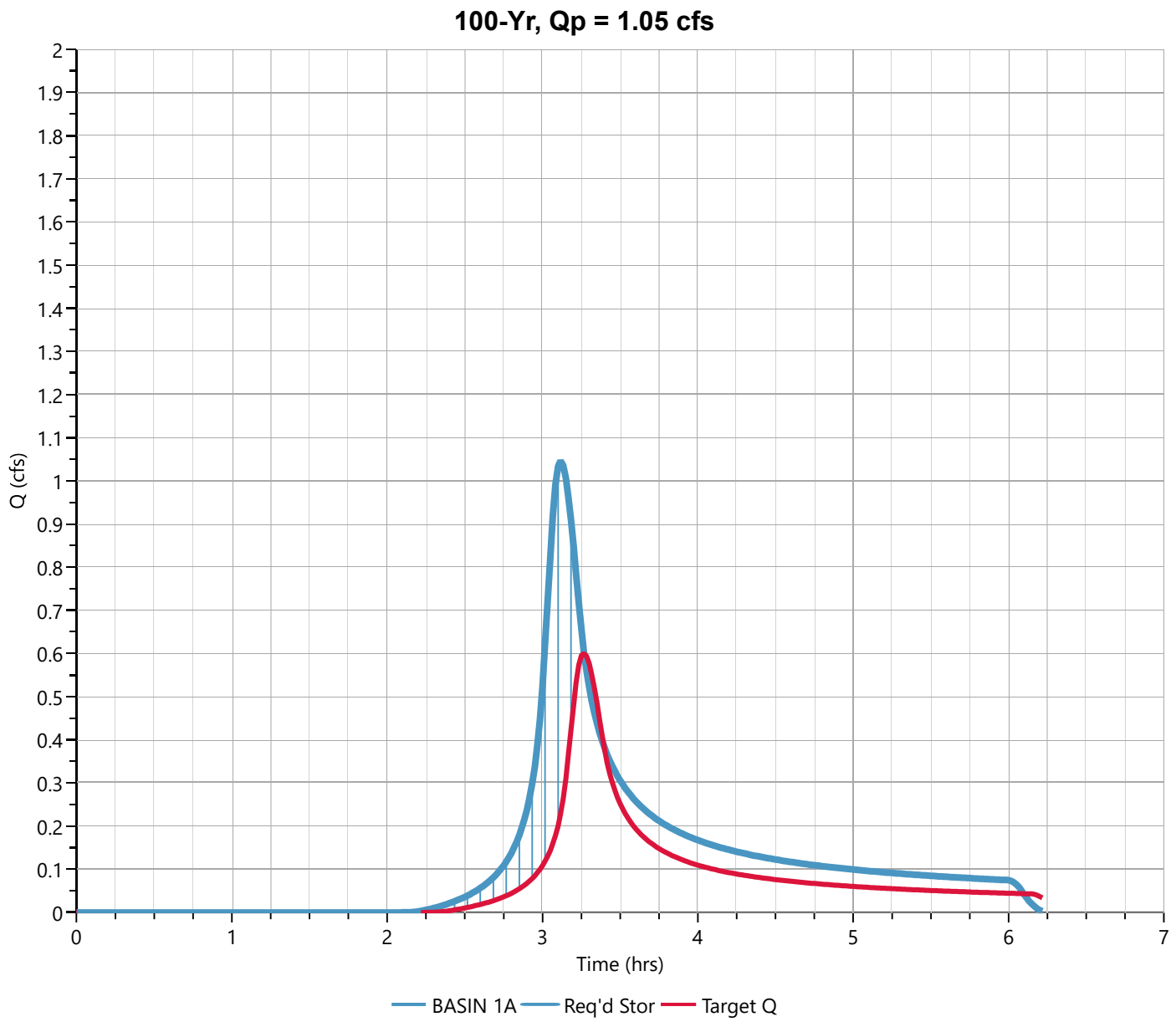
Studio Express by Hydrology Studio v 1.0.0.15

12-17-2023

BASIN 1A

Hyd. No. 1

Hydrograph Type	= NRCS	Peak Flow	= 1.046 cfs
Storm Frequency	= 100-yr	Time to Peak	= 3.12 hrs
Time Interval	= 1 min	Runoff Volume	= 2,648 cft
Drainage Area	= 0.24 ac	Curve Number	= 62
Tc Method	= User-Defined	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 7.322 in	Design Storm	= Synthetic
Storm Duration	= 6 hrs	Shape Factor	= 484
Target Outflow	= 0.600 cfs	Required Storage	= 654 cft



Hydrograph Discharge Table

NRCS

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
2.32	0.012	5.92	0.076						
2.42	0.023	6.02	0.073						
2.52	0.039	6.12	0.033						
2.62	0.061	6.22	0.003						
2.72	0.094	*...end*	*...end*						
2.82	0.150								
2.92	0.266								
3.02	0.622								
3.12	**1.046**								
3.22	0.783								
3.32	0.491								
3.42	0.365								
3.52	0.296								
3.62	0.252								
3.72	0.221								
3.82	0.198								
3.92	0.180								
4.02	0.165								
4.12	0.153								
4.22	0.144								
4.32	0.135								
4.42	0.128								
4.52	0.122								
4.62	0.116								
4.72	0.111								
4.82	0.106								
4.92	0.102								
5.02	0.099								
5.12	0.095								
5.22	0.092								
5.32	0.090								
5.42	0.087								
5.52	0.084								
5.62	0.082								
5.72	0.080								
5.82	0.078								

POST-DEVELOPMENT PEAK 100-YEAR DISCHARGES (Q)

BASIN LOT B1-B: Q_{100}

COMBINED RUNOFF COEFFICIENT (C):

Land Use	Coefficient (C)	Tributary Area
Single Family	0.64	0.04 AC

City of San Diego Drainage Design Manual - January 2017 Edition
Table A-1: Runoff Coefficient for Rational Method. (See Enclosed Calculations)

C= Runoff Factor = **0.64**

RAINFALL INTENSITY (I):

ΔE= Change in elevation along the Effective Slope = 16.5 Feet

D= Water Course Distance = 310 Feet

S= Slope = (ΔE/D) X 100% = 5.32 %

Tc = Time of Concentration

T_c= [1.8(1.1-C)(D^1/2)]/[S^(1/3)] = 8.35 Minutes
Use 5 Minutes Minimum

Urban Areas Overland Time of Flow Curves Pg. A-8
City of San Diego- Drainage Design Manual 2017

Intensity = Intensity-Duration-Frequency Curves Pg. A-4 = 4.40 Inches/Hour
City of San Diego- Drainage Design Manual 2017

PEAK DISCHARGES (Q):

A = Area of the basin = 0.04 Acres

Q = CIA = 0.11 ft^3/sec

Hydrograph Report

Project Name: Romero Dr TM

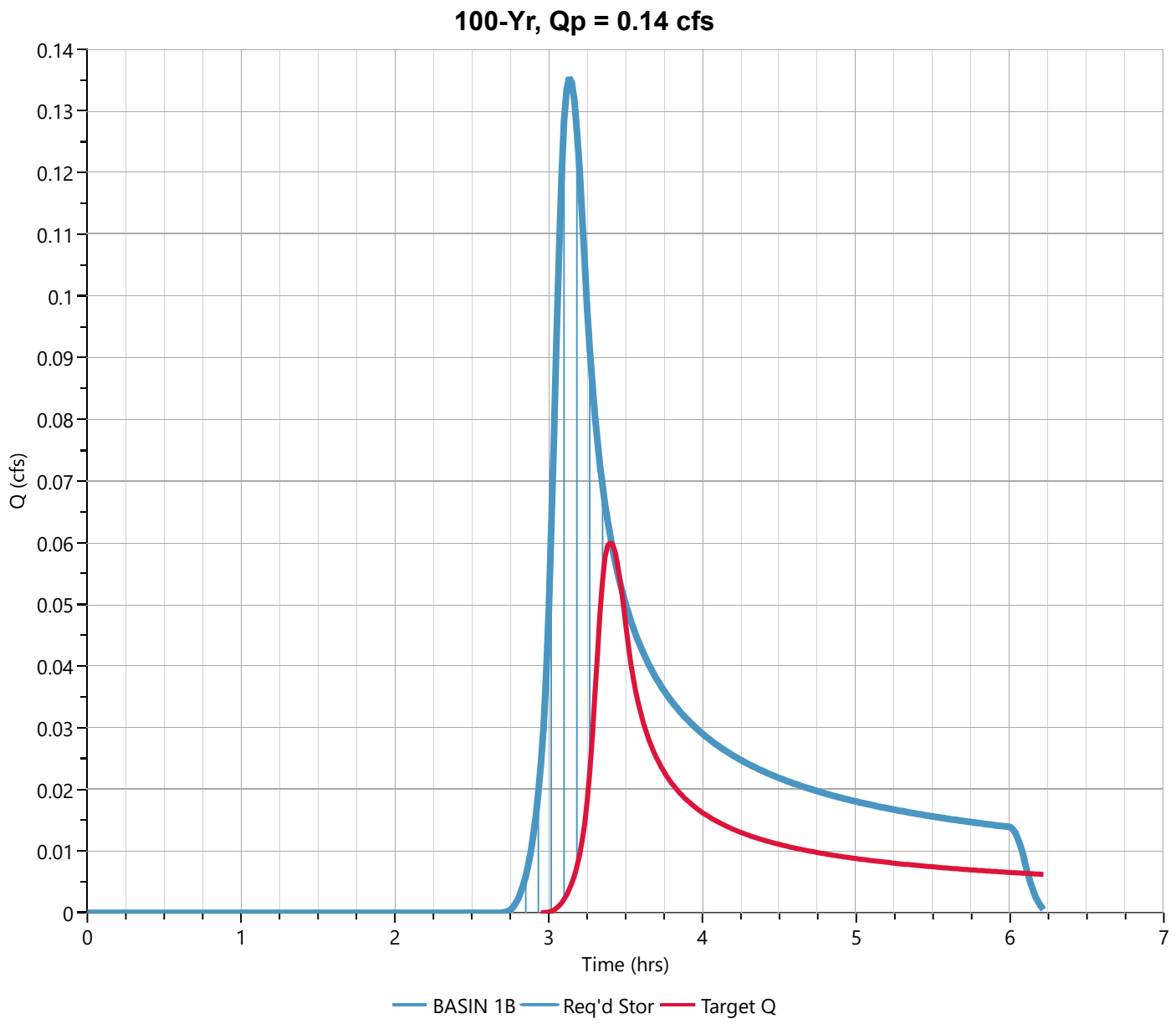
Studio Express by Hydrology Studio v 1.0.0.15

12-17-2023

BASIN 1B

Hyd. No. 2

Hydrograph Type	= NRCS	Peak Flow	= 0.135 cfs
Storm Frequency	= 100-yr	Time to Peak	= 3.13 hrs
Time Interval	= 1 min	Runoff Volume	= 382 cft
Drainage Area	= 0.06 ac	Curve Number	= 49
Tc Method	= User-Defined	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 7.322 in	Design Storm	= Synthetic
Storm Duration	= 6 hrs	Shape Factor	= 484
Target Outflow	= 0.060 cfs	Required Storage	= 113 cft



Hydrograph Discharge Table

NRCS

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
2.92	0.016								
3.02	0.062								
3.12	0.134								
3.22	0.113								
3.32	0.076								
3.42	0.059								
3.52	0.049								
3.62	0.042								
3.72	0.037								
3.82	0.034								
3.92	0.031								
4.02	0.029								
4.12	0.027								
4.22	0.025								
4.32	0.024								
4.42	0.023								
4.52	0.022								
4.62	0.021								
4.72	0.020								
4.82	0.019								
4.92	0.019								
5.02	0.018								
5.12	0.017								
5.22	0.017								
5.32	0.016								
5.42	0.016								
5.52	0.016								
5.62	0.015								
5.72	0.015								
5.82	0.014								
5.92	0.014								
6.02	0.014								
6.12	0.006								
...end	*...end*								

Romero Drive TM
Post-Development Lot 2

POST-DEVELOPMENT PEAK 100-YEAR DISCHARGES (Q)

BASIN LOT B2: Q_{100}

COMBINED RUNOFF COEFFICIENT (C):

Land Use	Coefficient (C)	Tributary Area
Single Family	0.50	0.64 AC

City of San Diego Drainage Design Manual - January 2017 Edition
Table A-1: Runoff Coefficient for Rational Method. (See Enclosed Calculations)

C= Runoff Factor = **0.50**

RAINFALL INTENSITY (I):

ΔE= Change in elevation along the Effective Slope = 7 Feet

D= Water Course Distance = 275 Feet

S= Slope = (ΔE/D) X 100% = 2.55 %

Tc = Time of Concentration

T_c= [1.8(1.1-C)(D^1/2)]/[S^(1/3)] = 13.12 Minutes

Urban Areas Overland Time of Flow Curves Pg. A-8
City of San Diego- Drainage Design Manual 2017

Intensity = Intensity-Duration-Frequency Curves Pg. A-4 = 3.30 Inches/Hour
City of San Diego- Drainage Design Manual 2017

PEAK DISCHARGES (Q):

A = Area of the basin = 0.64 Acres

Q = CIA = **1.06 ft^3/sec**

Hydrograph Report

Project Name: Romero Dr TM

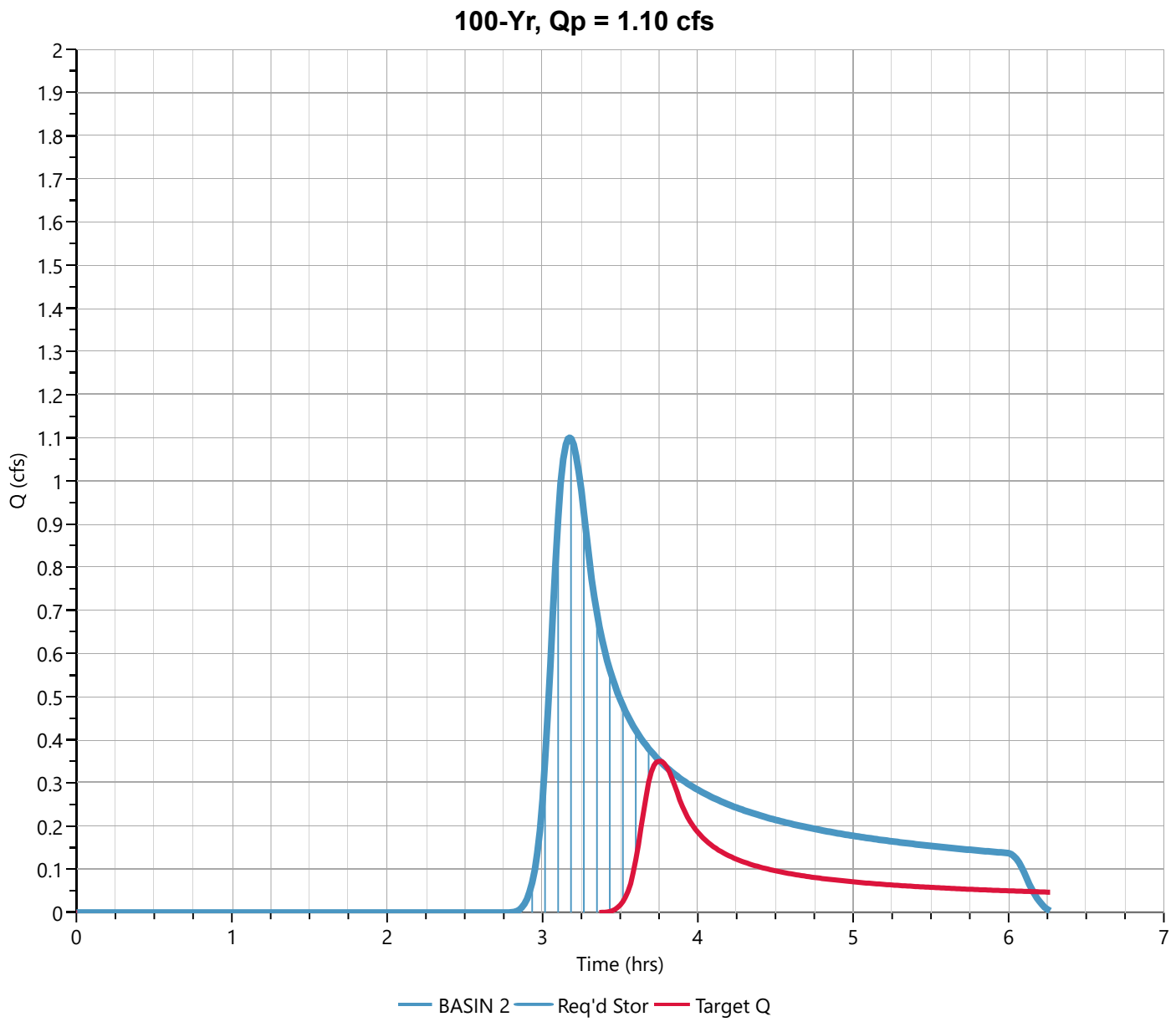
Studio Express by Hydrology Studio v 1.0.0.15

12-17-2023

BASIN 2

Hyd. No. 3

Hydrograph Type	= NRCS	Peak Flow	= 1.100 cfs
Storm Frequency	= 100-yr	Time to Peak	= 3.17 hrs
Time Interval	= 1 min	Runoff Volume	= 3,500 cft
Drainage Area	= 0.64 ac	Curve Number	= 46
Tc Method	= User-Defined	Time of Conc. (Tc)	= 11.0 min
Total Rainfall	= 7.322 in	Design Storm	= Synthetic
Storm Duration	= 6 hrs	Shape Factor	= 484
Target Outflow	= 0.350 cfs	Required Storage	= 1,471 cft



Hydrograph Discharge Table

NRCS

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
2.92	0.047								
3.02	0.353								
3.12	0.994								
3.22	1.058								
3.32	0.772								
3.42	0.583								
3.52	0.479								
3.62	0.412								
3.72	0.365								
3.82	0.330								
3.92	0.303								
4.02	0.281								
4.12	0.263								
4.22	0.247								
4.32	0.234								
4.42	0.223								
4.52	0.213								
4.62	0.204								
4.72	0.196								
4.82	0.189								
4.92	0.182								
5.02	0.177								
5.12	0.171								
5.22	0.166								
5.32	0.162								
5.42	0.157								
5.52	0.153								
5.62	0.150								
5.72	0.146								
5.82	0.143								
5.92	0.140								
6.02	0.135								
6.12	0.078								
6.22	0.018								
6.32	0.00								
...end	*...end*								

POST-DEVELOPMENT PEAK 100-YEAR DISCHARGES (Q)

BASIN LOT B3: Q_{100}

COMBINED RUNOFF COEFFICIENT (C):

Land Use	Coefficient (C)	Tributary Area
Single Family	0.69	0.59 AC

City of San Diego Drainage Design Manual - January 2017 Edition
Table A-1: Runoff Coefficient for Rational Method. (See Enclosed Calculation

C= Runoff Factor = **0.69**

RAINFALL INTENSITY (I):

ΔE = Change in elevation along the Effective Slope = 8 Feet

D= Water Course Distance = 193 Feet

S= Slope = (ΔE/D) X 100% = 4.15 %

Tc = Time of Concentration

T_c = [1.8(1.1-C)(D^1/2)]/[S^(1/3)] = 6.38 Minutes

Urban Areas Overland Time of Flow Curves Pg. A-8
City of San Diego- Drainage Design Manual 2017

Intensity = Intensity-Duration-Frequency Curves Pg. A-4 = 4.30 Inches/Hour
City of San Diego- Drainage Design Manual 2017

PEAK DISCHARGES (Q):

A = Area of the basin = 0.59 Acres

Q = CIA = 1.75 ft^3/sec

Hydrograph Report

Project Name: Romero Dr TM

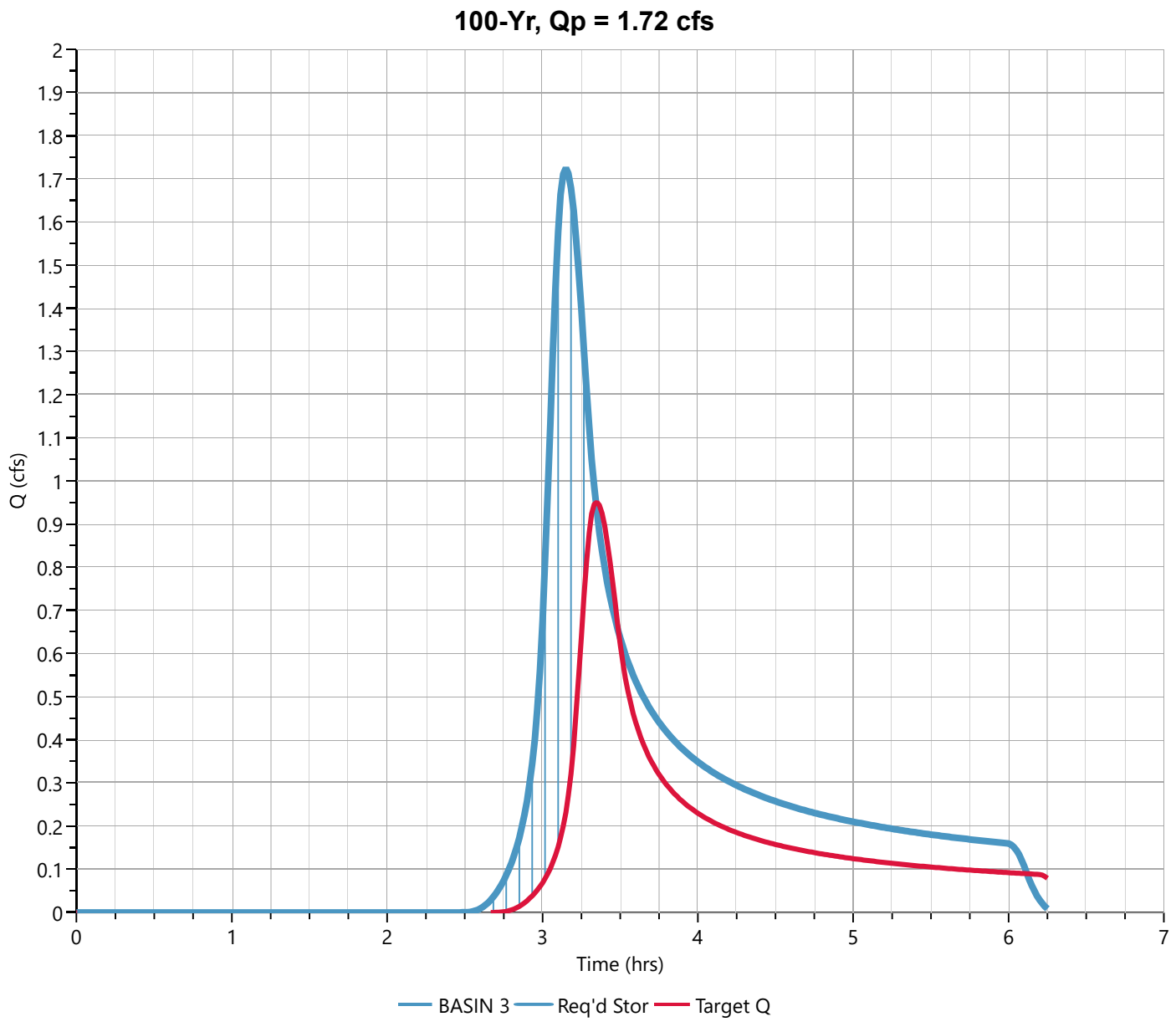
Studio Express by Hydrology Studio v 1.0.0.15

12-17-2023

BASIN 3

Hyd. No. 4

Hydrograph Type	= NRCS	Peak Flow	= 1.725 cfs
Storm Frequency	= 100-yr	Time to Peak	= 3.15 hrs
Time Interval	= 1 min	Runoff Volume	= 4,867 cft
Drainage Area	= 0.59 ac	Curve Number	= 54
Tc Method	= User-Defined	Time of Conc. (Tc)	= 11.0 min
Total Rainfall	= 7.322 in	Design Storm	= Synthetic
Storm Duration	= 6 hrs	Shape Factor	= 484
Target Outflow	= 0.950 cfs	Required Storage	= 1,265 cft



Hydrograph Discharge Table

NRCS

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
2.62	0.013	6.22	0.021						
2.72	0.053	6.32	0.00						
2.82	0.132	*...end*	*...end*						
2.92	0.298								
3.02	0.816								
3.12	1.663								
3.22	1.560								
3.32	1.050								
3.42	0.765								
3.52	0.616								
3.62	0.522								
3.72	0.458								
3.82	0.410								
3.92	0.374								
4.02	0.344								
4.12	0.320								
4.22	0.300								
4.32	0.283								
4.42	0.268								
4.52	0.255								
4.62	0.244								
4.72	0.234								
4.82	0.225								
4.92	0.216								
5.02	0.209								
5.12	0.202								
5.22	0.196								
5.32	0.190								
5.42	0.185								
5.52	0.180								
5.62	0.175								
5.72	0.171								
5.82	0.167								
5.92	0.163								
6.02	0.157								
6.12	0.091								

POST-DEVELOPMENT PEAK 100-YEAR DISCHARGES (Q)

BASIN LOT B4: Q_{100}

COMBINED RUNOFF COEFFICIENT (C):

Land Use	Coefficient (C)	Tributary Area
Single Family	0.55	0.58 AC

City of San Diego Drainage Design Manual - January 2017 Edition
Table A-1: Runoff Coefficient for Rational Method. (See Enclosed Calculation

C= Runoff Factor = **0.55**

RAINFALL INTENSITY (I):

ΔE= Change in elevation along the Effective Slope = 17 Feet

D= Water Course Distance = 323 Feet

S= Slope = (ΔE/D) X 100% = 5.26 %

Tc = Time of Concentration

T_c = [1.8(1.1-C)(D^1/2)]/[S^(1/3)] = 10.23 Minutes

Urban Areas Overland Time of Flow Curves Pg. A-8
City of San Diego- Drainage Design Manual 2017

Intensity = Intensity-Duration-Frequency Curves Pg. A-4 = 3.40 Inches/Hour
City of San Diego- Drainage Design Manual 2017

PEAK DISCHARGES (Q):

A = Area of the basin = 0.58 Acres

Q = CIA = 1.08 ft^3/sec

Hydrograph Report

Project Name: Romero Dr TM

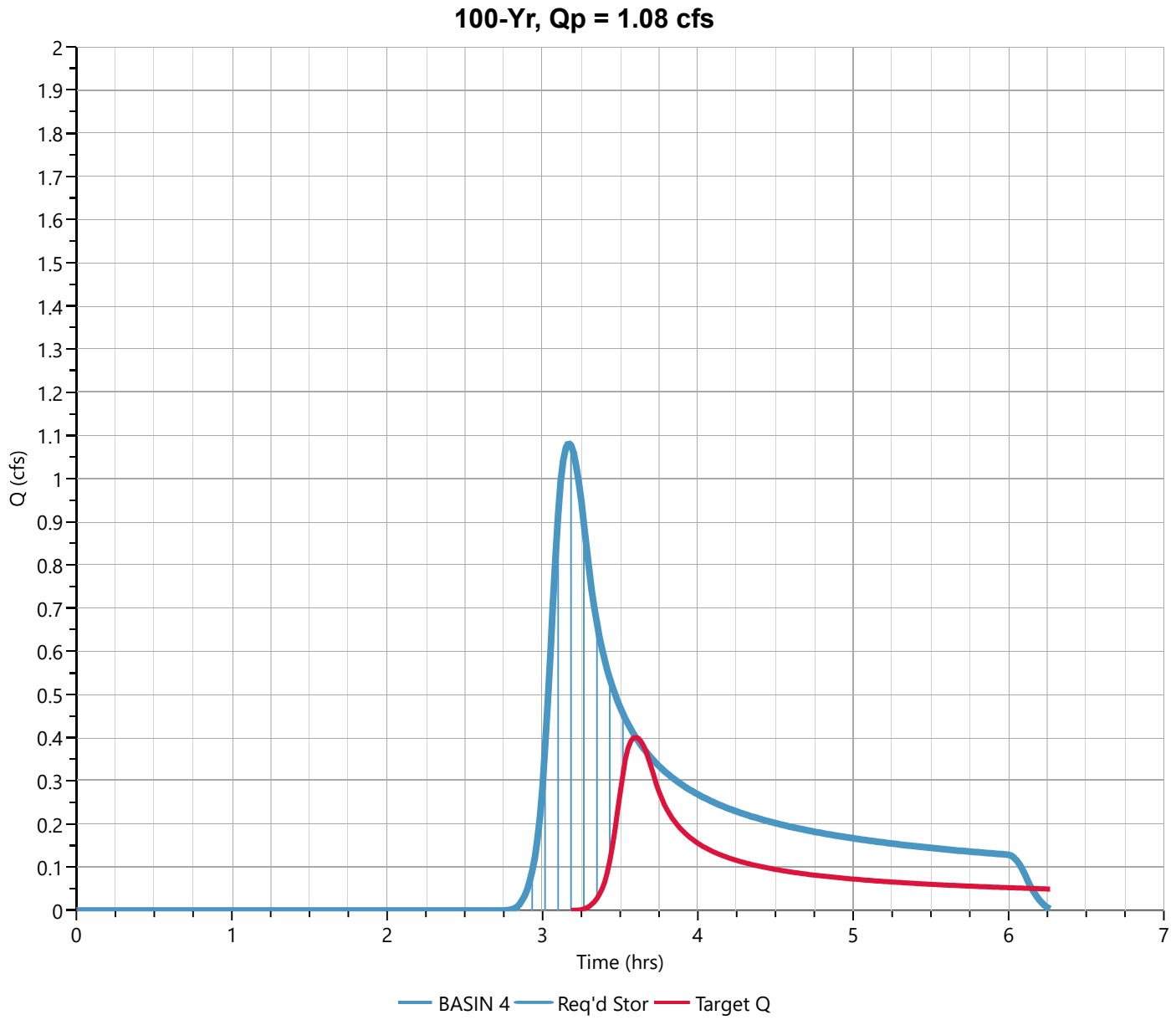
Studio Express by Hydrology Studio v 1.0.0.15

12-17-2023

BASIN 4

Hyd. No. 5

Hydrograph Type	= NRCS	Peak Flow	= 1.082 cfs
Storm Frequency	= 100-yr	Time to Peak	= 3.17 hrs
Time Interval	= 1 min	Runoff Volume	= 3,366 cft
Drainage Area	= 0.58 ac	Curve Number	= 47
Tc Method	= User-Defined	Time of Conc. (Tc)	= 11.0 min
Total Rainfall	= 7.322 in	Design Storm	= Synthetic
Storm Duration	= 6 hrs	Shape Factor	= 484
Target Outflow	= 0.400 cfs	Required Storage	= 1,233 cft



Hydrograph Discharge Table

NRCS

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
2.92	0.066								
3.02	0.377								
3.12	0.991								
3.22	1.030								
3.32	0.742								
3.42	0.557								
3.52	0.456								
3.62	0.392								
3.72	0.346								
3.82	0.313								
3.92	0.286								
4.02	0.265								
4.12	0.248								
4.22	0.233								
4.32	0.221								
4.42	0.210								
4.52	0.200								
4.62	0.192								
4.72	0.184								
4.82	0.178								
4.92	0.172								
5.02	0.166								
5.12	0.161								
5.22	0.156								
5.32	0.152								
5.42	0.148								
5.52	0.144								
5.62	0.140								
5.72	0.137								
5.82	0.134								
5.92	0.131								
6.02	0.127								
6.12	0.074								
6.22	0.017								
6.32	0.00								
...end	*...end*								

POST-DEVELOPMENT PEAK 100-YEAR DISCHARGES (Q)

BASIN LOT B5: Q_{100}

COMBINED RUNOFF COEFFICIENT (C):

Land Use	Coefficient (C)	Tributary Area
Single Family	0.77	0.98 AC

City of San Diego Drainage Design Manual - January 2017 Edition
Table A-1: Runoff Coefficient for Rational Method. (See Enclosed Calculation

C= Runoff Factor = **0.77**

RAINFALL INTENSITY (I):

ΔE= Change in elevation along the Effective Slope = 52 Feet

D= Water Course Distance = 617 Feet

S= Slope = (ΔE/D) X 100% = 8.43 %

Tc = Time of Concentration

T_c = [1.8(1.1-C)(D^1/2)]/[S^(1/3)] = 7.25 Minutes

Urban Areas Overland Time of Flow Curves Pg. A-8
City of San Diego- Drainage Design Manual 2017

Intensity = Intensity-Duration-Frequency Curves Pg. A-4 = 4.30 Inches/Hour
City of San Diego- Drainage Design Manual 2017

PEAK DISCHARGES (Q):

A = Area of the basin = 0.98 Acres

Q = CIA = 3.24 ft^3/sec

Hydrograph Report

Project Name: Romero Dr TM

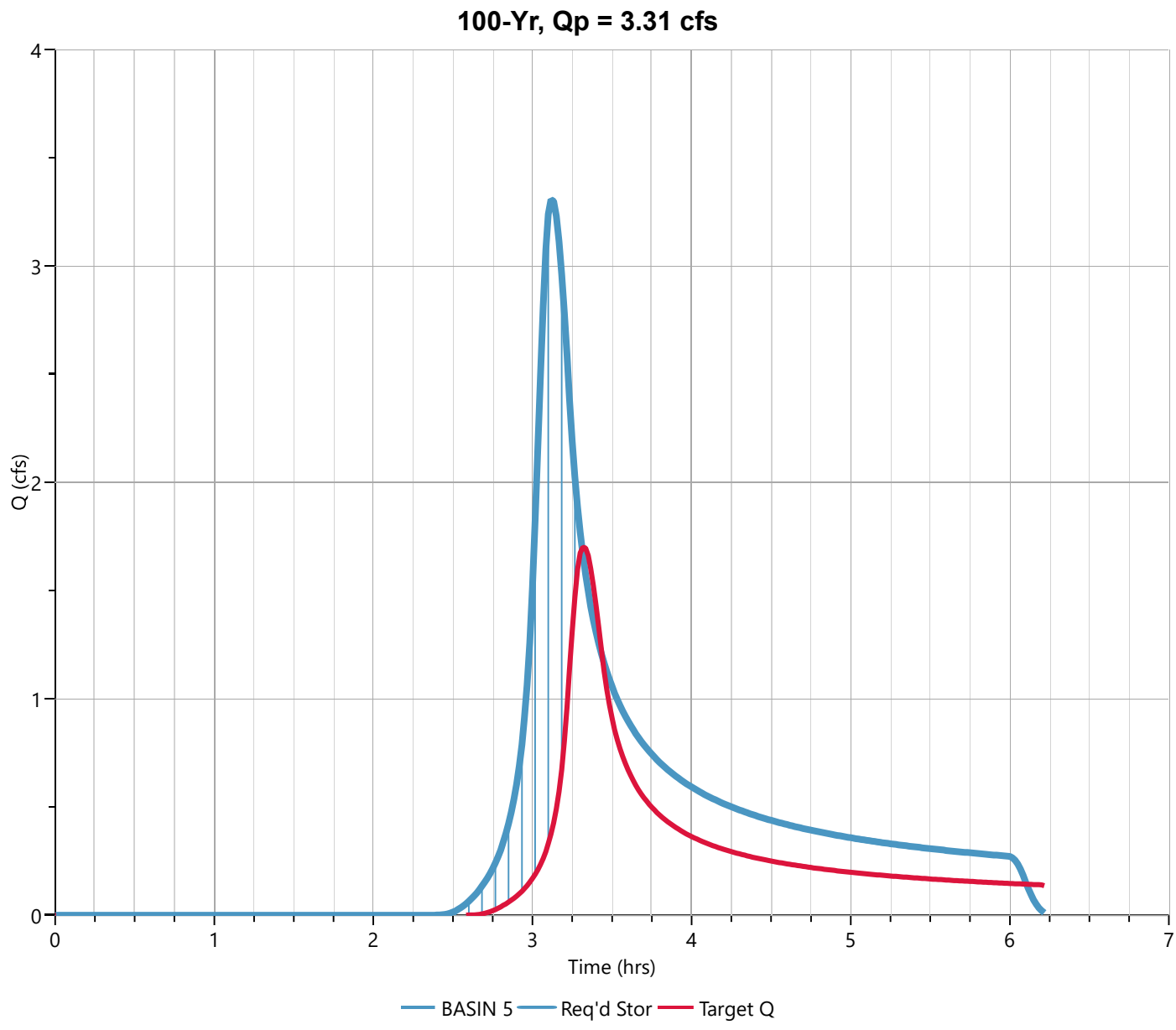
Studio Express by Hydrology Studio v 1.0.0.15

12-17-2023

BASIN 5

Hyd. No. 6

Hydrograph Type	= NRCS	Peak Flow	= 3.306 cfs
Storm Frequency	= 100-yr	Time to Peak	= 3.12 hrs
Time Interval	= 1 min	Runoff Volume	= 8,644 cft
Drainage Area	= 0.98 ac	Curve Number	= 56
Tc Method	= User-Defined	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 7.322 in	Design Storm	= Synthetic
Storm Duration	= 6 hrs	Shape Factor	= 484
Target Outflow	= 1.700 cfs	Required Storage	= 2,381 cft



Hydrograph Discharge Table

NRCS

Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)	Time (hrs)	Outflow (cfs)
2.52	0.020	6.12	0.120						
2.62	0.076	6.22	0.010						
2.72	0.171	*...end*	*...end*						
2.82	0.337								
2.92	0.688								
3.02	1.821								
3.12	**3.306**								
3.22	2.586								
3.32	1.665								
3.42	1.255								
3.52	1.025								
3.62	0.877								
3.72	0.772								
3.82	0.694								
3.92	0.633								
4.02	0.584								
4.12	0.544								
4.22	0.510								
4.32	0.481								
4.42	0.456								
4.52	0.434								
4.62	0.415								
4.72	0.398								
4.82	0.382								
4.92	0.368								
5.02	0.355								
5.12	0.344								
5.22	0.333								
5.32	0.323								
5.42	0.314								
5.52	0.306								
5.62	0.298								
5.72	0.290								
5.82	0.283								
5.92	0.277								
6.02	0.265								

POST-DEVELOPMENT PEAK 100-YEAR DISCHARGES (Q)

BASIN LOT B6: Q_{100}

COMBINED RUNOFF COEFFICIENT (C):

Land Use	Coefficient (C)	Tributary Area
Single Family	0.50	0.65 AC

City of San Diego Drainage Design Manual - January 2017 Edition
Table A-1: Runoff Coefficient for Rational Method. (See Enclosed Calculation

C= Runoff Factor = **0.50**

RAINFALL INTENSITY (I):

ΔE= Change in elevation along the Effective Slope = 31 Feet

D= Water Course Distance = 580 Feet

S= Slope = (ΔE/D) X 100% = 5.34 %

Tc = Time of Concentration

T_c = [1.8(1.1-C)(D^1/2)]/[S^(1/3)] = 14.88 Minutes

Urban Areas Overland Time of Flow Curves Pg. A-8
City of San Diego- Drainage Design Manual 2017

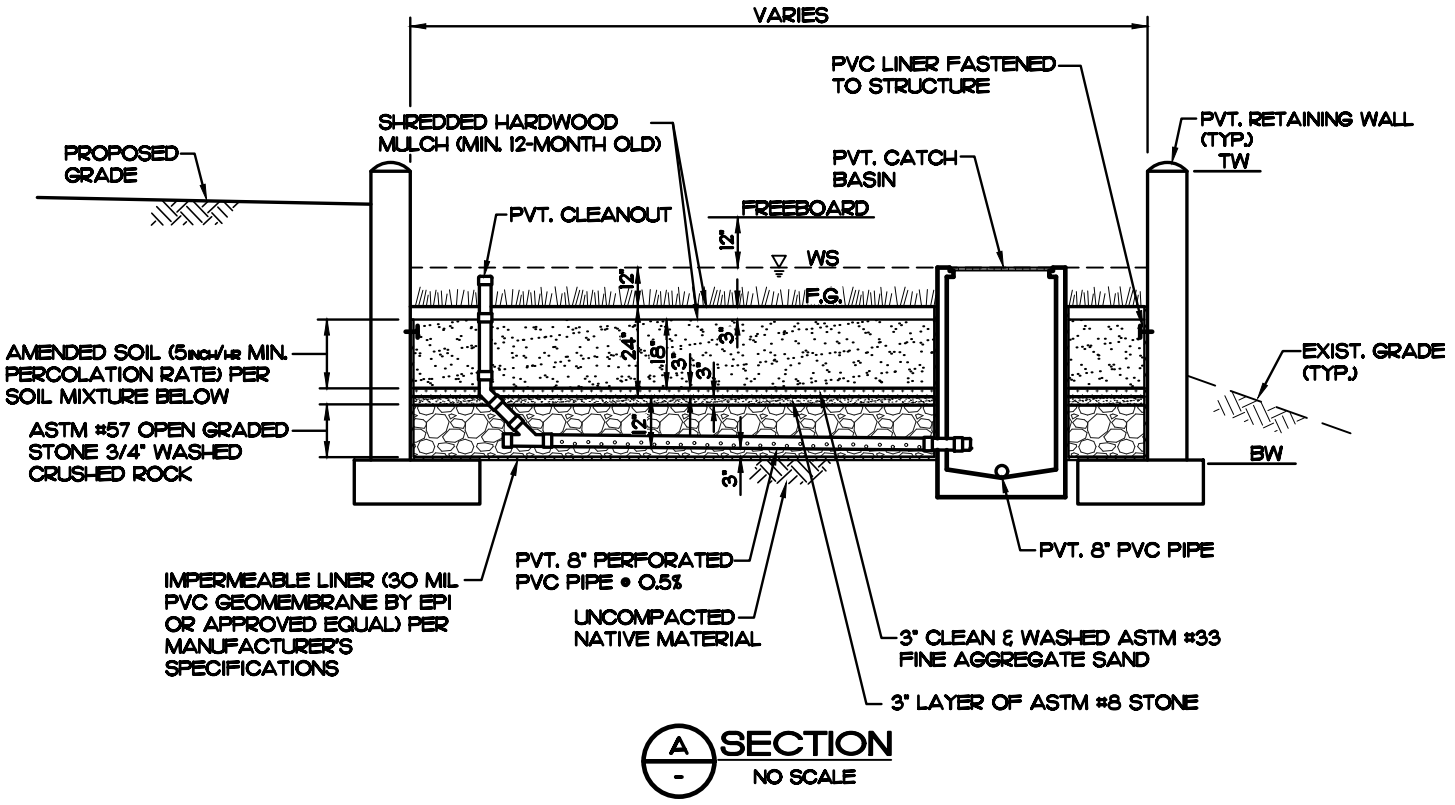
Intensity = Intensity-Duration-Frequency Curves Pg. A-4 = 2.90 Inches/Hour
City of San Diego- Drainage Design Manual 2017

PEAK DISCHARGES (Q):

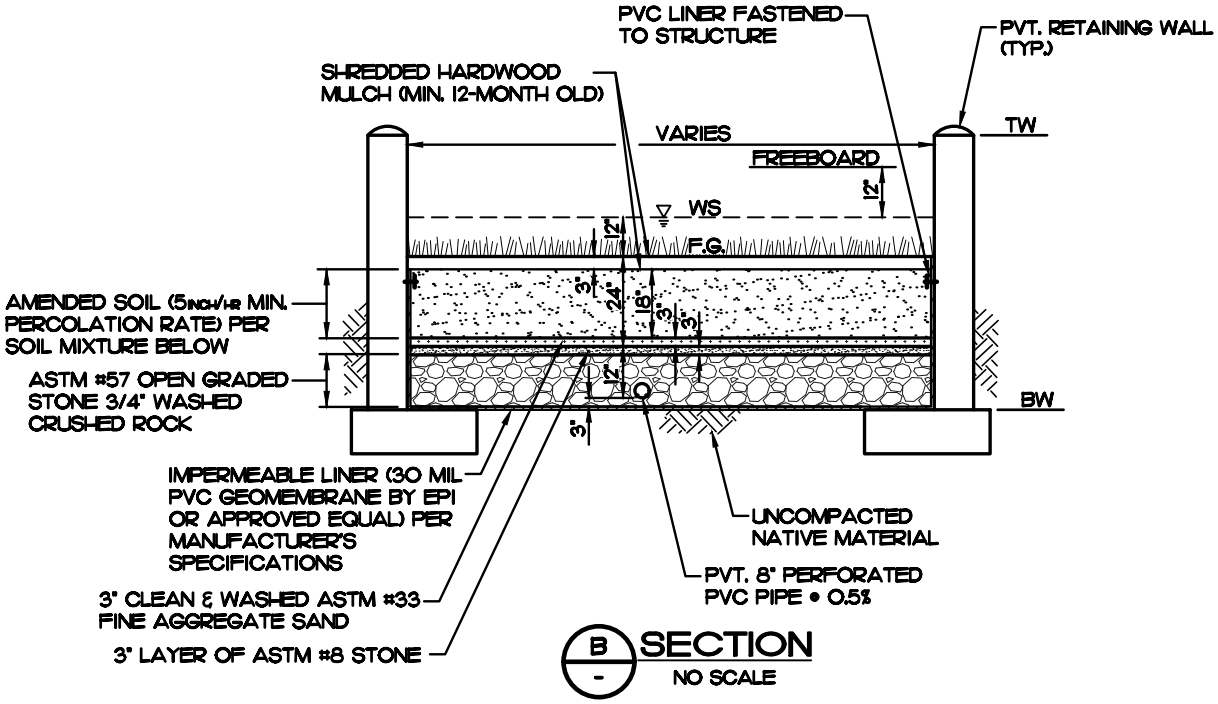
A = Area of the basin = 0.65 Acres

Q = CIA = **0.94 ft^3/sec**

POST-DEVELOPMENT MITIGATION CALCULATIONS



A - SECTION
NO SCALE



B - SECTION
NO SCALE

SOIL MIXTURE:
85% WASHED SAND, 10% FINES (SILT & CLAY), 5% ORGANIC MATTER.
(SEE CITY OF SAN DIEGO STORM WATER STANDARDS, APPENDIX F.)

PVT. BIOFILTRATION BASIN

NO SCALE

HYDRAULIC CALCULATIONS

(12" PVC & 6" PVC DISCHARGE VELOCITY CALCULATIONS)

Channel Report

Project filename: Romero TM Post-Development.stx

Studio Express by Hydrology Studio v 1.0.0.15

12-17-2023

12-inch PVC

Channel 1

CIRCULAR PIPE

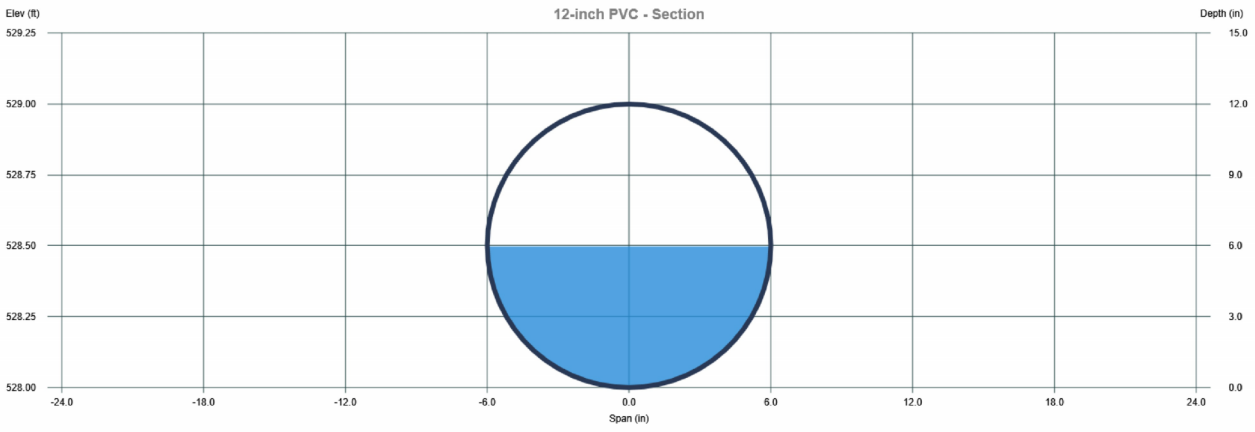
Diameter	= 12.0 in
Invert Elevation	= 528.00 ft
Pipe Slope	= 4.000 %
Manning's n	= 0.013

DISCHARGE

Method	= Known Q
Known Q	= 3.40 cfs

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(in)	(sqft)	(ft/s)	(ft)		(in)	(ft)	(ft)	(lb/sqft)	(ft)
3.40	5.9	0.38	8.88	1.55	0.013	9.5	528.5	529.72	1.22	1.00



Channel Report

Project filename: Romero TM Post-Development.stx

Studio Express by Hydrology Studio v 1.0.0.15

12-17-2023

6-inch PVC LOT 1 Basins

Channel 2

CIRCULAR PIPE

Diameter	= 6.0 in
Invert Elevation	= 528.00 ft
Pipe Slope	= 10.000 %
Manning's n	= 0.013

DISCHARGE

Method	= Known Q
Known Q	= 0.66 cfs

CALCULATION SAMPLE

Flow	Depth	Area	Velocity	WP	n-value	Crit Depth	HGL	EGL	Max Shear	Top Width
(cfs)	(in)	(sqft)	(ft/s)	(ft)		(in)	(ft)	(ft)	(lb/sqft)	(ft)
0.66	2.6	0.08	7.93	0.73	0.013	5.0	528.2	529.20	1.37	0.50