PRELIMINARY HYDROLOGY STUDY

TTM NO. 83442
Arkansas Street Project
City of Artesia

Project Address:
Arkansas Street & Pioneer Boulevard
Artesia, California

Prepared For:

City Ventures
3121 Michelson Drive, Suite 150
Irvine, CA 92612
Contact: Kim Prijatel

Prepared By:

C&V Consulting, Inc.
9830 Irvine Center Drive
Irvine, CA 92618
Contact: Ryan Bittner, P.E.

May 2021

Preliminary Hydrology Study
For
Tentative Tract Map No. 83442

Acknowledgement and Signature Page

This Preliminary Hydrology Study was prepared by C&V Consulting, Inc. under the supervision of Ryan Bittner, P.E.

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Ryan Bittner, P.E. 68167 Date
C&V Consulting, Inc.

TABLE OF CONTENTS

APPENDICES

I. Purpose

The purpose of this report is to provide quantitative information to verify the design of the storm drain infrastructure and hydrologic methodology of the project site. The values and statements within the confirm the subject site is designed and planned in accordance with the Los Angeles County Hydrology Manual and the City of Artesia drainage requirements.

II. Site Description

The proposed project site comprises several existing lots that forms two adjacent rectangular shape area with a total of 2.654 acre. It is located at Arkansas Street and Pioneer Boulevard, (APN:7014-003-021 through 028). The site is bounded by Arkansas Street to the north, Pioneer Boulevard to the east, and single family residentials to the south and west.

The northerly portion of the project site consist of a few single-family residential homes and a commercial building. The southerly portion of the project site is an existing RV parking lot covered with AC paving with a small building serving the RV storage site. There is an existing retaining wall along the southerly border of the parking lot.

The existing drainage of the project site consist of two outlets. The properties of the northerly portion of the project site appears to drain north-westerly towards Arkansas Street and downstream to an off-site catch basin. The RV parking lot drainage is inverted to a longitudinal gutter that is split easterly and north-westerly. The drainage extending to the northwest enters the same catch basin as the northerly portion of the site, which continues to flow westerly. Whereas the drainage extending to the east ends at a drainage inlet on the side of the drive-through entrance to the adjacent property and continue downstream towards Pioneer Boulevard via off-site v-gutter . All drainage appears to surface flow with no sign of any storm drain on Arkansas to the downstream catch basin.

The project proposes the construction of 10 buildings with 60 attached condominium with private garages, private drive aisles, sidewalks, trash enclosures and common landscaped areas. The project site will be accessible with an entrance/ exit along Arkansas Street. An off-site public parking area is proposed along Arkansas Street, which will not be a part of this hydrology as perviousness of land usage and drainage pattern will be preserved being replacement in-kind. On-site grading design will preserve the drainage pattern of the two separate outlets from the proposed project site. The two outlets are delineated with (2) two on-site drainage management areas per proposed on-site grading design. Grated and curb inlets are located at street low points to collect and direct runoffs from each DMA to its corresponding detention system, which will feed the WetlandMOD biofiltration system per pump station to conform with water quality treatment standards. Treated stormwater from each DMA will be discharge per pump station to the outlet per existing conditions.

In cases of high storm event, northerly portion of the site, DMA-A, is graded to outlet overflow at the entrance of the site towards Arkansas Street after the detention fills up and storm runoff bubbles out from the catch basin. As for the south-easterly portion of the site, DMA-B, overflow pipe is installed in the lowest catch basin to outlet towards the adjacent properties v-gutter towards Pioneer Boulevard as existing conditions.

According to the federal Emergency Management Agency (FEMA) FIRM rate map number 06037C1839F, effective date September 26, 2008, the site is located within flood Zone X, area with reduced flood risk due to levee.

A separately preliminary LID plan is prepared to address the Los Angeles County storm water quality requirements.

Refer to Vicinity Map in Appendix A for site location.

III. Methodology

The project site's drainage was analyzed per the Los Angeles County Hydrology Manual. The existing and proposed conditions of the site were analyzed for peak flow rate and time of concentration for the 25-, 50-, and 100- storm events based on acreage and land cover per LACDPW HydroCalc program.

IV. Design Assumption

1. The LACDPW HydroCalc Calculator Program was used to determine Tc, Peak run-off flow rate, and run-off volume for subarea based on the longest flow path and elevation difference.
2. The Property is located in the "Whitter" rainfall region per Figure 1.H1.10 of the Hydrology Manual. A depth of 5.5 inches of rainfall was determined from the 50-year storm 24-hour isohyet map.
3. The site is in the soil classification of "006" per Figure 1.H1.10 of the Hydrology Manual.
4. Existing condition is assumed to be a recommended value of 21% impervious for low-density single family residential area and a recommended value of 91% impervious for high density trailer parks and mobile home area per Hydrology Manual.
5. Proposed condition is assumed to be approximately 86% impervious base on the recommended values of Medium-Rise Apartments, Condominiums per Hydrology Manual.
6. Proposed storm drains will be sized to convey the 25-year storm per urban flood requirement.
7. No direct connections to the public storm drain are proposed. Therefore, proposed peak flow mitigation will governed by the existing peak flows.

V. Hydraulic Calculation

Pipe Sizing

Onsite storm drain piping will be sized for the 25-year storm event and will be analyzed based on open channel flow. Therefore, WSPG hydraulic pressure analysis is not warranted.

$Q = \frac{k'}{n} d^{8/3} S^{1/2}$ per King's Handbook

k' = 0.463
d = pipe diameter

n=0.013*
S=0.005

Pipe Diameter	Max. Q (cfs)
8"	0.854
12"	2.518
15"	4.566
18"	7.425
24"	15.991
36"	47.146

n=0.013*
S=0.010

Pipe Diameter	Max. Q (cfs)
8"	1.208
12"	3.562
15"	6.457
18"	10.501
24"	22.614
36"	66.675

*A Manning's Roughness Coefficient of 0.013 has been utilized to represent the roughness coefficient of PVC and/or HDPE piping.

Detention Sizing

Detention calculation was verified that water quality detention requirement is greater than pre- and post-development conditions difference. Refer to summary of detention sizing below:

Proposed Condition Drainage Area	Area (ac)	Pre- vs. Post Q_{25} Hydrograph Difference	Water Quality Treatment Volume (cu-ft)	Proposed Detention Volume (cu-ft)
DMA-A	1.579	1,346.79	5,912.72	6,191.10
DMA-B	1.075	-	4,025.44	4,044.80
Total	2.654	1,346.79	9,938.16	10,235.90

Refer to separate prepared LID for additional information on water quality treatment volume.

Catch Basin Inlet Sizing

Catch Basin inlet sizing will be sized based on the 25-year storm event to conform with LACDPW Hydrology urban flood street capacity and will be provided during final engineering.

100-Year Water Surface Elevation (WSE)

The elevation of the 100-year water surface will be analyzed during final engineering. Building finished floors will be set at a minimum of at least 1 foot above the 100-year WSE.

VI. Results

Below is a summary of the project site existing and proposed conditions peak runoff values at two separate outlets of the project site.

Drainage summary at Outlet A towards Arkansas Street:

Existing Condition Drainage Area	Area (ac)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
DMA-XA-1	1.205	2.39	3.05	3.87
DMA-XA-2	0.203	0.48	0.60	0.67
Total (Outlet A)	1.408	2.87	3.64	4.54

Proposed Condition Drainage Area	Area (ac)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
DMA-A	1.579	3.70	4.23	5.20

Q25 Percent Difference	28.8%

Drainage summary at Outlet B towards Pioneer Boulevard:

Existing Condition Drainage Area	Area (ac)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
DMA-XB	1.246	2.56	3.11	3.77

Proposed Condition Drainage Area	Area (ac)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
DMA-B (Outlet B)	1.075	2.52	3.15	3.54

Q25 Percent Difference	-1.5%

Drainage summary of the entire project site:

	Area (ac)	Q_{25} (cfs)	Q_{50} (cfs)	Q_{100} (cfs)
Existing Condition Drainage	2.654	5.43	6.75	8.31
Proposed Condition Drainage	2.654	6.22	7.38	8.75
Percent Difference	-	14.5%	9.2%	5.3%

Refer to Appendix C, D, & E of this report for additional information and LACDPW HydroCalc output data, as well as the pre-developed and post-developed hydrology maps.

VII. Conclusion

The result from this hydrology study demonstrate that the overall proposed development condition will generate a high peak runoff flowrate than the existing condition of the site. The project site proposes two drainage outlets preserving existing site condition. Proposed Outlet A towards Arkansas Street will generate a higher flowrate and Outlet B towards Pioneer Boulevard will generate a lower flowrate for the 25-year storm event. Detention sizing per water quality treatment for both outlets are determined to be greater than Hydrology requirement for the 25-year pre- and post- development difference; therefore, additional detention will not be required. During final engineering, Pervious area is to be verify with final site plan to confirm the water quality treatment detention volume.

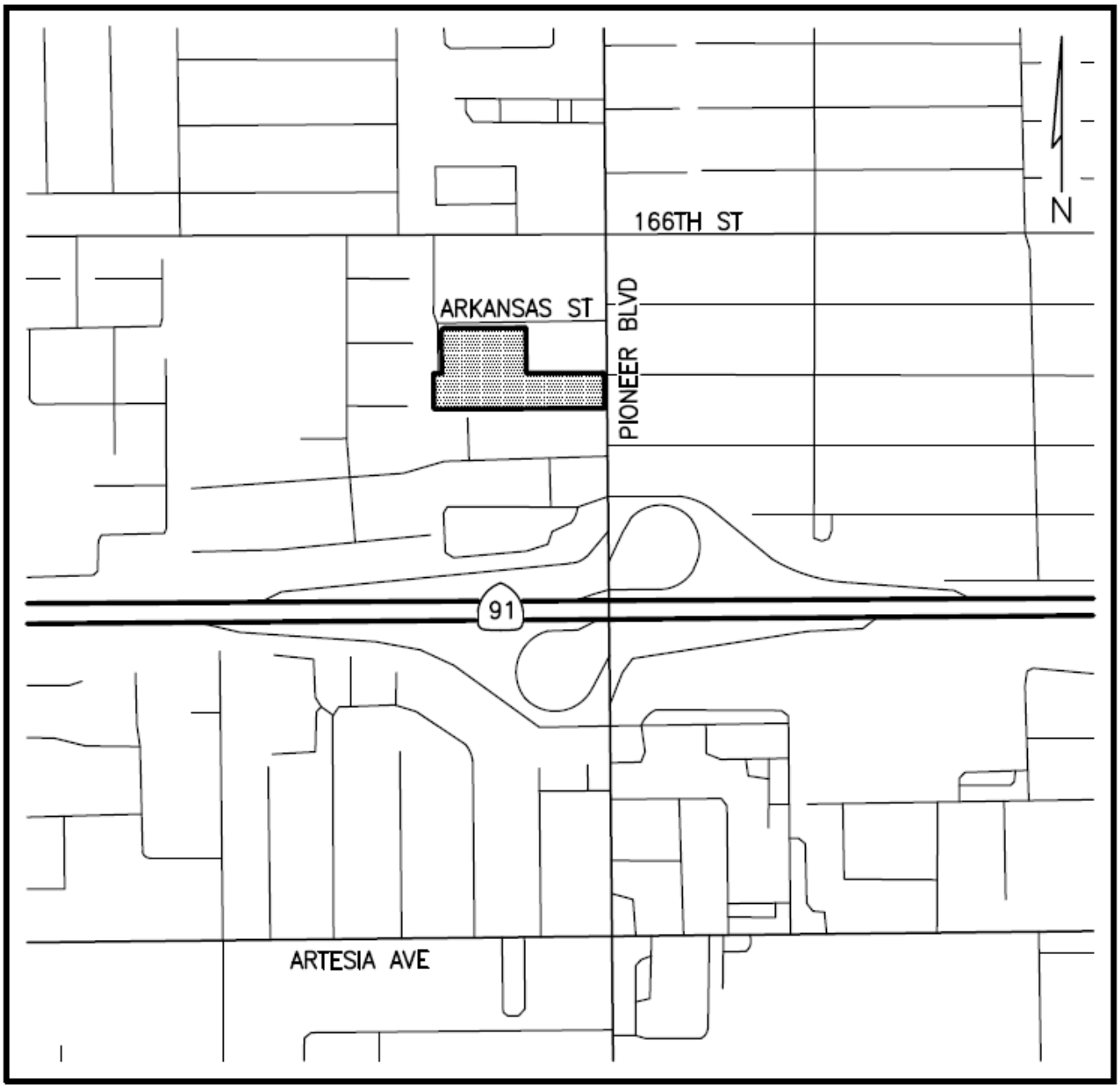
In cases of high storm event, northerly portion of the site, DMA-A, is graded to outlet overflow at the entrance of the site towards Arkansas Street after the detention fills up and storm runoff bubbles out from the catch basin. As for the south-easterly portion of the site, DMA-B, overflow pipe is installed in the lowest catch basin to outlet towards the adjacent properties v-gutter towards Pioneer Boulevard as existing conditions. The proposed development will be graded to preserve the existing flow paths and continues to flow downstream to the existing LACDPW storm drain system.

VIII. References

1. Los Angeles County Department of Public Works (LACDPW) Hydrology Manual, January 2006.
2. LACDPW HydroCalc Program was utilized to determine flow rates and time of concentrations.
3. Existing and Proposed Conditions Hydrology Maps for Tract Map No. 83381, prepared by C&V Consulting, Inc.
4. KING, HORACE WILLIAMS HANDBOOK OF HYDRAULICS: for the Solution of Hydraulic Problems (Classic Reprint). FORGOTTEN Books, 2015

APPENDIX A

Vicinity Map



VICINITY MAP

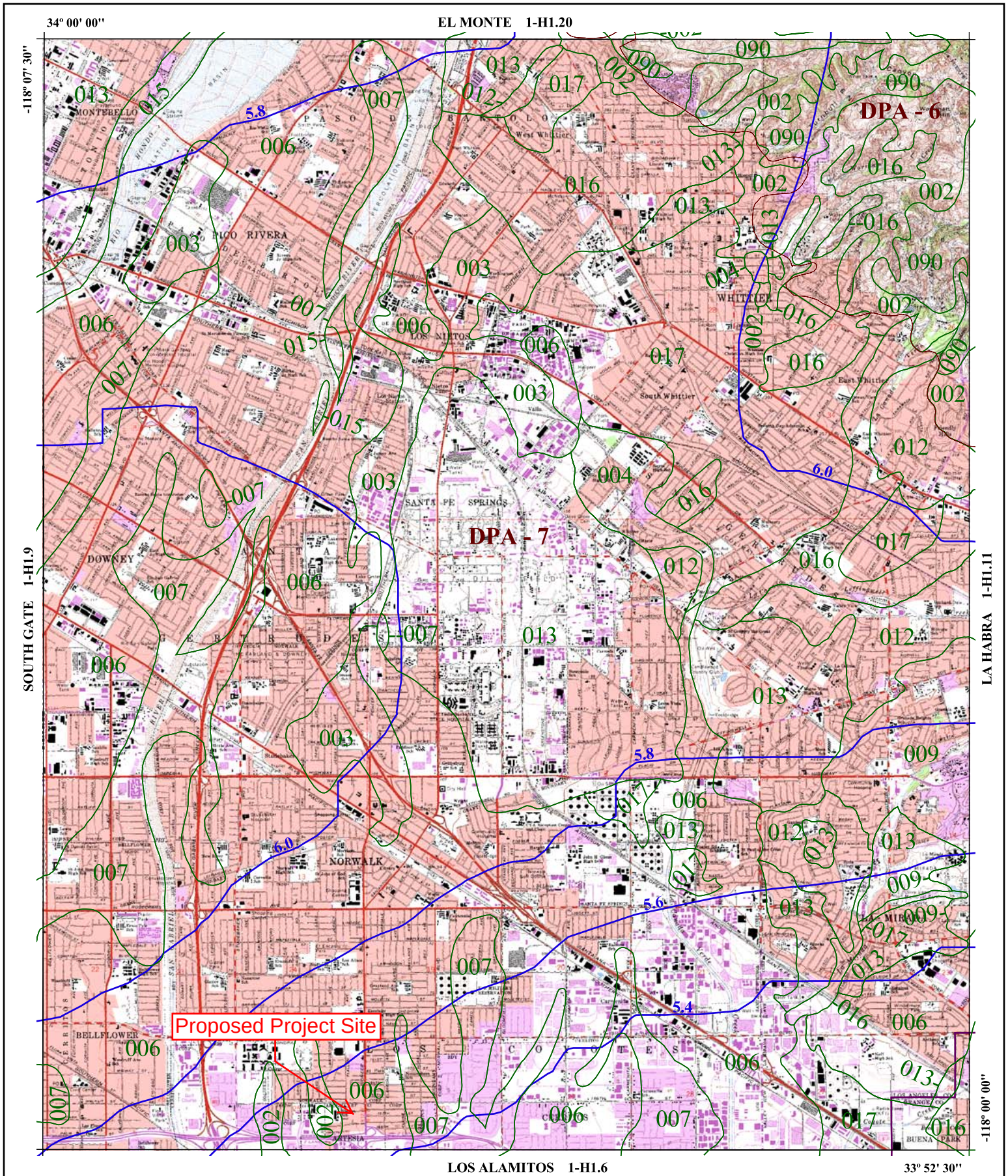
N.T.S.

ARKANSAS STREET & PIONEER BOULEVARD

ARTESIA, CALIFORNIA

APPENDIX B

Los Angeles Isohyet Map



016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

N W E S

1 0 1 2 Miles

25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

W H I T T I E R
50-YEAR 24-HOUR ISOHYET

1-H1.10

LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works

APPENDIX C

HydroCalc Outputs

CVEN-147 ARTESIA PROJECT HYDROLOGY SUMMARY

EXISTING DEVELOPMENT CONDITION

DMA	DESCRIPTION	AREA (SQFT)	AREA (AC)	PERVIOUS	IMPERVIOUS	IMP %	Q25	Q50	Q100
XA-1	Residential	52470.90	1.205	41452.01	11018.89	21%	2.39	3.05	3.87
XA-2	Trailer Parking	8857.58	0.203	797.18	8060.40	91%	0.48	0.60	0.67
DMA-XA	Total	61328.48	1.408	8585.99	19079.29	31%	2.87	3.64	4.54
DMA-XB	Trailer Parking	54294.01	1.246	4886.46	49407.55	91%	2.56	3.11	3.77
		TOTAL	2.654			TOTAL	5.43	6.75	8.31

PROPOSED DEVELOPMENT CONDITION

DMA	DESCRIPTION	AREA (SQFT)	AREA (AC)	PERVIOUS	IMPERVIOUS	IMP %	Q25	Q50	Q100
A	Condominium	68787.28	1.579	9630.22	59157.06	86%	3.70	4.23	5.20
B	Condominium	46835.21	1.075	6556.93	40278.28	86%	2.52	3.15	3.54
		TOTAL	2.654			TOTAL	6.22	7.38	8.75

DIFFERENCE				
	A	28.8%	16.1%	14.7%
	B	-1.5%	1.1%	-6.0%
	TOTAL	14.5%	9.2%	5.3%

Peak Flow Hydrologic Analysis

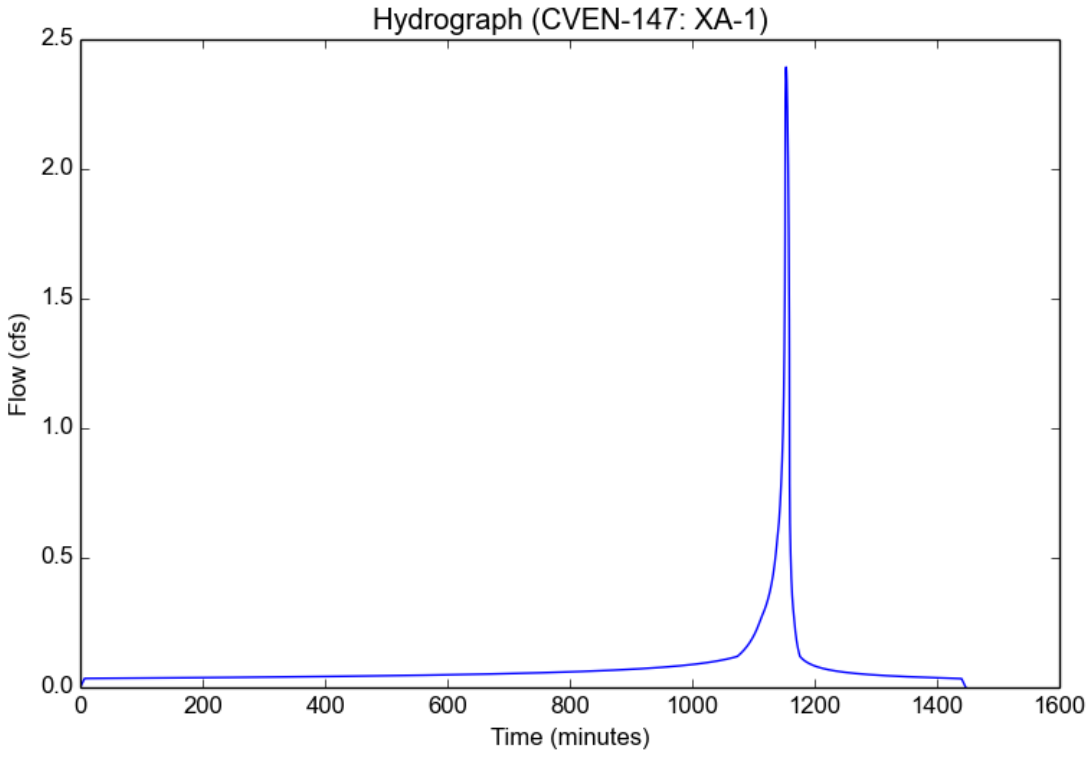
File location: P:/C/CVEN-147/Admin/Reports/Hydrology/Preliminary/Appendix C - HydroCalc/CVEN-147 - XA-1, 25-YR.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	XA-1
Area (ac)	1.205
Flow Path Length (ft)	259.0
Flow Path Slope (vft/hft)	0.0042
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.21
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	4.829
Peak Intensity (in/hr)	2.4597
Undeveloped Runoff Coefficient (Cu)	0.7827
Developed Runoff Coefficient (Cd)	0.8074
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	2.393
Burned Peak Flow Rate (cfs)	2.393
24-Hr Clear Runoff Volume (ac-ft)	0.1631
24-Hr Clear Runoff Volume (cu-ft)	7104.4704



Peak Flow Hydrologic Analysis

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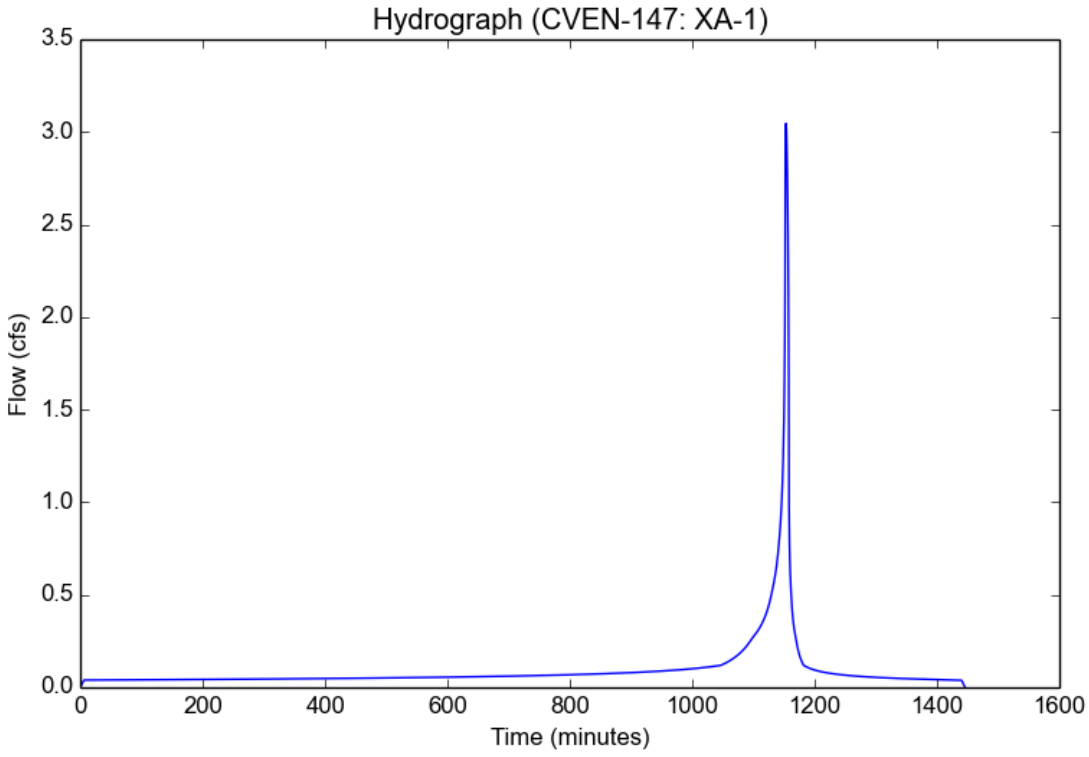
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	XA-1
Area (ac)	1.205
Flow Path Length (ft)	259.0
Flow Path Slope (vft/hft)	0.0042
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.21
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.5
Peak Intensity (in/hr)	3.012
Undeveloped Runoff Coefficient (Cu)	0.8231
Developed Runoff Coefficient (Cd)	0.8393
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	3.046
Burned Peak Flow Rate (cfs)	3.046
24-Hr Clear Runoff Volume (ac-ft)	0.1923
24-Hr Clear Runoff Volume (cu-ft)	8375.3255



Peak Flow Hydrologic Analysis

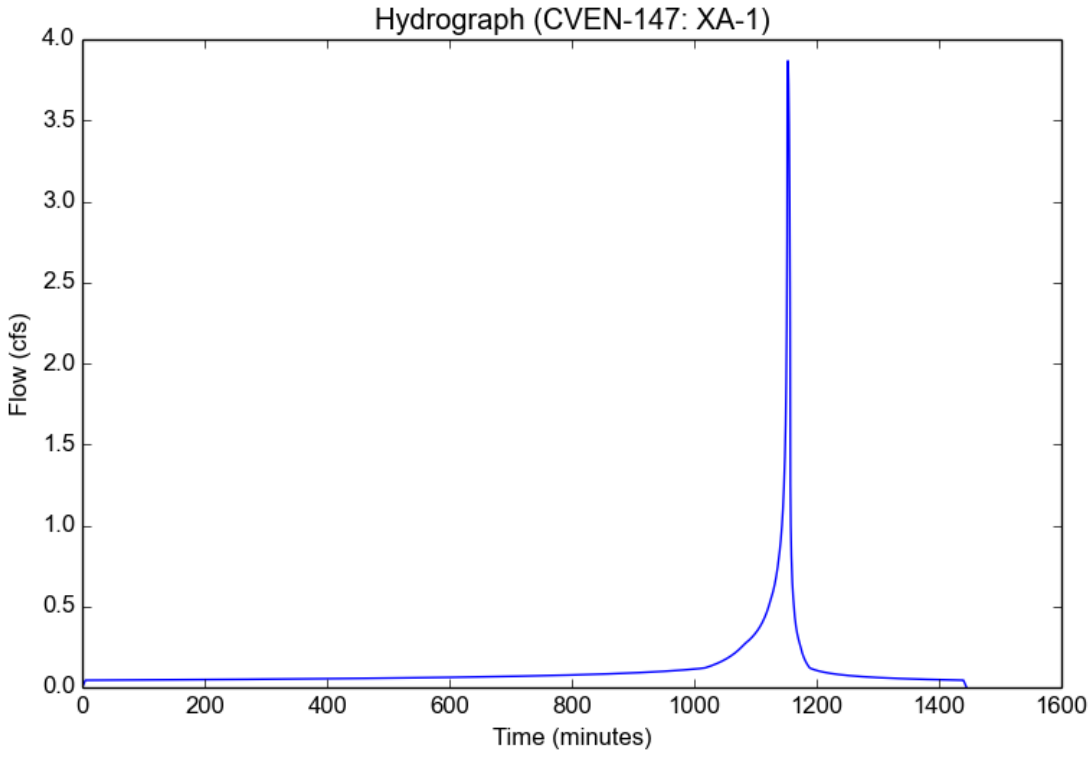
File location: P:/C/CVEN-147/Admin/Reports/Hydrology/Preliminary/Appendix C - HydroCalc/CVEN-147 - XA-1, 100-YR.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	XA-1
Area (ac)	1.205
Flow Path Length (ft)	259.0
Flow Path Slope (vft/hft)	0.0042
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.21
Soil Type	6
Design Storm Frequency	100-yr
Fire Factor	0
LID	False

Output Results

Modeled (100-yr) Rainfall Depth (in)	6.171
Peak Intensity (in/hr)	3.6818
Undeveloped Runoff Coefficient (Cu)	0.8643
Developed Runoff Coefficient (Cd)	0.8718
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.8679
Burned Peak Flow Rate (cfs)	3.8679
24-Hr Clear Runoff Volume (ac-ft)	0.2232
24-Hr Clear Runoff Volume (cu-ft)	9721.8259



Peak Flow Hydrologic Analysis

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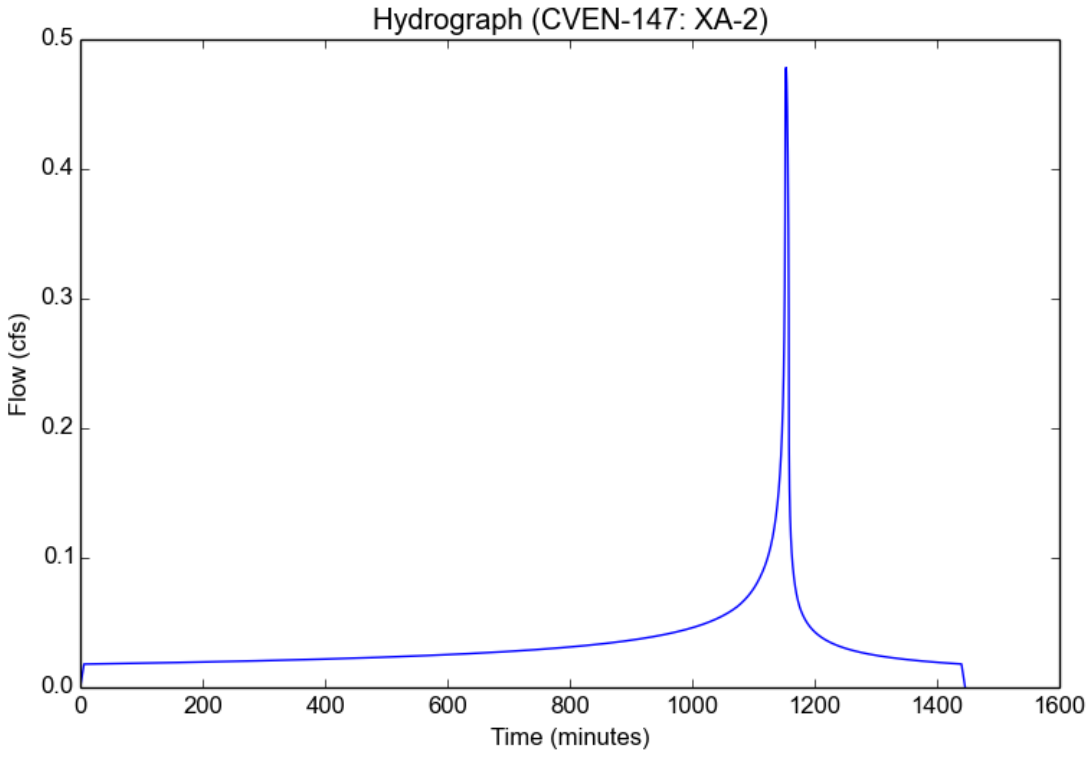
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	XA-2
Area (ac)	0.203
Flow Path Length (ft)	234.0
Flow Path Slope (vft/hft)	0.0034
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.91
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	4.829
Peak Intensity (in/hr)	2.6445
Undeveloped Runoff Coefficient (Cu)	0.7973
Developed Runoff Coefficient (Cd)	0.8908
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	0.4782
Burned Peak Flow Rate (cfs)	0.4782
24-Hr Clear Runoff Volume (ac-ft)	0.0677
24-Hr Clear Runoff Volume (cu-ft)	2950.7413



Peak Flow Hydrologic Analysis

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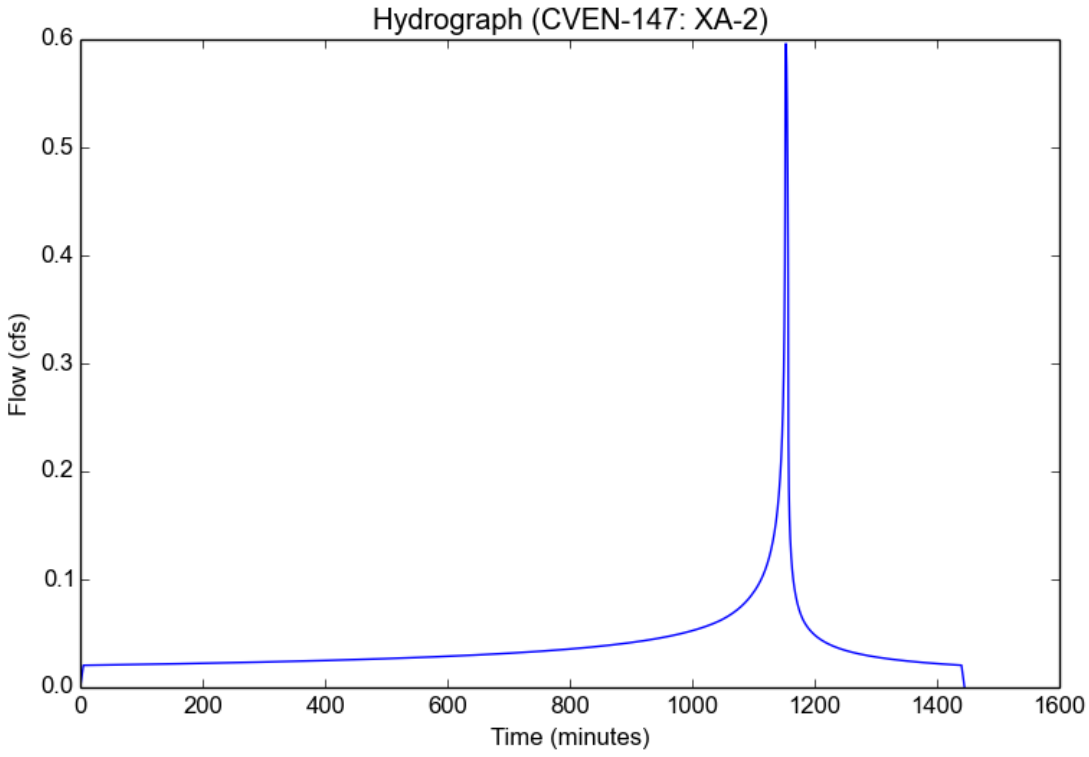
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	XA-2
Area (ac)	0.203
Flow Path Length (ft)	234.0
Flow Path Slope (vft/hft)	0.0034
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.91
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.5
Peak Intensity (in/hr)	3.2815
Undeveloped Runoff Coefficient (Cu)	0.842
Developed Runoff Coefficient (Cd)	0.8948
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.596
Burned Peak Flow Rate (cfs)	0.596
24-Hr Clear Runoff Volume (ac-ft)	0.0773
24-Hr Clear Runoff Volume (cu-ft)	3366.2014



Peak Flow Hydrologic Analysis

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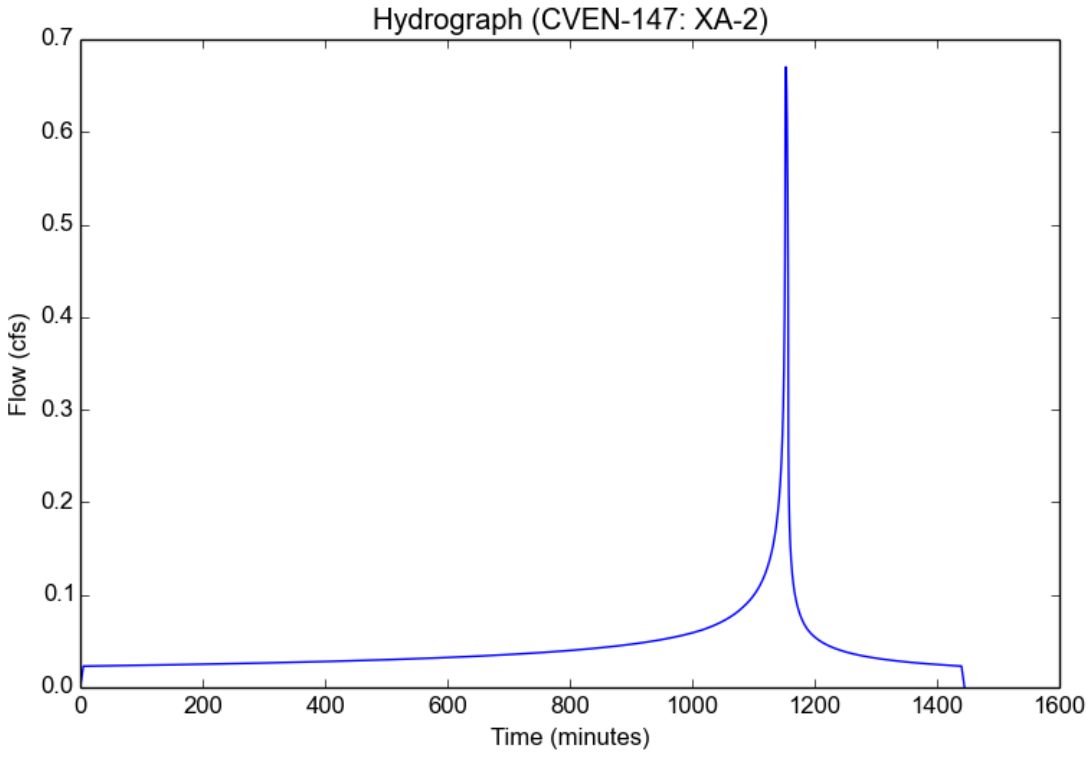
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	XA-2
Area (ac)	0.203
Flow Path Length (ft)	234.0
Flow Path Slope (vft/hft)	0.0034
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.91
Soil Type	6
Design Storm Frequency	100-yr
Fire Factor	0
LID	False

Output Results

Modeled (100-yr) Rainfall Depth (in)	6.171
Peak Intensity (in/hr)	3.6818
Undeveloped Runoff Coefficient (Cu)	0.8643
Developed Runoff Coefficient (Cd)	0.8968
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.6703
Burned Peak Flow Rate (cfs)	0.6703
24-Hr Clear Runoff Volume (ac-ft)	0.0868
24-Hr Clear Runoff Volume (cu-ft)	3782.9805



Peak Flow Hydrologic Analysis

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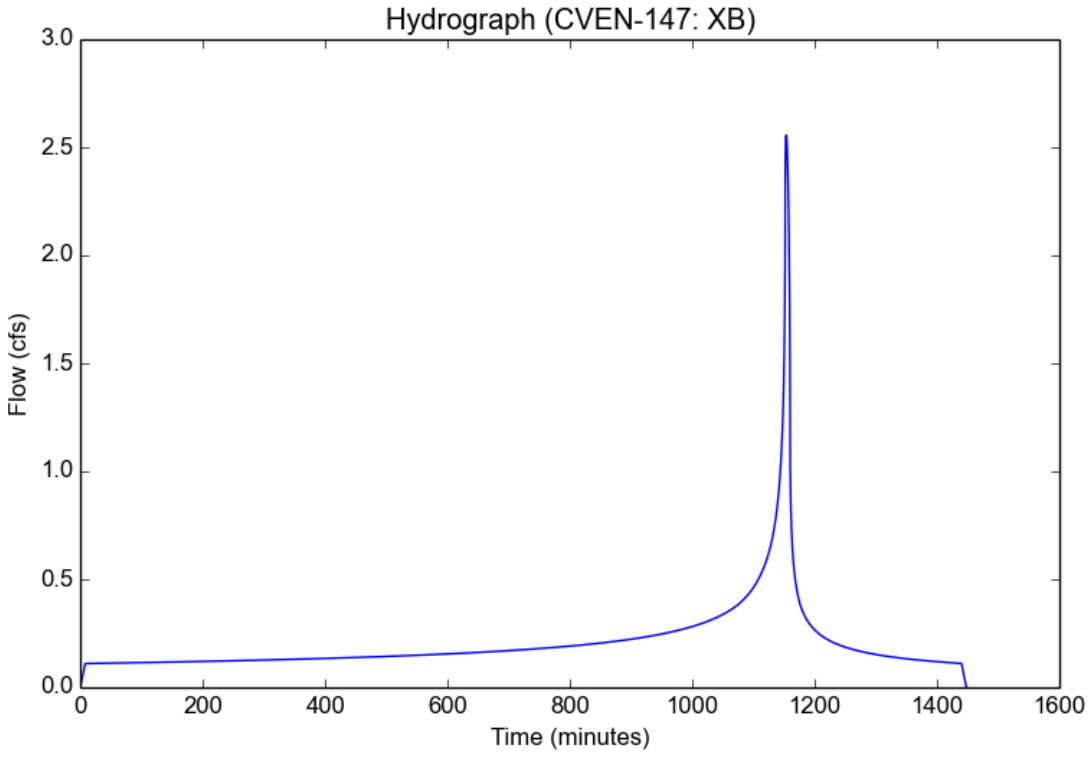
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	XB
Area (ac)	1.246
Flow Path Length (ft)	366.0
Flow Path Slope (vft/hft)	0.0041
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.91
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	4.829
Peak Intensity (in/hr)	2.3101
Undeveloped Runoff Coefficient (Cu)	0.7663
Developed Runoff Coefficient (Cd)	0.888
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	2.5559
Burned Peak Flow Rate (cfs)	2.5559
24-Hr Clear Runoff Volume (ac-ft)	0.4158
24-Hr Clear Runoff Volume (cu-ft)	18110.2048



Peak Flow Hydrologic Analysis

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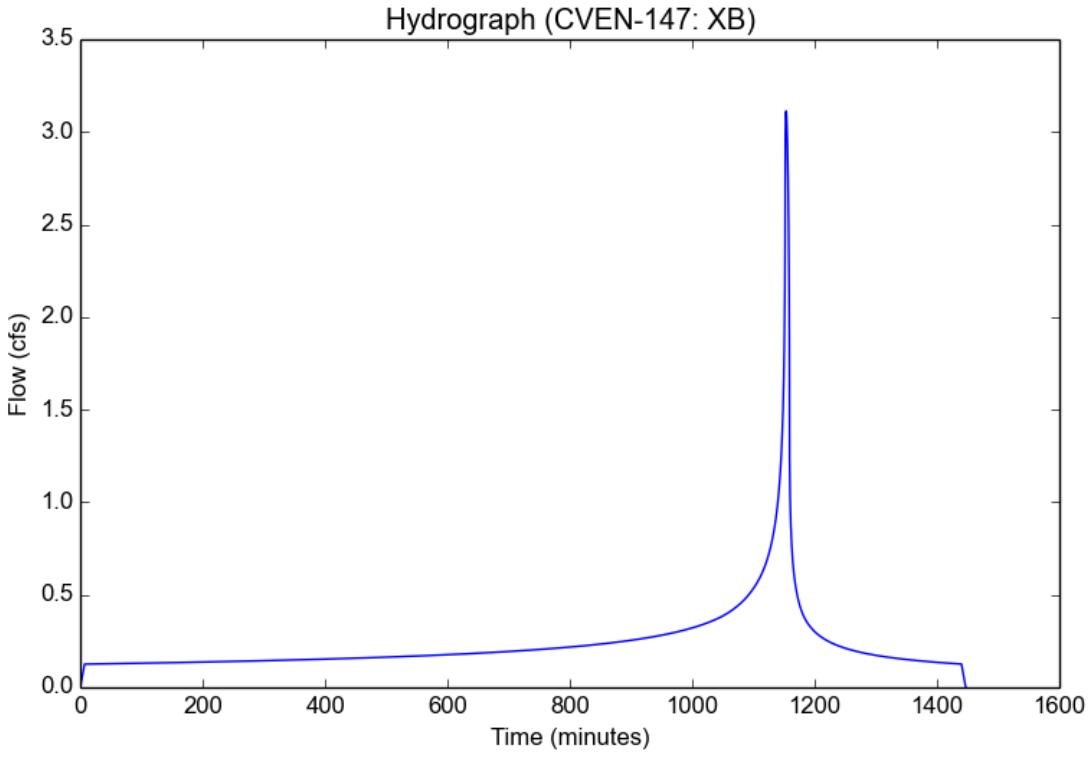
Input Parameters

Project Name	CVEN-147
Subarea ID	XB
Area (ac)	1.246
Flow Path Length (ft)	366.0
Flow Path Slope (vft/hft)	0.0041
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.91
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.5
Peak Intensity (in/hr)	2.8015
Undeveloped Runoff Coefficient (Cu)	0.8083
Developed Runoff Coefficient (Cd)	0.8918
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	3.1128
Burned Peak Flow Rate (cfs)	3.1128
24-Hr Clear Runoff Volume (ac-ft)	0.4743
24-Hr Clear Runoff Volume (cu-ft)	20660.2465



Peak Flow Hydrologic Analysis

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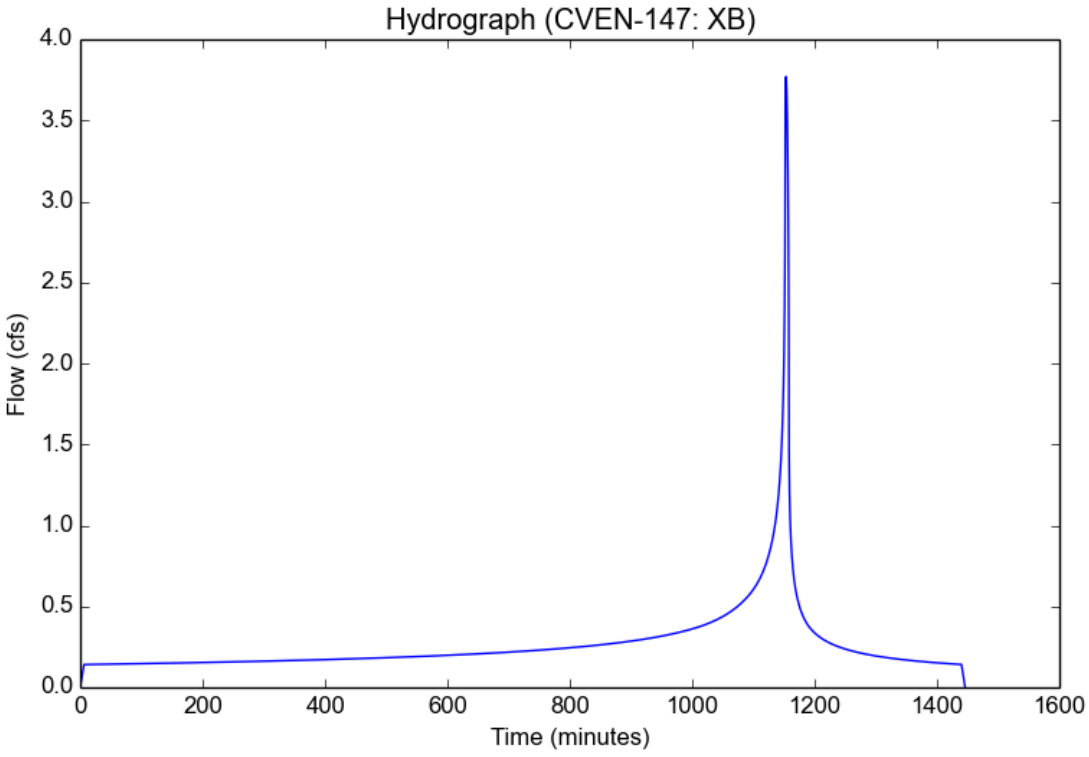
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	XB
Area (ac)	1.246
Flow Path Length (ft)	366.0
Flow Path Slope (vft/hft)	0.0041
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.91
Soil Type	6
Design Storm Frequency	100-yr
Fire Factor	0
LID	False

Output Results

Modeled (100-yr) Rainfall Depth (in)	6.171
Peak Intensity (in/hr)	3.3794
Undeveloped Runoff Coefficient (Cu)	0.8489
Developed Runoff Coefficient (Cd)	0.8954
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	3.7703
Burned Peak Flow Rate (cfs)	3.7703
24-Hr Clear Runoff Volume (ac-ft)	0.533
24-Hr Clear Runoff Volume (cu-ft)	23218.9355



Peak Flow Hydrologic Analysis

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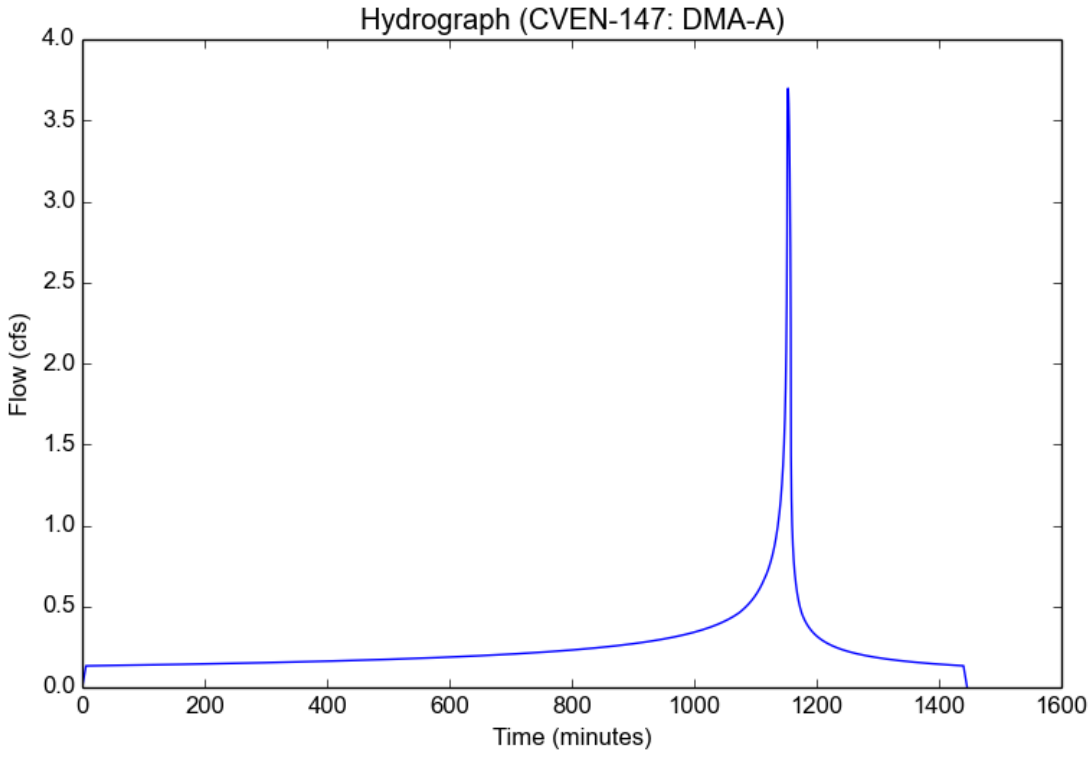
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	DMA-A
Area (ac)	1.579
Flow Path Length (ft)	324.0
Flow Path Slope (vft/hft)	0.0086
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.86
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	4.829
Peak Intensity (in/hr)	2.6445
Undeveloped Runoff Coefficient (Cu)	0.7973
Developed Runoff Coefficient (Cd)	0.8856
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	3.6981
Burned Peak Flow Rate (cfs)	3.6981
24-Hr Clear Runoff Volume (ac-ft)	0.5045
24-Hr Clear Runoff Volume (cu-ft)	21977.8488



Peak Flow Hydrologic Analysis

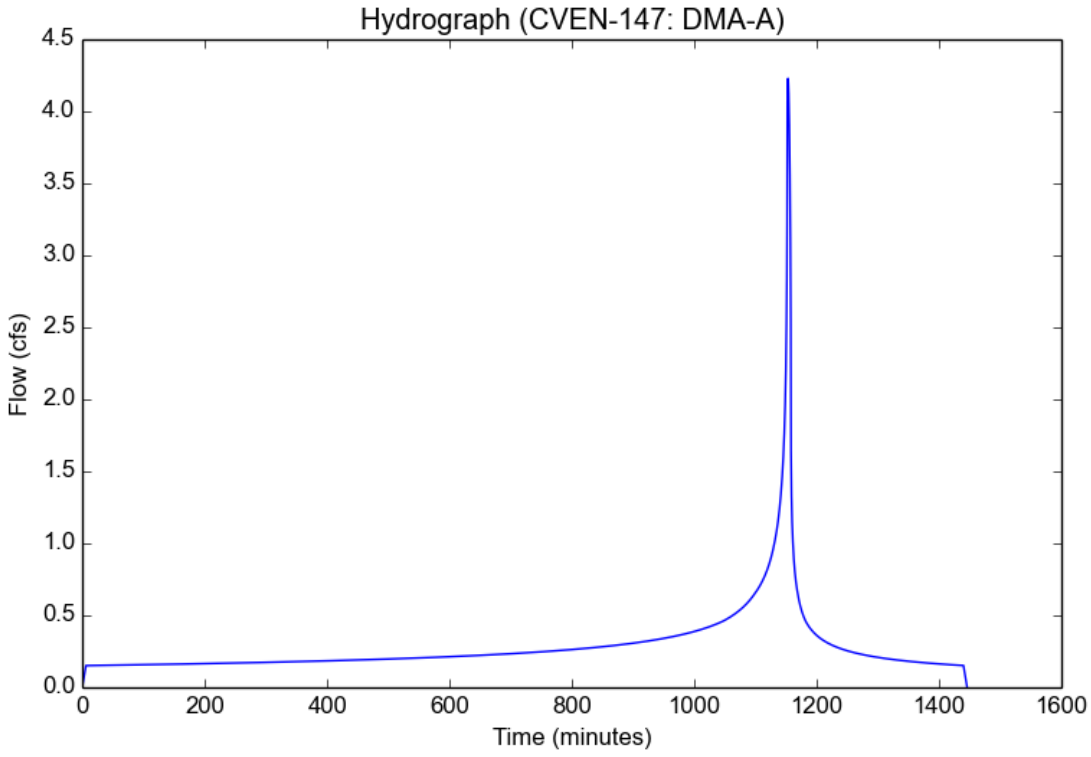
File location: P:/C/CVEN-147/Admin/Reports/Hydrology/Preliminary/Appendix C - HydroCalc/HydroCalc/CVEN-147 - DMA-A, 50-YR.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	DMA-A
Area (ac)	1.579
Flow Path Length (ft)	324.0
Flow Path Slope (vft/hft)	0.0086
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.86
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.5
Peak Intensity (in/hr)	3.012
Undeveloped Runoff Coefficient (Cu)	0.8231
Developed Runoff Coefficient (Cd)	0.8892
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	4.2291
Burned Peak Flow Rate (cfs)	4.2291
24-Hr Clear Runoff Volume (ac-ft)	0.5761
24-Hr Clear Runoff Volume (cu-ft)	25096.2504



Peak Flow Hydrologic Analysis

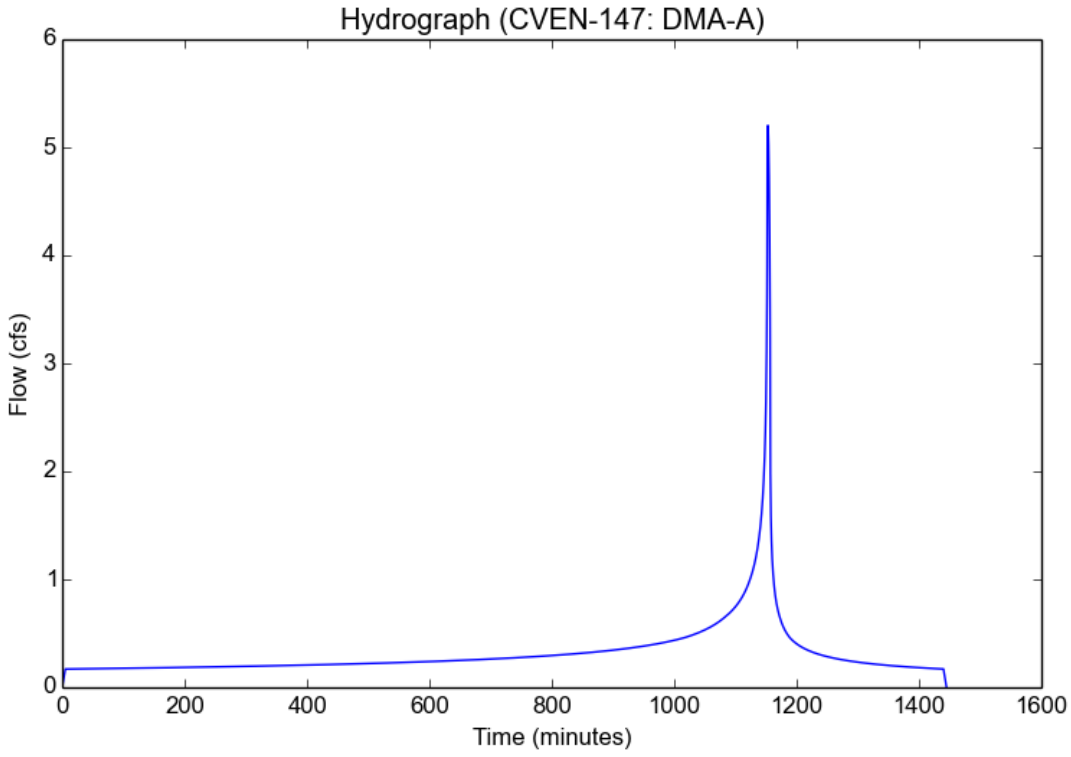
File location: P:/C/CVEN-147/Admin/Reports/Hydrology/Preliminary/Appendix C - HydroCalc/HydroCalc/CVEN-147 - DMA-A, 100-YR.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	DMA-A
Area (ac)	1.579
Flow Path Length (ft)	324.0
Flow Path Slope (vft/hft)	0.0086
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.86
Soil Type	6
Design Storm Frequency	100-yr
Fire Factor	0
LID	False

Output Results

Modeled (100-yr) Rainfall Depth (in)	6.171
Peak Intensity (in/hr)	3.6818
Undeveloped Runoff Coefficient (Cu)	0.8643
Developed Runoff Coefficient (Cd)	0.895
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	5.2032
Burned Peak Flow Rate (cfs)	5.2032
24-Hr Clear Runoff Volume (ac-ft)	0.6481
24-Hr Clear Runoff Volume (cu-ft)	28233.3931



Peak Flow Hydrologic Analysis

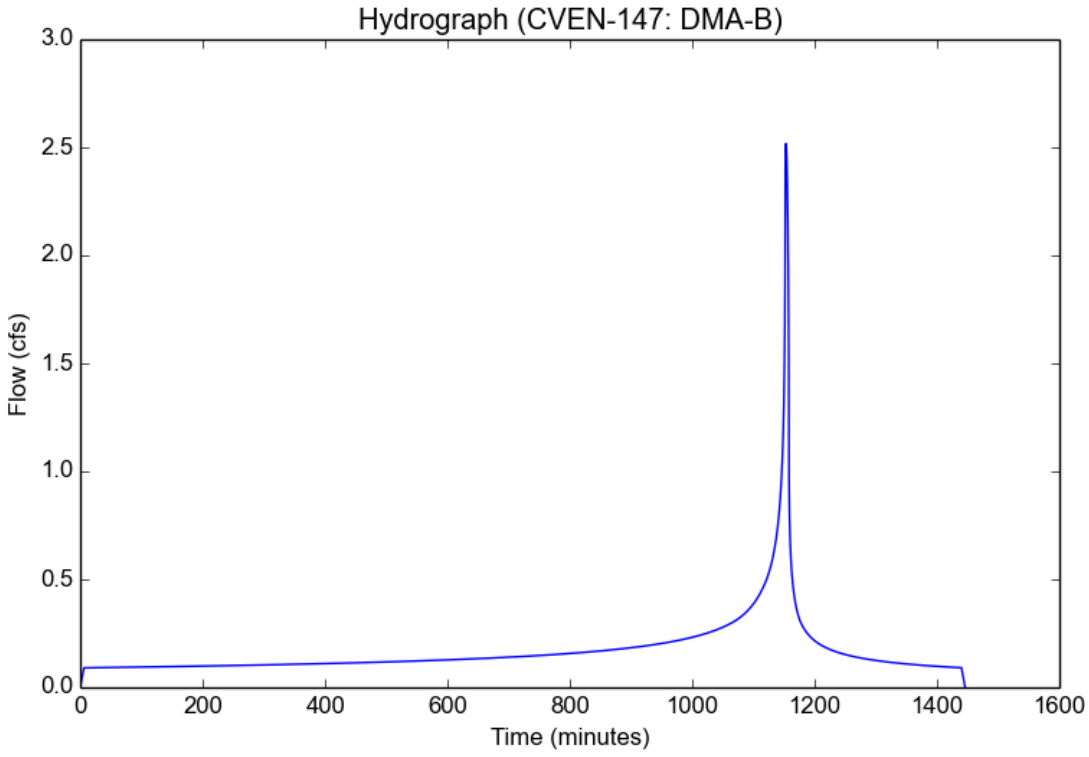
File location: P:/C/CVEN-147/Admin/Reports/Hydrology/Preliminary/Appendix C - HydroCalc/HydroCalc/CVEN-147 - DMA-B, 25-YR.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	DMA-B
Area (ac)	1.075
Flow Path Length (ft)	280.0
Flow Path Slope (vft/hft)	0.0071
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.86
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	4.829
Peak Intensity (in/hr)	2.6445
Undeveloped Runoff Coefficient (Cu)	0.7973
Developed Runoff Coefficient (Cd)	0.8856
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	2.5177
Burned Peak Flow Rate (cfs)	2.5177
24-Hr Clear Runoff Volume (ac-ft)	0.3435
24-Hr Clear Runoff Volume (cu-ft)	14962.7533



Peak Flow Hydrologic Analysis

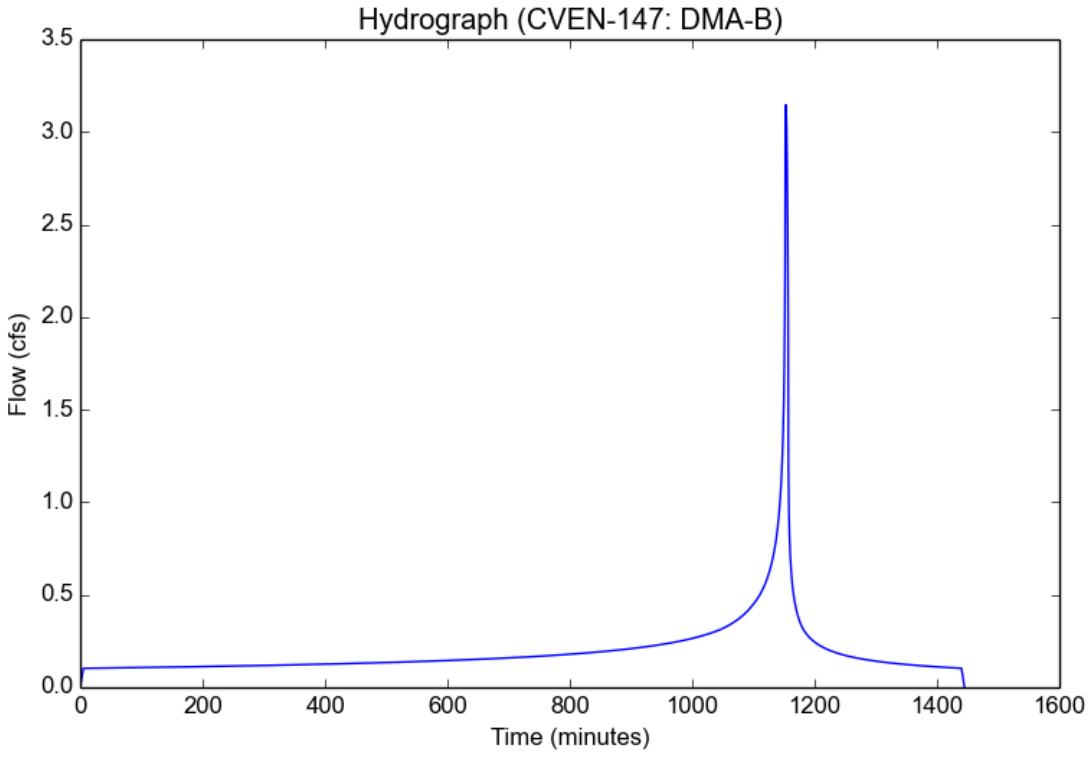
File location: P:/C/CVEN-147/Admin/Reports/Hydrology/Preliminary/Appendix C - HydroCalc/HydroCalc/CVEN-147 - DMA-B, 50-YR.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	DMA-B
Area (ac)	1.075
Flow Path Length (ft)	280.0
Flow Path Slope (vft/hft)	0.0071
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.86
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.5
Peak Intensity (in/hr)	3.2815
Undeveloped Runoff Coefficient (Cu)	0.842
Developed Runoff Coefficient (Cd)	0.8919
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.1462
Burned Peak Flow Rate (cfs)	3.1462
24-Hr Clear Runoff Volume (ac-ft)	0.3923
24-Hr Clear Runoff Volume (cu-ft)	17086.7417



Peak Flow Hydrologic Analysis

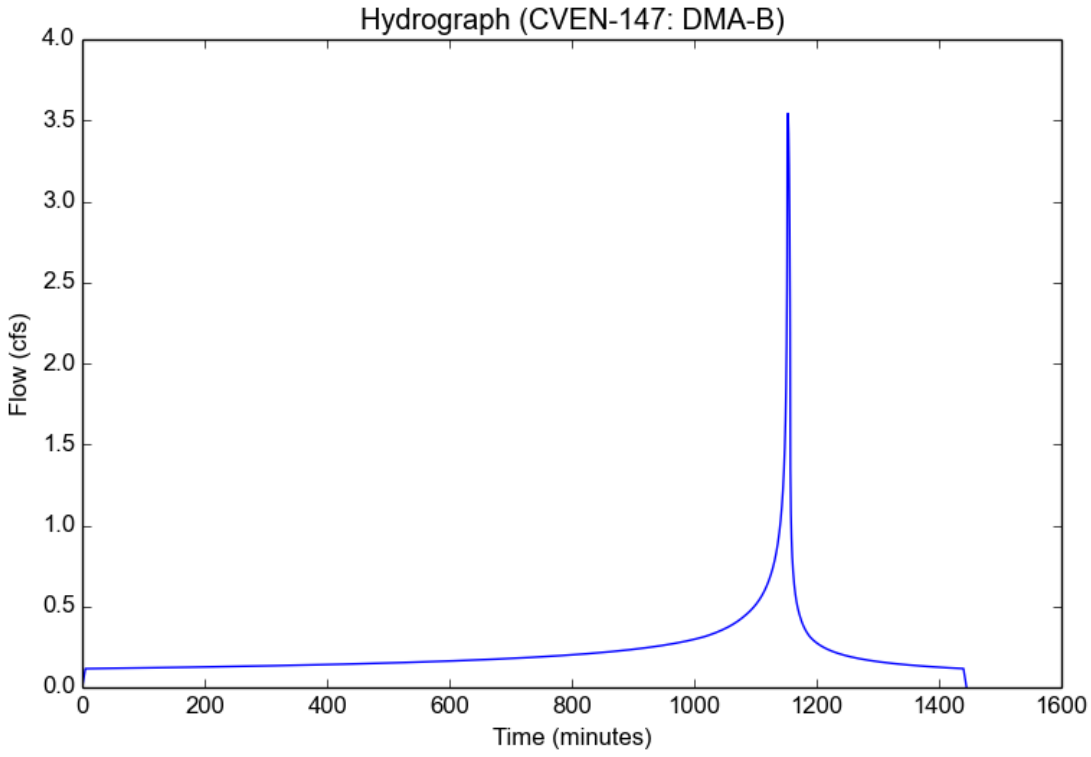
File location: P:/C/CVEN-147/Admin/Reports/Hydrology/Preliminary/Appendix C - HydroCalc/HydroCalc/CVEN-147 - DMA-B, 100-YR.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	CVEN-147
Subarea ID	DMA-B
Area (ac)	1.075
Flow Path Length (ft)	280.0
Flow Path Slope (vft/hft)	0.0071
50-yr Rainfall Depth (in)	5.5
Percent Impervious	0.86
Soil Type	6
Design Storm Frequency	100-yr
Fire Factor	0
LID	False

Output Results

Modeled (100-yr) Rainfall Depth (in)	6.171
Peak Intensity (in/hr)	3.6818
Undeveloped Runoff Coefficient (Cu)	0.8643
Developed Runoff Coefficient (Cd)	0.895
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.5424
Burned Peak Flow Rate (cfs)	3.5424
24-Hr Clear Runoff Volume (ac-ft)	0.4413
24-Hr Clear Runoff Volume (cu-ft)	19221.5944



Pre vs. Post Detention Calculation

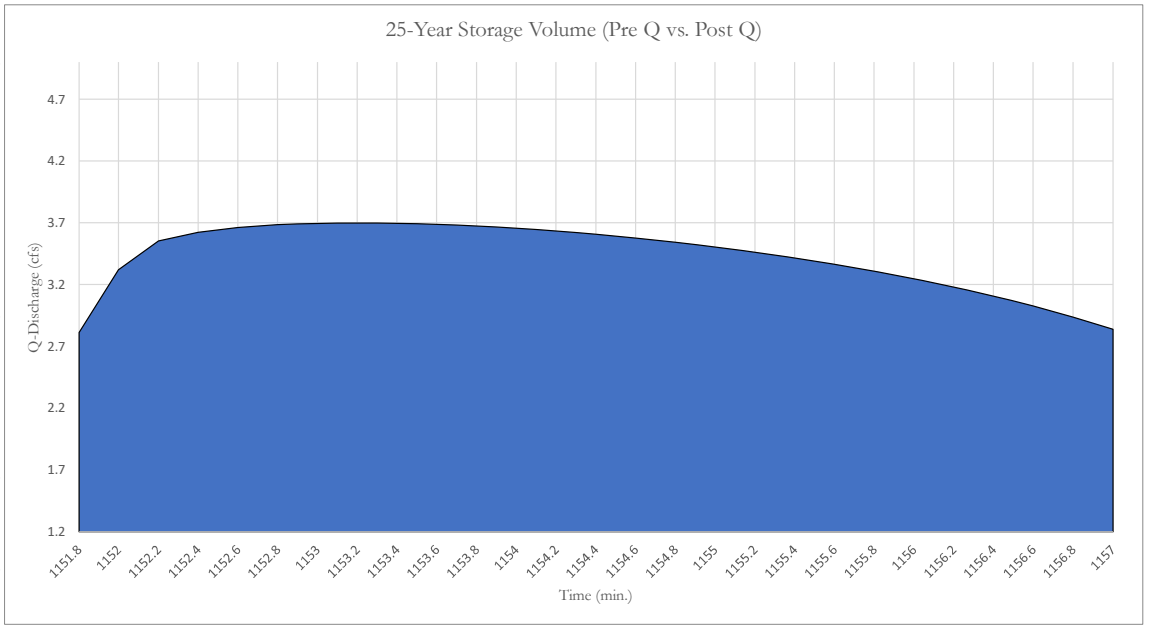
Pre-Development Outlet DMA-A Acreage = 1.205 ac

Post-Development Outlet DMA-A Acreage = 1.69 ac

Pre-Q = 2.87 cfs

Unit Hydrograph - Q25 Detention

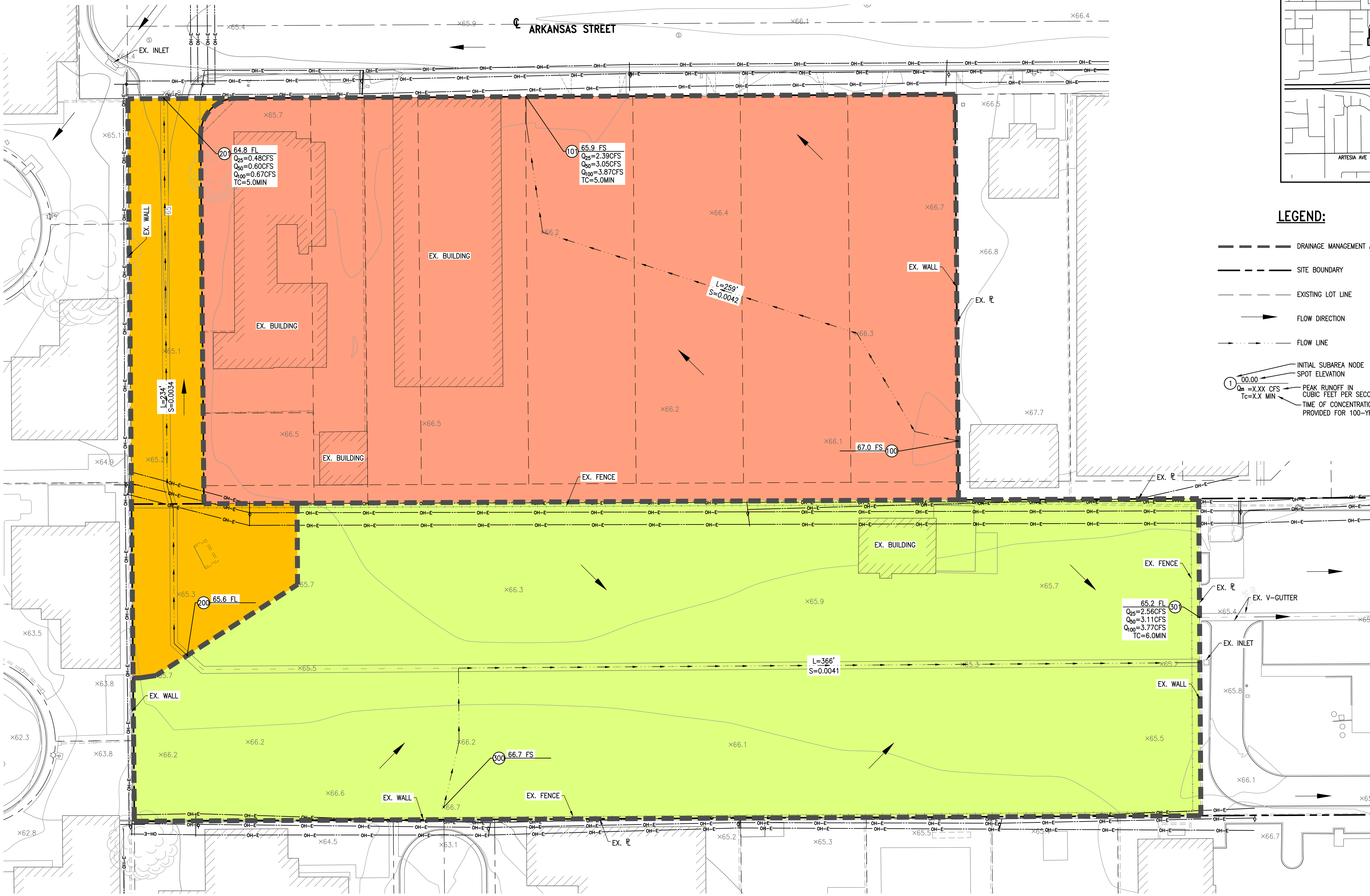
Time (min)	Q (cfs)	Area Under Curve
1151.8	2.811592486	0.612927375
1152	3.317681259	0.687042539
1152.2	3.55274413	0.717409624
1152.4	3.621352114	0.728154501
1152.6	3.660192894	0.734302852
1152.8	3.682835622	0.737740228
1153	3.694566659	0.739265276
1153.2	3.698086105	0.739306126
1153.4	3.694975152	0.738121141
1153.6	3.686236257	0.735877111
1153.8	3.672534849	0.732685668
1154	3.654321826	0.728622287
1154.2	3.631901042	0.723736958
1154.4	3.605468541	0.718060444
1154.6	3.575135897	0.711607972
1154.8	3.540943824	0.704381306
1155	3.502869232	0.696324982
1155.2	3.460380584	0.687392013
1155.4	3.413539542	0.677585815
1155.6	3.362318604	0.666873477
1155.8	3.306416167	0.655184374
1156	3.245427569	0.642424225
1156.2	3.178814679	0.628467307
1156.4	3.10585839	0.613144062
1156.6	3.025582231	0.596220604
1156.8	2.936623812	0.577362782
1157	2.837004004	0.567400801
Total		22.44652135
Volume		1346.791281 cf

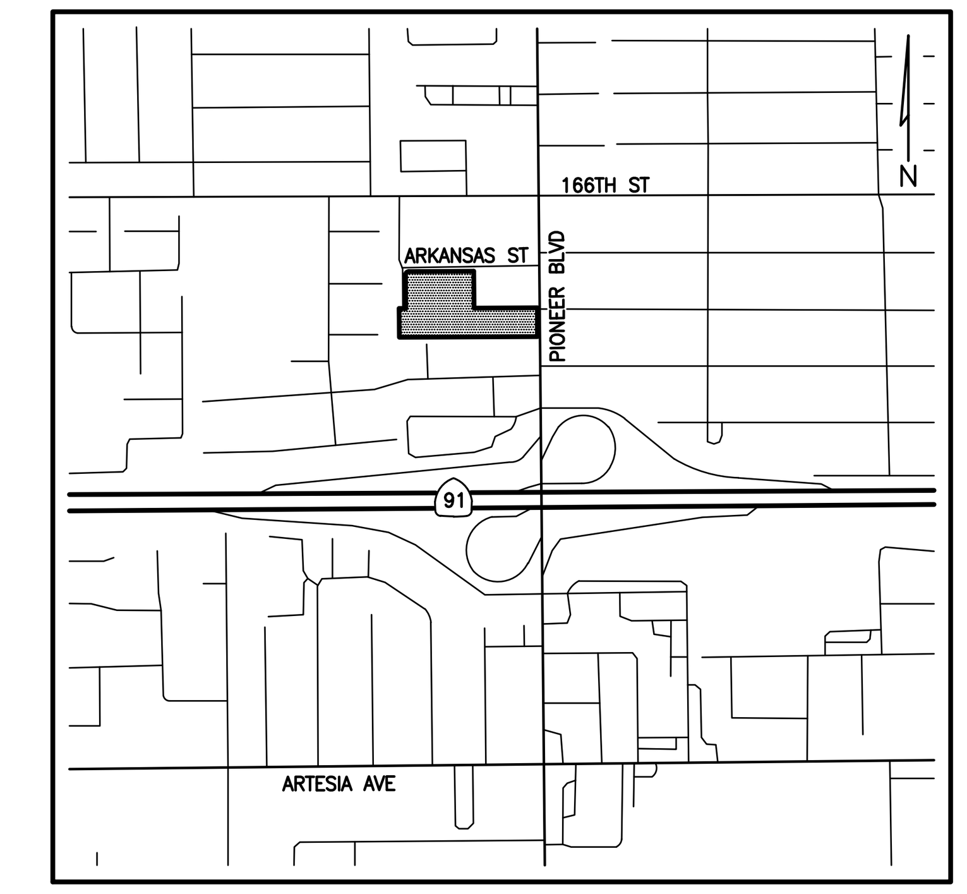


APPENDIX D

Preliminary Existing Conditions Hydrology Map

PRELIMINARY PRE-DEVELOPMENT HYDROLOGY MAP





VICINITY MAP
N.T.S.

LEGEND:

- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- SITE BOUNDARY
- EXISTING LOT LINE
- FLOW DIRECTION
- FLOW LINE
- INITIAL SUBAREA NODE
- SPOT ELEVATION
- 1 00.00 Q_{25} =X.XX CFS — PEAK RUNOFF IN CUBIC FEET PER SECOND (CFS)
- Tc=X.X MIN — TIME OF CONCENTRATION IN MINUTES (MIN) PROVIDED FOR 100-YR STORM EVENT

DMA	COLOR	LANDUSE	AREA (SF)	AREA (AC)	IMPERVIOUS %
XA-1		RESIDENTIAL	52,470.90	1.205	21%
XA-2		RV PARKING	8,857.58	0.203	91%
XB		RV PARKING	54,294.01	1.246	91%

NOTE: EXISTING DEVELOPMENT IMPERVIOUS COVERS ARE ASSUMPTION PER LANDUSE BASED ON LOS ANGELES COUNTY HYDROLOGY MANUAL.

SCALE: 1" = 20'
0 10 20 40

REVISIONS

NO.	DATE	DESCRIPTION	BY

C&V CONSULTING, INC.
CIVIL ENGINEERING
LAND PLANNING & SURVEYING
9830 IRVINE CENTER DRIVE
IRVINE, CALIFORNIA 92618
(949) 916-3800
INFO@CVC-INC.NET
WWW.CVC-INC.NET

ARKANSAS STREET AND
PIONEER BOULEVARD
TRACT NO. 83442

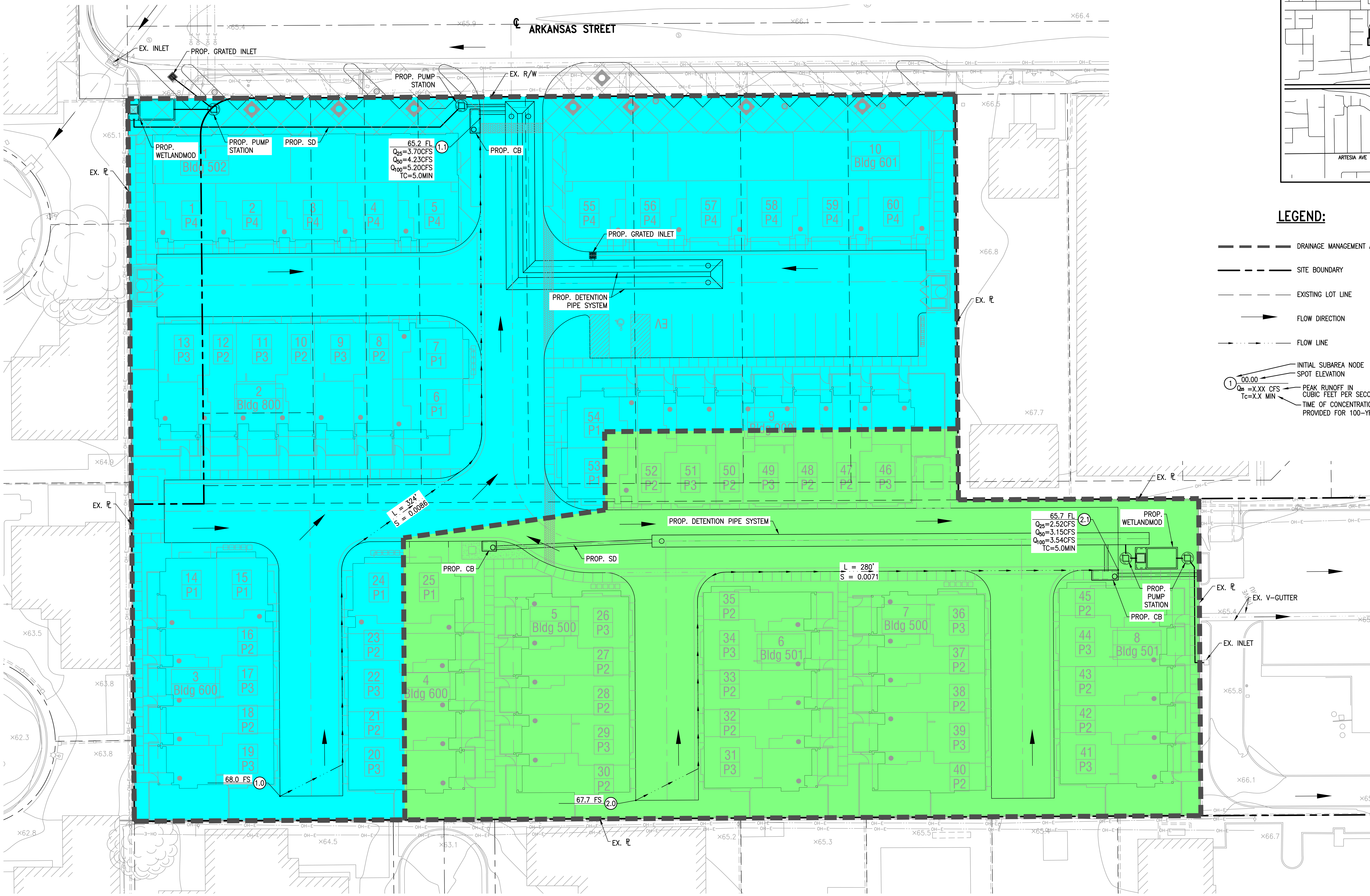
CITY OF ARTESIA
COUNTY OF LOS ANGELES, CALIFORNIA
SHEET 1 OF 1 SHEETS

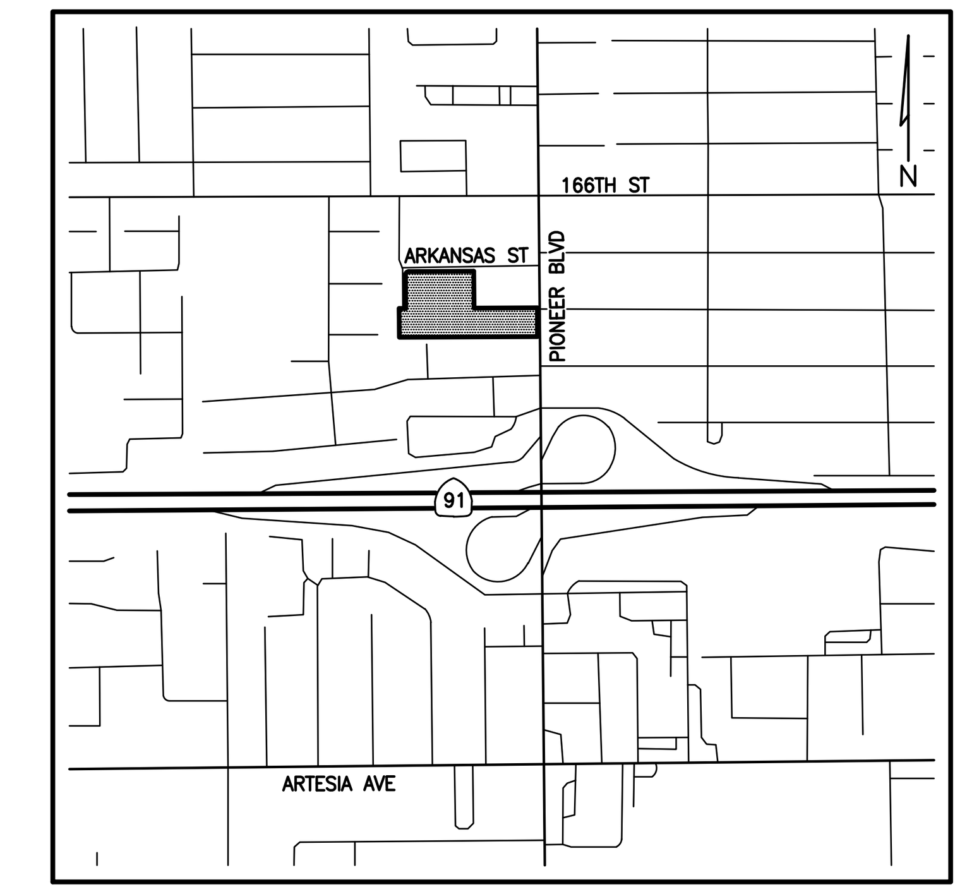
PROJ: CVEN-147
DWG: P:\C\CVEN-147\dwg\Sheets\EH\HYD\X-HYD-PRE.dwg BY: klam Apr 30, 2021 - 2:41:28pm

APPENDIX E

Preliminary Proposed Conditions Hydrology Map

PRELIMINARY POST-DEVELOPMENT HYDROLOGY MAP





VICINITY MAP
N.T.S.

LEGEND:

- DRAINAGE MANAGEMENT AREA (DMA) BOUNDARY
- SITE BOUNDARY
- EXISTING LOT LINE
- FLOW DIRECTION
- FLOW LINE
- (1) 00.00 — INITIAL SUBAREA NODE; SPOT ELEVATION
- Q_{25} =X.XX CFS — PEAK RUNOFF IN CUBIC FEET PER SECOND (CFS)
- Tc=X.X MIN — TIME OF CONCENTRATION IN MINUTES (MIN) PROVIDED FOR 100-YR STORM EVENT

DMA	COLOR	LANDUSE	AREA (SF)	AREA (AC)	IMPERVIOUS %	TREATMENT VOLUME (CF)	DETENTION CAPACITY (CF)
A		RESIDENTIAL	68,787.28	1.579	86%	5,912.72	6,191.10
B		RESIDENTIAL	46,835.21	1.075	86%	4,025.44	4,044.80

NOTE: EXISTING DEVELOPMENT IMPERVIOUS COVERS ARE ASSUMPTION PER LANDUSE BASED ON LOS ANGELES COUNTY HYDROLOGY MANUAL.

C&V CONSULTING, INC.
CIVIL ENGINEERING
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INFO@CVC-INC.NET
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SCALE: 1" = 20'
0 10 20 40

REVISIONS

NO.	DATE	DESCRIPTION	BY

ARKANSAS STREET AND
PIONEER BOULEVARD
TRACT NO. 83442

CITY OF ARTESIA
COUNTY OF LOS ANGELES, CALIFORNIA
SHEET 1 OF 1 SHEETS

PROJ: CVEN-147 DWG: P:\C\CVEN-147\dwg\Sheets\EH\HYD\P-HYD-PRE.dwg BY: klam Apr 30, 2021 - 3:45:39pm

APPENDIX F

Hydraulic Calculation

(To be Provided in Final Engineering)

APPENDIX G

References

National Flood Hazard Layer FIRMette

FEMA

118°5'21"W 33°52'59"N

118°4'43"W 33°52'29"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

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

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

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

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

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

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

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/19/2021 at 8:46 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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