Appendix F

Hydrology Study

HYDROLOGY STUDY
FOR

TRACT 8943
HAVERHILL DRIVE
GLASSELL PARK

LOS ANGELES, CALIFORNIA

Prepared For:

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I. Introduction

The proposed development is located on Haverhill Dr. in the City of Los Angeles, CA. It is owned by Glassell Park, LLC and it is a development of the remaining undeveloped lots of Tract No. 8943. The site is situated between Division St. and Loveland Dr. The proposed development is a single family housing and consists of 32 lots. These lots include lot numbers 118-126, 132-134, 153-161, 190-193, and 226-232 of Tract No 8943. The development also includes the road shown on the tract map where existing Haverhill Dr. will be extended towards Loveland Dr. Sundown Dr. and Brilliant Way will also both be extended to connect to the new Haverhill road. The project size is approximately 5.20 acres.

II. Purpose of Study

The main purposes of this drainage study are:

1) To determine the design peak 50-year frequency storm runoff for project site and its tributary frontage streets, and the corresponding 10-year and 25-year frequency storm runoffs in the existing pre-developed condition and in the proposed developed condition;

2) To determine the required size for the proposed storm drain system including grate inlets, pipe sizes, and concrete channels.

3) To determine the hydraulic capacities of the existing street (Division St.), and the existing 27 inch catch basin lateral located at the intersection of Division St. and Jessica Dr. Said storm drain systems are runoff discharge locations for the proposed development. Verifying the existing capacity for both systems will determine if they are capable of accommodating the storm water runoff from the proposed development. If existing runoff capacities are higher than the proposed sum of the 50-year storm runoff of all tributary areas then the proposed system works and doesn't need modification. However, if the existing runoff capacities are lower, the proposed storm drain system needs to be modified to ensure that runoff discharging into both systems does not exceed their capacity.

III. Existing Condition Hydrology

The total Tributary Area for the existing hydrology condition of the site is approximately 20.87 acres, of which 5.20 acres comprises the project area. The project site is located on a hillside with an approximate elevation difference of 100 ft. Drainage is through natural drain from the west to east portion of the site. Storm water runoff from the northern portion of the site is observed to be sheet flowing into an existing 24" concrete channel that extends from the adjacent lot down to Division St. See attached "Existing Drainage-Photo Exhibit" for location and photos of the existing channel.

The southern portion of the site, storm water runoff is observed to be sheet flowing to the lower adjacent lots through an existing ribbon gutter. The ribbon gutter is connected to a drain inlet with a 6" diameter outlet. See attached "Existing Drainage-Photo Exhibit" for location and photos of the outlet.

The project site's total runoff is ultimately discharged into Division St. and collected through the nearest storm drain system, an existing street catch basin inlet with a 27-inch RCP lateral. It is located southeast of the project site at the intersection of Jessica Dr. and Division St. See attached "Existing Hydrology Map" for more information.

Based on topography and existing drainage maps, the current site is observed to be divided into six tributary areas that are mostly undeveloped.

IV. Proposed Condition Hydrology

The proposed condition is divided into eleven (11) tributary areas, which four (4) areas (E, F, H, I) will remain undisturbed. The total Tributary Area for the proposed hydrology condition is 20.88 acres of which 5.20 acres comprises the proposed project development.

Except for area E, F, H, I storm water runoff from the tributary areas will be collected through street grate inlets and discharge into Division St. Thirteen (13) grate inlets are proposed to collect all water runoff from all the tributary areas. A 24-inch RCP is proposed to collect the water from the grate inlets into two discharge locations on Division St. These two discharge locations are situated near the north and south portion of the property.

The proposed development creates an increase in impervious ratio from 16 to 40 percent of the total tributary area.

V. Proposed Condition Hydraulics

Storm water for the proposed development would be collected through thirteen (13) proposed grate inlets and into the two 24" RCP main where both are connected to concrete channels.

Storm water runoff from the northern portion of the project site will discharge through a proposed 24-inch RCP into an existing 24 inch wide concrete channel. The existing channel was constructed to include some storm water runoff from the proposed development. The existing channel extends from an adjacent lot, below lot 119, down to Division St. See attached "Existing Drainage-Photo Exhibit" for location and photos of the existing channel.

Runoff from the south portion of the site is collected through a proposed 24-inch RCP into a proposed 30 inch wide concrete channel. The existing 6-inch diameter outlet is observed to be insufficient for the proposed project's peak flowrate therefore it will be removed and replaced with the proposed concrete channel. The channel will be placed within the existing 10-foot sewer and storm drain easement. Any existing improvement within the existing easement will be demolished and removed. A 24-inch RCP will connect to the concrete channel to collect runoff from the proposed development. The channel extends down to Division St., where a parkway drain is proposed to discharge water into a curb and gutter into Division St.

Total storm water runoff from the project site ultimately discharge into an existing street catch basin inlet on Division Street, located at the intersection of Jessica Dr.

See attached "Proposed Hydrology Map" for more information.

VI. Low Impact Development (LID)

See Low Impact Development (LID) Report.

VII. Conclusion

Based on the Los Angeles County Hydrology Map, http://dpw.lacounty.gov/wrd/hydrologygis/, the project site is located in the Soil Classification Area 2 with a 50-yr 24-hour isohyet of 6.6 inches of rainfall.

Below are table summaries of the hydrology results for each tributary area calculated from the *County of Los Angeles Public Work's HydroCalc* software. See attached calculation printout for more details.

EXISTING CONDITION HYDROLOGY

Tributary Area	Area (Ac)	Impervious (%)	Pervious (%)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)
A	2.31	29	71	5.73	7.16	8.23
B	3.39	18	82	7.62	10.50	12.08
C	10.45	10	90	16.25	22.57	27.62
D	2.60	6.21	93.79	6.41	8.05	9.28
E	0.73	100	0	1.22	1.64	1.96
F	1.39	9.58	90.42	3.43	4.30	4.96
TOTAL	**20.87**					**64.13**
G (Off-site)	9.21	5	95	14.26	19.85	24.32

See attached calculation printout for more details.

PROPOSED CONDITION HYDROLOGY

Tributary Area	Development Type	Area (Ac)	Impervious (%)	Pervious (%)	Q_{10} (cfs)	Q_{25} (cfs)	Q_{50} (cfs)
A	Disturbed	1.78	43.8	56.2	4.43	5.52	6.33
B	Disturbed	3.41	65.2	34.8	7.81	10.59	12.11
C	Disturbed	1.08	21.5	78.5	2.67	3.35	3.85
D	Disturbed	4.08	63	37	7.27	9.50	11.53
E	Undisturbed	2.67	5	95	6.58	8.26	9.53
F	Undisturbed	2.60	6.21	93.79	6.41	8.05	9.28
G	Disturbed	1.12	48	52	2.79	3.47	3.98
H	Undisturbed	1.39	9.58	90.42	3.43	4.30	3.43
I	Undisturbed	0.73	100	0	1.22	1.64	1.96
J	Disturbed	0.82	40	60	2.04	2.54	2.92
K	Disturbed	1.20	2	98	2.95	3.71	4.28
TOTAL		**20.88**					**69.20**
L (Off-site)	Undisturbed	9.21	5	95	14.26	19.85	24.32

Below are table summaries of the hydraulic results for all proposed storm drain system calculated from the *Bentley's FlowMaster* software. See attached calculation printout for more details.

PROPOSED GRATE INLETS

Grate Inlet (GI)	Contributing Tributary Subarea(s)	Area (ac)	Q_{10} (cfs)	Total Flow (Q_{10} + $Q_{UPSTREAM\ BYPASS}$)	Grate Inlet Full Capacity (cfs)	Flow Bypass to downstream GI (cfs)
GI-1	B1	1.83	4.19	4.19	5.75	0
GI-2	B2	1.43	3.27	3.27	3.27	0
GI-3	B3	0.11	0.25	0.25	0.25	0
GI-4	B4	0.04	0.10	0.10	3.90	0
GI-5	D1	1.71	3.05	3.05	3.30	0
GI-6	D2	0.79	1.41	1.41	2.15	0
GI-7	D3	0.34	0.61	0.61	1.70	0
GI-8	D6	0.12	0.21	0.21	0.50	0
GI-9	D5	0.09	0.16	0.16	0.70	0
GI-10	D4	0.53	0.94	0.94	0.94	0
GI-11	D7	0.50	0.89	0.89	0.90	0
GI-12	G1	0.49	1.22	1.22	1.50	0
GI-13	G2	0.03	0.08	0.08	0.08	0

PROPOSED SD PIPES

Pipe Location	Contributing Tributary Areas	Q_{50} (cfs)	Proposed Pipe Size (in)	Pipe Size Capacity (cfs)	Pipe Slope (ft/ft)	Pipe Velocity (fps)
North of Area B	B	12.11	24	71.53	0.4	45.54
South End of Haverhill Dr.	D+G+J+K	22.71	24	50.58	0.2	32.20

PROPOSED CONCRETE CHANNELS

Channel	Contributing Tributary Areas	Q_{50} (cfs)	Slope (ft/ft)	Velocity (fps)	Depth (in)	Percent Full (%)
Existing 24" Wide	B	12.11	0.135	17.15	4.20	35.00
Proposed 30" Wide	D+G+J+K	22.71	0.25	24.70	4.44	74.00

Below are table summaries of the capacities for the existing 27 inch RCP lateral and street (Division St) calculated from *Bentley's FlowMaster* software. See attached calculation printout for more details.

CAPACITY FOR EXISTING STREET (DIVISION ST)

	Contributing Tributary Areas	Slope (ft/ft)	Street Capacity (R/W to R/W) (Q_{50}) (cfs)	Design Capacity (Q_{50}) (cfs)	Existing Street Capacity> Design Capacity?
Division St. (34 ft wide)	All (A through K)+ L (Off-site)	0.0650	116.19	93.50	***Yes**

Note:
Area L is an off-site tributary area located west of Division St. See "Proposed Hydrology Map for more information)

CAPACITY FOR EXISTING 27-INCH RCP LATERAL

	Contributing Tributary Areas	Slope (ft/ft)	Full Pipe Capacity (Q_{50}) (cfs)	Design Capacity (Q_{50}) (cfs)	Percent Full (%)	Existing Pipe Capacity> Design Capacity?
27" RCP Lateral	All (A through K)	0.2054	138.50	69.18	50.6	***Yes**

*Existing runoff capacities are greater than the proposed indicating that both discharge locations can accommodate the storm water runoff from the proposed development.

ATTACHMENT A

10-YEAR STORM
25-YEAR STORM
50-YEAR STORM
HYDROLOGY CALCULATIONS
PER LA COUNTY'S HYDROCALC

EXISTING CONDITION
10-YEAR, 25-YEAR, AND 50-YEAR

Hydrology Map A GIS viewer application to view the data for the hydrology manual.

LAYERS

- [x] 50yr Two Tenths (Rainfall)
- [ ] DPA Zones
- [x] Soils 2004
- [ ] TG Page
- [x] Final 85th Percentile, 24-hr Rainfall
- [ ] 1-year, 1-hour Rainfall Intensity

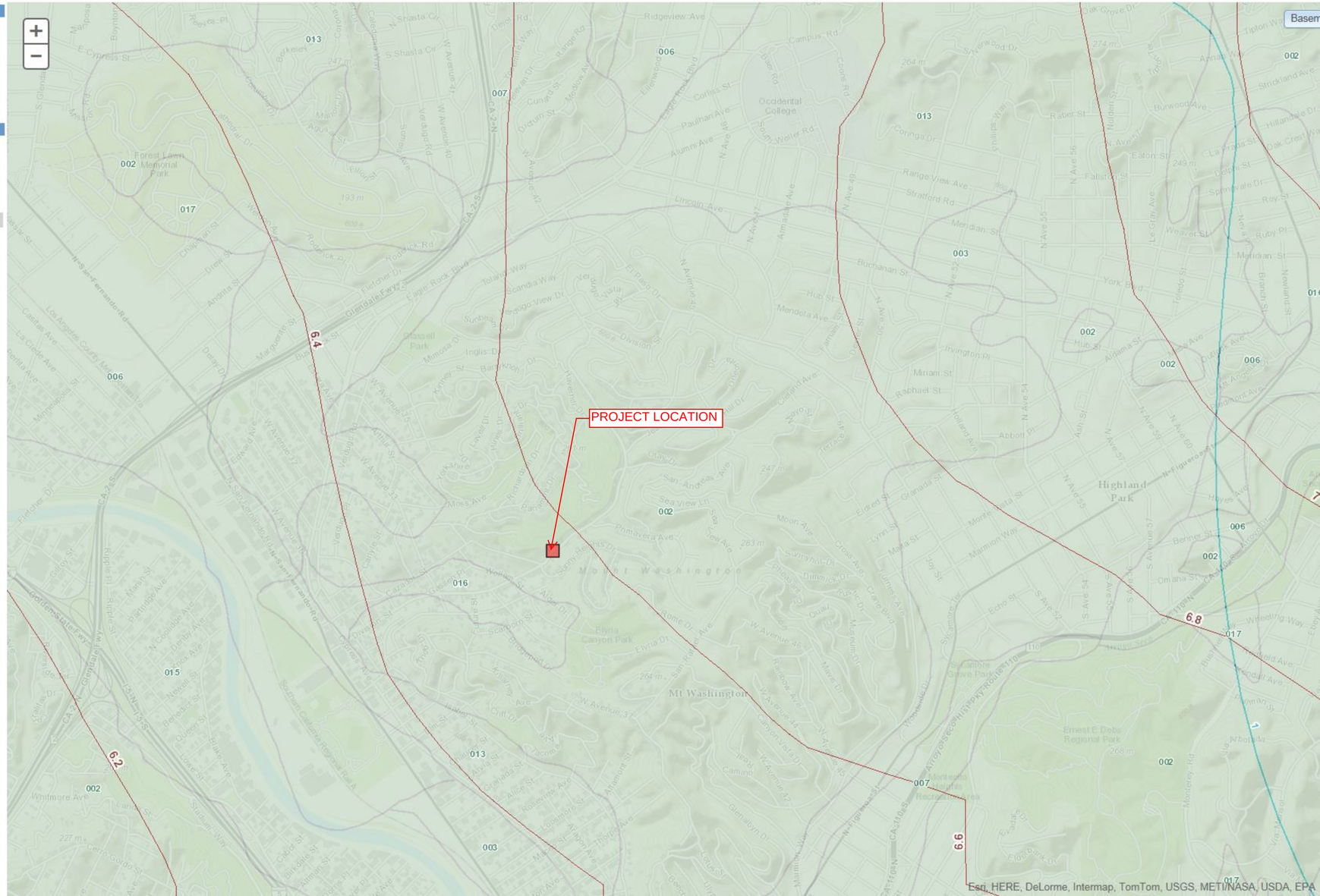
SEARCH

Zoom to TG Page:

Enter Address, Cross Street, or Parcel No.:
(ex: 900 S. Fremont Ave., Fremont@Valley, 5342005904) cazdor st, division st Search

Address Search Results:

cazdor st division st



Peak Flow Hydrologic Analysis

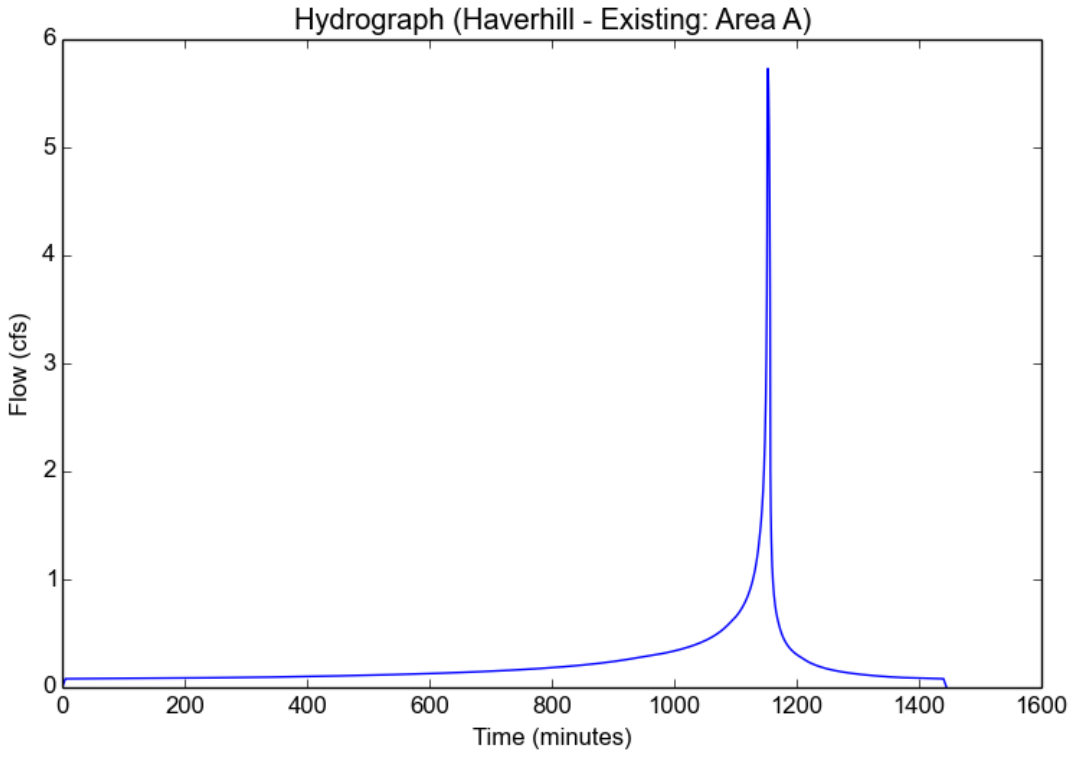
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/10-yr/Haverhill - Existing - Area A.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area A
Area (ac)	2.31
Flow Path Length (ft)	271.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.29
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8825
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	5.7315
Burned Peak Flow Rate (cfs)	5.9432
24-Hr Clear Runoff Volume (ac-ft)	0.4496
24-Hr Clear Runoff Volume (cu-ft)	19583.7128



Peak Flow Hydrologic Analysis

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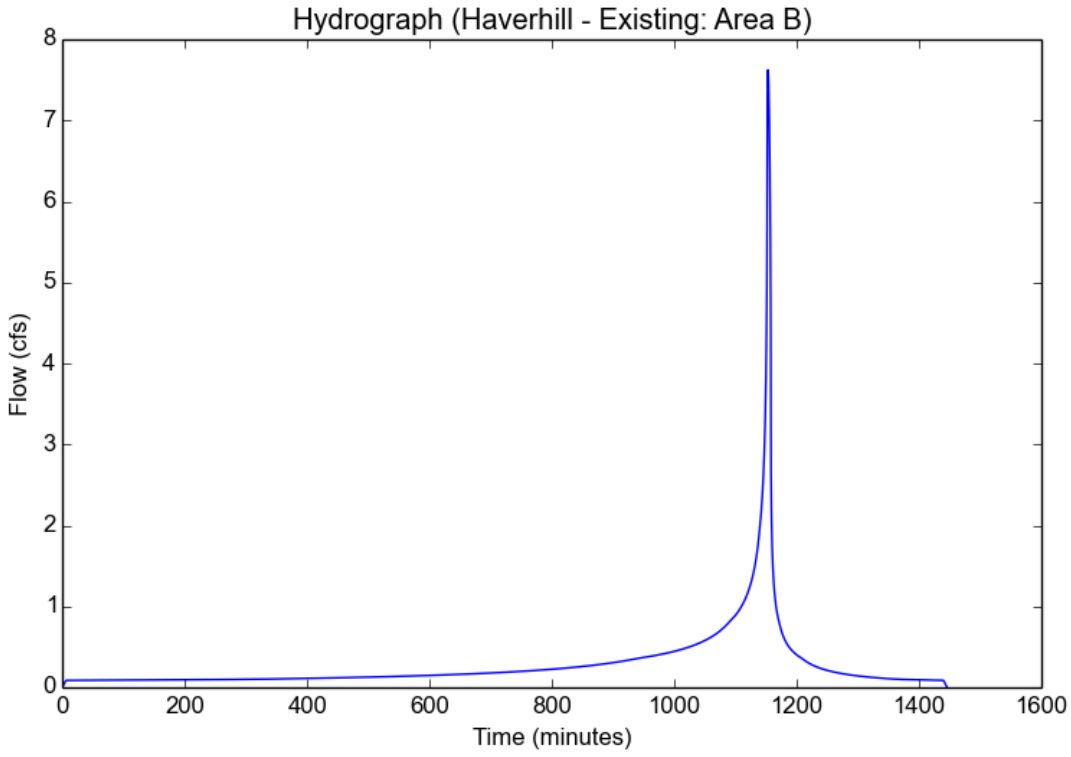
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area B
Area (ac)	3.39
Flow Path Length (ft)	538.0
Flow Path Slope (vft/hft)	0.0868
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.18
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.5807
Undeveloped Runoff Coefficient (Cu)	0.8651
Developed Runoff Coefficient (Cd)	0.8714
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	7.6234
Burned Peak Flow Rate (cfs)	7.9313
24-Hr Clear Runoff Volume (ac-ft)	0.5778
24-Hr Clear Runoff Volume (cu-ft)	25168.163



Peak Flow Hydrologic Analysis

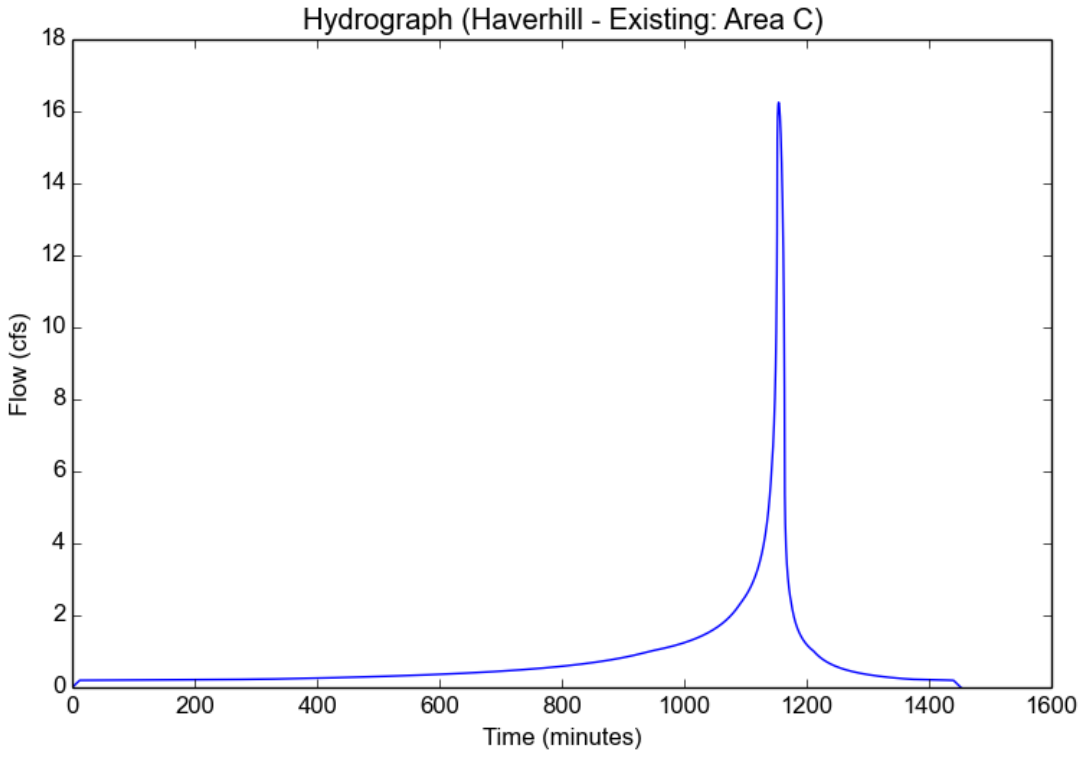
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/10-yr/Haverhill - Existing - Area C.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area C
Area (ac)	10.45
Flow Path Length (ft)	1724.0
Flow Path Slope (vft/hft)	0.1137
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.1
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	1.8631
Undeveloped Runoff Coefficient (Cu)	0.8273
Developed Runoff Coefficient (Cd)	0.8346
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	16.2492
Burned Peak Flow Rate (cfs)	17.083
24-Hr Clear Runoff Volume (ac-ft)	1.5955
24-Hr Clear Runoff Volume (cu-ft)	69499.8955



Peak Flow Hydrologic Analysis

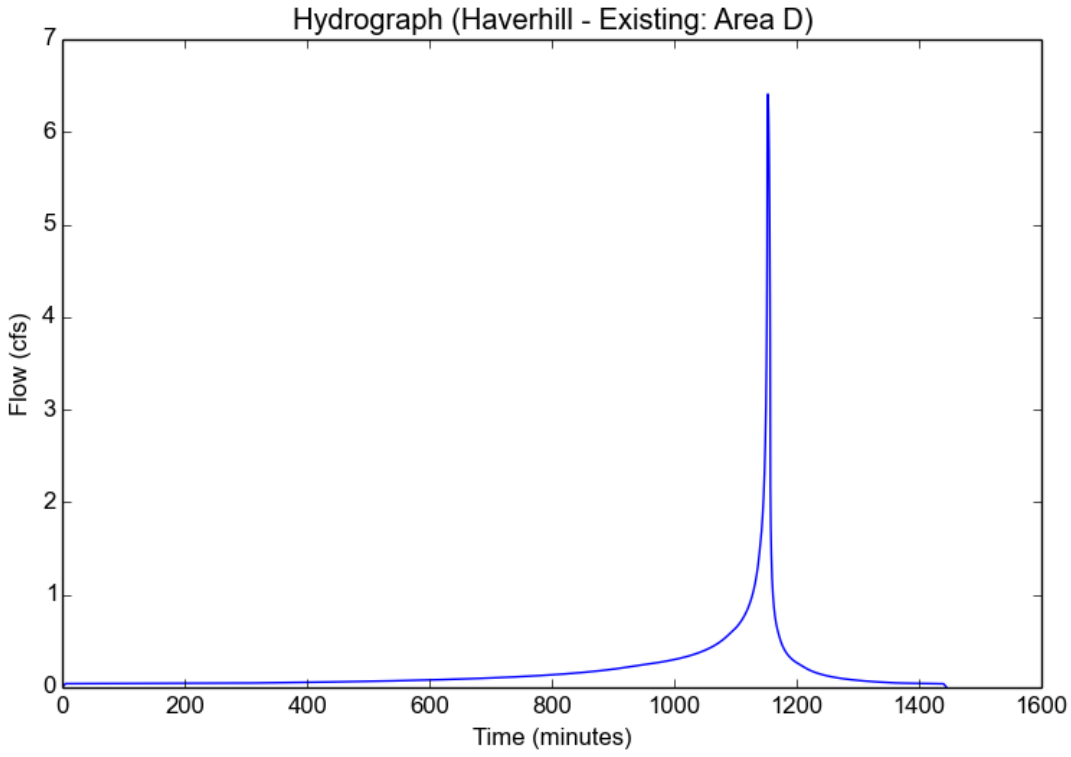
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/10-yr/Haverhill - Existing - Area D.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area D
Area (ac)	2.6
Flow Path Length (ft)	467.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0621
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8769
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	6.4099
Burned Peak Flow Rate (cfs)	6.6596
24-Hr Clear Runoff Volume (ac-ft)	0.3759
24-Hr Clear Runoff Volume (cu-ft)	16375.2691



Peak Flow Hydrologic Analysis

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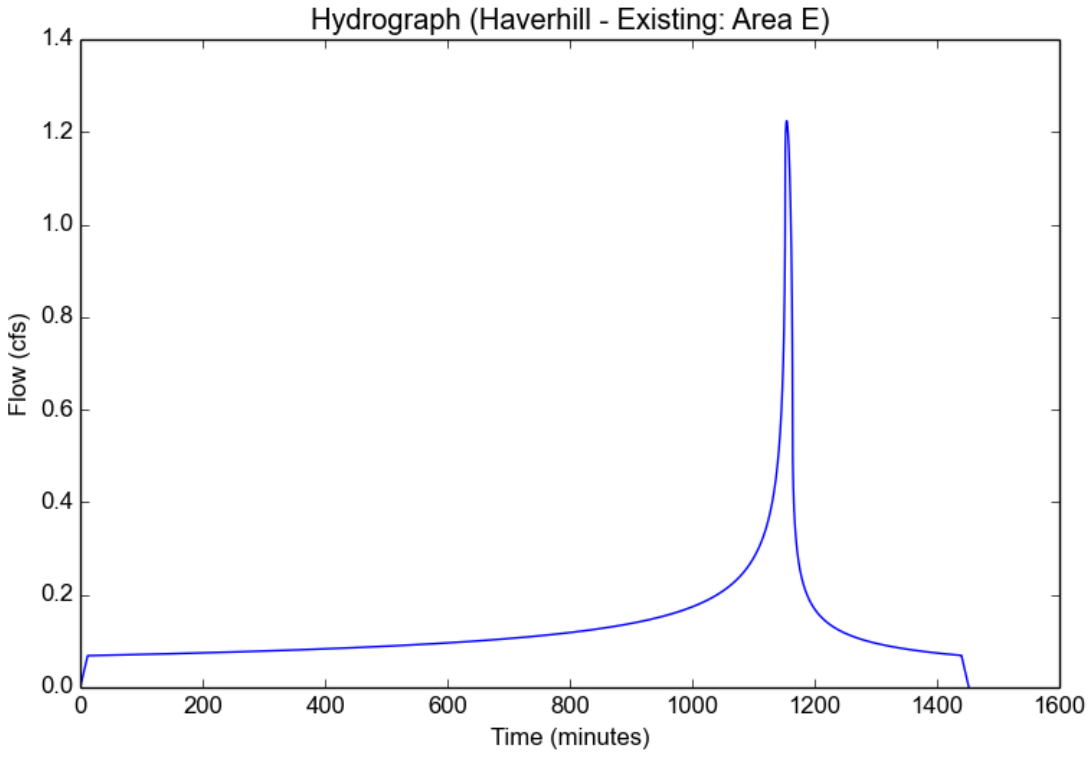
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area E
Area (ac)	0.73
Flow Path Length (ft)	1452.0
Flow Path Slope (vft/hft)	0.0592
50-yr Rainfall Depth (in)	6.6
Percent Impervious	1.0
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	1.8631
Undeveloped Runoff Coefficient (Cu)	0.8273
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	1.2241
Burned Peak Flow Rate (cfs)	1.2593
24-Hr Clear Runoff Volume (ac-ft)	0.2559
24-Hr Clear Runoff Volume (cu-ft)	11145.7887



Peak Flow Hydrologic Analysis

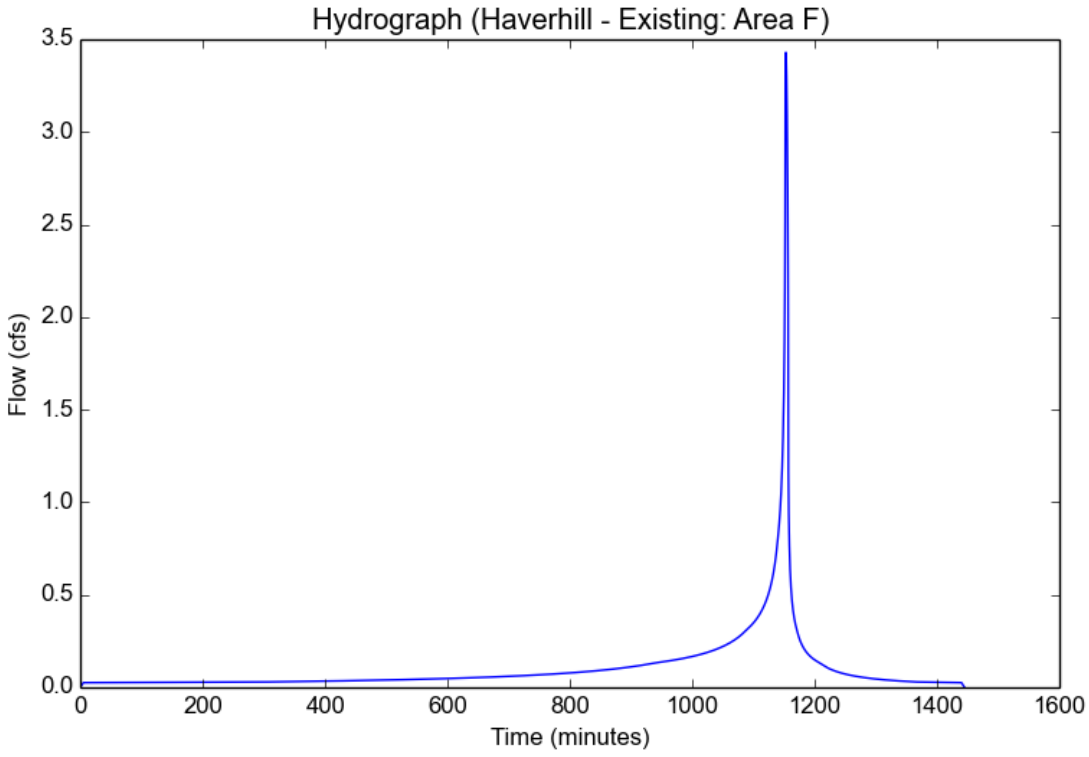
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/10-yr/Haverhill - Existing - Area F.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area F
Area (ac)	1.39
Flow Path Length (ft)	119.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0958
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8777
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.4301
Burned Peak Flow Rate (cfs)	3.5627
24-Hr Clear Runoff Volume (ac-ft)	0.2113
24-Hr Clear Runoff Volume (cu-ft)	9202.4735



Peak Flow Hydrologic Analysis

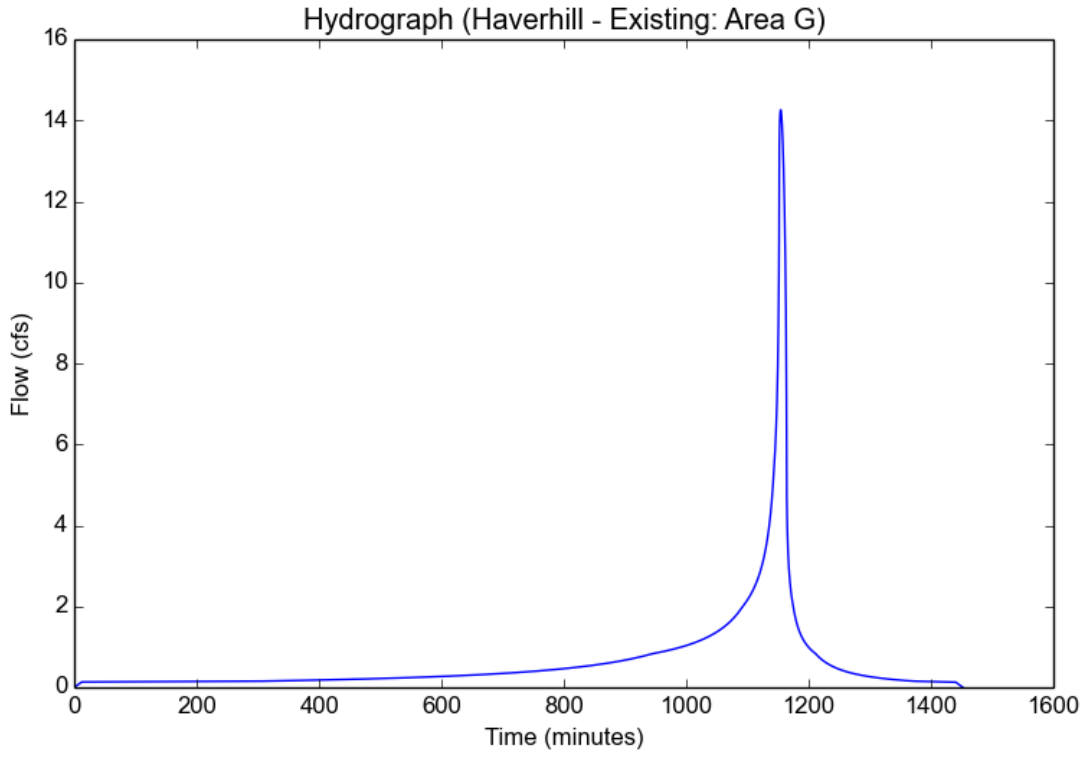
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/10-yr/Haverhill - Existing - Area G.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area G
Area (ac)	9.21
Flow Path Length (ft)	1432.0
Flow Path Slope (vft/hft)	0.06
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.05
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	1.8631
Undeveloped Runoff Coefficient (Cu)	0.8273
Developed Runoff Coefficient (Cd)	0.8309
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	14.2587
Burned Peak Flow Rate (cfs)	15.0097
24-Hr Clear Runoff Volume (ac-ft)	1.305
24-Hr Clear Runoff Volume (cu-ft)	56843.7325



Peak Flow Hydrologic Analysis

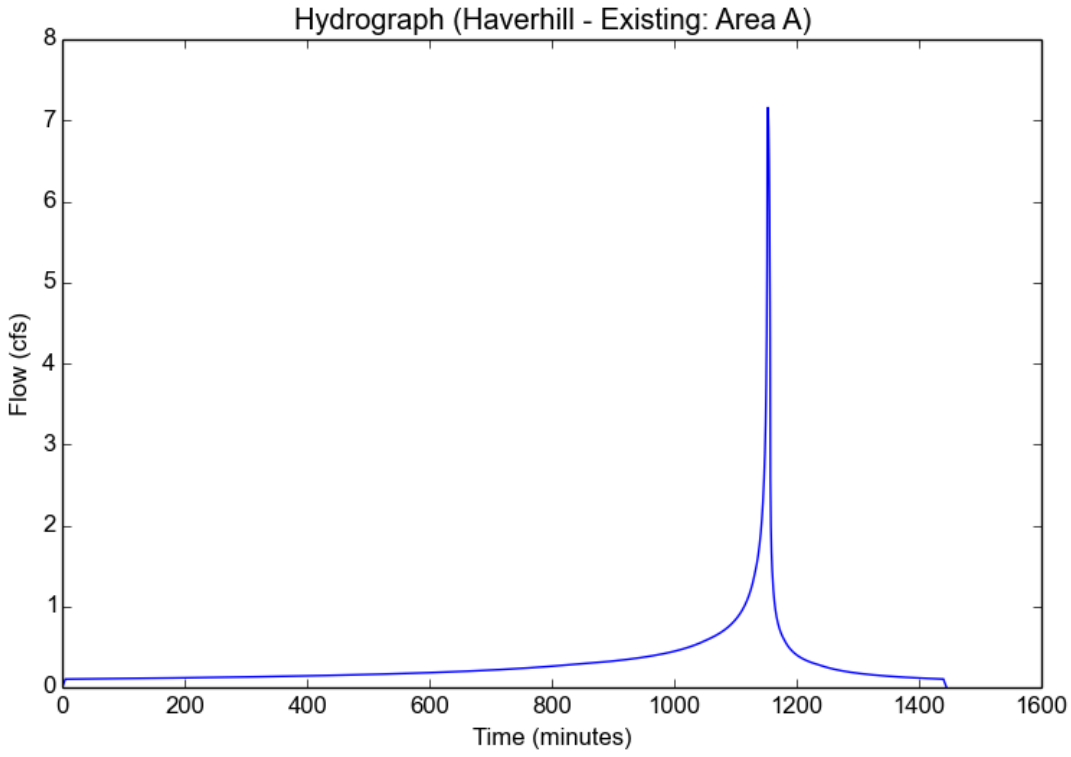
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/25-yr/Haverhill - Existing - Area A.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area A
Area (ac)	2.31
Flow Path Length (ft)	271.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.29
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.8962
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	7.1578
Burned Peak Flow Rate (cfs)	7.3952
24-Hr Clear Runoff Volume (ac-ft)	0.6012
24-Hr Clear Runoff Volume (cu-ft)	26187.4033



Peak Flow Hydrologic Analysis

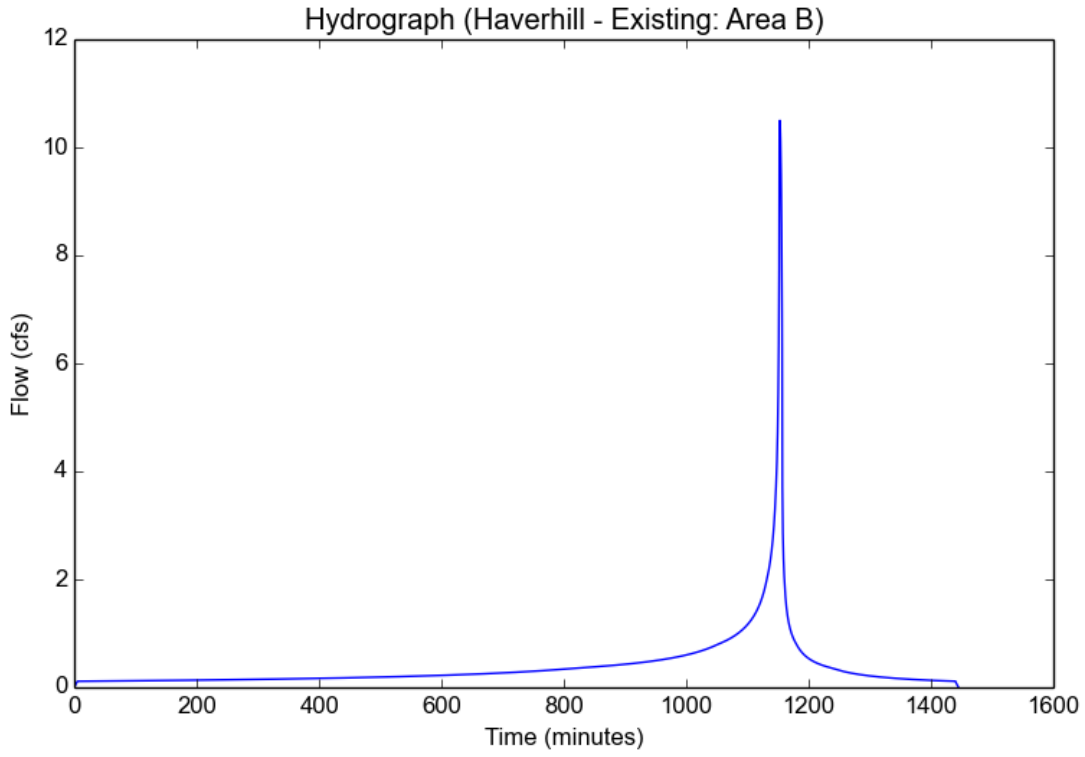
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/25-yr/Haverhill - Existing - Area B.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area B
Area (ac)	3.39
Flow Path Length (ft)	538.0
Flow Path Slope (vft/hft)	0.0868
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.18
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.8957
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	10.4975
Burned Peak Flow Rate (cfs)	10.8478
24-Hr Clear Runoff Volume (ac-ft)	0.7926
24-Hr Clear Runoff Volume (cu-ft)	34524.0178



Peak Flow Hydrologic Analysis

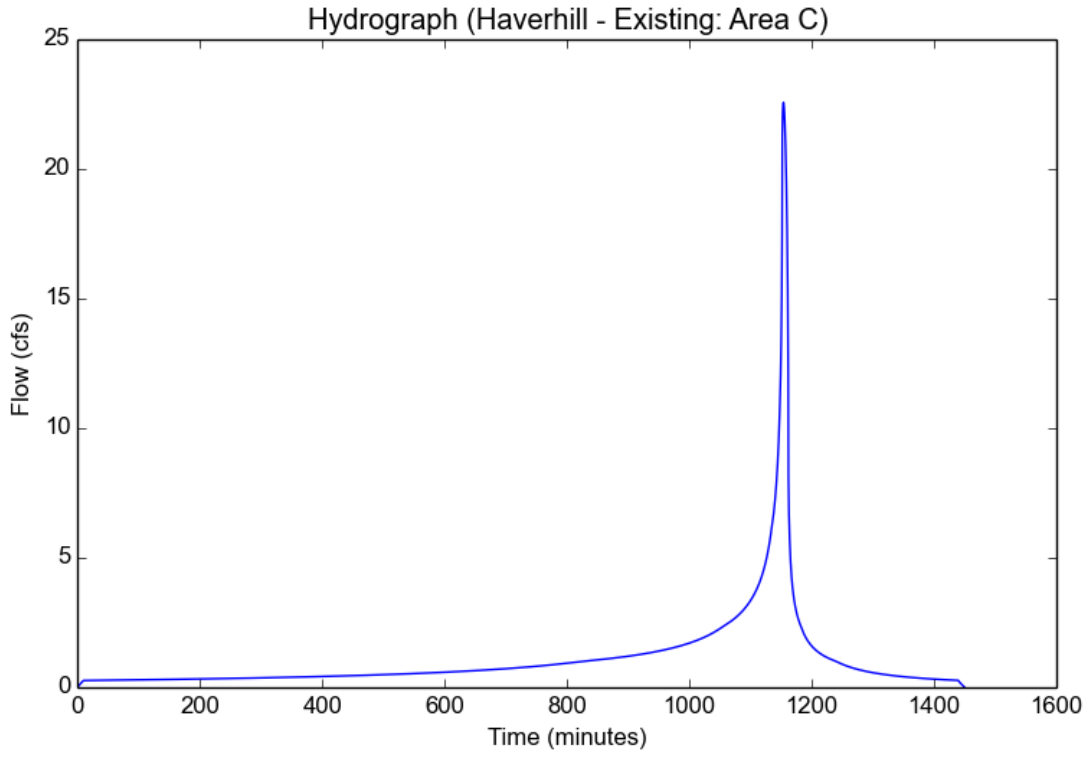
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/25-yr/Haverhill - Existing - Area C.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area C
Area (ac)	10.45
Flow Path Length (ft)	1724.0
Flow Path Slope (vft/hft)	0.1137
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.1
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	2.4961
Undeveloped Runoff Coefficient (Cu)	0.8614
Developed Runoff Coefficient (Cd)	0.8652
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	22.5691
Burned Peak Flow Rate (cfs)	23.5257
24-Hr Clear Runoff Volume (ac-ft)	2.2401
24-Hr Clear Runoff Volume (cu-ft)	97580.2026



Peak Flow Hydrologic Analysis

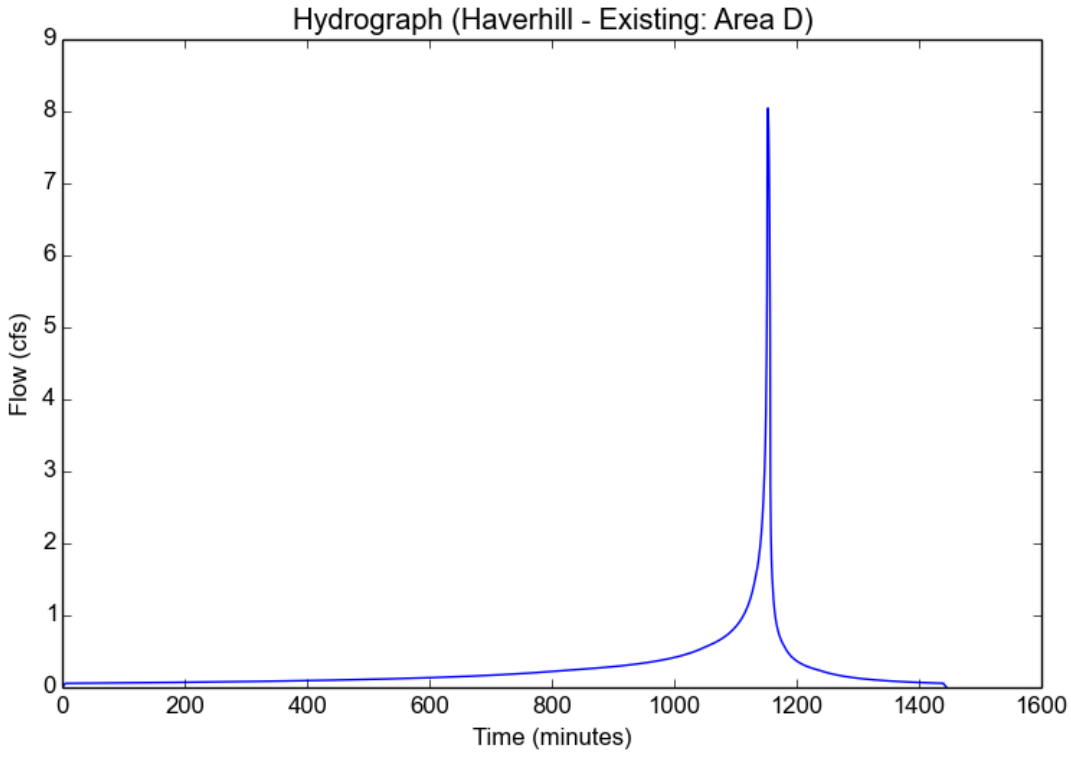
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/25-yr/Haverhill - Existing - Area D.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area D
Area (ac)	2.6
Flow Path Length (ft)	467.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0621
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.895
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	8.0456
Burned Peak Flow Rate (cfs)	8.3159
24-Hr Clear Runoff Volume (ac-ft)	0.5341
24-Hr Clear Runoff Volume (cu-ft)	23266.9999



Peak Flow Hydrologic Analysis

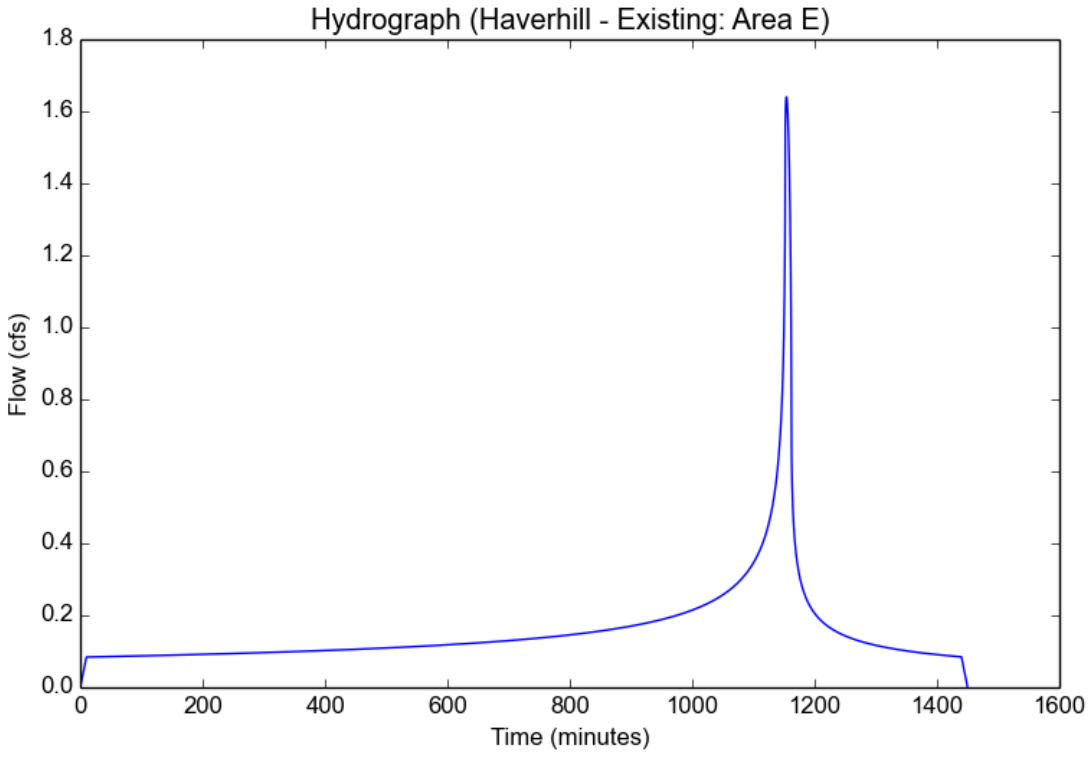
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/25-yr/Haverhill - Existing - Area E.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area E
Area (ac)	0.73
Flow Path Length (ft)	1452.0
Flow Path Slope (vft/hft)	0.0592
50-yr Rainfall Depth (in)	6.6
Percent Impervious	1.0
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	2.4961
Undeveloped Runoff Coefficient (Cu)	0.8614
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	1.6399
Burned Peak Flow Rate (cfs)	1.6895
24-Hr Clear Runoff Volume (ac-ft)	0.3146
24-Hr Clear Runoff Volume (cu-ft)	13705.8782



Peak Flow Hydrologic Analysis

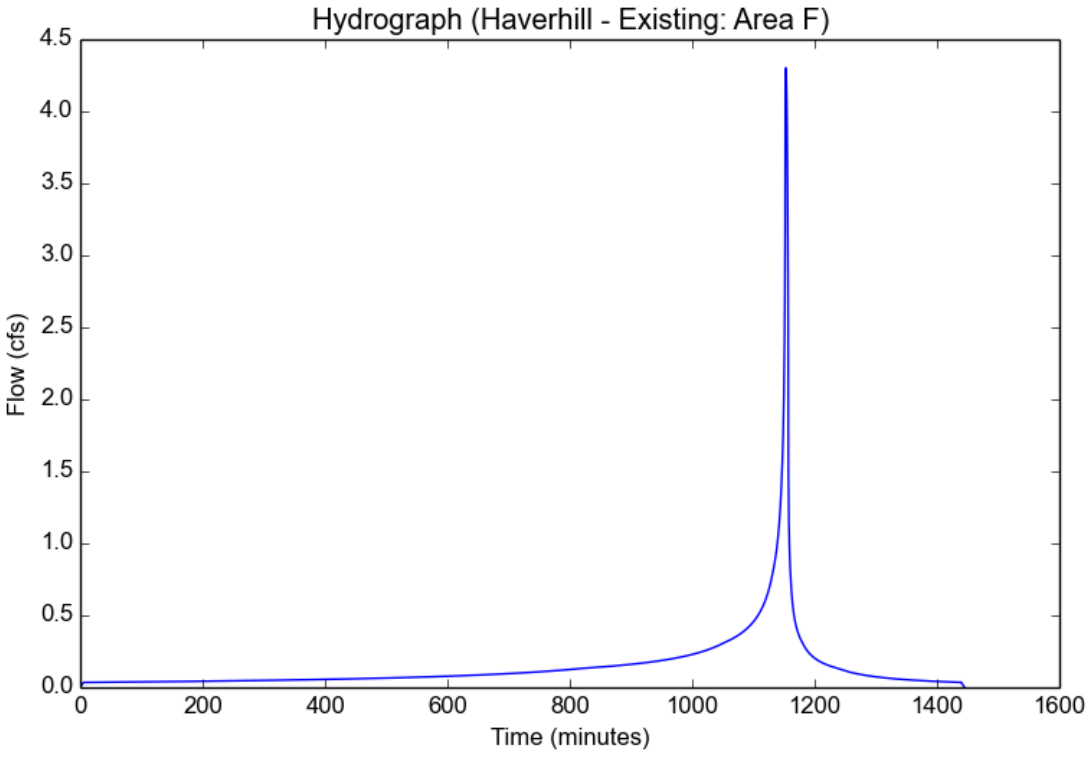
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/25-yr/Haverhill - Existing - Area F.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area F
Area (ac)	1.39
Flow Path Length (ft)	119.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0958
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.8952
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	4.3022
Burned Peak Flow Rate (cfs)	4.4464
24-Hr Clear Runoff Volume (ac-ft)	0.2968
24-Hr Clear Runoff Volume (cu-ft)	12929.6669



Peak Flow Hydrologic Analysis

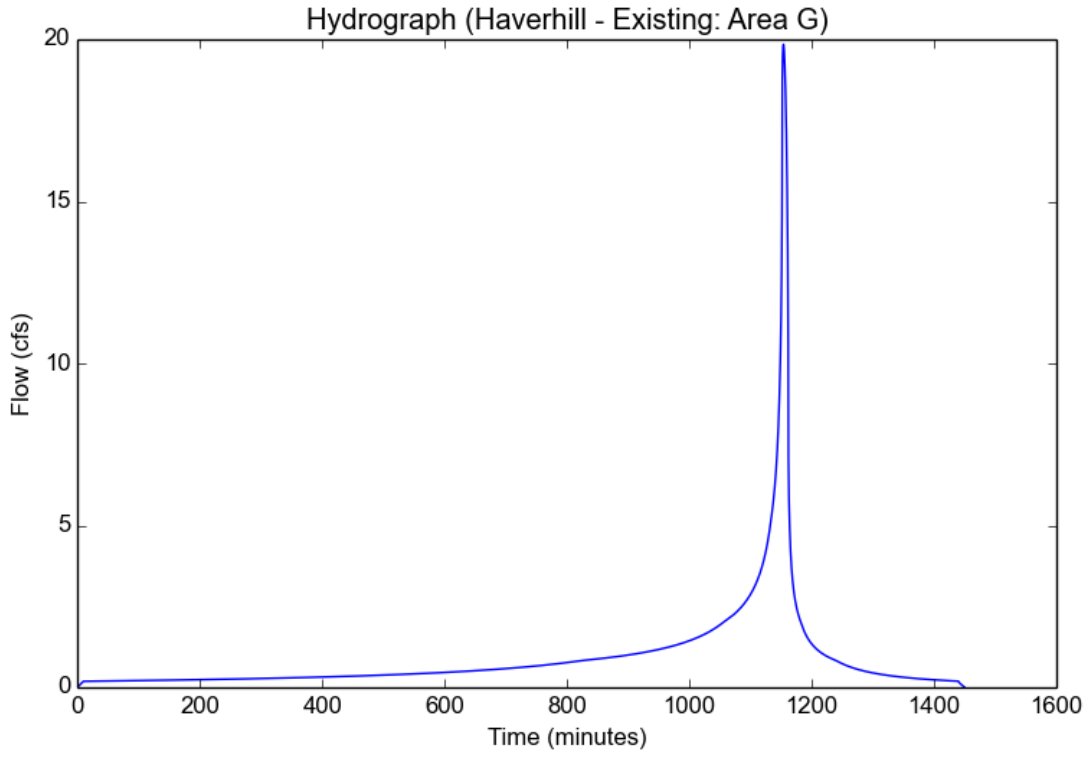
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/25-yr/Haverhill - Existing - Area G.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area G
Area (ac)	9.21
Flow Path Length (ft)	1432.0
Flow Path Slope (vft/hft)	0.06
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.05
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	2.4961
Undeveloped Runoff Coefficient (Cu)	0.8614
Developed Runoff Coefficient (Cd)	0.8633
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	19.8467
Burned Peak Flow Rate (cfs)	20.7018
24-Hr Clear Runoff Volume (ac-ft)	1.8635
24-Hr Clear Runoff Volume (cu-ft)	81172.5266



Peak Flow Hydrologic Analysis

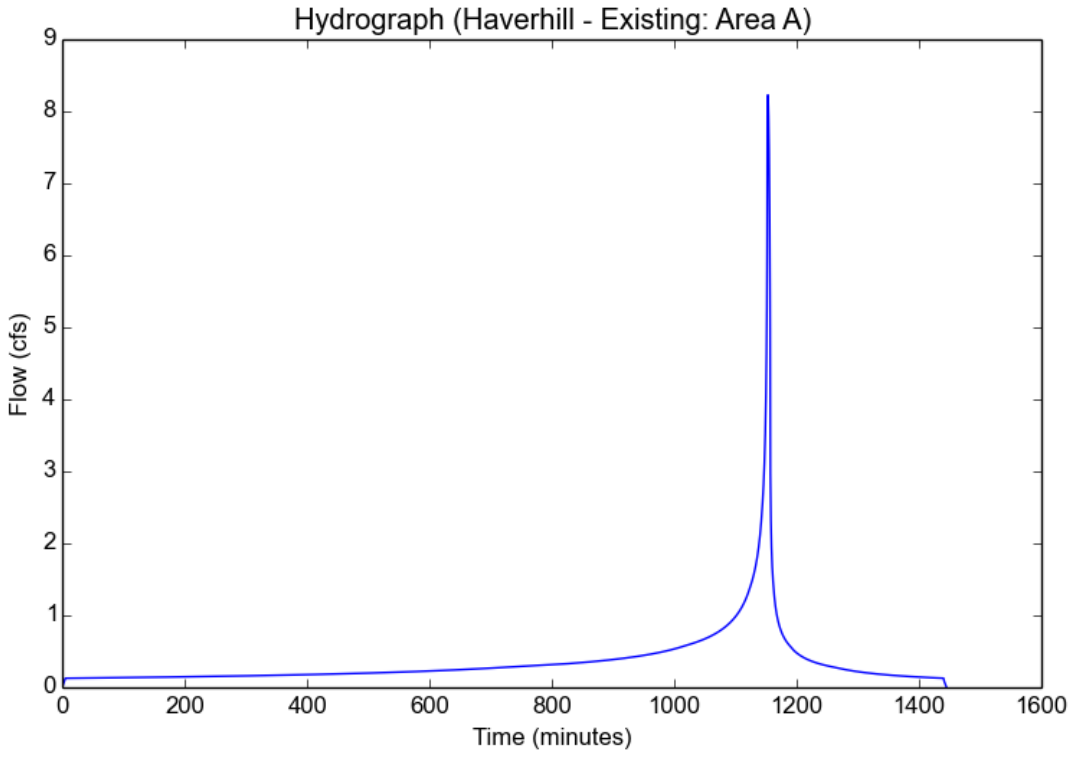
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/50-yr/Haverhill - Existing - Area A.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area A
Area (ac)	2.31
Flow Path Length (ft)	271.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.29
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.9045
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	8.2273
Burned Peak Flow Rate (cfs)	8.4811
24-Hr Clear Runoff Volume (ac-ft)	0.7213
24-Hr Clear Runoff Volume (cu-ft)	31417.8324



Peak Flow Hydrologic Analysis

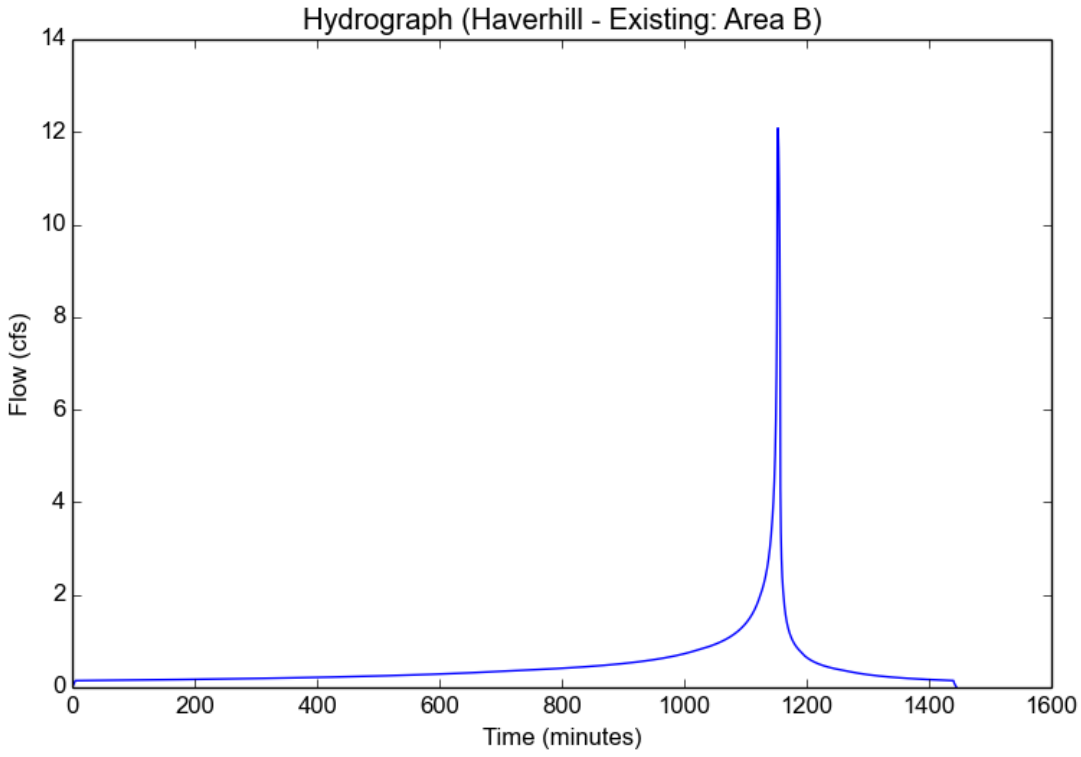
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/50-yr/Haverhill - Existing - Area B.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area B
Area (ac)	3.39
Flow Path Length (ft)	538.0
Flow Path Slope (vft/hft)	0.0868
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.18
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.9052
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	12.0832
Burned Peak Flow Rate (cfs)	12.4528
24-Hr Clear Runoff Volume (ac-ft)	0.9646
24-Hr Clear Runoff Volume (cu-ft)	42018.8576



Peak Flow Hydrologic Analysis

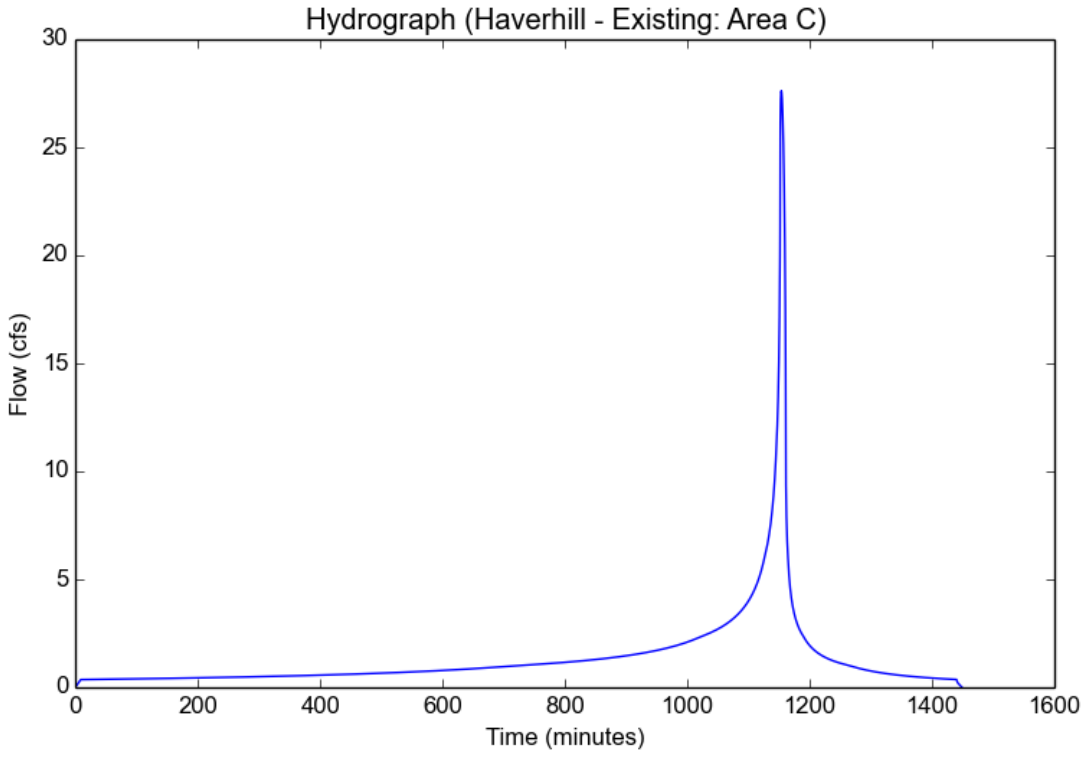
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/50-yr/Haverhill - Existing - Area C.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area C
Area (ac)	10.45
Flow Path Length (ft)	1724.0
Flow Path Slope (vft/hft)	0.1137
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.1
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	2.9872
Undeveloped Runoff Coefficient (Cu)	0.8831
Developed Runoff Coefficient (Cd)	0.8848
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	27.6203
Burned Peak Flow Rate (cfs)	28.6276
24-Hr Clear Runoff Volume (ac-ft)	2.7617
24-Hr Clear Runoff Volume (cu-ft)	120300.2561



Peak Flow Hydrologic Analysis

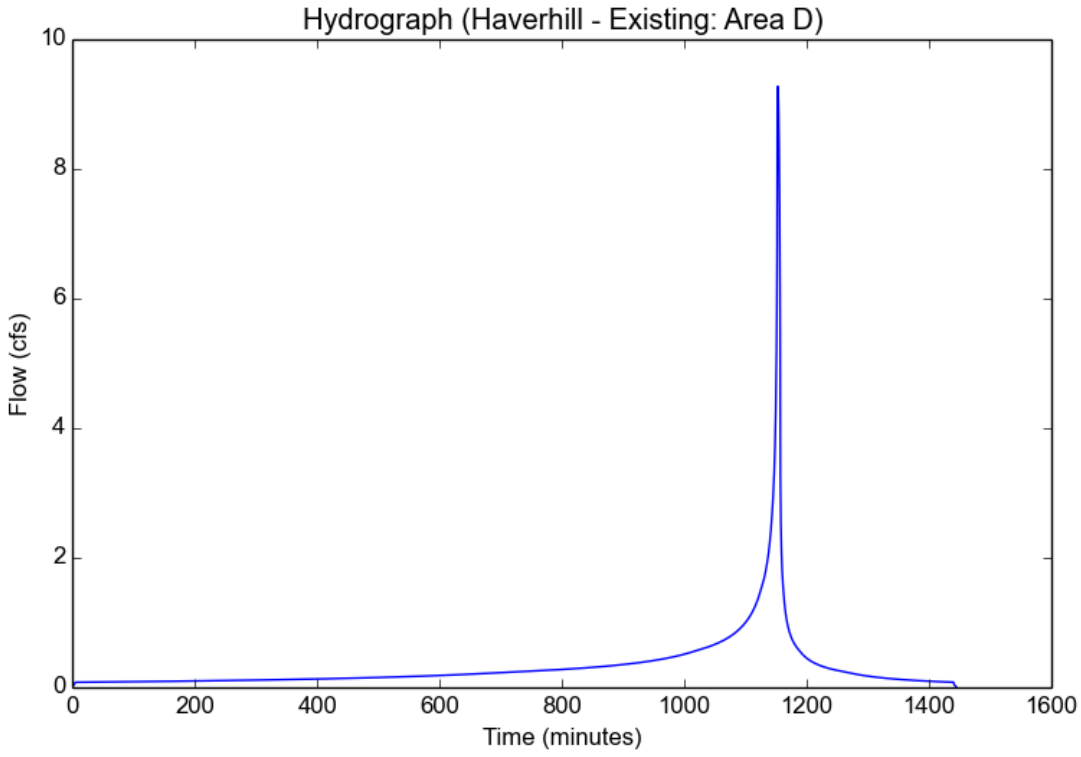
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/50-yr/Haverhill - Existing - Area D.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area D
Area (ac)	2.6
Flow Path Length (ft)	467.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0621
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.9059
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	9.275
Burned Peak Flow Rate (cfs)	9.5562
24-Hr Clear Runoff Volume (ac-ft)	0.6627
24-Hr Clear Runoff Volume (cu-ft)	28866.4775



Peak Flow Hydrologic Analysis

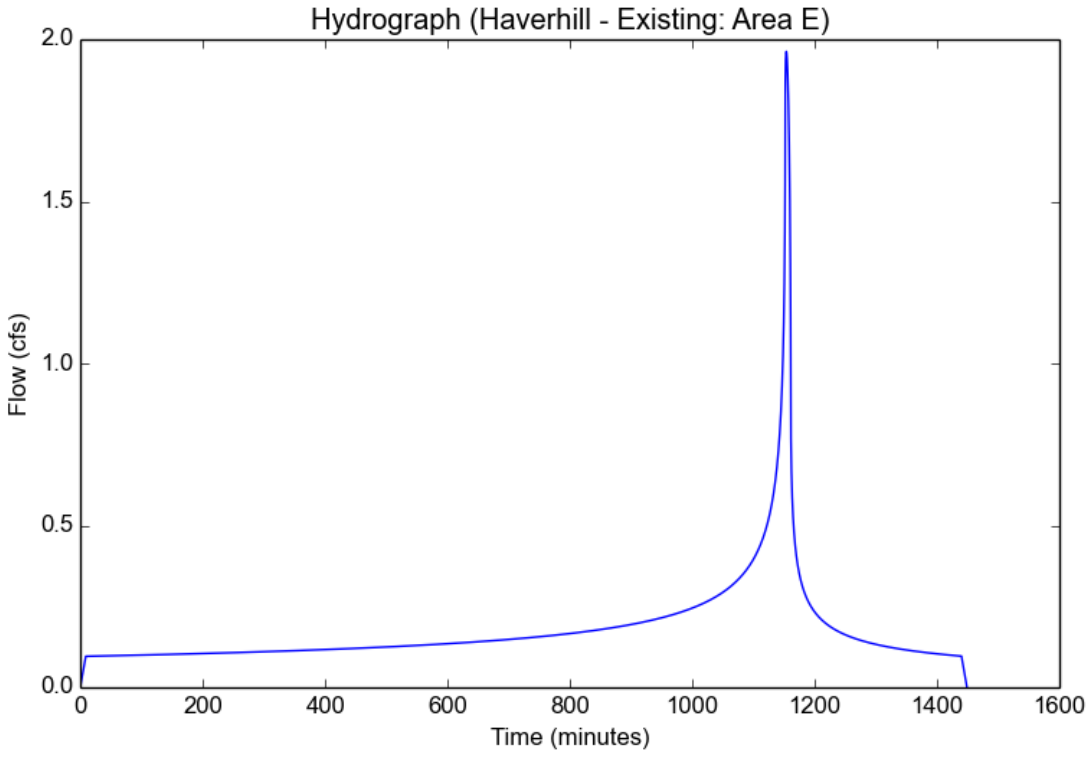
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/50-yr/Haverhill - Existing - Area E.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area E
Area (ac)	0.73
Flow Path Length (ft)	1452.0
Flow Path Slope (vft/hft)	0.0592
50-yr Rainfall Depth (in)	6.6
Percent Impervious	1.0
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	2.9872
Undeveloped Runoff Coefficient (Cu)	0.8831
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	1.9626
Burned Peak Flow Rate (cfs)	2.0237
24-Hr Clear Runoff Volume (ac-ft)	0.3584
24-Hr Clear Runoff Volume (cu-ft)	15610.3359



Peak Flow Hydrologic Analysis

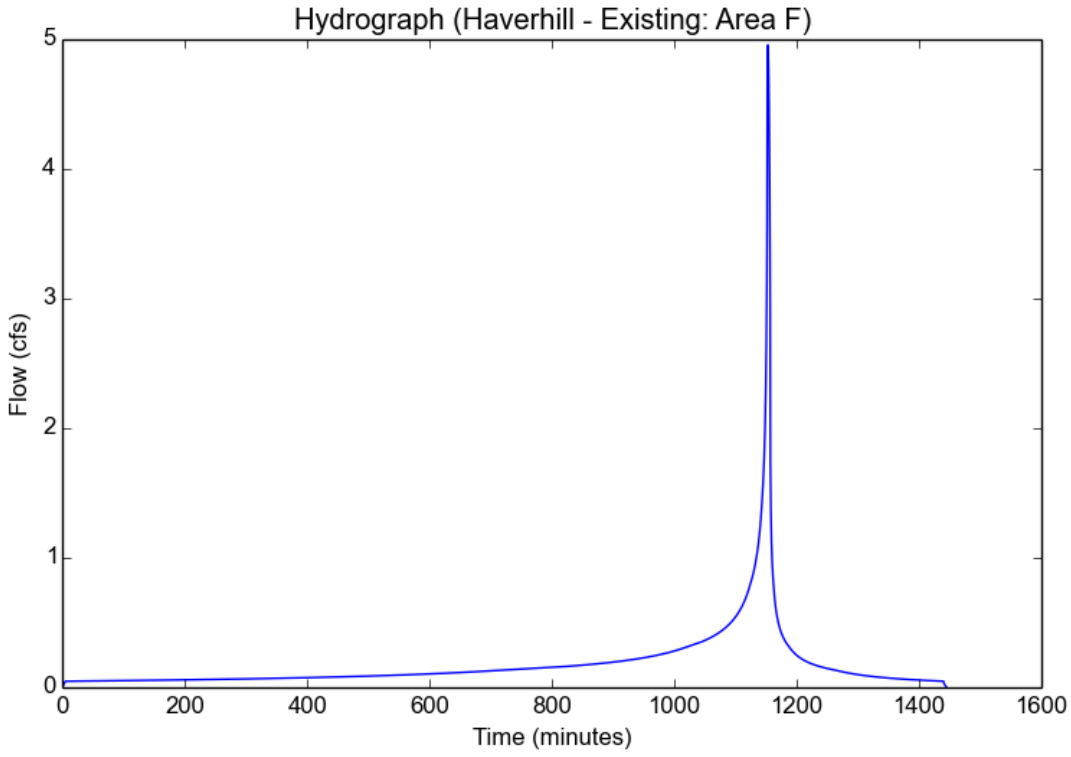
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/50-yr/Haverhill - Existing - Area F.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area F
Area (ac)	1.39
Flow Path Length (ft)	119.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0958
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.9057
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	4.9574
Burned Peak Flow Rate (cfs)	5.1081
24-Hr Clear Runoff Volume (ac-ft)	0.3661
24-Hr Clear Runoff Volume (cu-ft)	15945.9687



Peak Flow Hydrologic Analysis

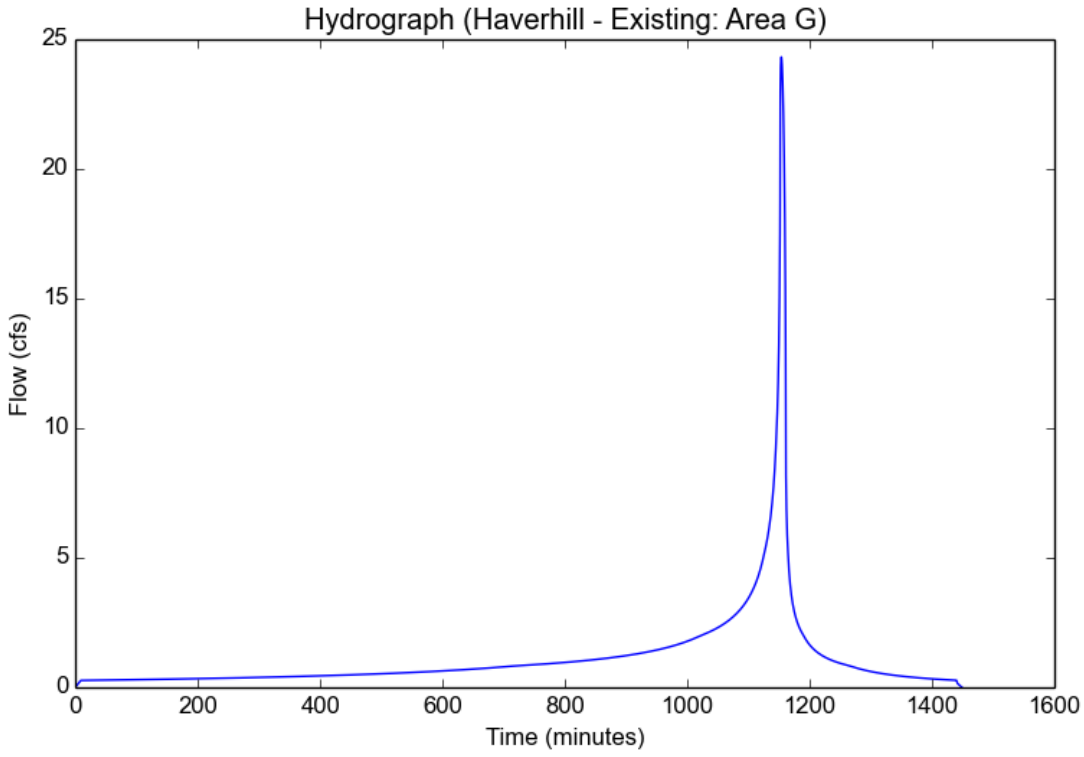
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Existing/HydroCalc/50-yr/Haverhill - Existing - Area G.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Existing
Subarea ID	Area G
Area (ac)	9.21
Flow Path Length (ft)	1432.0
Flow Path Slope (vft/hft)	0.06
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.05
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	2.9872
Undeveloped Runoff Coefficient (Cu)	0.8831
Developed Runoff Coefficient (Cd)	0.8839
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	24.3196
Burned Peak Flow Rate (cfs)	25.2139
24-Hr Clear Runoff Volume (ac-ft)	2.318
24-Hr Clear Runoff Volume (cu-ft)	100974.2016



PROPOSED CONDITION
10-YEAR, 25-YEAR, AND 50-YEAR

Peak Flow Hydrologic Analysis

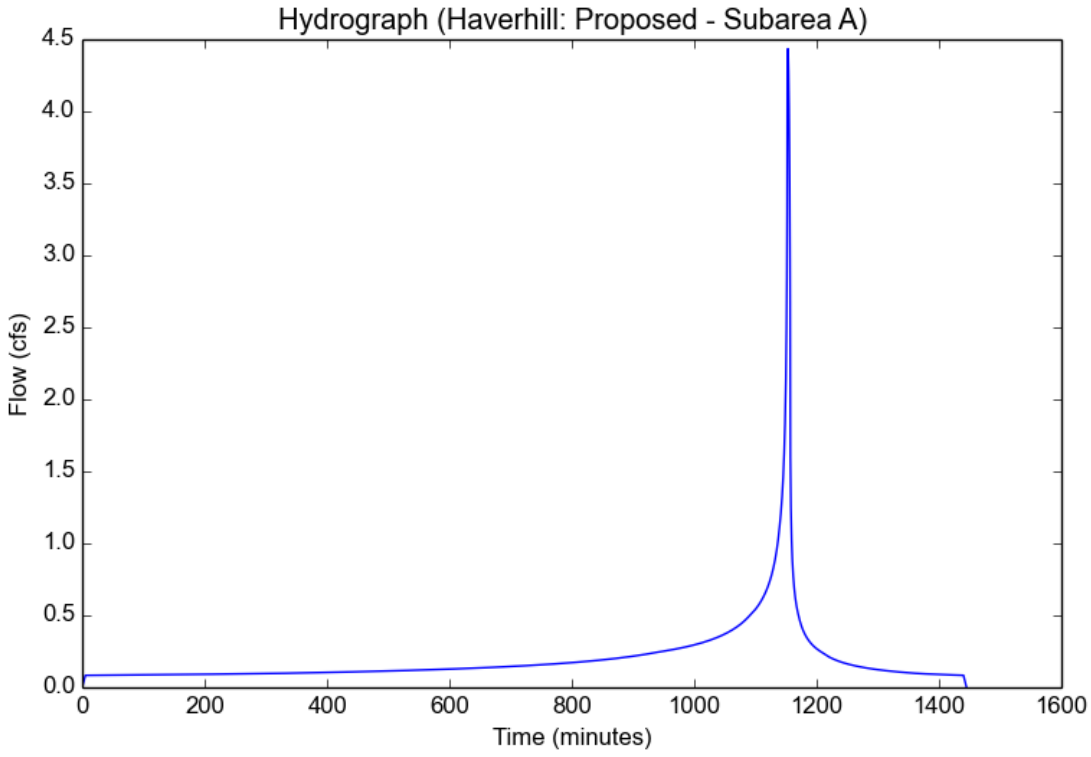
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea A.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill
Subarea ID	Proposed - Subarea A
Area (ac)	1.78
Flow Path Length (ft)	242.0
Flow Path Slope (vft/hft)	0.5
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.438
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8861
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	4.4347
Burned Peak Flow Rate (cfs)	4.5928
24-Hr Clear Runoff Volume (ac-ft)	0.4043
24-Hr Clear Runoff Volume (cu-ft)	17609.999



Peak Flow Hydrologic Analysis

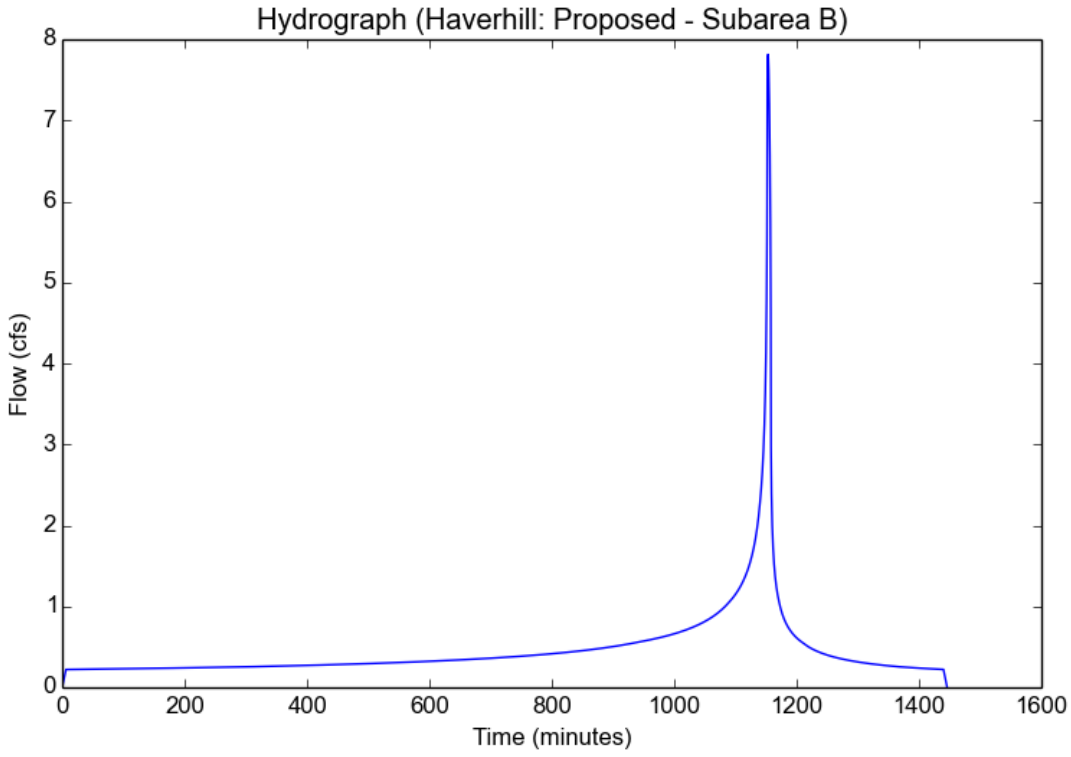
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea B.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill
Subarea ID	Proposed - Subarea B
Area (ac)	3.41
Flow Path Length (ft)	584.0
Flow Path Slope (vft/hft)	0.0799
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.652
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.5807
Undeveloped Runoff Coefficient (Cu)	0.8651
Developed Runoff Coefficient (Cd)	0.8879
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	7.8132
Burned Peak Flow Rate (cfs)	8.0833
24-Hr Clear Runoff Volume (ac-ft)	0.9346
24-Hr Clear Runoff Volume (cu-ft)	40712.9746



Peak Flow Hydrologic Analysis

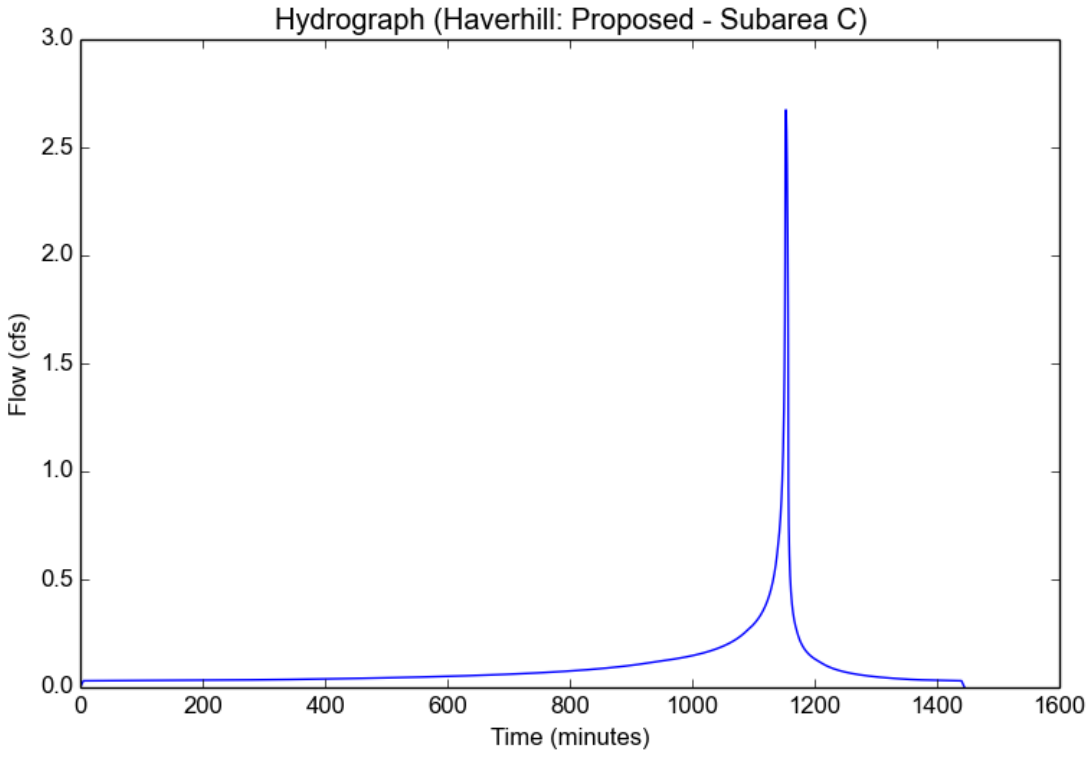
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea C.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill
Subarea ID	Proposed - Subarea C
Area (ac)	1.08
Flow Path Length (ft)	147.0
Flow Path Slope (vft/hft)	0.286
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.215
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8806
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.674
Burned Peak Flow Rate (cfs)	2.7746
24-Hr Clear Runoff Volume (ac-ft)	0.1924
24-Hr Clear Runoff Volume (cu-ft)	8381.344



Peak Flow Hydrologic Analysis

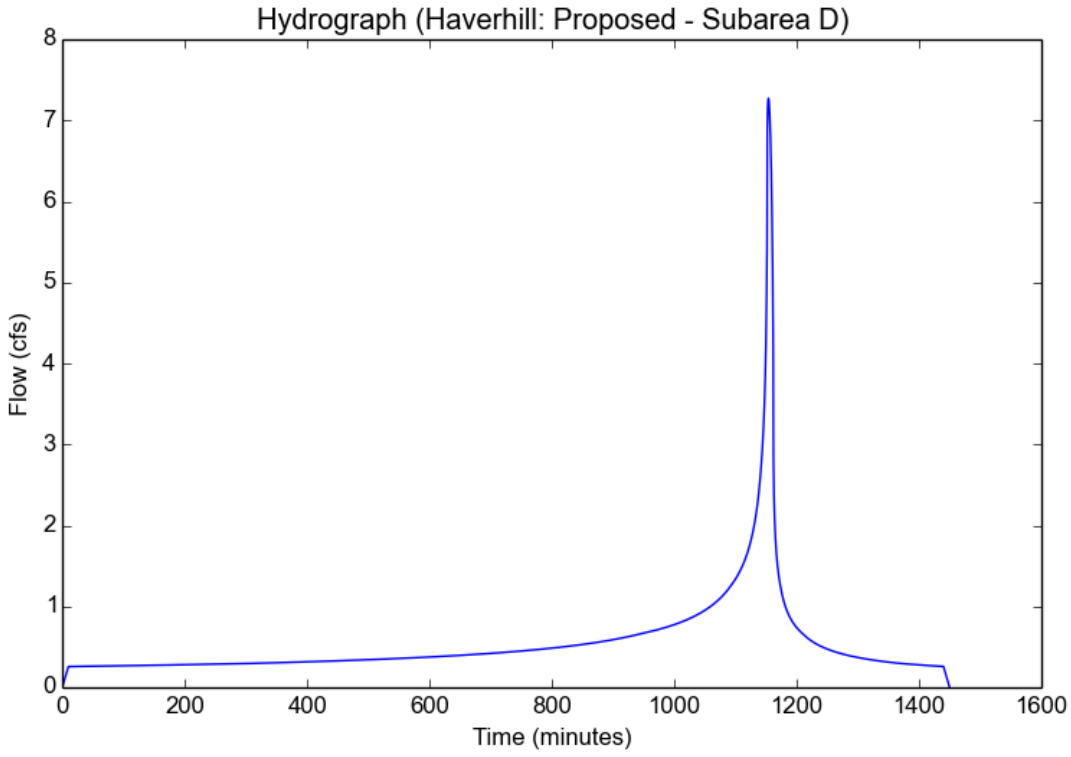
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea D.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill
Subarea ID	Proposed - Subarea D
Area (ac)	4.08
Flow Path Length (ft)	1322.0
Flow Path Slope (vft/hft)	0.0901
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.63
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.0298
Undeveloped Runoff Coefficient (Cu)	0.8408
Developed Runoff Coefficient (Cd)	0.8781
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	7.2721
Burned Peak Flow Rate (cfs)	7.5374
24-Hr Clear Runoff Volume (ac-ft)	1.0984
24-Hr Clear Runoff Volume (cu-ft)	47847.3374



Peak Flow Hydrologic Analysis

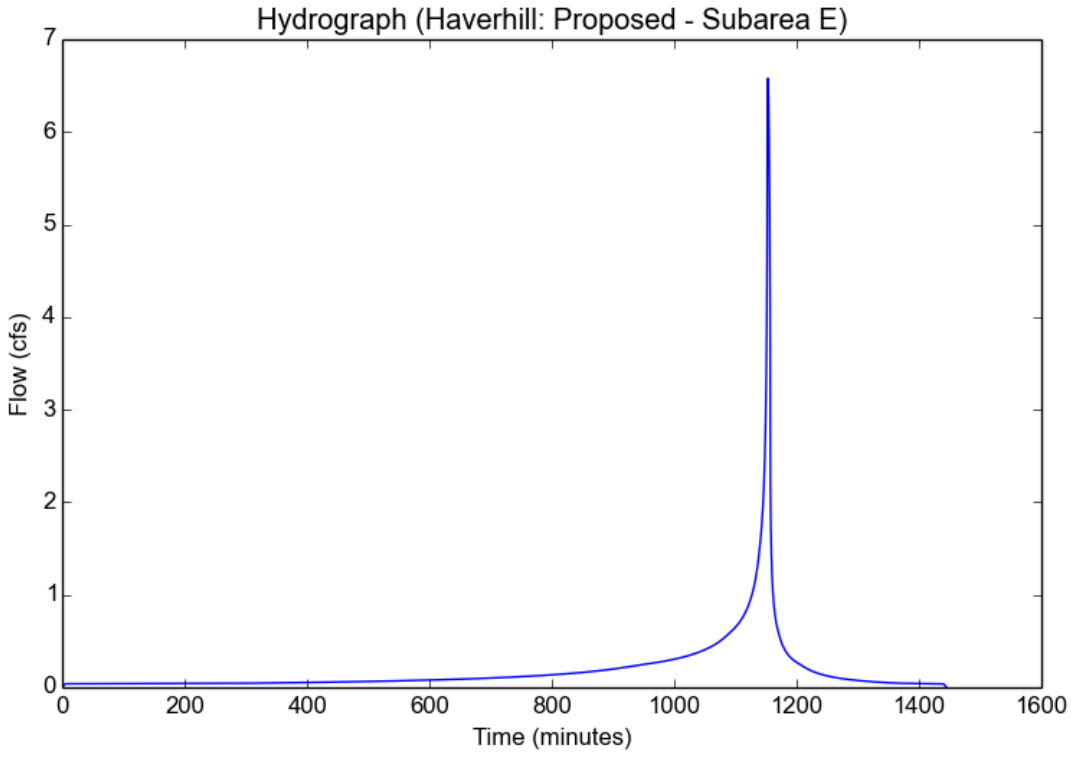
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea E.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill
Subarea ID	Proposed - Subarea E
Area (ac)	2.67
Flow Path Length (ft)	574.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.05
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8766
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	6.5803
Burned Peak Flow Rate (cfs)	6.8373
24-Hr Clear Runoff Volume (ac-ft)	0.379
24-Hr Clear Runoff Volume (cu-ft)	16507.1601



Peak Flow Hydrologic Analysis

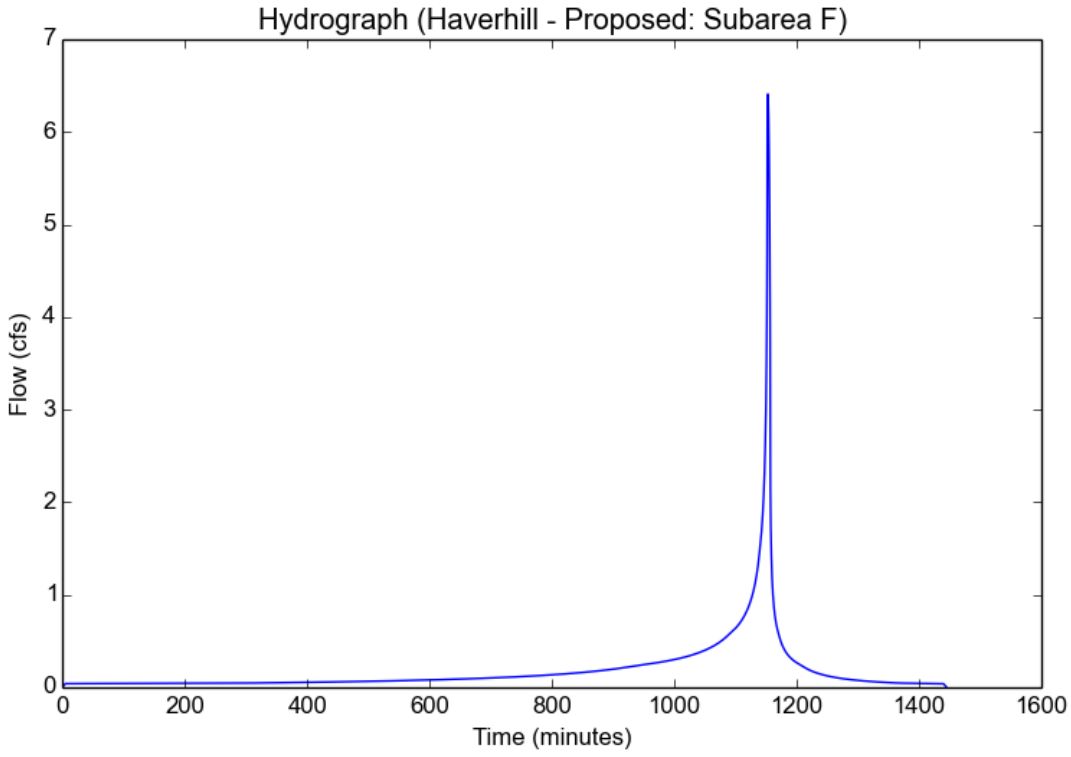
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea F.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea F
Area (ac)	2.6
Flow Path Length (ft)	467.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0621
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8769
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	6.4099
Burned Peak Flow Rate (cfs)	6.6596
24-Hr Clear Runoff Volume (ac-ft)	0.3759
24-Hr Clear Runoff Volume (cu-ft)	16375.2691



Peak Flow Hydrologic Analysis

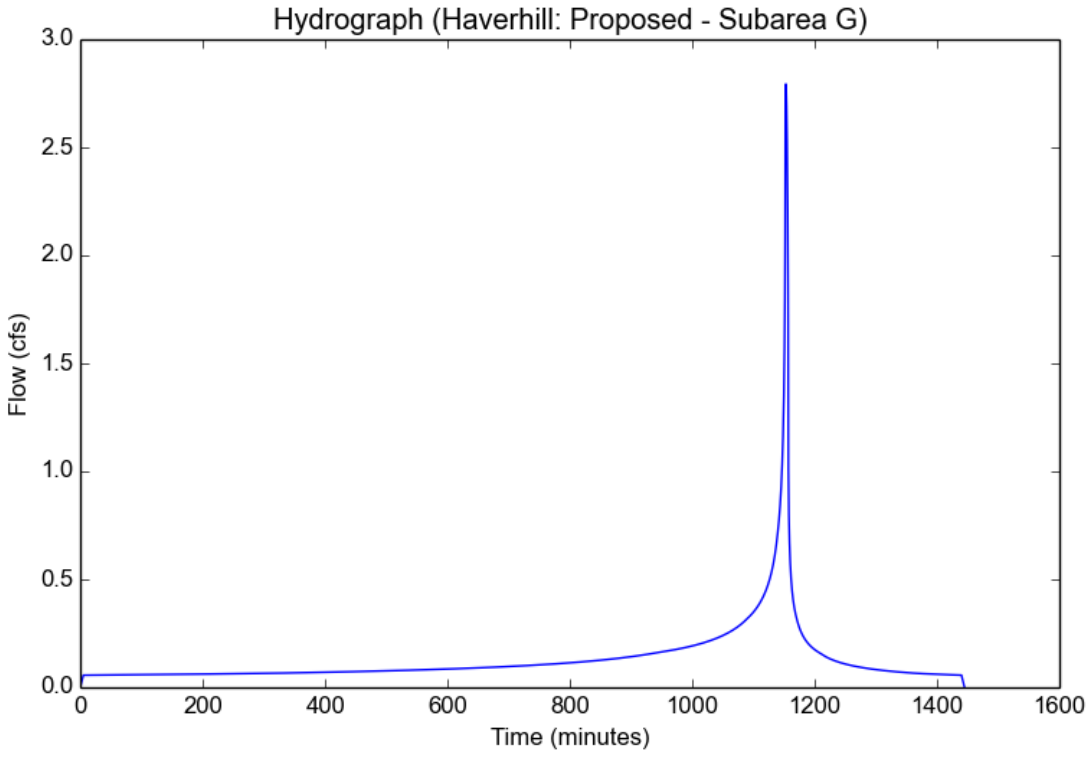
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea G.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill
Subarea ID	Proposed - Subarea G
Area (ac)	1.12
Flow Path Length (ft)	157.0
Flow Path Slope (vft/hft)	0.038
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.48
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8872
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.7937
Burned Peak Flow Rate (cfs)	2.8922
24-Hr Clear Runoff Volume (ac-ft)	0.2647
24-Hr Clear Runoff Volume (cu-ft)	11530.3356



Peak Flow Hydrologic Analysis

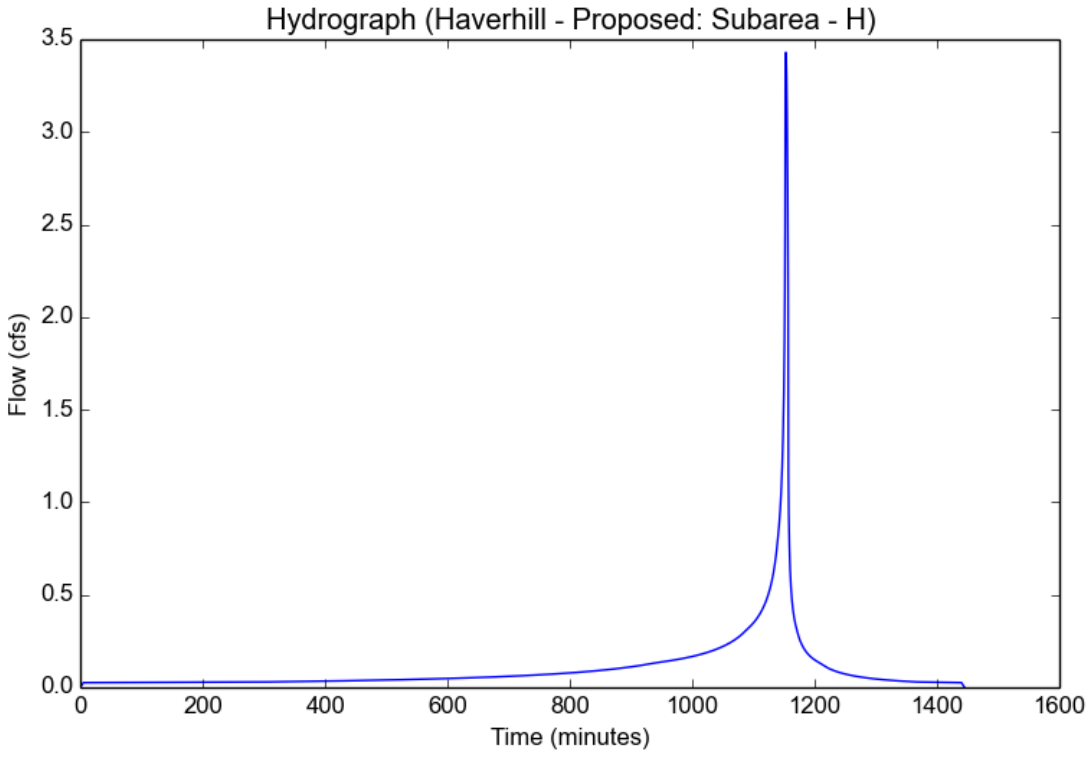
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea - H.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea - H
Area (ac)	1.39
Flow Path Length (ft)	119.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0958
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8777
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.4301
Burned Peak Flow Rate (cfs)	3.5627
24-Hr Clear Runoff Volume (ac-ft)	0.2113
24-Hr Clear Runoff Volume (cu-ft)	9202.4735



Peak Flow Hydrologic Analysis

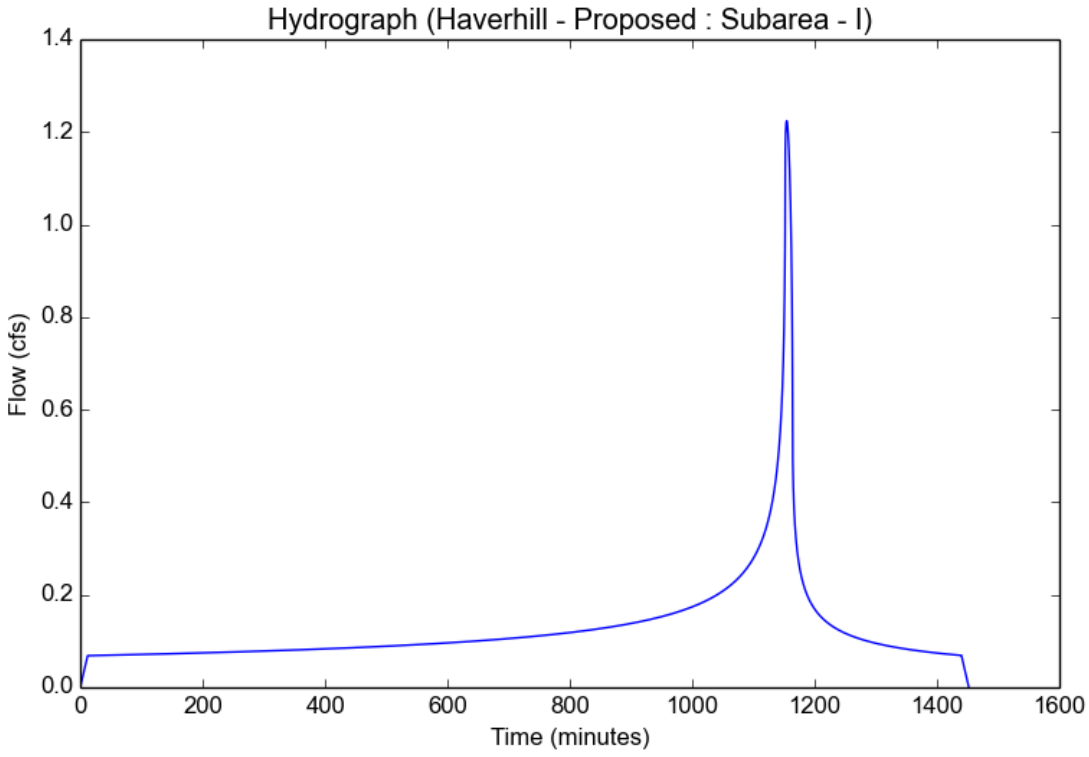
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea - I.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea - I
Area (ac)	0.73
Flow Path Length (ft)	1464.0
Flow Path Slope (vft/hft)	0.061
50-yr Rainfall Depth (in)	6.6
Percent Impervious	1.0
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	1.8631
Undeveloped Runoff Coefficient (Cu)	0.8273
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	1.2241
Burned Peak Flow Rate (cfs)	1.2241
24-Hr Clear Runoff Volume (ac-ft)	0.2559
24-Hr Clear Runoff Volume (cu-ft)	11145.7887



Peak Flow Hydrologic Analysis

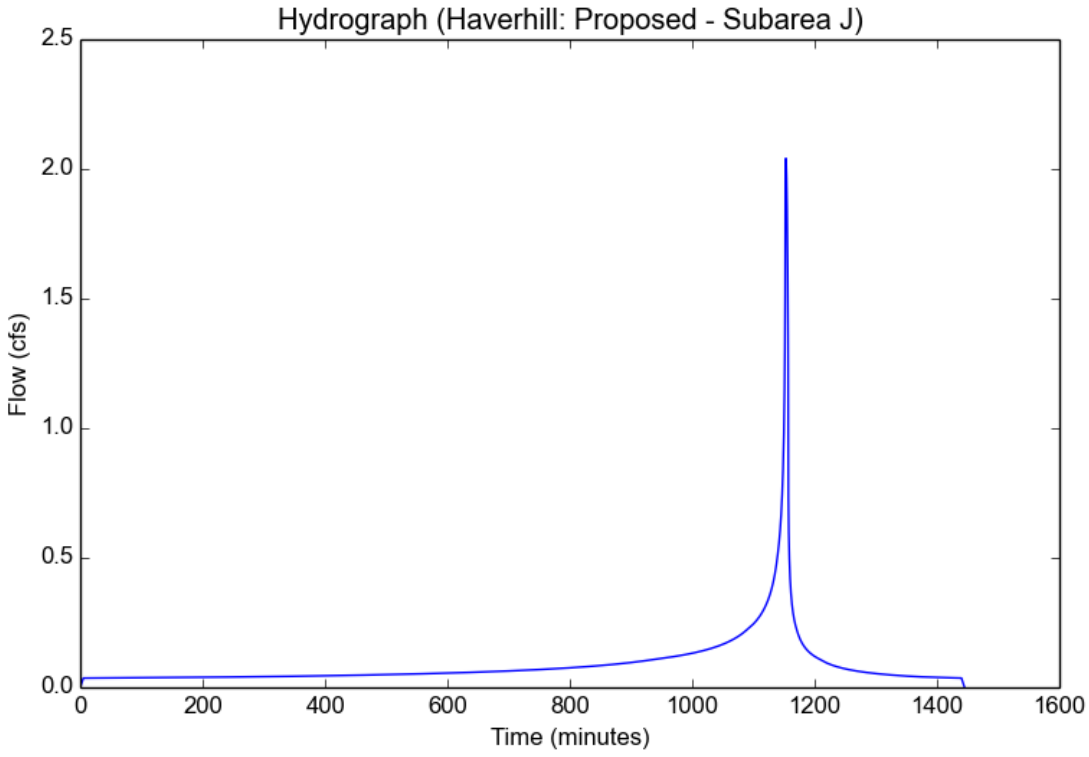
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea J.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill
Subarea ID	Proposed - Subarea J
Area (ac)	0.82
Flow Path Length (ft)	310.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.4
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8852
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.0408
Burned Peak Flow Rate (cfs)	2.1142
24-Hr Clear Runoff Volume (ac-ft)	0.1794
24-Hr Clear Runoff Volume (cu-ft)	7814.4597



Peak Flow Hydrologic Analysis

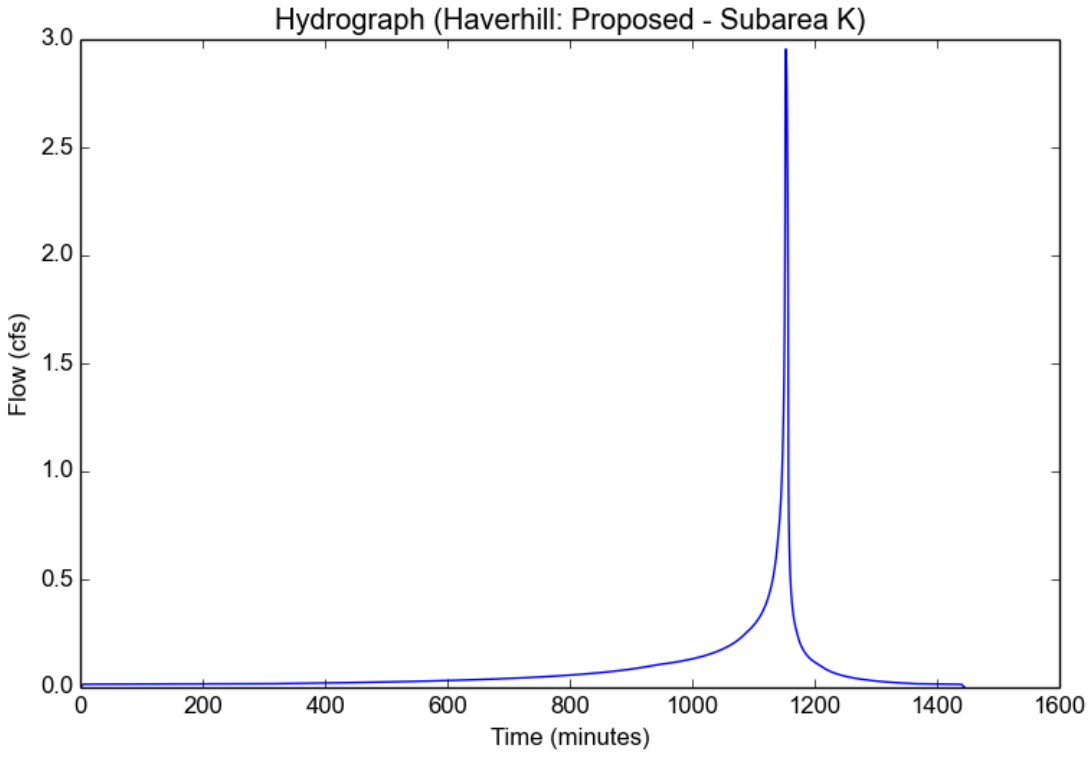
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea K.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill
Subarea ID	Proposed - Subarea K
Area (ac)	1.2
Flow Path Length (ft)	506.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.02
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8758
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.9549
Burned Peak Flow Rate (cfs)	3.0711
24-Hr Clear Runoff Volume (ac-ft)	0.1624
24-Hr Clear Runoff Volume (cu-ft)	7074.6473



Peak Flow Hydrologic Analysis

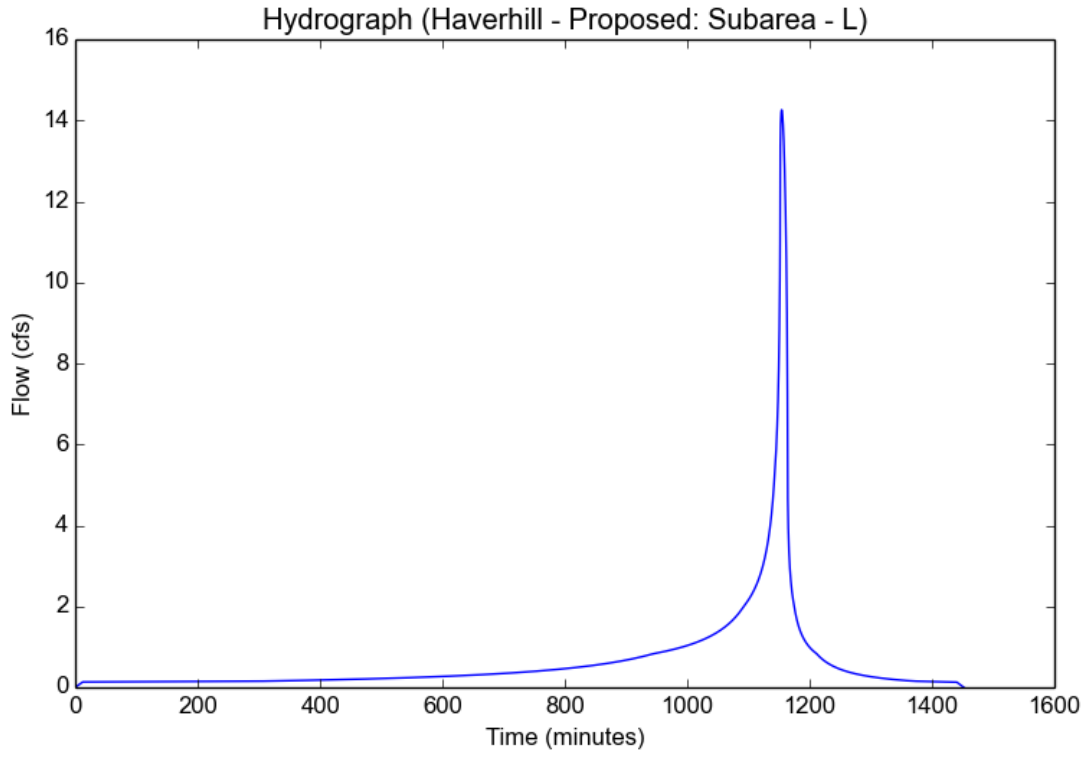
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/10-yr/Haverhill - Proposed - Subarea - L.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea - L
Area (ac)	9.21
Flow Path Length (ft)	1432.0
Flow Path Slope (vft/hft)	0.06
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.05
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	1.8631
Undeveloped Runoff Coefficient (Cu)	0.8273
Developed Runoff Coefficient (Cd)	0.8309
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	14.2587
Burned Peak Flow Rate (cfs)	15.0097
24-Hr Clear Runoff Volume (ac-ft)	1.305
24-Hr Clear Runoff Volume (cu-ft)	56843.7325



Peak Flow Hydrologic Analysis

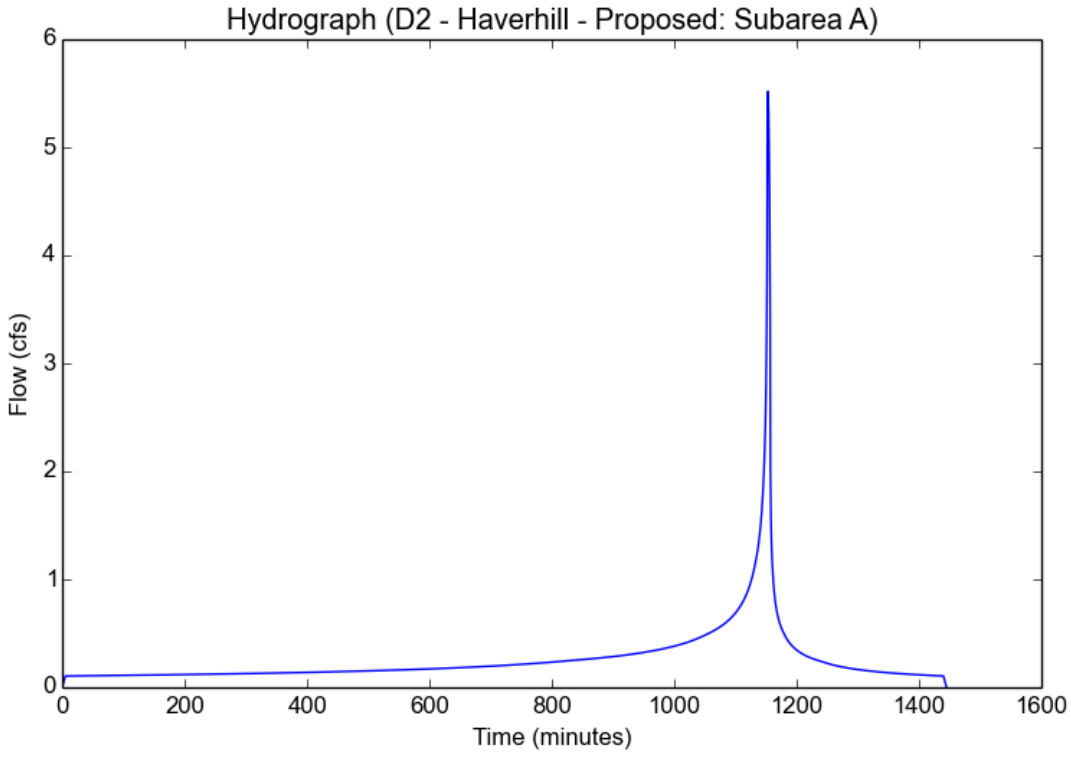
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/D2 - Haverhill - Proposed - Subarea A.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea A
Area (ac)	1.78
Flow Path Length (ft)	242.0
Flow Path Slope (vft/hft)	0.5
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.438
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.897
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	5.5204
Burned Peak Flow Rate (cfs)	5.7019
24-Hr Clear Runoff Volume (ac-ft)	0.5266
24-Hr Clear Runoff Volume (cu-ft)	22939.0803



Peak Flow Hydrologic Analysis

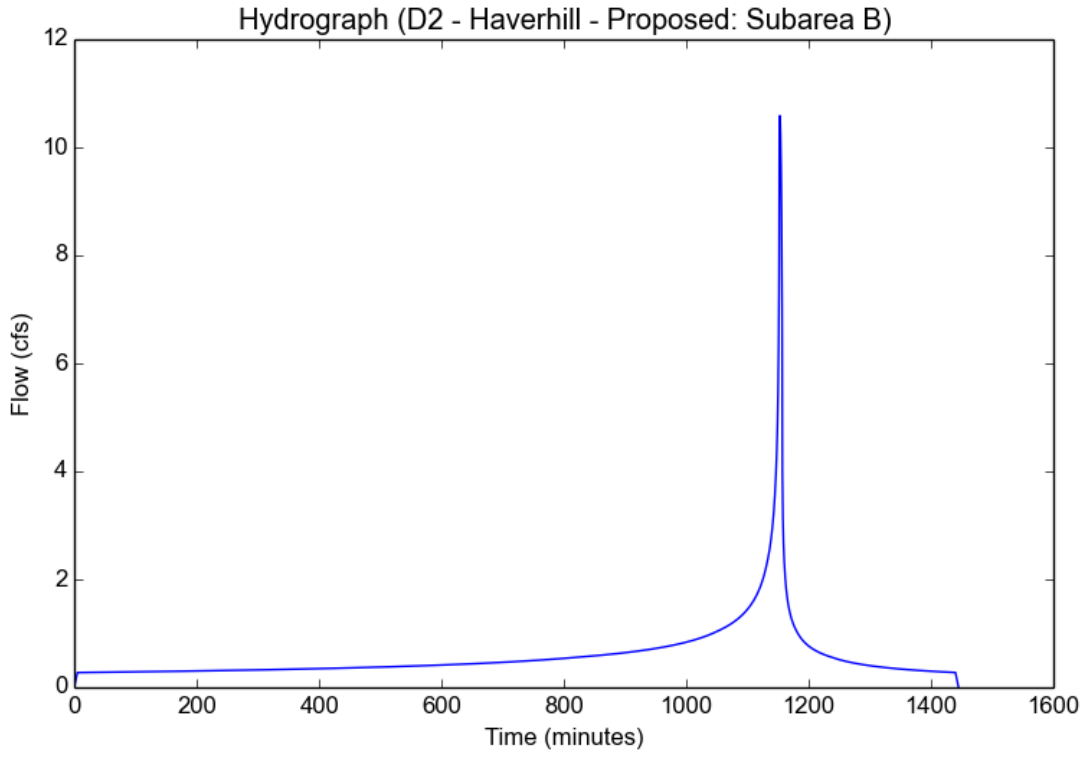
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/D2 - Haverhill - Proposed - Subarea B.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea B
Area (ac)	3.41
Flow Path Length (ft)	584.0
Flow Path Slope (vft/hft)	0.0799
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.652
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.8982
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	10.5889
Burned Peak Flow Rate (cfs)	10.9328
24-Hr Clear Runoff Volume (ac-ft)	1.1844
24-Hr Clear Runoff Volume (cu-ft)	51590.5262



Peak Flow Hydrologic Analysis

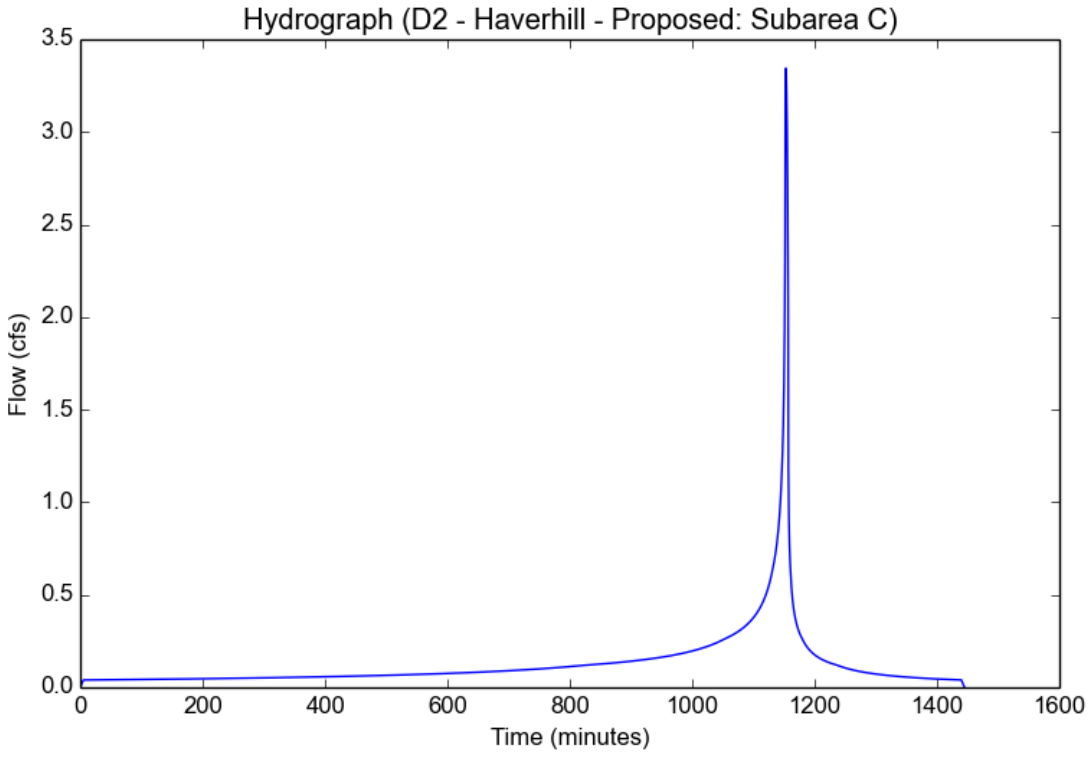
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/D2 - Haverhill - Proposed - Subarea C.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea C
Area (ac)	1.08
Flow Path Length (ft)	147.0
Flow Path Slope (vft/hft)	0.286
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.215
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.8959
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.345
Burned Peak Flow Rate (cfs)	3.4564
24-Hr Clear Runoff Volume (ac-ft)	0.2616
24-Hr Clear Runoff Volume (cu-ft)	11394.83



Peak Flow Hydrologic Analysis

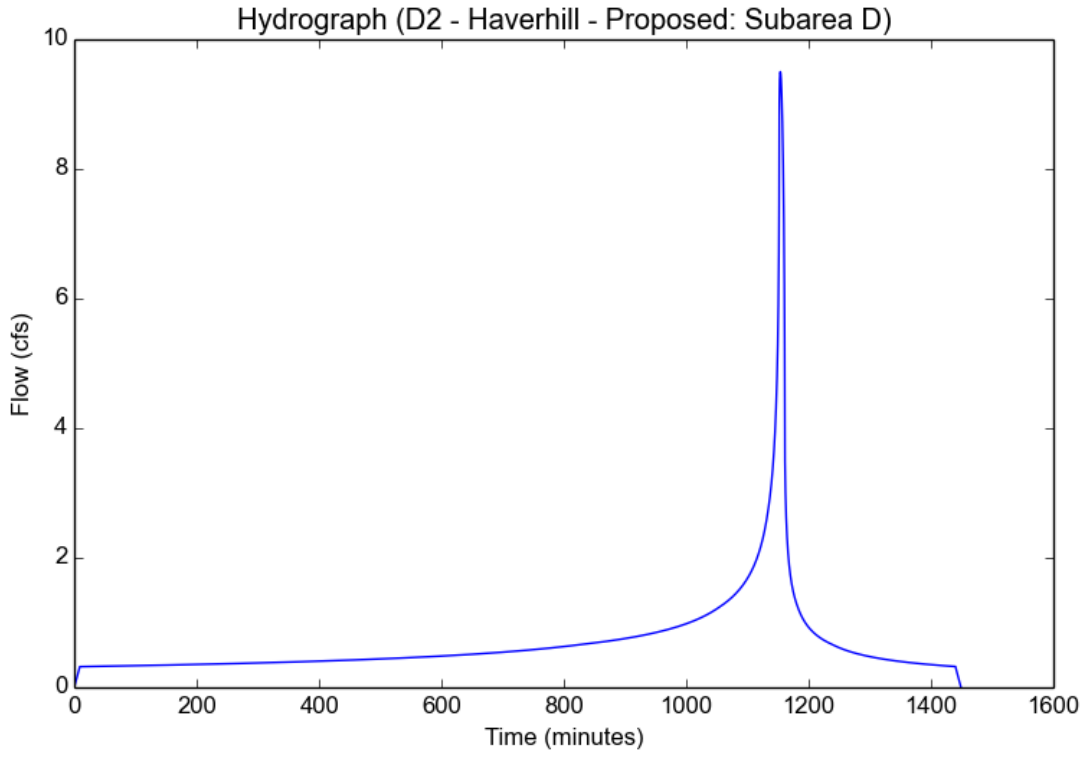
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/D2 - Haverhill - Proposed - Subarea D.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea D
Area (ac)	4.08
Flow Path Length (ft)	1322.0
Flow Path Slope (vft/hft)	0.0901
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.63
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	2.6228
Undeveloped Runoff Coefficient (Cu)	0.867
Developed Runoff Coefficient (Cd)	0.8878
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	9.5002
Burned Peak Flow Rate (cfs)	9.8296
24-Hr Clear Runoff Volume (ac-ft)	1.3952
24-Hr Clear Runoff Volume (cu-ft)	60775.382



Peak Flow Hydrologic Analysis

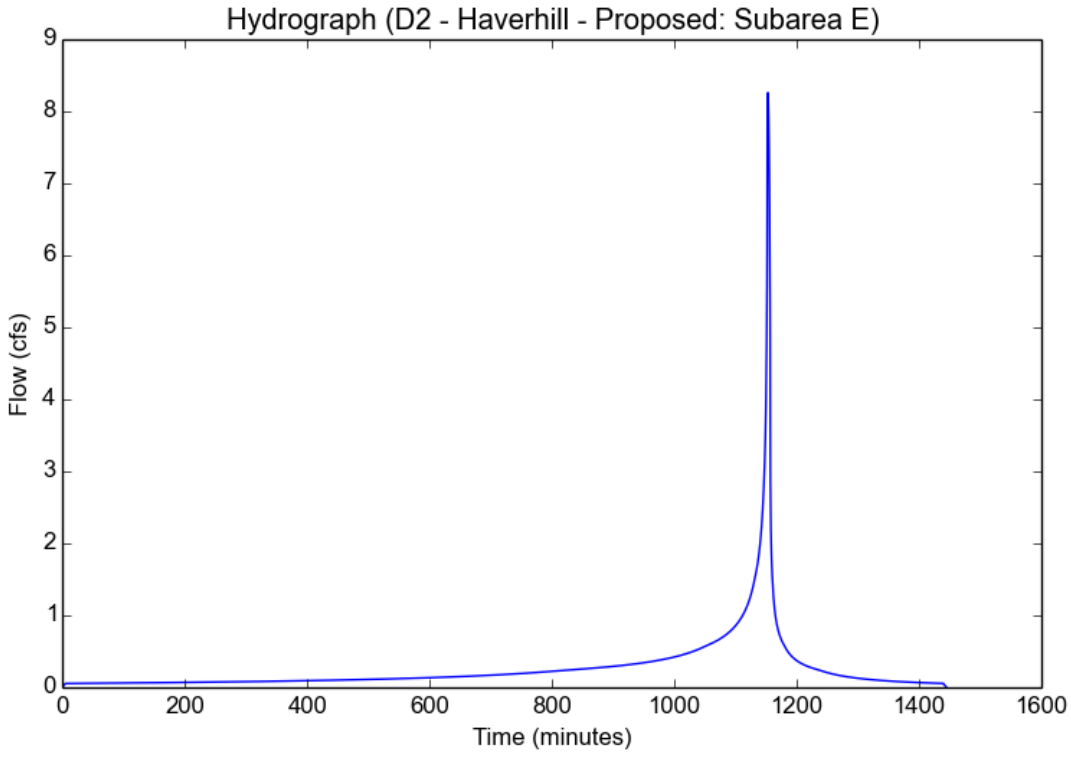
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/D2 - Haverhill - Proposed - Subarea E.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea E
Area (ac)	2.67
Flow Path Length (ft)	574.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.05
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.895
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	8.2616
Burned Peak Flow Rate (cfs)	8.5393
24-Hr Clear Runoff Volume (ac-ft)	0.5407
24-Hr Clear Runoff Volume (cu-ft)	23554.9409



Peak Flow Hydrologic Analysis

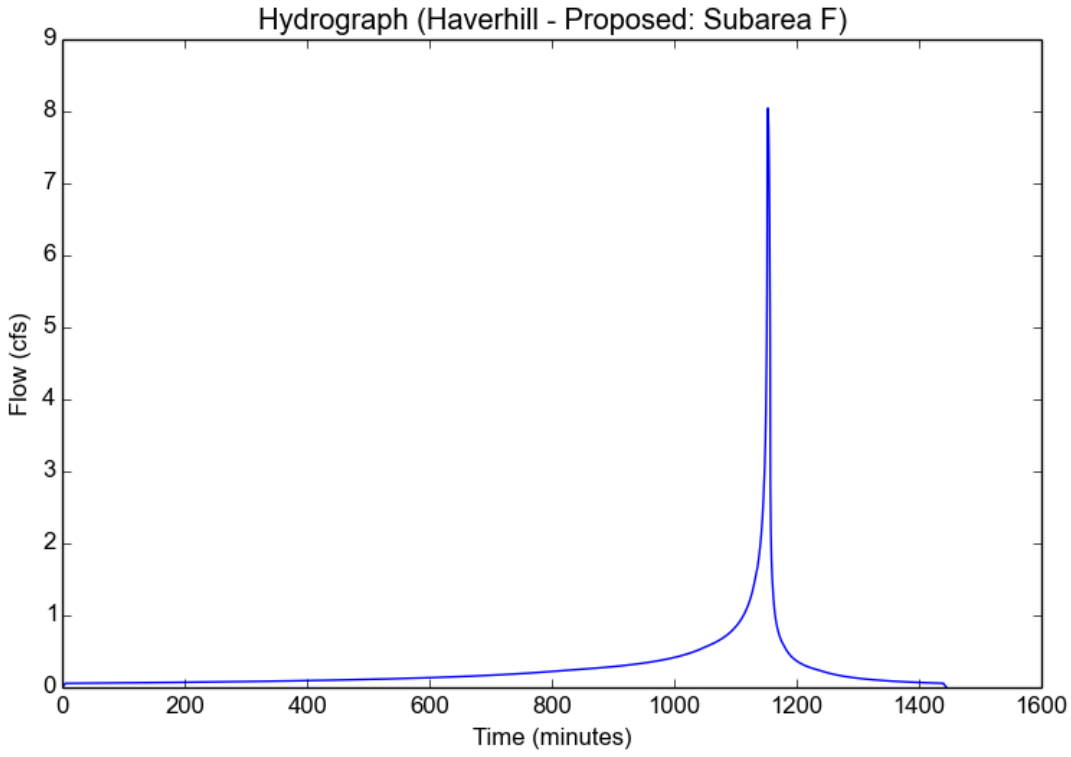
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/Haverhill - Proposed - Subarea F.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea F
Area (ac)	2.6
Flow Path Length (ft)	467.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0621
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.895
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	8.0456
Burned Peak Flow Rate (cfs)	8.3159
24-Hr Clear Runoff Volume (ac-ft)	0.5341
24-Hr Clear Runoff Volume (cu-ft)	23266.9999



Peak Flow Hydrologic Analysis

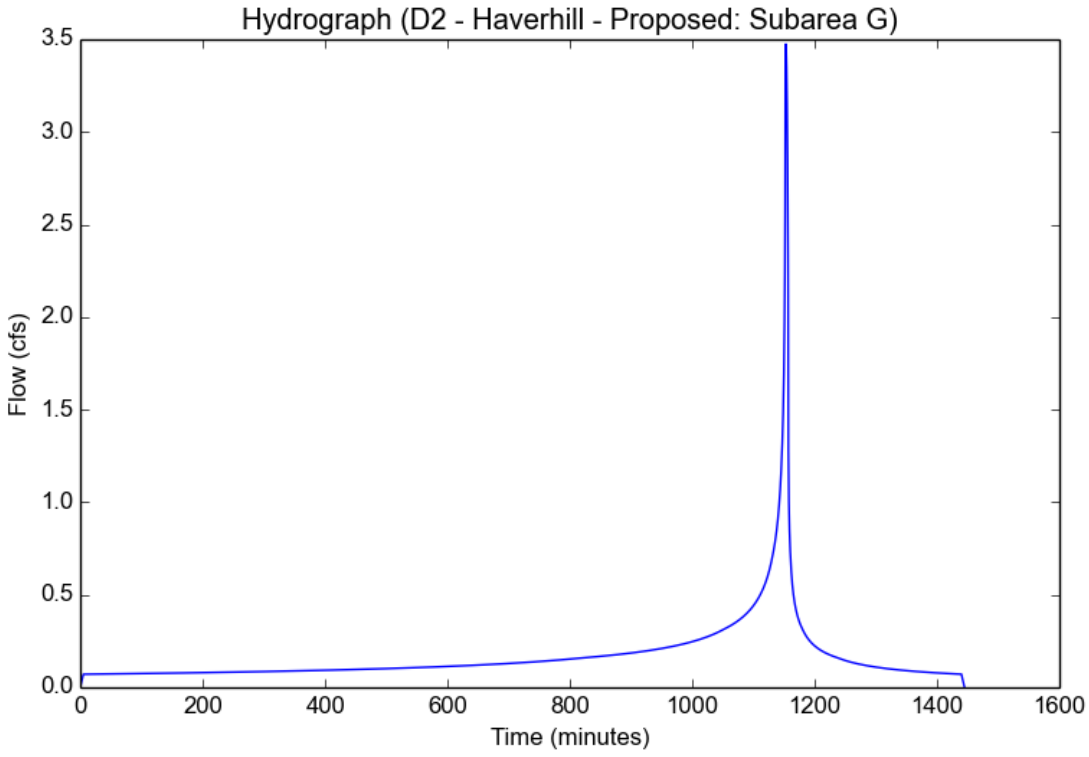
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/D2 - Haverhill - Proposed - Subarea G.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea G
Area (ac)	1.12
Flow Path Length (ft)	157.0
Flow Path Slope (vft/hft)	0.038
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.48
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.8973
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.4744
Burned Peak Flow Rate (cfs)	3.5883
24-Hr Clear Runoff Volume (ac-ft)	0.3427
24-Hr Clear Runoff Volume (cu-ft)	14926.4133



Peak Flow Hydrologic Analysis

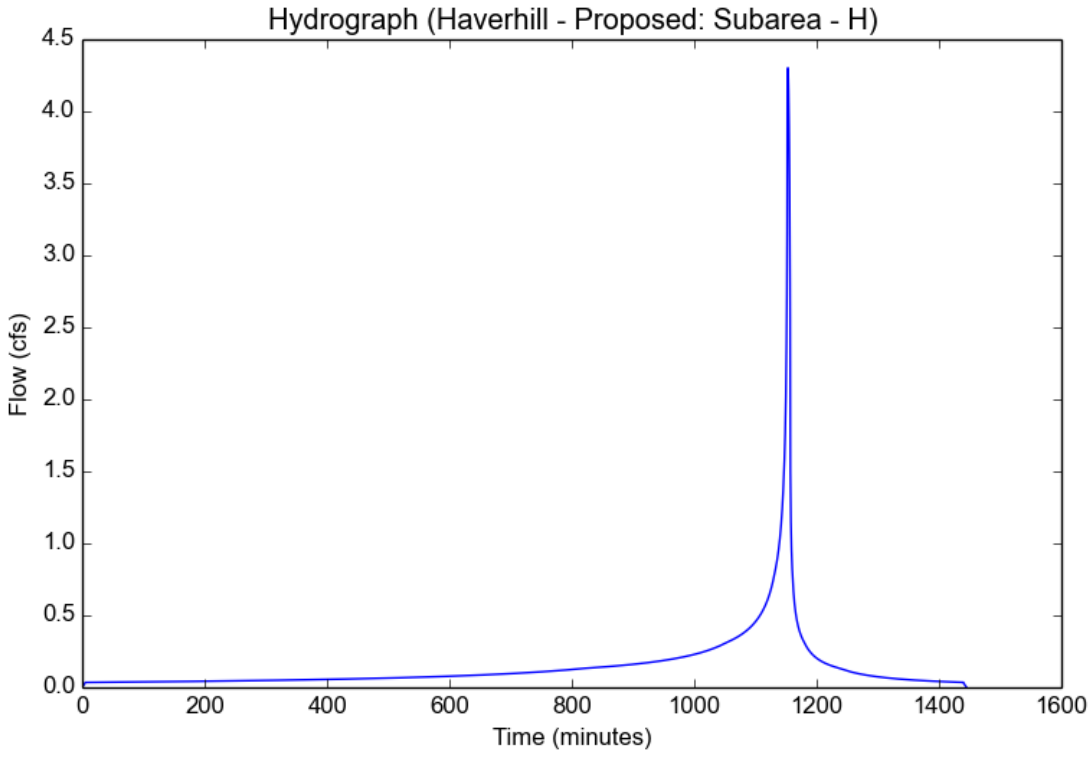
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/Haverhill - Proposed - Subarea - H.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea - H
Area (ac)	1.39
Flow Path Length (ft)	119.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0958
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.8952
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	4.3022
Burned Peak Flow Rate (cfs)	4.4464
24-Hr Clear Runoff Volume (ac-ft)	0.2968
24-Hr Clear Runoff Volume (cu-ft)	12929.6669



Peak Flow Hydrologic Analysis

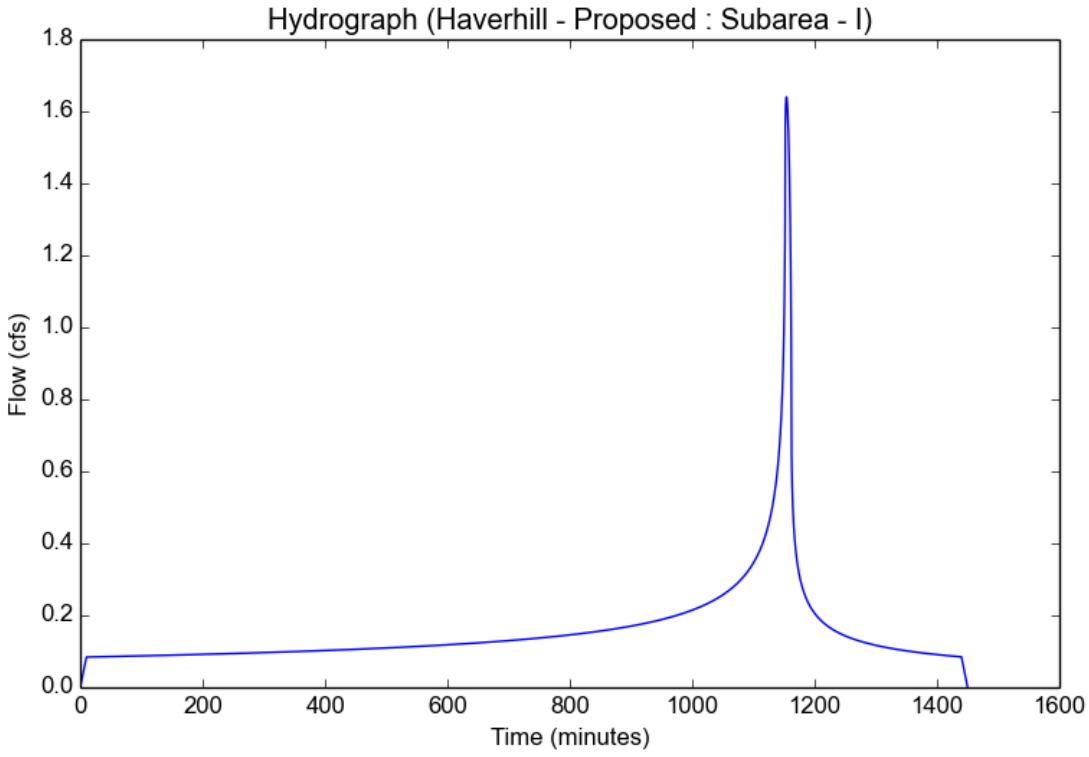
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/Haverhill - Proposed - Subarea - I.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea - I
Area (ac)	0.73
Flow Path Length (ft)	1464.0
Flow Path Slope (vft/hft)	0.061
50-yr Rainfall Depth (in)	6.6
Percent Impervious	1.0
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	2.4961
Undeveloped Runoff Coefficient (Cu)	0.8614
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	1.6399
Burned Peak Flow Rate (cfs)	1.6399
24-Hr Clear Runoff Volume (ac-ft)	0.3146
24-Hr Clear Runoff Volume (cu-ft)	13705.8782



Peak Flow Hydrologic Analysis

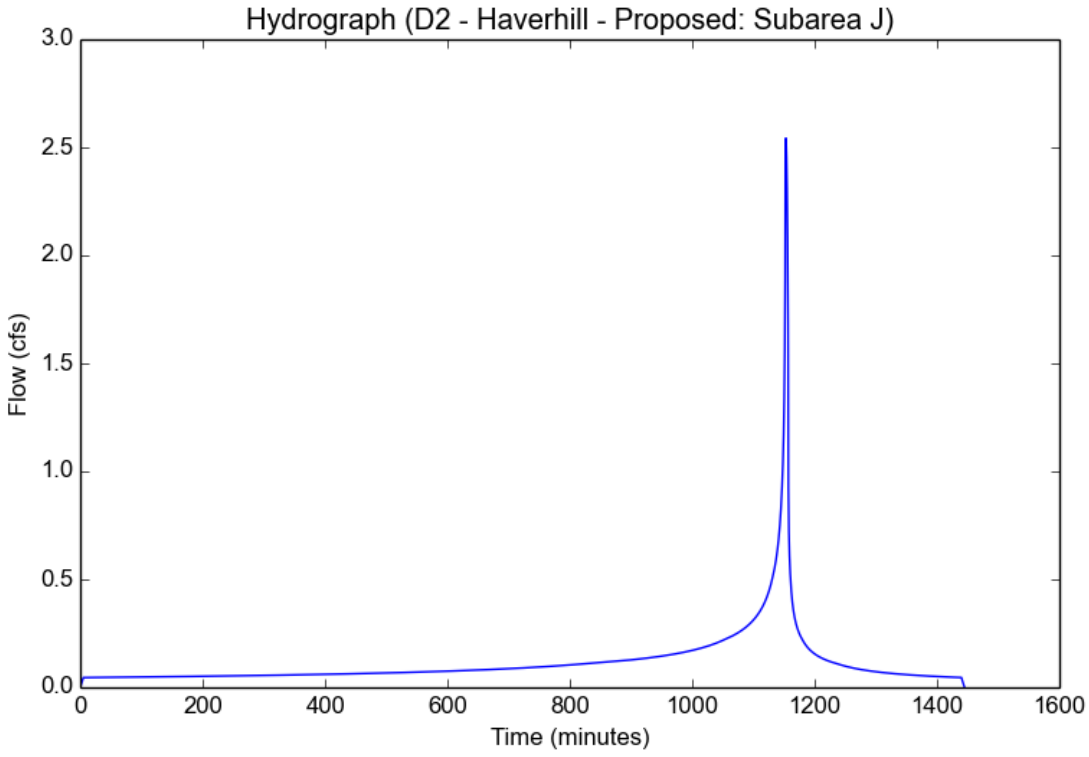
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/D2 - Haverhill - Proposed - Subarea J.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea J
Area (ac)	0.82
Flow Path Length (ft)	310.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.4
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.8968
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.5425
Burned Peak Flow Rate (cfs)	2.6263
24-Hr Clear Runoff Volume (ac-ft)	0.2351
24-Hr Clear Runoff Volume (cu-ft)	10240.9804



Peak Flow Hydrologic Analysis

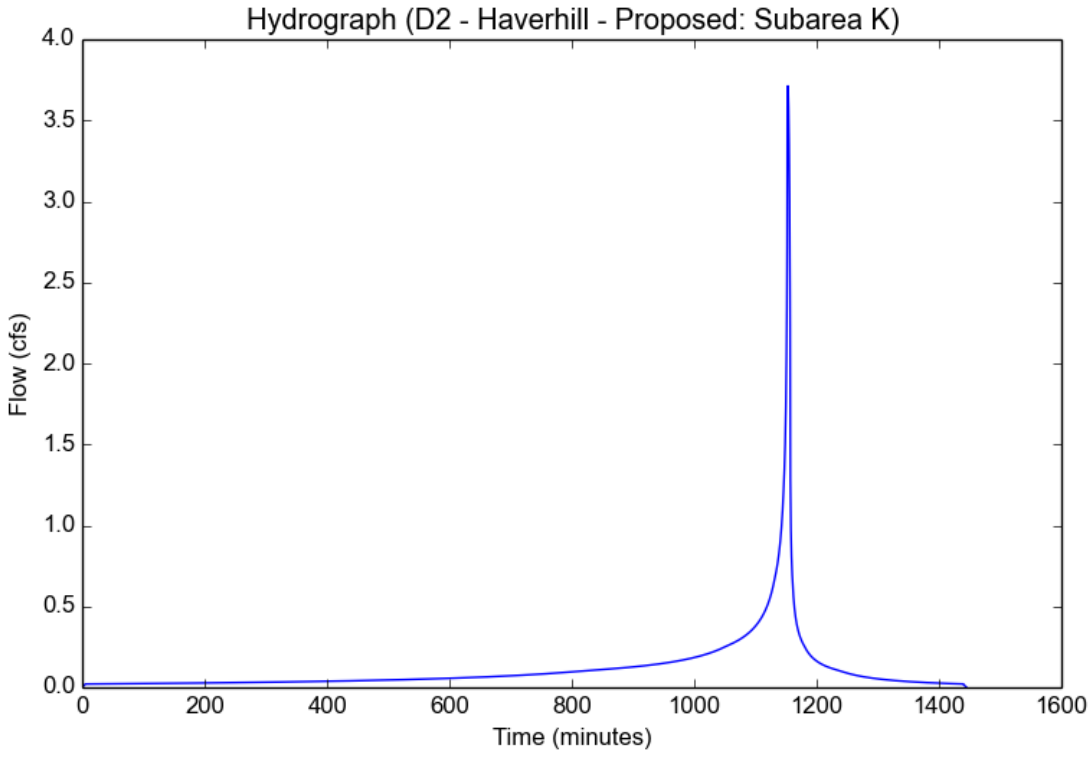
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/D2 - Haverhill - Proposed - Subarea K.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea K
Area (ac)	1.2
Flow Path Length (ft)	506.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.02
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	3.4573
Undeveloped Runoff Coefficient (Cu)	0.8947
Developed Runoff Coefficient (Cd)	0.8948
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.7124
Burned Peak Flow Rate (cfs)	3.8374
24-Hr Clear Runoff Volume (ac-ft)	0.2344
24-Hr Clear Runoff Volume (cu-ft)	10209.3209



Peak Flow Hydrologic Analysis

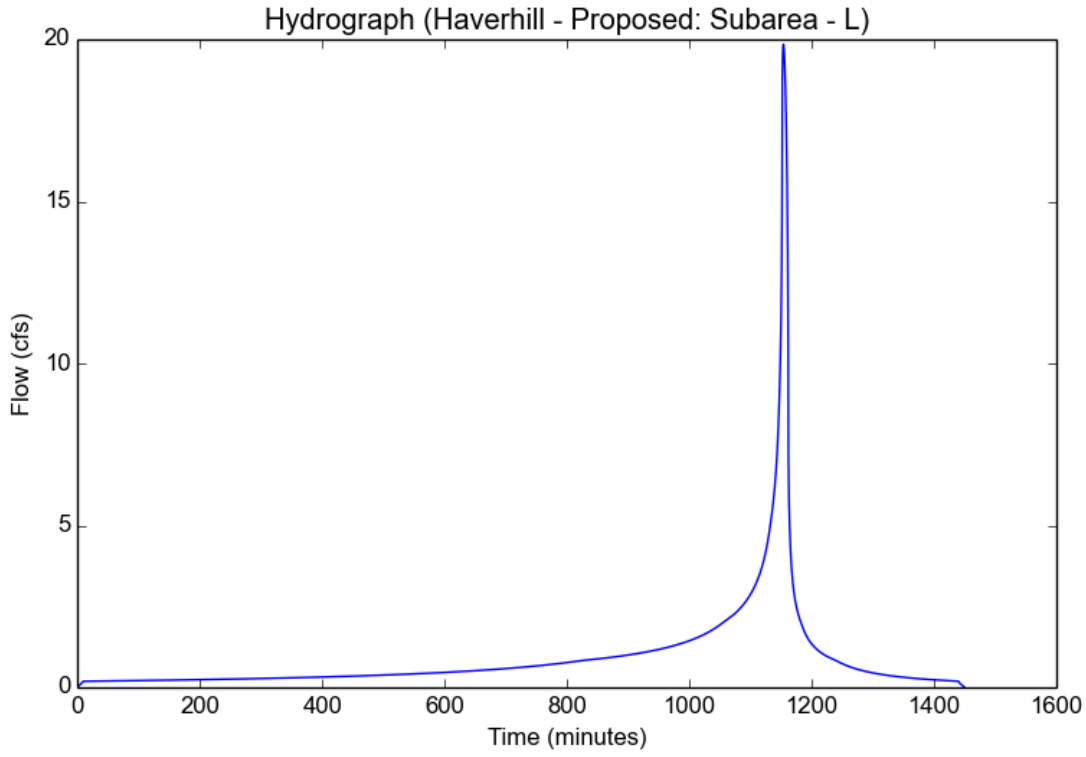
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/25-yr/Haverhill - Proposed - Subarea - L.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea - L
Area (ac)	9.21
Flow Path Length (ft)	1432.0
Flow Path Slope (vft/hft)	0.06
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.05
Soil Type	2
Design Storm Frequency	25-yr
Fire Factor	lar
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.7948
Peak Intensity (in/hr)	2.4961
Undeveloped Runoff Coefficient (Cu)	0.8614
Developed Runoff Coefficient (Cd)	0.8633
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	19.8467
Burned Peak Flow Rate (cfs)	20.7018
24-Hr Clear Runoff Volume (ac-ft)	1.8635
24-Hr Clear Runoff Volume (cu-ft)	81172.5266



Peak Flow Hydrologic Analysis

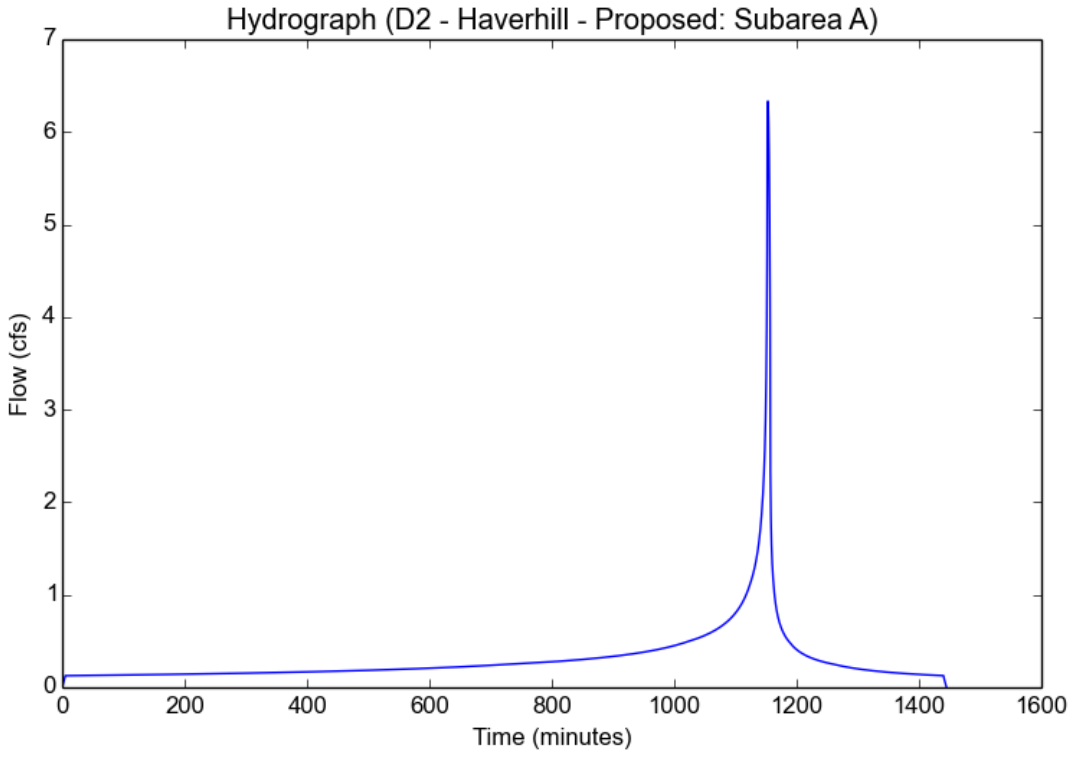
File location: Q:/L.A. City/D2 - Haverhill/PCC/Hydrology/Proposed/HydroCalc/D2 - Haverhill - Proposed - Subarea A.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea A
Area (ac)	1.78
Flow Path Length (ft)	242.0
Flow Path Slope (vft/hft)	0.5
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.438
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.9035
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	6.3331
Burned Peak Flow Rate (cfs)	6.5306
24-Hr Clear Runoff Volume (ac-ft)	0.6221
24-Hr Clear Runoff Volume (cu-ft)	27097.313



Peak Flow Hydrologic Analysis

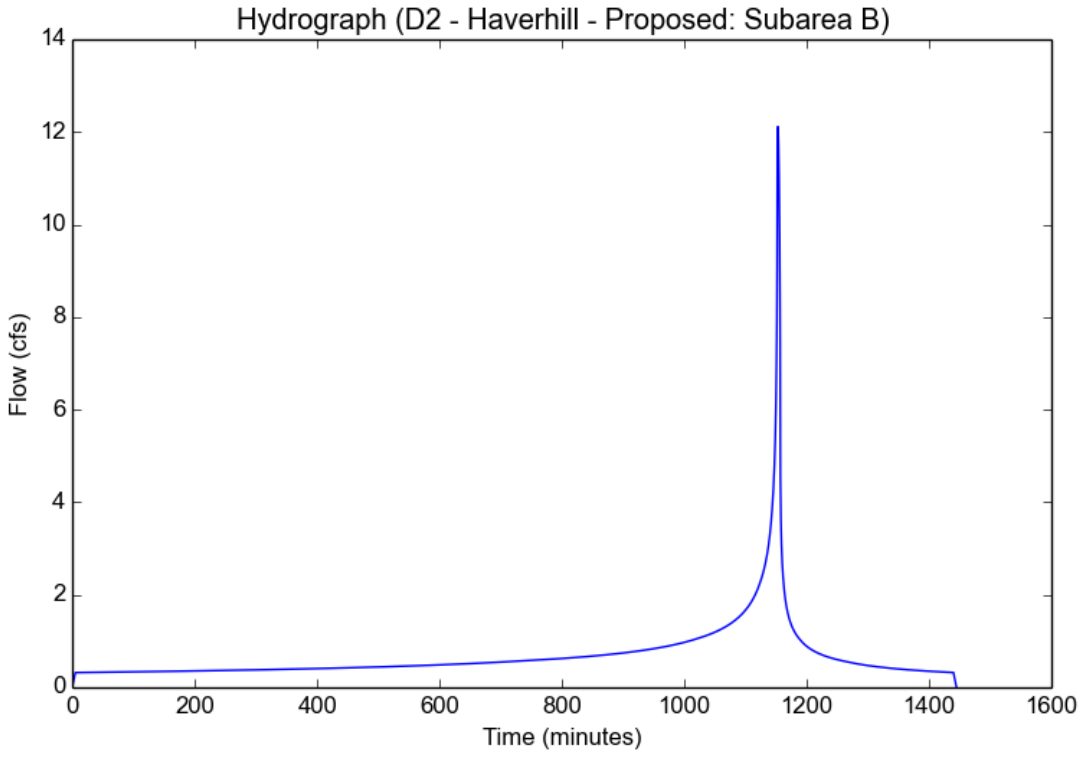
File location: Q:/L.A. City/D2 - Haverhill/PCC/Hydrology/Proposed/HydroCalc/D2 - Haverhill - Proposed - Subarea B.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea B
Area (ac)	3.41
Flow Path Length (ft)	584.0
Flow Path Slope (vft/hft)	0.0799
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.652
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.9022
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	12.1144
Burned Peak Flow Rate (cfs)	12.498
24-Hr Clear Runoff Volume (ac-ft)	1.3754
24-Hr Clear Runoff Volume (cu-ft)	59910.7533



Peak Flow Hydrologic Analysis

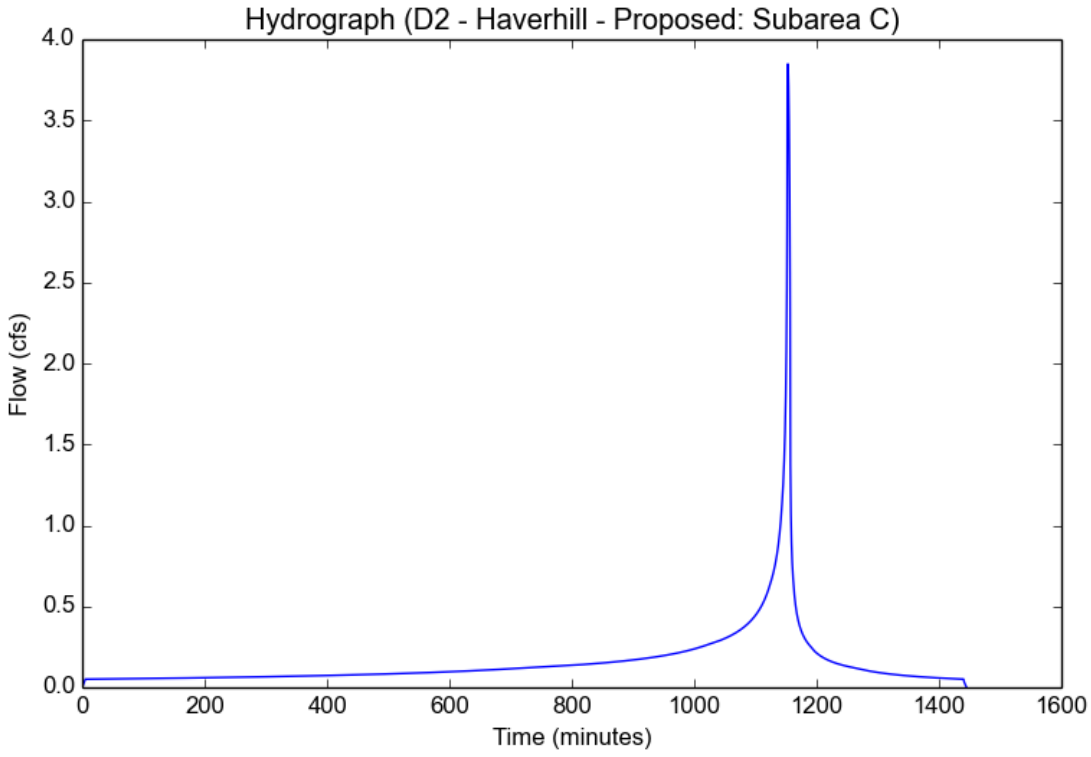
File location: Q:/L.A. City/D2 - Haverhill/PCC/Hydrology/Proposed/HydroCalc/D2 - Haverhill - Proposed - Subarea C.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea C
Area (ac)	1.08
Flow Path Length (ft)	147.0
Flow Path Slope (vft/hft)	0.286
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.215
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.905
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.8486
Burned Peak Flow Rate (cfs)	3.9666
24-Hr Clear Runoff Volume (ac-ft)	0.3168
24-Hr Clear Runoff Volume (cu-ft)	13800.9126



Peak Flow Hydrologic Analysis

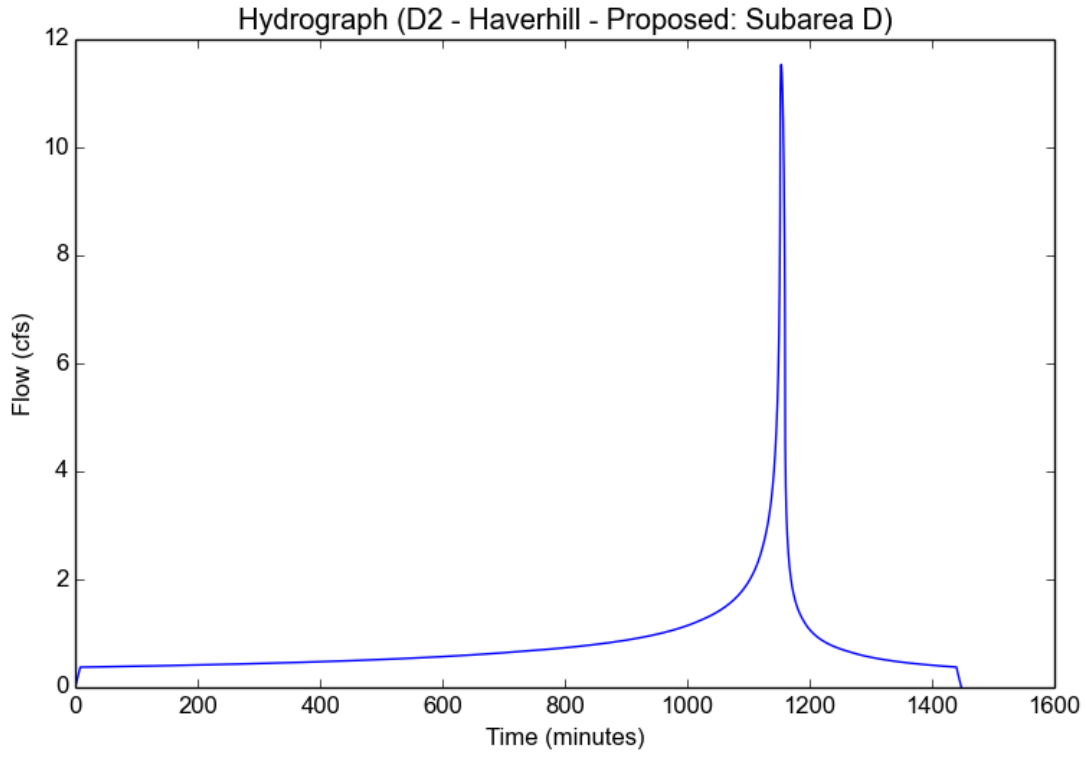
File location: Q:/L.A. City/D2 - Haverhill/PCC/Hydrology/Proposed/HydroCalc/D2 - Haverhill - Proposed - Subarea D.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea D
Area (ac)	4.08
Flow Path Length (ft)	1322.0
Flow Path Slope (vft/hft)	0.0901
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.63
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.1573
Undeveloped Runoff Coefficient (Cu)	0.8875
Developed Runoff Coefficient (Cd)	0.8954
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	11.5337
Burned Peak Flow Rate (cfs)	11.9145
24-Hr Clear Runoff Volume (ac-ft)	1.6228
24-Hr Clear Runoff Volume (cu-ft)	70691.0925



Peak Flow Hydrologic Analysis

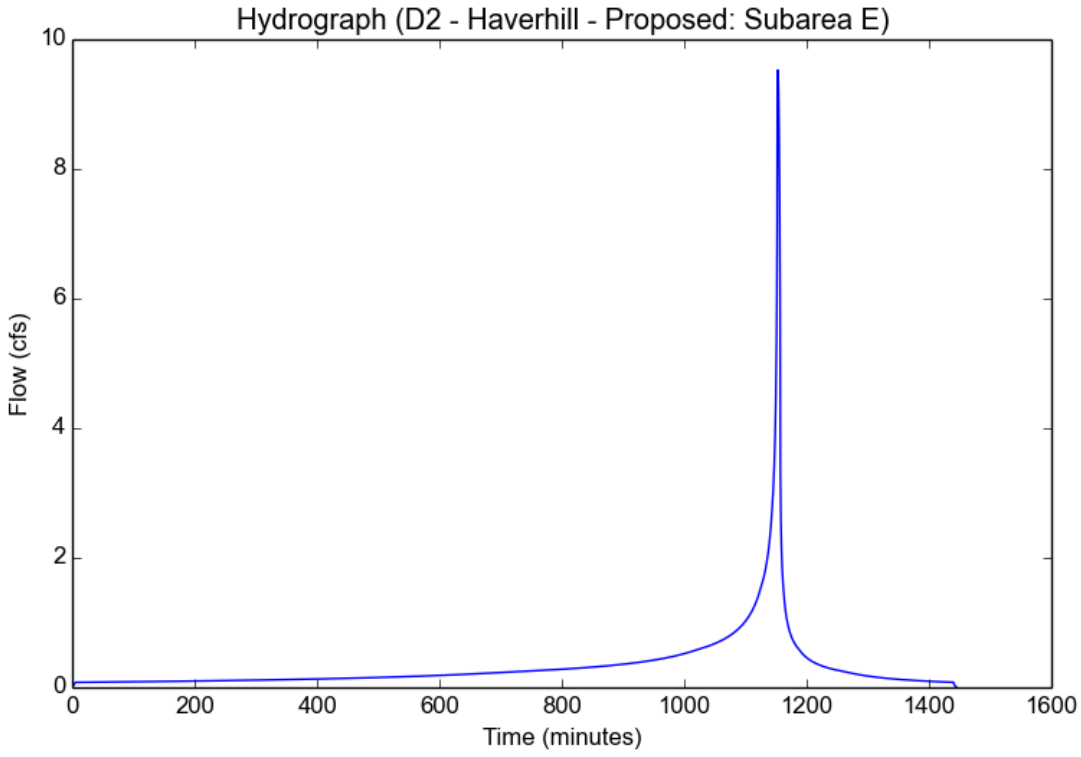
File location: Q:/L.A. City/D2 - Haverhill/PCC/Hydrology/Proposed/HydroCalc/D2 - Haverhill - Proposed - Subarea E.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea E
Area (ac)	2.67
Flow Path Length (ft)	574.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.05
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.906
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	9.5255
Burned Peak Flow Rate (cfs)	9.8141
24-Hr Clear Runoff Volume (ac-ft)	0.6724
24-Hr Clear Runoff Volume (cu-ft)	29289.4937



Peak Flow Hydrologic Analysis

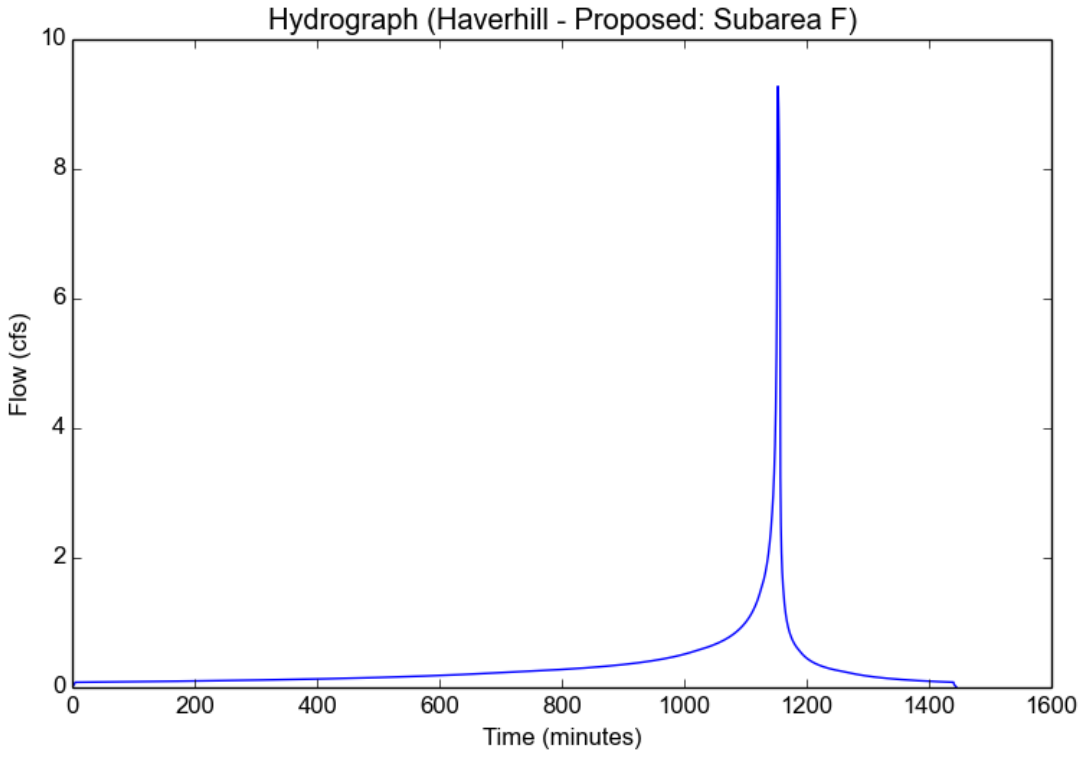
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/50-yr/Haverhill - Proposed - Subarea F.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea F
Area (ac)	2.6
Flow Path Length (ft)	467.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0621
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.9059
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	9.275
Burned Peak Flow Rate (cfs)	9.5562
24-Hr Clear Runoff Volume (ac-ft)	0.6627
24-Hr Clear Runoff Volume (cu-ft)	28866.4775



Peak Flow Hydrologic Analysis

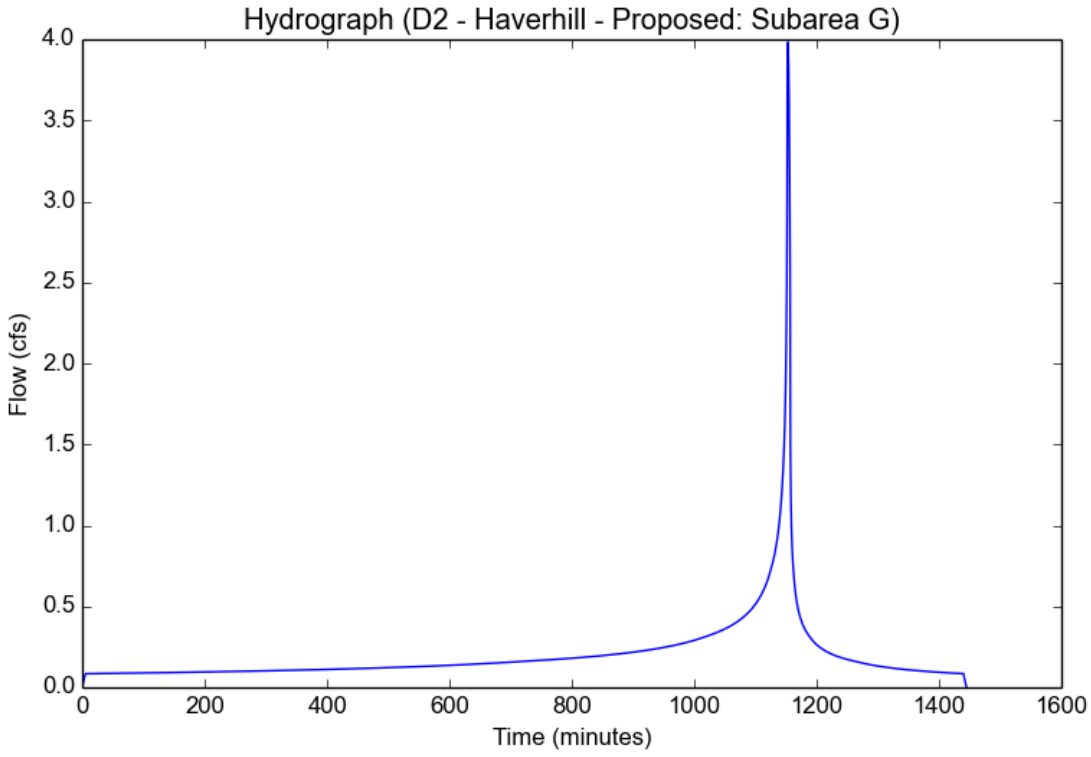
File location: Q:/L.A. City/D2 - Haverhill/PCC/Hydrology/Proposed/HydroCalc/D2 - Haverhill - Proposed - Subarea G.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea G
Area (ac)	1.12
Flow Path Length (ft)	157.0
Flow Path Slope (vft/hft)	0.038
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.48
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.9033
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.9837
Burned Peak Flow Rate (cfs)	4.1083
24-Hr Clear Runoff Volume (ac-ft)	0.4033
24-Hr Clear Runoff Volume (cu-ft)	17565.66



Peak Flow Hydrologic Analysis

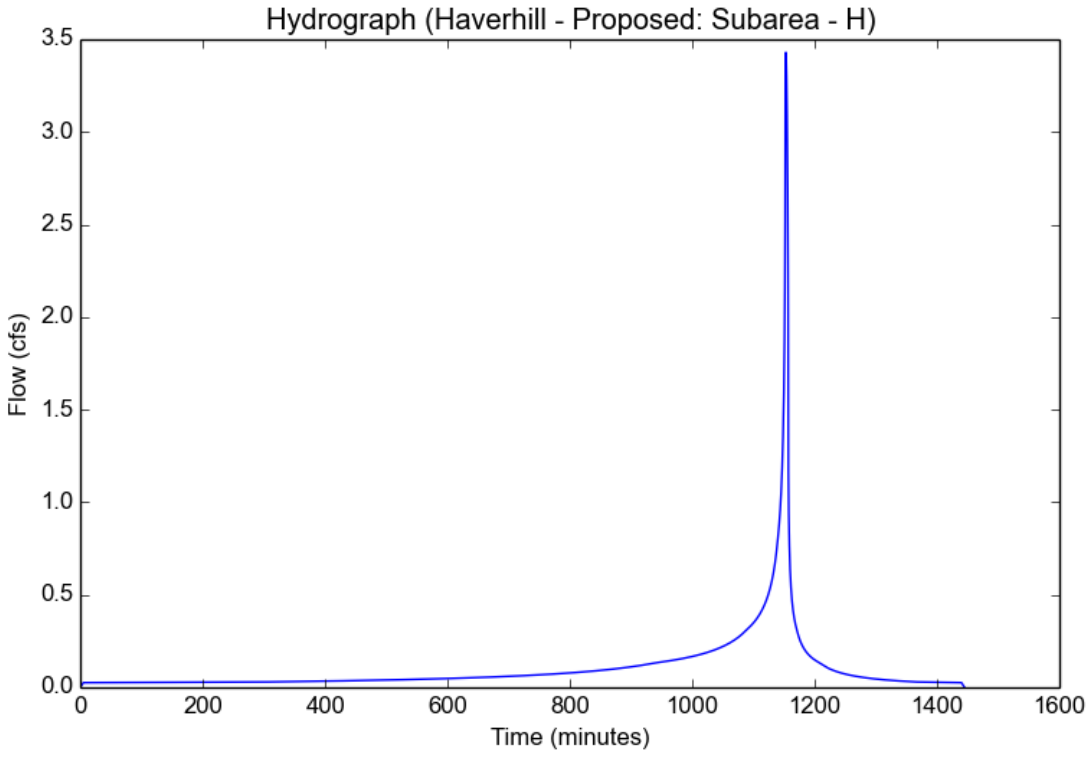
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/50-yr/Haverhill - Proposed - Subarea - H.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea - H
Area (ac)	1.39
Flow Path Length (ft)	119.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.0958
Soil Type	2
Design Storm Frequency	10-yr
Fire Factor	lar
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	4.7124
Peak Intensity (in/hr)	2.8115
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8777
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	3.4301
Burned Peak Flow Rate (cfs)	3.5627
24-Hr Clear Runoff Volume (ac-ft)	0.2113
24-Hr Clear Runoff Volume (cu-ft)	9202.4735



Peak Flow Hydrologic Analysis

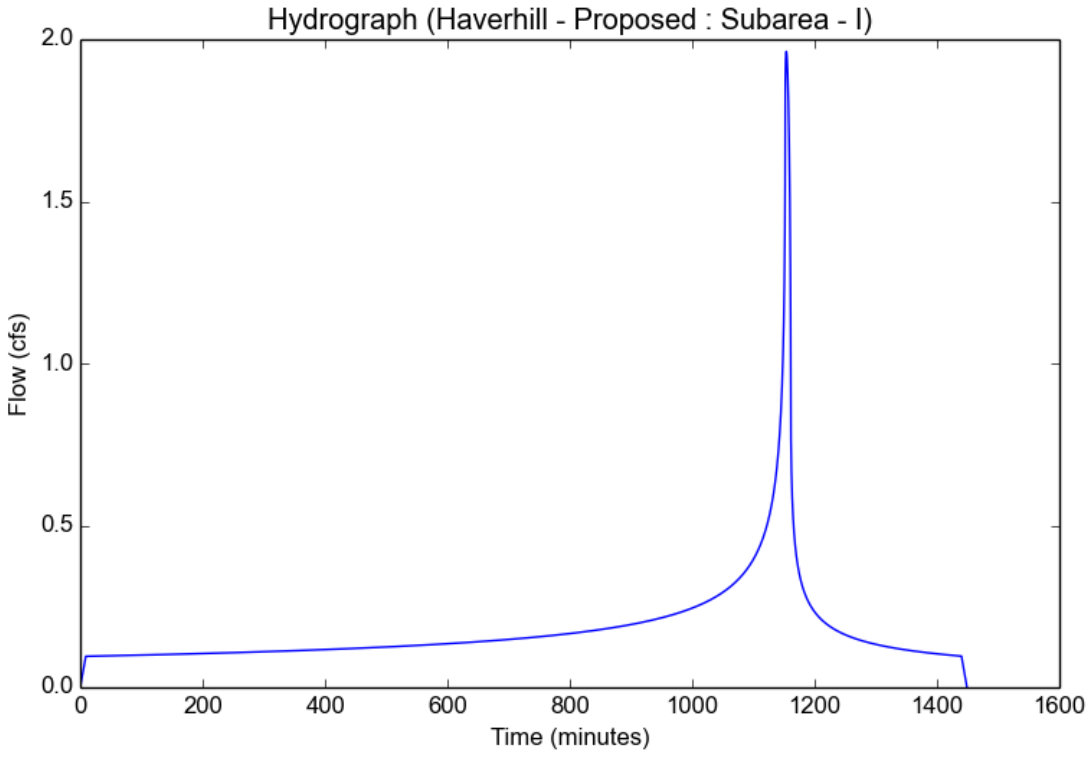
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/50-yr/Haverhill - Proposed - Subarea - I.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea - I
Area (ac)	0.73
Flow Path Length (ft)	1464.0
Flow Path Slope (vft/hft)	0.061
50-yr Rainfall Depth (in)	6.6
Percent Impervious	1.0
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	2.9872
Undeveloped Runoff Coefficient (Cu)	0.8831
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	1.9626
Burned Peak Flow Rate (cfs)	1.9626
24-Hr Clear Runoff Volume (ac-ft)	0.3584
24-Hr Clear Runoff Volume (cu-ft)	15610.3359



Peak Flow Hydrologic Analysis

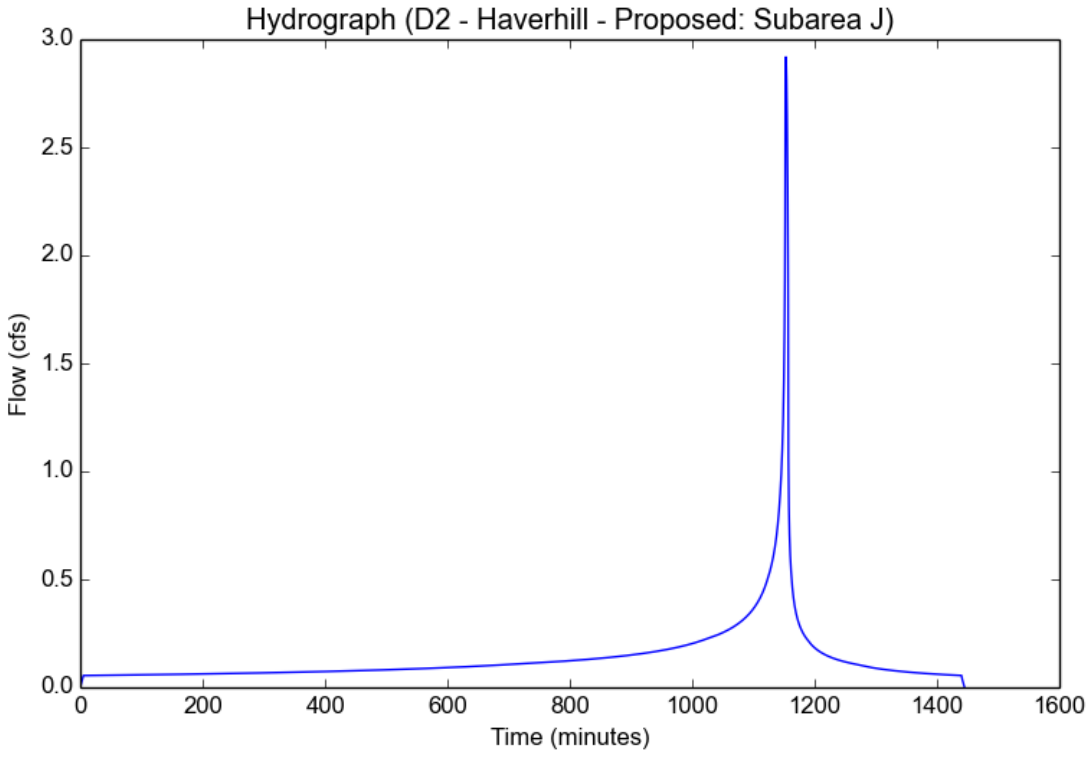
File location: Q:/L.A. City/D2 - Haverhill/PCC/Hydrology/Proposed/HydroCalc/D2 - Haverhill - Proposed - Subarea J.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea J
Area (ac)	0.82
Flow Path Length (ft)	310.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.4
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.9038
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.9183
Burned Peak Flow Rate (cfs)	3.009
24-Hr Clear Runoff Volume (ac-ft)	0.2787
24-Hr Clear Runoff Volume (cu-ft)	12141.4474



Peak Flow Hydrologic Analysis

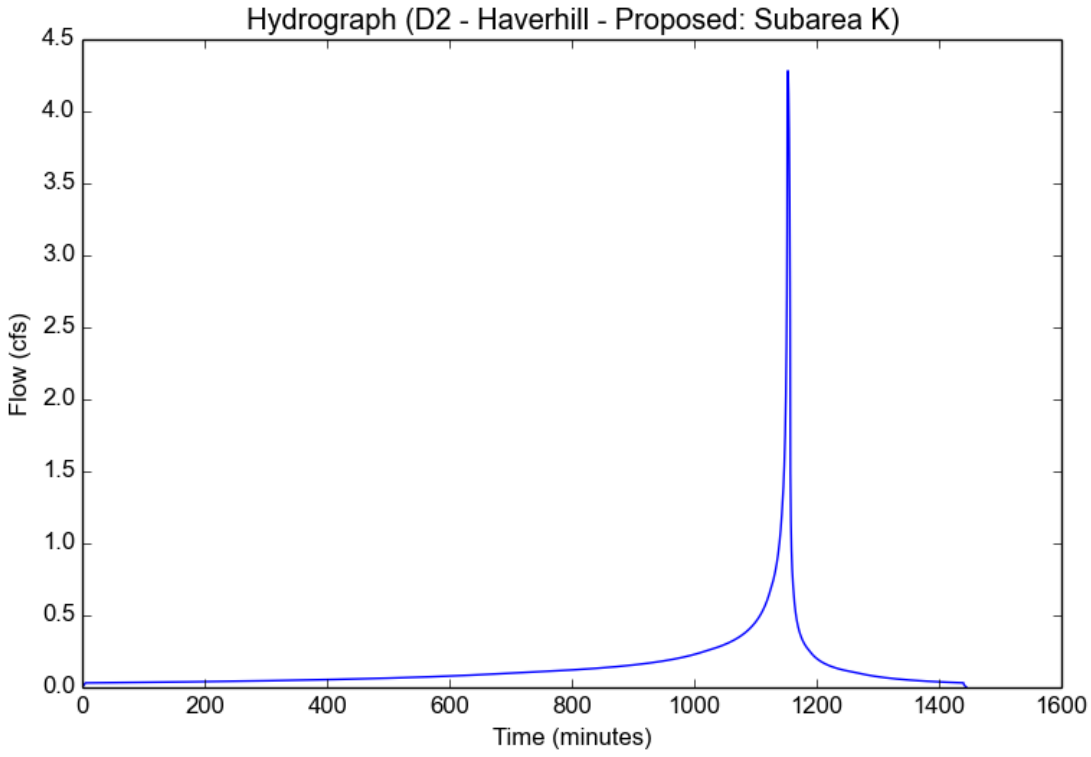
File location: Q:/L.A. City/D2 - Haverhill/PCC/Hydrology/Proposed/HydroCalc/D2 - Haverhill - Proposed - Subarea K.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	D2 - Haverhill - Proposed
Subarea ID	Subarea K
Area (ac)	1.2
Flow Path Length (ft)	506.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.02
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	3.9377
Undeveloped Runoff Coefficient (Cu)	0.9063
Developed Runoff Coefficient (Cd)	0.9062
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	4.282
Burned Peak Flow Rate (cfs)	4.4115
24-Hr Clear Runoff Volume (ac-ft)	0.2931
24-Hr Clear Runoff Volume (cu-ft)	12769.1756



Peak Flow Hydrologic Analysis

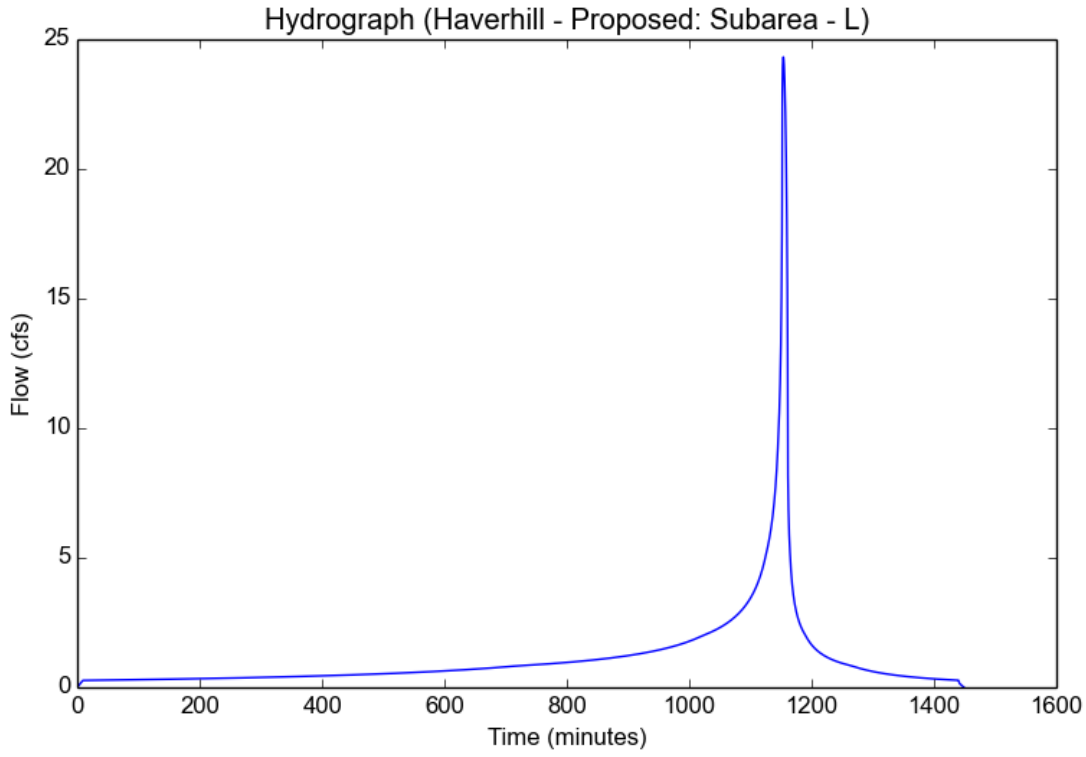
File location: Q:/L.A. City/D2 - Haverhill/UCI/Hydrology/Proposed/HydroCalc/50-yr/Haverhill - Proposed - Subarea - L.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Haverhill - Proposed
Subarea ID	Subarea - L
Area (ac)	9.21
Flow Path Length (ft)	1432.0
Flow Path Slope (vft/hft)	0.06
50-yr Rainfall Depth (in)	6.6
Percent Impervious	0.05
Soil Type	2
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.6
Peak Intensity (in/hr)	2.9872
Undeveloped Runoff Coefficient (Cu)	0.8831
Developed Runoff Coefficient (Cd)	0.8839
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	24.3196
Burned Peak Flow Rate (cfs)	25.2139
24-Hr Clear Runoff Volume (ac-ft)	2.318
24-Hr Clear Runoff Volume (cu-ft)	100974.2016



ATTACHMENT B

HYDRAULIC CALCULATIONS
PER BENTLEY'S FLOWMASTER

Proposed 24" RCP (North)
Worksheet for Circular Channel

Project Description	
Project File	e:\drawings\l.a. city\d2 - haverhill\uci\hydrology\proposed\flowmaster\sd later.fm2
Worksheet	Proposed 24" (North)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.400000	ft/ft
Depth	12.0	in
Diameter	24.00	in

Results		
Discharge	71.53	cfs
Flow Area	1.57	ft²
Wetted Perimeter	3.14	ft
Top Width	2.00	ft
Critical Depth	2.00	ft
Percent Full	50.00	
Critical Slope	0.095945	ft/ft
Velocity	45.54	ft/s
Velocity Head	32.23	ft
Specific Energy	33.23	ft
Froude Number	9.06	
Maximum Discharge	153.90	cfs
Full Flow Capacity	143.07	cfs
Full Flow Slope	0.100000	ft/ft
Flow is supercritical.		

Proposed 24" RCP South
Worksheet for Circular Channel

Project Description	
Project File	e:\drawings\l.a. city\d2 - haverhill\uci\hydrology\proposed\flowmaster\sd later.fm2
Worksheet	Proposed 24" (South)
Flow Element	Circular Channel
Method	Manning's Formula
Solve For	Discharge

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.200000	ft/ft
Depth	12.0	in
Diameter	24.00	in

Results		
Discharge	50.58	cfs
Flow Area	1.57	ft²
Wetted Perimeter	3.14	ft
Top Width	2.00	ft
Critical Depth	1.98	ft
Percent Full	50.00	
Critical Slope	0.046141	ft/ft
Velocity	32.20	ft/s
Velocity Head	16.11	ft
Specific Energy	17.11	ft
Froude Number	6.41	
Maximum Discharge	108.82	cfs
Full Flow Capacity	101.16	cfs
Full Flow Slope	0.050000	ft/ft
Flow is supercritical.		

Existing Concrete Channel
Worksheet for Rectangular Channel

Project Description	
Project File	e:\drawings\l.a. city\d2 - haverhill\uci\hydrology\proposed\flowmaster\sd later.fm2
Worksheet	Existing Concrete Channel
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.135000	ft/ft
Bottom Width	2.00	ft
Discharge	12.11	cfs

Results		
Depth	0.35	ft
Flow Area	0.71	ft²
Wetted Perimeter	2.71	ft
Top Width	2.00	ft
Critical Depth	1.04	ft
Critical Slope	0.006298	ft/ft
Velocity	17.15	ft/s
Velocity Head	4.57	ft
Specific Energy	4.92	ft
Froude Number	5.09	
Flow is supercritical.		

Proposed Concrete Channel
Worksheet for Rectangular Channel

Project Description	
Project File	e:\drawings\l.a. city\d2 - haverhill\uci\hydrology\proposed\flowmaster\sd later.fm2
Worksheet	Proposed Concrete Channel
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Channel Slope	0.250000	ft/ft
Bottom Width	2.50	ft
Discharge	22.71	cfs

Results		
Depth	0.37	ft
Flow Area	0.92	ft²
Wetted Perimeter	3.24	ft
Top Width	2.50	ft
Critical Depth	1.37	ft
Critical Slope	0.005946	ft/ft
Velocity	24.70	ft/s
Velocity Head	9.48	ft
Specific Energy	9.85	ft
Froude Number	7.18	
Flow is supercritical.		

Worksheet for Street Capacity for Sundown Drive (GI-1)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.15000	ft/ft
Discharge	4.19	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.23	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.44	ft²
Wetted Perimeter	4.54	ft
Hydraulic Radius	0.10	ft

Worksheet for Street Capacity for Sundown Drive (GI-1)

Results

Top Width		4.31	ft
Normal Depth		0.23	ft
Critical Depth		0.41	ft
Critical Slope		0.00481	ft/ft
Velocity		9.42	ft/s
Velocity Head		1.38	ft
Specific Energy		1.61	ft
Froude Number		5.17	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.23	ft
Critical Depth	0.41	ft
Channel Slope	0.15000	ft/ft
Critical Slope	0.00481	ft/ft

Worksheet for Street Capacity for Haverhill Drive (GI-2)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.11550	ft/ft
Discharge	3.27	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.22	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.40	ft²
Wetted Perimeter	4.26	ft
Hydraulic Radius	0.09	ft

Worksheet for Street Capacity for Haverhill Drive (GI-2)

Results

Top Width		4.03	ft
Normal Depth		0.22	ft
Critical Depth		0.39	ft
Critical Slope		0.00505	ft/ft
Velocity		8.08	ft/s
Velocity Head		1.02	ft
Specific Energy		1.24	ft
Froude Number		4.50	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.22	ft
Critical Depth	0.39	ft
Channel Slope	0.11550	ft/ft
Critical Slope	0.00505	ft/ft

Worksheet for Street Capacity for Haverhill Drive (GI-3)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.11550	ft/ft
Discharge	0.25	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.08	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.06	ft²
Wetted Perimeter	1.40	ft
Hydraulic Radius	0.04	ft

Worksheet for Street Capacity for Haverhill Drive (GI-3)

Results

Top Width		1.31	ft
Normal Depth		0.08	ft
Critical Depth		0.15	ft
Critical Slope		0.00648	ft/ft
Velocity		4.50	ft/s
Velocity Head		0.31	ft
Specific Energy		0.40	ft
Froude Number		3.85	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.08	ft
Critical Depth	0.15	ft
Channel Slope	0.11550	ft/ft
Critical Slope	0.00648	ft/ft

Worksheet for Street Capacity for Sundown Drive (GI-4)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.15000	ft/ft
Discharge	0.10	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.06	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.03	ft²
Wetted Perimeter	0.94	ft
Hydraulic Radius	0.03	ft

Worksheet for Street Capacity for Sundown Drive (GI-4)

Results

Top Width		0.88	ft
Normal Depth		0.06	ft
Critical Depth		0.10	ft
Critical Slope		0.00726	ft/ft
Velocity		3.97	ft/s
Velocity Head		0.25	ft
Specific Energy		0.30	ft
Froude Number		4.14	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.06	ft
Critical Depth	0.10	ft
Channel Slope	0.15000	ft/ft
Critical Slope	0.00726	ft/ft

Worksheet for Street Capacity for Brilliant Drive (GI-5)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.20000	ft/ft
Discharge	3.05	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.20	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.31	ft²
Wetted Perimeter	3.66	ft
Hydraulic Radius	0.08	ft

Worksheet for Street Capacity for Brilliant Drive (GI-5)

Results

Top Width		3.46	ft
Normal Depth		0.20	ft
Critical Depth		0.38	ft
Critical Slope		0.00512	ft/ft
Velocity		9.87	ft/s
Velocity Head		1.51	ft
Specific Energy		1.71	ft
Froude Number		5.82	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.20	ft
Critical Depth	0.38	ft
Channel Slope	0.20000	ft/ft
Critical Slope	0.00512	ft/ft

Worksheet for Street Capacity for Haverhill Way (GI-6)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.20000	ft/ft
Discharge	1.41	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.15	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.17	ft²
Wetted Perimeter	2.54	ft
Hydraulic Radius	0.07	ft

Worksheet for Street Capacity for Haverhill Way (GI-6)

Results

Top Width		2.39	ft
Normal Depth		0.15	ft
Critical Depth		0.28	ft
Critical Slope		0.00529	ft/ft
Velocity		8.39	ft/s
Velocity Head		1.09	ft
Specific Energy		1.24	ft
Froude Number		5.58	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.28	ft
Channel Slope	0.20000	ft/ft
Critical Slope	0.00529	ft/ft

Worksheet for Street Capacity for Haverhill Way (GI-7)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.11750	ft/ft
Discharge	0.61	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.12	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.11	ft²
Wetted Perimeter	1.94	ft
Hydraulic Radius	0.06	ft

Worksheet for Street Capacity for Haverhill Way (GI-7)

Results

Top Width		1.82	ft
Normal Depth		0.12	ft
Critical Depth		0.21	ft
Critical Slope		0.00583	ft/ft
Velocity		5.67	ft/s
Velocity Head		0.50	ft
Specific Energy		0.62	ft
Froude Number		4.11	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.12	ft
Critical Depth	0.21	ft
Channel Slope	0.11750	ft/ft
Critical Slope	0.00583	ft/ft

Worksheet for Street Capacity for Haverhill Way (GI-8)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.13950	ft/ft
Discharge	0.21	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.08	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.04	ft²
Wetted Perimeter	1.26	ft
Hydraulic Radius	0.04	ft

Worksheet for Street Capacity for Haverhill Way (GI-8)

Results

Top Width		1.18	ft
Normal Depth		0.08	ft
Critical Depth		0.14	ft
Critical Slope		0.00661	ft/ft
Velocity		4.67	ft/s
Velocity Head		0.34	ft
Specific Energy		0.42	ft
Froude Number		4.21	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.08	ft
Critical Depth	0.14	ft
Channel Slope	0.13950	ft/ft
Critical Slope	0.00661	ft/ft

Worksheet for Street Capacity for Haverhill Way @ Warped (GI-9)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.06320	ft/ft
Discharge	0.16	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.08	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.05	ft²
Wetted Perimeter	1.32	ft
Hydraulic Radius	0.04	ft

Worksheet for Street Capacity for Haverhill Way @ Warped (GI-9)

Results

Top Width		1.24	ft
Normal Depth		0.08	ft
Critical Depth		0.12	ft
Critical Slope		0.00682	ft/ft
Velocity		3.22	ft/s
Velocity Head		0.16	ft
Specific Energy		0.24	ft
Froude Number		2.83	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.08	ft
Critical Depth	0.12	ft
Channel Slope	0.06320	ft/ft
Critical Slope	0.00682	ft/ft

Worksheet for Street Capacity for Haverhill Drive (GI-10)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.14310	ft/ft
Discharge	0.94	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.13	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.14	ft²
Wetted Perimeter	2.23	ft
Hydraulic Radius	0.06	ft

Worksheet for Street Capacity for Haverhill Drive (GI-10)

Results

Top Width		2.09	ft
Normal Depth		0.13	ft
Critical Depth		0.24	ft
Critical Slope		0.00555	ft/ft
Velocity		6.79	ft/s
Velocity Head		0.72	ft
Specific Energy		0.85	ft
Froude Number		4.65	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.13	ft
Critical Depth	0.24	ft
Channel Slope	0.14310	ft/ft
Critical Slope	0.00555	ft/ft

Worksheet for Street Capacity for Brilliant Drive (GI-11)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.20000	ft/ft
Discharge	0.89	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.12	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.12	ft²
Wetted Perimeter	2.02	ft
Hydraulic Radius	0.06	ft

Worksheet for Street Capacity for Brilliant Drive (GI-11)

Results

Top Width		1.89	ft
Normal Depth		0.12	ft
Critical Depth		0.24	ft
Critical Slope		0.00558	ft/ft
Velocity		7.65	ft/s
Velocity Head		0.91	ft
Specific Energy		1.03	ft
Froude Number		5.44	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.12	ft
Critical Depth	0.24	ft
Channel Slope	0.20000	ft/ft
Critical Slope	0.00558	ft/ft

Worksheet for Capacity for Haverhill Way (GI-12)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02580	ft/ft
Discharge	1.22	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.20	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.34	ft²
Wetted Perimeter	3.84	ft
Hydraulic Radius	0.09	ft

Worksheet for Capacity for Haverhill Way (GI-12)

Results

Top Width		3.63	ft
Normal Depth		0.20	ft
Critical Depth		0.27	ft
Critical Slope		0.00539	ft/ft
Velocity		3.63	ft/s
Velocity Head		0.20	ft
Specific Energy		0.41	ft
Froude Number		2.10	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.20	ft
Critical Depth	0.27	ft
Channel Slope	0.02580	ft/ft
Critical Slope	0.00539	ft/ft

Worksheet for Capacity for Haverhill Way (GI-13)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.03800	ft/ft
Discharge	0.08	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+12	0.50
-0+12	0.00
-0+10	0.13
-0+08	0.22
-0+06	0.29
-0+04	0.34
-0+02	0.37
0+00	0.38

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+12, 0.50)	(0+00, 0.38)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.07	ft
Elevation Range	0.00 to 0.50 ft	
Flow Area	0.04	ft²
Wetted Perimeter	1.12	ft
Hydraulic Radius	0.03	ft

Worksheet for Capacity for Haverhill Way (GI-13)

Results

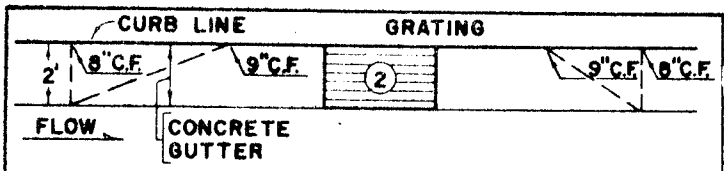
Top Width		1.05	ft
Normal Depth		0.07	ft
Critical Depth		0.09	ft
Critical Slope		0.00748	ft/ft
Velocity		2.24	ft/s
Velocity Head		0.08	ft
Specific Energy		0.15	ft
Froude Number		2.14	
Flow Type	Supercritical		

GVF Input Data

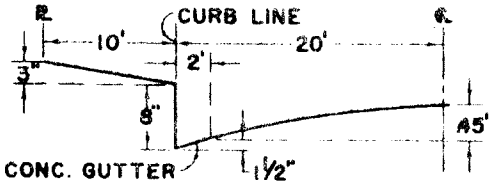
Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.07	ft
Critical Depth	0.09	ft
Channel Slope	0.03800	ft/ft
Critical Slope	0.00748	ft/ft



GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION (ABOVE BASIN)

NOTES

1. THIS CHART GIVES GRATING CAPACITIES OF STANDARD CITY GRATINGS (STANDARD PLAN NO B-2523) DEVELOPED FROM HYDRAULIC MODEL STUDIES FOR VARIOUS VALUES OF "D" ON THE INDICATED SLOPE.
2. THIS CHART IS APPLICABLE ONLY TO CONDITIONS SHOWN ON THE ABOVE SKETCH.

DESIGN CHART LL-22

SHOWING EFFECT OF SLOPE

GRATING CAPACITIES

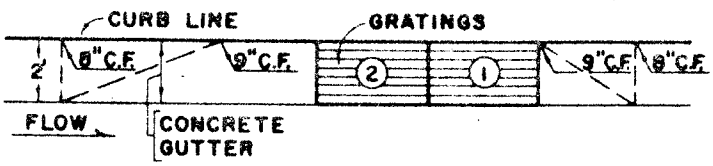
BUREAU OF ENGINEERING - CITY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
STORM DRAIN DESIGN DIVISION

W.O. 51005 MARCH, 1957

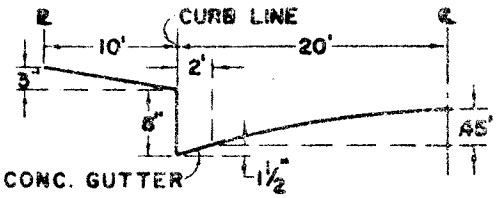
DESIGNED BY: F.J.D. & W.H.T. DRAWN BY: O.G.S.

GI-4, GI-8

GI-9



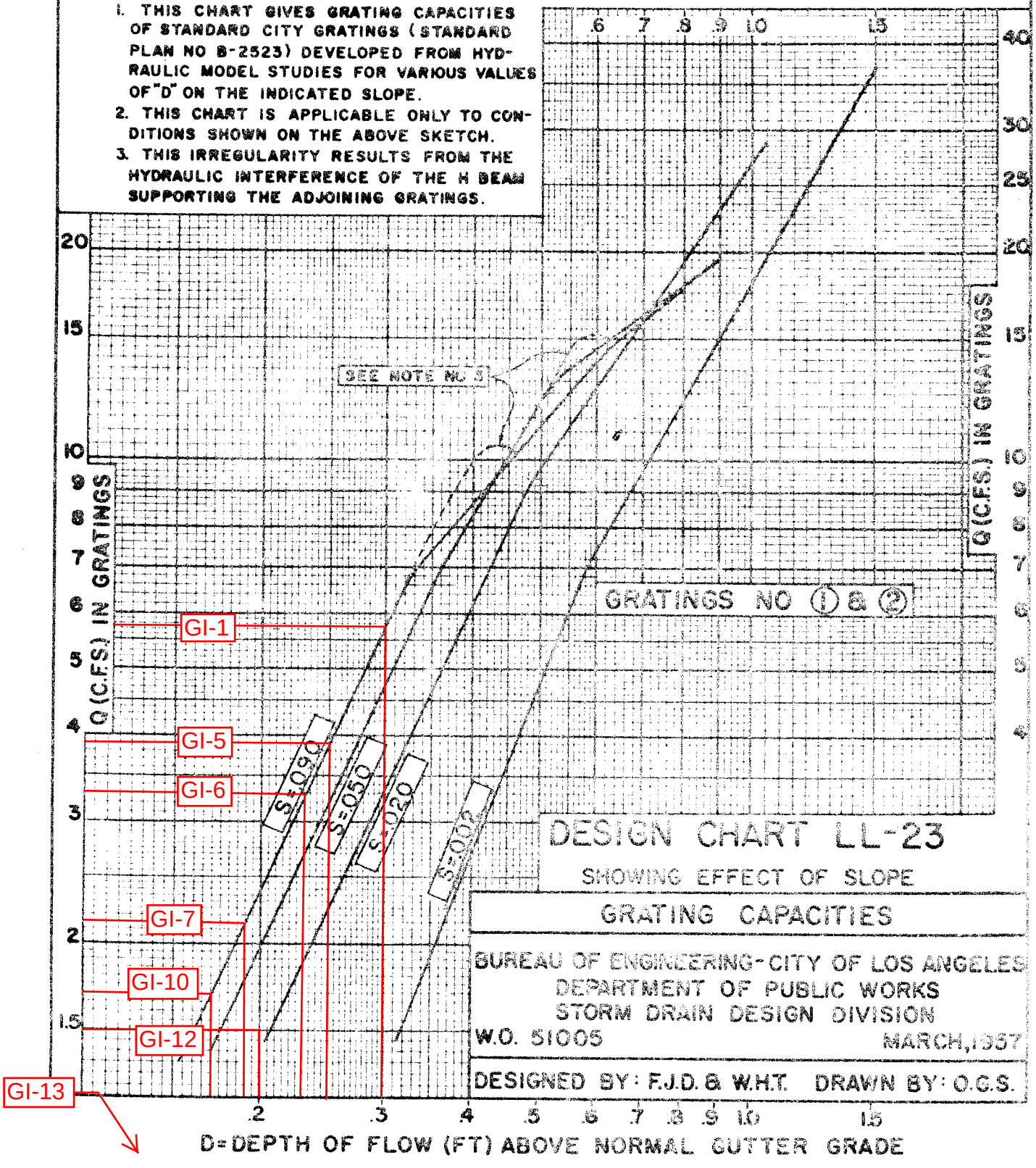
GRATING & GUTTER PLAN



TYPICAL HALF STREET SECTION
(ABOVE BASIN)

NOTES

1. THIS CHART GIVES GRATING CAPACITIES OF STANDARD CITY GRATINGS (STANDARD PLAN NO B-2523) DEVELOPED FROM HYDRAULIC MODEL STUDIES FOR VARIOUS VALUES OF "D" ON THE INDICATED SLOPE.
2. THIS CHART IS APPLICABLE ONLY TO CONDITIONS SHOWN ON THE ABOVE SKETCH.
3. THIS IRREGULARITY RESULTS FROM THE HYDRAULIC INTERFERENCE OF THE H BEAM SUPPORTING THE ADJOINING GRATINGS.



DESIGN CHART LL-23

SHOWING EFFECT OF SLOPE

GRATING CAPACITIES

BUREAU OF ENGINEERING - CITY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
STORM DRAIN DESIGN DIVISION

W.O. 51005 MARCH, 1957

DESIGNED BY: F.J.D. & W.H.T. DRAWN BY: O.C.S.

Worksheet for Capacity - 27" RCP Lateral

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.20000	ft/ft
Normal Depth	2.25	ft
Diameter	2.25	ft

Results

Discharge	138.50	ft^3/s
Flow Area	3.98	ft^2
Wetted Perimeter	7.07	ft
Hydraulic Radius	0.56	ft
Top Width	0.00	ft
Critical Depth	2.25	ft
Percent Full	100.0	%
Critical Slope	0.19605	ft/ft
Velocity	34.83	ft/s
Velocity Head	18.86	ft
Specific Energy	21.11	ft
Froude Number	0.00	
Maximum Discharge	148.98	ft^3/s
Discharge Full	138.50	ft^3/s
Slope Full	0.20000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for Capacity - 27" RCP Lateral

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.25	ft
Critical Depth	2.25	ft
Channel Slope	0.20000	ft/ft
Critical Slope	0.19605	ft/ft

Worksheet for Capacity - Division St.

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.06500	ft/ft
Normal Depth	0.50	ft

Section Definitions

Station (ft)	Elevation (ft)
0+00	0.50
0+08	0.34
0+08	0.00
0+10	0.16
0+17	0.24
0+25	0.27
0+34	0.24
0+40	0.16
0+42	0.00
0+42	0.34
0+50	0.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 0.50)	(0+50, 0.50)	0.013

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	116.19	ft^3/s
Elevation Range	0.00 to 0.50 ft	

Worksheet for Capacity - Division St.

Results

Flow Area		11.03	ft²
Wetted Perimeter		50.70	ft
Hydraulic Radius		0.22	ft
Top Width		50.00	ft
Normal Depth		0.50	ft
Critical Depth		0.83	ft
Critical Slope		0.00311	ft/ft
Velocity		10.54	ft/s
Velocity Head		1.73	ft
Specific Energy		2.23	ft
Froude Number		3.96	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.83	ft
Channel Slope	0.06500	ft/ft
Critical Slope	0.00311	ft/ft

Cross Section for Capacity - Division St.

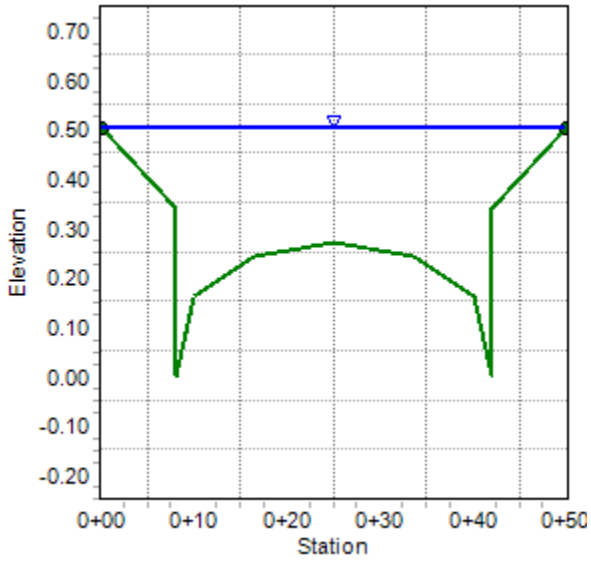
Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.06500	ft/ft
Normal Depth	0.50	ft
Discharge	116.19	ft³/s

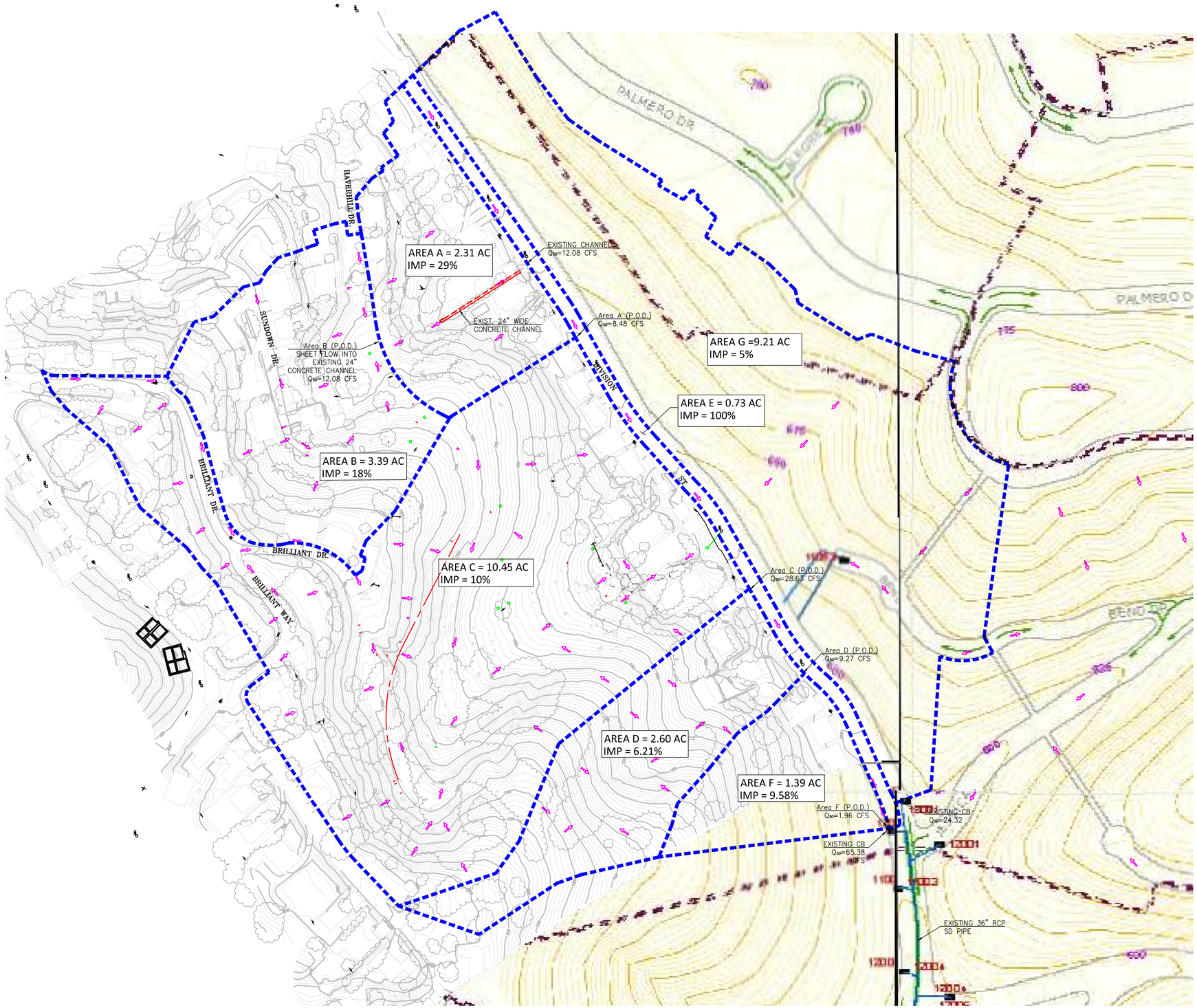
Cross Section Image



ATTACHMENT C

MAPS AND STORM DRAIN AS BUILTS

HYDROLOGY MAPS



10, 25, 50-YR STORM TABLE SUMMARY

LOCATION	AREA	IMPERVIOUS	PERVIOUS	Q_{10}	Q_{25}	Q_{50}
A	2.31 ac	29%	71%	5.73 cfs	7.16 cfs	8.23 cfs
B	3.39 ac	18%	82%	7.62 cfs	10.50 cfs	12.08 cfs
C	10.45 ac	10%	90%	16.25 cfs	22.57 cfs	27.62 cfs
D	2.60 ac	6.21%	93.79%	6.41 cfs	8.05 cfs	9.28 cfs
E	0.73 ac	100%	0%	1.22 cfs	1.64 cfs	1.96 cfs
F	1.39 ac	9.58%	90.42%	3.43 cfs	4.30 cfs	4.96 cfs
G (Off-site)	9.21 ac	5%	95%	14.26 cfs	19.85 cfs	24.32 cfs

N

GRAPHIC SCALE: 1" = 80'

0 80 160

LEGEND:

- SUBAREA BOUNDARY
- PROPOSED DIRECTION OF FLOW
- EXISTING DIRECTION OF FLOW

Date	Revision	By

PREPARED BY:

UNITED CIVIL, INC.
30141 AGOURA ROAD, SUITE 215
AGOURA HILLS, CA 91301
PH: (818) 707-8648
FAX: (818) 707-8649

DESIGNED _____

DRAWN _____

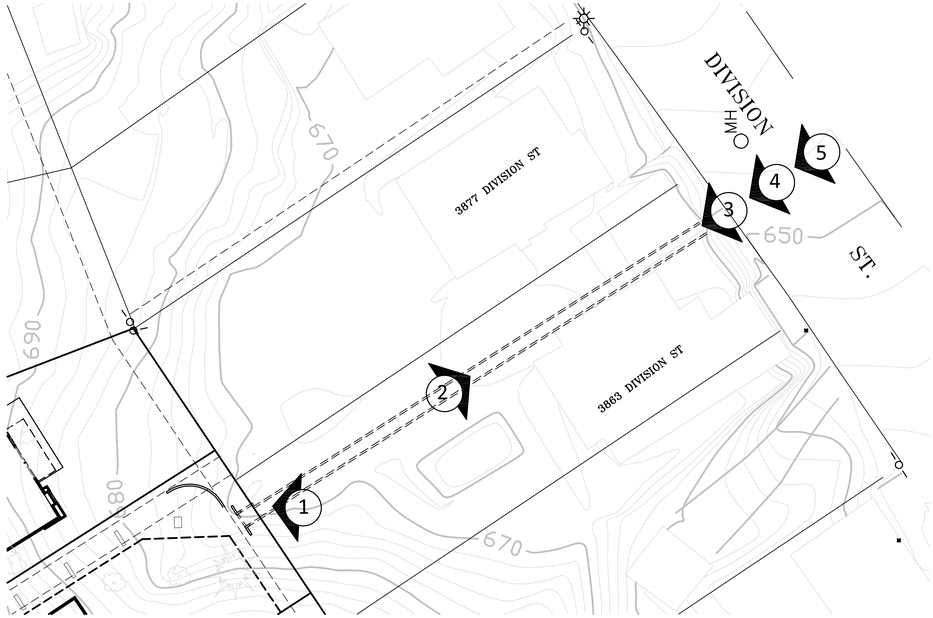
EXISTING HYDROLOGY MAP

TRACT NO. 8943
2410 N. HAVERHILL DRIVE
LOS ANGELES, CA 90065

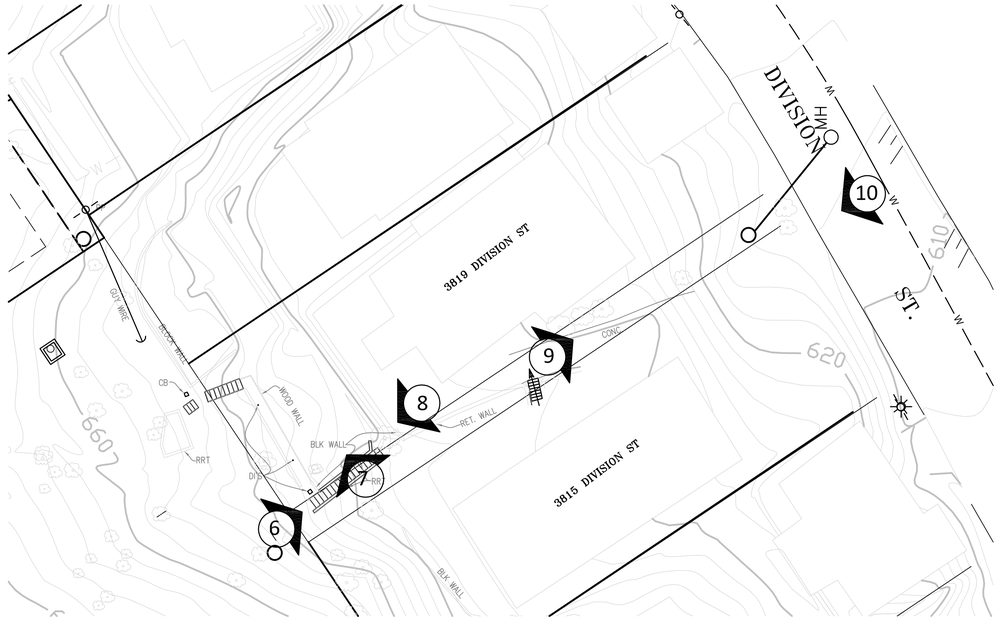
SHEET 1 OF 2

01/29/2015

EXISTING OUTLET (NORTH)



EXISTING OUTLET (SOUTH)



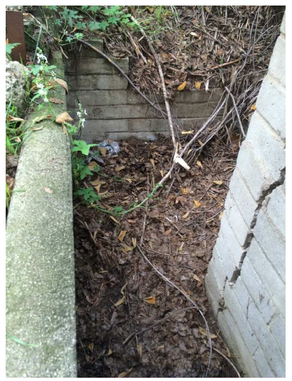


PHOTO 1

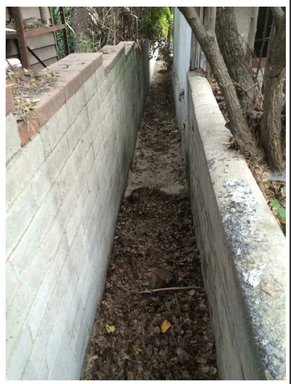


PHOTO 2

PHOTO 3

PHOTO 4

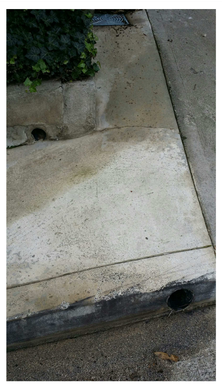


PHOTO 5

PHOTO 6

PHOTO 7

PHOTO 8

PHOTO 9

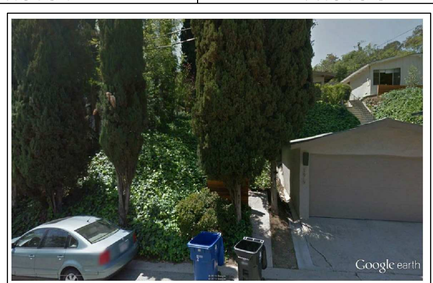


PHOTO 10

LEGEND:

6 — VIEW DIRECTION / PHOTO NUMBER

N

GRAPHIC SCALE: 1" = 20'

0 20 40

Date	Revision	By

PREPARED BY:

UNITED CIVIL, INC.
30141 AGOURA ROAD, SUITE 215
AGOURA HILLS, CA 91301
PH: (818) 707-8688
FAX: (818) 707-8649

DESIGNED

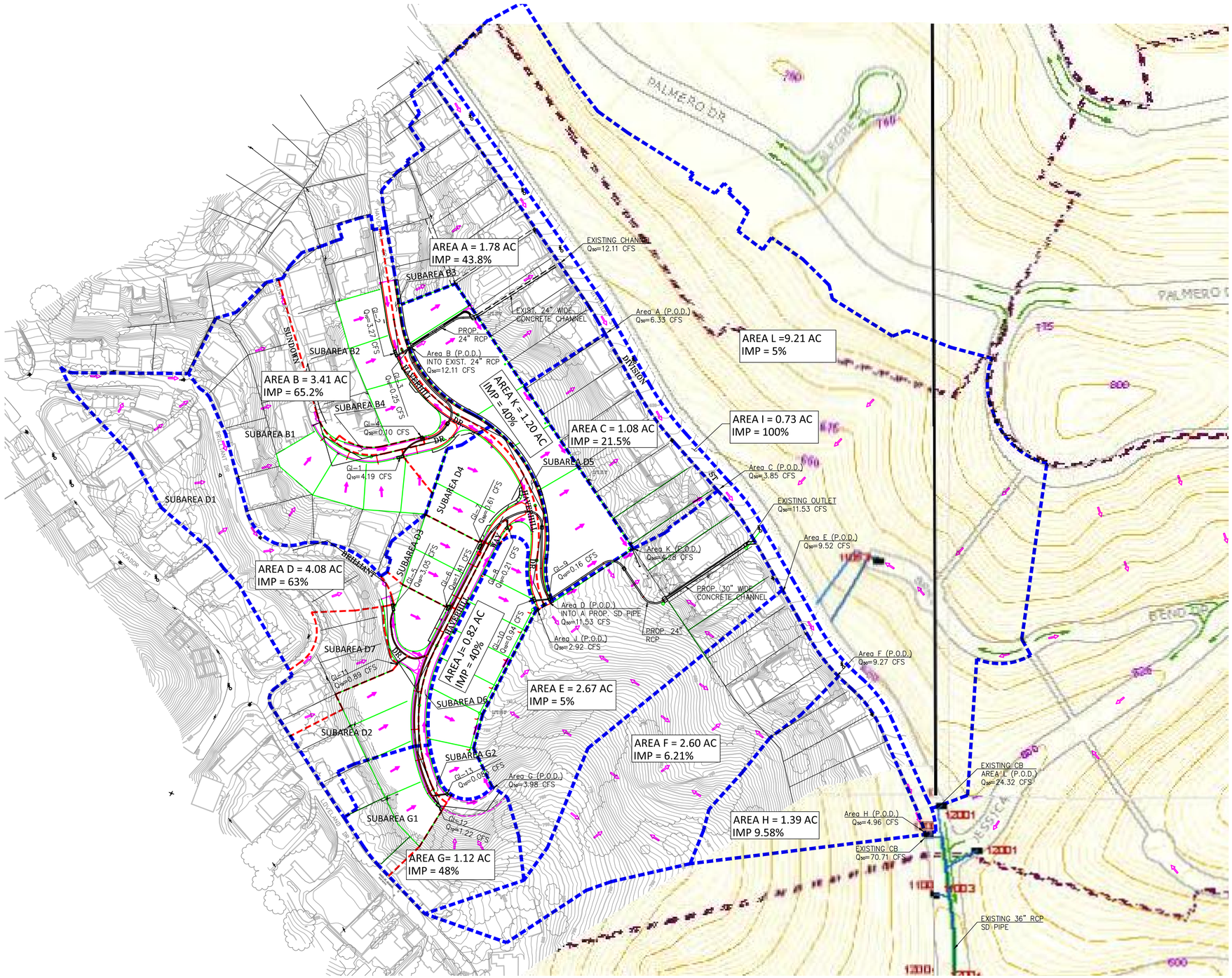
DRAWN

EXISTING DRAINAGE–PHOTO EXHIBIT

TRACT NO. 8943
2410 N. HAVERHILL DRIVE
LOS ANGELES, CA 90065

SHEET 2 OF 2

01/29/2015



10, 25, 50-YR STORM TABLE SUMMARY

LOCATION	AREA	IMPERVIOUS	PERVIOUS	Q_{10}	Q_{25}	Q_{50}
A	1.78 ac	43.8%	56.2%	4.43 cfs	5.52 cfs	6.33 cfs
B	3.41 ac	65.2%	34.8%	7.81 cfs	10.59 cfs	12.11 cfs
C	1.08 ac	21.5%	78.5%	2.67 cfs	3.35 cfs	3.85 cfs
D	4.08 ac	63%	37%	7.27 cfs	9.50 cfs	11.53 cfs
E	2.67 ac	5%	95%	6.58 cfs	8.26 cfs	9.53 cfs
F	2.60 ac	6.21%	93.79%	6.41 cfs	8.05 cfs	9.28 cfs
G	1.12 ac	48%	52%	2.79 cfs	3.47 cfs	3.98 cfs
H	1.39 ac	9.58%	90.42%	3.43 cfs	4.30 cfs	3.43 cfs
I	0.73 ac	100%	0%	1.22 cfs	1.64 cfs	1.96 cfs
J	0.82 ac	40%	60%	2.04 cfs	2.54 cfs	2.92 cfs
K	1.20 ac	2%	98%	2.95 cfs	3.71 cfs	4.28 cfs
L (Off-site)	9.21 ac	5%	95%	14.26 cfs	19.85 cfs	24.32 cfs

PROPOSED GRATE INLET (GI) TABLE SUMMARY

LOCATION	TRIBUTARY SUBAREA	AREA	Q_{10} cfs	Q_{TOTAL} cfs	GI CAPACITY cfs	Q_{DOWN} cfs
GI-1	B1	1.83	4.19	4.19	5.75	0
GI-2	B2	1.43	3.27	3.27	3.27	0
GI-3	B3	0.11	0.25	0.25	0.25	0
GI-4	B4	0.04	0.10	0.10	3.90	0
GI-5	D1	1.71	3.05	3.05	3.30	0
GI-6	D2	0.79	1.41	1.41	2.15	0
GI-7	D3	0.34	0.61	0.61	1.70	0
GI-8	D6	0.12	0.21	0.21	0.50	0
GI-9	D5	0.09	0.16	0.16	0.70	0
GI-10	D4	0.53	0.94	0.94	0.94	0
GI-11	D7	0.50	0.89	0.89	0.90	0
GI-12	G1	0.49	1.22	1.22	1.50	0
GI-13	G2	0.03	0.08	0.08	0.08	0

Q_{DOWN} = BYPASS FLOWRATE TO THE DOWNSTREAM GRATE INLET

GRAPHIC SCALE: 1" = 80'

0 80 160

LEGEND:

- DRAINAGE AREA BOUNDARY
- SUBAREA BOUNDARY
- PROPOSED DIRECTION OF FLOW
- EXISTING DIRECTION OF FLOW

Date	Revision	By

PREPARED BY:

UNITED CIVIL, INC.
30141 AGOURA ROAD, SUITE 215
AGOURA HILLS, CA 91301
PH: (818) 707-8648
FAX: (818) 707-8649

DESIGNED _____

DRAWN _____

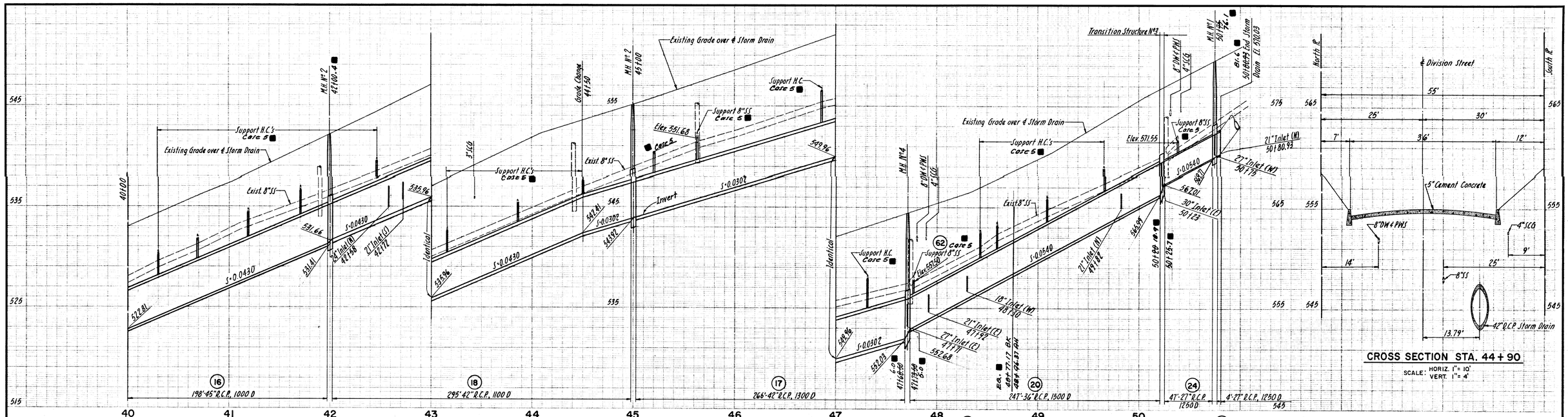
PROPOSED HYDROLOGY MAP

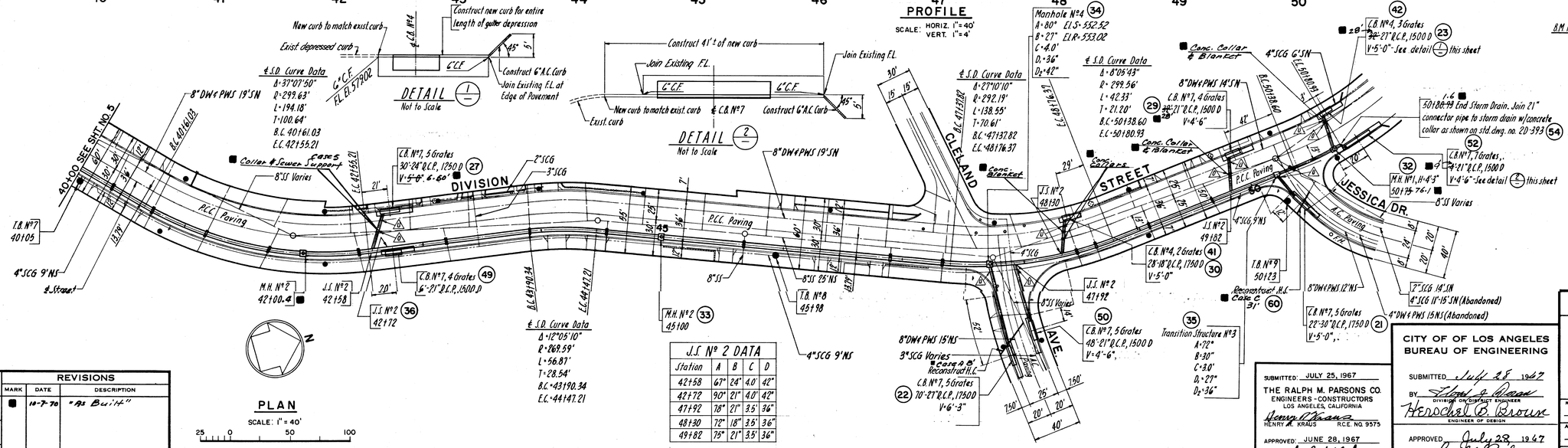
TRACT NO. 8943
2410 N. HAVERHILL DRIVE
LOS ANGELES, CA 90065

SHEET 1 OF 1

01/29/2015

STORM DRAIN AS BUILTS





J.S. N° 2 DATA				
Station	A	B	C	D
42+58	67°	24"	4.0'	42"
42+72	90°	21"	4.0'	42"
47+92	78°	21"	3.5'	36"
48+30	72°	18"	3.5'	36"
49+82	75°	21"	3.5'	36"

BENCH MARK

B.M. N° 12-26960 Std. survey monument GLn J-11 H, 4.8 ft. N. of S. curb Jessica Drive, 29'± E. of E. curb line Division Street. Elevation 577.716

Reference Drawings

CITY OF LOS ANGELES				OTHERS
Street Plan & Profile	Sewer & S.D. Plan & Profile	Field Book	Misc.	
17280	23577	8111	DW & PWS	SCG
14661		8506	152-219	STL 37
			Substruct.	PT & T
			SUB 418	

1964 STORM DRAIN BOND ISSUE

LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

LOS ANGELES

PROJECT NO. 5207

STA. 40+00 TO STA. 50+50

PLAN AND PROFILE

RECOMMENDED BY: O. F. Edell, DIVISION ENGINEER (OMEN)

APPROVAL RECOMMENDED BY: Walter W. Kaucher, ASST CHIEF DEPUTY ENGINEER

APPROVED BY: Walter J. Wood, CHIEF ENGINEER

SCALE: AS SHOWN | DATE: JAN. '68 | DWG. NO. 364-5207-D2.6 | SHEET 6 OF 9

"AS BUILT" DRAWING

DRAWN BY	REVISIONS		
CITY	MARK	DATE	DESCRIPTION
CHECKED BY	■	10-7-70	"As Built"
CITY			
DESIGNED BY			
CITY			
SUBMITTED BY			
C.W.H.			

INITIAL DATE | DESIGNED BY | DRAWN BY | CHECKED BY | SUBMITTED BY | PROJECT ENGR.

SUBMITTED: JULY 25, 1967

THE RALPH M. PARSONS CO. ENGINEERS-CONSTRUCTORS LOS ANGELES, CALIFORNIA

Henry M. Kraus

HENRY M. KRAUS R.C.E. NO. 9575

APPROVED: JUNE 28, 1967

Charles J. Lord

CHARLES J. LORD R.C.E. NO. 9774

CITY OF OF LOS ANGELES BUREAU OF ENGINEERING

SUBMITTED July 25 1967

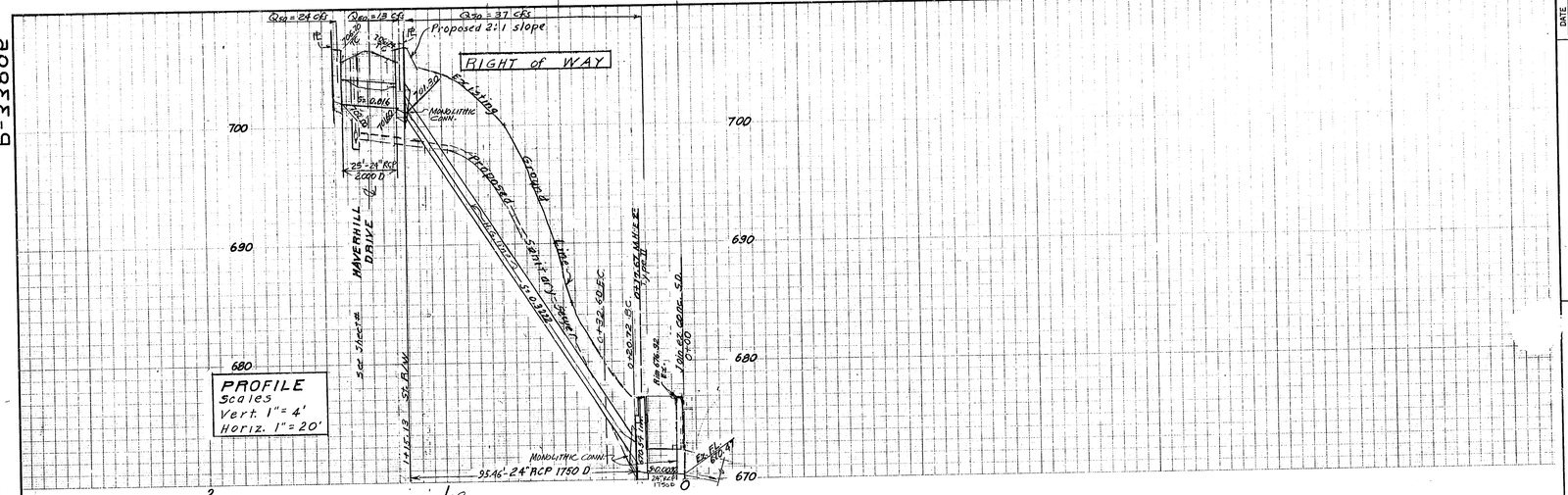
BY Floyd J. Brown, DIVISION OR DISTRICT ENGINEER

Herschel E. Brown, ENGINEER OF DESIGN

APPROVED July 28 1967

Lyndell W. Barden, CITY ENGINEER

b-33882



DESIGNED	EVT. ENG.	DATE
DRAWN	EVT. ENG.	10-96
CHECKED	A. LEE	12-30-96
SUPERVISED	V. Nguyen	11-23-98
PROJECT ENGR.	R.E. NO. 21475	
ASST. DIV./DIST. ENGR.	R.E. NO. C20144	

NO.	REVISION DESCRIPTION	DIV./DIST. ENGR.	DATE

CITY OF LOS ANGELES
CITY ENGINEER
ROBERT S. HORII
DATE: JAN 13, 1999
DIV./DIST. ENGR. R.E. NO. 21639

Plans prepared by:
WYNNE ENGINEERING CO.
1328 9th St. No. 6
Santa Monica CA 90401
(310) 393-8949
Douglas Wynne CE 9438

HAVERHILL DRIVE, SUNDOWN DRIVE TO HAVERHILL WAY
DESIGN PERMIT BD 000213 CONST. PERMIT BC-

SCALES	HORIZ. 1"= 20'
	VERT. 1"= 4'

SHEET 4 OF 4 SHEETS | INDEX NUMBER P-33895

b-33882

29X