

PRELIMINARY HYDROLOGY STUDY

1651 East Rowland Avenue
Assessor's Parcel 8442-018-900
West Covina, California
(Preliminary Review 19-05)

PREPARED FOR:

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Purpose

The intent of this Preliminary Hydrology Study (“Study”) is to compare storm runoff rates and volumes emanating from areas tributary to the Pioneer School site and its proposed development. A variety of rainfall events will be analyzed for comparative purposes and to quantify design requirements. The Study will attempt to normalize anticipated flow rates for this area in accordance with the original Bond Program storm drain design. The flow rates and volumes established in this Study will be used as a basis of design for the storm drain system developed for the project.

This study is based on Los Angeles County Department of Public Works Rational Method Hydrology. The Topographic Survey, Preliminary Grading Plan and proposed Site Plan will serve as references for the study.

Site Description and Project Overview

The Site, consisting of 9.1 acres, is located at 1651 E. Rowland Avenue in the City of West Covina. It served as an elementary school in the Covina-Valley Unified School District from the late 1960s to about 1980. Various educational and vocational uses have occupied the site since 1980, but the original school buildings and ancillary improvements have remained. The site is bounded by single family residential development along the west and north half and by commercial property along the east side and northeast corner.

Prevailing drainage for the area is southwesterly at a rate of approximately 1%. The City of West Covina holds storm drain easements over strips of land along the north and west side of the site. An existing earthen swale within these easement strips conveys runoff from a portion of the school site, residential property along Eileen Street, and a portion of the Food 4 Less/Big Lots shopping center adjacent to the northeast corner of the site. The swale outlets through an existing parkway drain onto Rowland Avenue at the southwest corner of the site.

The drainage area of the properties along Eileen Street and the shopping center which contribute storm runoff to the school site is approximately 5.8 acres. The tributary areas are fairly equally split between the two land uses. Runoff from the Food 4 Less/Big Lots shopping center is picked up in a catch basin at the southwest corner of the property. The runoff collected at this catch basin is conveyed via pipe underground along the adjacent westerly residential property to the earthen swale west side of Eileen Street on the school site. A curb depression was also constructed at this location to discharge runoff from Eileen Street into the swale. The pipe drainage and the runoff from Eileen Street meander along the swale to the parkway drain outlet at Rowland Avenue.

Approximately 70% of the school site currently drains to the swale as well. The remainder of the school site, primarily asphalt covered parking stalls, driveways, and

playground areas, drain out to Rowland Avenue by sheet flowing through the parking lot/drop-off zone along the southeast side of the school.

Proposed development of the property will consist of both detached single family homes and multifamily townhouse buildings. The townhouse buildings will be located on the east half of the project, adjacent to the commercial properties. The home clusters will be located along the west half of the site and along the north side adjacent to the existing residential developments. The overall layout and vehicle circulation pattern will allow storm runoff from the proposed development to perpetuate the school's current drainage split.

Drainage Overview

The site and surrounding area west of Azusa Avenue and north of Rowland Street, as shown on the Pre-Development Hydrology Map (approx. 36.4 acres), are tributary to Line "C" Unit 4 Project 599 located in Lark Ellen Avenue of the 1958 Los Angeles County Storm Drain Bond Issue. Runoff from this area is conveyed along Rowland Avenue via street flow and intercepted by catch basins near the intersection with Lark Ellen Avenue, approximately 1600 feet west of the site.

Watershed times of concentration were calculated for both the pre and post development conditions. For the capital storm event, a pre-development time of concentration of 18 minutes was calculated for the watershed to the pick-up at Lark Ellen Avenue. The peak runoff rate for the watershed is approximately 70 cubic feet per second (cfs). The calculated flow rate emanating from the school site and northerly tributary areas is 28.7 cfs, of which, 17.5 cfs is from the school. The proposed development actually reduces peak runoff rates slightly, approximately 5%, for most rainfall events. This is primarily due to an elongated drainage path within the development resulting in slightly longer times of concentration. The runoff volumes are higher for the developed condition because of larger impervious area.

Methodology

Hydrologic calculations in this study were performed in conformance with the Los Angeles County Hydrology Manual, dated January 2006, utilizing the Modified Rational Method TC Calculator. The Modified Rational Method equation relates rainfall intensity, time of concentration, runoff coefficient, and drainage area size to the direct runoff from each drainage sub-area. Soil types, rainfall data and runoff coefficients were obtained from the LACDPW Hydrology Manual. Volumetric runoff differentials were calculated for pre- and post-development of the project site based on the County's capital storm criteria. Construction of the proposed residential development and other related improvements increases the Site's impervious percentage to a post construction condition of approximately 80%. The pre and post construction impervious ratios were selected based on the LACDPW Hydrology Manual Appendix D Impervious data table.

Recommendations

It is recommended that the offsite tributary runoff from the Food 4 Less/Big Lots shopping center be intercepted in a pipe at Eileen Street and rerouted down the proposed westerly driveway to onsite infiltration areas. A catch basin should also be constructed within the Eileen Street cul-de-sac to pick up runoff within the street and convey it to the same infiltration area. Capital storm peak runoff from these two sources is about 14 cubic feet per second, which can be conveyed by a 24 inch diameter pipe. An emergency vehicle access driveway is also proposed at the end of the cul-de-sac which will serve as secondary overflow from Eileen Street in the event of a pipe blockage.

Onsite runoff will be picked up in catch basins located around the garage entrance driveways intersecting the main east and west driveway loops. These catch basins will be piped to infiltration areas near each drive approach with Rowland Avenue. Parkway drains will be provided to outlet peak flows onto Rowland Avenue. The anticipated peak flow rate along the easterly driveway is approximately 8 cfs. The peak flow rate to the westerly driveway is about 15 cfs. It is recommended that the infiltration areas be designed for a retention volume of approximately 26,000 cubic feet.

HYDROLOGIC ANALYSIS

34° 07' 30"

AZUSA 1-HI.31

-118° 00' 00"

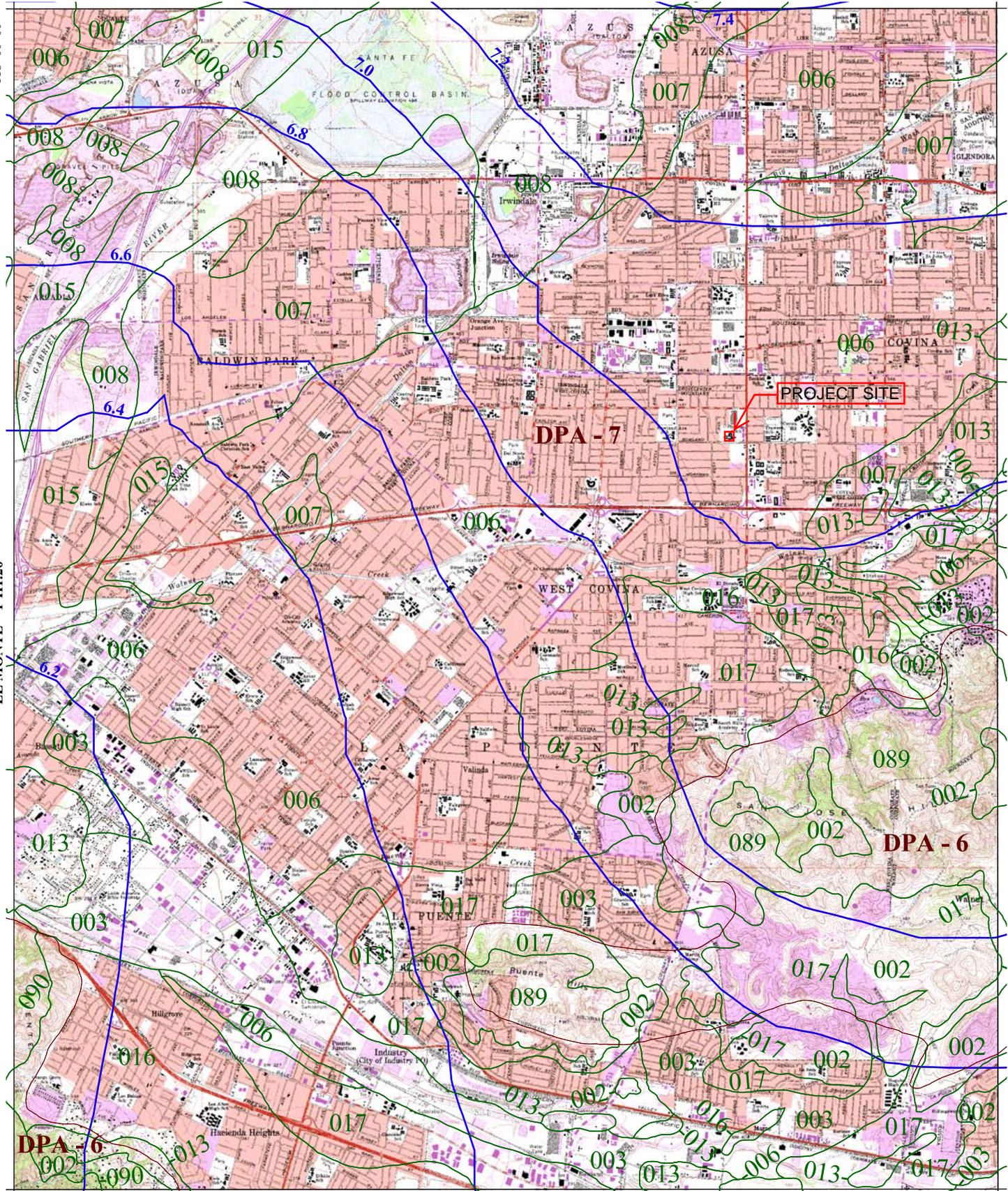
EL MONTE 1-HI.20

SAN DIMAS 1-HI.22

-117° 52' 30"

LA HABRA 1-HI.11

34° 00' 00"



- 016 SOIL CLASSIFICATION AREA
- 7.2 INCHES OF RAINFALL
- DPA - 6 DEBRIS POTENTIAL AREA



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

BALDWIN PARK 50-YEAR 24-HOUR ISOHYET

1-HI.21



LA County Hydrology Map



About



Legend



Layers

Legend

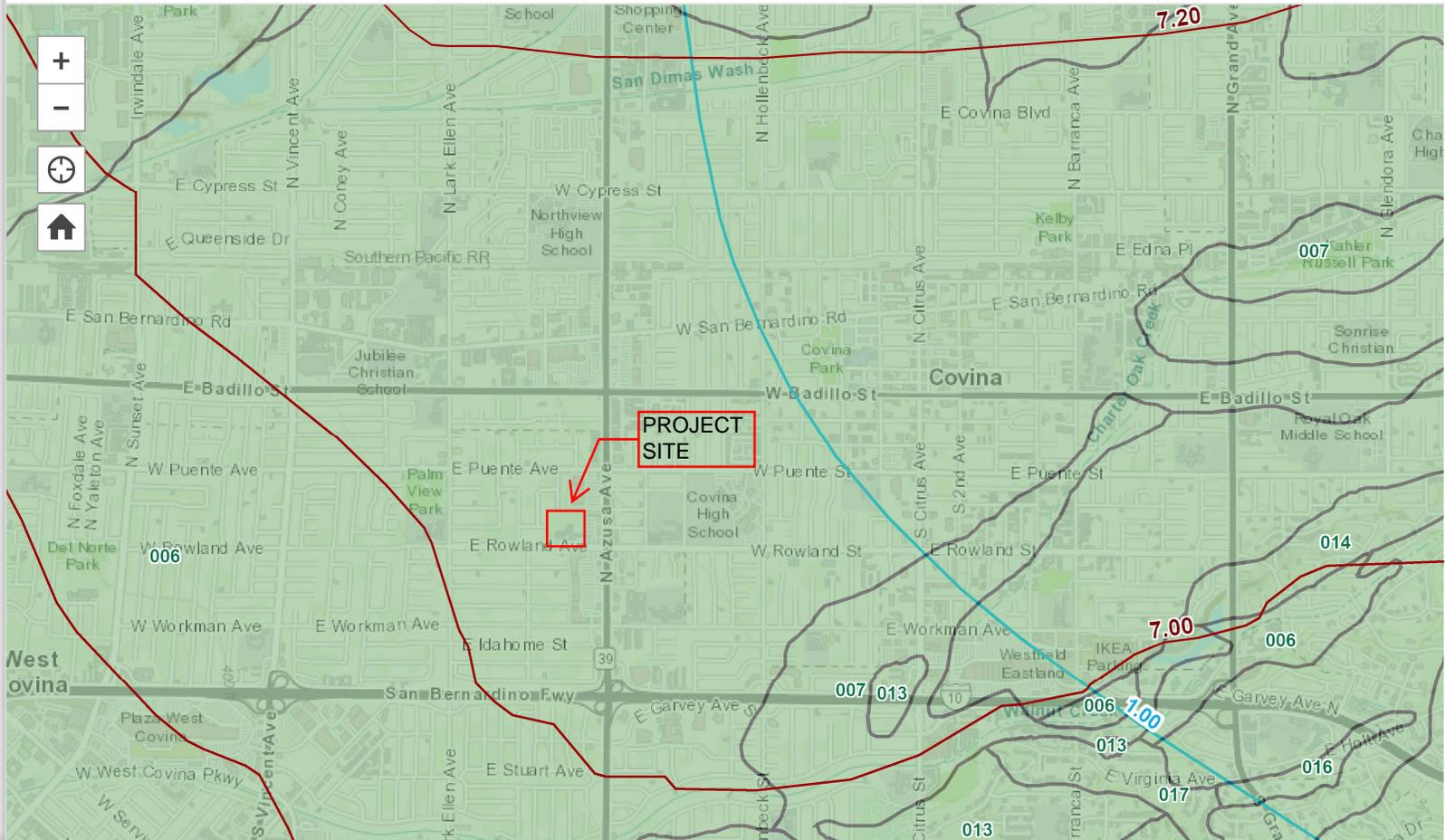
50yr Two Tenths (Rainfall)



Soils 2004



Final 85th Percentile, 24-hr Rainfall



Pre-development

Sub-Area	Area (Ac.)	% Impervious	Area x %Imp.	L(ft.)	% Area	Q50 (cfs)	Q25 (cfs)	Q10 (cfs)	Q5 (cfs)	Q2 (cfs)	Q 85th (cfs)
A-1	2.9	0.92	2.67	512	0.08	5.58	4.55	3.28	2.40	1.41	0.22
A-2	2.9	0.45	1.31		0.08	5.58	4.55	3.28	2.40	1.41	0.22
A-3	9.1	0.53	4.82	728	0.25	17.51	14.29	10.30	7.53	4.41	0.69
A-4	0.77	0.87	0.67		0.02	1.48	1.21	0.87	0.64	0.37	0.06
A-5	20.7	0.45	9.32	1530	0.57	39.84	32.50	23.43	17.13	10.03	1.58
Total	36.37	0.52	18.78	2770		70.00	57.10	41.16	30.10	17.63	2.77

Frequency	Qpeak total (cfs)	Run-off Volume (Ac-ft)	Tc (min.)
50 yr	70.00	12.33	18
25 yr	57.10	10.65	20
10yr	41.16	8.48	24
5yr	30.10	6.81	28
2yr	17.63	4.39	30
85th	2.77	1.55	98

Post-development

Sub-Area	Area (Ac.)	% Impervious	Area x %Imp.	L(ft.)	% Area	Q50 (cfs)	Q25 (cfs)	Q10 (cfs)	Q5 (cfs)	Q2 (cfs)	Q 85th (cfs)
A-1	2.90	0.92	2.67	512	0.08	5.33	4.39	3.20	2.37	1.46	0.24
A-2	2.90	0.45	1.31		0.08	5.33	4.39	3.20	2.37	1.46	0.24
A-3	9.10	0.80	7.28	980	0.25	16.73	13.77	10.04	7.44	4.58	0.75
A-4	0.77	0.87	0.67		0.02	1.42	1.17	0.85	0.63	0.39	0.06
A-5	20.70	0.45	9.32	1525	0.57	38.05	31.33	22.85	16.92	10.42	1.71
Total	36.37	0.58	21.24	3017		66.86	55.04	40.14	29.72	18.30	3.01

Frequency	Qpeak total (cfs)	Run-off Volume (Ac-ft)	Tc (min.)
50 yr	66.86	13.17	20
25 yr	55.04	11.41	22
10yr	40.14	9.12	26
5yr	29.72	7.36	30
2yr	18.30	4.77	30
85th	3.01	1.7	99

Peak Flow Hydrologic Analysis

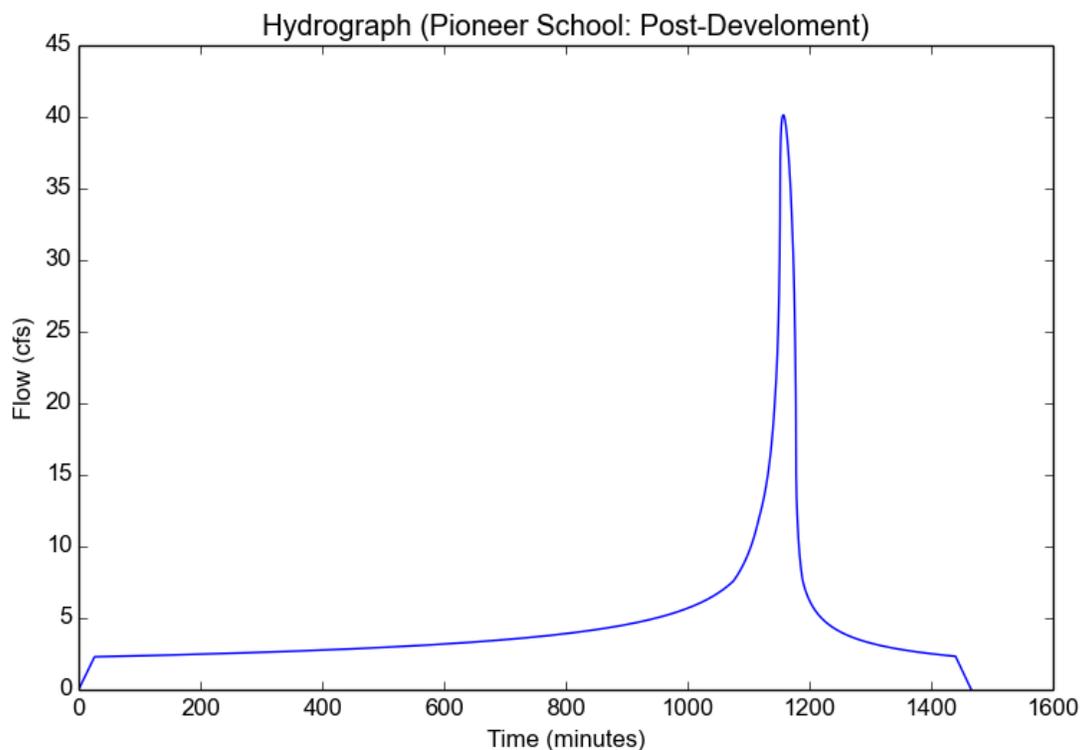
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Input Parameters

Project Name	Pioneer School
Subarea ID	Post-Develoment
Area (ac)	36.37
Flow Path Length (ft)	3017.0
Flow Path Slope (vft/hft)	0.0118
50-yr Rainfall Depth (in)	7.05
Percent Impervious	0.58
Soil Type	6
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	5.0337
Peak Intensity (in/hr)	1.3838
Undeveloped Runoff Coefficient (Cu)	0.656
Developed Runoff Coefficient (Cd)	0.7975
Time of Concentration (min)	26.0
Clear Peak Flow Rate (cfs)	40.1374
Burned Peak Flow Rate (cfs)	40.1374
24-Hr Clear Runoff Volume (ac-ft)	9.1179
24-Hr Clear Runoff Volume (cu-ft)	397175.356



Peak Flow Hydrologic Analysis

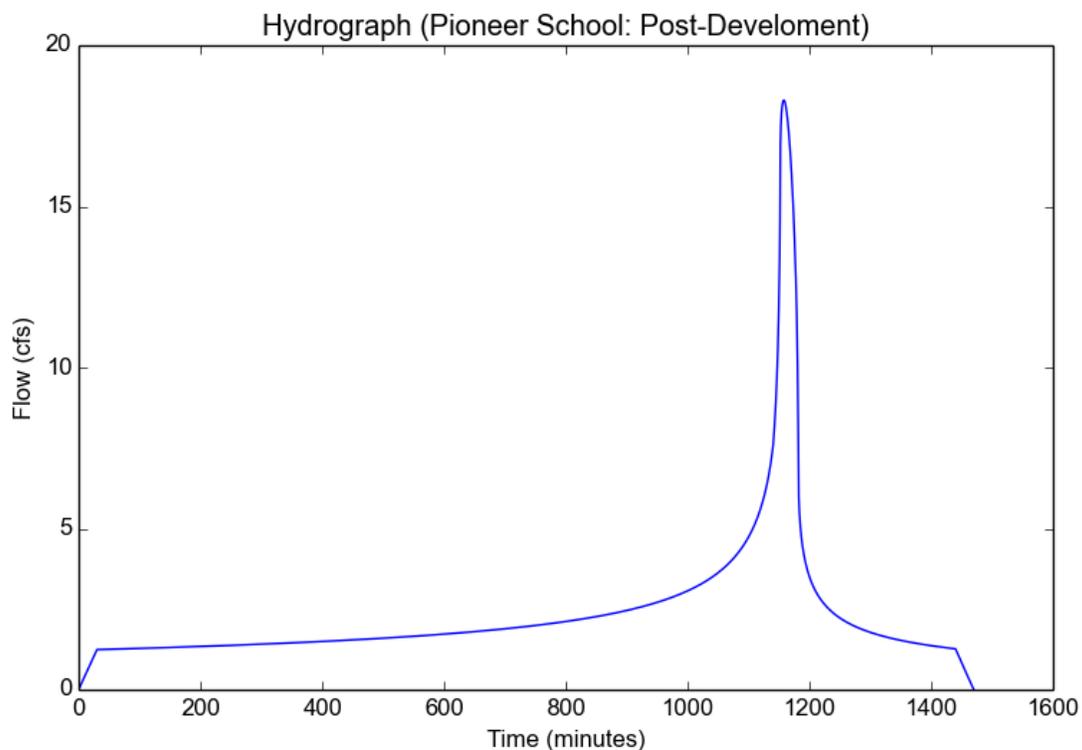
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Input Parameters

Project Name	Pioneer School
Subarea ID	Post-Develoment
Area (ac)	36.37
Flow Path Length (ft)	3017.0
Flow Path Slope (vft/hft)	0.0118
50-yr Rainfall Depth (in)	7.05
Percent Impervious	0.58
Soil Type	6
Design Storm Frequency	2-yr
Fire Factor	0
LID	False

Output Results

Modeled (2-yr) Rainfall Depth (in)	2.7283
Peak Intensity (in/hr)	0.7012
Undeveloped Runoff Coefficient (Cu)	0.4655
Developed Runoff Coefficient (Cd)	0.7175
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	18.2996
Burned Peak Flow Rate (cfs)	18.2996
24-Hr Clear Runoff Volume (ac-ft)	4.7651
24-Hr Clear Runoff Volume (cu-ft)	207568.5006



Peak Flow Hydrologic Analysis

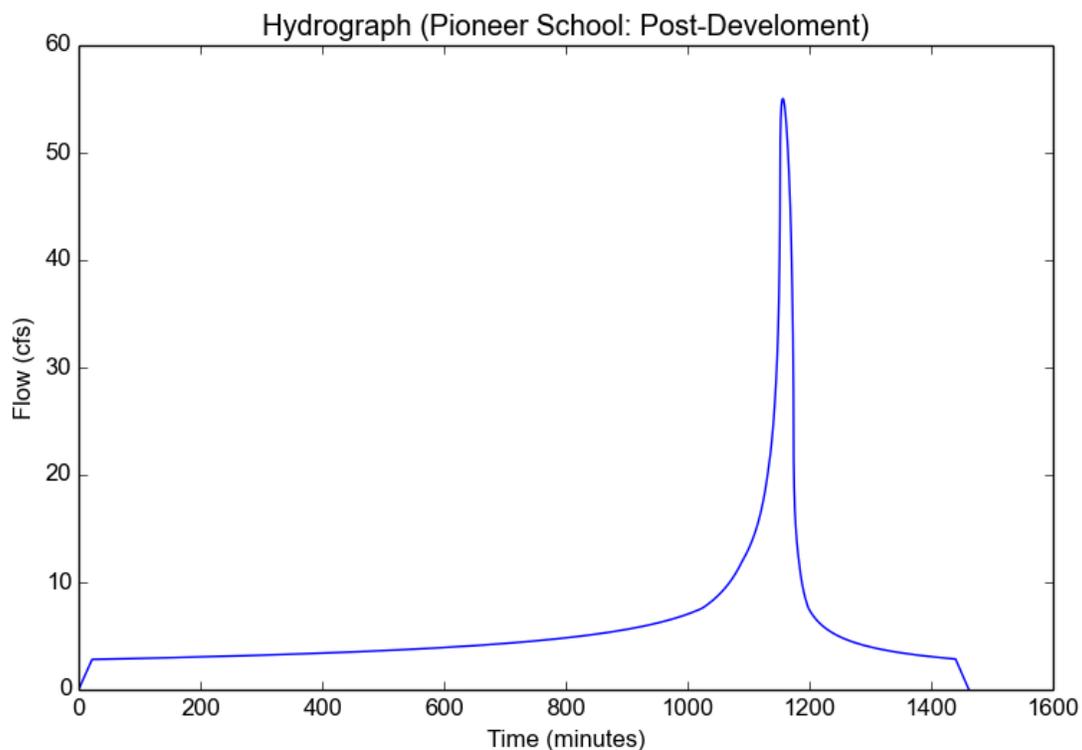
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Input Parameters

Project Name	Pioneer School
Subarea ID	Post-Develoment
Area (ac)	36.37
Flow Path Length (ft)	3017.0
Flow Path Slope (vft/hft)	0.0118
50-yr Rainfall Depth (in)	7.05
Percent Impervious	0.58
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.1899
Peak Intensity (in/hr)	1.8406
Undeveloped Runoff Coefficient (Cu)	0.7148
Developed Runoff Coefficient (Cd)	0.8222
Time of Concentration (min)	22.0
Clear Peak Flow Rate (cfs)	55.0418
Burned Peak Flow Rate (cfs)	55.0418
24-Hr Clear Runoff Volume (ac-ft)	11.4116
24-Hr Clear Runoff Volume (cu-ft)	497089.2327



Peak Flow Hydrologic Analysis

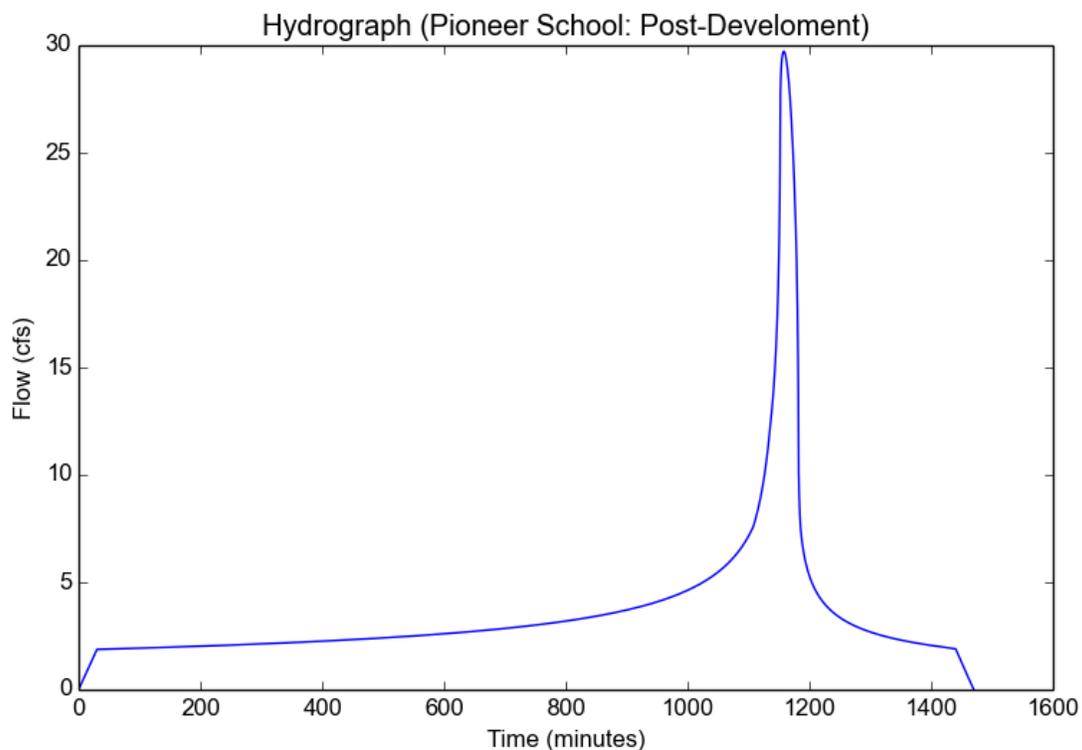
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Input Parameters

Project Name	Pioneer School
Subarea ID	Post-Development
Area (ac)	36.37
Flow Path Length (ft)	3017.0
Flow Path Slope (vft/hft)	0.0118
50-yr Rainfall Depth (in)	7.05
Percent Impervious	0.58
Soil Type	6
Design Storm Frequency	5-yr
Fire Factor	0
LID	False

Output Results

Modeled (5-yr) Rainfall Depth (in)	4.1172
Peak Intensity (in/hr)	1.0582
Undeveloped Runoff Coefficient (Cu)	0.5959
Developed Runoff Coefficient (Cd)	0.7723
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	29.7235
Burned Peak Flow Rate (cfs)	29.7235
24-Hr Clear Runoff Volume (ac-ft)	7.357
24-Hr Clear Runoff Volume (cu-ft)	320472.4346



Peak Flow Hydrologic Analysis

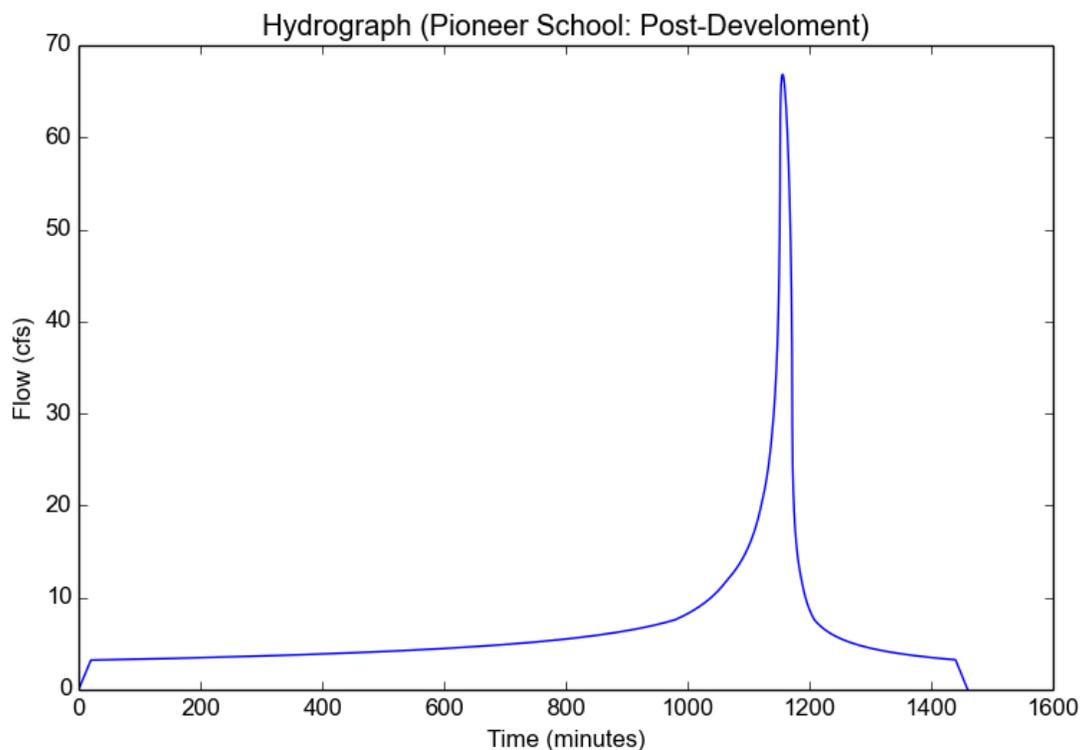
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Input Parameters

Project Name	Pioneer School
Subarea ID	Post-Develoment
Area (ac)	36.37
Flow Path Length (ft)	3017.0
Flow Path Slope (vft/hft)	0.0118
50-yr Rainfall Depth (in)	7.05
Percent Impervious	0.58
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	7.05
Peak Intensity (in/hr)	2.1924
Undeveloped Runoff Coefficient (Cu)	0.7534
Developed Runoff Coefficient (Cd)	0.8384
Time of Concentration (min)	20.0
Clear Peak Flow Rate (cfs)	66.8553
Burned Peak Flow Rate (cfs)	66.8553
24-Hr Clear Runoff Volume (ac-ft)	13.1717
24-Hr Clear Runoff Volume (cu-ft)	573758.9329



Peak Flow Hydrologic Analysis

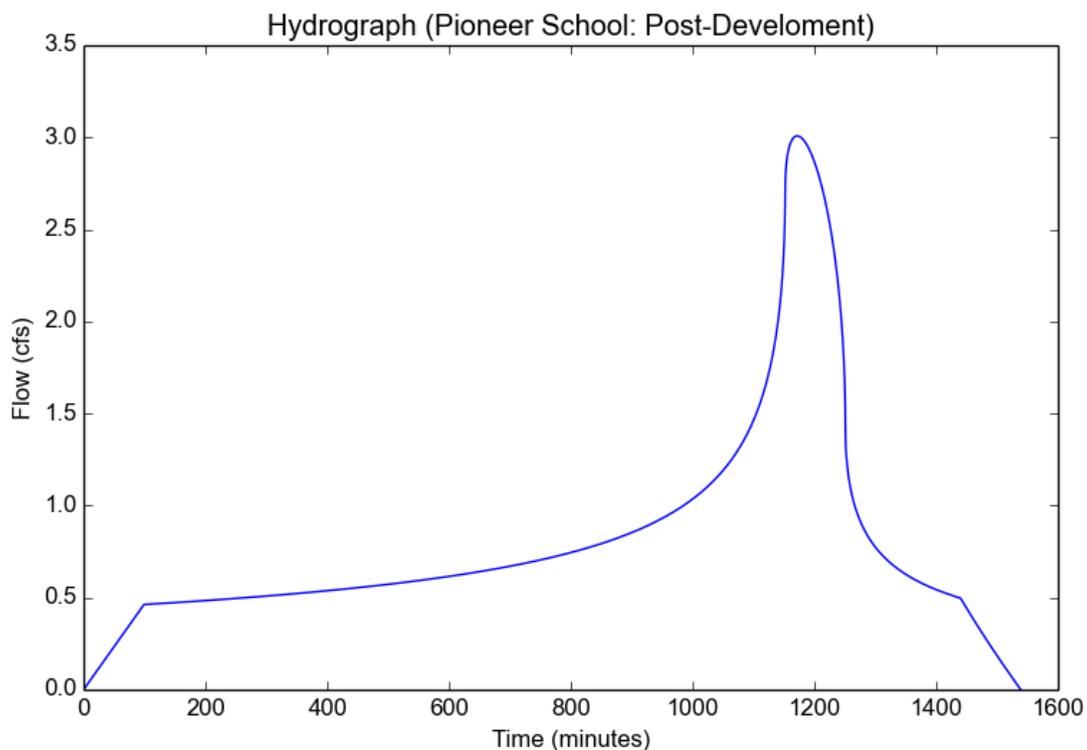
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Input Parameters

Project Name	Pioneer School
Subarea ID	Post-Development
Area (ac)	36.37
Flow Path Length (ft)	3017.0
Flow Path Slope (vft/hft)	0.0118
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.58
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.1466
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.564
Time of Concentration (min)	99.0
Clear Peak Flow Rate (cfs)	3.0081
Burned Peak Flow Rate (cfs)	3.0081
24-Hr Clear Runoff Volume (ac-ft)	1.6955
24-Hr Clear Runoff Volume (cu-ft)	73855.3158



Peak Flow Hydrologic Analysis

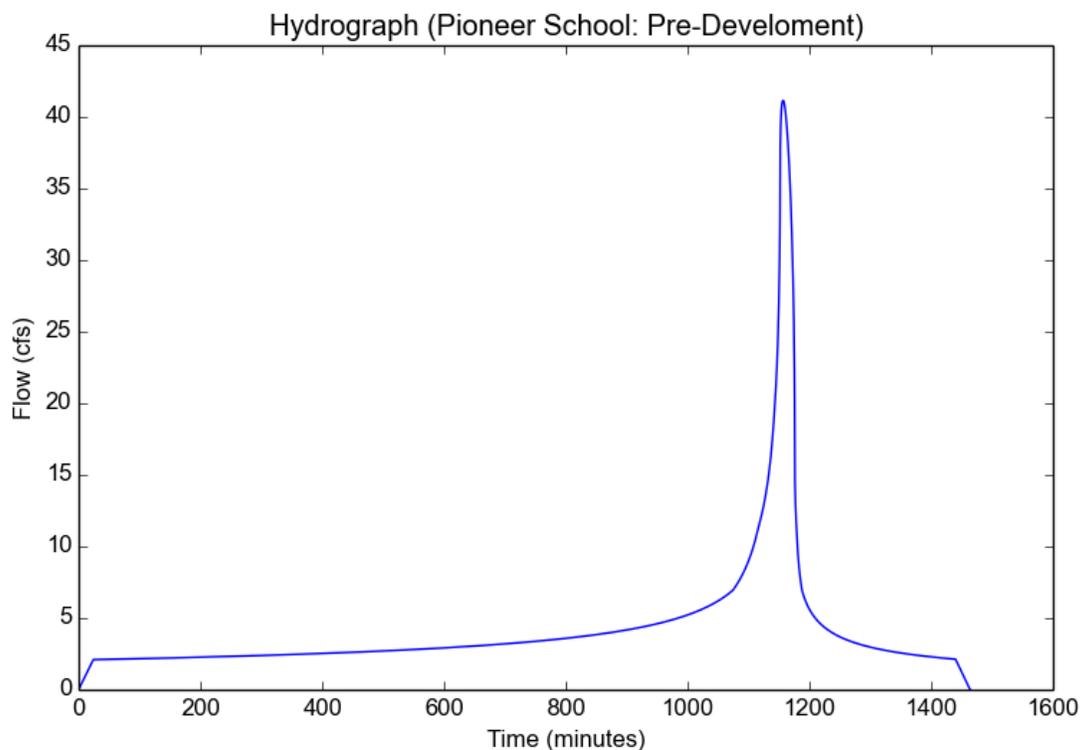
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Input Parameters

Project Name	Pioneer School
Subarea ID	Pre-Development
Area (ac)	36.37
Flow Path Length (ft)	2770.0
Flow Path Slope (vft/hft)	0.0129
50-yr Rainfall Depth (in)	7.05
Percent Impervious	0.52
Soil Type	6
Design Storm Frequency	10-yr
Fire Factor	0
LID	False

Output Results

Modeled (10-yr) Rainfall Depth (in)	5.0337
Peak Intensity (in/hr)	1.4368
Undeveloped Runoff Coefficient (Cu)	0.6658
Developed Runoff Coefficient (Cd)	0.7876
Time of Concentration (min)	24.0
Clear Peak Flow Rate (cfs)	41.1564
Burned Peak Flow Rate (cfs)	41.1564
24-Hr Clear Runoff Volume (ac-ft)	8.4767
24-Hr Clear Runoff Volume (cu-ft)	369243.95



Peak Flow Hydrologic Analysis

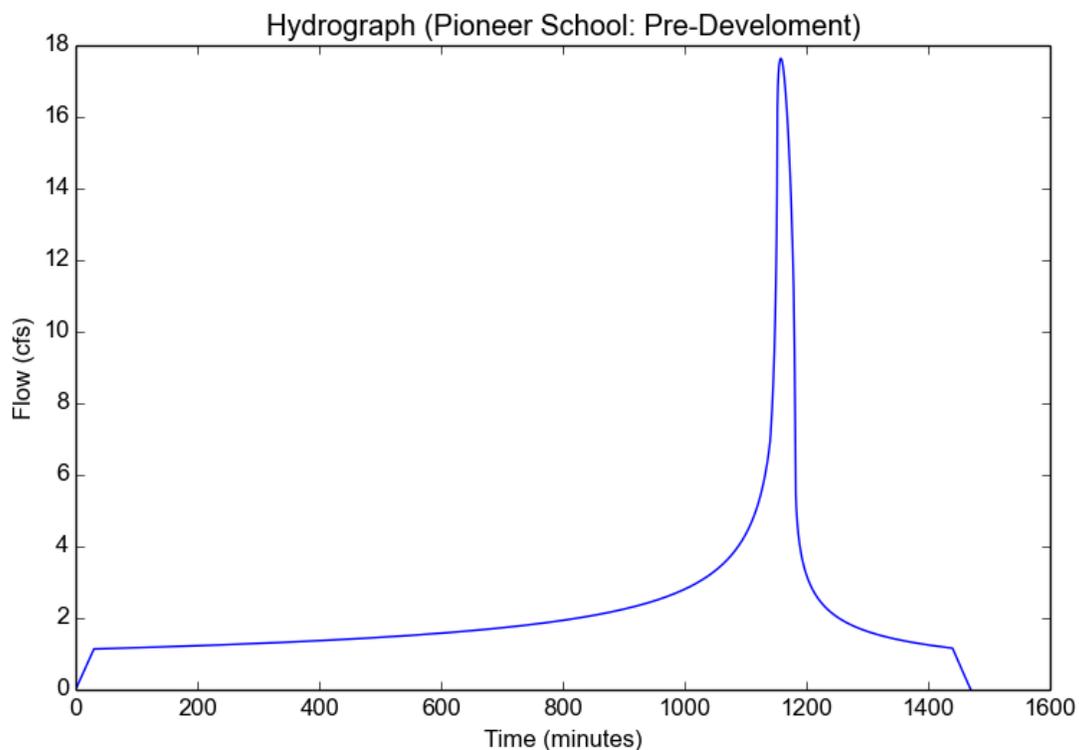
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Input Parameters

Project Name	Pioneer School
Subarea ID	Pre-Development
Area (ac)	36.37
Flow Path Length (ft)	2770.0
Flow Path Slope (vft/hft)	0.0129
50-yr Rainfall Depth (in)	7.05
Percent Impervious	0.52
Soil Type	6
Design Storm Frequency	2-yr
Fire Factor	0
LID	False

Output Results

Modeled (2-yr) Rainfall Depth (in)	2.7283
Peak Intensity (in/hr)	0.7012
Undeveloped Runoff Coefficient (Cu)	0.4655
Developed Runoff Coefficient (Cd)	0.6914
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	17.6347
Burned Peak Flow Rate (cfs)	17.6347
24-Hr Clear Runoff Volume (ac-ft)	4.3914
24-Hr Clear Runoff Volume (cu-ft)	191291.2605



Peak Flow Hydrologic Analysis

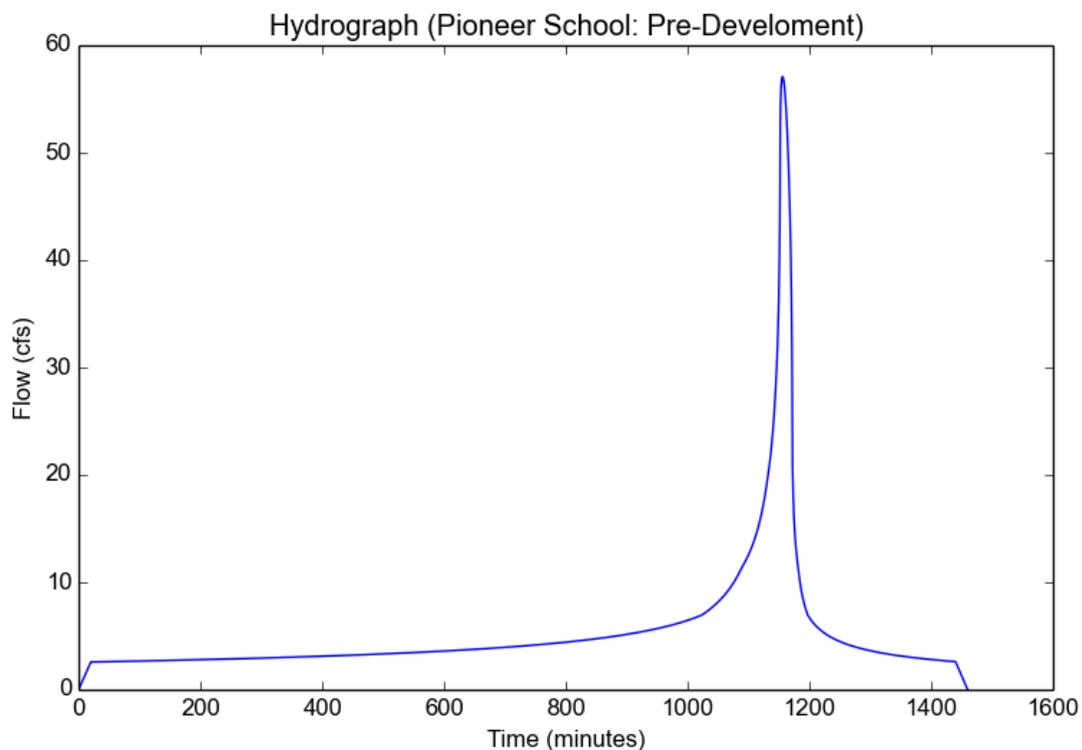
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	Pioneer School
Subarea ID	Pre-Development
Area (ac)	36.37
Flow Path Length (ft)	2770.0
Flow Path Slope (vft/hft)	0.0129
50-yr Rainfall Depth (in)	7.05
Percent Impervious	0.52
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.1899
Peak Intensity (in/hr)	1.9249
Undeveloped Runoff Coefficient (Cu)	0.7241
Developed Runoff Coefficient (Cd)	0.8155
Time of Concentration (min)	20.0
Clear Peak Flow Rate (cfs)	57.0966
Burned Peak Flow Rate (cfs)	57.0966
24-Hr Clear Runoff Volume (ac-ft)	10.6514
24-Hr Clear Runoff Volume (cu-ft)	463973.7023



Peak Flow Hydrologic Analysis

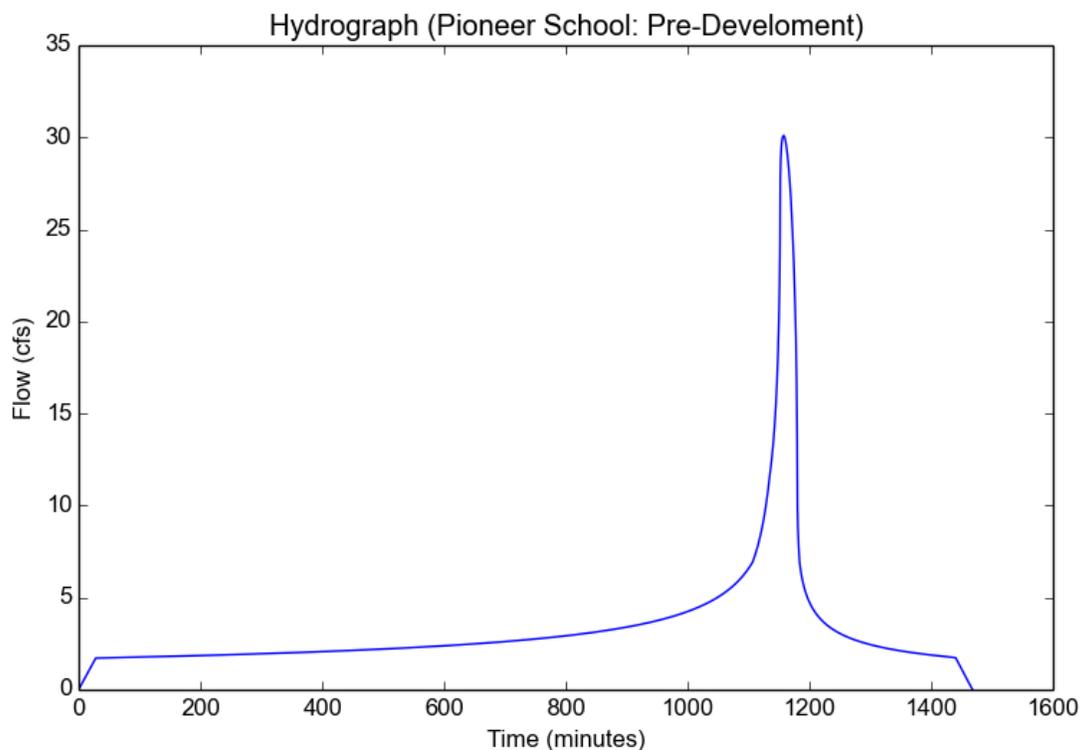
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Input Parameters

Project Name	Pioneer School
Subarea ID	Pre-Development
Area (ac)	36.37
Flow Path Length (ft)	2770.0
Flow Path Slope (vft/hft)	0.0129
50-yr Rainfall Depth (in)	7.05
Percent Impervious	0.52
Soil Type	6
Design Storm Frequency	5-yr
Fire Factor	0
LID	False

Output Results

Modeled (5-yr) Rainfall Depth (in)	4.1172
Peak Intensity (in/hr)	1.0931
Undeveloped Runoff Coefficient (Cu)	0.6024
Developed Runoff Coefficient (Cd)	0.7571
Time of Concentration (min)	28.0
Clear Peak Flow Rate (cfs)	30.1006
Burned Peak Flow Rate (cfs)	30.1006
24-Hr Clear Runoff Volume (ac-ft)	6.8173
24-Hr Clear Runoff Volume (cu-ft)	296963.589



Peak Flow Hydrologic Analysis

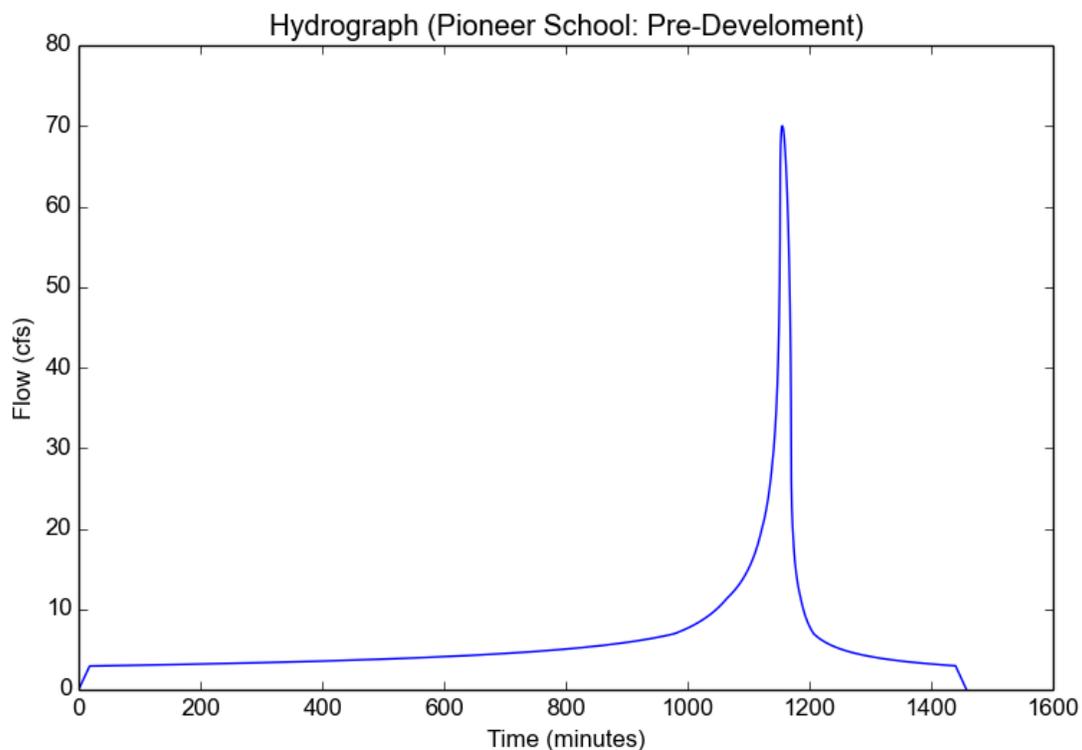
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Input Parameters

Project Name	Pioneer School
Subarea ID	Pre-Development
Area (ac)	36.37
Flow Path Length (ft)	2770.0
Flow Path Slope (vft/hft)	0.0129
50-yr Rainfall Depth (in)	7.05
Percent Impervious	0.52
Soil Type	6
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	7.05
Peak Intensity (in/hr)	2.3037
Undeveloped Runoff Coefficient (Cu)	0.7656
Developed Runoff Coefficient (Cd)	0.8355
Time of Concentration (min)	18.0
Clear Peak Flow Rate (cfs)	70.0037
Burned Peak Flow Rate (cfs)	70.0037
24-Hr Clear Runoff Volume (ac-ft)	12.3326
24-Hr Clear Runoff Volume (cu-ft)	537206.5457



Peak Flow Hydrologic Analysis

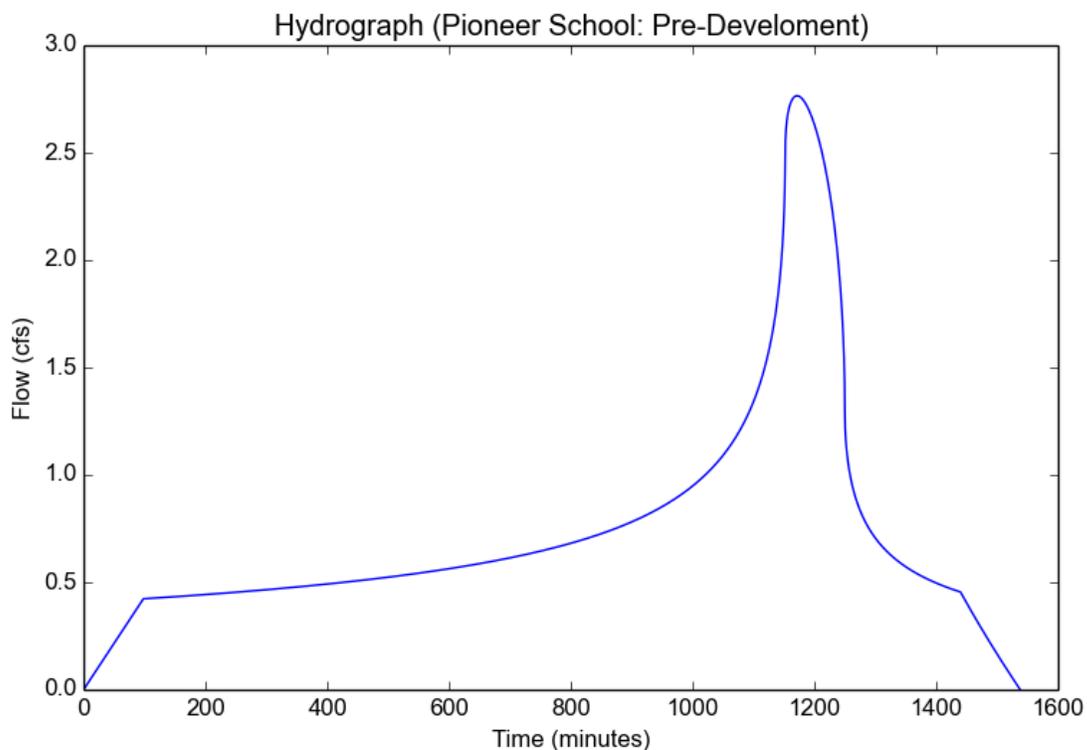
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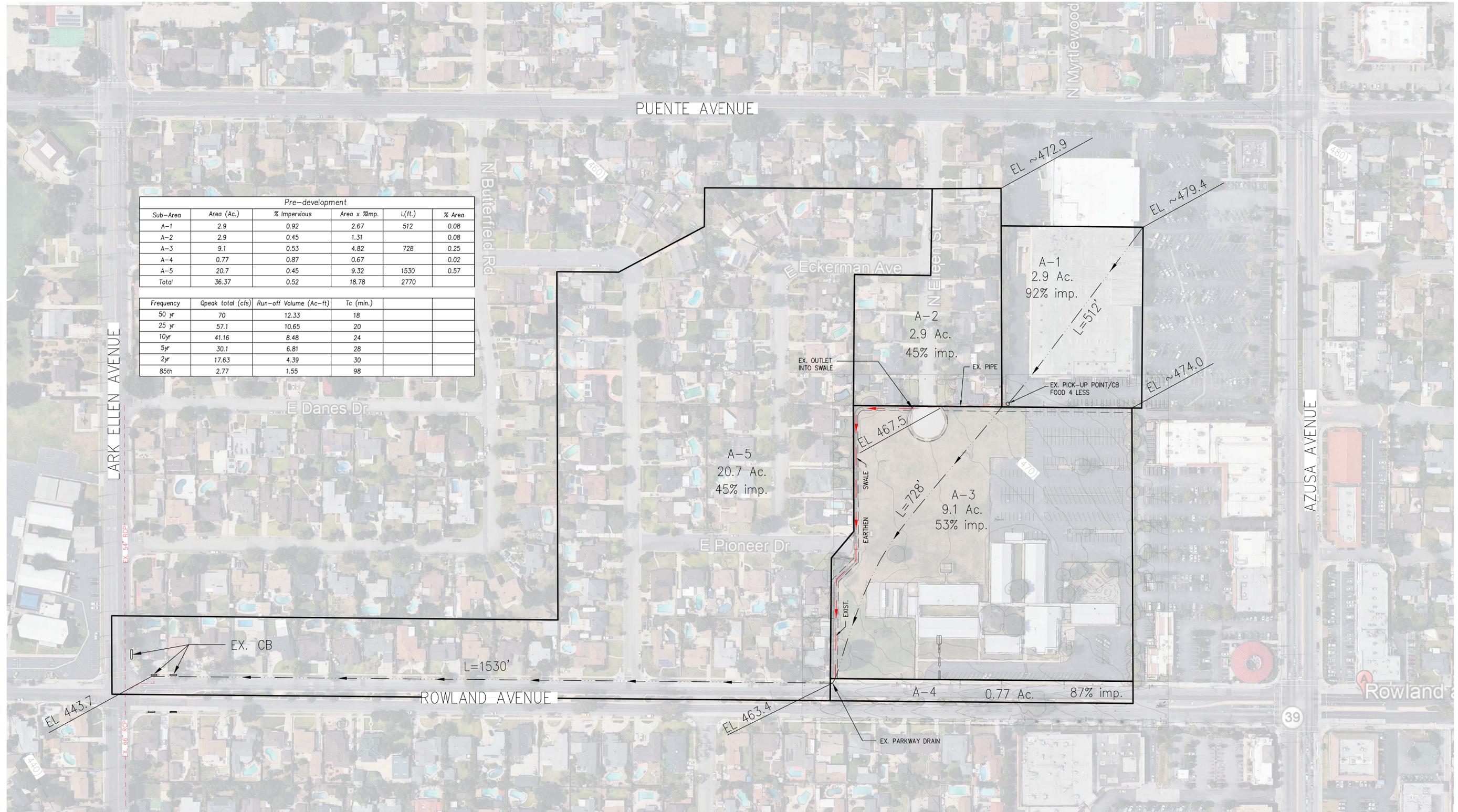
Input Parameters

Project Name	Pioneer School
Subarea ID	Pre-Development
Area (ac)	36.37
Flow Path Length (ft)	2770.0
Flow Path Slope (vft/hft)	0.0129
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.52
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.1473
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.516
Time of Concentration (min)	98.0
Clear Peak Flow Rate (cfs)	2.7653
Burned Peak Flow Rate (cfs)	2.7653
24-Hr Clear Runoff Volume (ac-ft)	1.5512
24-Hr Clear Runoff Volume (cu-ft)	67569.5733





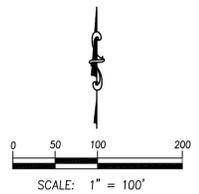
Pre-development					
Sub-Area	Area (Ac.)	% Impervious	Area x % Imp.	L(ft.)	% Area
A-1	2.9	0.92	2.67	512	0.08
A-2	2.9	0.45	1.31	512	0.08
A-3	9.1	0.53	4.82	728	0.25
A-4	0.77	0.87	0.67	1530	0.02
A-5	20.7	0.45	9.32	1530	0.57
Total	36.37	0.52	18.78	2770	

Frequency	Qpeak total (cfs)	Run-off Volume (Ac-ft)	Tc (min.)
50 yr	70	12.33	18
25 yr	57.1	10.65	20
10yr	41.16	8.48	24
5yr	30.1	6.81	28
2yr	17.63	4.39	30
85th	2.77	1.55	98



LEGEND

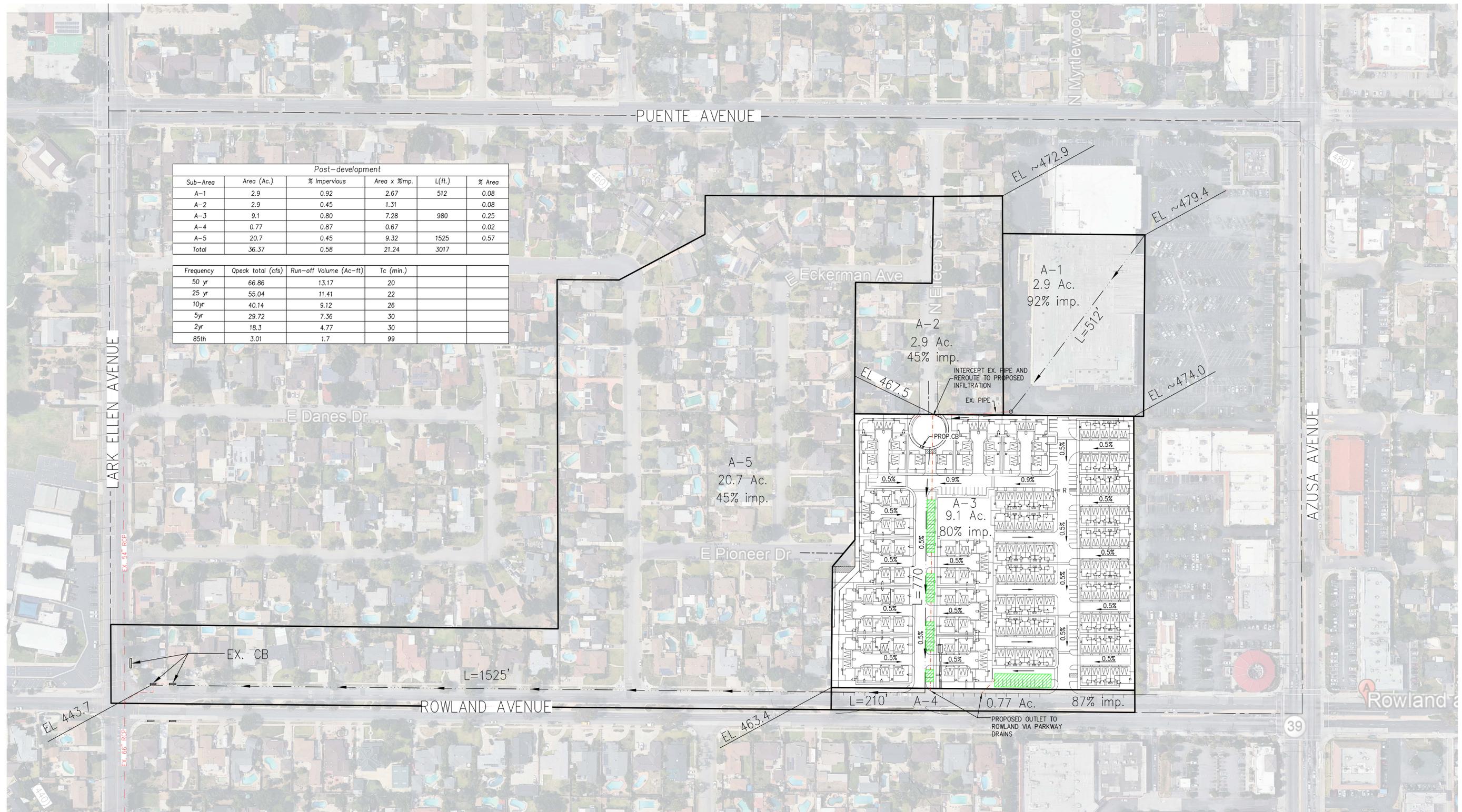
- EXISTING PIPE
- EX. SWALE
- FLOW LINE



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**HYDROLOGY MAP
PRE-DEVELOPMENT
PIONEER SCHOOL**

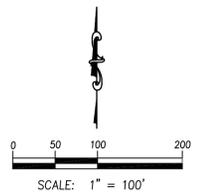


Post-development					
Sub-Area	Area (Ac.)	% Impervious	Area x %Imp.	L(ft.)	% Area
A-1	2.9	0.92	2.67	512	0.08
A-2	2.9	0.45	1.31	512	0.08
A-3	9.1	0.80	7.28	980	0.25
A-4	0.77	0.87	0.67		0.02
A-5	20.7	0.45	9.32	1525	0.57
Total	36.37	0.58	21.24	3017	

Frequency	Qpeak total (cfs)	Run-off Volume (Ac-ft)	Tc (min.)
50 yr	66.86	13.17	20
25 yr	55.04	11.41	22
10yr	40.14	9.12	26
5yr	29.72	7.36	30
2yr	18.3	4.77	30
85th	3.01	1.7	99

LEGEND

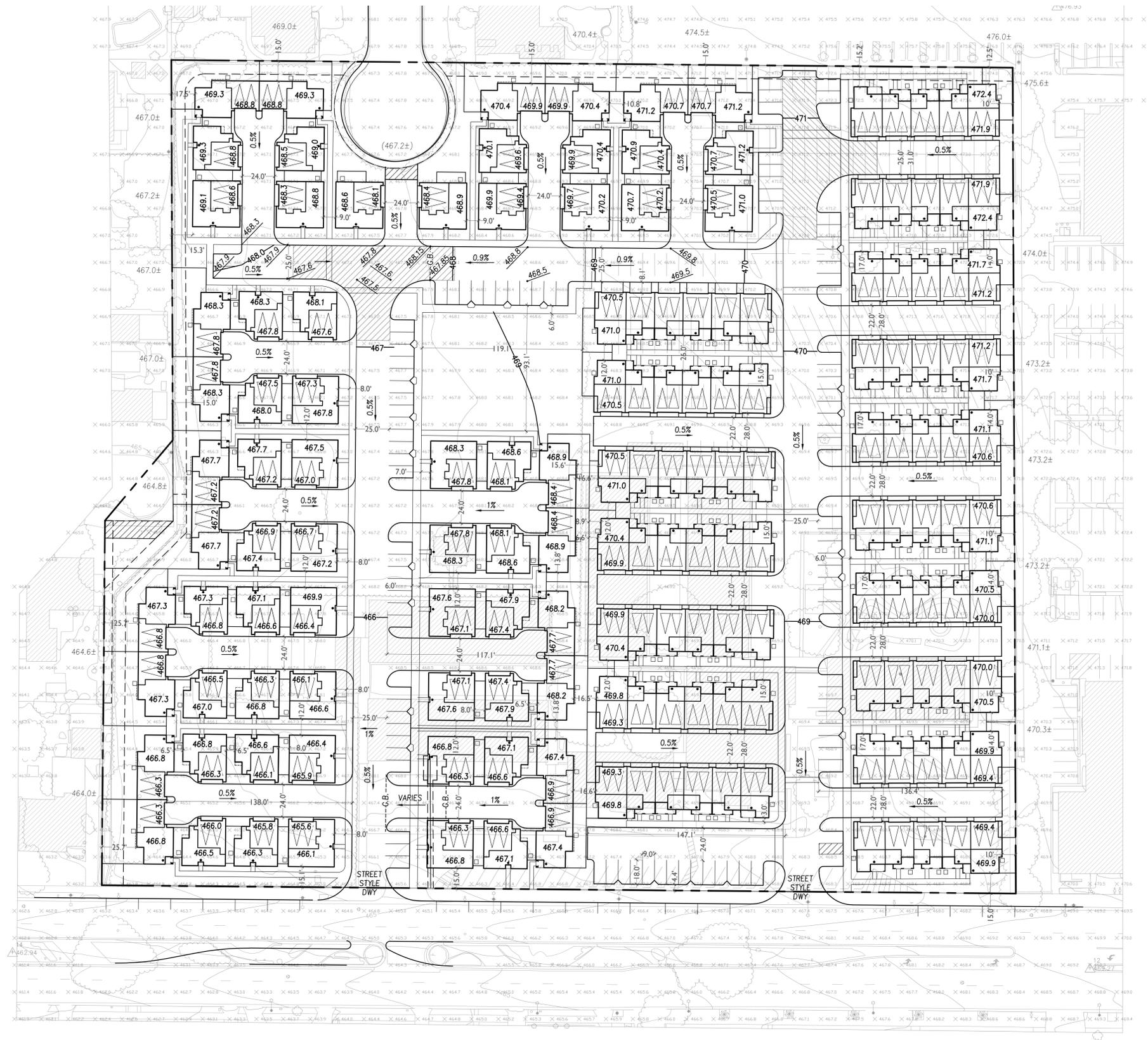
- EXISTING PIPE
- PROPOSED PIPE
- FLOW LINE
- PROPOSED DRAINAGE PATH
- PROPOSED INFILTRATION



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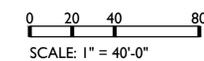
**HYDROLOGY MAP
POST-DEVELOPMENT
PIONEER SCHOOL**



PRELIMINARY GRADING PLAN

PIONEER SCHOOL SITE

West Covina, California



NOTES:

- HOUSE/UNIT ELEVATIONS ARE PAD GRADE
- STREET CONTOUR ARE FINISH PAVEMENT

EARTHWORK

	CUT (C.Y.)	FILL (C.Y.)
RAW EXCAVATIONS	8700	6450 *
OVER-EXCAVATION & RE-COMPACTION (3' SITE)	43,500	43,500
SUBSIDENCE (0.2' SITE)	-	2,900
LOSS (10%)	-	4,350
TOTAL	52,200	57,200
IMPORT		5,000 C.Y.

* ASSUMES 8" THICKNESS ROADWAY/PARKING BASE AND PAVEMENT.

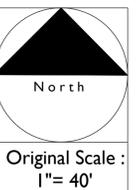
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Original Scale :
1" = 40'

