

APPENDIX H

Hydrology Analysis

HYDROLOGY, HYDRAULICS, AND LID REPORT

“ IMPORTANT NOTICE: The City of Lancaster’s Master Plan of Drainage Study and Master Planned Facilities report were being prepared during the time that this Study was being prepared. This project will be conditioned per the results of the City’s new Master Plan, which is expected to be completed in late 2017. Therefore, the off-site storm flows and proposed storm drains to convey off-site flows listed in this study are subject to change. The on-site basins proposed in the study are not anticipated to be affected by the City study as these basins are proposed to mitigate the increase in run off from the development and are independent from the off-site flows that need to be conveyed through the project site. “

Avanti South
Lancaster, California

July 17, 2017

PREPARED FOR:

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July 2016 - KHA Project #099185002

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I. INTRODUCTION

A. Purpose and Scope

The purpose of this study is to analyze the hydrology and hydraulic design for the proposed Avanti South residential development. This key points this study will address are:

1. The proposed building pads will sit above the revised FEMA Floodplain.
2. The proposed development will convey the on-site 25-year design storm via storm drain pipes while conveying the remainder of the 50-year design storm via street gutters. The 50-year design storms will be routed to on-site basins to either retain the design volume or detain 85% of the pre-development peak flow rate (Q).
3. The off-site drainage south of Avenue L shall be routed through the site via storm drain pipes.

B. Methodology and References

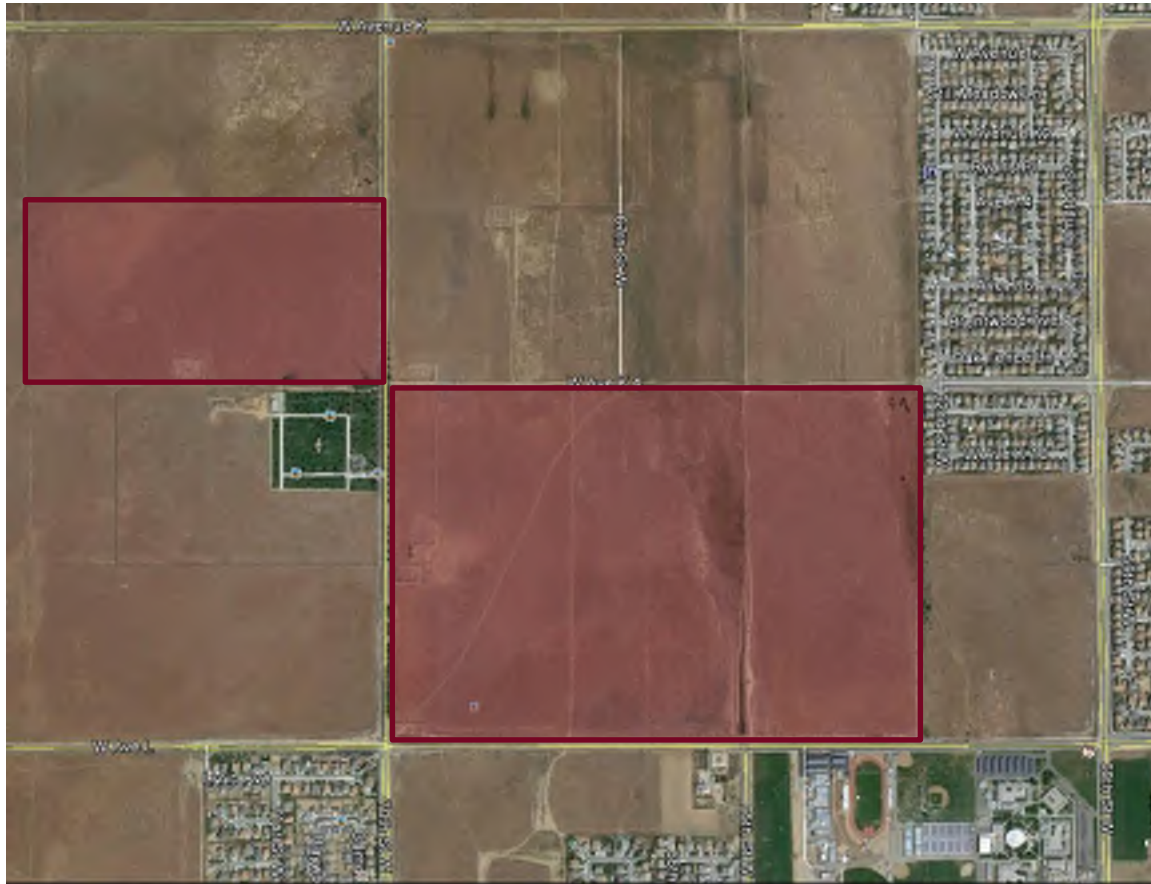
This study was performed using the following reference materials and tools:

1. Los Angeles County Department of Public Works Hydrology Manual. January 2006
2. HydroCalc (software)
3. Beltley FlowMaster (software)

C. Location and Description of Property

Figure 1 shows the proposed location of the proposed Avanti South residential development. The overall site includes a 240 acres portion bounded between Avenue L to Avenue K from 62nd Street West to 70th Street West and an 80 acre portion along 70th in Lancaster, CA. The APN's for the project are 3204-001-195, 3204-001-184, 3204-008-045, 3204-008-047. The site is undeveloped and has some existing vegetation. This site is relatively flat sloping at approximately one percent (1%) from the south to north via sheet flow over the majority of the site. The off-site runoff is concentrated at 65th Street and the easterly boundary of the site. See **Appendix C** for a copy of the Assessor's Parcels Map.

Figure 1. Location Map



D. Proposed Land Use

The proposed development will be part of the Avanti South Specific Plan, which is currently being reviewed by the City of Lancaster Planning Department.

II. Low Impact Development (LID) Requirements

Meeting with Carlyle Workman:

It is our understanding that the City of Lancaster is not subject to the LID regulations required by Los Angeles County. Therefore, no LID facilities have been proposed.

III. HYDROLOGY

A. Floodplain Information

Research into the Federal emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Los Angeles County, California and Incorporated Area Panel 415 of 2350 Map Number 06037C0415F Effective Date September 26, 2008 shows that the project lies within Zone X determined to be areas of 0.2% annual chance flood; areas of 1% chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile. (See FIRM attached Appendix C)

B. Overall Watershed Drainage

The project site lies within the Portal Ridge Watershed. This portion of the Portal Ridge Watershed was updated in 2005 via the Hydrology Study prepared for TTM 53229 by CCL Engineering. The noted study analyzed the off-site storm runoff that will affect the subject project as well as the onsite for TTM 53229. There exists (2) 72 inch storm drains in 65th Street West south of Avenue L that outlet to a graded ditch within an easement with a graded swale daylighting several hundred feet north of Avenue L. There are also (2) existing 84 inch storm drains in 65th Street West north of the subject property from Avenue J-12 northerly to Avenue J.

C. Drainage Concept

The noted 2005 hydrology study determined that **435 cfs** is conveyed through the existing double 72 inch storm drains at 65th Street West that cross under Avenue L. It also determined that **218 cfs** of offsite runoff enters the Avanti South site at the South East Corner (SEC) of the site, which is at Avenue L at the alignment of 62nd Street West. The Walmart project east of the Avanti South site is conditioned to install a storm drain in Avenue L to convey the **218 cfs** to outlet at the SEC of the Avanti South site. The Avanti South project will convey the noted **435 cfs** via a storm drain in 65th west from Avenue L northerly to Avenue K-8, the noted **218 cfs** will be conveyed via a storm drain along the eastern portion of Avanti South to Avenue K-8, then westerly in Avenue K-8 to 65th Street. The Avanti North project will then convey this offsite drainage through its site northerly to the existing 84 inch storm drain at Avenue J-12.

The 240 acre portion of Avanti South will mitigate the on-site storm run-off via four (4) detention basins located along the west side of 65th Street West. The on-site storm flows will be mitigated to 85% of the pre-developed condition out letting into the 65th Street West storm drains. The 80 acre portion of Avanti South will mitigate the storm run-off via three (3) retention basins. Retention basins are proposed for this portion of the project since there are no proposed storm drains for outlet. The basins will rely on infiltration and the final sizing will be based upon the results of percolation tests.

D. Project Site Drainage

Existing On-Site Drainage

The site is currently undeveloped natural grade and vegetation. Based on the Modified Rational Method (MODRAT) outlined in the LACDPW Hydrology Manual, using the HydroCalc software, the on-site 50-year pre-development peak runoff flow (Q) for the 240-acre parcel is **26.95 cfs**. Including the off-site flow, the total peak runoff flow is **679.95 cfs**. For the 80-acre parcel the pre-development peak runoff flow (Q) is **9.13 cfs**. See Appendix B for HydroCalc data. The 240-acre parcel will utilize detention basins, which will be designed to mitigate the maximum outflow to 85% of the pre-developed peak runoff. The 80-acre parcel will utilize retention basins sized to capture 100% of the 50-year generated runoff volume. Therefore, **no runoff** will leave the site.

Developed On-Site Drainage

The developed site consists of backbone streets and mass-graded pads for future development. Runoff will be conveyed to the basins via non-erosive drainage devices including catch basins and street gutters.

Based on the Modified Rational Method (MODRAT) outlined in the LACDPW Hydrology Manual, using the HydroCalc software, the 50-year post-developed runoff volume for the 240-acre and 80-acre parcels are **2,224,101 cf** and **700,832 cf** respectively. See Appendix B for HydroCalc Data. Since the developed runoff will be split into several sub-areas and captured in catch basins, the peak flows (Q) were analyzed for each drainage area (DMA). The hydrographs for the developed sub-areas were utilized to calculate the required storage of each basin.

IV. PROPOSED DRAINAGE FACILITIES

A. General Description

The project incorporates the following types of drainage facilities:

1. Concrete Street Gutters
2. Local Catch Basins
3. Retention Basins
4. Detention Basins

B. Hydraulic Analyses

According to the current Hydrology Report for the Avanti North property done by MDS Consulting, the 72" storm drain pipe proposed within 65th Street West will be daylighting into the detention basin located north of Avenue K-8. It is assumed that the hydraulic grade line at the basin will be at the invert of the outfall pipe. The 72" main will not be flowing under pressure. Therefore, the hydraulic grade lines of the system will be the same as the depth of flow. The flow depths are shown on the Basin Sections Exhibit in Appendix A.

C. Facility Design Calculations

Storm Drain Pipes

All storm drain pipes were sized using FlowMaster with Manning's Formula. Peak flows were determined by establishing a baseline cfs/acre based on impervious data available in the LA County Hydrology Manual. This baseline cfs/acre was used to determine the total cfs flowing to each catch basin's tributary area

Retention Basin

Retention basins for the 80-acre parcel are sized to hold the entirety of the 50-year storm. The retention rates of the existing soils are assumed to be 3.75 in/hr. This is based on percolation testing of a neighboring property conducted by Earth Systems. These assumed percolation rates will allow the 50-year storm to infiltrate within the required drawdown time. All calculations were performed using HydroCalc. Impervious values for specific plan areas were determined using Appendix D of the LA County Hydrology Manual based on proposed land use.

Detention Basin

Detention basins for the 240-acre parcel are sized to mitigate 85% of the peak pre-developed flow (Q) for each drainage area. Additional retention volume is provided below the detention floor based on the inverts of connecting storm drain pipes from the drainage areas. To be conservative, infiltration within the retention volume was not taken into account in the detention basin sizing. Detention volumes were determined by adding the volume of the proposed hydrograph that exceeded 85% of the peak runoff flow from the existing hydrograph. All calculations were performed using HydroCalc. Impervious values for specific plan areas were determined using Appendix D of the LA County Hydrology Manual based on proposed land use.

V. CONCLUSIONS

Impact of proposed development on off-site property and facilities

The proposed development results in a decrease in runoff and flow depth to the adjacent roadways adjacent to the site by limiting the flow leaving the site to 85% off the peak pre-developed flow for the 240-acre site. The 80-acre site shall capture and infiltrate 100% of the post-development 50-year design storm. The proposed grading design maintains the historic drainage patterns and adequately conveys all off-site drainage through the site via a proposed storm drain system.

On-site flood protection

The proposed project shall set pads above existing grade ensuring the site will remain outside of the FEMA floodplain.

Appendix A
Exhibits

34° 45' 00"

ROSAMOND 1-HI.77

-118° 15' 00"

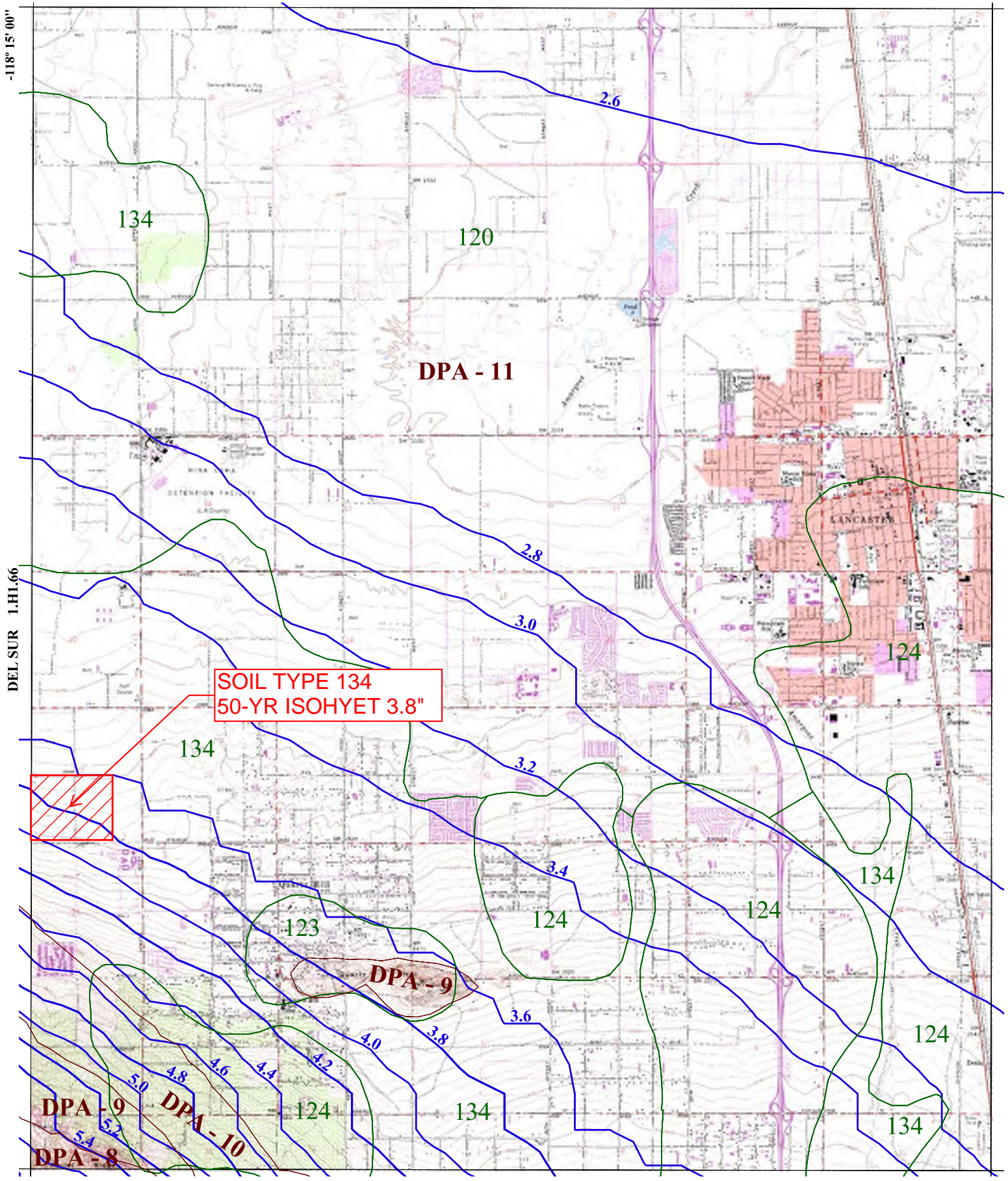
DEL SUR 1-HI.66

LANCASTER EAST 1-HI.68

-118° 07' 30"

RITTER RIDGE 1-HI.57

34° 37' 30"



**SOIL TYPE 134
50-YR ISOHYET 3.8"**

DPA - 9
DPA - 10
DPA - 8



- 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

**LANCASTER WEST
50-YEAR 24-HOUR ISOHYET**

1-HI.67



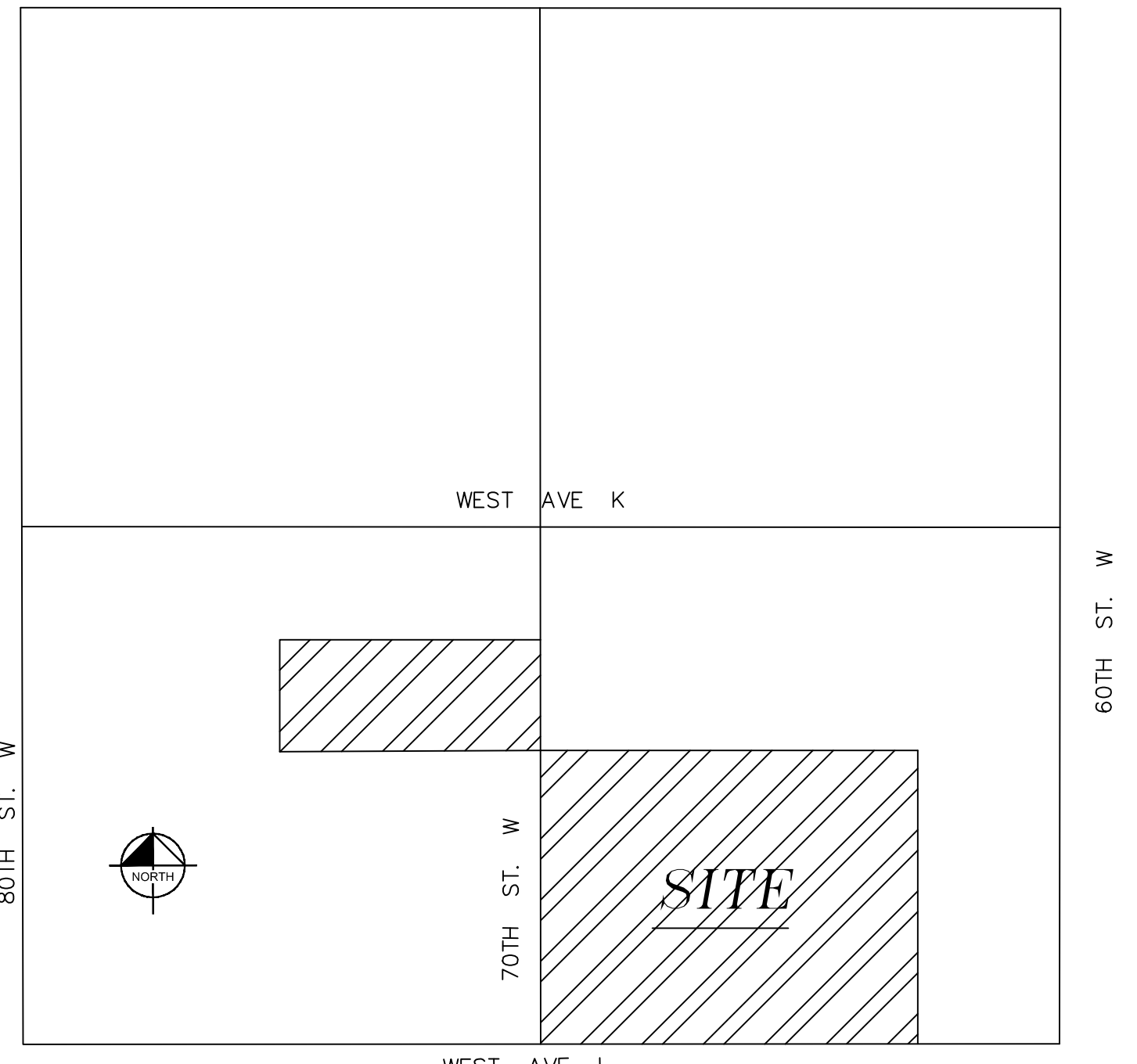


LEGEND

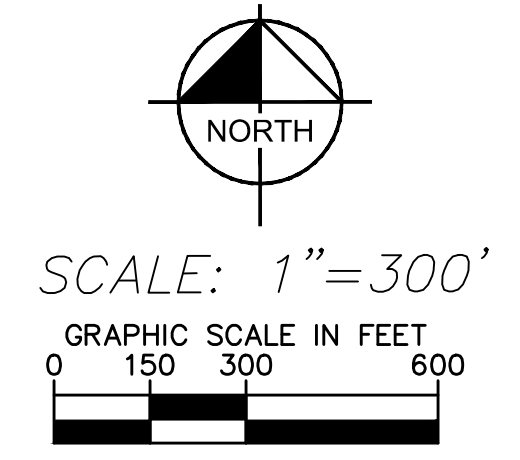
- DRAINAGE AREA NO. (EAST/WEST)
- DRAINAGE AREA (ACRE) | Q₅₀ PEAK FLOW RATE (CFS)
- DRAINAGE AREA BOUNDARY
- EXISTING CONTOUR ELEVATION
- DIRECTION OF FLOW

SITE CHARACTERISTICS

SOIL CLASSIFICATION NUMBER = 134
 24-HOUR, 50-YEAR RAINFALL DEPTH = 3.8 IN
 PERCENT IMPERVIOUS (BASED ON LA COUNTY HYDROLOGY STANDARDS) = 2%



VICINITY MAP
NTS



EXISTING HYDROLOGY MAP
AVANTI SOUTH
 MAY 26, 2016

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***NOTE:**
RETENTION BASIN LOCATIONS DEPENDENT ON FINAL LAND PLAN. SIZING MAY VARY BASED ON FINAL PERCOLATION TEST RATES

AVANTI SOUTH - HYDROLOGY SUMMARY				
DRAINAGE AREA	EFFECTIVE IMPERVIOUS AREA	DETENTION VOLUME REQUIRED (CF)	DETENTION VOLUME PROVIDED (CF)	Q ₅₀ ALLOWABLE (CFS)
DMA 1E	75%	56,703	-	2.12
DMA 1W	68%	62,924	-	2.81
DMA 1 (TOTAL)	-	119,627	199,000	4.93
DMA 2E	69%	64,816	-	2.82
DMA 2W	72%	86,561	-	3.49
DMA 2 (TOTAL)	-	151,377	218,700	6.30
DMA 3E	69%	47,234	-	2.05
DMA 3W	66%	80,363	-	3.79
DMA 3 (TOTAL)	-	127,597	181,100	5.84
DMA 4E	80%	94,022	-	3.12
DMA 4W	86%	93,615	-	2.72
DMA 4 (TOTAL)	-	187,637	201,000	5.84
DMA 5*	67%	700,830	723,500	-

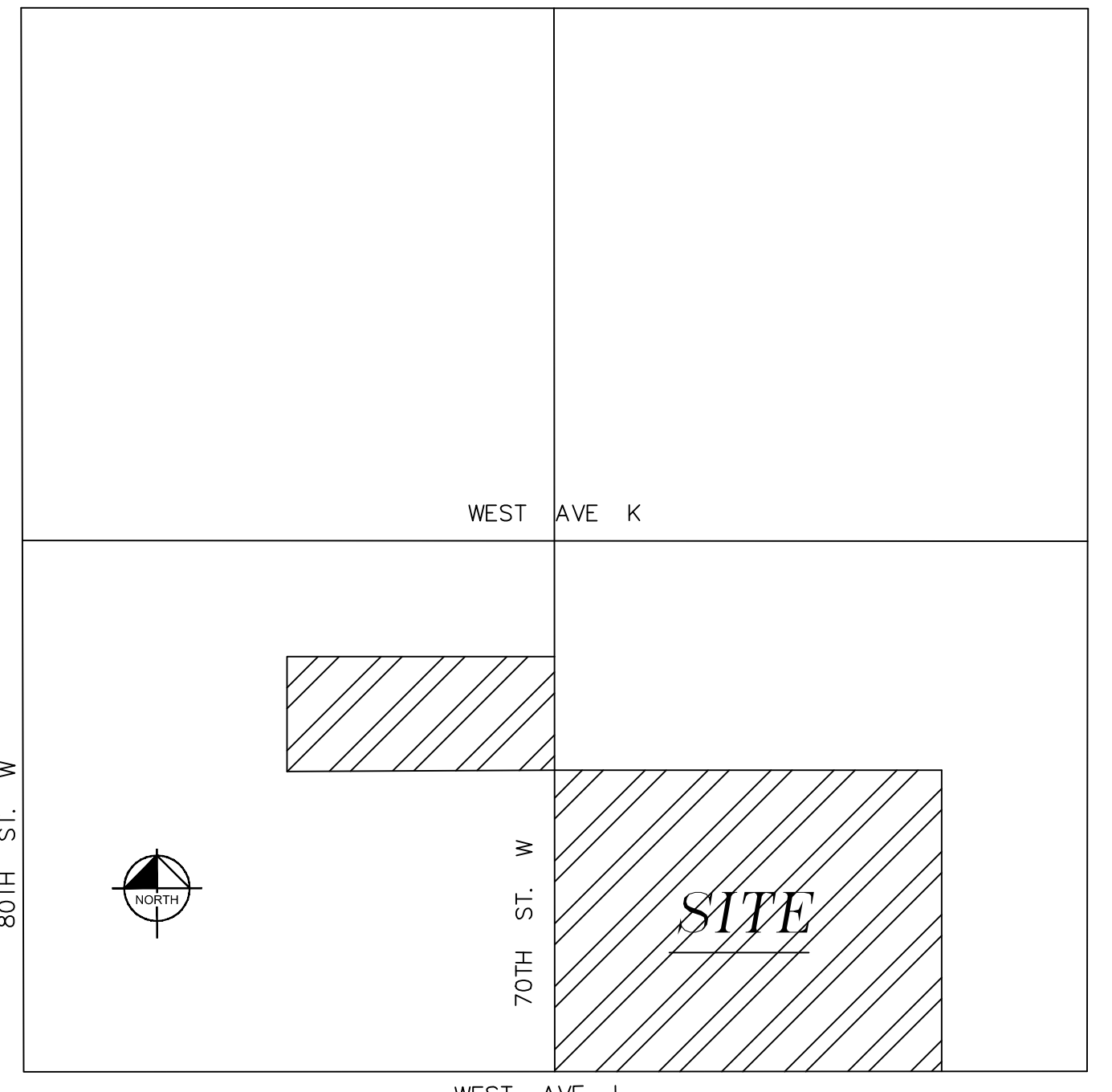
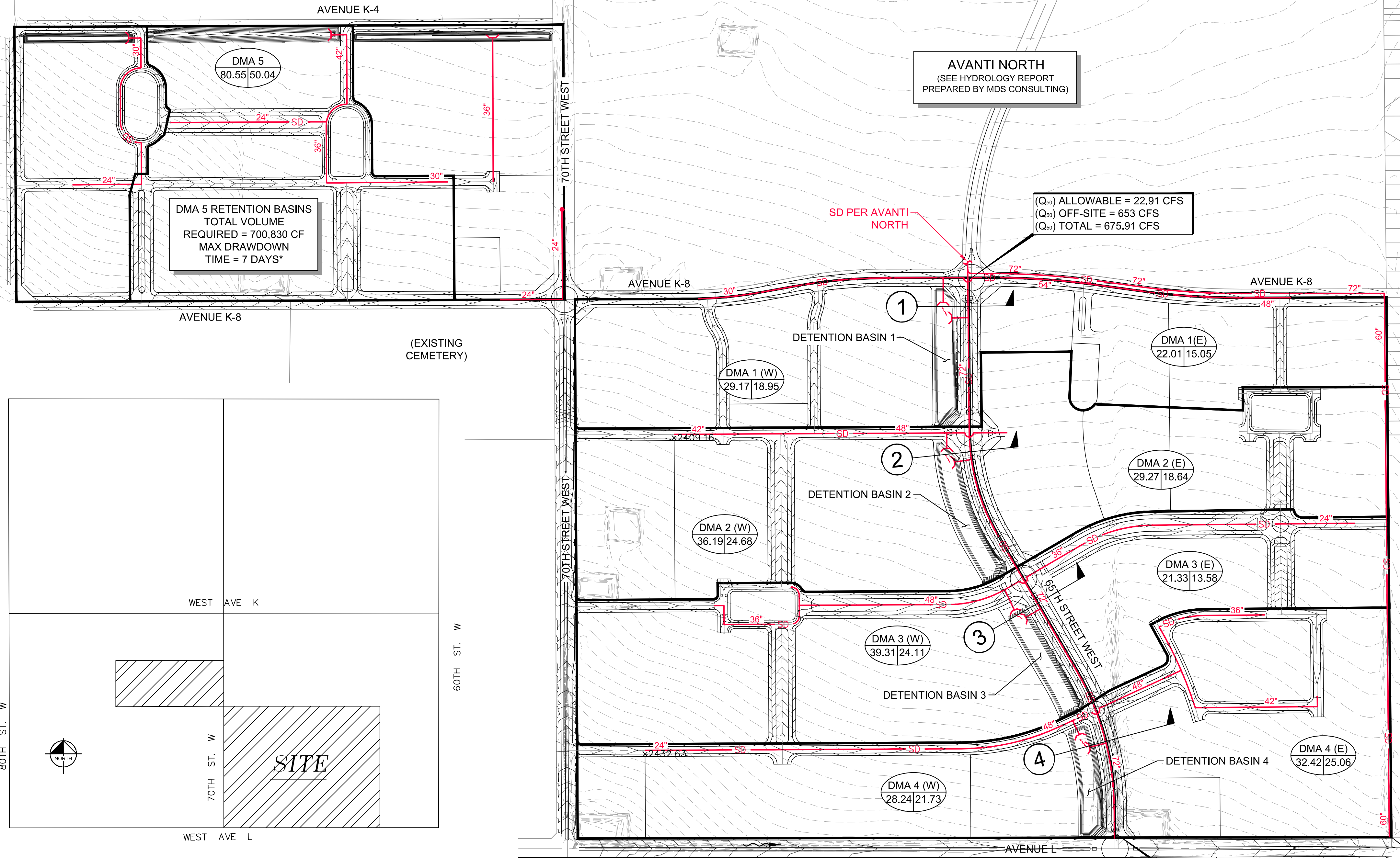
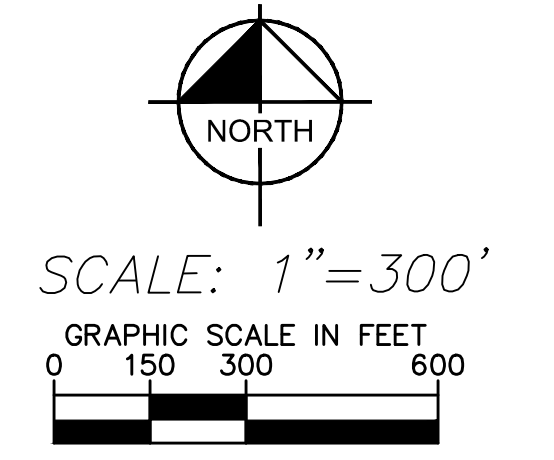
*NOTE: DMA 5 SHALL FLOW TO A RETENTION BASIN AND SHALL NOT DISCHARGE ANY OF THE DEVELOPED RUNOFF

LEGEND

- DRAINAGE AREA NO. (EAST/WEST)
- DRAINAGE AREA (ACRE)
- Q₅₀ PEAK FLOW RATE (CFS)
- DRAINAGE AREA BOUNDARY
- EXISTING CONTOUR ELEVATION
- PROPOSED CONTOUR
- PROPOSED STORM DRAIN

SITE CHARACTERISTICS

SOIL CLASSIFICATION NUMBER = 134
24-HOUR, 50-YEAR RAINFALL DEPTH = 3.8 IN



VICINITY MAP
NTS

AVANTI NORTH
(SEE HYDROLOGY REPORT PREPARED BY MDS CONSULTING)

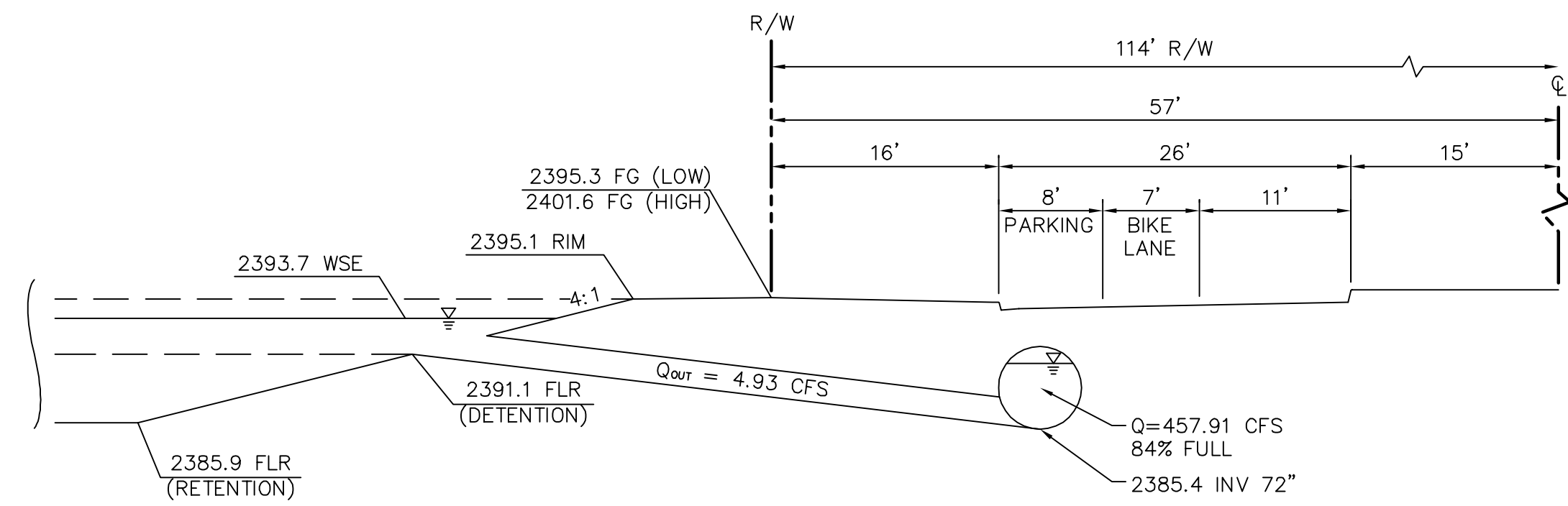
(Q₅₀) ALLOWABLE = 22.91 CFS
(Q₅₀) OFF-SITE = 653 CFS
(Q₅₀) TOTAL = 675.91 CFS

(Q₅₀) OFF-SITE = 435 CFS
(OBTAINED FROM HYDROLOGY REPORT PREPARED BY CCL ENGINEERING)

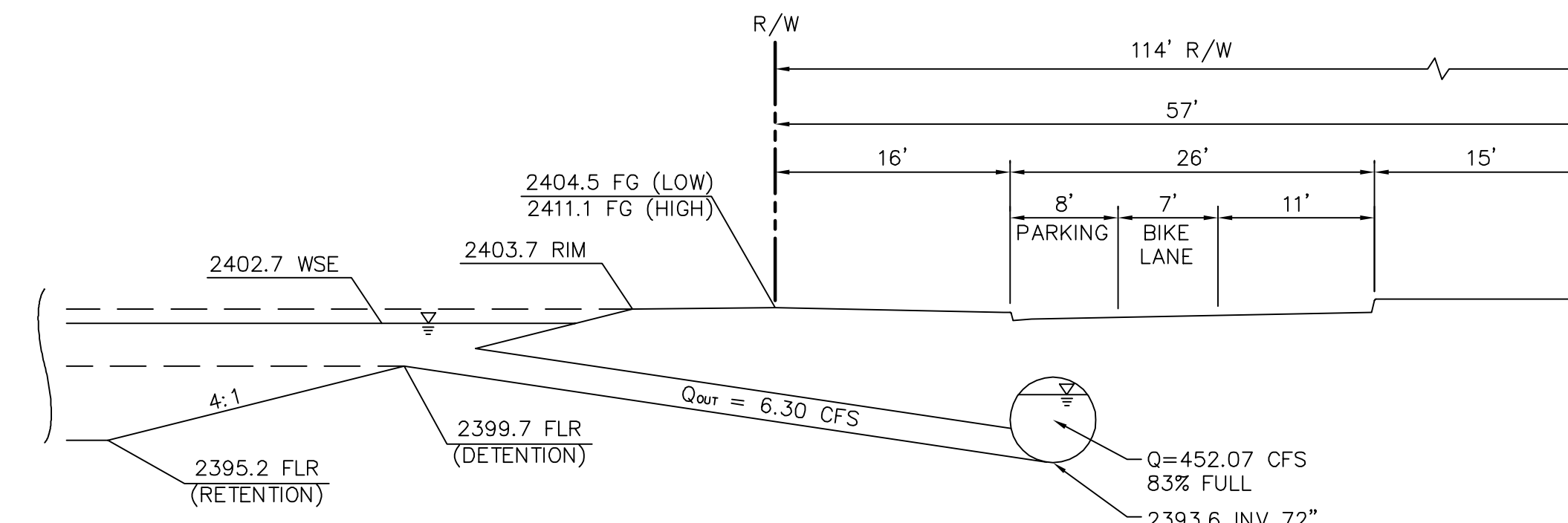
(Q₅₀) OFF-SITE = 218 CFS
(OBTAINED FROM HYDROLOGY REPORT PREPARED BY CCL ENGINEERING)

**PROPOSED HYDROLOGY MAP
AVANTI SOUTH
MAY 26, 2016**

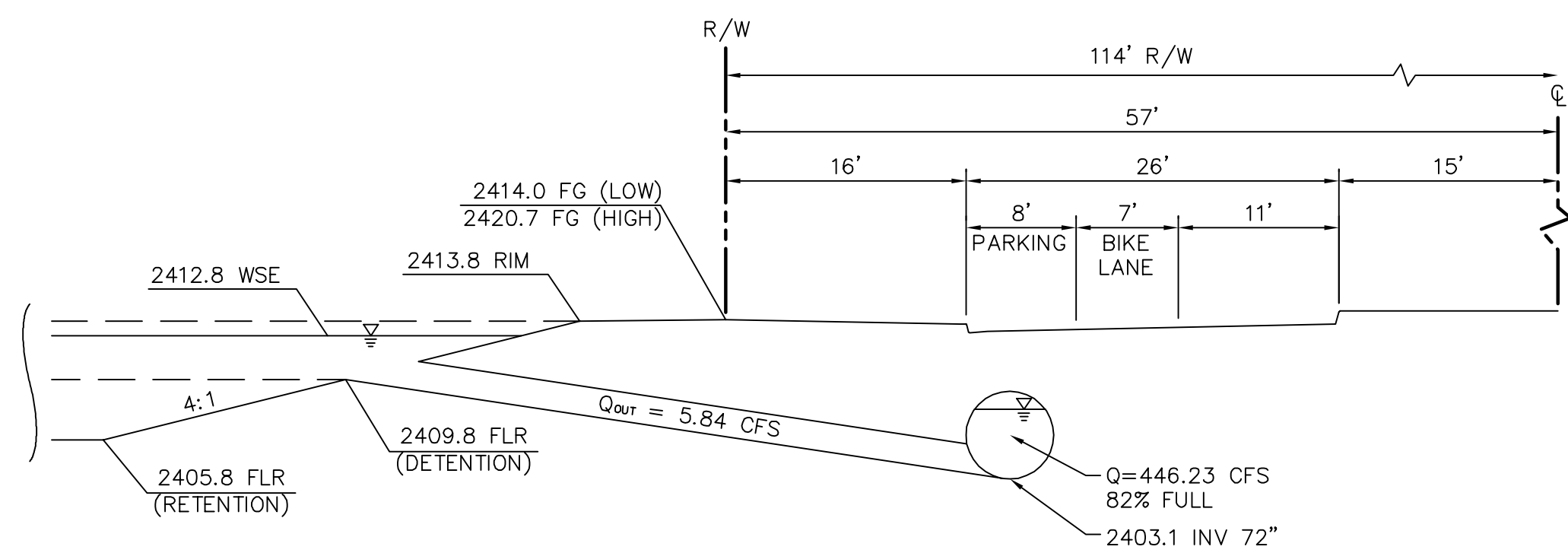
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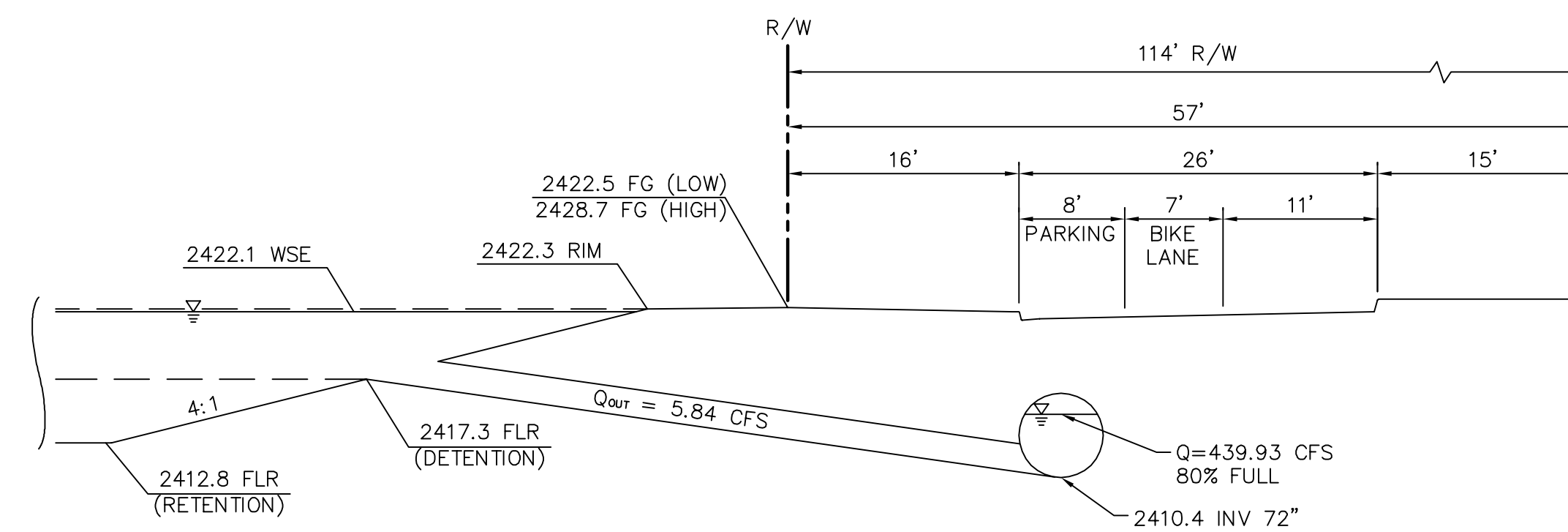
BASIN 1
 $V_{PROVIDED} = 199,000$ CF
 $V_{REQUIRED} = 119,627$ CF
 $V_{RETENTION} = 136,170$ CF
 $Q_{OUT} = 4.93$ CFS (85% PREDEVELOPED)



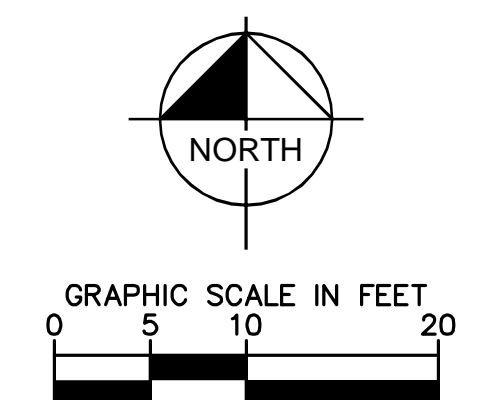
BASIN 2
 $V_{PROVIDED} = 218,700$ CF
 $V_{REQUIRED} = 151,377$ CF
 $V_{RETENTION} = 139,150$ CF
 $Q_{OUT} = 6.30$ CFS (85% PREDEVELOPED)



BASIN 3
 $V_{PROVIDED} = 181,100$ CF
 $V_{REQUIRED} = 121,597$ CF
 $V_{RETENTION} = 106,940$ CF
 $Q_{OUT} = 5.84$ CFS (85% PREDEVELOPED)



BASIN 4
 $V_{PROVIDED} = 201,000$ CF
 $V_{REQUIRED} = 187,637$ CF
 $V_{RETENTION} = 88,170$ CF
 $Q_{OUT} = 5.84$ CFS (85% PREDEVELOPED)



BASIN CROSS SECTIONS
AVANTI SOUTH
MAY 26, 2016

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Appendix B
Hydrologic Calculations

Peak Flow Hydrologic Analysis

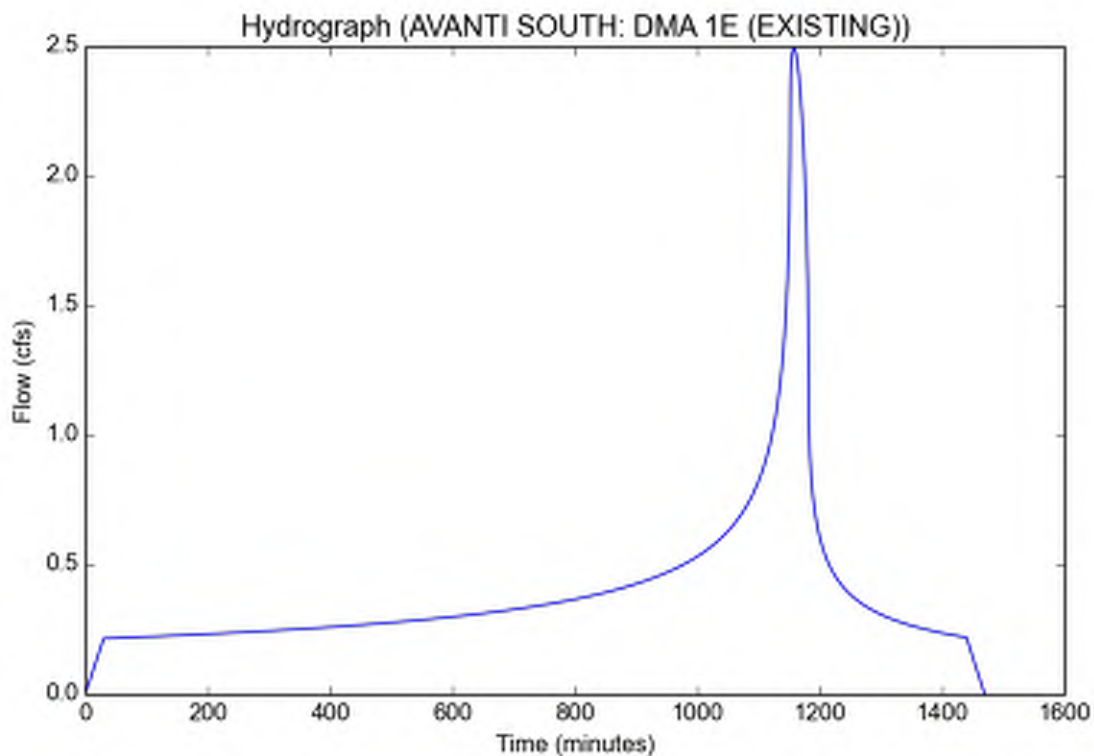
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 1E (EXISTING)
Area (ac)	22.01
Flow Path Length (ft)	1500.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.02
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.116
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	2.4936
Burned Peak Flow Rate (cfs)	2.4936
24-Hr Clear Runoff Volume (ac-ft)	0.8018
24-Hr Clear Runoff Volume (cu-ft)	34927.6298



Peak Flow Hydrologic Analysis

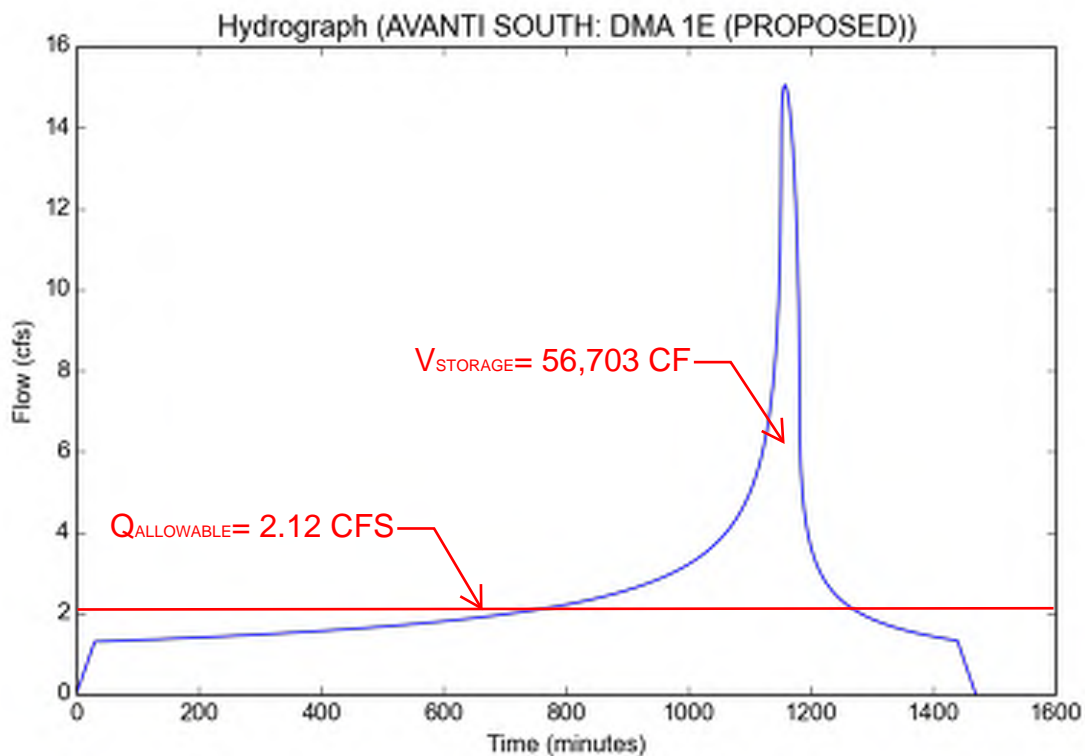
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 1E (PROPOSED)
Area (ac)	22.01
Flow Path Length (ft)	2000.0
Flow Path Slope (vft/hft)	0.003
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.75
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.7
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	15.0478
Burned Peak Flow Rate (cfs)	15.0478
24-Hr Clear Runoff Volume (ac-ft)	4.8386
24-Hr Clear Runoff Volume (cu-ft)	210770.1799



Peak Flow Hydrologic Analysis

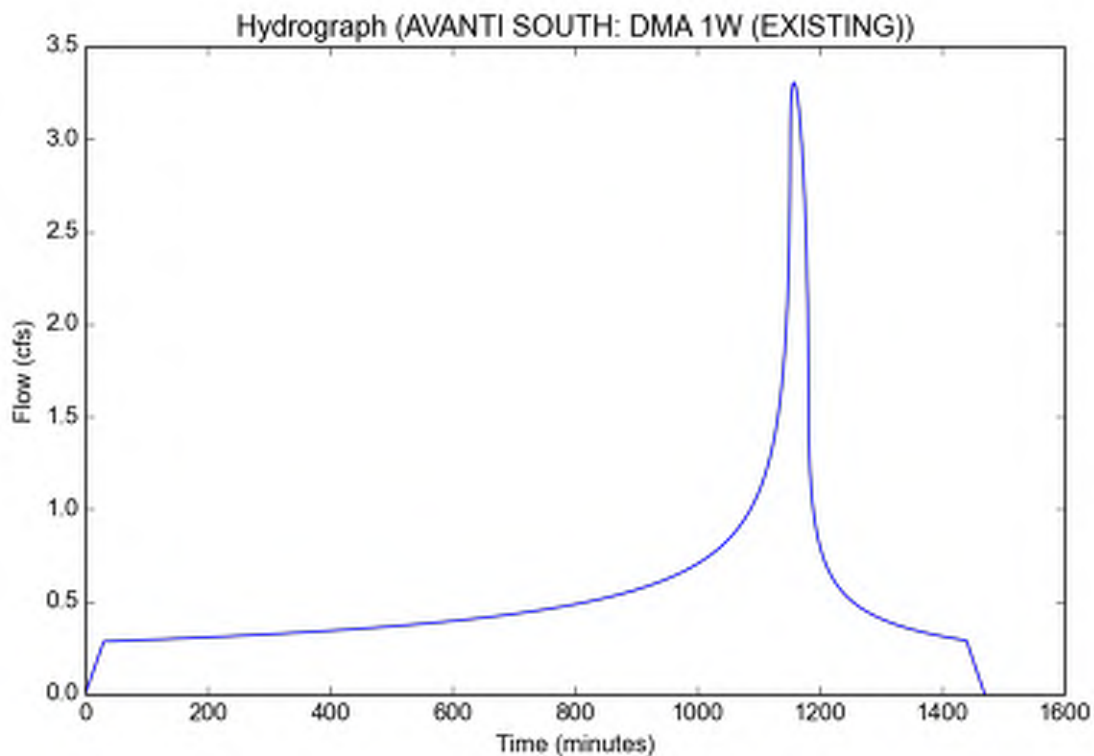
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 1W (EXISTING)
Area (ac)	29.17
Flow Path Length (ft)	2000.0
Flow Path Slope (vft/hft)	0.007
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.02
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.116
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	3.3048
Burned Peak Flow Rate (cfs)	3.3048
24-Hr Clear Runoff Volume (ac-ft)	1.0627
24-Hr Clear Runoff Volume (cu-ft)	46289.8211



Peak Flow Hydrologic Analysis

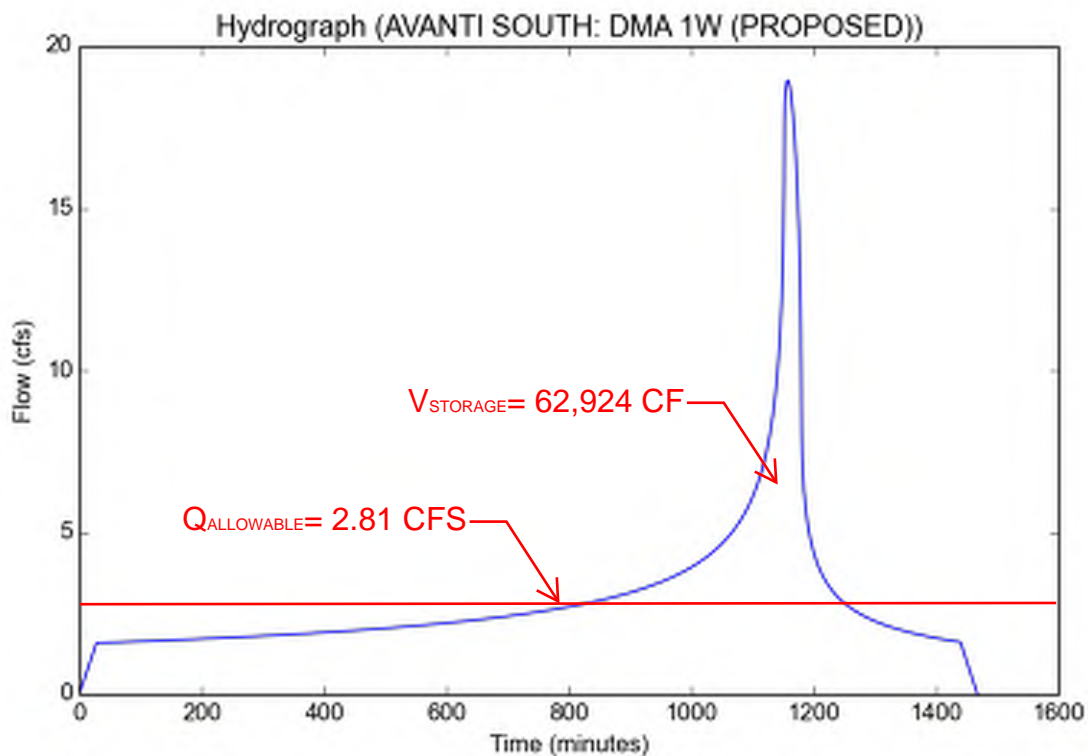
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 1W (PROPOSED)
Area (ac)	29.17
Flow Path Length (ft)	2000.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.68
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	1.0089
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.644
Time of Concentration (min)	28.0
Clear Peak Flow Rate (cfs)	18.9522
Burned Peak Flow Rate (cfs)	18.9522
24-Hr Clear Runoff Volume (ac-ft)	5.8996
24-Hr Clear Runoff Volume (cu-ft)	256987.9333



Peak Flow Hydrologic Analysis

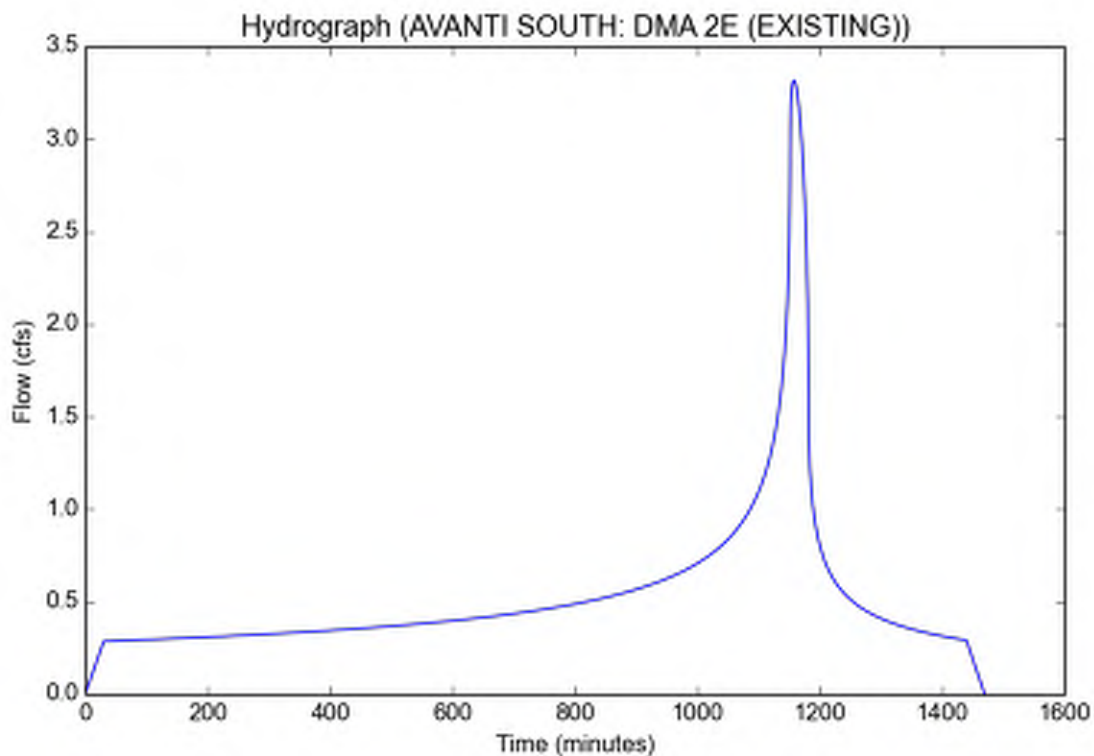
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 2E (EXISTING)
Area (ac)	29.27
Flow Path Length (ft)	2000.0
Flow Path Slope (vft/hft)	0.005
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.02
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.116
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	3.3162
Burned Peak Flow Rate (cfs)	3.3162
24-Hr Clear Runoff Volume (ac-ft)	1.0663
24-Hr Clear Runoff Volume (cu-ft)	46448.5109



Peak Flow Hydrologic Analysis

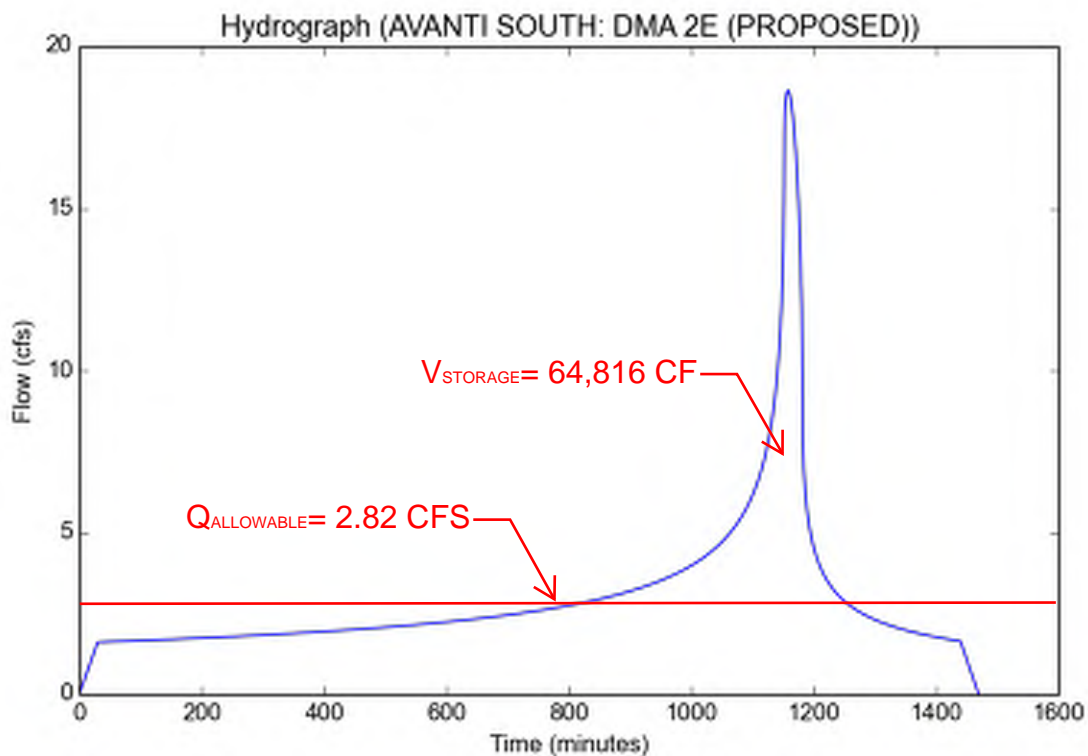
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 2E (PROPOSED)
Area (ac)	29.27
Flow Path Length (ft)	2100.0
Flow Path Slope (vft/hft)	0.004
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.69
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.652
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	18.6391
Burned Peak Flow Rate (cfs)	18.6391
24-Hr Clear Runoff Volume (ac-ft)	5.9934
24-Hr Clear Runoff Volume (cu-ft)	261072.6646



Peak Flow Hydrologic Analysis

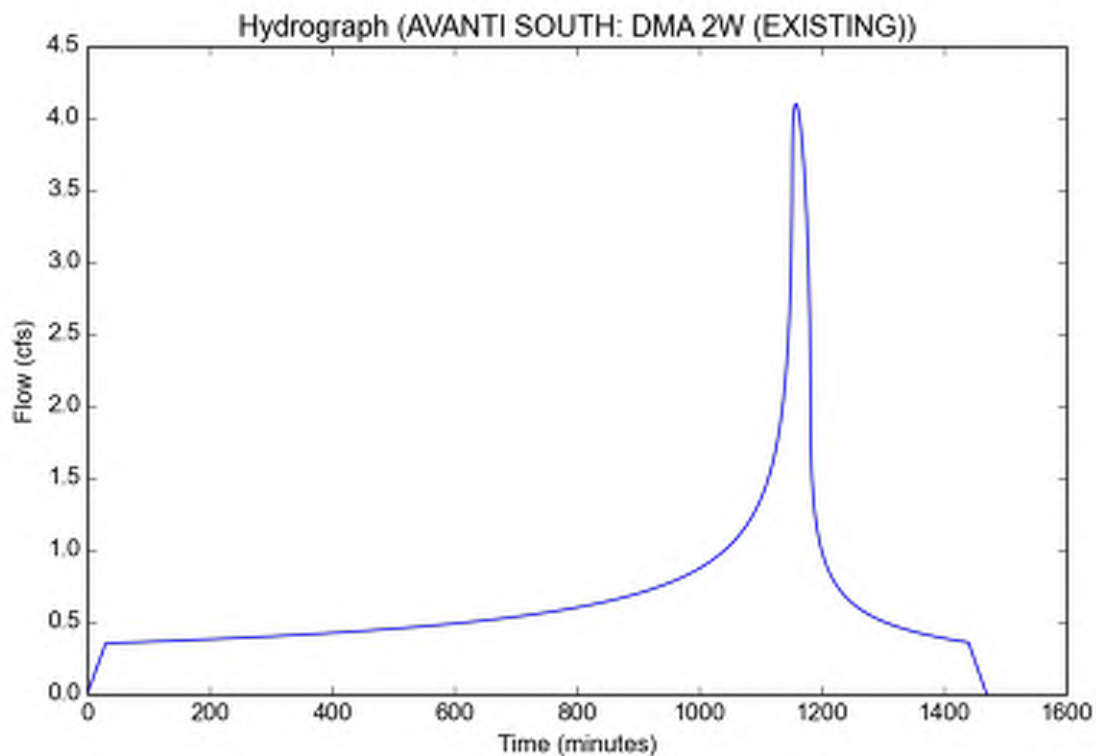
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 2W (EXISTING)
Area (ac)	36.19
Flow Path Length (ft)	2000.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.02
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.116
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	4.1002
Burned Peak Flow Rate (cfs)	4.1002
24-Hr Clear Runoff Volume (ac-ft)	1.3184
24-Hr Clear Runoff Volume (cu-ft)	57429.8466



Peak Flow Hydrologic Analysis

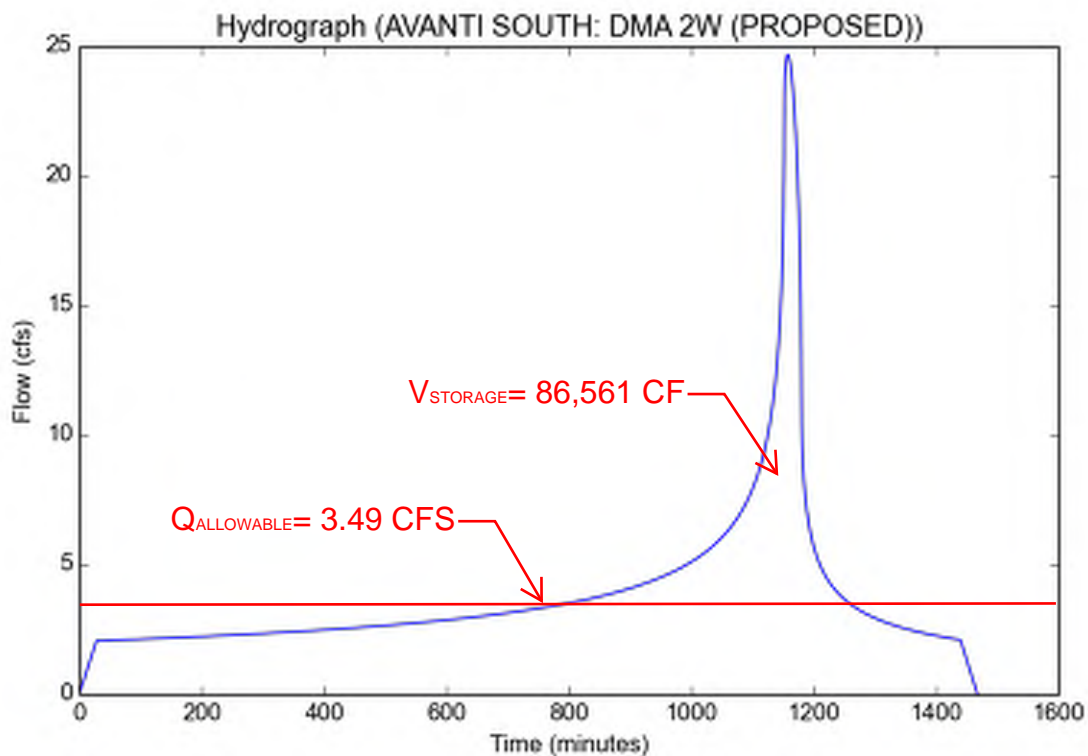
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 2W (PROPOSED)
Area (ac)	36.19
Flow Path Length (ft)	2000.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.72
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	1.0089
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.676
Time of Concentration (min)	28.0
Clear Peak Flow Rate (cfs)	24.6816
Burned Peak Flow Rate (cfs)	24.6816
24-Hr Clear Runoff Volume (ac-ft)	7.6831
24-Hr Clear Runoff Volume (cu-ft)	334676.8821



Peak Flow Hydrologic Analysis

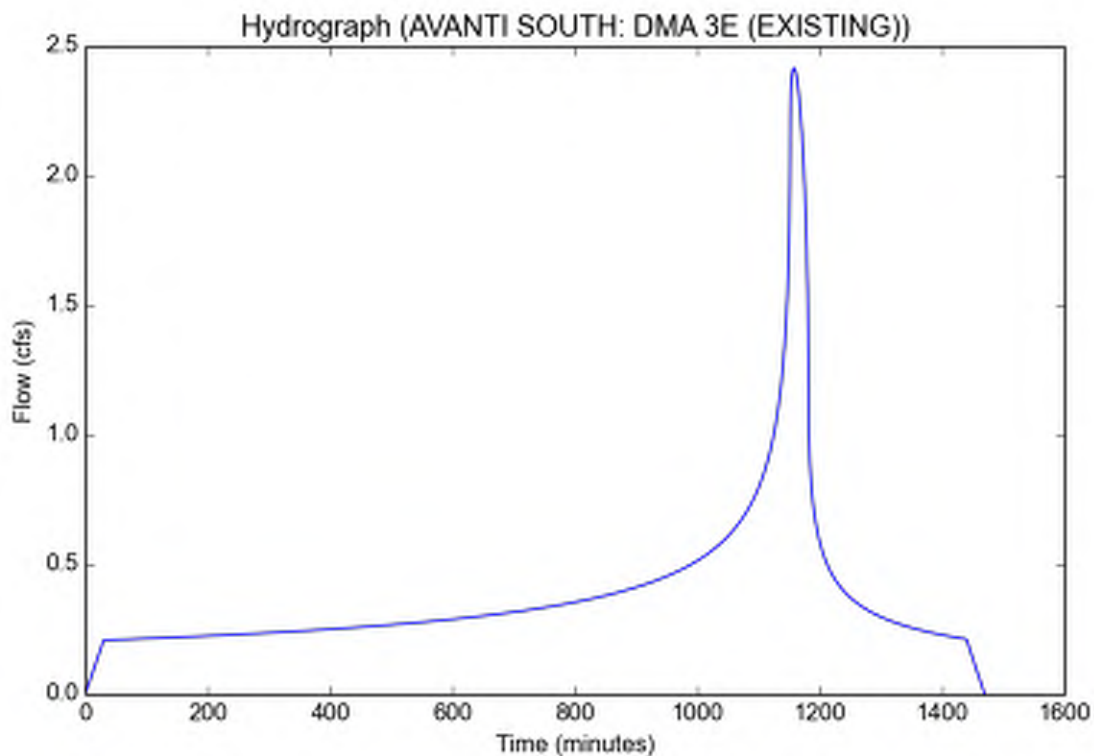
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 3E (EXISTING)
Area (ac)	21.33
Flow Path Length (ft)	1700.0
Flow Path Slope (vft/hft)	0.008
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.02
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.116
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	2.4166
Burned Peak Flow Rate (cfs)	2.4166
24-Hr Clear Runoff Volume (ac-ft)	0.7771
24-Hr Clear Runoff Volume (cu-ft)	33848.539



Peak Flow Hydrologic Analysis

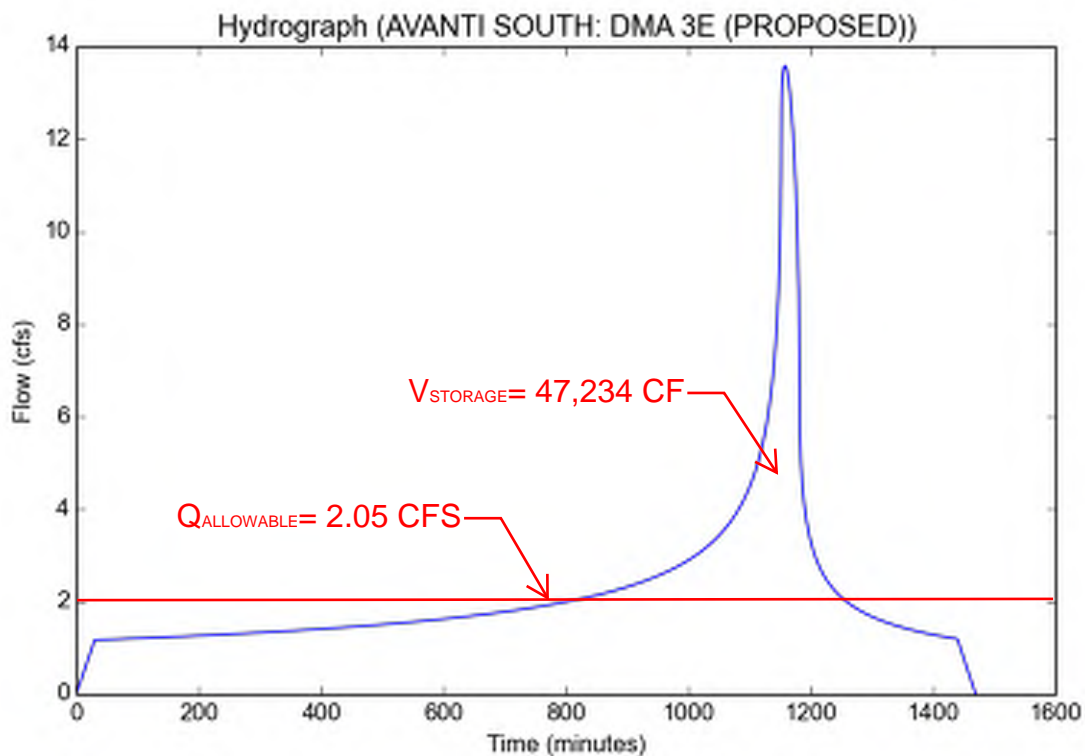
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 3E (PROPOSED)
Area (ac)	21.33
Flow Path Length (ft)	1800.0
Flow Path Slope (vft/hft)	0.004
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.69
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.652
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	13.583
Burned Peak Flow Rate (cfs)	13.583
24-Hr Clear Runoff Volume (ac-ft)	4.3676
24-Hr Clear Runoff Volume (cu-ft)	190252.1331



Peak Flow Hydrologic Analysis

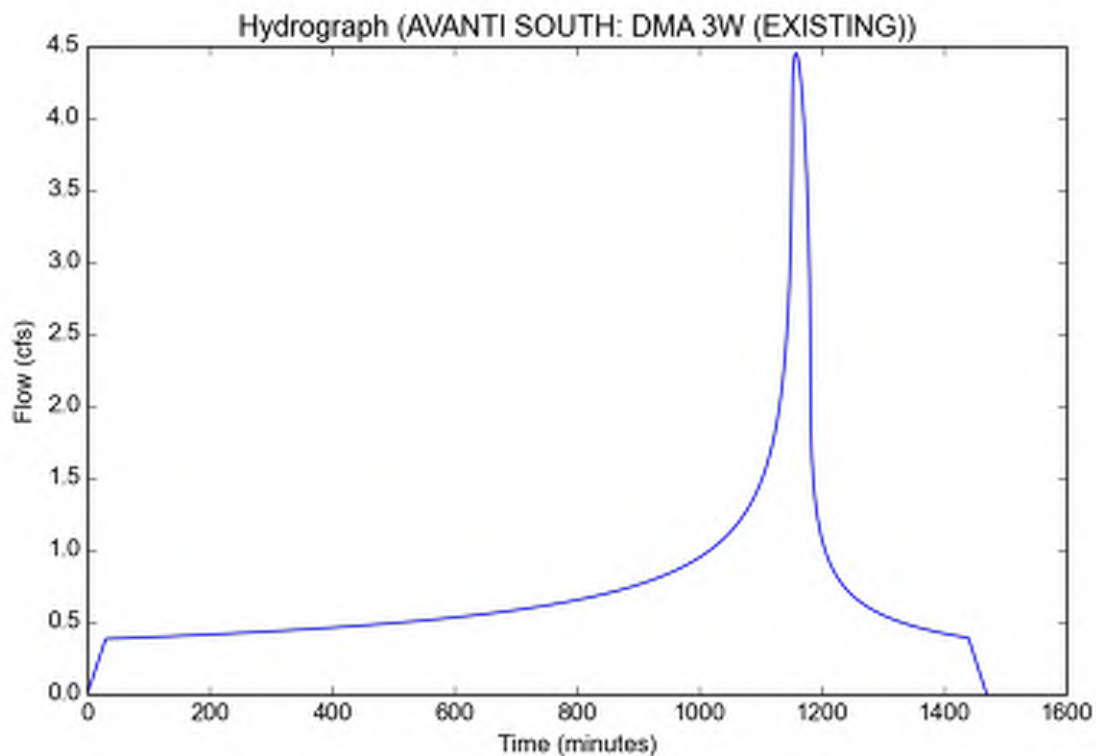
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 3W (EXISTING)
Area (ac)	39.31
Flow Path Length (ft)	2300.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.02
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.116
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	4.4537
Burned Peak Flow Rate (cfs)	4.4537
24-Hr Clear Runoff Volume (ac-ft)	1.4321
24-Hr Clear Runoff Volume (cu-ft)	62380.969



Peak Flow Hydrologic Analysis

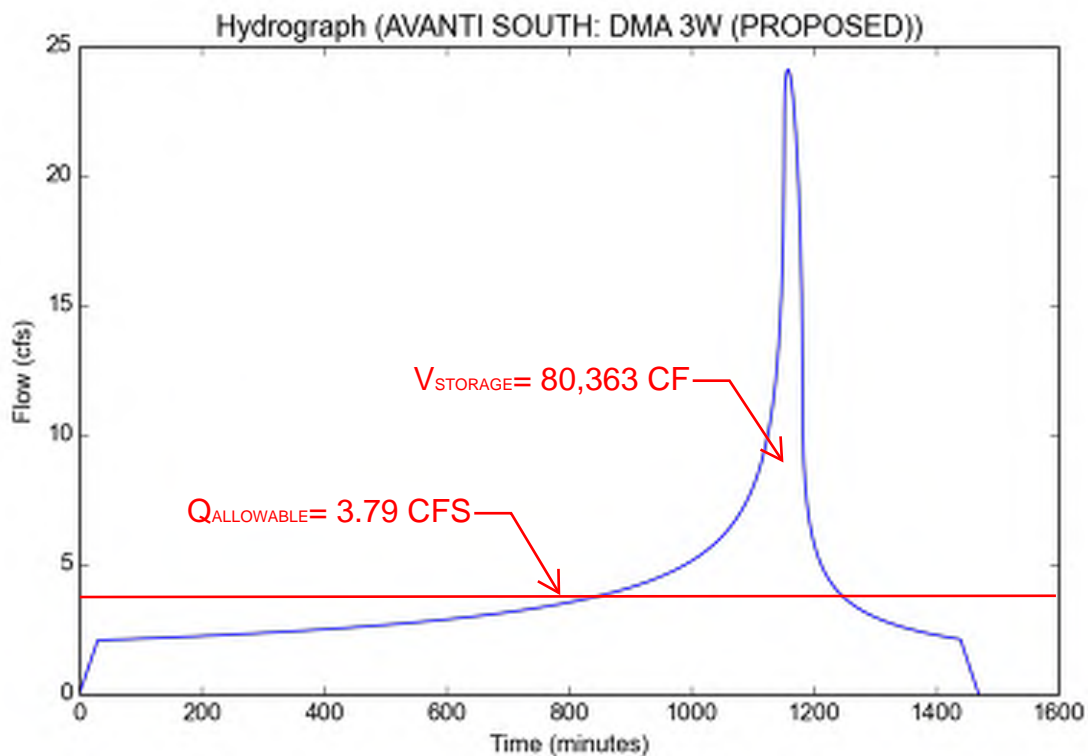
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 3W (PROPOSED)
Area (ac)	39.31
Flow Path Length (ft)	2200.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.66
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.628
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	24.1112
Burned Peak Flow Rate (cfs)	24.1112
24-Hr Clear Runoff Volume (ac-ft)	7.7529
24-Hr Clear Runoff Volume (cu-ft)	337717.6598



Peak Flow Hydrologic Analysis

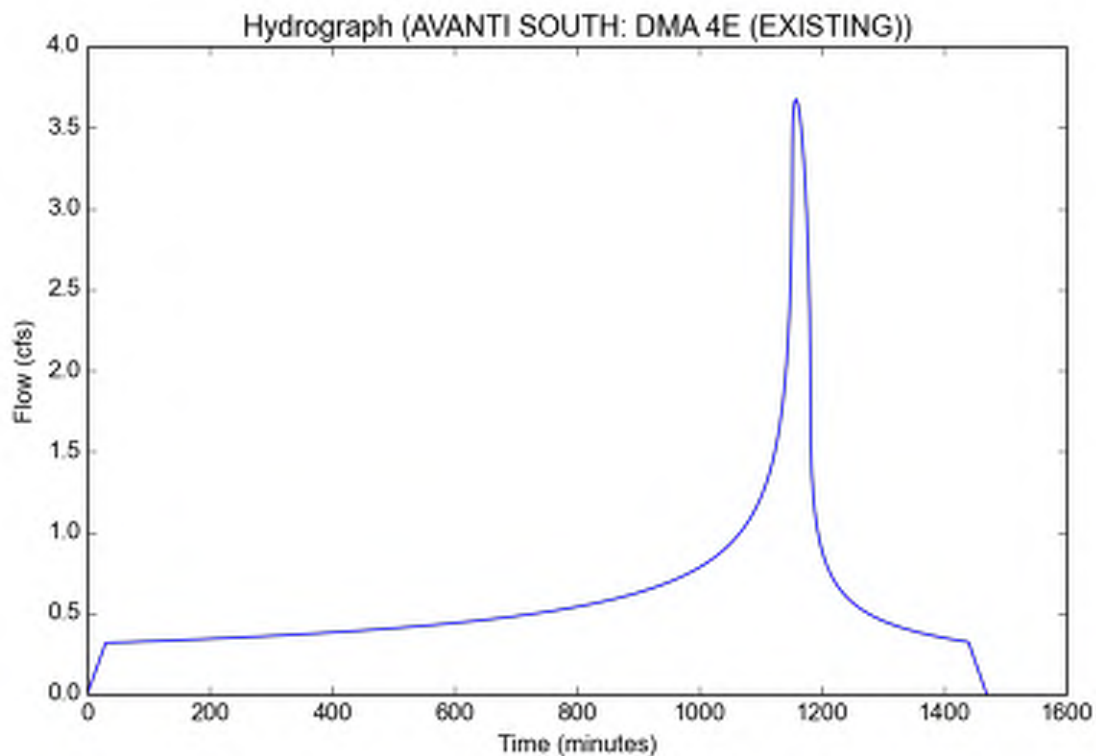
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 4E (EXISTING)
Area (ac)	32.42
Flow Path Length (ft)	1700.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.02
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.116
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	3.673
Burned Peak Flow Rate (cfs)	3.673
24-Hr Clear Runoff Volume (ac-ft)	1.1811
24-Hr Clear Runoff Volume (cu-ft)	51447.2403



Peak Flow Hydrologic Analysis

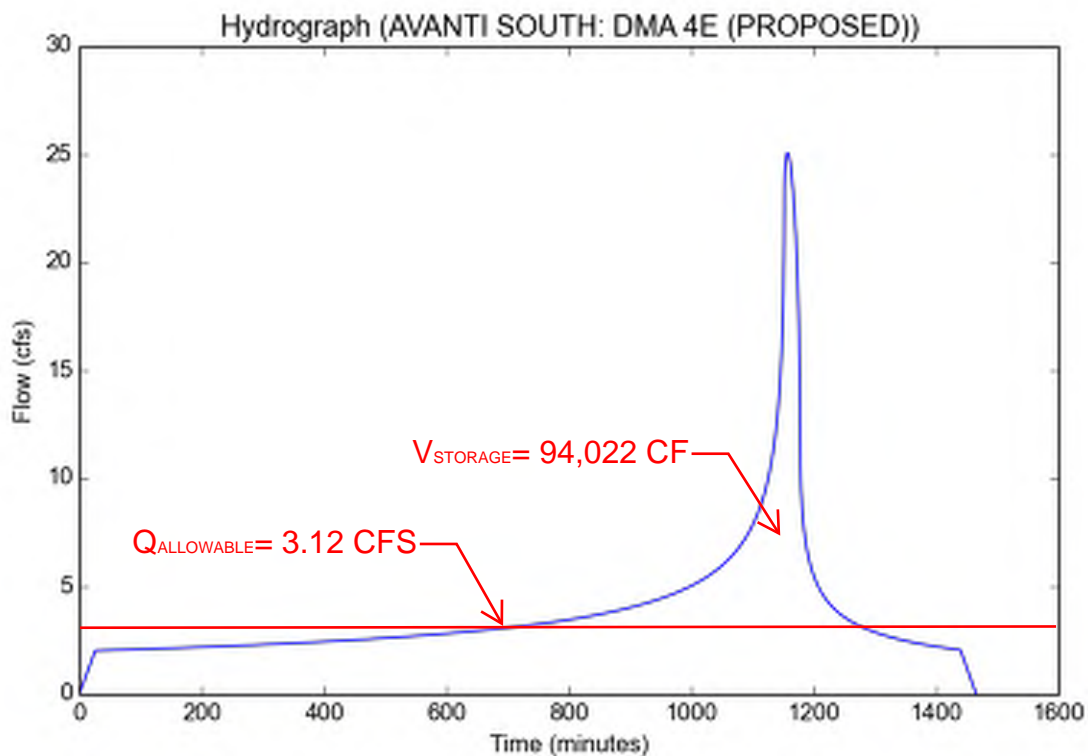
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 4E (PROPOSED)
Area (ac)	32.42
Flow Path Length (ft)	1600.0
Flow Path Slope (vft/hft)	0.004
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.8
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	1.0446
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.74
Time of Concentration (min)	26.0
Clear Peak Flow Rate (cfs)	25.0617
Burned Peak Flow Rate (cfs)	25.0617
24-Hr Clear Runoff Volume (ac-ft)	7.5344
24-Hr Clear Runoff Volume (cu-ft)	328196.9669



Peak Flow Hydrologic Analysis

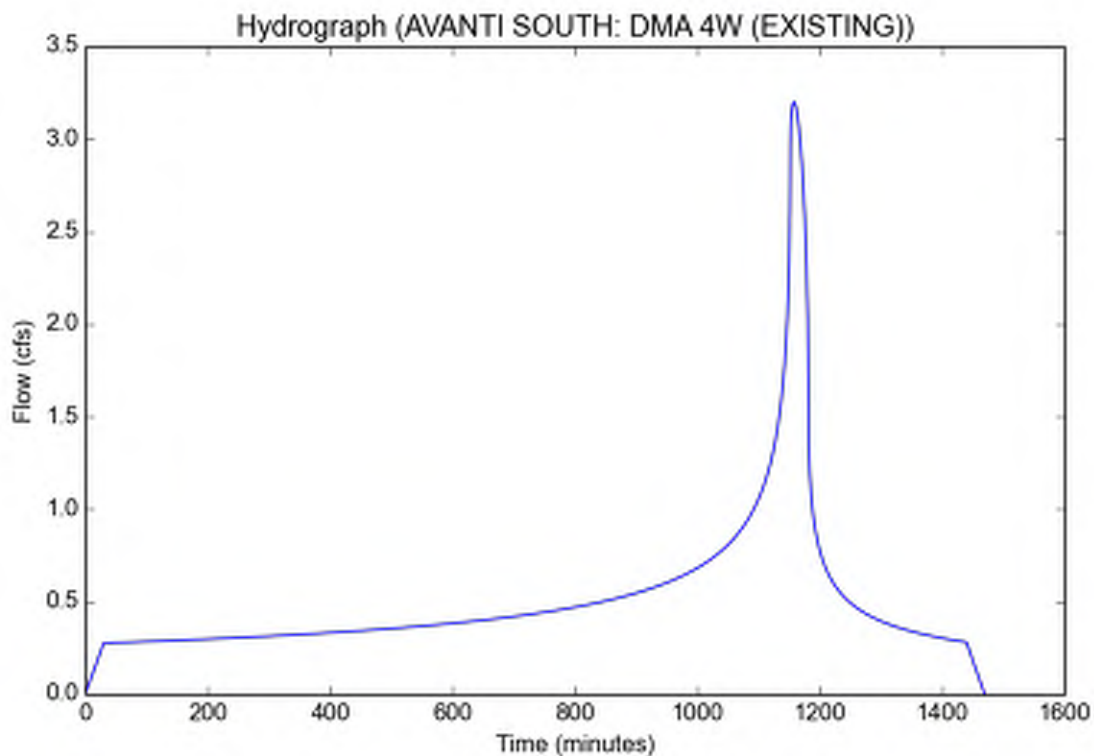
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 4W (EXISTING)
Area (ac)	28.24
Flow Path Length (ft)	2500.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.02
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.116
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	3.1995
Burned Peak Flow Rate (cfs)	3.1995
24-Hr Clear Runoff Volume (ac-ft)	1.0288
24-Hr Clear Runoff Volume (cu-ft)	44814.0057



Peak Flow Hydrologic Analysis

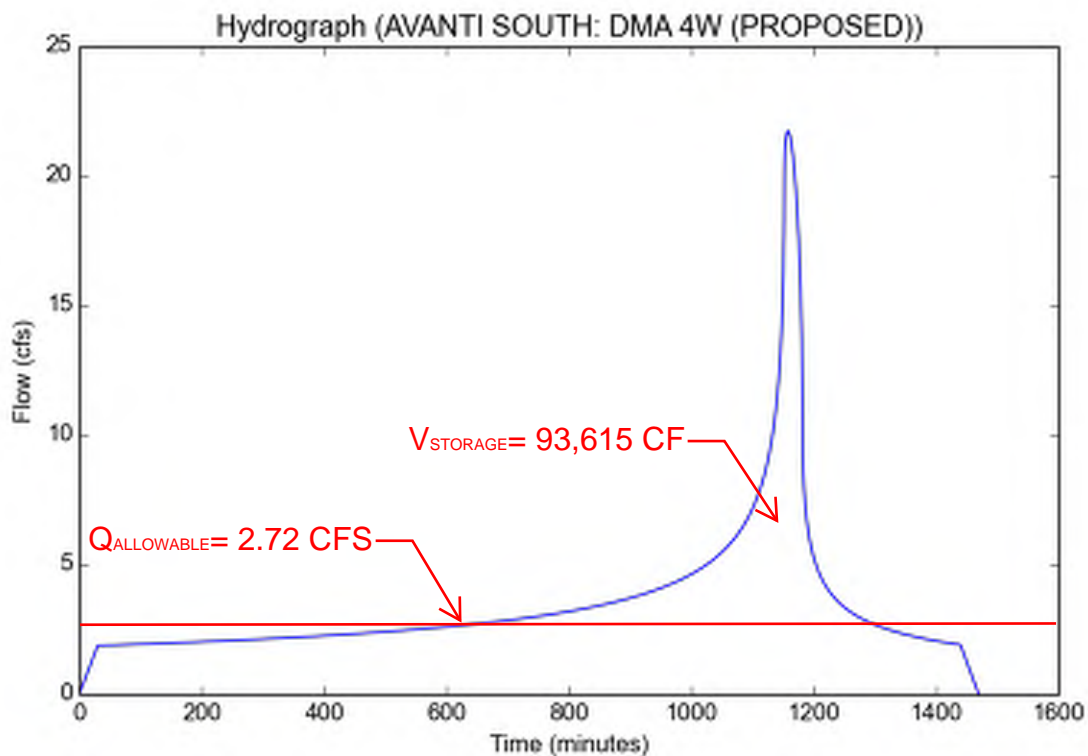
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 4W (PROPOSED)
Area (ac)	28.24
Flow Path Length (ft)	2500.0
Flow Path Slope (vft/hft)	0.006
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.86
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.788
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	21.7343
Burned Peak Flow Rate (cfs)	21.7343
24-Hr Clear Runoff Volume (ac-ft)	6.9887
24-Hr Clear Runoff Volume (cu-ft)	304426.1768



Peak Flow Hydrologic Analysis

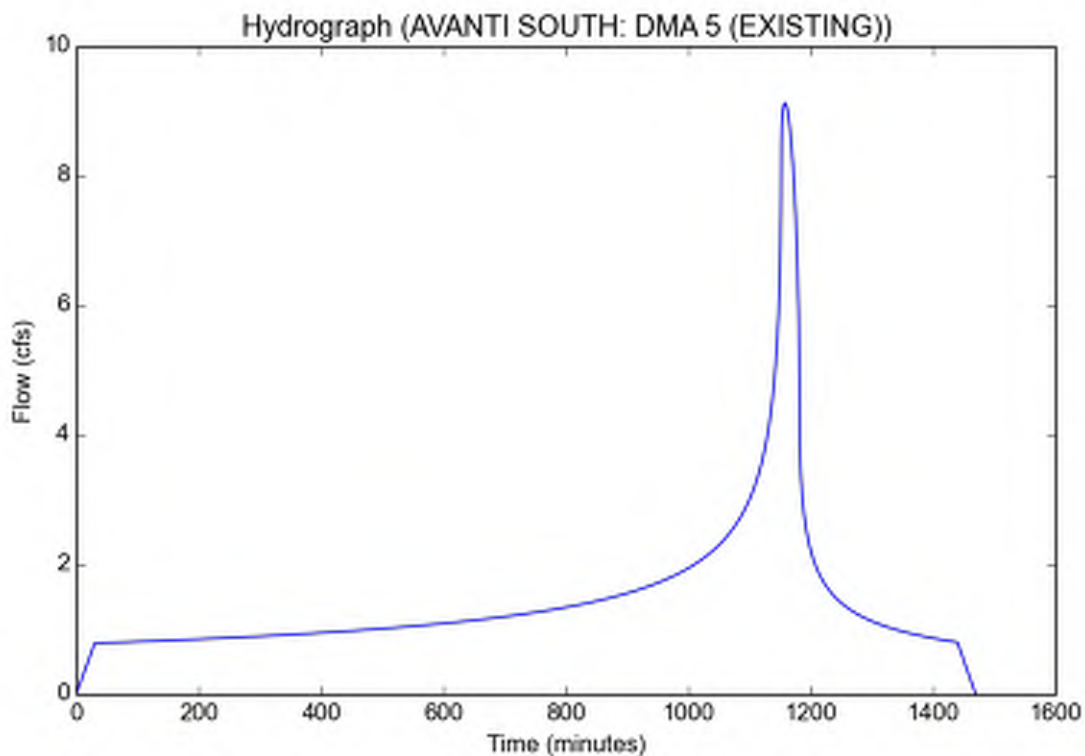
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	AVANTI SOUTH
Subarea ID	DMA 5 (EXISTING)
Area (ac)	80.55
Flow Path Length (ft)	3000.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.02
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.116
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	9.126
Burned Peak Flow Rate (cfs)	9.126
24-Hr Clear Runoff Volume (ac-ft)	2.9345
24-Hr Clear Runoff Volume (cu-ft)	127824.6516



Peak Flow Hydrologic Analysis

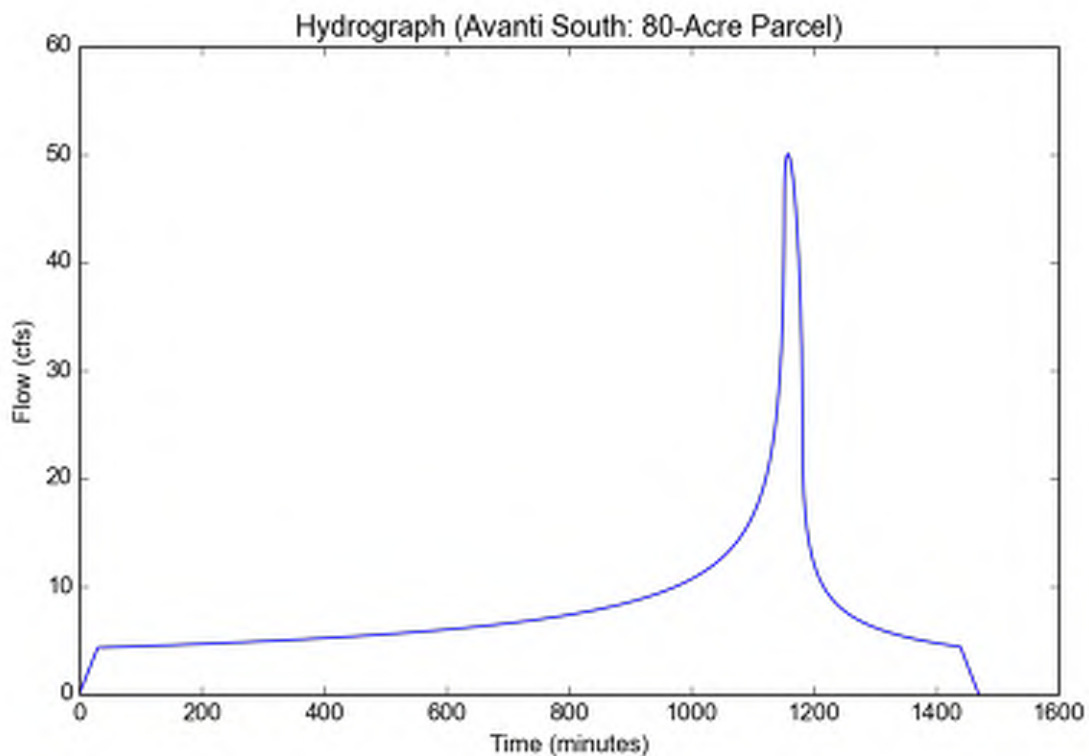
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Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	Avanti South
Subarea ID	80-Acre Parcel
Area (ac)	80.55
Flow Path Length (ft)	2960.0
Flow Path Slope (vft/hft)	0.0111
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.67
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	0.9767
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.636
Time of Concentration (min)	30.0
Clear Peak Flow Rate (cfs)	50.0355
Burned Peak Flow Rate (cfs)	50.0355
24-Hr Clear Runoff Volume (ac-ft)	16.0889
24-Hr Clear Runoff Volume (cu-ft)	700831.7104



Peak Flow Hydrologic Analysis

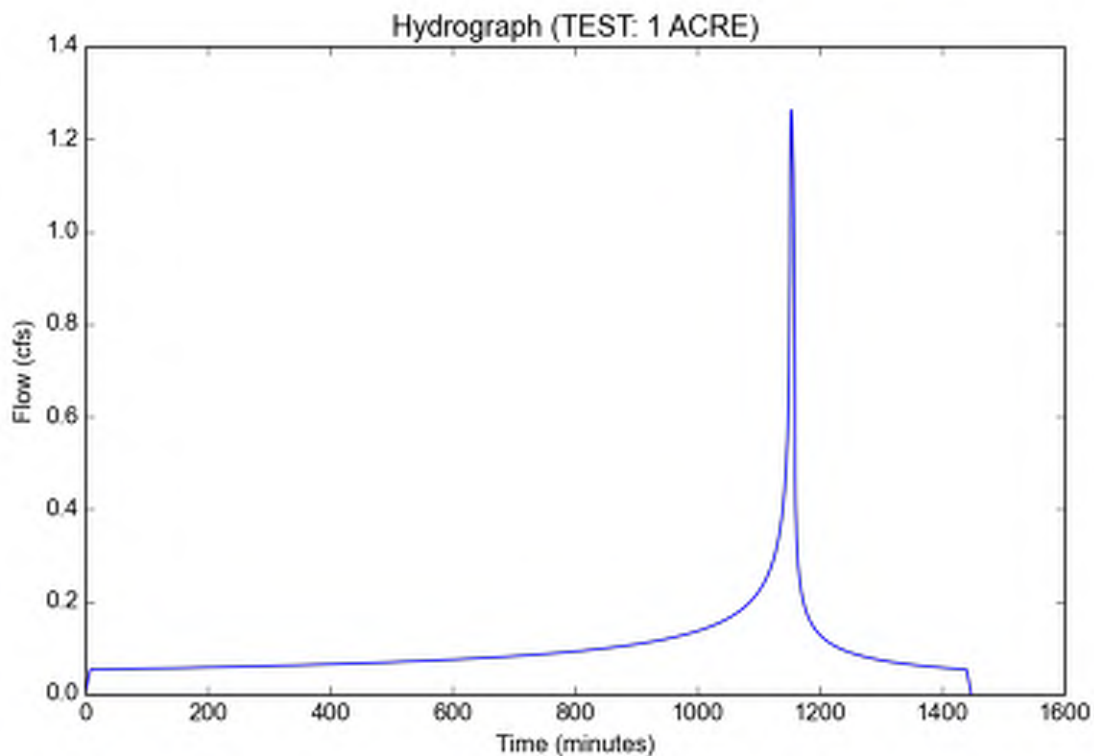
File location: C:/Users/patrick.kauffman/Desktop/TEST - 1 ACRE.pdf
Version: HydroCalc 0.3.0-beta

Input Parameters

Project Name	TEST
Subarea ID	1 ACRE
Area (ac)	1.0
Flow Path Length (ft)	295.16
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	3.8
Percent Impervious	0.67
Soil Type	134
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

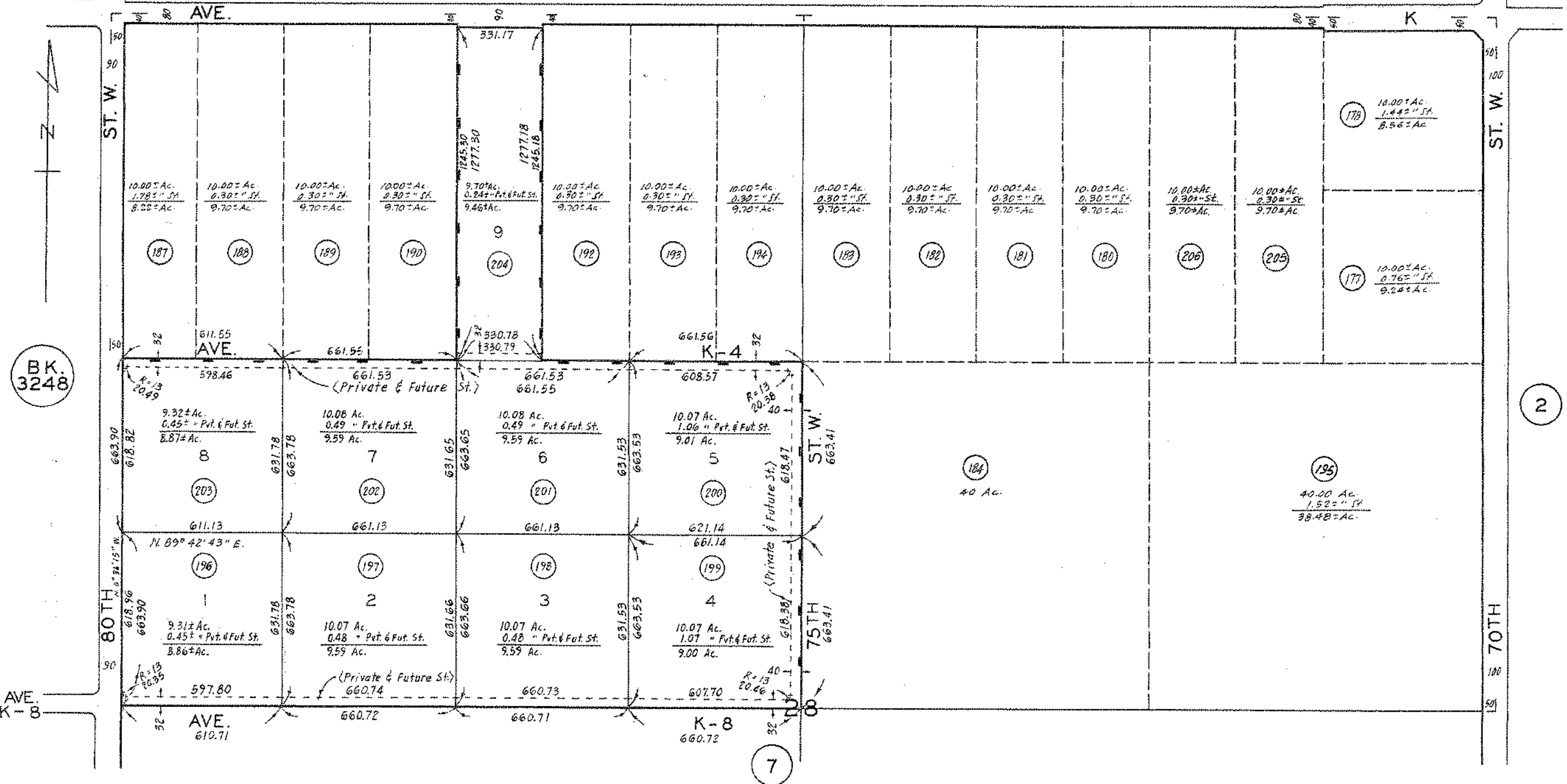
Output Results

Modeled (50-yr) Rainfall Depth (in)	3.8
Peak Intensity (in/hr)	1.8178
Undeveloped Runoff Coefficient (Cu)	0.2766
Developed Runoff Coefficient (Cd)	0.6943
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	1.2621
Burned Peak Flow Rate (cfs)	1.2621
24-Hr Clear Runoff Volume (ac-ft)	0.2006
24-Hr Clear Runoff Volume (cu-ft)	8736.5047



Appendix C
Supporting Documents

BK. 3203



BK. 3248

2

7

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2417

T. 7 N., R. 13 W.

TRACT NO. 35575 M. B. 918-44-45

PER PLAN ADAPPT SEC.
3204 - 1

ASSESSOR'S MAP
COUNTY OF LOS ANGELES, CALIF

2014

PG 2



MAPPING AND GIS SERVICES SCALE 1" = 400'

PG 7

T7N R13W

AVE K-8

PG 79

PG 6

PG 66

AVE K-12

PG 77

PG 78

PG 4

ST W 100 150 100 150 70TH 100 150

605.26 N 79°41'12"E R=2500 443.82 156.86 N 89°51'30"E 514.24 S 82°08'56"E R=3500 488.25 96.52 27 699.51

R=2000 349.84

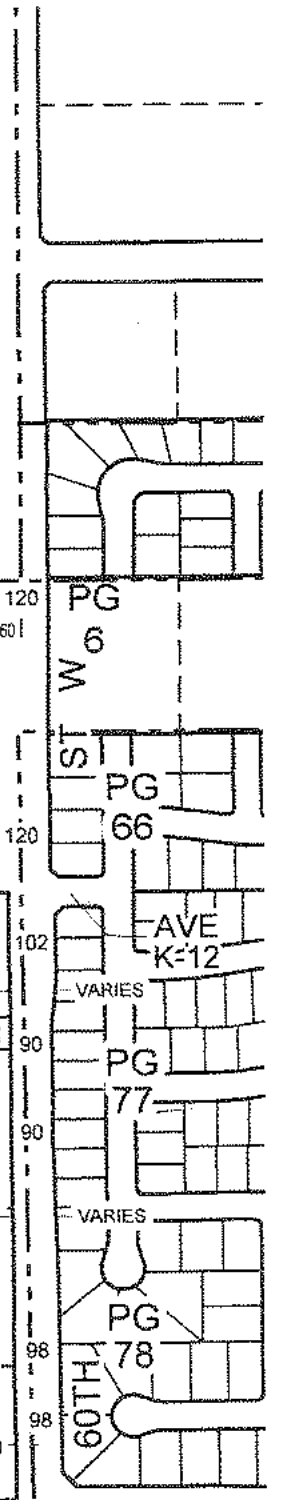
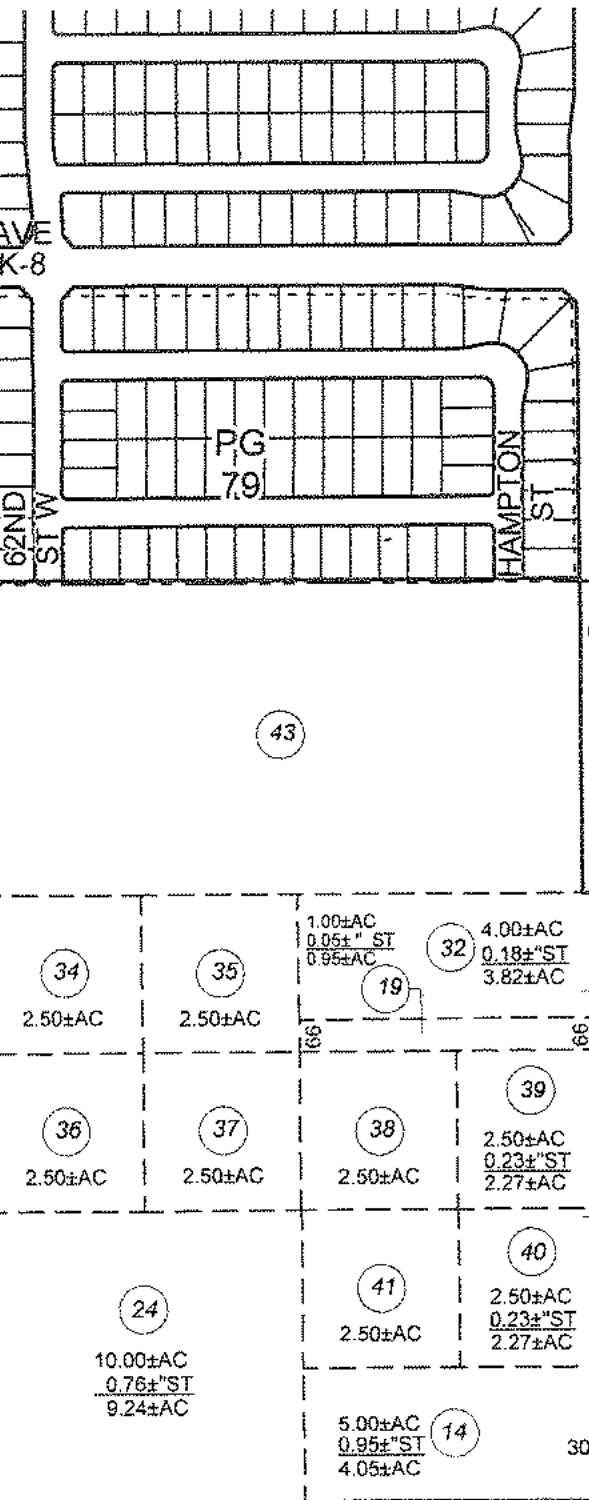
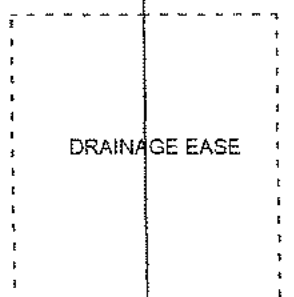
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47

165.03±AC
-6.02±"ST
-4.62±"DR
154.39±AC

45

80.65±AC
-1.51±"ST
-4.62±"DR
74.52±AC



NOTES TO USERS

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

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

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

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

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

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

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

NGS Information Services
NOAA, NNGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

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

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1994 or later and from National Geospatial Intelligence Agency imagery produced at a scale of 1:4,000 from photography dated 2003 or later.

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

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

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

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at <http://www.msc.fema.gov/>.

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

LEGEND

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

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

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

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

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

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

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS
OTHERWISE PROTECTED AREAS (OPAs)

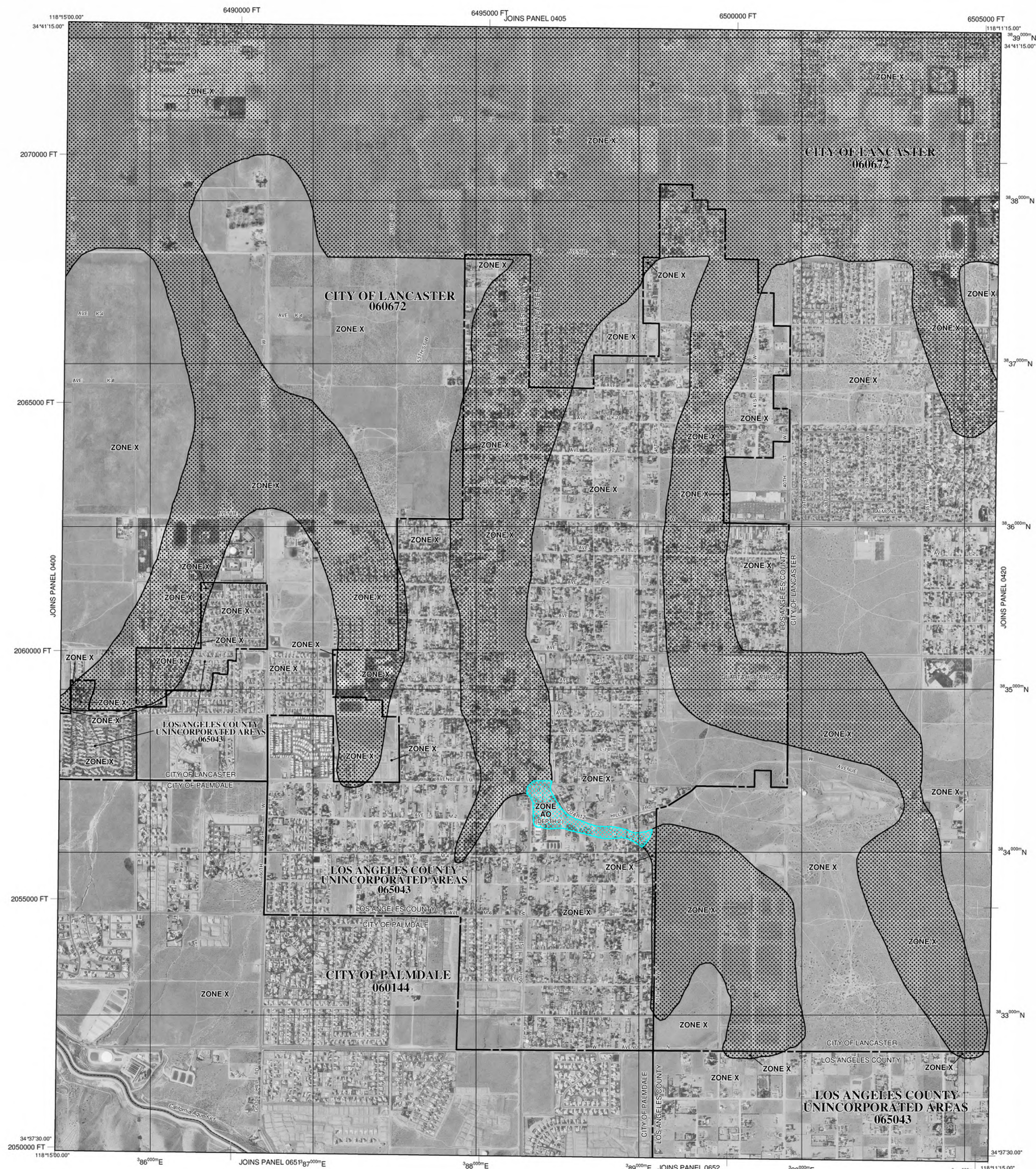
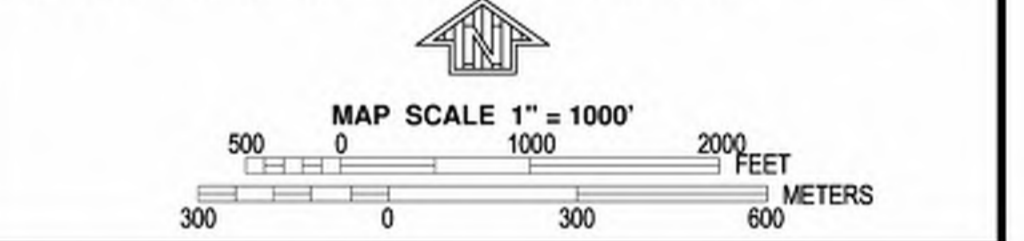
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- Base Flood Elevation line and value; elevation in feet* (EL. 98.7)
- Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- Cross section line
- Transsect line
- 97°07'30".322230" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 42°75'00"N 1000-meter Universal Transverse Mercator grid values, zone 11
- 6000000 FT 5000-foot grid ticks: California State Plane coordinate system, V zone (FIPS ZONE 0405), Lambert Conformal Conic
- DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
- 1.5 River Mile
- MAP REPOSITORIES Refer to Map Repositories list on Map Index
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP September 26, 2008
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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

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



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0415F

FIRM FLOOD INSURANCE RATE MAP

LOS ANGELES COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 415 OF 2350
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
LOS ANGELES COUNTY	065043	0415	F
LANCASTER, CITY OF	060672	0415	F
PALMDALE, CITY OF	060144	0415	F

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

MAP NUMBER 06037C0415F

EFFECTIVE DATE SEPTEMBER 26, 2008

Federal Emergency Management Agency