

PRELIMINARY DRAINAGE REPORT

**16201 Raymer
Van Nuys
16201 Raymer Street.
Van Nuys, CA 91406**

September 15, 2023

PREPARED FOR:

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References

Hydrology Manual. Los Angeles County, Department of Public Works, Water Resources Division, January 2006.

LA County Hydrology Map website. Los Angeles County Department of Public Works (LACDPW) Hydrology Map. <https://dpw.lacounty.gov/wrd/hydrologygis/>, Site visited September 15, 2023.

NavigateLA Website, City of Los Angeles, Bureau of Engineering, Department of Public Works. <https://navigatela.lacity.org/navigatela/>, Site visited September 15, 2023.

1. Introduction

The project site is comprised of three existing parcels totaling 5.46 acres located at 16201 Raymer Street in the City of Los Angeles and County of Los Angeles, California. Figure 1 shows the project area and vicinity map. The proposed site development (Project) includes an industrial development with approximately 123,468 square feet (sf) of industrial building, approximately 114,500 square feet (sf) of sidewalk, truck dock, parking stalls, and landscaping areas. The proposed site will also include private internal driveways, landscaping, stormwater conveyance and treatment structures/ utilities, and subterranean parking for the proposed development. This document provides the methodology and calculations for the storm water design of the proposed project. This analysis considers existing and proposed conditions and provides calculations for the sizing of storm drain pipes and catch basins. Low Impact Development (LID) is incorporated in the proposed Project with the analysis, calculations, and narrative are presented in a separate Project report.

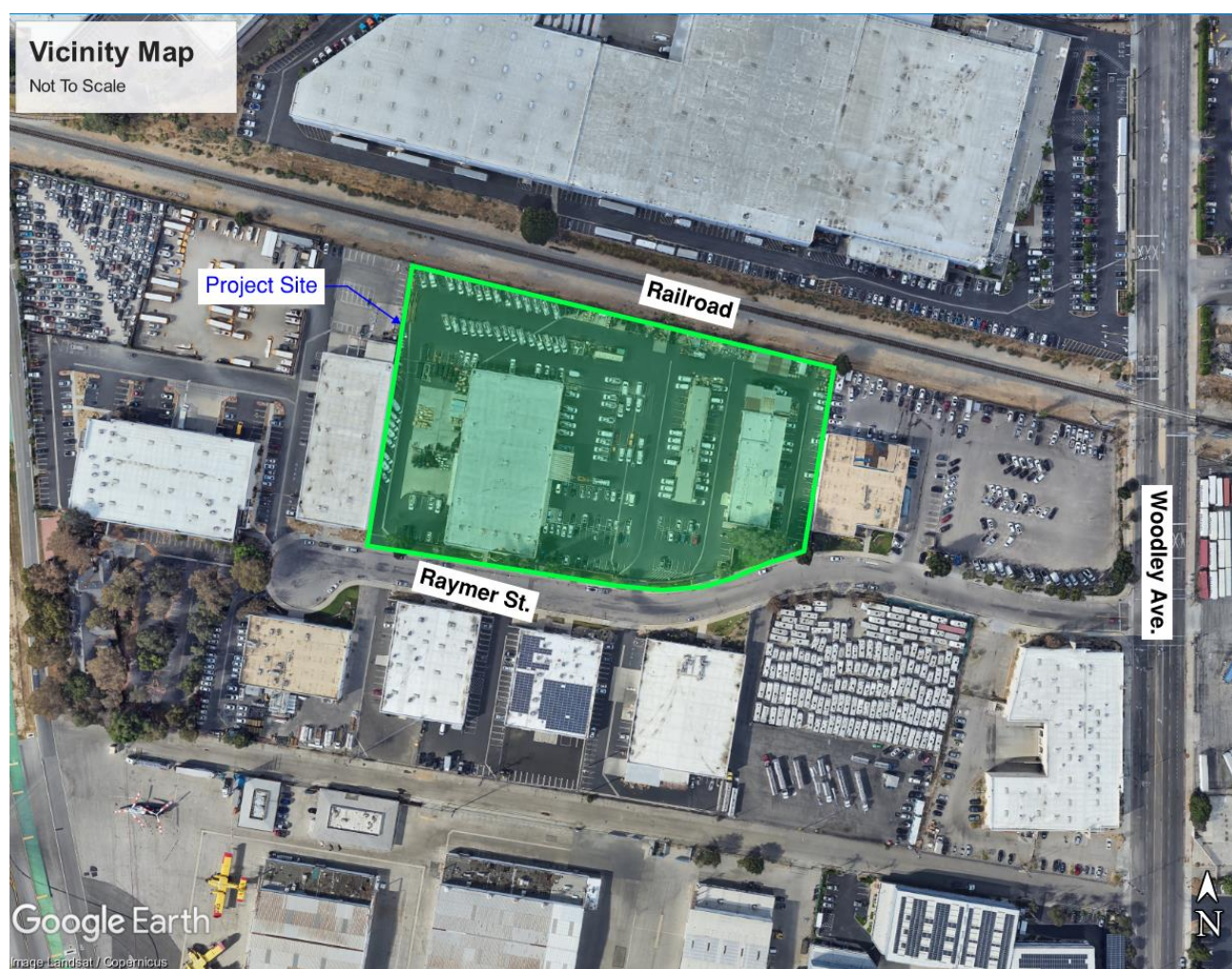


Figure 1: Project Vicinity Map

2. Methodology

The Los Angeles County, Department of Public Works, Water Resources Division, Hydrology Manual, date January 2006, was used utilized for procedures and methodologies followed herein. The Los

Angeles County Department of Public Works (LACDPW) Hydrology Maps were used to determine the approximate rainfall depth produced during a 24-hour 25-year storm on the site. This hydrology map contains historical rainfall data from the previous 40-80 years at 99 rainfall gauges across the County. Soil type at the site is available on the Hydrology Map. The LACDPW HydroCalc Calculator was used to determine the pre- and post-development onsite flows for the project site.

A topographic site survey performed by Calvada Surveying, Inc. and dated March 28, 2023, was used as the base of design and calculations for the Project and used to calculate the existing area of perviousness and the longest flow path and slope.

The proposed storm drain system has been sized to handle the 25-year storm event using the following software programs: HydroCalc to determine peak flow rates and FloMaster to size the pipes and size the overflow lift station.

The County's HydroCalc software was utilized to determine the peak flow rates and time of concentration for the project. The site has been modeled with larger subareas to obtain preliminary levels results and will be further broken down into multiple smaller subareas for sizing inlets and pipes upon Final hydrologic Analysis.

The onsite portion of the analysis was completed using the County's Modified Rational Method (MODRAT).

3. Existing Drainage Conditions

The elevation of the Project site ranges from approximately 799 to 805 feet above mean sea level. In the existing condition, the site drains completely by surface runoff. The majority of the site sheets flows towards the valley gutters running north to south of the parcel at a slope of approximately 1%. There are multiple onsite inlets located along the southern right-of-way to capture the runoff and convey along the street curb and gutter line through curb drains.

Based on survey topo shots and google earth, the runoff discharges to the public catch basins along Raymer Street, and ultimately discharges to a 36-in RCP in the City of Los Angeles storm drain system on Raymer Street. The existing offsite drainage pattern as described, is shown in Figure 2.

This combined flow is collected via public curb opening catch basins, subsequently integrating into the public storm drain system jointly managed by the City of Los Angeles and the County of Los Angeles that eventually drains to the Queensway Bay.

A Geotracker review has been done and shows that there are not any open or closed cases regarding handling hazardous materials or testing on the site.

There are no known LID stormwater water quality treatment devices onsite in the existing conditions.

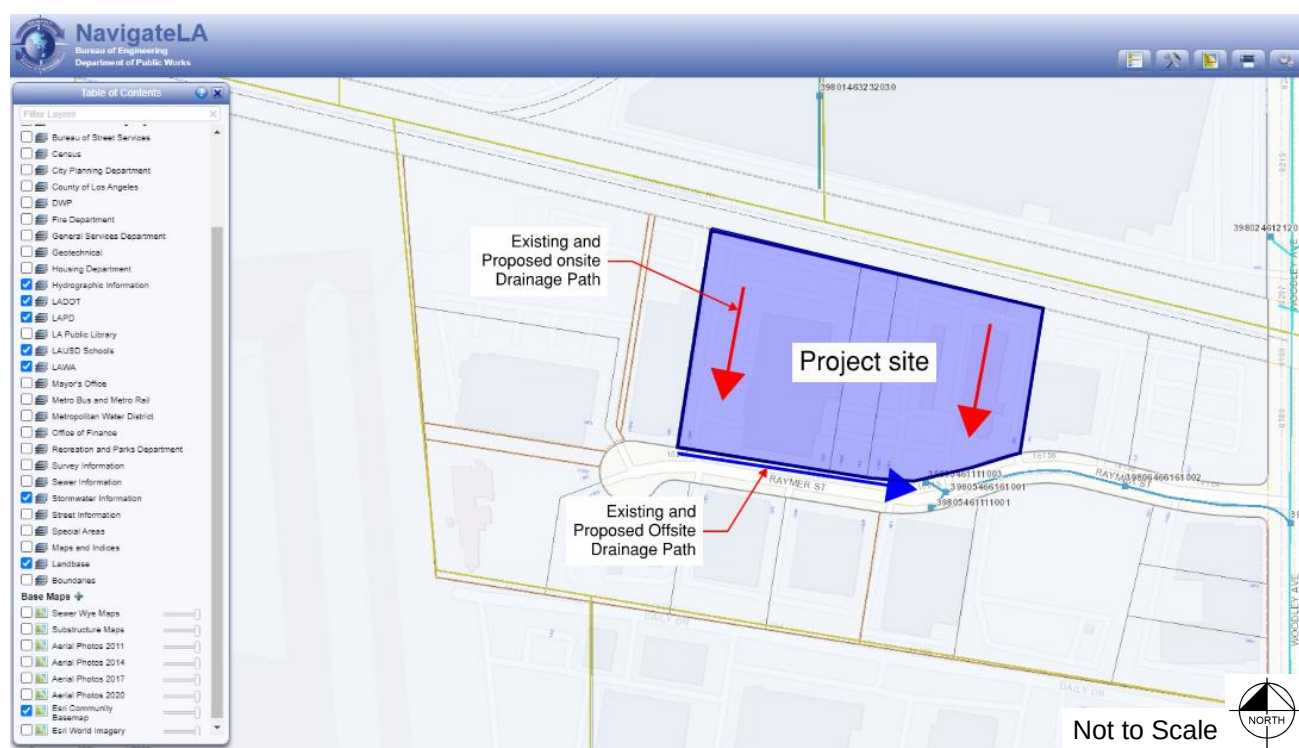


Figure 2: Existing and Proposed Offsite Drainage Pattern

4. Proposed Drainage Conditions

The proposed site improvements include a new storm drain system with inlets internal to the site and within the private driveways to collect onsite runoff. Per the topographic survey and the City of Los Angeles's Navigate LA system, there are existing stormwater conveyance facilities in the public right-of-way and adjacent to the proposed development.

Under the proposed condition, the drainage pattern will remain similar to existing conditions. The site will continue to drain from the north to the south and ultimately toward Raymer Street. An underground storm drain system will connect a network of roof drains and surface inlets. The runoff will be captured via proposed onsite inlets and conveyed into underground capture and reuse system for the water quality purpose. The overflow of the entire site (25-year storm event) will be ultimately discharged south of the property to the existing curb and gutter near on Raymer Street. These on-site drains will ultimately drain toward Raymer Street through a new parkway drain.

The collected site runoff will be discharged, via a proposed parkway drain to the curb and gutter in Raymer Street, and ultimately relay the runoff to the existing 36-in RCP via catch basins south of the project property. The proposed offsite drainage pattern as described, is shown in Figure 2. The runoff will be captured via proposed onsite inlets and conveyed into underground cistern tanks for water quality purposes. The overflow of the entire site (25-year storm event) will be ultimately discharged south-west corner of the property existing curb and gutter near on Raymer Street. There are multiple offsite catch basins and an existing public storm drain line along Raymer Street, and the onsite overflow from the site will ultimately flow in that direction and into the city of Los Angeles and County of Los Angeles public storm system. Since the pervious areas have increased in the proposed condition in comparison with the existing, the peak flow will naturally decrease, eliminating the need for detention measures.

There is a surcharge in the storm drain pipe system onsite from hydrodynamic separator to the parkway drain. When both the storm drain pipe and the BMP tanks reach their maximum capacity, water begins to overflow from the bubbler catch basin, flowing towards the curb and gutter in the street via a proposed parkway drain. This overflow is above the LID mitigated volume.

The proposed storm drain system onsite will consist of catch basins that collect runoff throughout the site and convey it via HDPE pipe to the LID system at the northwestern corner of the site. The mitigated volume will be pre-treated for water quality and then stored in an underground rainwater harvesting cistern to be used for onsite landscape irrigation. Calculations and design details can be found in the Project LID Report, prepared under a separate cover. Once the cistern is at capacity, runoff will bypass the pretreatment unit and go to the overflow pipe and discharge to the gutter in Raymer Street. A new parkway drain is proposed in the sidewalk along Raymer Street to discharge the overflow.

5. Calculations

Hydrology

From the LACDPW Hydrology Maps, the Project area soil type of 016 and the 50-year, 24-hr event rainfall depth of 7.3-in were obtained. Hydrology Maps are included in Appendix A. From the topographic survey and the proposed site plan, areas of perviousness and imperviousness were tabulated, and percentages of the total site are summarized in Table 1 for the existing and proposed conditions. Drainage exhibits illustrating areas of perviousness are included in Appendix B. For the purposed of this analysis, permeable pavers are considered pervious for calculations herein.

Table 1: Site Perviousness for Existing and Proposed Conditions

Site Condition	Impervious		Pervious	
	Area	%	Area	%
Existing Condition	5.24 ac	96%	0.22 ac	4%
Proposed Condition	4.71 ac	86%	0.75 ac	14%

Using the topographic survey and the proposed site plan, the site was delineated into a single drainage management area (DMA) and the length and slope of the longest flow path identified for each DMA for the existing and proposed conditions. Using the impervious values from Table 1, and the other collected parameters, values were entered into the LACDPW HydroCalc Calculator. Input parameters are summarized in Table 2.

Table 2: HydroCalc Input Parameters

Input Parameter	Existing Conditions	Proposed Conditions
Site Area	5.46-ac	
50-Year Rainfall Depth	7.3-in	
Soil Type	016	
Percent Impervious	96%	86%
Longest Flow Path	460 ft	812 ft
Flow Path Slope	1.1%	1.0%

The LACDPW HydroCalc Calculator was run for the existing and proposed conditions. The 25-year storm peak flow rate and 24-hr clear runoff volume results are summarized in Table 3. The HydroCalc result printouts are included in Appendix C.

Table 3: HydroCalc Results for the 50-Year Storm Event Peak Flow Rate

Condition	25-Year Peak Flow Rate
Existing Conditions	17.2 cfs
Proposed Conditions	14.1 cfs
Difference (Proposed less Existing)	3.1 cfs

The comparison in Table 3 shows that the runoff peak flow rates do not increase from the existing condition to the proposed conditions, and thus **stormwater detention is not required for Project**.

Hydraulics

For the hydraulic analysis, the proposed site was used to delineate DMAs defining tributary areas to each area drain and inlet and determine the areas of perviousness. The longest flow path and slope were estimated from the proposed grading scheme. These parameters were used in HydroCalc to produce 25-year peak flow rates for each DMA. A summary table, DMA delineation exhibit, and HydroCalc result printouts are in Appendix D. Storm drain pipe sizes were then assigned using FloMaster with pipes running at full at a slope of 0.5%.

6. Conclusion

The proposed drainage system of the 16201 Raymer Street development is designed to provide stormwater control measures based on the current City of Los Angeles requirements. The site has been analyzed for adherence to Low Impact Development (LID) design requirements for stormwater treatment (provided under separate cover), along with stormwater runoff control for the 25-year storm event per the Los Angeles County requirements.

The analysis shows that the proposed development will not change the overall runoff flow and thus **stormwater detention is not required**. This analysis shows that the proposed drainage pattern will remain as existing condition and there are no changes to the offsite drainage pattern.

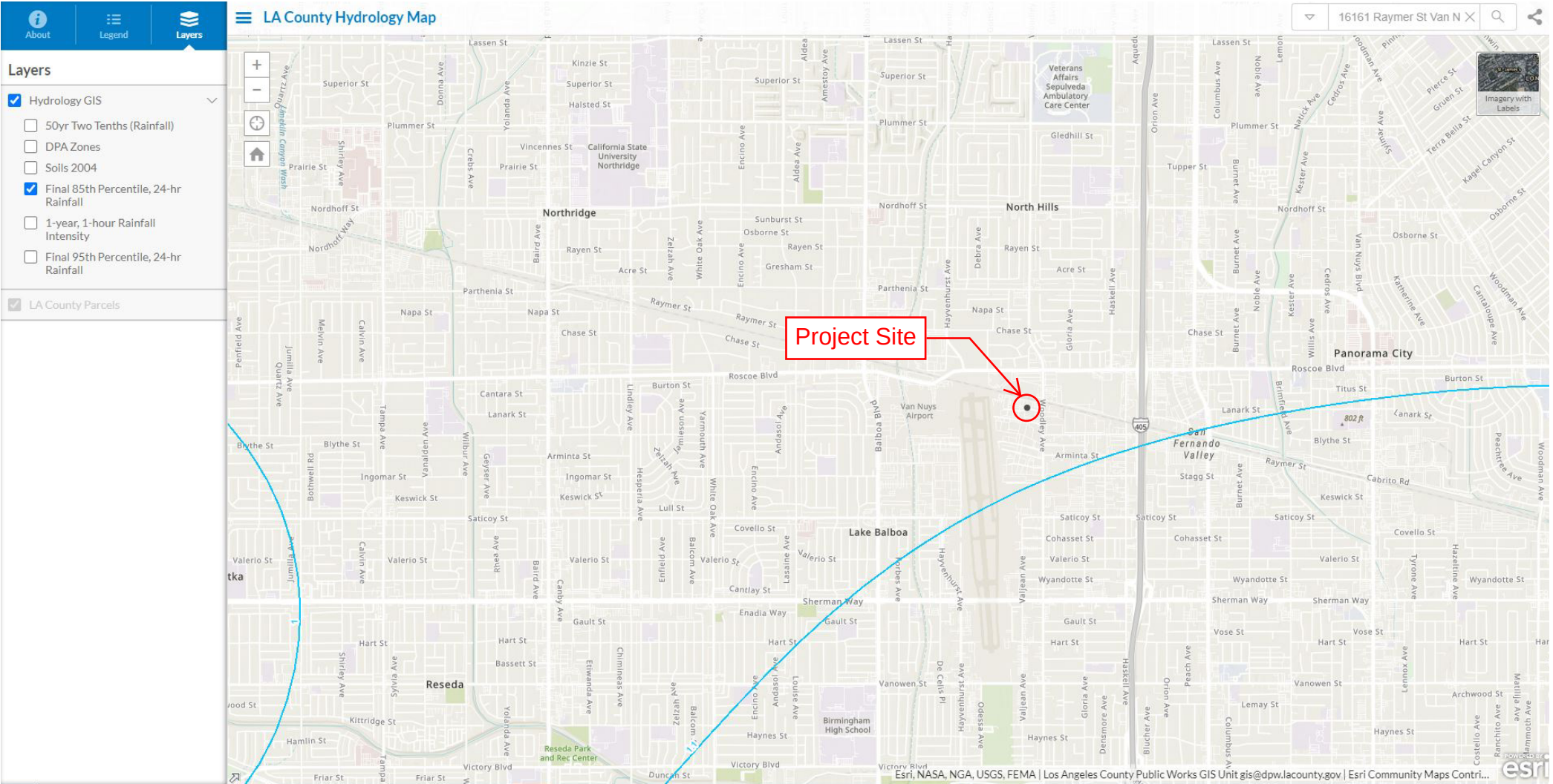
APPENDIX A

LACDPW Hydrology Maps

16201 Raymer St., Van Nuys, CA

85th Percentile = 1.1 inch

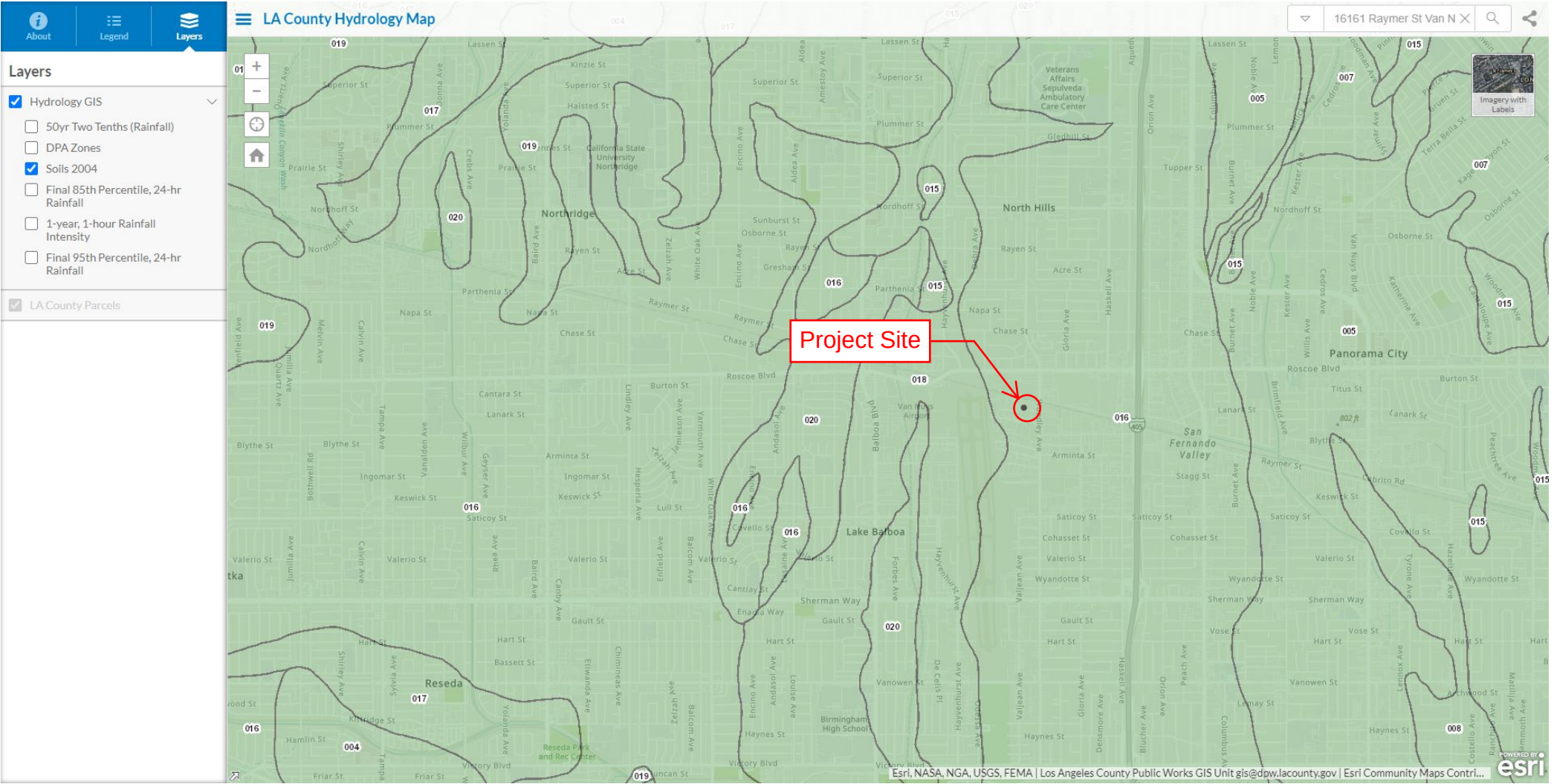
Hydrology Map References



16201 Raymer St., Van Nuys, CA

Hydrology Map References

Soil Type = 016

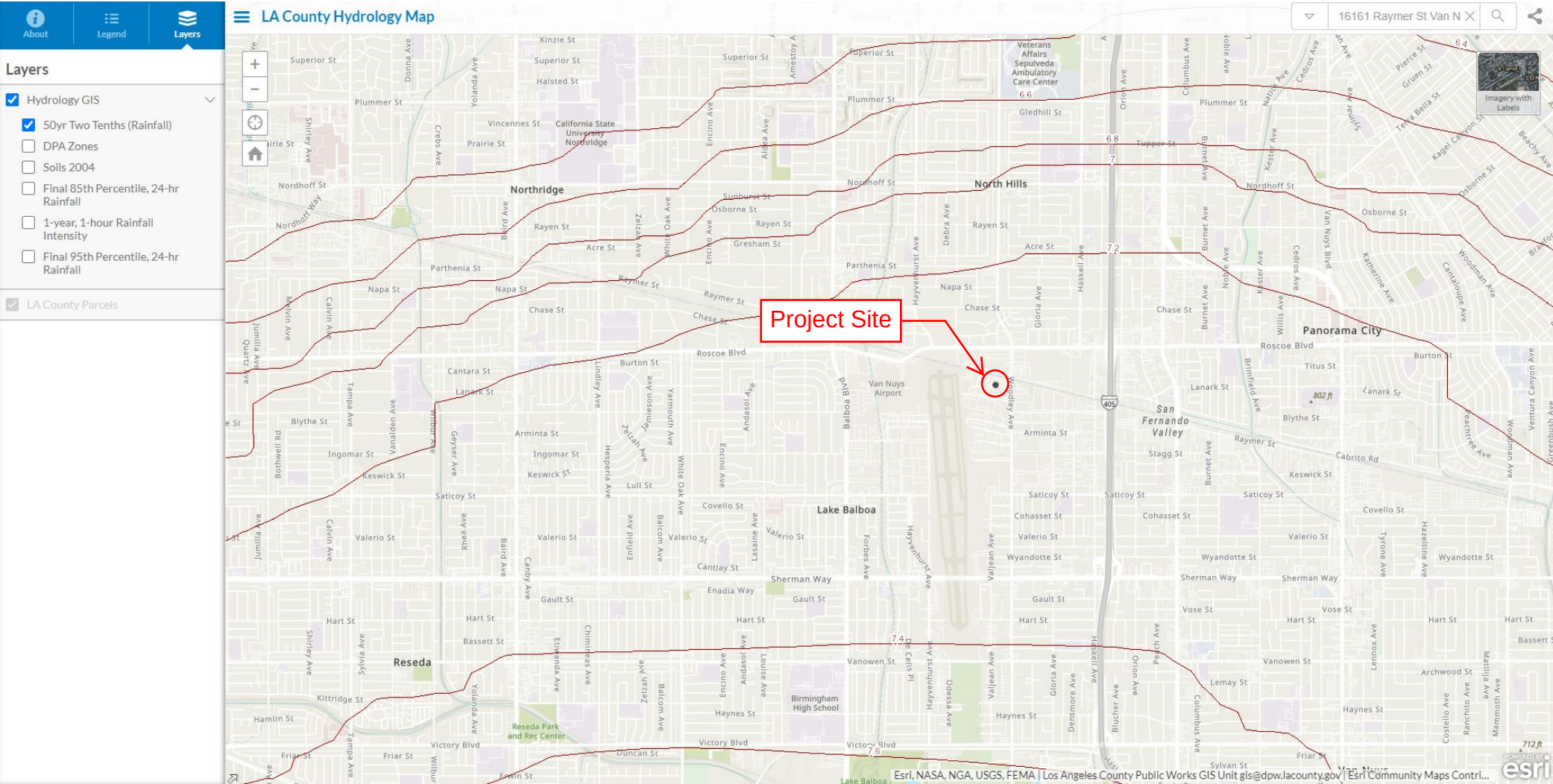


16201 Raymer St., Van Nuys, CA

Hydrology Map References

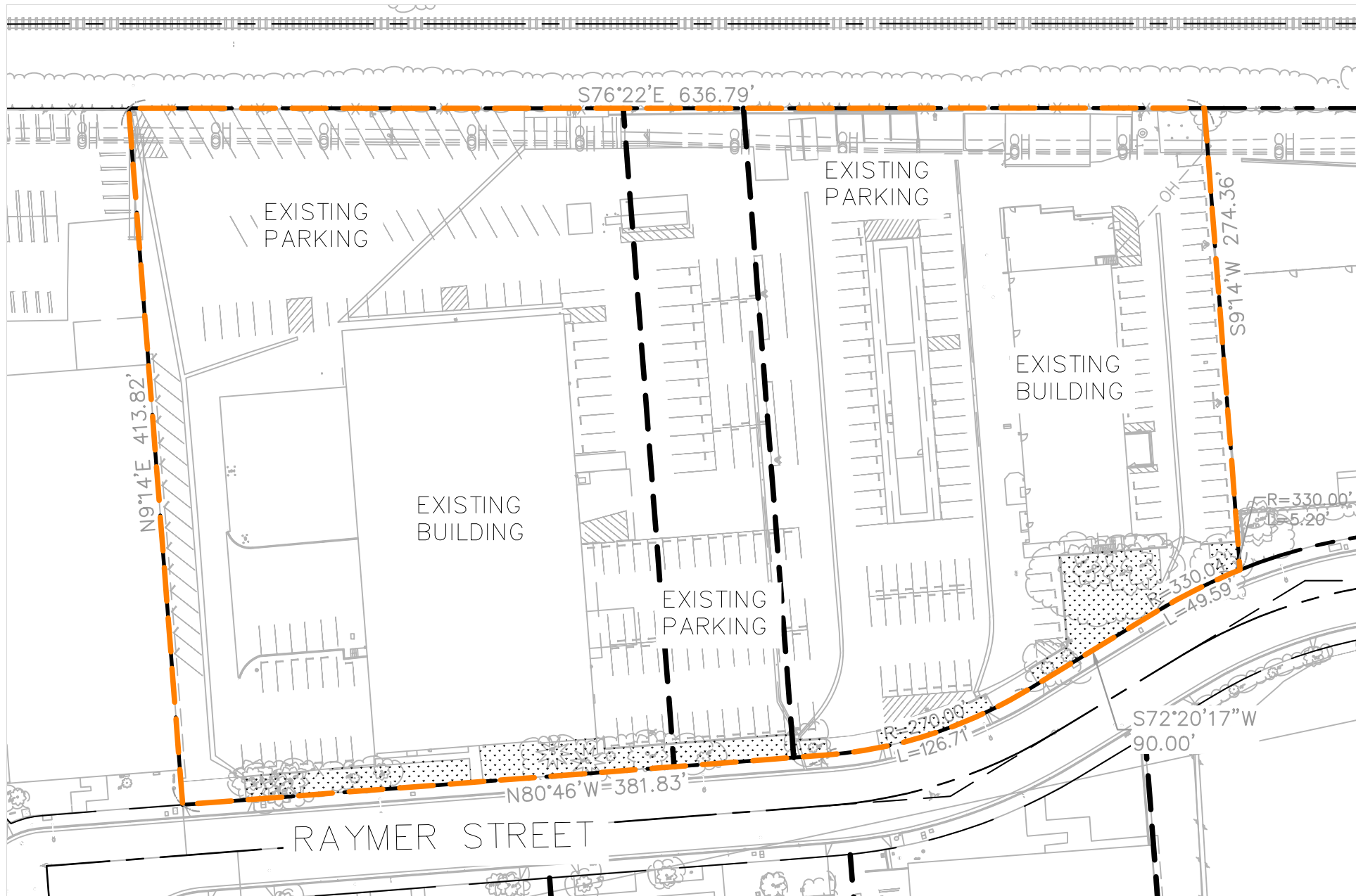


50-year = 7.3 inch



APPENDIX B

Hydrology Exhibits for Existing and Proposed Conditions



LEGEND

- PROPERTY LINE
- DRAINAGE MANAGEMENT AREA
- PERVIOUS AREA

PROPERTY AREA = 5.46 AC

	IMPERVIOUS AREA	PERVIOUS AREA	DISTURBED AREA
EXISTING CONDITIONS	5.24 AC	0.22 AC	5.46 AC

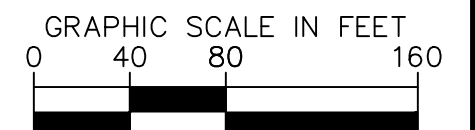
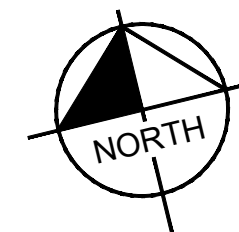
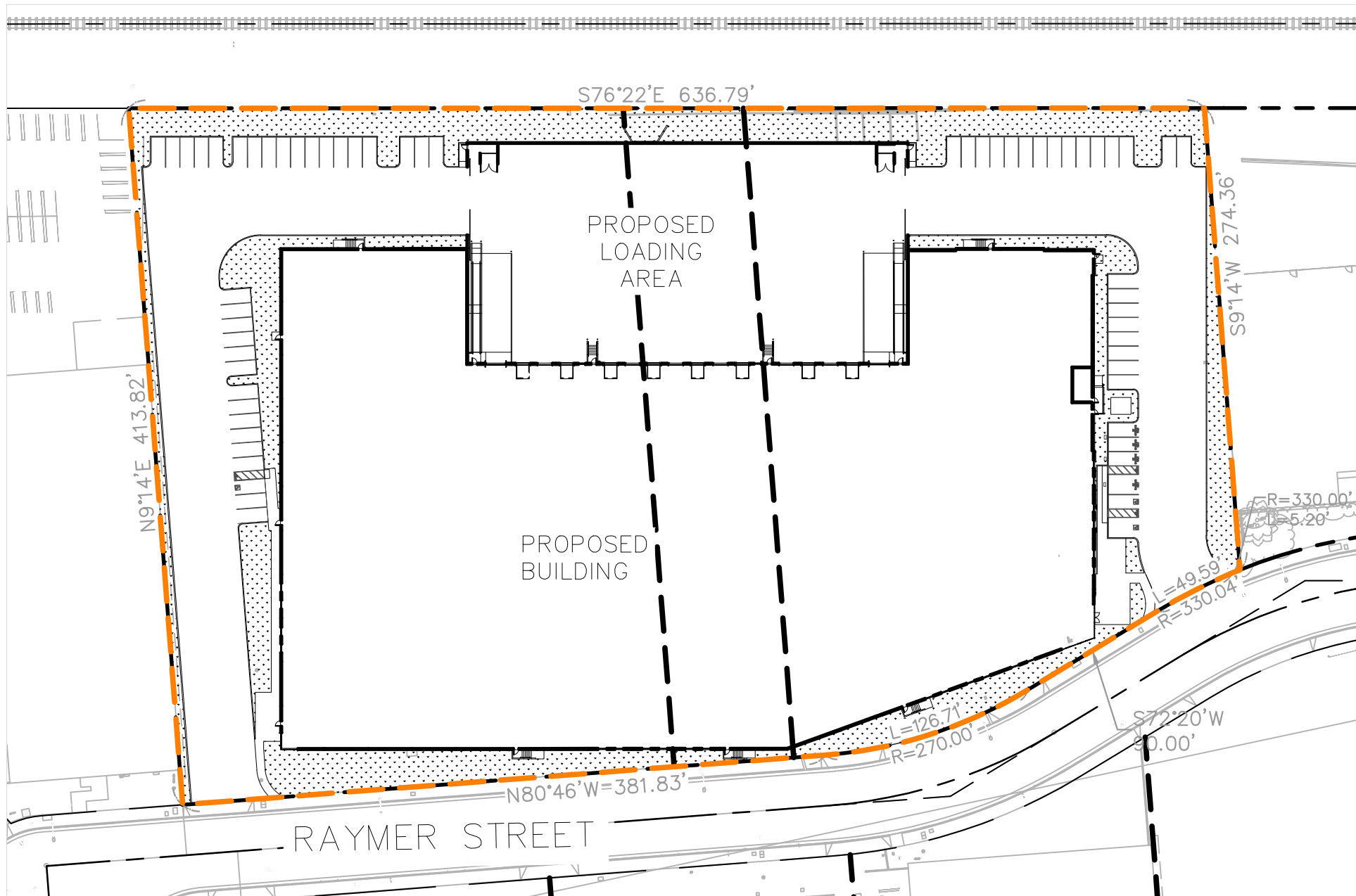


EXHIBIT 1 - 16201 RAYMER ST EXISTING HYDROLOGY

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LEGEND

- PROPERTY LINE
- DRAINAGE MANAGEMENT AREA
- PERVIOUS AREA (LANDSCAPE)

PROPERTY AREA = 5.46 AC

	IMPERVIOUS AREA	PERVIOUS AREA	DISTURBED AREA
PROPOSED CONDITIONS	4.71 AC	0.75 AC	5.46 AC

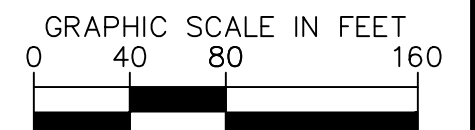
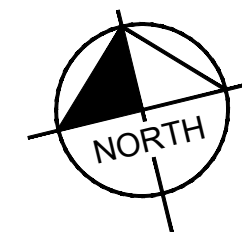


EXHIBIT 2 - 16201 RAYMER ST PROPOSED HYDROLOGY

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APPENDIX C

Hydrology HydroCalc Result Printouts

Peak Flow Hydrologic Analysis

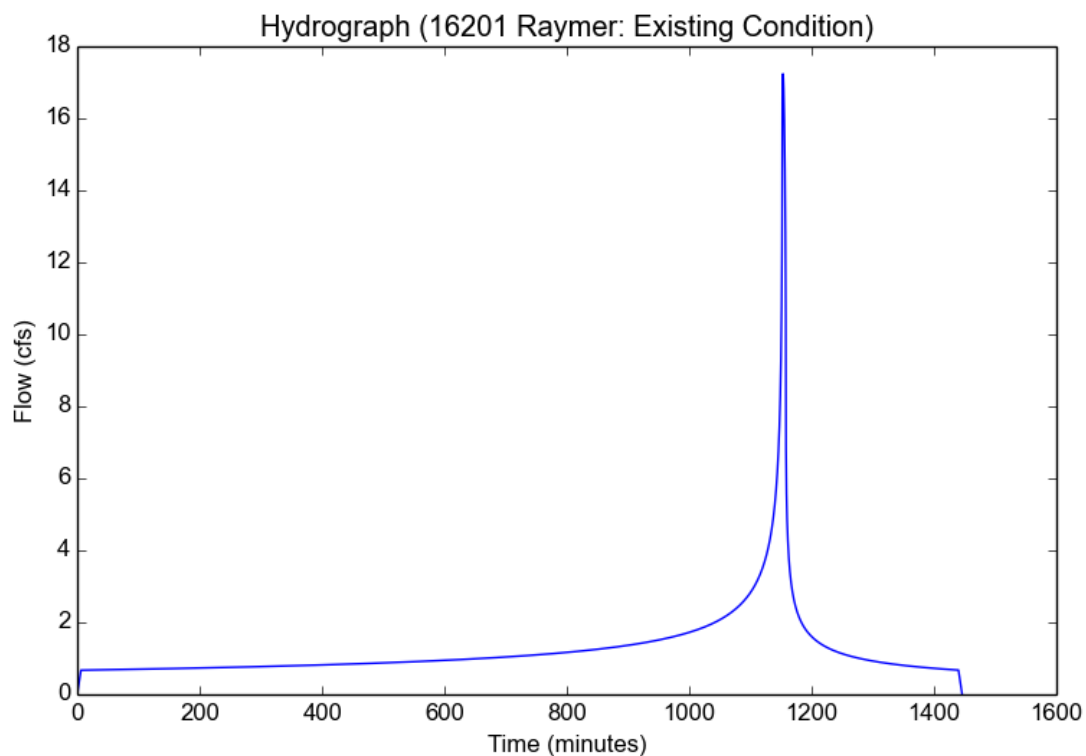
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	Existing Condition
Area (ac)	5.462695133
Flow Path Length (ft)	460.0
Flow Path Slope (vft/hft)	0.0113
50-yr Rainfall Depth (in)	7.3
Percent Impervious	0.96
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.51
Undeveloped Runoff Coefficient (Cu)	0.8755
Developed Runoff Coefficient (Cd)	0.899
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	17.2378
Burned Peak Flow Rate (cfs)	17.2378
24-Hr Clear Runoff Volume (ac-ft)	2.524
24-Hr Clear Runoff Volume (cu-ft)	109945.5566



Peak Flow Hydrologic Analysis

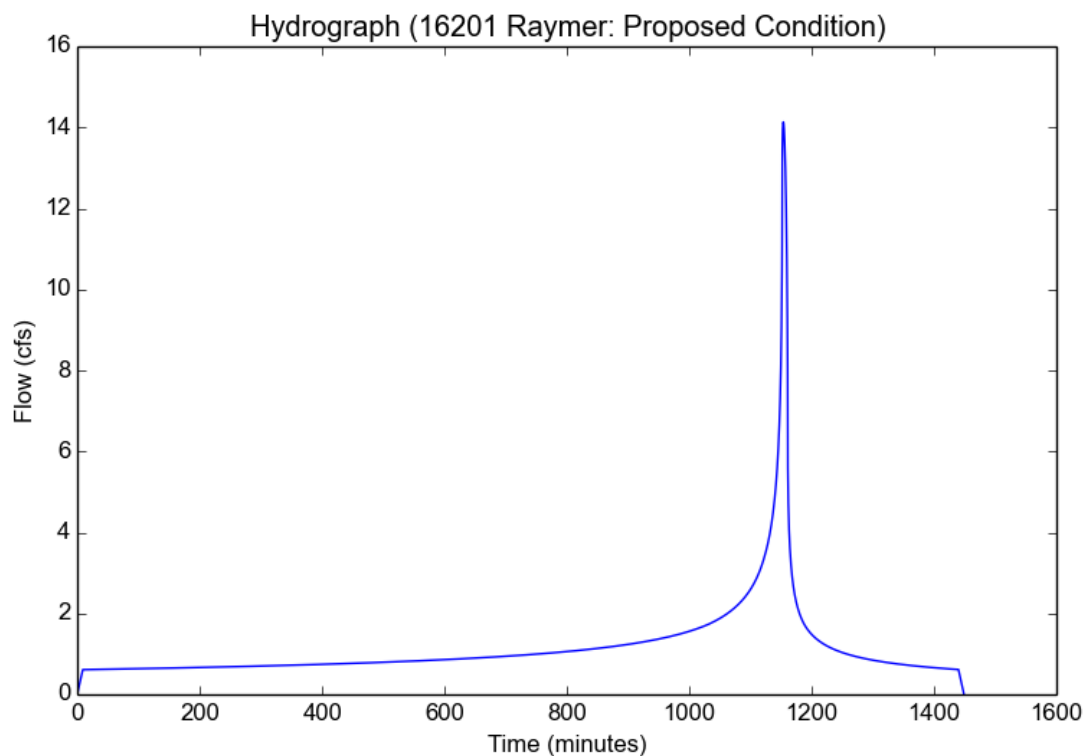
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	Proposed Condition
Area (ac)	5.462695133
Flow Path Length (ft)	812.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	7.3
Percent Impervious	0.86
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	2.901
Undeveloped Runoff Coefficient (Cu)	0.8417
Developed Runoff Coefficient (Cd)	0.8918
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	14.1331
Burned Peak Flow Rate (cfs)	14.1331
24-Hr Clear Runoff Volume (ac-ft)	2.3233
24-Hr Clear Runoff Volume (cu-ft)	101200.9433



APPENDIX D

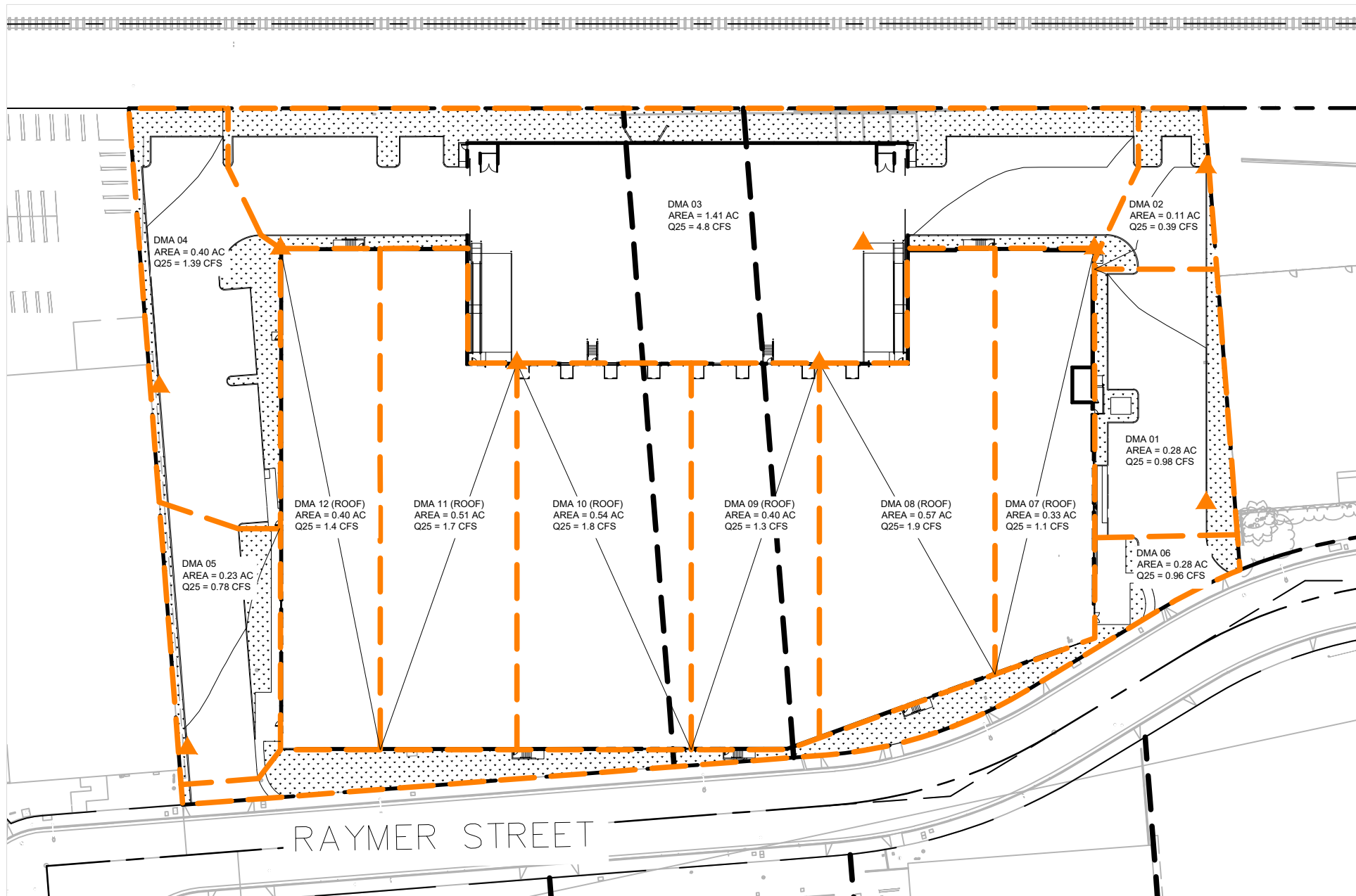
Hydraulic HydroCalc Result Printouts and Exhibit

Proposed Conditions

Name	Area		Pervious		Impervious		Length (Ft)	HydroCalc Q25
	(SF)	(AC)	(SF)	(AC)	(SF)	(AC)		
DMA 01	12,407	0.28	3,051	0.07	9,356	0.21	174	0.98
DMA 02	4,936	0.11	1,668	0.04	3,268	0.08	100	0.39
DMA 03	61,288	1.41	12,257	0.28	49,031	1.13	200	4.8
DMA 04	17,635	0.40	4,669	0.11	12,966	0.30	182	1.39
DMA 05	9,939	0.23	2,483	0.06	7,456	0.17	144	0.78
DMA 06	12,283	0.28	8,555	0.20	3,728	0.09	30	0.96
DMA 07	14,260	0.33	0	0.00	14,260	0.33	260	1.12
DMA 08	24,674	0.57	0	0.00	24,674	0.57	212	1.94
DMA 09	17,300	0.40	0	0.00	17,300	0.40	241	1.36
DMA 10	23,625	0.54	0	0.00	23,625	0.54	251	1.86
DMA 11	22,085	0.51	0	0.00	22,085	0.51	242	1.74
DMA 12	17,523	0.40	0	0.00	17,523	0.40	300	1.38
Total	237,956	5.46	32,683	0.75	205,273	4.71	812	14.1*

*Total Q25 from the overall proposed site analysis.

See Exhibit 3 for DMAs.



LEGEND

- PROPERTY LINE
- DRAINAGE MANAGEMENT AREA
- PERVIOUS AREA (LANDSCAPE)
- DRAINAGE POINT OF INTEREST

PROPERTY AREA = 5.46 AC

	IMPERVIOUS AREA	PERVIOUS AREA	DISTURBED AREA
PROPOSED CONDITIONS	4.71 AC	0.75 AC	5.46 AC

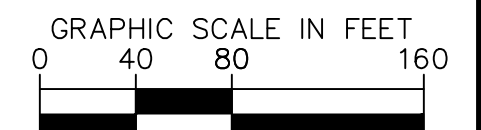
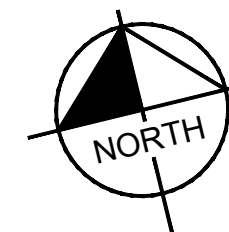


EXHIBIT 3 - 16201 RAYMER ST PROPOSED HYDROLOGY

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Peak Flow Hydrologic Analysis

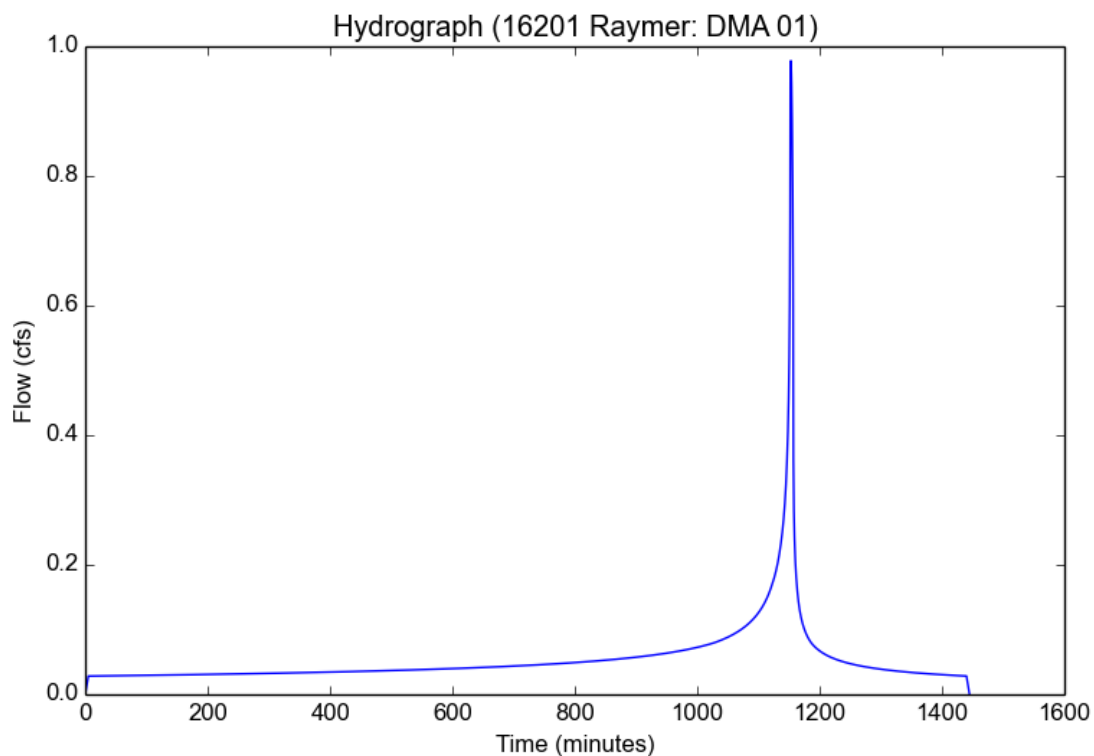
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 01
Area (ac)	0.284820707
Flow Path Length (ft)	174.0
Flow Path Slope (vft/hft)	0.018
50-yr Rainfall Depth (in)	7.3
Percent Impervious	0.75
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.8979
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.978
Burned Peak Flow Rate (cfs)	0.978
24-Hr Clear Runoff Volume (ac-ft)	0.1096
24-Hr Clear Runoff Volume (cu-ft)	4775.9504



Peak Flow Hydrologic Analysis

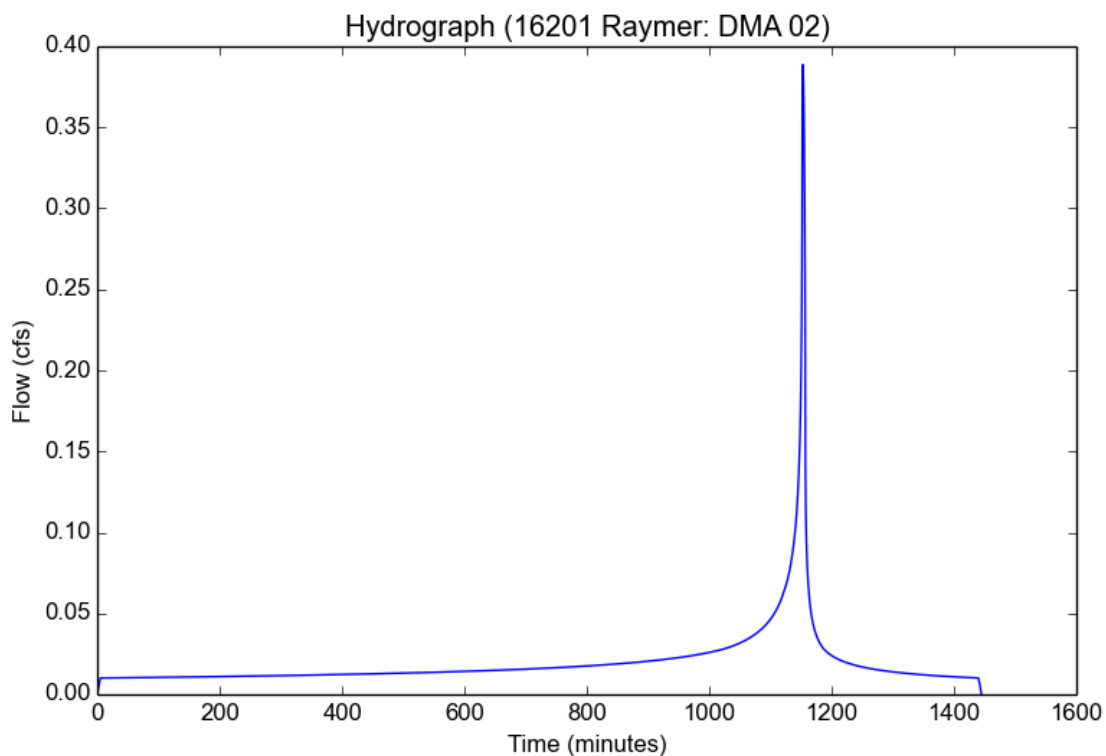
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 02
Area (ac)	0.113306474
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	7.3
Percent Impervious	0.66
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.8972
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.3887
Burned Peak Flow Rate (cfs)	0.3887
24-Hr Clear Runoff Volume (ac-ft)	0.0399
24-Hr Clear Runoff Volume (cu-ft)	1736.8659



Peak Flow Hydrologic Analysis

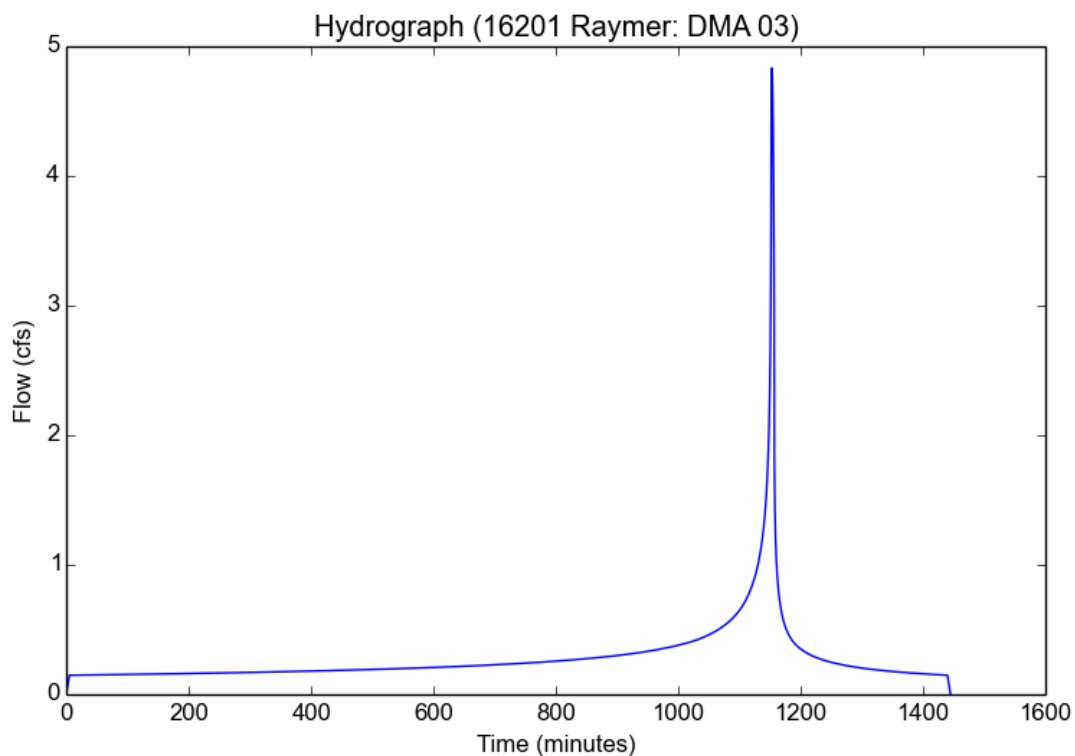
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 03
Area (ac)	1.406987374
Flow Path Length (ft)	200.0
Flow Path Slope (vft/hft)	0.015
50-yr Rainfall Depth (in)	7.3
Percent Impervious	0.8
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.8983
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	4.8333
Burned Peak Flow Rate (cfs)	4.8333
24-Hr Clear Runoff Volume (ac-ft)	0.5674
24-Hr Clear Runoff Volume (cu-ft)	24717.8251



Peak Flow Hydrologic Analysis

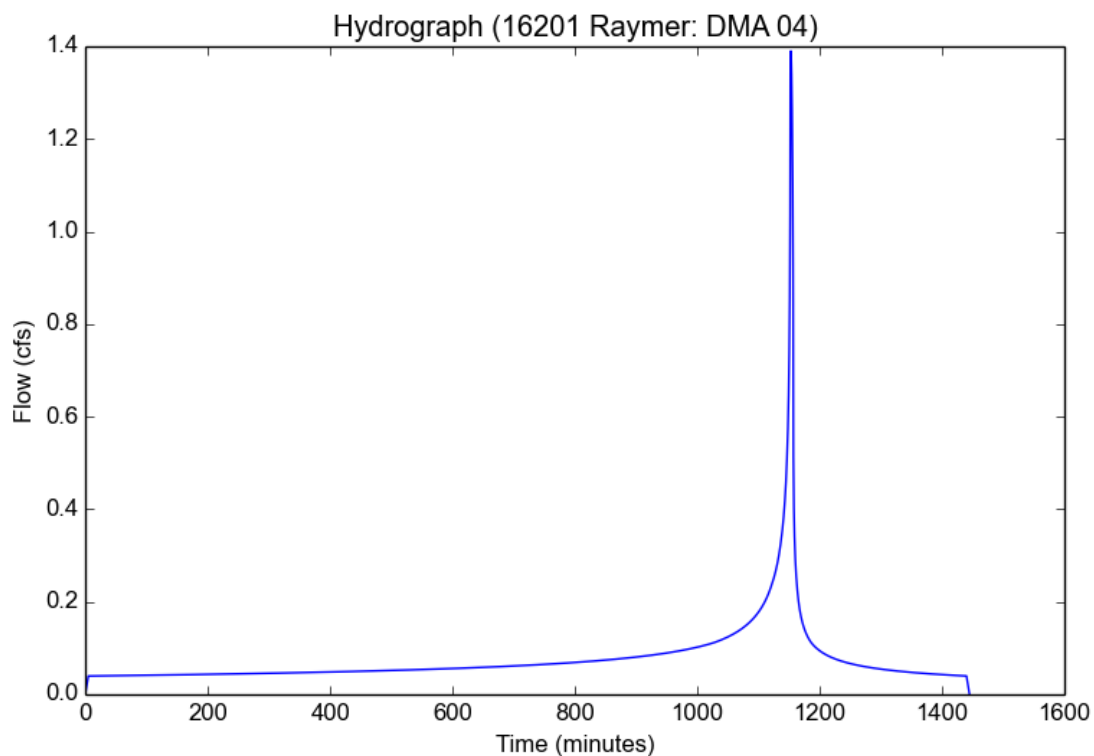
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 04
Area (ac)	0.404848944
Flow Path Length (ft)	182.0
Flow Path Slope (vft/hft)	0.015
50-yr Rainfall Depth (in)	7.3
Percent Impervious	0.74
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.8978
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.39
Burned Peak Flow Rate (cfs)	1.39
24-Hr Clear Runoff Volume (ac-ft)	0.1544
24-Hr Clear Runoff Volume (cu-ft)	6723.8697



Peak Flow Hydrologic Analysis

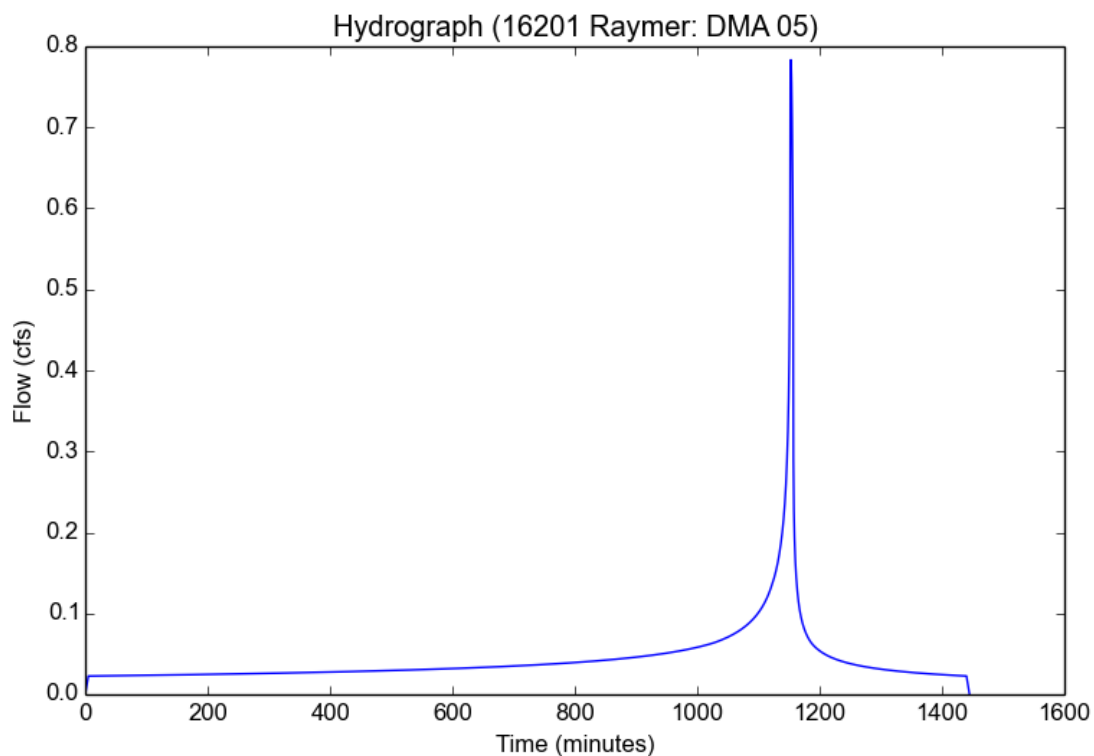
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 05
Area (ac)	0.228156795
Flow Path Length (ft)	144.0
Flow Path Slope (vft/hft)	0.032
50-yr Rainfall Depth (in)	7.3
Percent Impervious	0.75
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.8979
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.7834
Burned Peak Flow Rate (cfs)	0.7834
24-Hr Clear Runoff Volume (ac-ft)	0.0878
24-Hr Clear Runoff Volume (cu-ft)	3825.7947



Peak Flow Hydrologic Analysis

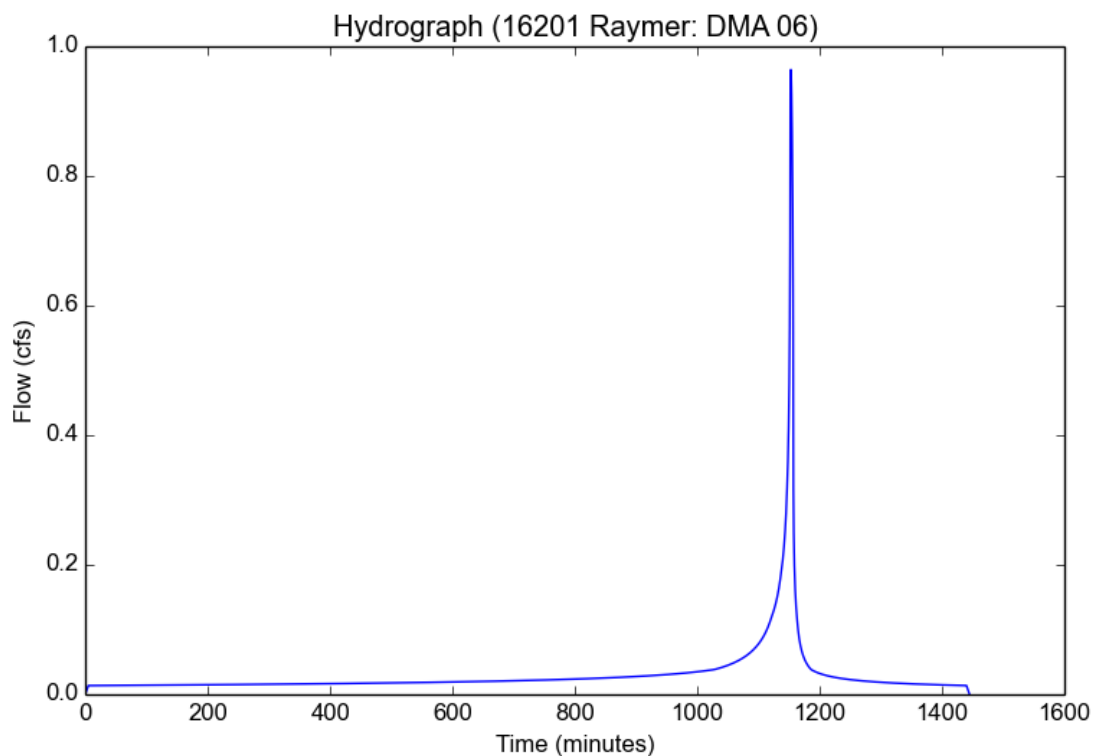
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 06
Area (ac)	0.281987144
Flow Path Length (ft)	40.0
Flow Path Slope (vft/hft)	0.03
50-yr Rainfall Depth (in)	7.3
Percent Impervious	0.3
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.8941
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.9642
Burned Peak Flow Rate (cfs)	0.9642
24-Hr Clear Runoff Volume (ac-ft)	0.062
24-Hr Clear Runoff Volume (cu-ft)	2699.0463



Peak Flow Hydrologic Analysis

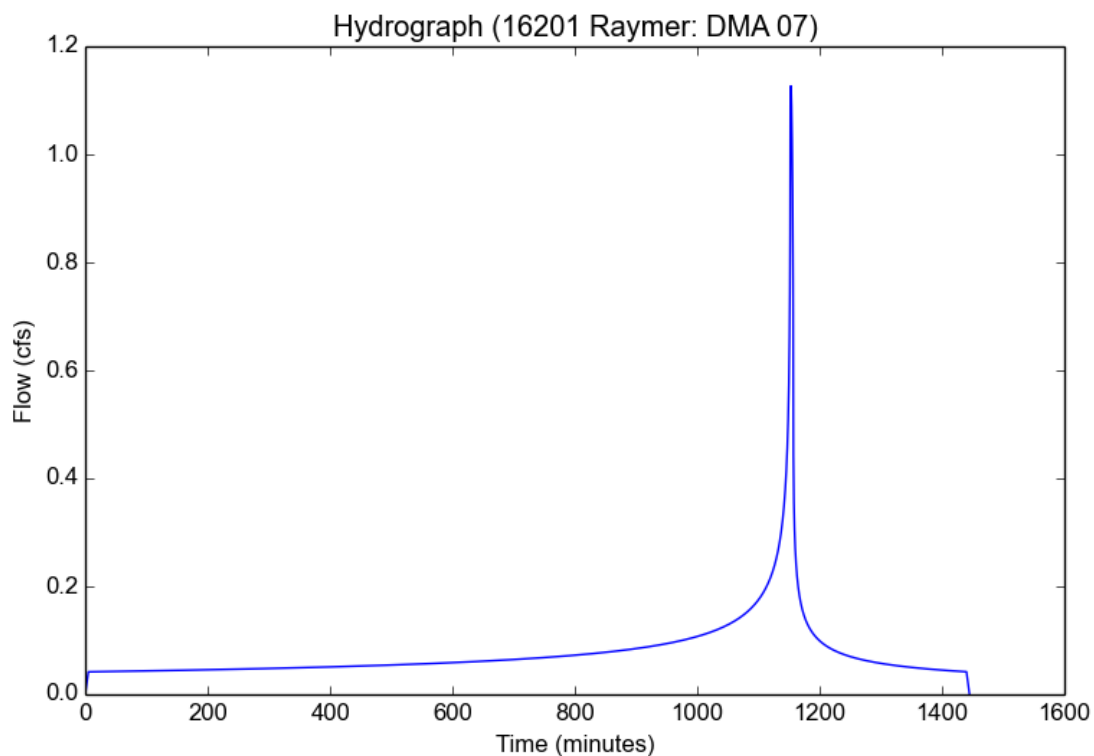
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 07
Area (ac)	0.327368457
Flow Path Length (ft)	260.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	7.3
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.1267
Burned Peak Flow Rate (cfs)	1.1267
24-Hr Clear Runoff Volume (ac-ft)	0.1561
24-Hr Clear Runoff Volume (cu-ft)	6798.2848



Peak Flow Hydrologic Analysis

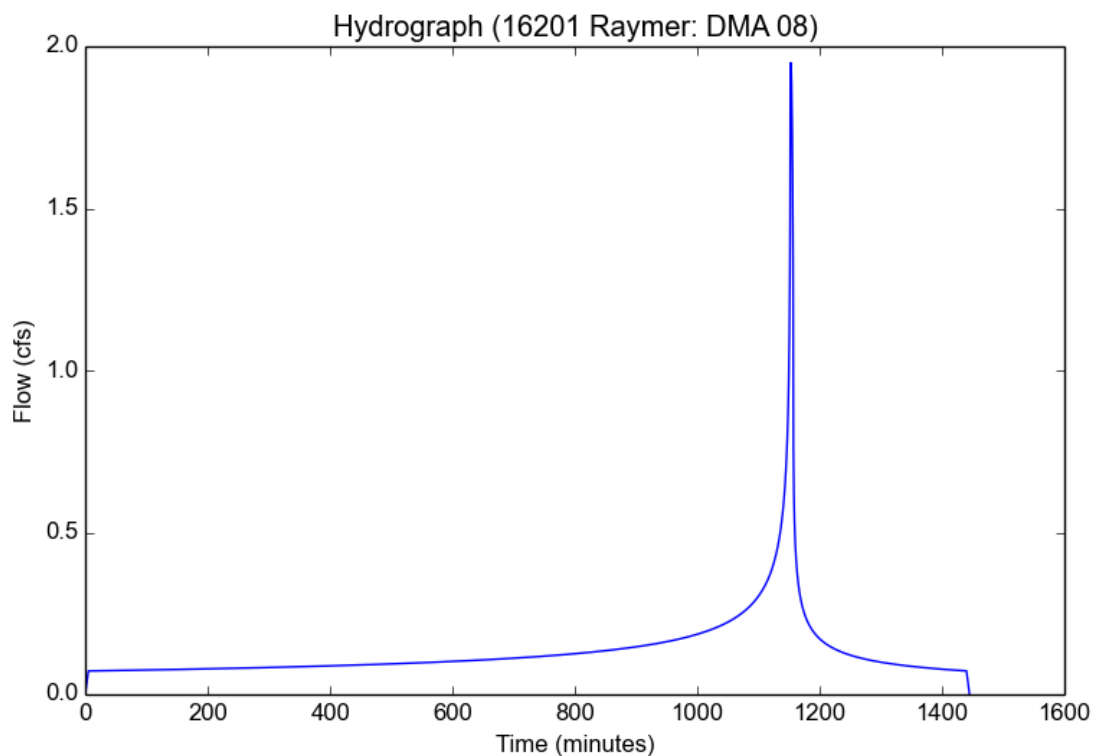
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 08
Area (ac)	0.566443756
Flow Path Length (ft)	212.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	7.3
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.9495
Burned Peak Flow Rate (cfs)	1.9495
24-Hr Clear Runoff Volume (ac-ft)	0.27
24-Hr Clear Runoff Volume (cu-ft)	11763.033



Peak Flow Hydrologic Analysis

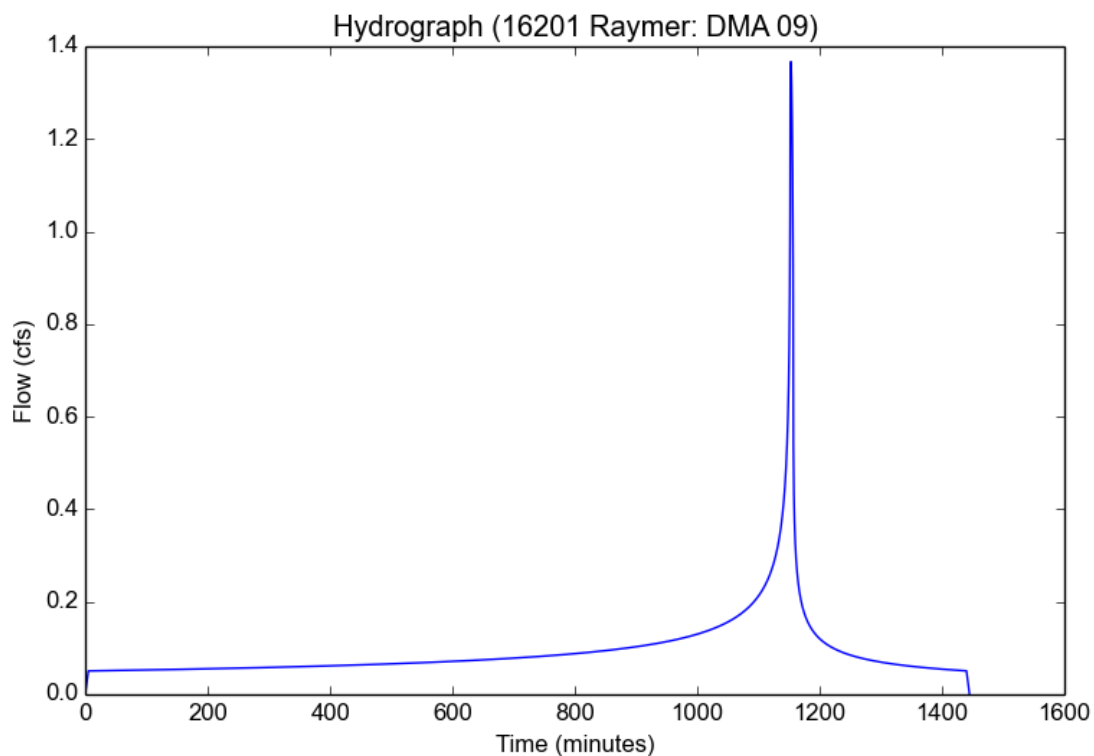
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 09
Area (ac)	0.397162075
Flow Path Length (ft)	241.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	7.3
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.3669
Burned Peak Flow Rate (cfs)	1.3669
24-Hr Clear Runoff Volume (ac-ft)	0.1893
24-Hr Clear Runoff Volume (cu-ft)	8247.6513



Peak Flow Hydrologic Analysis

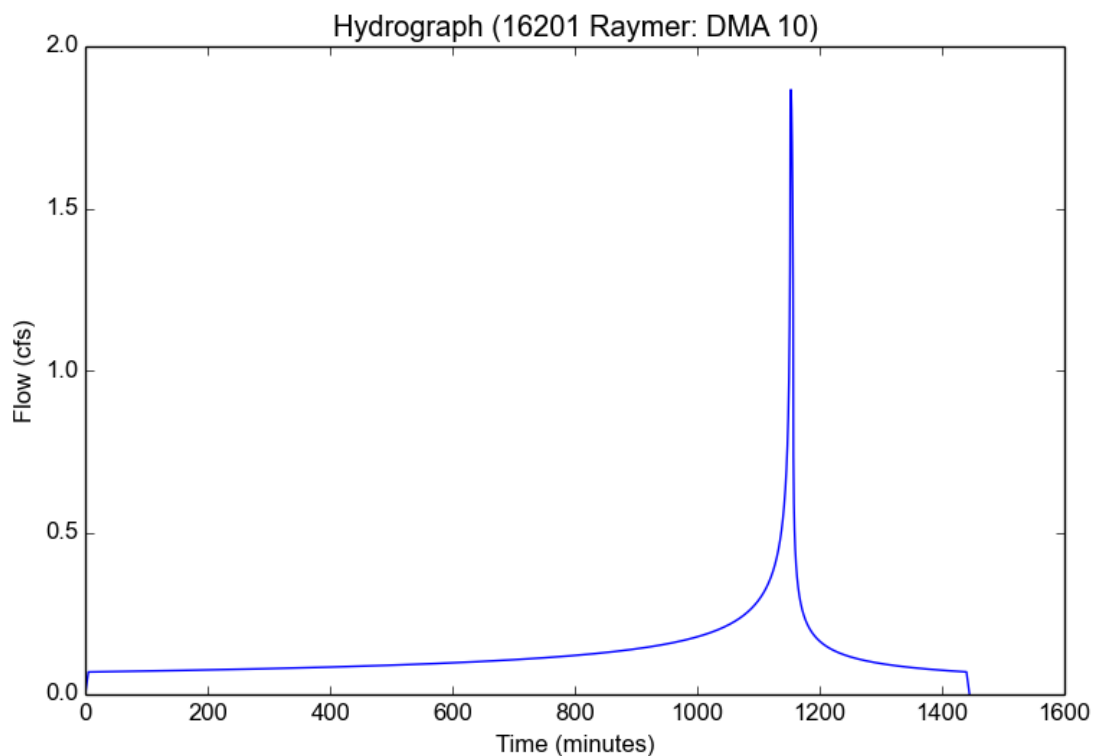
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 10
Area (ac)	0.542359275
Flow Path Length (ft)	251.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	7.3
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.8666
Burned Peak Flow Rate (cfs)	1.8666
24-Hr Clear Runoff Volume (ac-ft)	0.2586
24-Hr Clear Runoff Volume (cu-ft)	11262.8835



Peak Flow Hydrologic Analysis

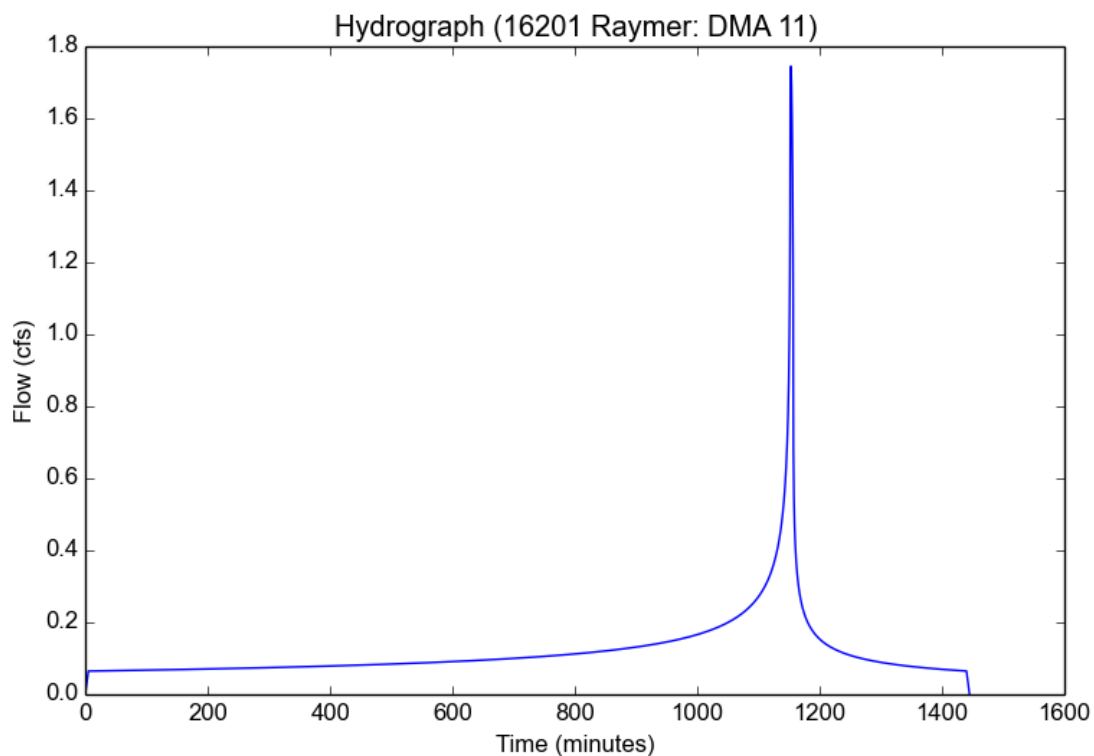
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 11
Area (ac)	0.507001837
Flow Path Length (ft)	242.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	7.3
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.7449
Burned Peak Flow Rate (cfs)	1.7449
24-Hr Clear Runoff Volume (ac-ft)	0.2417
24-Hr Clear Runoff Volume (cu-ft)	10528.6346



Peak Flow Hydrologic Analysis

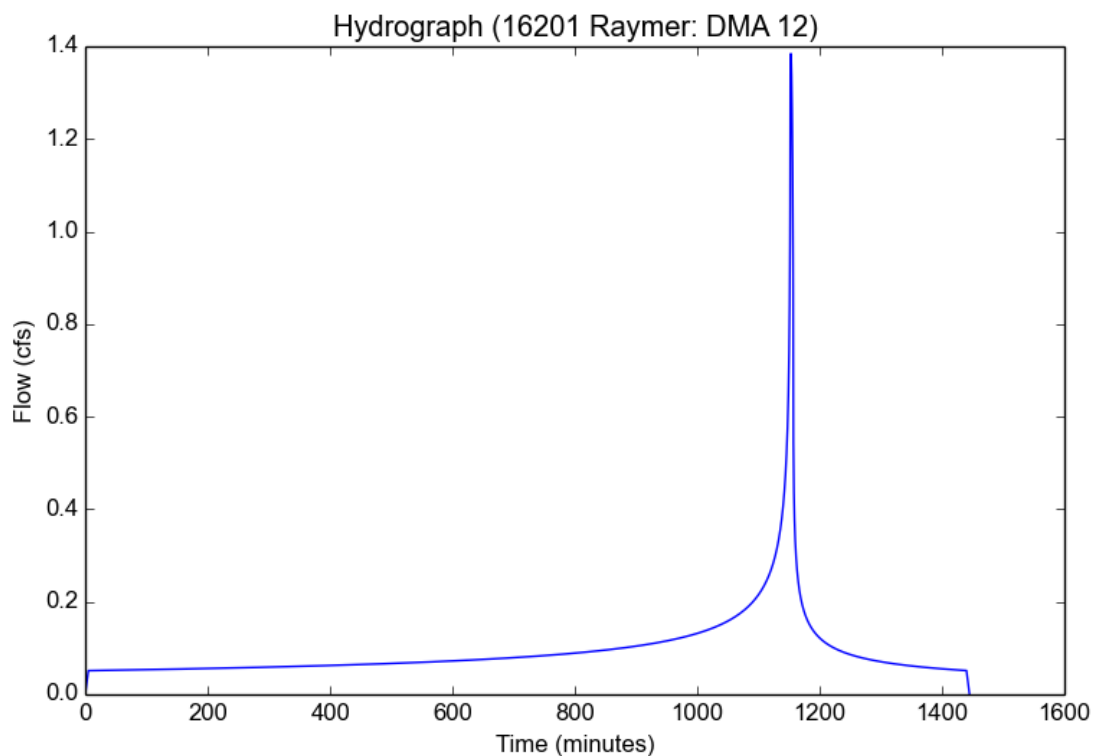
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	16201 Raymer
Subarea ID	DMA 12
Area (ac)	0.402272727
Flow Path Length (ft)	300.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	7.3
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

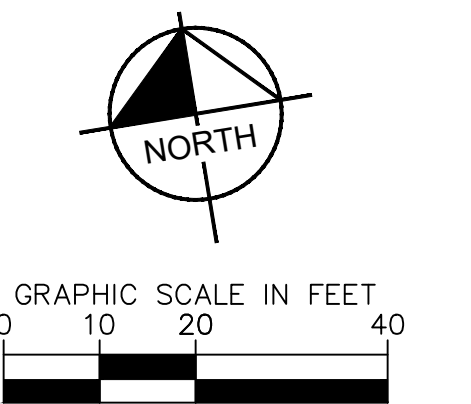
Output Results

Modeled (25-yr) Rainfall Depth (in)	6.4094
Peak Intensity (in/hr)	3.824
Undeveloped Runoff Coefficient (Cu)	0.8916
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.3845
Burned Peak Flow Rate (cfs)	1.3845
24-Hr Clear Runoff Volume (ac-ft)	0.1918
24-Hr Clear Runoff Volume (cu-ft)	8353.7815



APPENDIX E

Hydraulics Calculations - FloMaster



16201 Raymer Street

Circular Pipe - 10"

Project Description	
Friction Method	Manning
Solve For	Formula Discharge
Input Data	
Roughness Coefficient	0.012
Channel Slope	0.005 ft/ft
Normal Depth	10.0 in
Diameter	10.0 in
Results	
Discharge	1.68 cfs
Flow Area	0.5 ft ²
Wetted Perimeter	2.6 ft
Hydraulic Radius	2.5 in
Top Width	0.00 ft
Critical Depth	7.0 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	3.08 ft/s
Velocity Head	0.15 ft
Specific Energy	0.98 ft
Froude Number	(N/A)
Maximum Discharge	1.81 cfs
Discharge Full	1.68 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	10.0 in
Critical Depth	7.0 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

16201 Raymer Street

Circular Pipe - 12"

Project Description	
Friction Method	Manning
Solve For	Formula Discharge
Input Data	
Roughness Coefficient	0.012
Channel Slope	0.005 ft/ft
Normal Depth	12.0 in
Diameter	12.0 in
Results	
Discharge	2.73 cfs
Flow Area	0.8 ft ²
Wetted Perimeter	3.1 ft
Hydraulic Radius	3.0 in
Top Width	0.00 ft
Critical Depth	8.5 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	3.47 ft/s
Velocity Head	0.19 ft
Specific Energy	1.19 ft
Froude Number	(N/A)
Maximum Discharge	2.94 cfs
Discharge Full	2.73 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	12.0 in
Critical Depth	8.5 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Circular Pipe - 18"

Project Description	
Friction Method	Manning
Solve For	Formula
	Discharge
Input Data	
Roughness Coefficient	0.012
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Results	
Discharge	8.05 cfs
Flow Area	1.8 ft ²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	13.2 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	4.55 ft/s
Velocity Head	0.32 ft
Specific Energy	1.82 ft
Froude Number	(N/A)
Maximum Discharge	8.66 cfs
Discharge Full	8.05 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	18.0 in
Critical Depth	13.2 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

16201 Raymer Street

Circular Pipe - 21"

Project Description	
Friction Method	Manning
Solve For	Formula Discharge
Input Data	
Roughness Coefficient	0.012
Channel Slope	0.005 ft/ft
Normal Depth	21.0 in
Diameter	21.0 in
Results	
Discharge	12.14 cfs
Flow Area	2.4 ft ²
Wetted Perimeter	5.5 ft
Hydraulic Radius	5.3 in
Top Width	0.00 ft
Critical Depth	15.6 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	5.05 ft/s
Velocity Head	0.40 ft
Specific Energy	2.15 ft
Froude Number	(N/A)
Maximum Discharge	13.06 cfs
Discharge Full	12.14 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	21.0 in
Critical Depth	15.6 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

16201 Raymer Street

Circular Pipe - 24"

Project Description	
Friction Method	Manning
Solve For	Formula Discharge
Input Data	
Roughness Coefficient	0.012
Channel Slope	0.005 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Results	
Discharge	17.33 cfs
Flow Area	3.1 ft ²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	18.0 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	5.52 ft/s
Velocity Head	0.47 ft
Specific Energy	2.47 ft
Froude Number	(N/A)
Maximum Discharge	18.64 cfs
Discharge Full	17.33 cfs
Slope Full	0.005 ft/ft
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	24.0 in
Critical Depth	18.0 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

16201 Raymer Street

Weir Equation

Drop Inlet	Drop Inlet Type	Width/Perimeter (ft)	Ponded Depth (in)	% Opening of Grate	Full Capacity (cfs)	Clogging Factor (%)	Clogged Capacity (cfs)
DMA 02 GRADED INLET	12"x12" Grate	4	8	100	6.53	75	4.90
	18"x18" Grate	6	8	100	9.80	75	7.35
	24"x24" Grate	8	8	100	13.06	75	9.80
	24"x48" Grate	12	8	100	19.60	75	14.70
	36"X36" Grate	12	8	100	19.60	75	14.70

Weir Equation

Catch Basin	Catch Basin Type	Width/Perimeter (ft)	Ponded Depth (in)	% Opening of Grate	Full Capacity (cfs)	Clogging Factor (%)	Clogged Capacity (cfs)
ALL CURB OPENING CBS	3.5' Curb Inlet	3.5	8	100	5.72	75	4.29
	7' Curb Inlet	7	5.83	100	7.11	100	7.11
	14' Curb Inlet	14	5.83	100	14.22	102	14.51

Orifice Equation

Catch Basin Number	Type	Area (sq. ft.)*	Ponded Depth (in)	% Opening of Grate	Full Capacity (cfs)	Clogging Factor (%)	Clogged Capacity (cfs)
1	18"x18" Grate	2.25	6	75	6.41	50	3.20
2	12"x12" Grate	1	6	75	2.85	50	1.42
3	24"x24" Grate	4	6	75	11.39	50	5.70
4	30"x30" Grate	6.25	6	75	17.80	50	8.90
5	3.5' Curb Inlet	2.33	6	100	8.85	100	8.85
6	7' Curb Inlet	4.67	6	100	17.73	100	17.73
7	10' Curb Inlet	6.67	10	100	32.70	100	32.70
8	14' Curb Inlet	9.33	10	100	45.74	100	45.74
9	36" Riser	7.07	12	100	37.96	100	37.96
10	12" Riser	7.07	12	100	37.96	100	37.96
11	36"x36"	9	6	100	34.17	100	34.17
12	48"x48"	16	6	100	60.75	100	60.75
					0.00		0.00
					0.00		0.00
					0.00		0.00