APPENDIX E

- LID Plan
- Hydrology Report

PROJECT NO.: [CONFCDMS0003]

PRELIMINARY LOW IMPACT DEVELOPMENT (LID) PLAN

-FOR-

MORNINGSTAR OF GRANADA HILLS

APN(S): 2601-040-091, 2601-040-092, 2601-040-049, & 2601-040-090
LOT(S)/PARCEL(S):
PLANNING APPLICTION #:
GRADING PERMIT #:
BUILDING PERMIT #:

PREPARED FOR: **CONFLUENT DEVELOPMENT**
2240 BLAKE ST. SUITE 200
DENVER, CO 80205
H. MCNEISH
hmcneish@confluentdev.com
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PREPARED BY: **JOSE CRUZ, PE, MS, QSD**
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DATE PREPARED: 06-28-2022

DAVID EVANS AND ASSOCIATES INC.

This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein. The registered civil engineer has also judged the qualifications of any technical specialists providing engineering data upon which recommendations, conclusions, and decisions are based.

	06-28-2022
[Jose Cruz]	Date

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SECTION I. INTRODUCTION AND PURPOSE

The purpose of this report is to provide documentation for the Low Impact Development of the Storm Drain Improvement associated with the construction of MorningStar of Granada Hills located at 17551 and 17663 Rinaldi St., Granada Hills, CA.

The project proposes 135,907.20 square feet of new impervious surfaces. To meet water quality requirement, this report provides documentation, BMP selection validation, and BMP maintenance requirements/agreements for the owner.

The 50-yr storm event and hydraulic calculations are included as part of the Hydrology Report dated 06-28-2022.

This report will evaluate the proposed water quality BMP design. Analysis will be performed for the greater of 85th percentile and .75" storm event.

SECTION II. PROJECT LOCATION AND DESCRIPTION

II.1 EXISTING CONDITIONS

The project is located at 17551 and 17663 Rinaldi St., Granada Hills, CA. Surrounding uses predominantly include single family residences and a religious church/school.

The existing site consists of 44% undeveloped land with majority being on the westerly side of the property. There are currently three residential homes on the easterly side of the property adjacent to Shoshone Ave. The site currently sheet flows on the undeveloped land labeled area "A1" in **Appendix A** from west to east and onto Shoshone Ave. Area labeled as "B1" consist of a single-family home where water also flows from west to east and onto Shoshone Ave. Street flows are then collected at Shoshone Ave gutter and flowing into a street catch basin. Area labeled as "C1" consist of two single family residential homes on the southeast corner of the property with water flowing from west to the southeast corner of Rinaldi St and Shoshone Ave. Area labeled as "D1" consists of undeveloped land located on the west side of the property with sheet flow occurring from the west side of the property to the south side and onto Rinaldi St. Both areas "C1" and "D1" travel to the gutter on Rinaldi St, adjacent to the property, and into the existing catch basin on the northwest corner of Rinaldi St and Shoshone Ave. Existing catch basins are maintained by LACFCD and drain into an existing 72" R.C.P. on Shoshone Ave via a 21" RCP lateral.

II.2 EXISTING GEOTECHINCAL CONDITIONS

The existing site has had a preliminary geotechnical investigation by GMU Geotechnical, INC utilizing five hollow stem auger drill holes and seven test pits. Based on the geologic map of the Oat Mountain and Canoga Park Quadrangle, the project site is underlain by alluvium deposits that consists of sands, clays and gravels. During the investigation, artificial fill soils were encountered in majority of the excavation to a maximum depth of 10 feet below existing grade that consists of light brown to dark brown, damp to moist, medium dense to silty and clayey sands, and firm to very stiff sandy clays. During the investigation with maximum depth of 51.5 ft below existing grade, groundwater was not encountered. It is assumed that infiltration can be performed, utilizing a minimum infiltration rate of 0.30 in/hr. The assumed value of 0.30 in/hr per City of LA should be field conducted. For the purposes of this preliminary report, infiltration testing will be recommended to confirm infiltration is a feasible BMP selection.

II.3 PROPOSED CONDITIONS

The proposed site will be developed with a two story 103,983 SF, senior living facility with 65 assisted living units and 30 memory care units for a total of 95 units. There will also be standard amenity spaces including dining, indoor and secure outdoor recreation, and social gathering spaces. There are three proposed on-site storm drains labeled "SD A" and "SD B" and "SD-C" on **Appendix B** With all to be expected to be a pipe no larger than 24 inch in diameter. Storm drain "SD A" collects area labeled "A1", while "SD B" collects area "B1", and Storm drain "SD C" collects area labeled "C1".

The total area for "A1" is 2.24 acres and total mitigation volume is 5,600 ft^3.

The area for "SD B" is 2.37 acres and total mitigation volume is 5,570 ft^3.

The area for "SD C" is 0.38 acres and total mitigation volume is 1,126 ft^3.

For LID purposes, the areas have been combined and analyzed, collectively, to determine the appropriate BMP will be needed for the entire site. The proposed mitigation volume treatment of the combined areas of 13,196 ft^3. It should be noted that the minimum infiltration rate of 0.30 in/hr was utilized in the calculation. During the final design of the project, a Geotechnical Infiltration Study shall be performed to determine field infiltration rate. Each area will need a 20 ft in depth Drywell(BMP 1.1) with 10 ft of the drywell consisting of an infiltration storage. In addition, due to the low infiltration rate a combination of two 105 ft long, 10 ft in diameter Storage Pipes/Tanks(BMP 1.2) to store the remaining volume are required. The total volume being treated by the Drywell(BMP 1.1) is 176 ft^3 hence the need of two Storage Pipes/Tanks being needed to store the remaining 12,668 ft^3. This study is being analyzed with the minimum infiltration rate required and will be further analyzed when Geotechnical Engineers provide actual infiltration rate that can result in no Storage Pipes/Tanks being needed.

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SECTION III. METHODOLOGY

The calculations and stormwater management methods contained in this report are based on the current City of Los Angeles and Los Angeles County Low Impact Development (LID) standards, and the LA County Hydrology Manual (LACHM).

III.1 HYDROLOGY

Hydrologic calculations for the project were performed using the methods outlined in the LA County Hydrology Manual to calculate the 85th percentile for Water Quality purposes. For the small sub watersheds of this project, a time of concentration of 5 minutes is assumed as a minimum. Due to the onsite retention of the majority of the new paved surfaces, flows leaving the site in the "post-developed" condition will be less than the "pre-developed" condition.

Hydrocalc software version 1.0.3, provided by LA County, was used to calculate the storm volumes and flowrates. Input parameters for soil class and isohyetals were gathered from the LA County Hydrology Map at https://dpw.lacounty.gov/wrd/hydrologygis/.

See Appendix 'C' for Hydrocalc inputs and calculations.

III.1.1. STORM EVENT 1

The 0.75-inch storm event was calculated for Water Quality purposes. This 0.75-inch rainfall value was input in the HydroCalc program to determine flow rate and volume. The volume for the area labeled as "A1" is 3,750 ft^3 and the volume for the area labeled as "B1" is 4,479 ft^3 and the volume for the area labeled as "C1" is 760 ft^3. The total combined 24-HR clear runoff volume for the 0.75" storm event is 8,989 ft^3.

III.1.2. STORM EVENT 2

The 85th percentile storm event was calculated for Water Quality purposes. This 85th percentile rainfall value was input in the HydroCalc program to determine flow rate and volume. For area labeled as "A1" the total mitigation volume obtained is 5,600 ft^3. For area labeled as "B1" the total mitigation volume obtained is 6,570 ft^3. For area labeled as "C1" the total mitigation volume obtained is 1,126 ft^3. The total mitigation volume for the 85th percentile is 13,196 ft^3 and is greater than the 8,989 ft^3 obtained from the 0.75 inch storm event. The Low Impact Development Standards Manual states that the larger value of 0.75 inch or the 85th percentile, 24-hour rain event value shall be utilized.

III.2 HYDRAULIC DESIGN

III.2.1. INLET SIZING

For preliminary purposes, the inlet sizing for each contributing areas are assumed to be a standard 12" x 12" grate inlet.

III.2.2. PIPE SIZING

The overall project has been calculated and the proposed on-site storm drain network is expected to be a maximum of 24" in diameter network.

III.2.3. CURB DRAINS

In the event of a large storm event, an overflow pipe from the cistern will convey the water directly to the back of the catch basin on Rinaldi street. In case of higher storm events, operating through the system, the low point of the site is located adjacent to the driveway off Rinaldi and would flow out the driveway onto Rinaldi as an emergency.

See calculations in Appendix 'D'.

III.2.4. WATER QUANTITY

The site proposes to retain and infiltrate the 85th percentile storm event using one Drywell(BMP 1.1) for each area and two 10 ft in diameter, 105 ft in length Storage Pipes/Tanks(BMP 1.2) for the remaining volume of all areas combined. The two 10 ft in diameter and 105 ft long Pipes/Tanks will be used to store the remaining 13,196 ft^3, mechanically treated water until reaching the overflow pipe. When reaching overflow pipe, the water will then be released to a maximum outlet pipe of 24-inches which is proposed to be connected to the existing Catch Basin located on Rinaldi Avenue, fronting the project property. As mentioned on Section II.3, this study is based on the minimum infiltration rate of 0.30 in/hr and the proposed BMP's will need to be updated when Geotechnical engineer provides actual infiltration rate that can result in no need of Storage Pipes/Tanks(BMP 1.2).

SECTION IV. WATER QUALITY BMP DESIGN

IV.1 INFILTRATION FEASIBILITY

During preliminary geotechnical investigation by GMU Geotechnical, INC the site was tested up to a depth of 51.5 ft below existing grade with no groundwater being encountered. For preliminary purposes, the site will be analyzed based on the minimum Infiltration rate for LA County of 0.30 in/hr.

IV.2 CALCULATION OF THE SWQDV

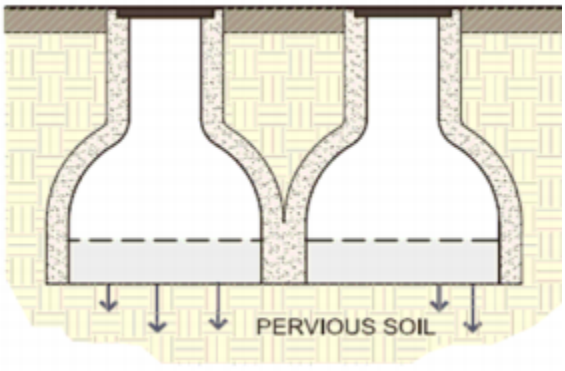
DMA	Area (sq ft)	Area (Acres)	Impervious Area (sq ft)	Pervious Area (sq ft)	Drains to	BMP Designation	SWQDV (cu-ft)	Volume Provided (cu-ft)	Q_{100} (cfs)
A	97,574.4	2.24	63,423.1	34,151.3	Drywell	BMP # 1.1	5,500*	176	8.63
B	103,237.2	2.37	77,427.8	25,809.4	Drywell	BMP # 1.1	6,570*	176	8.38
C	16,552.8	0.38	13,242.2	3,310.5	Drywell	BMP # 1.1	1,126*	176	1.46
C					Storage Pipes/Tanks	BMP # 1.2		13,269	
*Note: Volumes are combined to determine full storage requirement									
**Note:									

IV.3 STORMWATER QUALITY CONTROL MEASURES

IV.3.1. INFILTRATION GALLERY / UNDERGROUND DETENTION CHAMBERS

To provide infiltration at a depth that is commensurate with Geotechnical investigations and soil borings, underground detention chambers are proposed as the main treatment BMP. These are sized to receive the flows of DMA 'A&B' and are conservatively sized to assume that that the pervious pavement is clogged and impervious.

See appendix D for sizing calculations.

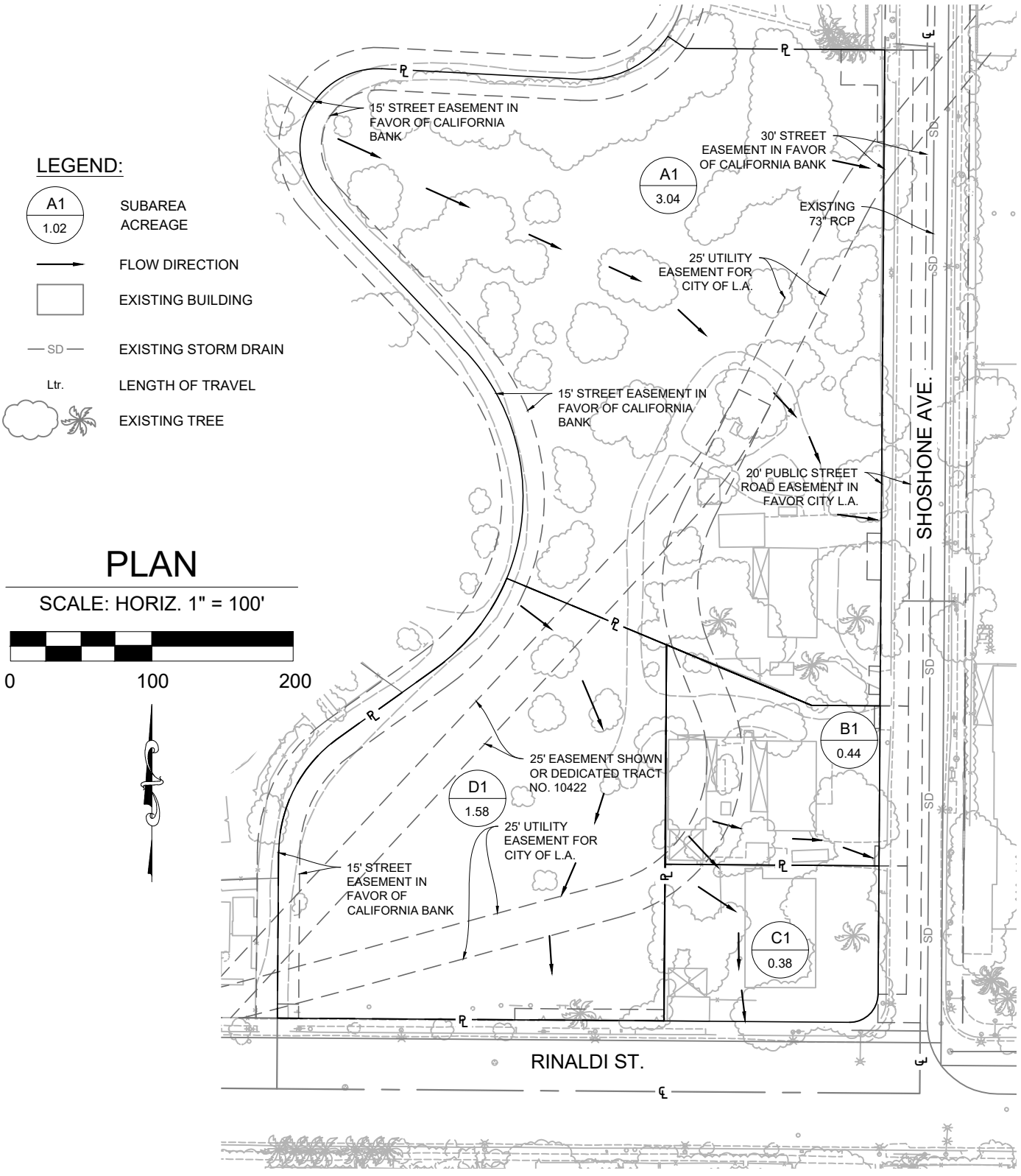


	Site Specific Source Control Measure	Included?	Reason
S1	Storm Drain Message and Signage Design	YES	ALL INLETS TO BE MARKED AND STENCILED
S2	Outdoor Material Storage Area Design	NO	No long-term material storage as part of the proposed land use
S3	Outdoor Trash Storage and Waste Handling Area Design	NO	Provided indoors
S4	Outdoor Loading/Unloading Dock Area Design	NO	Provided indoors
S5	Outdoor Repair/Maintenance Bay Design	NO	No repair bays proposed as part of this project
S6	Outdoor Vehicle/Equipment/ Accessory Washing Area Design	NO	No outdoor washing permitted
S7	Fueling Area Design	NO	No fueling areas part of proposed land use.

SECTION V. PROPOSED MAINTENANCE PLAN

A maintenance plan has been included per the City of Los Angeles LID manual, per manufacturer's recommendations, see Appendix E.

APPENDIX A: PRE-DEVELOPMENT LID PLAN



PLAN

SCALE: HORIZ. 1" = 100'

0 100 200

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MORNINGSTAR OF GRANADA HILLS
17551 & 17563 RINALDI STREET
GRANADA HILLS, CA

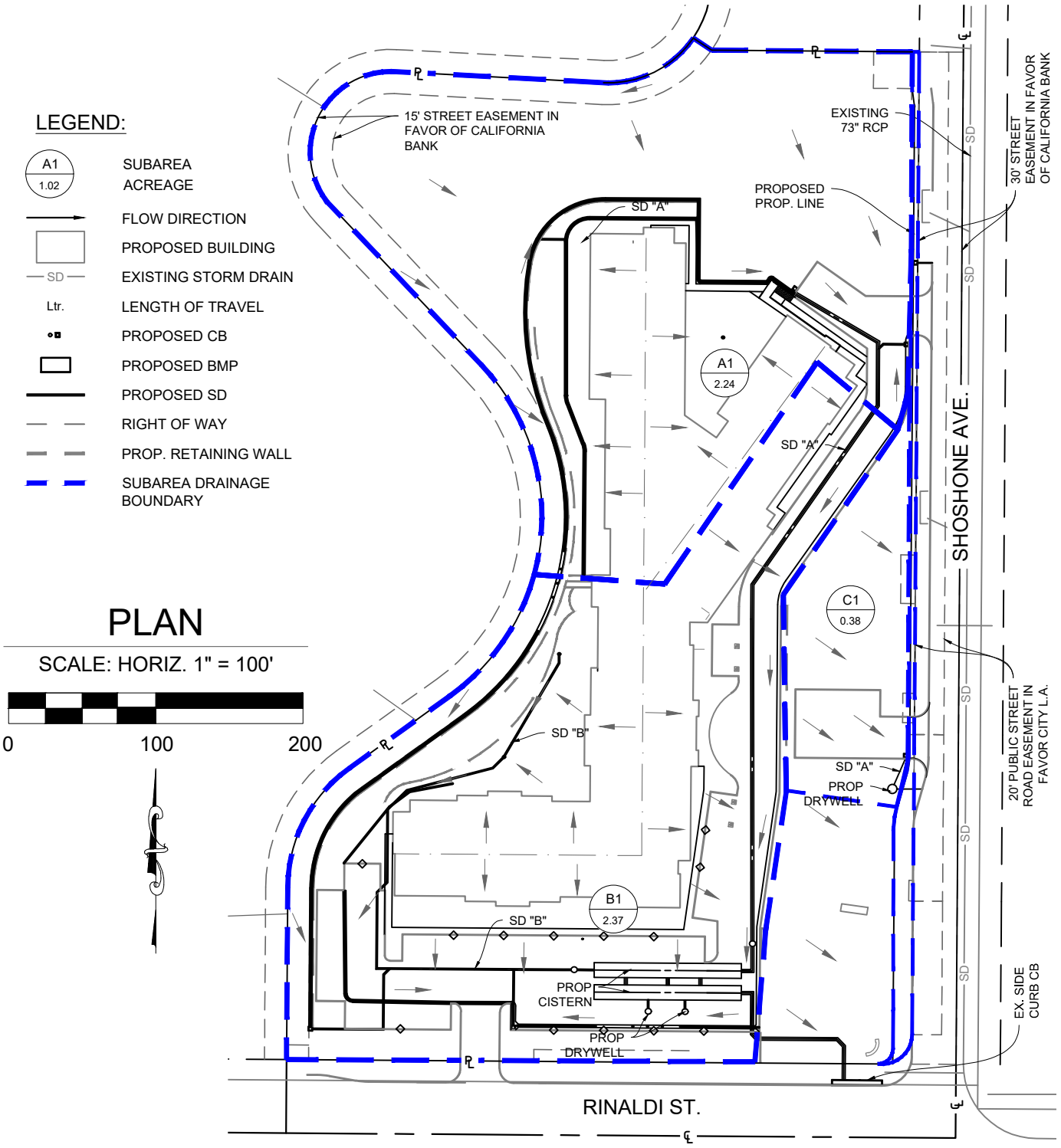
PRE-DEVELOPMENT LID PLAN

APPENDIX A

DSGN:	MCAL
DRWN:	MCAL
APVD:	JC
DATE:	6/23/22

1 OF 1

APPENDIX B: PRELIMINARY LID PLAN EXHIBIT



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MORNINGSTAR OF GRANADA HILLS
17551 & 17563 RINALDI STREET
GRANADA HILLS, CA

PRELIMINARY LID PLAN

APPENDIX B

DSGN:	CPST
DRWN:	CPST
APVD:	JC
DATE:	6/23/22

1 OF 1

6/24/2022 10:28 AM Clark Stanphill P:\C\CONFCDMS0003\0600INFO\0670Reports\LID Report\LID Plan\LID PLAN Updated.dwg

APPENDIX C: 85TH PERCENTILE DATA

- LA County 85th Percentile Isohyetal Excerpt
- LA County Soil Map Excerpt

Peak Flow Hydrologic Analysis

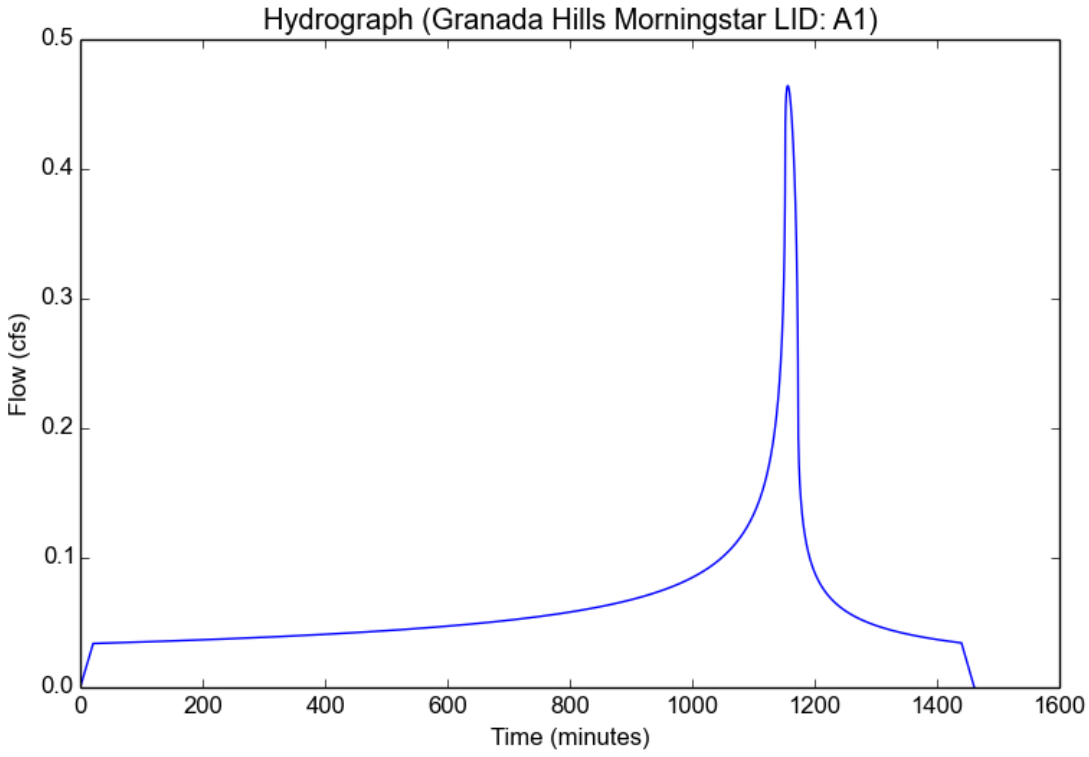
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/LID Report/85th percentile/Granada Hills Morningstar LID - A1.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Granada Hills Morningstar LID
Subarea ID	A1
Area (ac)	2.24
Flow Path Length (ft)	500.0
Flow Path Slope (vft/hft)	0.06
85th Percentile Rainfall Depth (in)	1.1
Percent Impervious	0.65
Soil Type	16
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.1
Peak Intensity (in/hr)	0.3343
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.62
Time of Concentration (min)	21.0
Clear Peak Flow Rate (cfs)	0.4643
Burned Peak Flow Rate (cfs)	0.4643
24-Hr Clear Runoff Volume (ac-ft)	0.1263
24-Hr Clear Runoff Volume (cu-ft)	5499.6788



Peak Flow Hydrologic Analysis

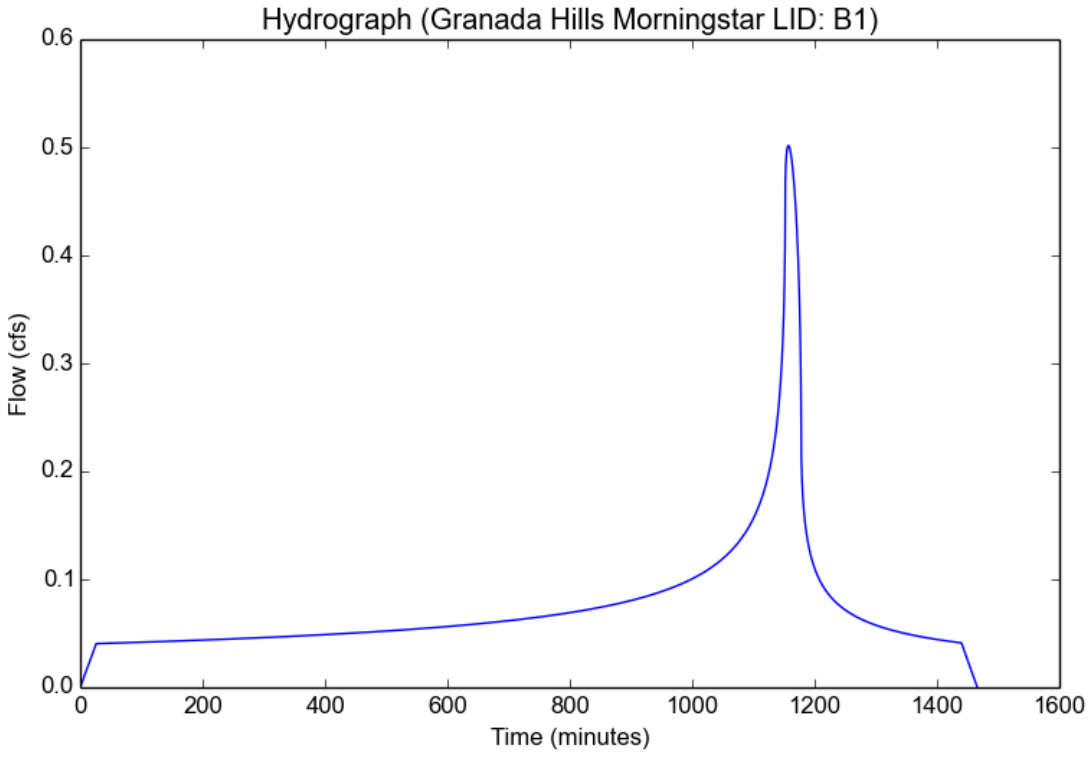
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/LID Report/85th percentile/Granada Hills Morningstar LID - B1.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Granada Hills Morningstar LID
Subarea ID	B1
Area (ac)	2.37
Flow Path Length (ft)	600.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.1
Percent Impervious	0.75
Soil Type	16
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.1
Peak Intensity (in/hr)	0.3024
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.7
Time of Concentration (min)	26.0
Clear Peak Flow Rate (cfs)	0.5017
Burned Peak Flow Rate (cfs)	0.5017
24-Hr Clear Runoff Volume (ac-ft)	0.1508
24-Hr Clear Runoff Volume (cu-ft)	6569.6965



Peak Flow Hydrologic Analysis

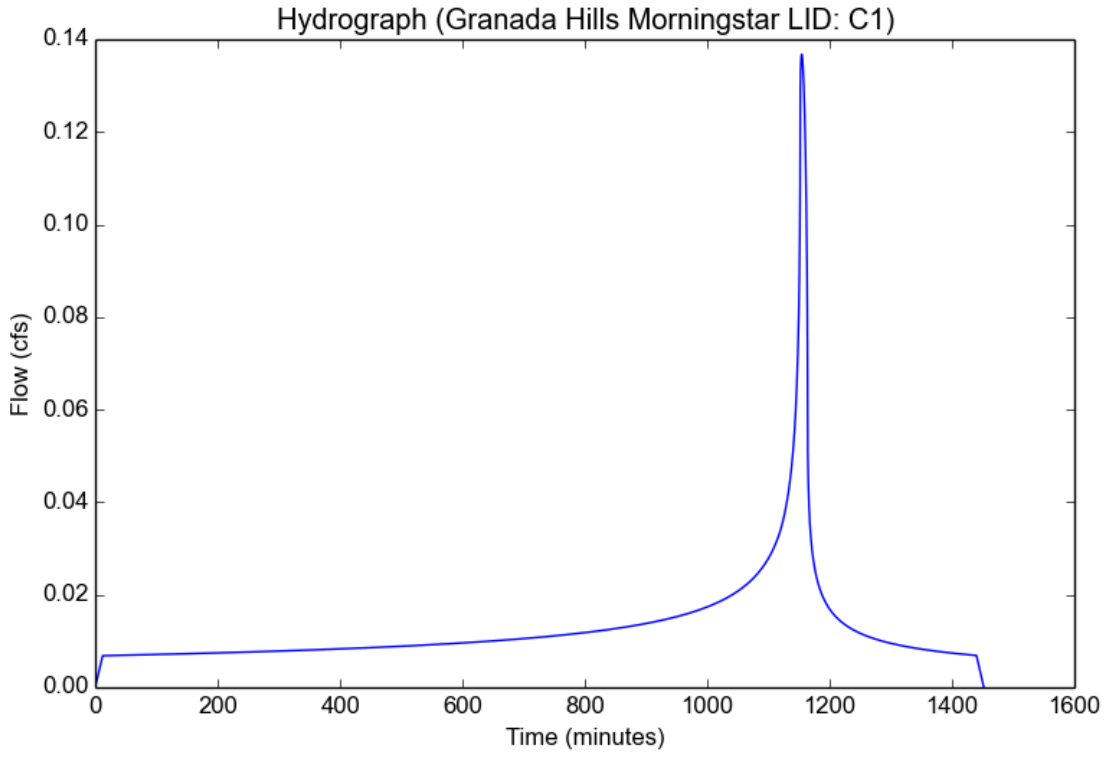
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/LID Report/85th percentile/Granada Hills Morningstar LID - C1.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	Granada Hills Morningstar LID
Subarea ID	C1
Area (ac)	0.38
Flow Path Length (ft)	250.0
Flow Path Slope (vft/hft)	0.03
85th Percentile Rainfall Depth (in)	1.1
Percent Impervious	0.8
Soil Type	2
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.1
Peak Intensity (in/hr)	0.4349
Undeveloped Runoff Coefficient (Cu)	0.538
Developed Runoff Coefficient (Cd)	0.8276
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	0.1368
Burned Peak Flow Rate (cfs)	0.1368
24-Hr Clear Runoff Volume (ac-ft)	0.0259
24-Hr Clear Runoff Volume (cu-ft)	1126.3488




2601-040-047
RIDGEWAY RD
2601-040-049
2601-040-091
2601-040-091
2601-040-047
2601-040-048
RIDGEWAY RD
2601-040-049
2601-040-092
016
11521
SHOSHONE AVE
SHOSHONE AVE
2607-011-031
2607-011-011
2607-011-012
Hillcrest Christian School
Hillcrest Christian School
Hillcrest Christian
2607-011-031
17601
17573
17549
17526
RINALDI ST
RINALDI ST
RINALDI ST
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2711-022-031
2711-022-030
2711-022-029
2711-022-028
11499
ENCINO AVE
2711-022-036
2711-022-027
11463

APPENDIX D: VOLUME PROVIDED CALCULATION

Mitigation Volume Required

V_M = 13,196 cu.ft

Radius = 2 ft
Depth = 10 ft
g = 0.4

Drywell Volume

$V_{storage}$ = Pi*r^2*h

$V_{storage}$ = 126 cu.ft

$V_{storage,g}$ = Pi*r^2*h*g

$V_{storage,g}$ = 50.4 cu.ft

V_{total} = 176 cu7.ft *Each Drywell

Cistern Volume (2 Cisterns, 105 ft EA)

Radius = 5 ft
Length = 210 ft
Vstorage = Pi*r^2*h

$V_{storage}$ = 16493 cu.ft

Loss from overflow pipe (top 2.5')

$A_{top\ 2.5'}$ = 15.35 SF
$V_{top\ 2.5'}$ = A*L Cu. Ft
$V_{top\ 2.5'}$ = 3223.5 Cu. Ft

Storage Total ((3) drywells, (2) 110' long 10' diameter cisterns

$V_{storage}$ = 13797.5

APPENDIX E: BMP FACT SHEETS

OPERATION AND MAINTENANCE OF *MaxWell*® DRYWELL

The Operation and Maintenance Format will include the following key components:

1.) Inspection Guidelines:

New installations

Newly installed systems should receive a thorough visual examination following the first several significant rainfall events. This assessment will assure that there is no standing water, and that runoff or nuisance water flows are being eliminated within the allowable 48 hour draw-down timeframe.

Ongoing Operations

At a minimum, the drainage structures should be inspected annually, and within 48 hours following a significant storm event to ensure that there is no standing water in the chambers.

2.) Maintenance Format:

After the first 12-months of entering service, it is recommended that an initial cleaning be undertaken. This will help to establish the amount of accumulated particulate matter and debris to be expected on a yearly basis. Thereafter, the systems should receive inspection at least annually, and cleaning should be undertaken when the evaluation reveals that 15% or more of the original chamber volume is occupied by silt and sediment.

During the maintenance operation, all screens and filters should be serviced and the floating absorbent blankets replaced, along with the geo-textile fabric at the bottom of the chambers. Should repair be needed, descriptions of deficiencies and estimated costs for suggested corrections should be provided. The above information shall be submitted in writing to the Owner at the conclusion of the maintenance service. Replacement is recommended for drywells that no longer dispose of ponded water within 48 hours after cleaning.

3.) Maintenance Records:

A written log shall be kept on-site of all inspections and maintenance performed on the drainage systems.

Torrent Resources Incorporated
1509 East Elwood Street
Phoenix Arizona 85040-1391

phone 602-268-0785
fax 602-268-0820

www.TorrentResources.com

AZ Lic. ROC070465 A, ROC047067 B-4; ADWR 363
CA Lic. 528080 A, C-42, HAZ
NV Lic. 0035350 A - NM Lic. 90504 GF04

An evolution of McGuckin Drilling

REM TRITON Filter Recommended Maintenance Procedures:

Maintenance and Inspections:

In order to ensure proper operation, REM (Revel Environmental Manufacturing, Inc.) recommends that REM Stormwater filters be serviced and maintained when debris and pollutant accumulations exceed no more than 80% of the filter's capacity. REM recommends that the filters are inspected and serviced at a minimum of three times (3X's) per seasonal cycle year. The frequency and length of duration between inspections and maintenance may fluctuate based on specific site conditions such as local weather conditions, site use, and pollutant type and loading volume.

Filter Media Replacement:

In order to ensure proper operation, REM recommends that the FOG Media, or other specified media (such as Activated Carbon, and/or Zeolite) be replaced when the outer surface of media is no more than 50% coated with contaminants. (The surface area of REM's standard FOG media is stark white in color. The media will blacken with encapsulated contaminants over time.) It is recommended that REM media packs and Bioflex be replaced a minimum of one time (1X) per seasonal cycle year. Sites with higher pollutant loading concentrations may require more frequent service and media replacement. Purchase replacement media packs from REM at (888) 526-4736 or sales@remfilters.com. Custom media configurations are available upon.

Disposal:

Captured pollutant debris and spent media must be disposed of in accordance with all Federal, State, and Local Laws and Regulations.

On-site Procedures for Triton Catch Basin Filter Inserts:

1. Secure area (proceed with traffic and pedestrian control plan).
2. Clean surface area immediately around each storm drain utilizing a stiff bristled push-broom, flat shovel or industrial vacuum.
3. Proceed with confined space procedures as necessary.
4. Remove grate or manhole cover and set aside.
5. Inspect perimeter filter flange gasket. Confirm media cartridge is secure in the filter basin.
6. Remove debris trapped in grate slot openings.
7. Utilize an industrial vacuum to remove debris from within filter basin.
8. Pressure wash media pack through the stainless steel cartridge. (Avoid discharge by utilizing an industrial vacuum to remove excess water while pressure washing).
9. Inspect media housed inside stainless steel cartridge. REM recommends replacing the filter media a minimum of once a year (see *Filter Media Replacement* above).
10. Place grate or manhole cover back on catch basin grate frame.
11. Secure dated service lock-out tag on grate lid.
12. Identify catch basin on site map for tracking and reporting.
13. Note observations, concerns or recommendation regarding specific filter on maintenance report.
14. Remove pedestrian and/or traffic control barricades.

APPENDIX F: LID MAINTENANCE PLAN

- LID Maintenance Plan

APPENDIX G: GEOTECHNICAL REPORT

- Geotechnical Report by GMU GEOTECHNICAL, INC Excerpt

DRAFT

Preliminary Geotechnical Investigation Report,
Confluent Senior Housing
11515 & 11525 Shoshone Avenue,
17551 & 17563 Rinaldi Street
Granada Hills, California

Prepared For
CONFLUENT DEVELOPMENT

November 11, 2020

GMU Project No. 20-307-00

23241 Arroyo Vista
Rancho Santa Margarita | CA 92688
949.888.6513 | FX: 949.888.1380 | www.gmugeo.com

INTRODUCTION

PURPOSE

This report presents the results of our preliminary geotechnical investigation for the proposed 2-story senior housing building development and site improvements, as shown on the reference (1) site plan by LRS Architects, to be located at 17551 W Rinaldi Street, 17563 W Rinaldi Avenue, 11515 N Shoshone Avenue, and 11525 N Shoshone Avenue, in the City of Granada Hills, California.

SCOPE

The scope of our preliminary geotechnical investigation along with future plan reviews, as outlined in our September 24, 2020 proposal, is as follows:

1. Staked five (5) hollow stem auger drill holes and seven (7) test pits, coordinated with Confluent Development, and contacted Utility Underground Service Alert (USA/Dig Alert) in order to provide advance notification of the 5 subsurface drill holes and 7 test pits planned within the project area.

2. Performed a field subsurface exploration program consisting of advancing: two (2) hollow stem auger drill hole to a depth of approximately 51.5 feet below the existing grade, three (3) hollow stem auger drill holes to a depth of approximately 21.5 feet below the existing grade, and seven (7) backhoe test pits. Logged the drill holes and test pits and obtained bulk and drive soil samples for geotechnical laboratory testing.

3. Performed laboratory testing on soil samples obtained from the drill holes. Testing included moisture and density, particle size, Atterberg Limits, expansion, chemical, compaction, consolidation, direct shear strength, and R-value tests.

4. Interpreted and evaluated the acquired field and laboratory data to perform geotechnical engineering design which included settlement analysis, liquefaction analysis, bearing capacity and associated settlement, pavement design, and seismic parameters in accordance with the California Building Code (CBC) 2019 standards.

5. Prepared and distributed this preliminary geotechnical foundation report containing our preliminary geotechnical conclusions and recommendations to support the initial design of the project.

GROUNDWATER

Groundwater was not observed during our exploration to a maximum depth of 51.5 feet below the existing grade. Based on review of nearby well data, we note that groundwater is anticipated to be deeper than 100 feet below the existing grade. Groundwater conditions may vary across the site due to stratigraphic and hydrologic conditions and may change over time as a consequence of seasonal and meteorological fluctuations, or activities by humans at this site and nearby sites. However, based on the above findings, groundwater is unlikely to impact the proposed development.

GEOLOGIC HAZARDS

FAULTING AND SEISMICITY

The site is not located within an Alquist-Priolo Earthquake Fault Zone, and no known active faults are shown on the reviewed geologic maps crossing the site, however, the site is located in the seismically active region of Southern California. The nearest known active faults are the Santa Susana and Sierra Madre fault systems, which are located approximately 1.8 and 2.6 miles from the site, respectively, and capable of generating a maximum earthquake magnitude (Mw) of 6.9 and 7.3, respectively.

Given the proximity of the site to these and numerous other active and potentially active faults, the site will likely be subject to earthquake ground motions in the future. A site PGA_M of 1.301g was calculated for the site in conformance with the 2019 CBC. This PGA_M is primarily dominated by earthquakes with a mean magnitude of 6.8 at a mean distance of 2.9 miles from the site using the USGS 2014 Interactive Deaggregation website.

LIQUEFACTION AND SEISMIC SETTLEMENT

Liquefaction

Based on our review of the State of California Official Map of Seismic Hazard for the Oat Mountain Quadrangle, the site is not located within a zone of required investigation for liquefaction. In addition, based on the lack of shallow groundwater, dense to very dense nature of the site soils, relatively shallow depth of bedrock and our liquefaction analysis, it is our professional opinion that the liquefaction potential at the site is very low.

PROJECT NO.: CONFCDMS0003

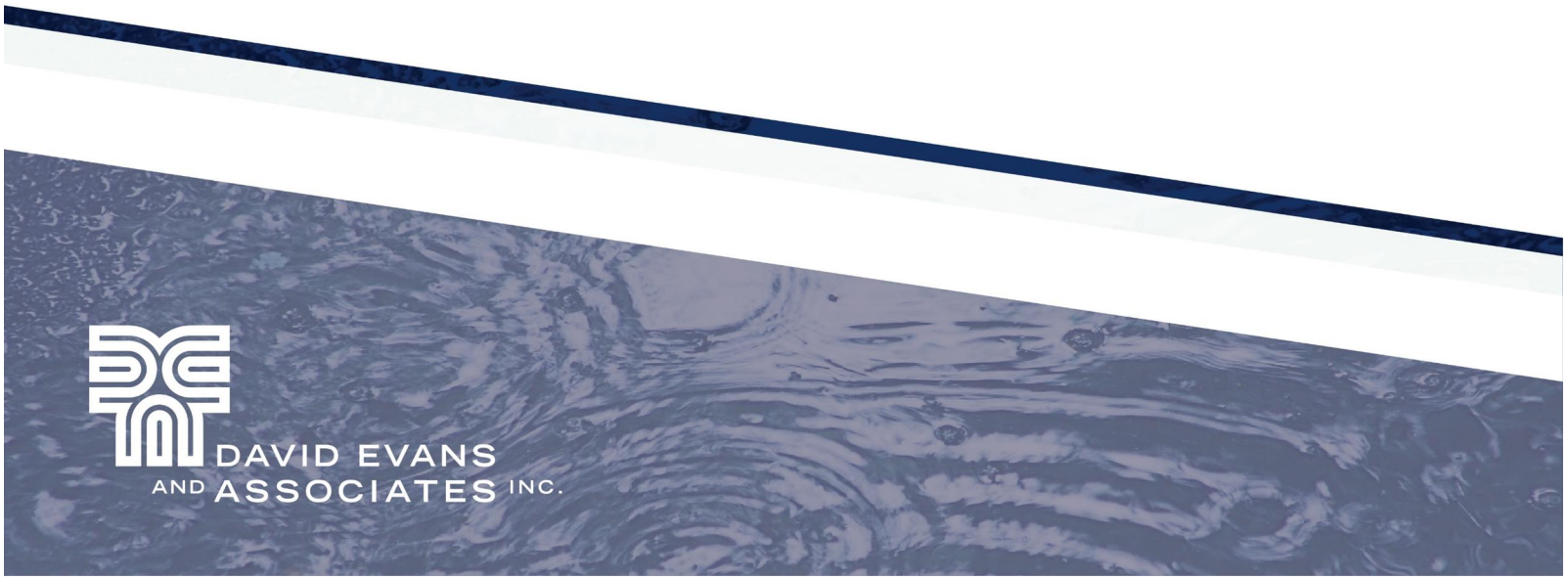
PRELIMINARY
HYDROLOGY AND HYDRAULICS REPORT

-FOR-

MORNINGSTAR OF GRANADA HILLS

PROJECT ADDRESS: 17551 & 17563 RINALDI STREET, GRANADA HILLS, CA
APN(S): 2601-040-091, 2601-040-092, 2601-040-049, & 2601-040-090
LOT(S)/PARCEL(S):
PLANNING APPLICTION #:
GRADING PERMIT #:
BUILDING PERMIT #:

PREPARED FOR: CONFLUENT DEVELOPMENT
2240 BLAKE ST. SUITE 200
DENVER, CO 80205
H. MCNEISH
(303) 573-6500
hmcneish@confluentdev.com
PREPARED BY: JOSE CRUZ, PE, MS, QSD
DATE PREPARED: October 27, 2022
DATE REVISED:



SECTION I. PROJECT DESCRIPTION

I.1 PROJECT CONTEXT

MorningStar of Granada Hills, to be located at 17551 and 17663 Rinaldi St., Granada Hills, CA will be a 103,983 SF, 2 story senior living facility with 65 assisted living units and 30 memory care units for a total of 95 units plus standard amenity spaces including dining, indoor and secure outdoor recreation, and social gathering spaces. The site is 5.44 Acres at the north-west corner of Rinaldi Street and Shoshone Avenue. Access to the site would be taken from both Shoshone and Rinaldi streets. The site design goal is to preserve the existing historic single homes and as much of the existing hillside to the north to create as much buffer from the neighbors to the west and north, while also pulling the building back from the primary corner as much as possible.

I.2 EXISTING DRAINAGE FACILITIES

There is one mapped (**Appendix B** – Drainage Map No. 356) existing storm drain channel adjacent to the City of Los Angeles drainage easement on the project property. The existing channel is located adjacent to Shoshone Avenue and easterly of the project's boundary. However, based of field exploration and research the drainage course does not physically exist. The street flow, flowing easterly on Rinaldi Street is intercepted by a side-opening catch basin, maintained by LACFCD and located on the north-west corner of Rinaldi Street and Shoshone Avenue. The catch basin drains into the existing 72" RCP. The proposed private on-site storm drains will connect to the existing side-opening catch basin at the south-east corner of the project site. The proposed on-site drainage system is composed to catch site runoff and flow through maximum 24" PVC, then navigated to water quality BMPs, and finally draining into 24" RCP that connects into the existing side-opening catch basin on the south-east of the project site.

I.3 PURPOSE

The purpose of the enclosed Hydrology Study is to determine the 50-year peak flows resulting from developing the proposed site and provide recommendations for the storm drain system serving the Project. Recommendations will be made to maintain 'post-developed' hydrologic conditions at or below 'pre-developed' levels. Analysis will be performed for 50-year storm events. Calculations are based on the methodologies outlined in the Los Angeles County Hydrology Manual and can be found in **Appendix B**.

SECTION II. EXISTING (PRE-DEVELOPED) HYDROLOGIC CONDITIONS

As was stated in the previous section, there is one side-opening catch basin located at the south-east corner of the project site where runoff is collected. Once the runoff is collected it will flow easterly along Rinaldi Street via 72" RCP.

Soil classification for the project is No. 016. The reader is instructed to refer to the documents in **Appendix C** of this report for additional information regarding soil types and locations. The soil classification boundary limit is based on Hydrology Map '1-H1.35' from the Los Angeles County Hydrology Manual in **Appendix C**.

Topography shows the site naturally drains from the north-west to the south-east corner of the project site. The site should be considered hilly and relatively flat where existing buildings lie with a maximum elevation drop of roughly 65-feet over approximately 700-feet.

The project site currently has multiple existing buildings that do not utilize an underground storm drain system. All runoff flows on to Shoshone Avenue, easterly of the project site, and Rinaldi Street, southerly of the project site. The runoff is then intercepted by existing side-curb catch basins.

The reader is advised to refer to **Figure I, Appendix B**, titled 'Pre-Development Hydrology Map' included in this report for additional information on the existing hydrologic characteristics of the site. Hydrologic calculations are also included in **Appendix D**.

SECTION III. PROPOSED (POST-DEVELOPMENT) HYDROLOGIC CONDITIONS

Based on the proposed grading design, the storm drains areas from A2-6 and B2-5 will be intercepted by the drain inlets around the proposed building and then conveyed through the on-site drainage system until the runoff reaches the on-site BMP's. The BMP's will treat and store the required mitigated water prior to making its way into the existing catch basin on the northwest corner of Rinaldi Street and Shoshone Avenue. From the catch basin, the runoff will make its way through the existing storm drain system, as seen in **Appendix C**, titled "LACDPW STORM DRAIN FACILITIES," and be conveyed southeast until reaching Bull Creek. The runoff from area C2 will be intercepted by a drain inlet and conveyed to a drywell which will overflow in Shoshone Ave. D2, and F2 will flow onto Shoshone Avenue until reaching Rinaldi Street and then head easterly where it will then be intercepted by an existing catch basin. The runoff from areas E2 will flow onto Rinaldi Street and be intercepted by the existing catch basin at the northwest corner of Rinaldi Street and Shoshone Avenue.

SECTION IV. METHODOLOGY

IV.1 HYDROLOGY

Hydrologic calculations for the project for both existing and proposed conditions were performed using the methods outlined in the Los Angeles County Hydrology Manual and the HydroCalc program to calculate the peak 50-year, 24-hour storm event. For the small sub watersheds of this project, a time of concentration of 5 minutes is assumed as a minimum.

IV.2 INLET SIZING

Grate inlet capacities were based on the 50-year storm event and will be selected to allow for 100% of the project run-off. See **Appendix D**.

IV.3 PIPE SIZING

The calculated peak flows were summed at each major junction to determine peak flows. Bentley Flowmaster pipe capacity calculations were used to size the pipes in each reach of the system. See calculations in **Appendix D**.

IV.4 WATER QUALITY BMP SIZING

The proposed BMP selected for project will follow City of Los Angeles Low Impact development Guide and will infiltrate. The current preliminary design will make use of drywells and will treat the 85th percentile.

SECTION V. SUMMARY OF RESULTS

The following section provides a summary of the results of the enclosed hydrologic analysis for MorningStar of Granada Hills. The reader shall refer to the Appendix included with this report for complete calculations.

Pre-Conditions

The existing site is developed with single-family homes on three of the lots. There is no existing drainage system on-site. All runoff is drained on to Shoshone Avenue, easterly of the property boundary, and Rinaldi Street, southerly of the property boundary. The drainage area has been split up into four (4) subareas that all drain off-site. The sub-area boundaries were established utilizing the site topography survey map to obtain the pre-development Q_{50} storm event runoff.

Sub-Area A1 – This area, 3.04 acres, is the largest and consists mainly of hilly area with a single-family home. All runoff is drained to the southwest corner of the subarea and onto Shoshone Avenue. The 50-year event Q* is 10.37 cfs.

Sub-Area B1 – This area, 0.44 acres, consists of a single-family home with most of the property being landscape. The runoff is drained to the southwest corner of the sub-area and then onto Shoshone Avenue. The 50-year event Q* is 1.50 cfs.

Sub-Area C1 – This area, 0.38 acres, also consists of a single-family home with the majority being landscape. The runoff drains southerly to the subarea and drained on to Rinaldi Street. The runoff of Rinaldi Street is caught by an existing catch basin along the road. The 50-year event Q* is 1.30 cfs.

Sub-Area D1 – This area, 1.58 acres, is undeveloped and hilly with no drainage system. All runoff is drained on to Rinaldi Street, southerly or the subarea. The 50-year event Q* is 5.38 cfs.

See **Figure I**, titled "Pre-Development Hydrology Map" for an illustration in **Appendix B**. Refer to **Appendix D** for all Pre-Development Hydrology calculations using HydroCalc.

T_c	5 min.*				Q_{Total}
Tributary Areas	A1	B1	C1	D1	
Q_{50} (cfs)	10.37	1.5	1.3	5.38	18.55

*Note: Time of concentration was assumed to be 5 minutes minimum due to the short travel paths of each subarea.

Post-Conditions

The proposed site will be developed with a senior living facility with a goal to preserve as much of the existing hillside. Most of the runoff with be intercepted with grates surrounding the proposed facility and continuing through the on-site storm drain system. The on-site storm drain system will convey the runoff to three (3) BMP's where the runoff will be treated prior to making its way to the catch basin located at the northwest corner of Rinaldi Street and Shoshone Avenue. The proposed development has been split up into fifteen (15) subareas so that most of the runoff drains into the proposed on-site drainage system and the remaining runoff will flow onto Shoshone Avenue and Rinaldi Street.

Sub-Area A2 – This area, 0.75 acres, consists of existing undeveloped land, an outdoor courtyard and sidewalk. The storm water runoff will flow into catch basins that feed into Storm Drain "A". The 50-year event Q* is 2.56 cfs.

Sub-Area A3 – This area, 0.12 acres, consists of proposed fire turn out lane and sidewalk. The storm water runoff will flow to a catch basin adjacent to the driveway off Shoshone that feeds into Storm Drain "A" . The 50-year event Q* is 0.41 cfs.

Sub-Area A4 – This area, 0.22 acres, consists of a portion of the proposed roof draining to the courtyard from Sub Area A2. The runoff will then be conveyed to the proposed storm drain system on-site labeled 'Storm Drain "A"'. The 50-year event Q* is 0.76 cfs.

Sub-Area A5 – This area, 0.16 acres, consists of a portion of the proposed roof, which flows into Sub Area A6. The runoff will then be conveyed to the proposed storm drain system on-site labeled 'Storm Drain "A"'. The 50-year event Q* is 0.55 cfs.

Sub-Area A6 – This area, 0.20 acres, consists of the proposed dining area and landscaped courtyard. The runoff is conveyed to the proposed storm drain, 'Storm Drain "A"'. The 50-year event Q* is 0.68 cfs.

Sub-Area B2 – This area, 0.47 acres, consists of half an existing access road. The runoff is conveyed to the proposed storm drain, 'Storm Drain "B"'. The 50-year event Q* is 1.44 cfs.

Sub-Area B3 – This area, 0.27 acres, consists of the proposed Courtyard and Landscaped slopes. The runoff is conveyed to the proposed storm drain, 'Storm Drain B"'. The 50-year event Q* is 0.92 cfs.

Sub-Area B4 – This area, 1.14 acres, consists of the proposed interior road, curb and gutter, along with site landscape. The runoff is conveyed to the proposed storm drain, 'Storm Drain B"'. The 50-year event Q* is 3.32 cfs.

Sub-Area B5 – This area, 0.26 acres, consists of a portion of the roof that slopes to the Sub Area B-3 and in conveyed to the proposed Storm Drain B. The 50-year event Q* is 0.89 cfs.

Sub-Area B6 – This area, 0.49 acres, consists of a portion of the roof that drains to the parking area and road that collects in a catch basin in sub area B4, which is then conveyed to Storm Drain B. The 50-year event Q* is 1.58 cfs.

Sub-Area C2 – This area, 0.38 acres, consists of the proposed parking area for the existing houses. The runoff is then conveyed to SD "C" and flow into the Dywell. The 50-year event Q* is 1.30 cfs.

Sub-Area D2 – This area, 0.35 acres, consists of undeveloped land and existing houses. The runoff will flow onto the corner of Rinaldi Street and Shoshone Ave and intercepted by the catch basin on the northwest corner of Rinaldi Street and Shoshone Avenue. The 50-year event Q* is 1.20 cfs.

Sub-Area E2 – This area, 0.44 acres, consists of undeveloped land. The storm water runoff will flow onto Shoshone Avenue and flow southerly until it is intercepted by a catch basin on Rinaldi Street. The 50-year event Q* is 1.50 cfs.

Sub-Area F2 – This area, 0.12 acres, consists of landscape and a portion of the driveway off Rinaldi St that surface flow to the existing catch basin at the corner of Rinaldi. The 50-year event Q* is 0.41 cfs.

Sub-Area G2 – This area, 0.1 acres, consists of proposed street area that is still tributary to the storm drain system but with no negative effect. The storm water runoff will flow onto Shoshone Avenue and flow southerly until it is intercepted by a catch basin on Rinaldi Street. The 50-year event Q* is 0.32 cfs.

See **Figure III**, titled "Post-Development Hydrology Map" for an illustration in **Appendix B**. Refer to **Appendix D** for all Pre-Development Hydrology calculations using HydroCalc.

T_c	5 min.*							
Tributary Areas	A2	A3	A4	A5	A6	B2	B3	B4
Q_{50} (cfs)	2.56	0.41	0.76	0.55	0.68	1.44	0.92	3.32

5 min.*								Q_{Total}
B5	B6	C2	D2	E2	F2	G2		
0.89	1.58	1.30	1.20	1.50	0.41	0.32		17.84

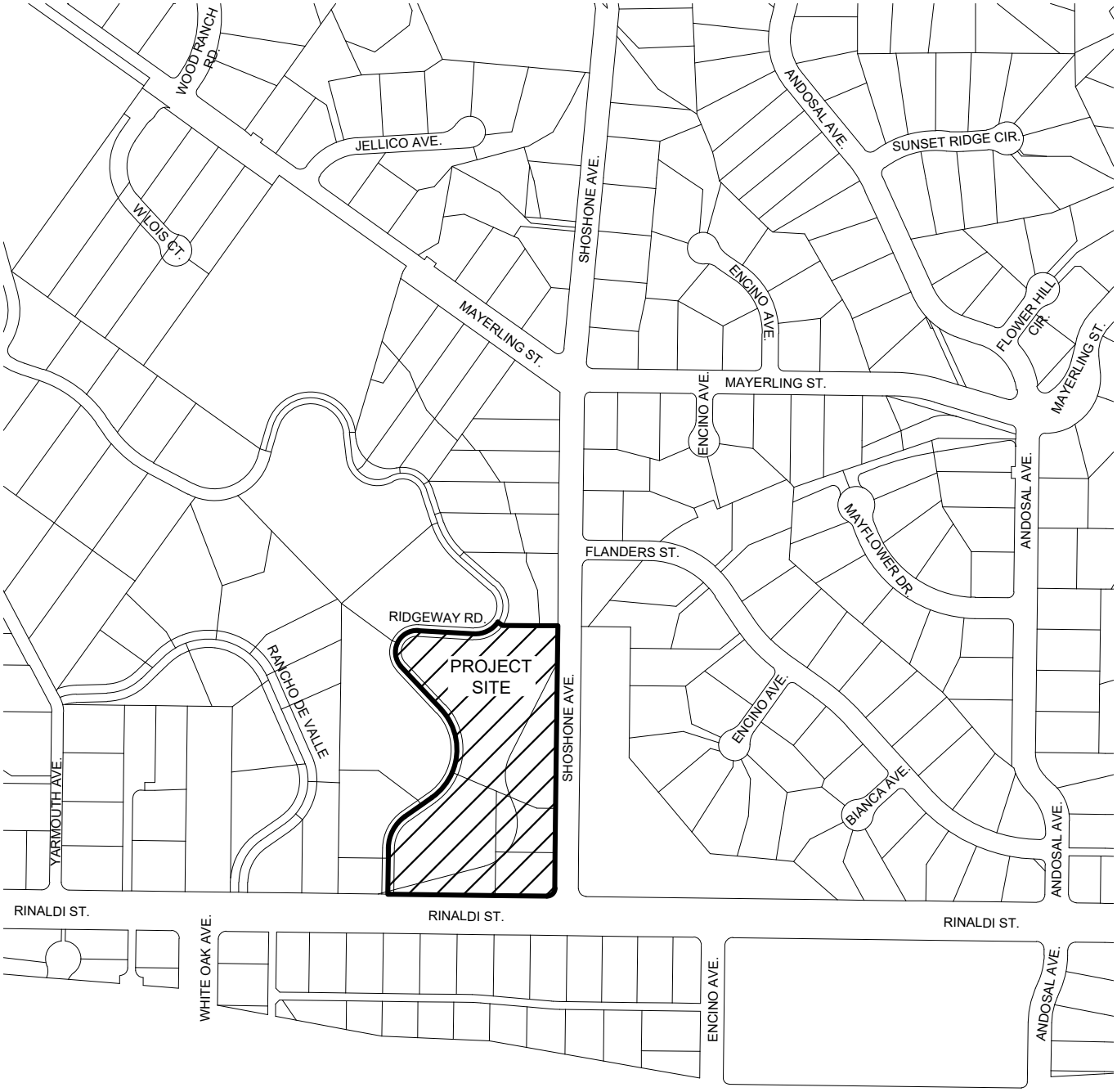
*Note: Time of concentration was assumed to be 5 minutes minimum due to the short travel paths of each subarea.

SECTION VI. CONCLUSION

Given the existing conditions of the site, the proposed senior living facility will decrease the runoff from 18.55 cfs to 17.84 cfs, based on the calculations in **Appendix D**. As part of the project, the proposed development includes a strip of land (Area P2) that will be dedicated to the city of Los Angeles thus reducing the overall project site. On Figure III, in **Appendix B** the property line on the easterly boundary is being proposed to move to the back of the walkway. Although some areas have increased in flow due to the pervious area, the movement of the property line decreases the area and therefore decreases the flow run-off. Most of the runoff will also be collected by the on-site storm drain system and be treated/stored, as part of the LID improvements, prior to flowing into the existing catch basin at the northwest corner of Rinaldi Street and Shoshone Avenue. The overall flowrate into the existing storm drain catch basin will decrease and therefore achieve the objective of the development.

APPENDIX A – VICINITY MAP

- Vicinity Map



PLAN

SCALE: HORIZ. 1" = 400'

0 400 800

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17551 & 17563 RINALDI STREET
GRANADA HILLS, CA

VICINITY MAP

APPENDIX A

DSGN:	ARSA
DRWN:	ARSA
APVD:	JC
DATE:	8/12/21

1 OF 1

APPENDIX B – HYDROLOGY MAPS

- Pre-Development Hydrology Map
- Post-Development Hydrology Map

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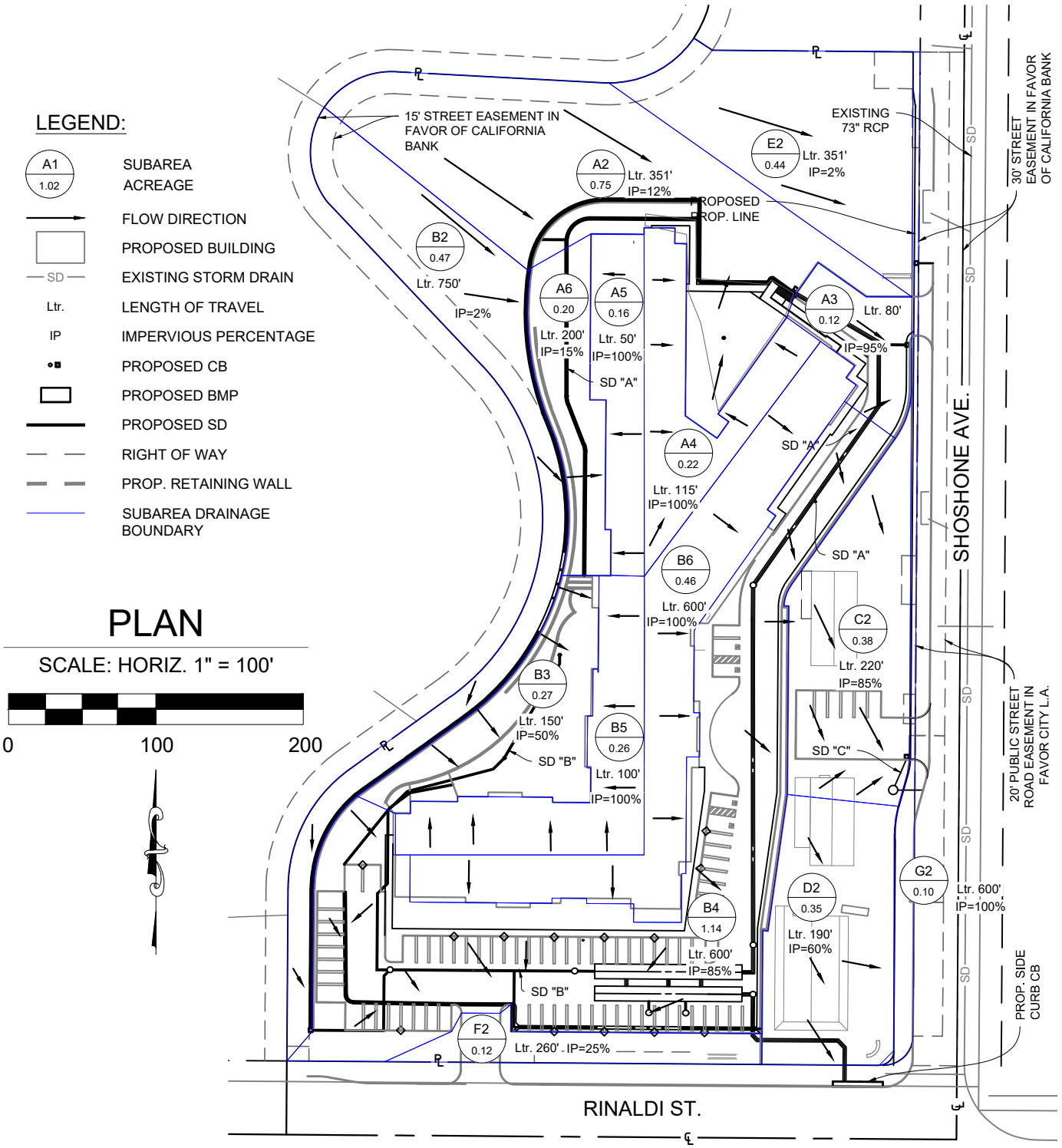
PRE-DEVELOPMENT HYDROLOGY MAP

FIGURE I

DSGN:	ARSA
DRWN:	ARSA
APVD:	JC
DATE:	8/12/21

1 OF 1



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POST-DEVELOPMENT HYDROLOGY MAP

FIGURE II

DSGN:	CPST
DRWN:	CPST
APVD:	JC
DATE:	6/23/22

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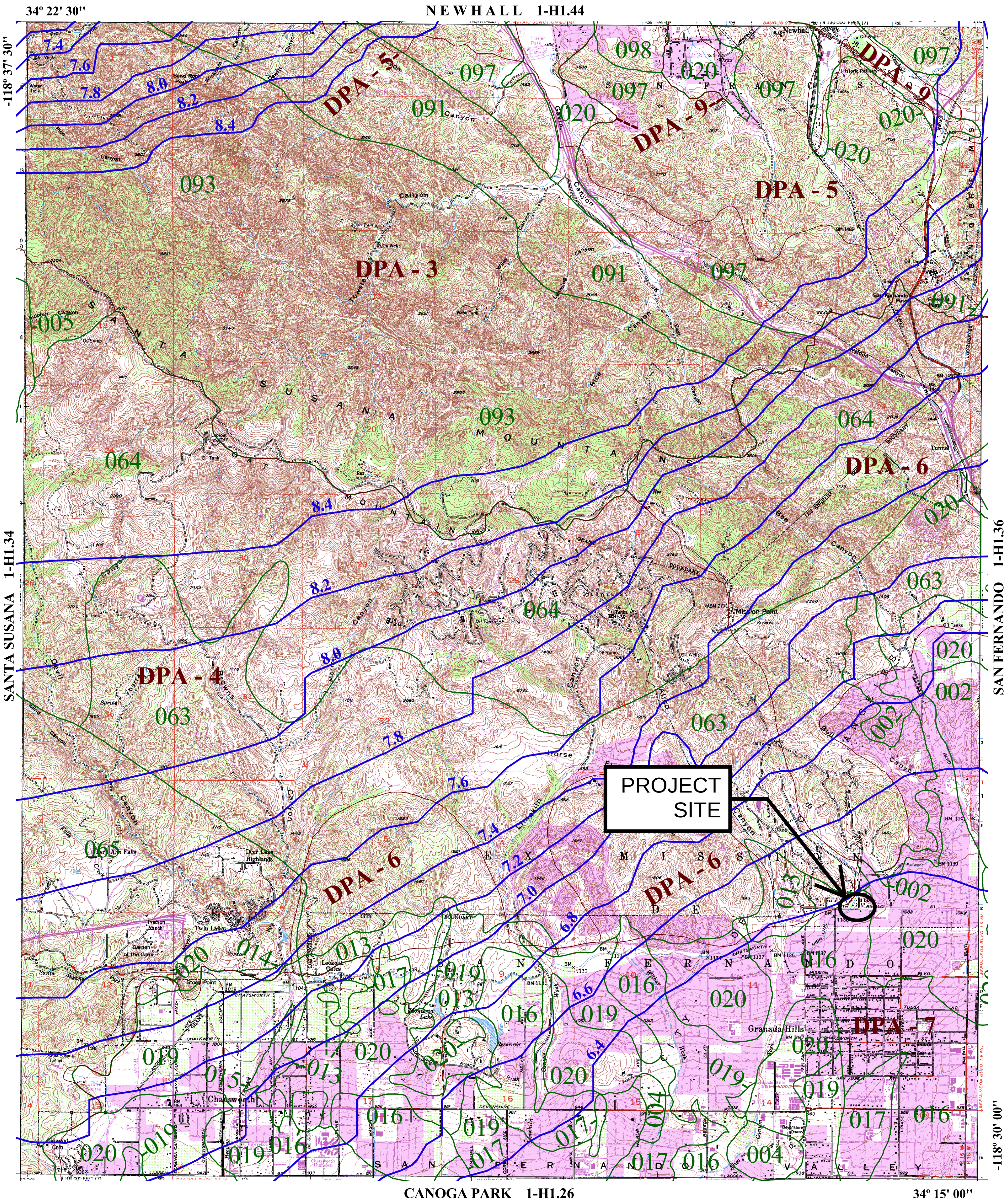
APPENDIX C – REFERENCE DOCUMENTS

Reference Documents

- Los Angeles County Hydrology Manual Reference Material
  - LACDPW – Soil Classification Map
  - LACDPW – Runoff Coefficient Curve for Soil Type No. 016
  - LACDPW – Proportion Impervious Data

- Drainage Maps
  - LACDPW Storm Drain Facilities
  - City of Los Angeles Drainage Map No. 356



016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

1 0 1 2 Miles

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

OAT MOUNTAIN
50-YEAR 24-HOUR ISOHYET

1-H1.35

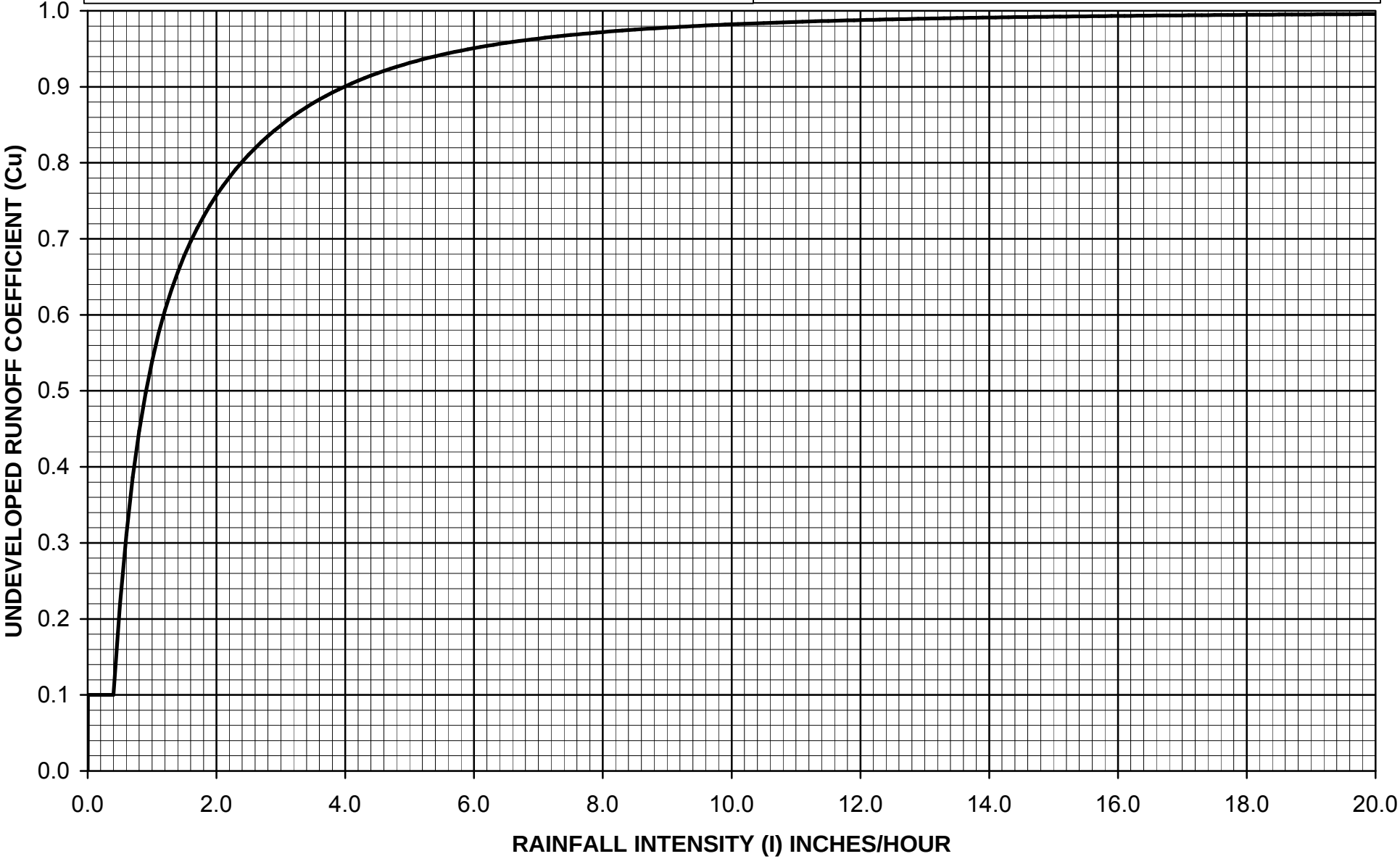
LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works

$C_D = (0.9 * IMP) + (1.0 - IMP) * C_U$

Where: C_D = Developed Runoff Coefficient
IMP = Proportion Impervious
C_U = Undeveloped runoff coefficient

Los Angeles County Department of Public Works

RUNOFF COEFFICIENT CURVE
SOIL TYPE NO. 016



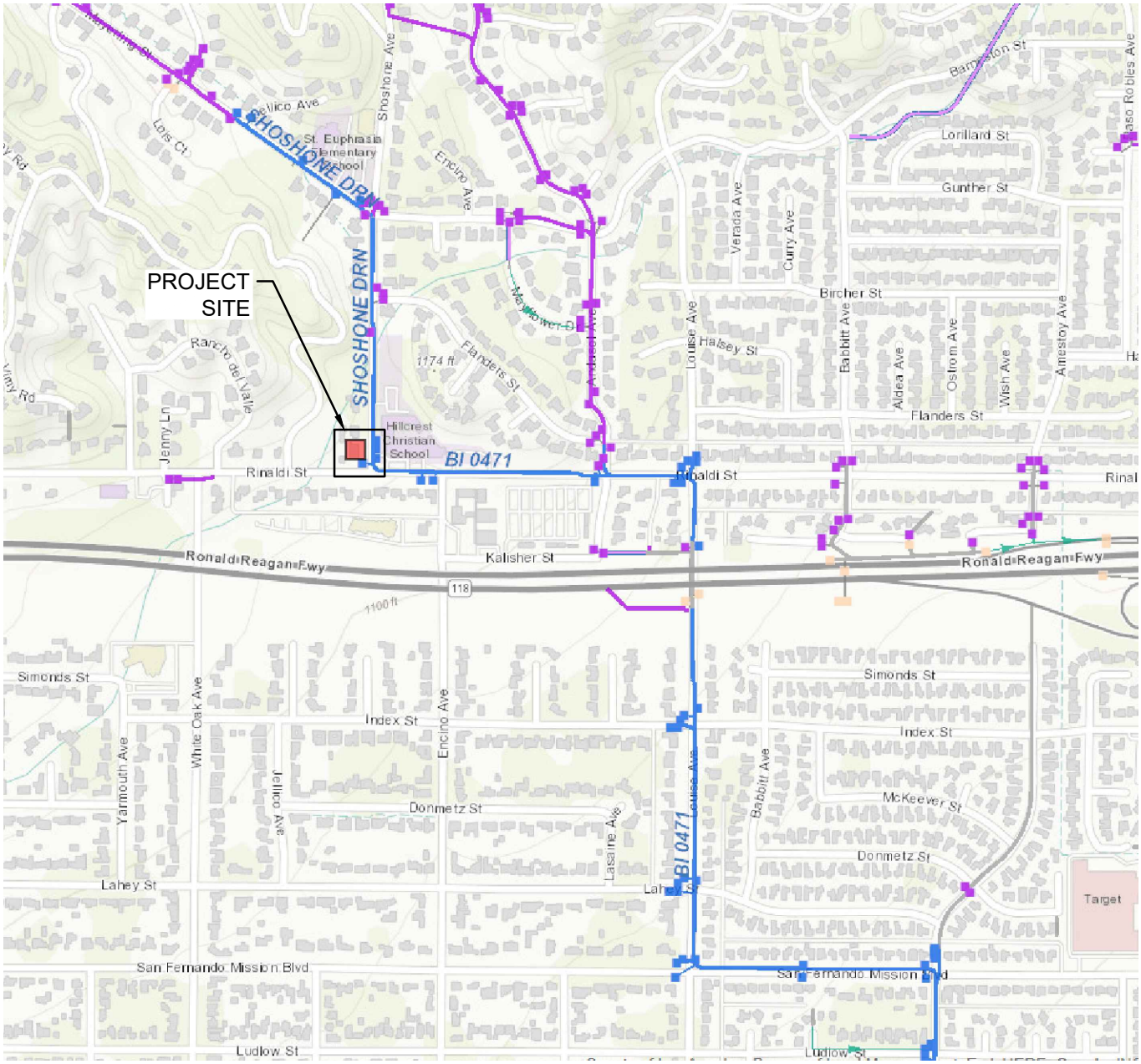
Proportion Impervious Data

Code	Land Use Description	% Impervious
1111	High-Density Single Family Residential	42
1112	Low-Density Single Family Residential	21
1121	Mixed Multi-Family Residential	74
1122	Duplexes, Triplexes and 2-or 3-Unit Condominiums and Townhouses	55
1123	Low-Rise Apartments, Condominiums, and Townhouses	86
1124	Medium-Rise Apartments and Condominiums	86
1125	High-Rise Apartments and Condominiums	90
1131	Trailer Parks and Mobile Home Courts, High-Density	91
1132	Mobile Home Courts and Subdivisions, Low-Density	42
1140	Mixed Residential	59
1151	Rural Residential, High-Density	15
1152	Rural Residential, Low-Density	10
1211	Low- and Medium-Rise Major Office Use	91
1212	High-Rise Major Office Use	91
1213	Skyscrapers	91
1221	Regional Shopping Center	95
1222	Retail Centers (Non-Strip With Contiguous Interconnected Off-Street	96
1223	Modern Strip Development	96
1224	Older Strip Development	97
1231	Commercial Storage	90
1232	Commercial Recreation	90
1233	Hotels and Motels	96
1234	Attended Pay Public Parking Facilities	91
1241	Government Offices	91
1242	Police and Sheriff Stations	91
1243	Fire Stations	91
1244	Major Medical Health Care Facilities	74
1245	Religious Facilities	82
1246	Other Public Facilities	91
1247	Non-Attended Public Parking Facilities	91
1251	Correctional Facilities	91
1252	Special Care Facilities	74
1253	Other Special Use Facilities	86
1261	Pre-Schools/Day Care Centers	68
1262	Elementary Schools	82
1263	Junior or Intermediate High Schools	82
1264	Senior High Schools	82
1265	Colleges and Universities	47
1266	Trade Schools and Professional Training Facilities	91
1271	Base (Built-up Area)	65
1271.01	Base High-Density Single Family Residential	42
1271.02	Base Duplexes, Triplexes and 2-or 3-Unit Condominiums and T	55

Code	Land Use Description	% Impervious
1271.03	Base Government Offices	91
1271.04	Base Fire Stations	91
1271.05	Base Non-Attended Public Parking Facilities	91
1271.06	Base Air Field	45
1271.07	Base Petroleum Refining and Processing	91
1271.08	Base Mineral Extraction - Oil and Gas	10
1271.09	Base Harbor Facilities	91
1271.10	Base Navigation Aids	47
1271.11	Base Developed Local Parks and Recreation	10
1271.12	Base Vacant Undifferentiated	1
1272	Vacant Area	2
1273	Air Field	45
1274	Former Base (Built-up Area)	65
1275	Former Base Vacant Area	2
1276	Former Base Air Field	91
1311	Manufacturing, Assembly, and Industrial Services	91
1312	Motion Picture and Television Studio Lots	82
1313	Packing Houses and Grain Elevators	96
1314	Research and Development	91
1321	Manufacturing	91
1322	Petroleum Refining and Processing	91
1323	Open Storage	66
1324	Major Metal Processing	91
1325	Chemical Processing	91
1331	Mineral Extraction - Other Than Oil and Gas	10
1332	Mineral Extraction - Oil and Gas	10
1340	Wholesaling and Warehousing	91
1411	Airports	91
1411.01	Airstrip	10
1412	Railroads	15
1412.01	Railroads-Attended Pay Public Parking Facilities	91
1412.02	Railroads-Non-Attended Public Parking Facilities	91
1412.03	Railroads-Manufacturing, Assembly, and Industrial Services	91
1412.04	Railroads-Petroleum Refining and Processing	91
1412.05	Railroads-Open Storage	66
1412.06	Railroads-Truck Terminals	91
1413	Freeways and Major Roads	91
1414	Park-and-Ride Lots	91
1415	Bus Terminals and Yards	91
1416	Truck Terminals	91
1417	Harbor Facilities	91
1418	Navigation Aids	47
1420	Communication Facilities	82
1420.01	Communication Facilities-Antenna	2

Code	Land Use Description	% Impervious
1431	Electrical Power Facilities	47
1431.01	Electrical Power Facilities-Powerlines (Urban)	2
1431.02	Electrical Power Facilities-Powerlines (Rural)	1
1432	Solid Waste Disposal Facilities	15
1433	Liquid Waste Disposal Facilities	96
1434	Water Storage Facilities	91
1435	Natural Gas and Petroleum Facilities	91
1435.01	Natural Gas and Petroleum Facilities-Manufacturing, Assembly, and In	91
1435.02	Natural Gas and Petroleum Facilities-Petroleum Refining and Processing	91
1435.03	Natural Gas and Petroleum Facilities-Mineral Extraction – Oil and Gas	10
1435.04	Natural Gas and Petroleum Facilities-Vacant Undifferentiated	1
1436	Water Transfer Facilities	96
1437	Improved Flood Waterways and Structures	100
1440	Maintenance Yards	91
1450	Mixed Transportation	90
1460	Mixed Transportation and Utility	91
1460.01	Mixed Utility and Transportation-Improved Flood Waterways and Structures	100
1460.02	Mixed Utility and Transportation-Railroads	15
1460.03	Mixed Utility and Transportation-Freeways and Major Roads	91
1500	Mixed Commercial and Industrial	91
1600	Mixed Urban	89
1700	Under Construction (Use appropriate value)	91
1810	Golf Courses	3
1821	Developed Local Parks and Recreation	10
1822	Undeveloped Local Parks and Recreation	2
1831	Developed Regional Parks and Recreation	2
1832	Undeveloped Regional Parks and Recreation	1
1840	Cemeteries	10
1850	Wildlife Preserves and Sanctuaries	2
1850.01	Wildlife-Commercial Recreation	90
1850.02	Wildlife-Other Special Use Facilities	86
1850.03	Wildlife-Developed Local Parks and Recreation	10
1860	Specimen Gardens and Arboreta	15
1870	Beach Parks	10
1880	Other Open Space and Recreation	10
2110	Irrigated Cropland and Improved Pasture Land	2
2120	Non-Irrigated Cropland and Improved Pasture Land	2
2200	Orchards and Vineyards	2
2300	Nurseries	15
2400	Dairy, Intensive Livestock, and Associated Facilities	42
2500	Poultry Operations	62
2600	Other Agriculture	42
2700	Horse Ranches	42

Code	Land Use Description	% Impervious
3100	Vacant Undifferentiated	1
3200	Abandoned Orchards and Vineyards	2
3300	Vacant With Limited Improvements (Use appropriate value)	42
3400	Beaches (Vacant)	1
4100	Water, Undifferentiated	100
4200	Harbor Water Facilities	100
4300	Marina Water Facilities	100
4400	Water Within a Military Installation	100



N.T.S.

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MORNINGSTAR OF GRANADA HILLS
17551 & 17563 RINALDI STREET
GRANADA HILLS, CA

LACDPW STORM DRAIN FACILITIES

DSGN:	ARSA
DRWN:	ARSA
APVD:	JC
DATE:	8/12/21

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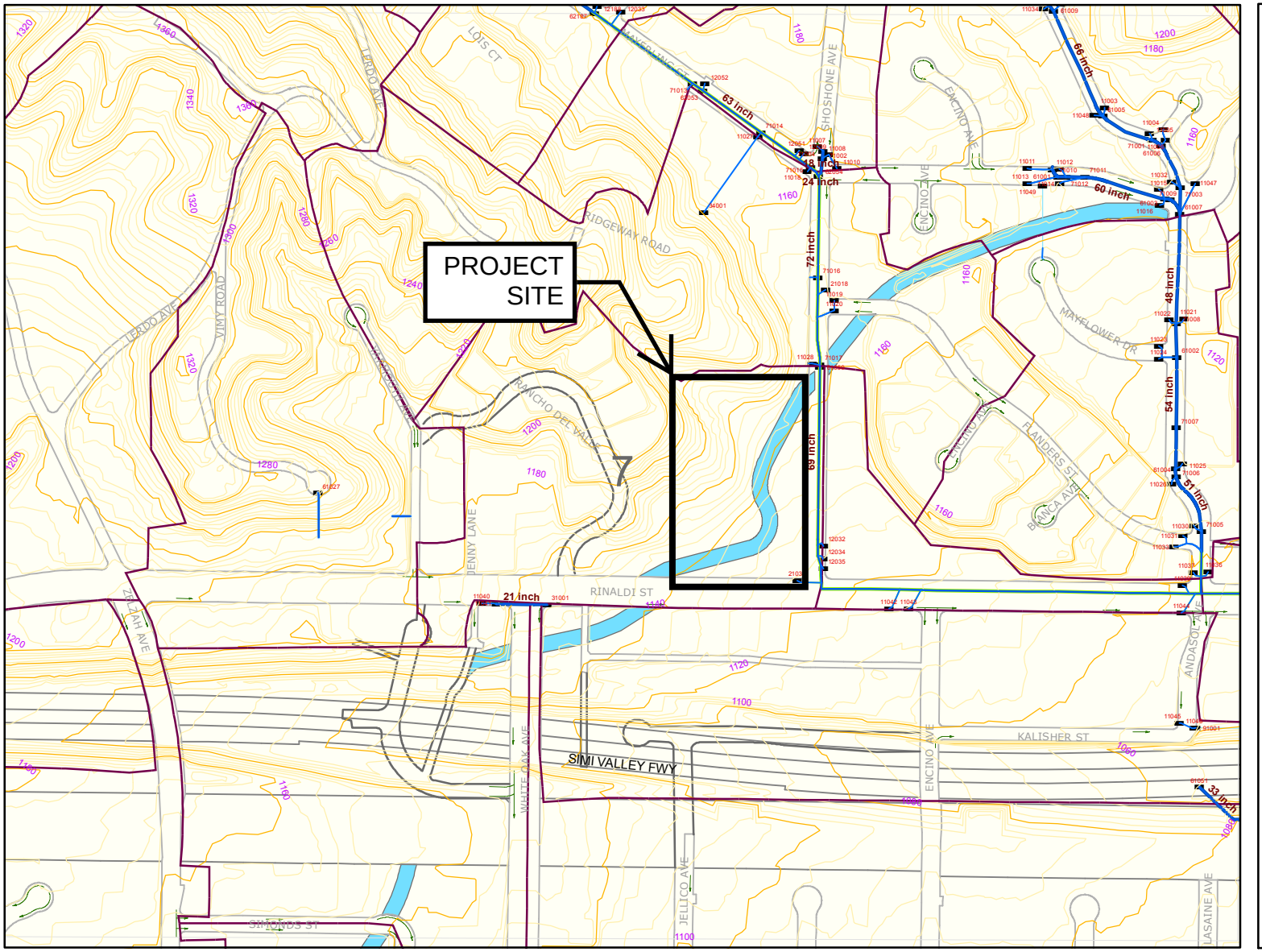
8/12/2021 9:21 AM Arturo Sanchez \\deainc.com\files\PROJECT\C\CONFCDMS00031\0400CADIEC\CHKBRD\ARSA\LACDPW STROM DRAIN FACILITIES.dwg



Drainage Map No. 356
Quadrant No. 2
Grid No. 7

- Inlet
- Flow Direction
- Relief Sewer
- Abandoned Pipe
- Miscellaneous Pipe
- Buildings and Cultural Features
- Coast / Stormwater Channel
- City of Los Angeles
- Subarea
- Railroad
- Jetty
- Los Angeles City Limit

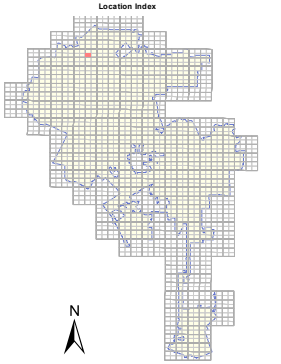
Contour Elevation Level

- 20 foot interval
- Other

Stormwater Pipe Ownership

- City of Los Angeles
- County of Los Angeles
- State of California
- Other

Location Index



N

Primary Office: VALLEY

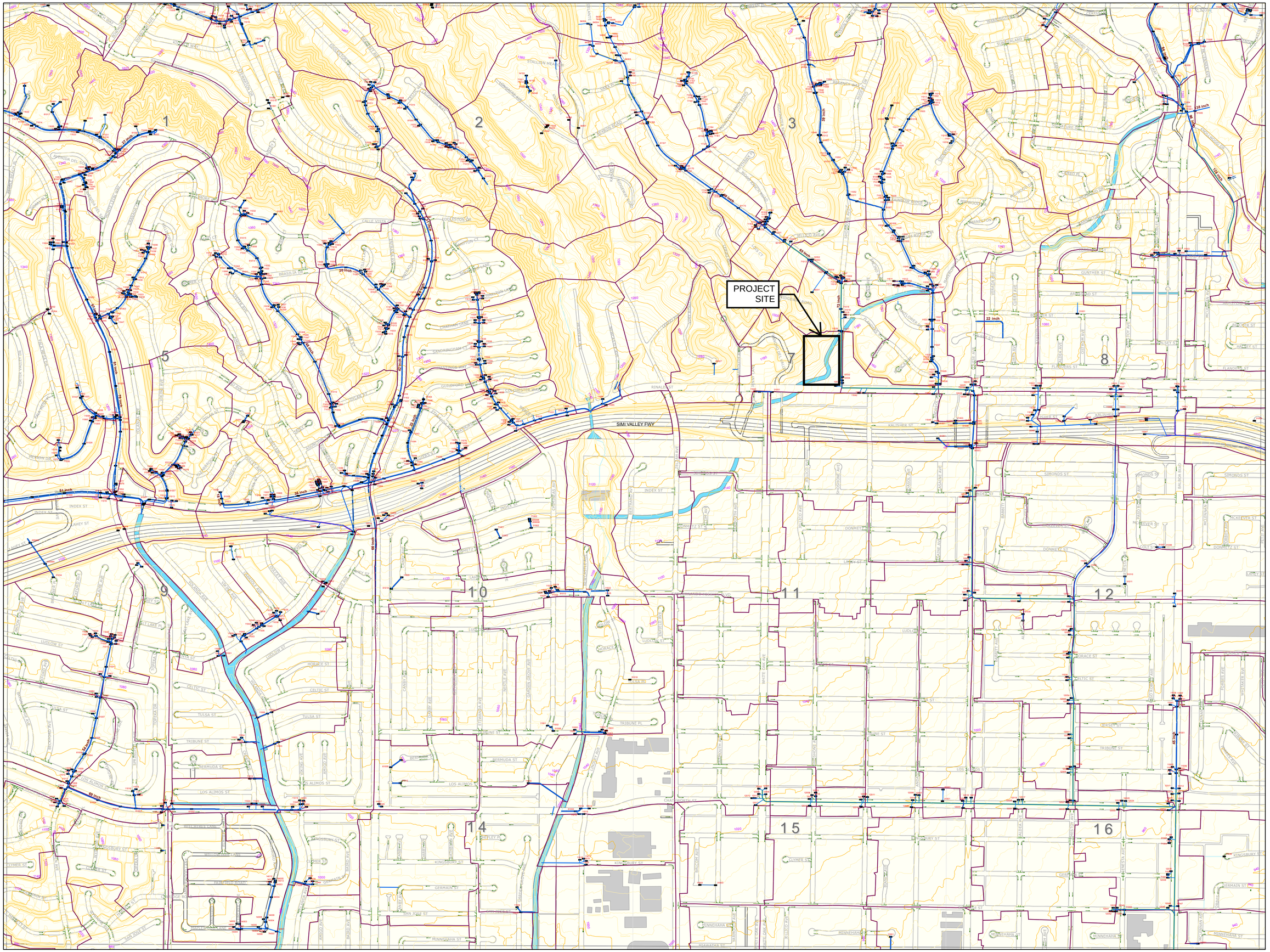
Feet

0 175 350 700

ENGINEERING
CITY OF LOS ANGELES

Landbase data is from the City of Los Angeles Survey and Mapping Division. Contours are derived from USGS digital elevation models. Drainage features are digitized from Stormwater Management drainage maps. Coordinate system is shown in California State Plane, NAD83, Zone 5 (feet). Cultural data are from Thomas Brothers maps digital data.

Drainage feature revised date: December, 2017
Landbase revised date: December, 2017
Contour revised date: September, 2006
Date Plotted: 12/5/2017



Landbase data is from the City of Los Angeles Survey and Mapping Division.
Contours are derived from USGS digital elevation models.
Drainage features are digitized from Stormwater Management drainage maps.
Coordinate system is shown in California State Plane, NAD83, Zone 5 (feet).
Cultural features are from Thomas Brothers maps digital data.

Drainage feature revised date: December, 2017
Landbase revised date: December, 2017
Contour revised date: September, 2006
Date Plotted: 12/5/2017

ENGINEERING
CITY OF LOS ANGELES

Drainage Map No. 356

Feet
0 500 1,000 2,000

- Inlet
- Flow Direction
- Relief Sewer
- Abandoned Pipe
- Miscellaneous Pipe

Contour Elevation Level
- 20 foot interval
- Other

- Buildings and Cultural Features
- Coast / Stormwater Channel
- City of Los Angeles
- Subarea
- Railroad
- Jetty
- Los Angeles City Limit

Stormwater Pipe Ownership
- City of Los Angeles
- County of Los Angeles
- State of California
- Other

Tile Index
N

Primary Office: VALLEY

APPENDIX D – HYDROLOGY CALCULATIONS

- 50-year Storm Event
  - Pre-Development Hydrology Calculations
  - Post-Development Hydrology Calculations

- Pipe Sizing
  - Bentley FlowMaster Pipe Capacity Calculations

Peak Flow Hydrologic Analysis

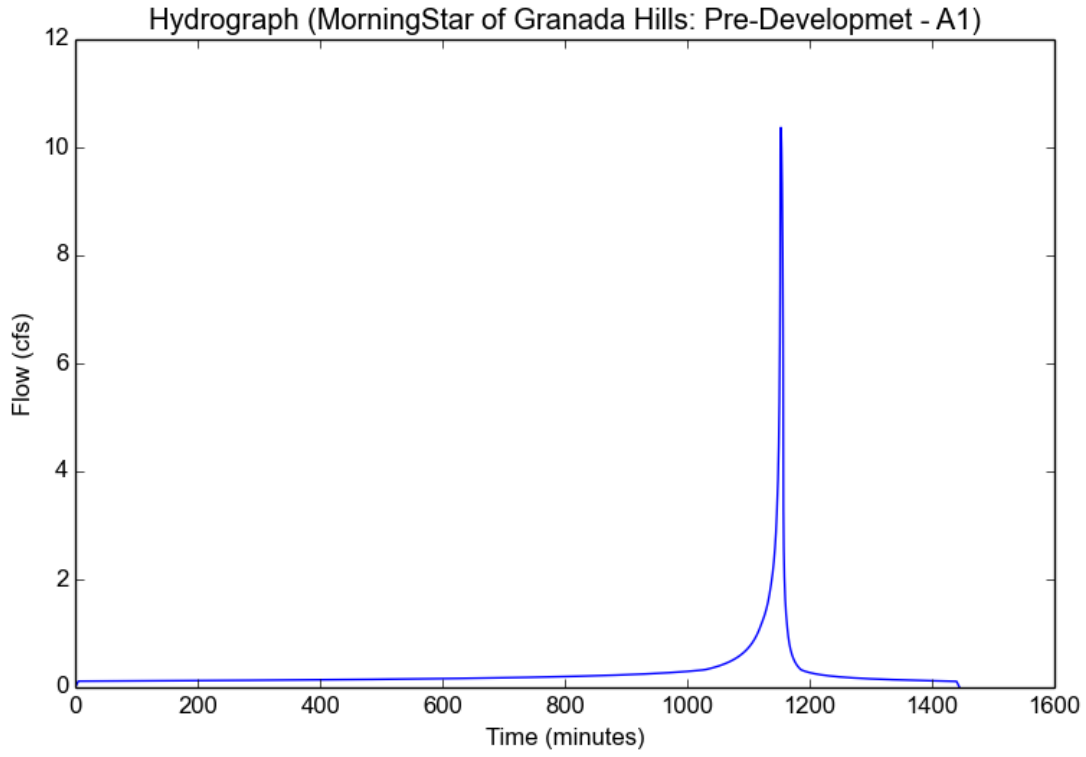
File location: //deainc.com/files/PROJECT/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Pre
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Pre-Developmet - A1
Area (ac)	3.04
Flow Path Length (ft)	520.0
Flow Path Slope (vft/hft)	0.098
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.21
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8932
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	10.3679
Burned Peak Flow Rate (cfs)	10.3679
24-Hr Clear Runoff Volume (ac-ft)	0.5665
24-Hr Clear Runoff Volume (cu-ft)	24675.6029



Peak Flow Hydrologic Analysis

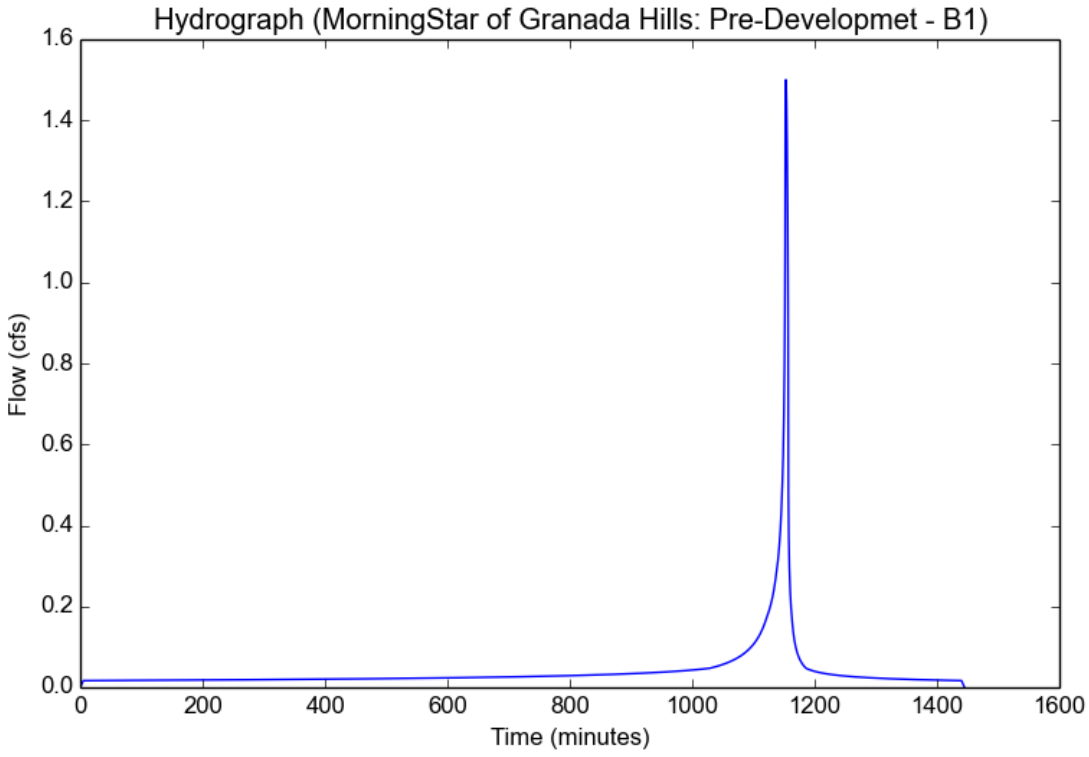
File location: //deainc.com/files/PROJECT/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Pre
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Pre-Developmet - B1
Area (ac)	0.44
Flow Path Length (ft)	200.0
Flow Path Slope (vft/hft)	0.064
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.21
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8932
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.5006
Burned Peak Flow Rate (cfs)	1.5006
24-Hr Clear Runoff Volume (ac-ft)	0.082
24-Hr Clear Runoff Volume (cu-ft)	3571.4688



Peak Flow Hydrologic Analysis

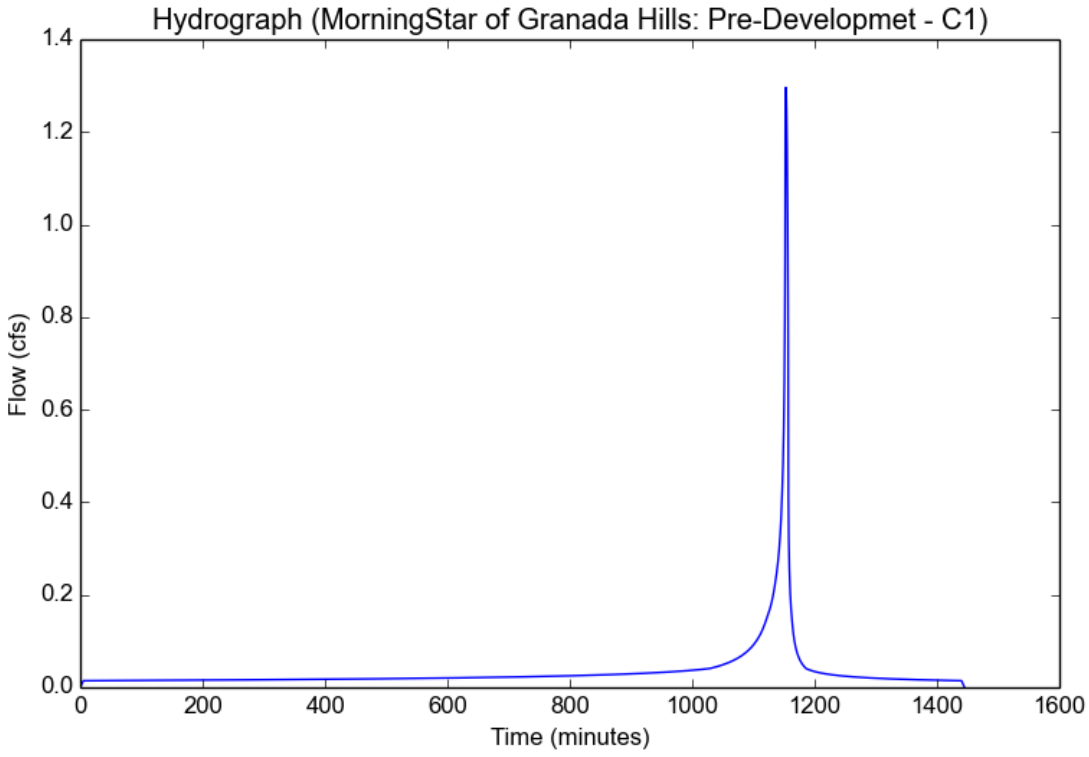
File location: //deainc.com/files/PROJECT/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Pre
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Pre-Developmet - C1
Area (ac)	0.38
Flow Path Length (ft)	125.0
Flow Path Slope (vft/hft)	0.055
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.21
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8932
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.296
Burned Peak Flow Rate (cfs)	1.296
24-Hr Clear Runoff Volume (ac-ft)	0.0708
24-Hr Clear Runoff Volume (cu-ft)	3084.4504



Peak Flow Hydrologic Analysis

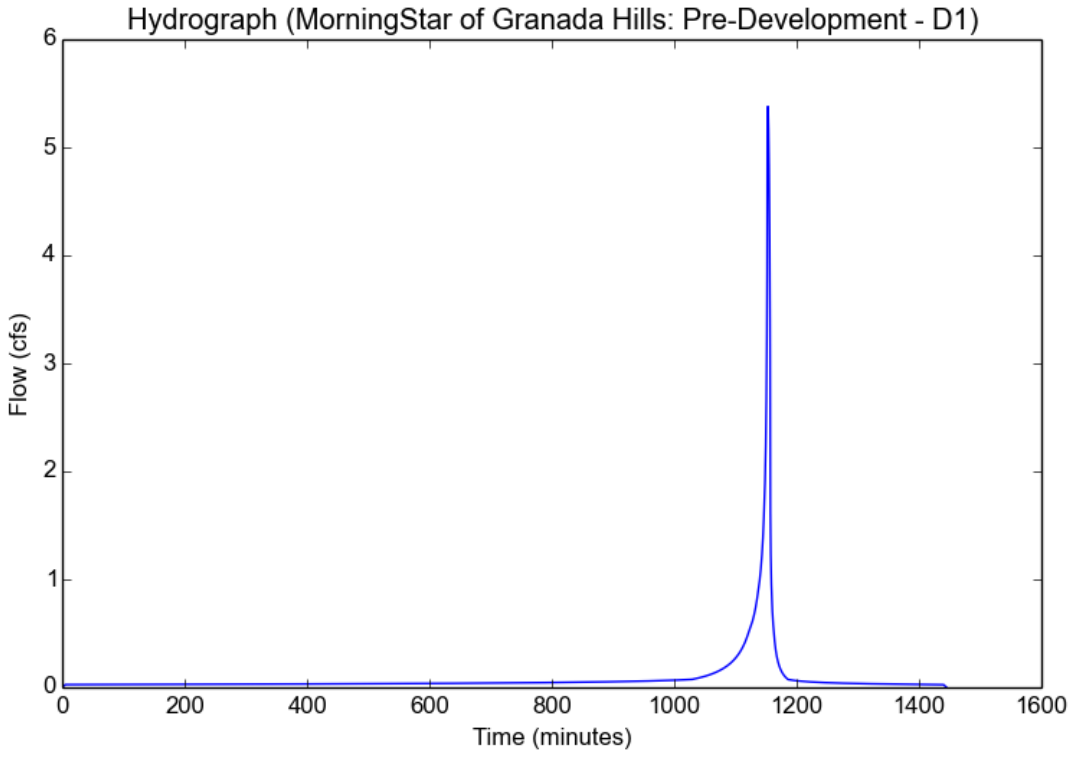
File location: //deainc.com/files/PROJECT/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Pre
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Pre-Development - D1
Area (ac)	1.58
Flow Path Length (ft)	300.0
Flow Path Slope (vft/hft)	0.09
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.02
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8915
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	5.3787
Burned Peak Flow Rate (cfs)	5.3787
24-Hr Clear Runoff Volume (ac-ft)	0.1843
24-Hr Clear Runoff Volume (cu-ft)	8029.5878



Peak Flow Hydrologic Analysis

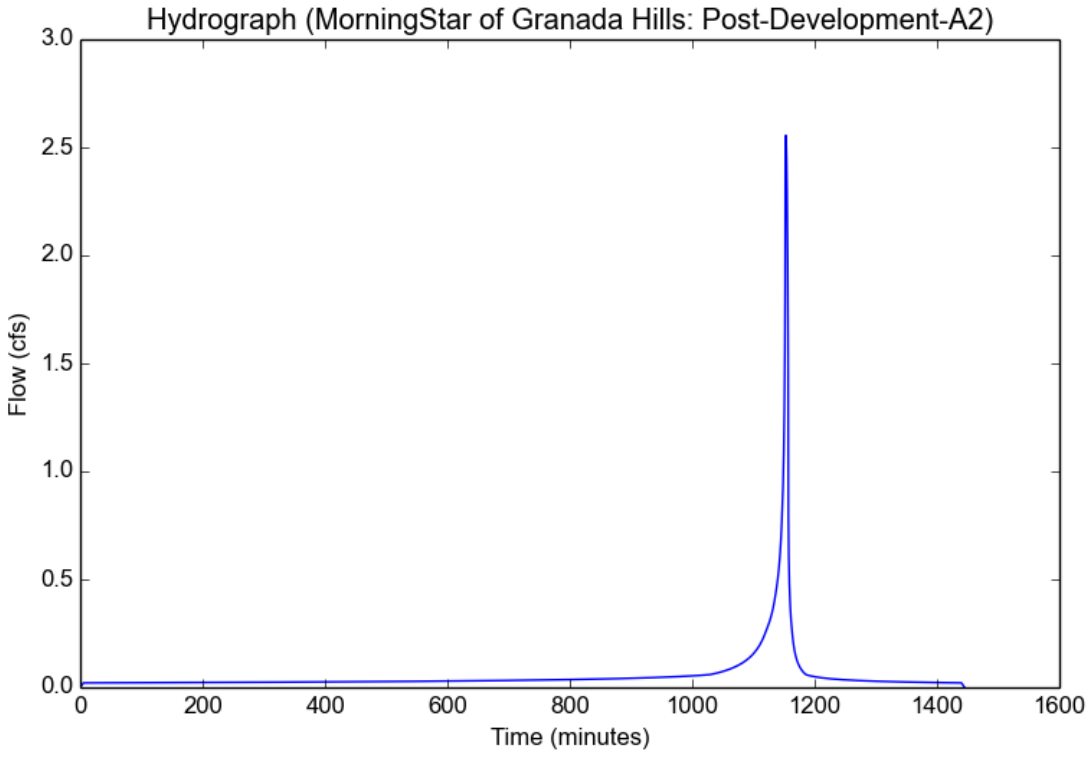
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-A2.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-A2
Area (ac)	0.75
Flow Path Length (ft)	350.0
Flow Path Slope (vft/hft)	0.2
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.12
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8924
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.5556
Burned Peak Flow Rate (cfs)	2.5556
24-Hr Clear Runoff Volume (ac-ft)	0.115
24-Hr Clear Runoff Volume (cu-ft)	5009.5226



Peak Flow Hydrologic Analysis

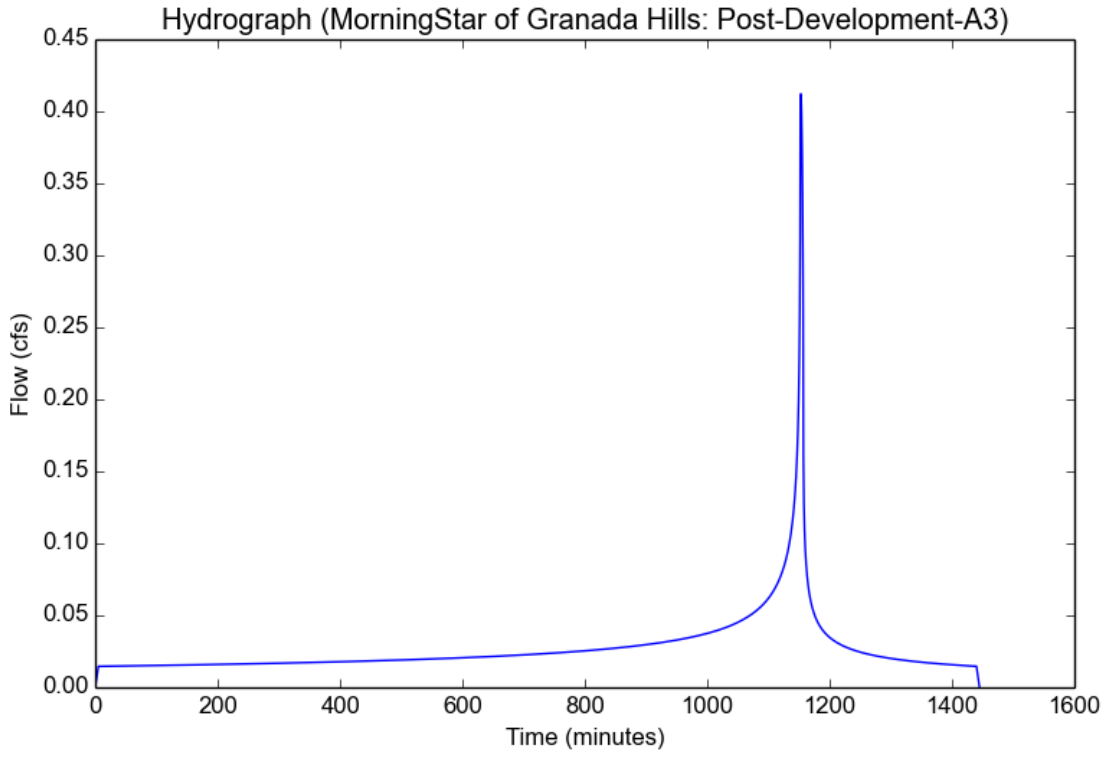
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-A3.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-A3
Area (ac)	0.12
Flow Path Length (ft)	80.0
Flow Path Slope (vft/hft)	0.04
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.95
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8996
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.4122
Burned Peak Flow Rate (cfs)	0.4122
24-Hr Clear Runoff Volume (ac-ft)	0.0549
24-Hr Clear Runoff Volume (cu-ft)	2392.48



Peak Flow Hydrologic Analysis

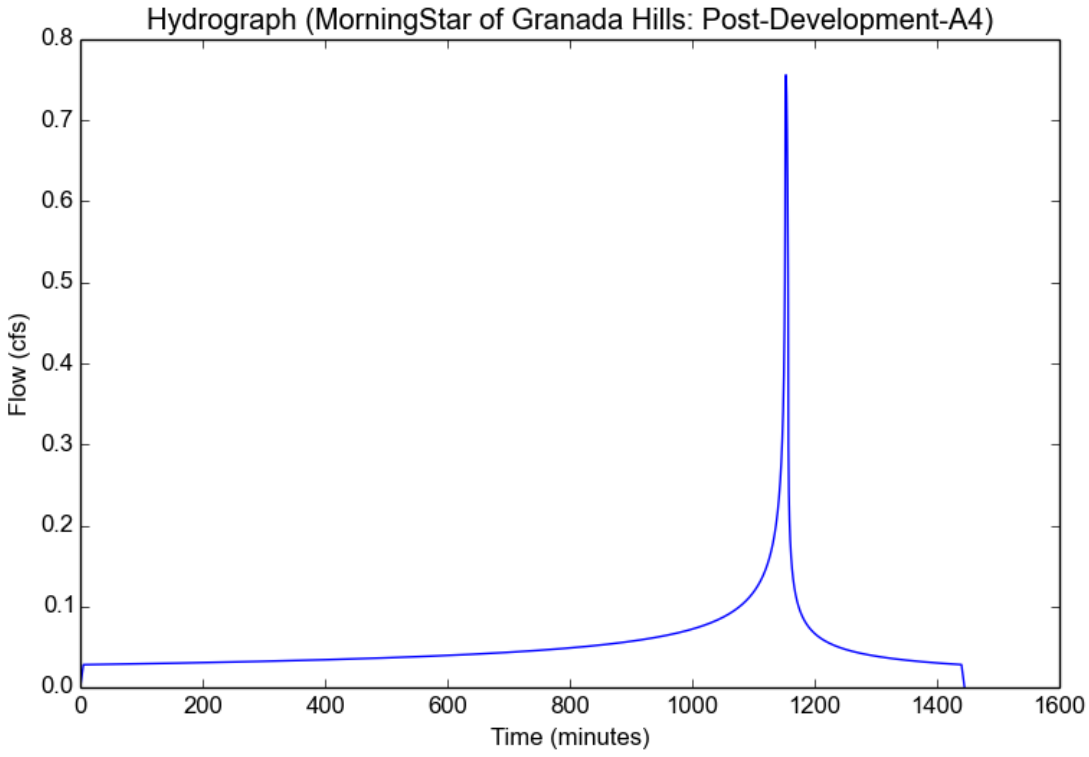
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-A4.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-A4
Area (ac)	0.22
Flow Path Length (ft)	115.0
Flow Path Slope (vft/hft)	0.33
50-yr Rainfall Depth (in)	6.4
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.756
Burned Peak Flow Rate (cfs)	0.756
24-Hr Clear Runoff Volume (ac-ft)	0.1047
24-Hr Clear Runoff Volume (cu-ft)	4561.9214



Peak Flow Hydrologic Analysis

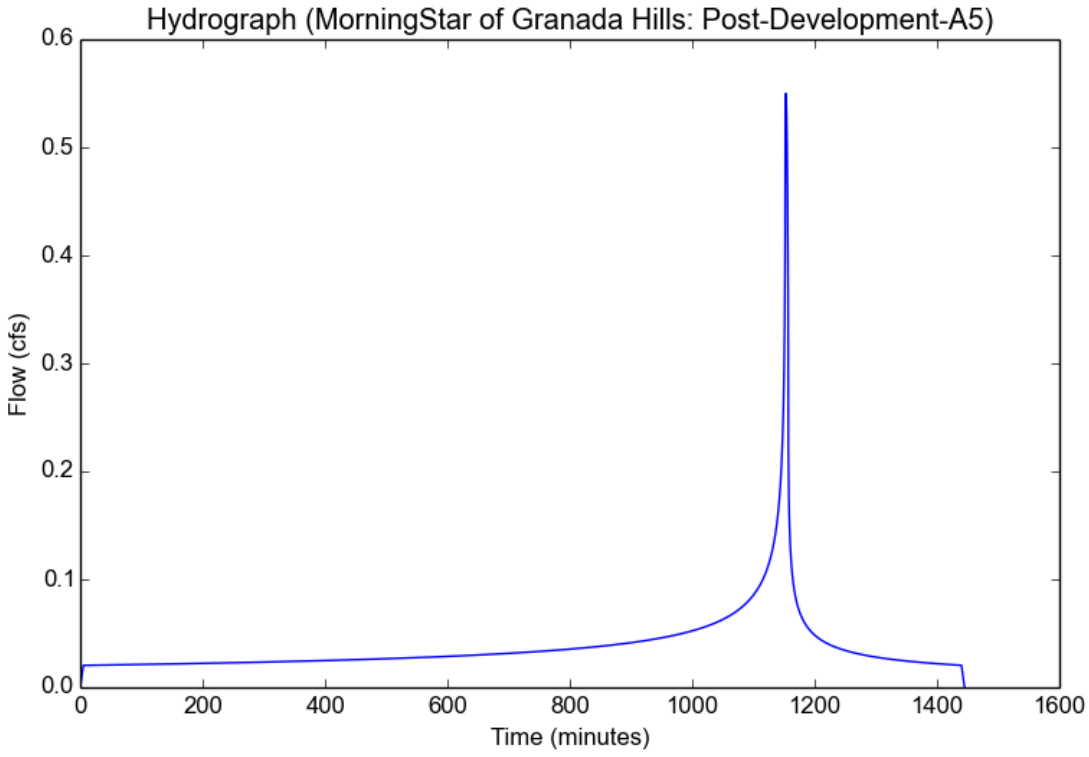
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-A5.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-A5
Area (ac)	0.16
Flow Path Length (ft)	50.0
Flow Path Slope (vft/hft)	0.33
50-yr Rainfall Depth (in)	6.4
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.5499
Burned Peak Flow Rate (cfs)	0.5499
24-Hr Clear Runoff Volume (ac-ft)	0.0762
24-Hr Clear Runoff Volume (cu-ft)	3317.761



Peak Flow Hydrologic Analysis

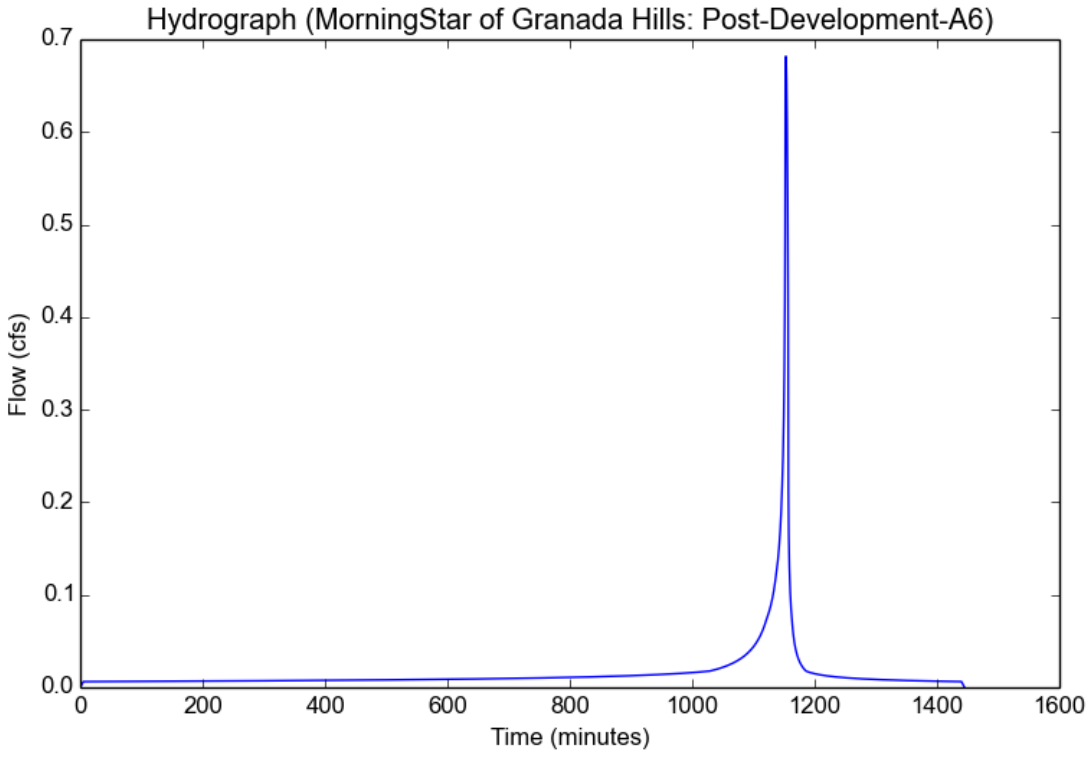
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-A6.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-A6
Area (ac)	0.2
Flow Path Length (ft)	200.0
Flow Path Slope (vft/hft)	0.01
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.15
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8927
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.6817
Burned Peak Flow Rate (cfs)	0.6817
24-Hr Clear Runoff Volume (ac-ft)	0.0329
24-Hr Clear Runoff Volume (cu-ft)	1431.7134



Peak Flow Hydrologic Analysis

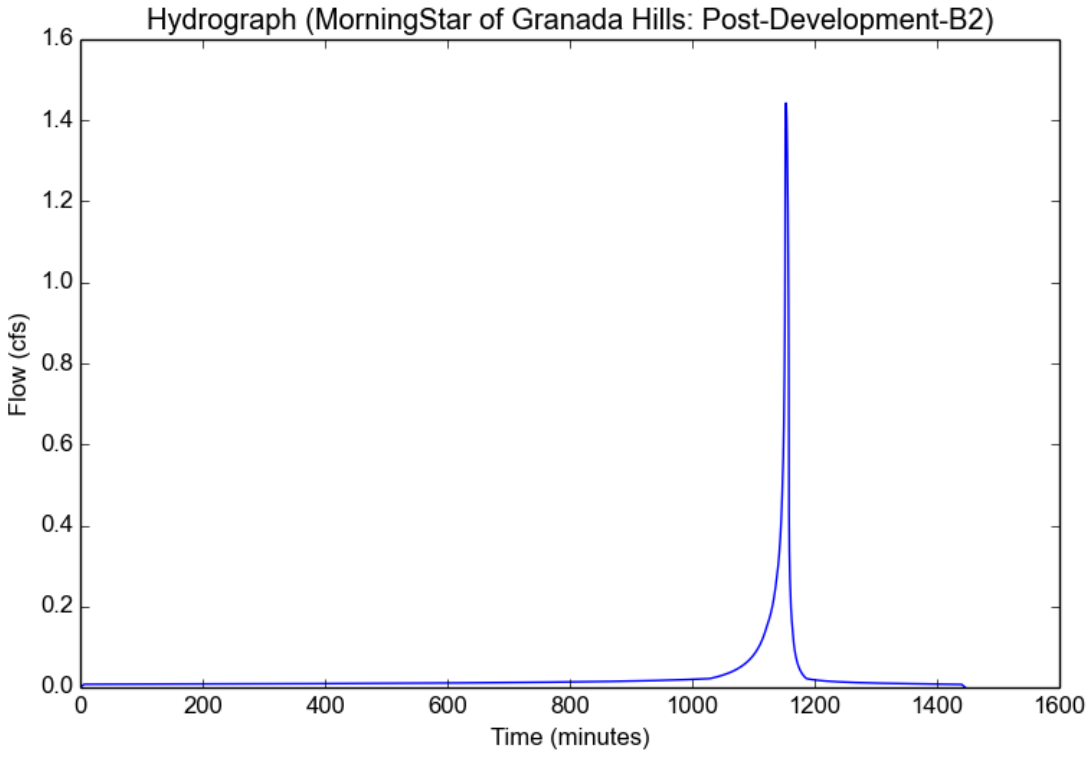
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-B2.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-B2
Area (ac)	0.47
Flow Path Length (ft)	750.0
Flow Path Slope (vft/hft)	0.1
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.02
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.5048
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.8758
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	1.4426
Burned Peak Flow Rate (cfs)	1.4426
24-Hr Clear Runoff Volume (ac-ft)	0.0548
24-Hr Clear Runoff Volume (cu-ft)	2386.9452



Peak Flow Hydrologic Analysis

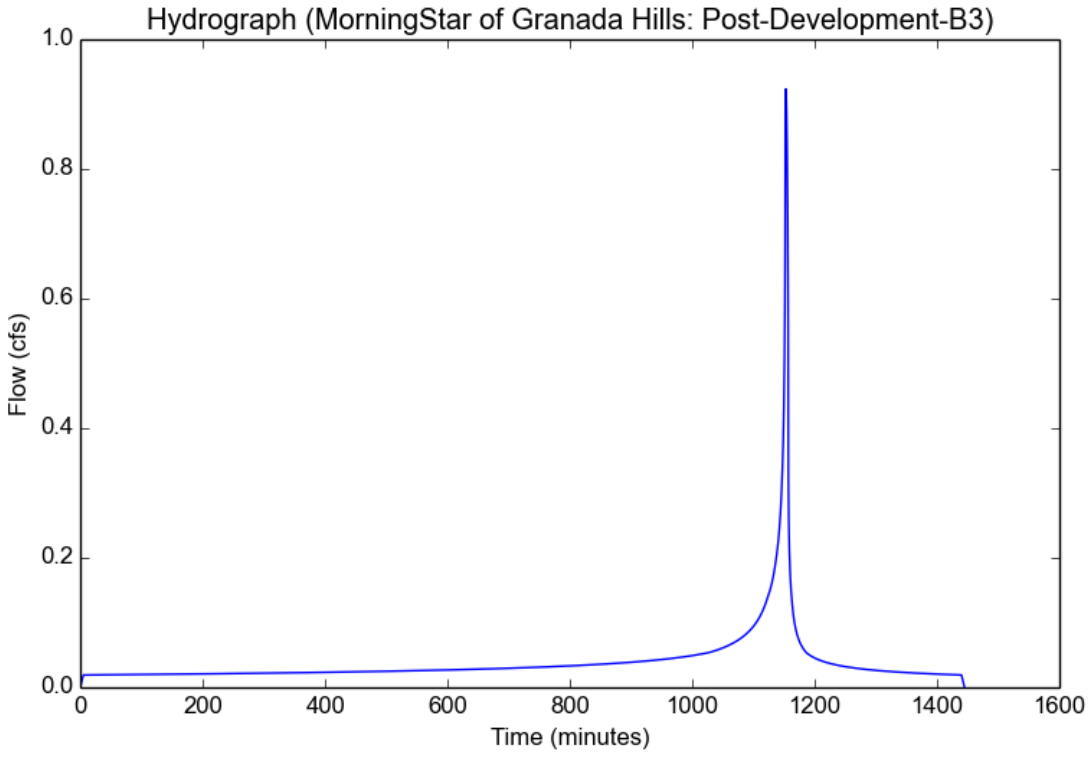
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-B3.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-B3
Area (ac)	0.27
Flow Path Length (ft)	150.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.5
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8957
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.9234
Burned Peak Flow Rate (cfs)	0.9234
24-Hr Clear Runoff Volume (ac-ft)	0.079
24-Hr Clear Runoff Volume (cu-ft)	3442.3049



Peak Flow Hydrologic Analysis

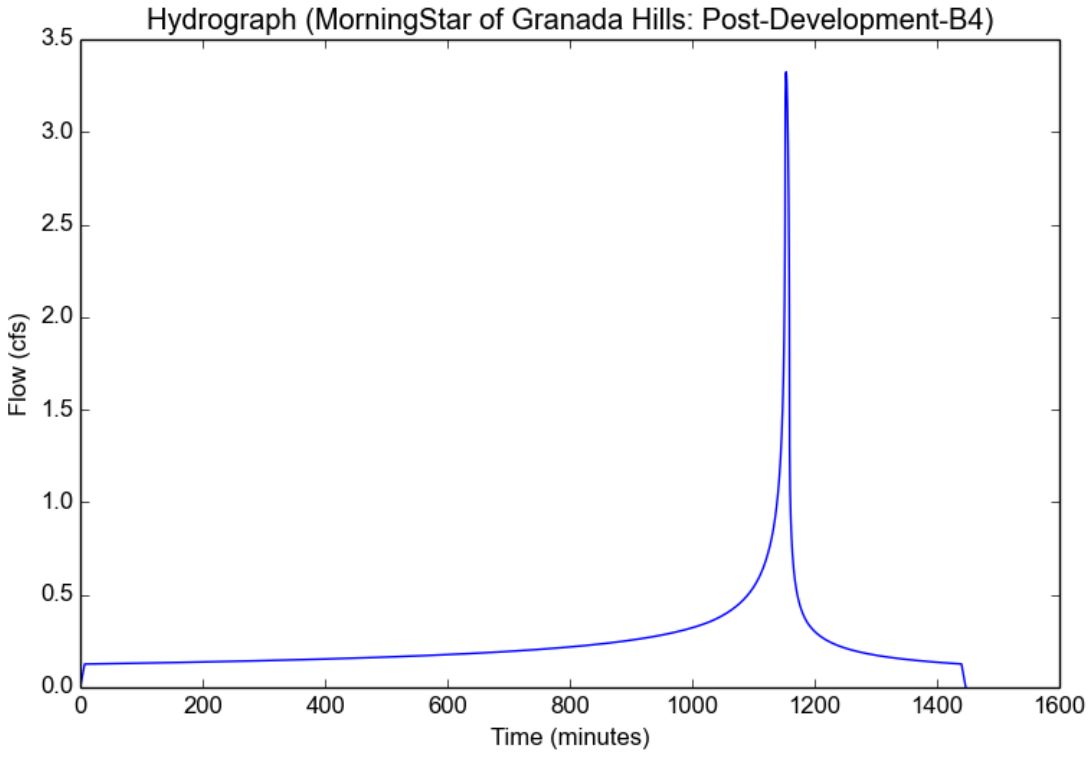
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-B4.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-B4
Area (ac)	1.14
Flow Path Length (ft)	600.0
Flow Path Slope (vft/hft)	0.02
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.85
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.2599
Undeveloped Runoff Coefficient (Cu)	0.8627
Developed Runoff Coefficient (Cd)	0.8944
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	3.3239
Burned Peak Flow Rate (cfs)	3.3239
24-Hr Clear Runoff Volume (ac-ft)	0.4799
24-Hr Clear Runoff Volume (cu-ft)	20906.6024



Peak Flow Hydrologic Analysis

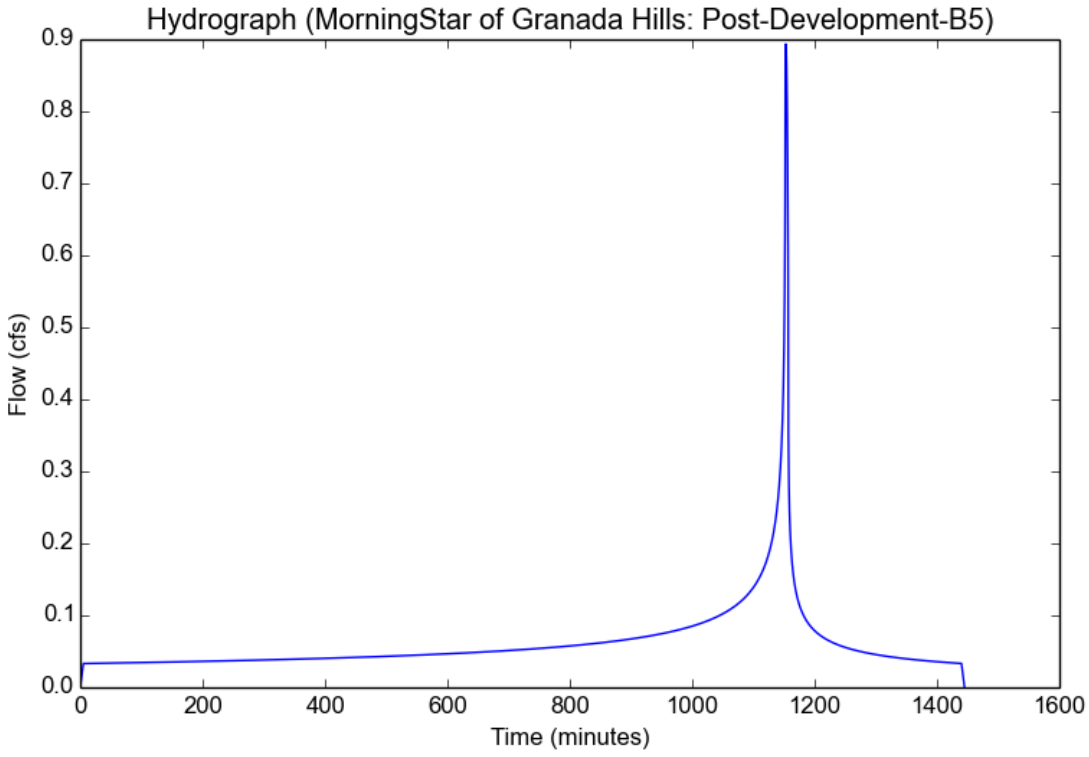
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-B5.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-B5
Area (ac)	0.26
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.33
50-yr Rainfall Depth (in)	6.4
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.8935
Burned Peak Flow Rate (cfs)	0.8935
24-Hr Clear Runoff Volume (ac-ft)	0.1238
24-Hr Clear Runoff Volume (cu-ft)	5391.3617



Peak Flow Hydrologic Analysis

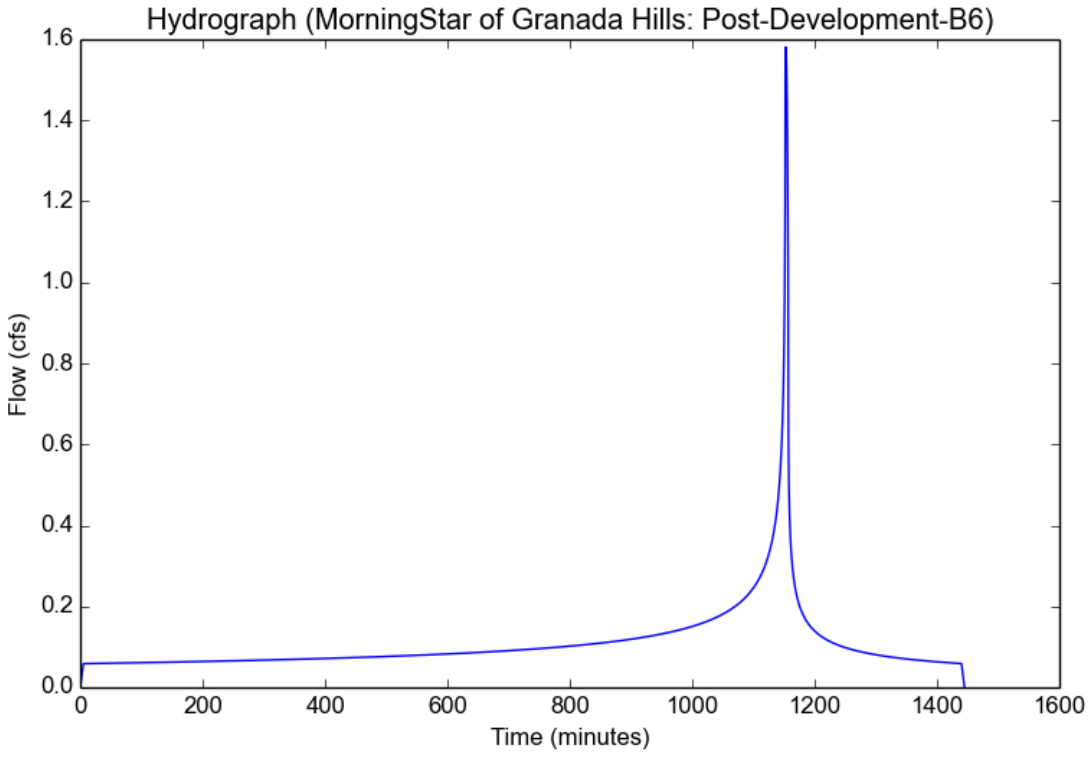
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-B6.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-B6
Area (ac)	0.46
Flow Path Length (ft)	600.0
Flow Path Slope (vft/hft)	0.33
50-yr Rainfall Depth (in)	6.4
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.5808
Burned Peak Flow Rate (cfs)	1.5808
24-Hr Clear Runoff Volume (ac-ft)	0.219
24-Hr Clear Runoff Volume (cu-ft)	9538.563



Peak Flow Hydrologic Analysis

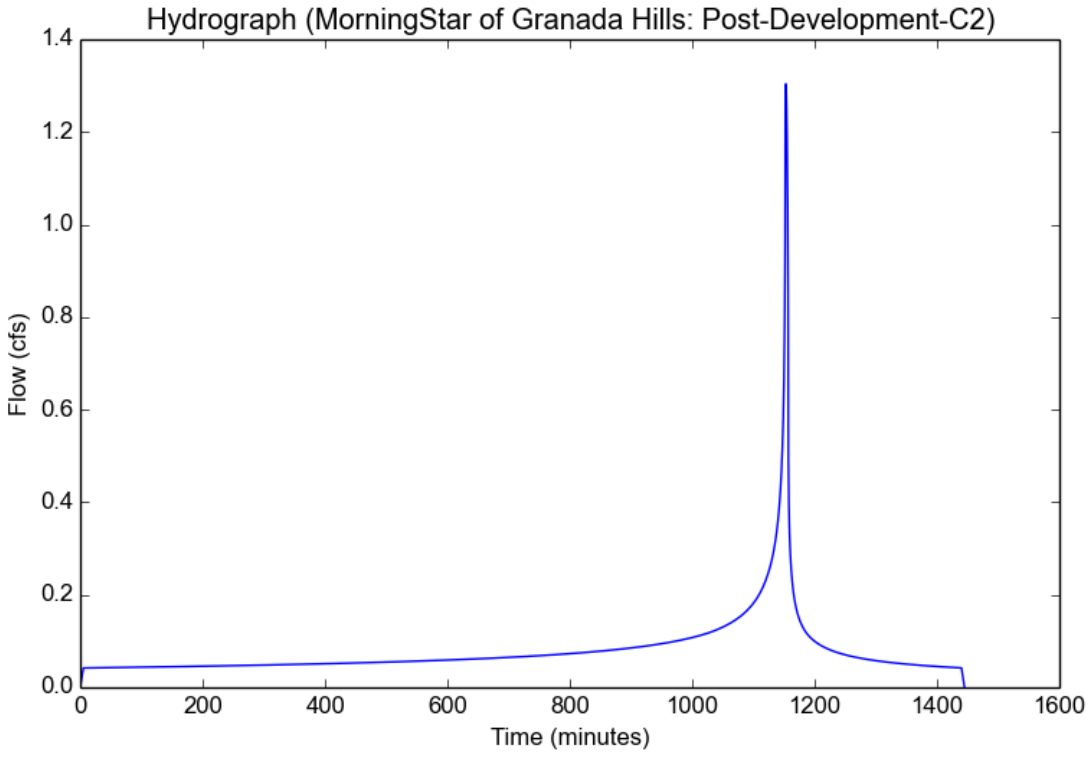
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-C2.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-C2
Area (ac)	0.38
Flow Path Length (ft)	220.0
Flow Path Slope (vft/hft)	0.03
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.85
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8987
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.304
Burned Peak Flow Rate (cfs)	1.304
24-Hr Clear Runoff Volume (ac-ft)	0.16
24-Hr Clear Runoff Volume (cu-ft)	6969.1954



Peak Flow Hydrologic Analysis

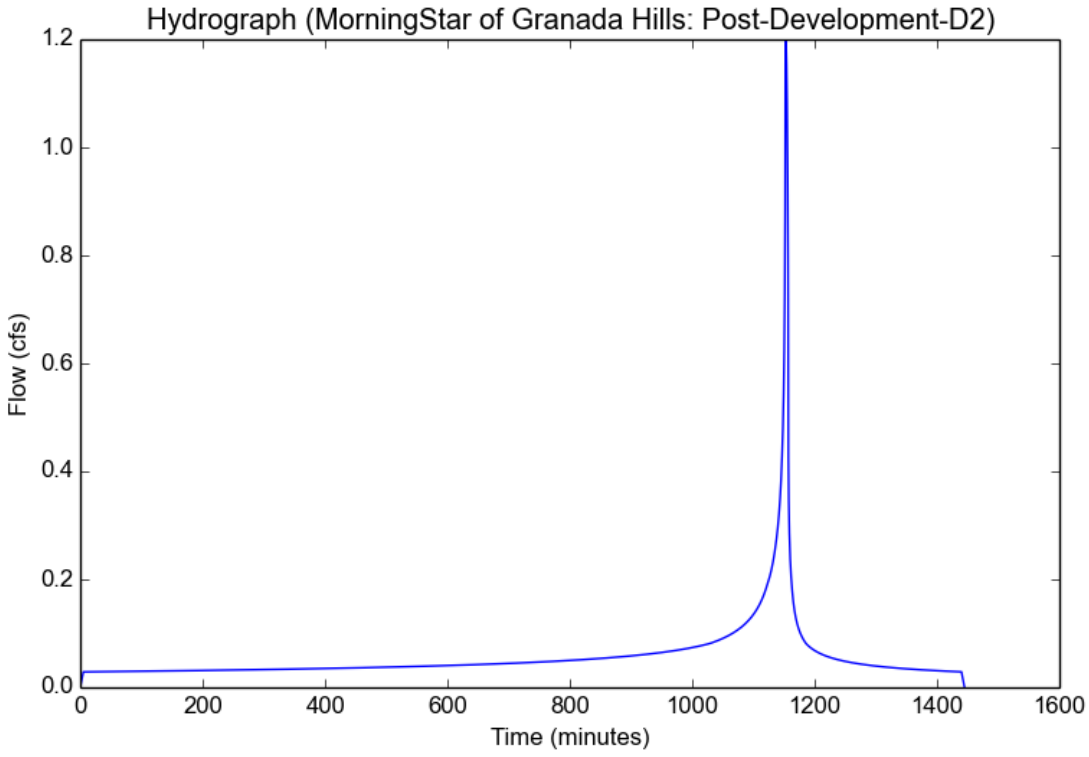
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-D2.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-D2
Area (ac)	0.35
Flow Path Length (ft)	190.0
Flow Path Slope (vft/hft)	0.03
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.6
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8965
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.1982
Burned Peak Flow Rate (cfs)	1.1982
24-Hr Clear Runoff Volume (ac-ft)	0.1153
24-Hr Clear Runoff Volume (cu-ft)	5021.3181



Peak Flow Hydrologic Analysis

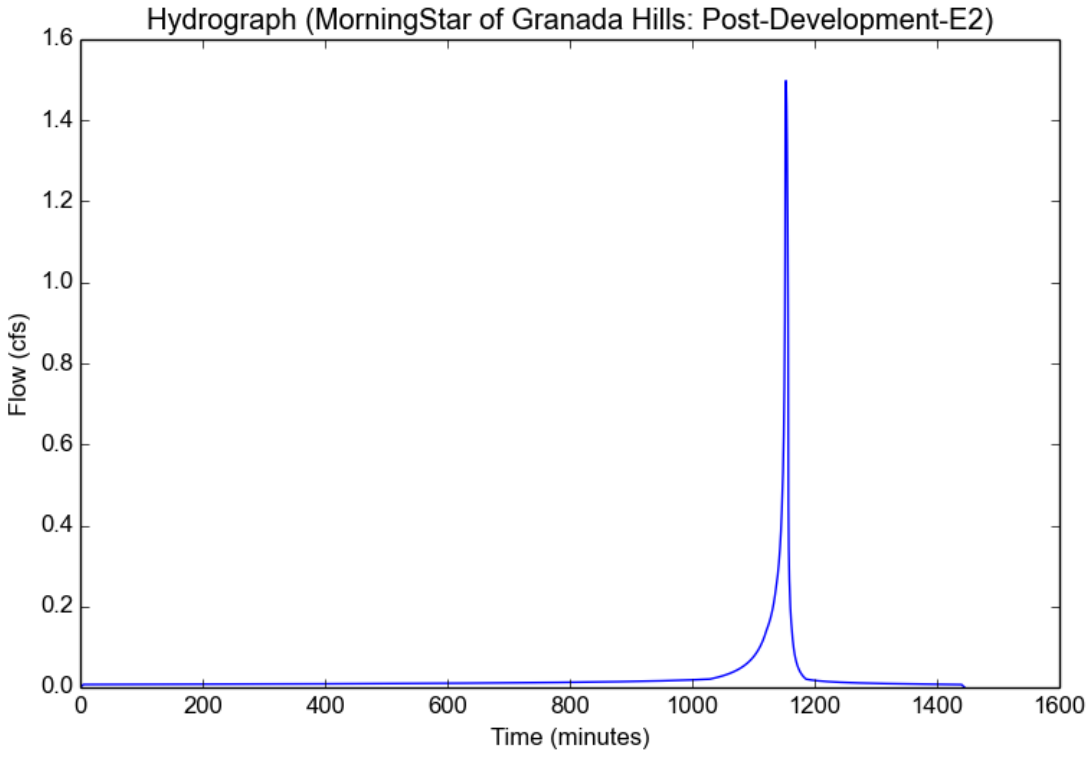
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-E2.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-E2
Area (ac)	0.44
Flow Path Length (ft)	351.0
Flow Path Slope (vft/hft)	0.2
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.02
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8915
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	1.4979
Burned Peak Flow Rate (cfs)	1.4979
24-Hr Clear Runoff Volume (ac-ft)	0.0513
24-Hr Clear Runoff Volume (cu-ft)	2236.0877



Peak Flow Hydrologic Analysis

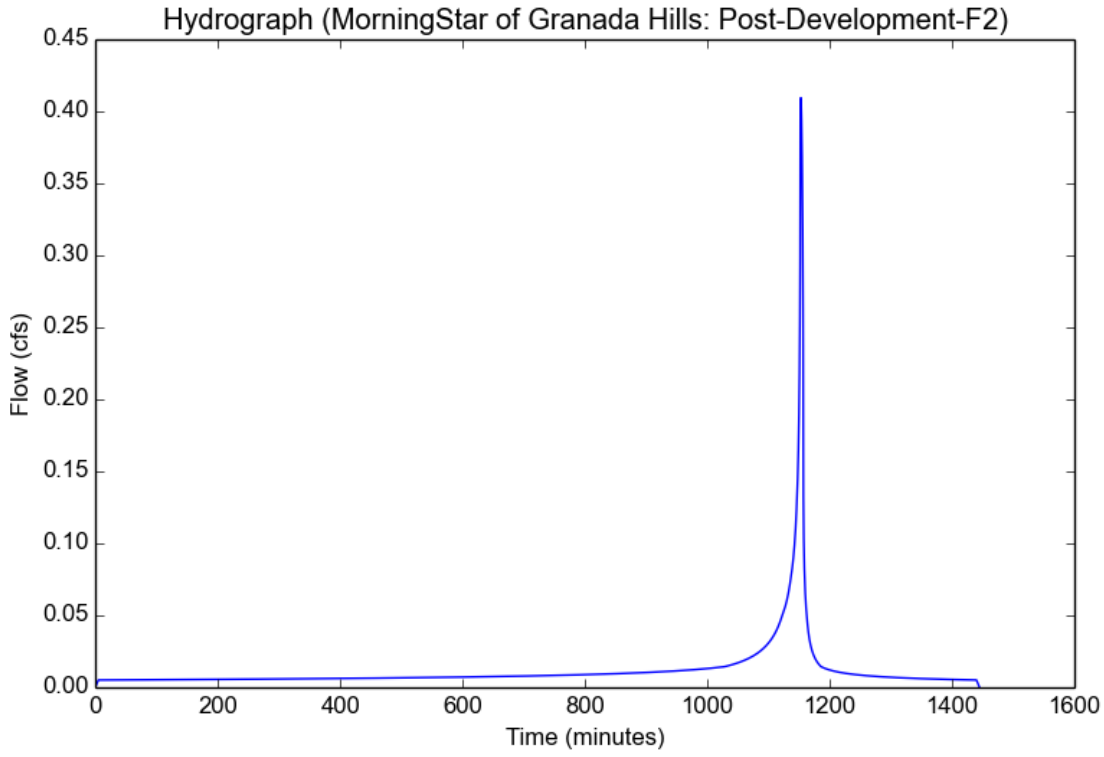
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-F2.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-F2
Area (ac)	0.12
Flow Path Length (ft)	260.0
Flow Path Slope (vft/hft)	0.04
50-yr Rainfall Depth (in)	6.4
Percent Impervious	0.25
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.8184
Undeveloped Runoff Coefficient (Cu)	0.8914
Developed Runoff Coefficient (Cd)	0.8935
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.4094
Burned Peak Flow Rate (cfs)	0.4094
24-Hr Clear Runoff Volume (ac-ft)	0.0241
24-Hr Clear Runoff Volume (cu-ft)	1050.7096



Peak Flow Hydrologic Analysis

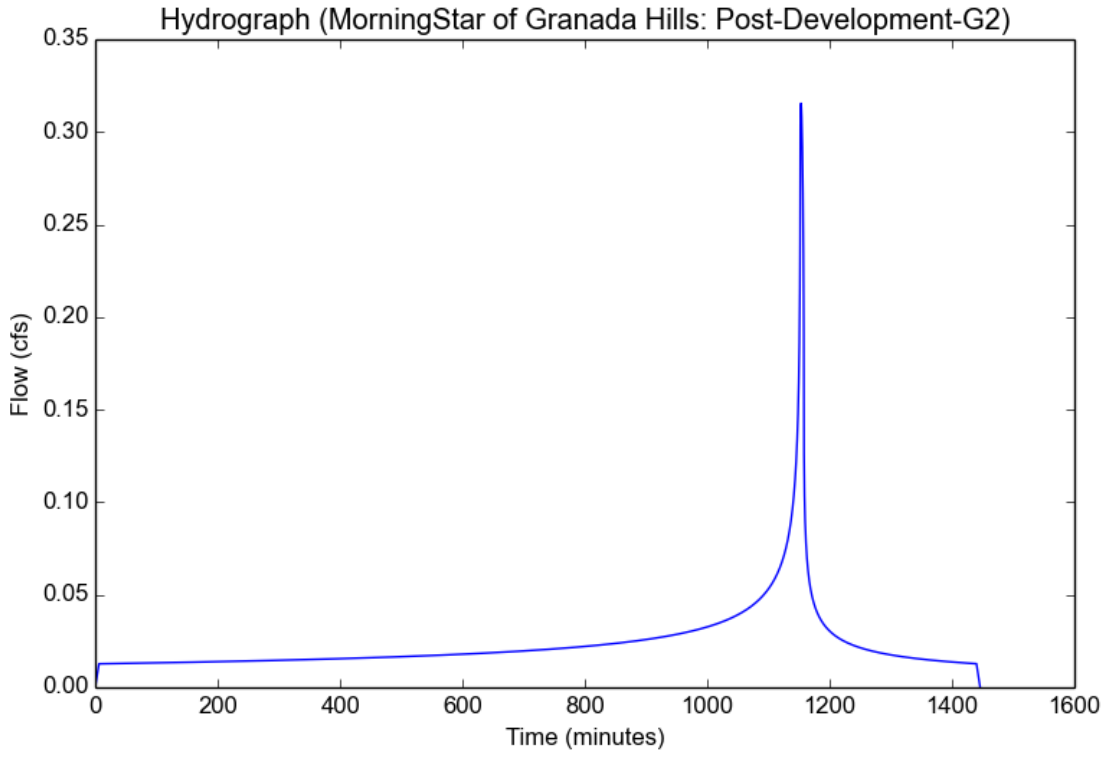
File location: P:/C/CONFCDMS0003/0600INFO/0670Reports/Hydrology Report/HydroCalcs/MorningStar of Granada Hills - Post-Development-G2.pdf
Version: HydroCalc 1.0.3

Input Parameters

Project Name	MorningStar of Granada Hills
Subarea ID	Post-Development-G2
Area (ac)	0.1
Flow Path Length (ft)	600.0
Flow Path Slope (vft/hft)	0.04
50-yr Rainfall Depth (in)	6.4
Percent Impervious	1.0
Soil Type	16
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.4
Peak Intensity (in/hr)	3.5048
Undeveloped Runoff Coefficient (Cu)	0.8753
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	0.3154
Burned Peak Flow Rate (cfs)	0.3154
24-Hr Clear Runoff Volume (ac-ft)	0.0476
24-Hr Clear Runoff Volume (cu-ft)	2073.6009



Worksheet for Granada Hills Area A

50 Yr. Q= 4.96 cfs

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	7.43 cfs

Results	
Discharge	7.43 cfs
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	12.7 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	4.20 ft/s
Velocity Head	0.27 ft
Specific Energy	1.77 ft
Froude Number	(N/A)
Maximum Discharge	7.99 cfs
Discharge Full	7.43 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

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	12.7 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Granada Hills Area B

50 Yr. Q= 8.15 cfs

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	16.00 cfs

Results	
Discharge	16.00 cfs
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	17.3 in
Percent Full	100.0 %
Critical Slope	0.007 ft/ft
Velocity	5.09 ft/s
Velocity Head	0.40 ft
Specific Energy	2.40 ft
Froude Number	(N/A)
Maximum Discharge	17.21 cfs
Discharge Full	16.00 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

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	17.3 in
Channel Slope	0.005 ft/ft
Critical Slope	0.007 ft/ft

Worksheet for Granada Hills Area C 50 Yr. Q= 1.30 cfs

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	12.0 in
Diameter	12.0 in
Discharge	2.52 cfs

Results	
Discharge	2.52 cfs
Normal Depth	12.0 in
Flow Area	0.8 ft²
Wetted Perimeter	3.1 ft
Hydraulic Radius	3.0 in
Top Width	0.00 ft
Critical Depth	8.2 in
Percent Full	100.0 %
Critical Slope	0.008 ft/ft
Velocity	3.21 ft/s
Velocity Head	0.16 ft
Specific Energy	1.16 ft
Froude Number	(N/A)
Maximum Discharge	2.71 cfs
Discharge Full	2.52 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

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	8.2 in
Channel Slope	0.005 ft/ft
Critical Slope	0.008 ft/ft

Granada Hills Full Area 50 Yr. Q= 17.84 cfs

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.010 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	22.62 cfs

Results	
Discharge	22.62 cfs
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	20.3 in
Percent Full	100.0 %
Critical Slope	0.009 ft/ft
Velocity	7.20 ft/s
Velocity Head	0.81 ft
Specific Energy	2.81 ft
Froude Number	(N/A)
Maximum Discharge	24.33 cfs
Discharge Full	22.62 cfs
Slope Full	0.010 ft/ft
Flow Type	Supercritical

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	100.0 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	24.0 in
Critical Depth	20.3 in
Channel Slope	0.010 ft/ft
Critical Slope	0.009 ft/ft