Hydrology, Hydraulics and Stormwater Low Impact Development Plan

Tentative Tract No. 83183

16209 E. San Bernardino Road

In the City of Covina, California

ESTU2020000680

Prepared for:

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Irvine, CA 92606

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Date:
April 14th, 2021

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Section I Introduction

i. Project Description:

The Project consists of the construction of 68 single family homes, common landscaped open space (Park Area), private streets that provide access to the units and the utility infrastructure to support the development. The Project will be built on one (1) common lot.

ii. Site Description:

The Project Site is located at 16209 East San Bernardino Road in the City of Covina, CA. The Assessor's Parcel Number (APN) for the property in question (PIQ) is 8435-006-900.

The site is located within the San Gabriel River Watershed, which is approximately 640 square miles of portions of Los Angeles, San Bernardino, and Orange Counties. The site is bound by East San Bernardino Road to the South, the Southern Pacific Railroad to the north, and residential uses to the east and west. The site is currently covered by an elementary school, asphalt concrete parking area and driveway access, and undeveloped pervious ground cover.

Surface water on the site is limited to precipitation falling directly on the site and irrigation. In addition, there is existing off-site "run-on" flows from the backyards of the neighboring property to the east that will need to be mitigated.

Groundwater was not encountered in any of the borings. The groundwater maps from the Seismic Hazard Zone Report for the Baldwin Park 7.5 Minute Quadrangle published by the California Geologic Survey indicate that the historic high groundwater is on the order of 150 feet below existing ground surface (CGS 1998b).

Section II Hydrology

i. Site Drainage Characteristics

Most of the existing site drains to the southwest towards San Bernardino Road and the neighboring property to the west at approximately 0.6% and discharges to San Bernardino Road through an existing overland longitudinal gutter. The site is approximately 40% covered by impervious surfaces, the remainder is landscaped or undeveloped.

Similar to the existing condition, the proposed Project will drain southerly toward San Bernardino Road at approximately 0.5% slope and discharge to San Bernardino Road through overland flow.

There are existing off-site "run-on" flows from the backyards of the neighboring property to the east. The existing off-site flows will be captured through weepholes in the proposed perimeter block wall and transported via a dedicated storm drain pipe and small inlet basins, and discharging directly to E. San Bernardino Road through a parkway drain.

According to the existing contours prepared by Hutt-Zollars Inc., a survey company, the existing off-site flow from the east side is flowing into project site and discharging to the south-west conner of project site at San Bernardino Road. The proposed drainage plan is changing the discharging point to the south-east conner.

ii. 25-year Storm Analysis

The Los Angeles County Department of Public Works "HydroCalc" was used to determine the pre- and post-project runoff quantities for a 25-yr 24-hr storm event. HydroCalc uses the following input variables to determine runoff quantities: the area (A) of the subarea, proportion of the subarea covered by impervious surfaces (IMP), flow path length of subarea, slope of subarea, rainfall depth and soil type (from LA County Hydrology Maps) to determine the runoff coefficient (C), time of concentration (Tc) and runoff quantities, flow, and volume (Q and V, respectively). The BALDWIN PARK 50-YEAR 24-HOUR ISOHYET Map (see Appendix B) was used to determine the 50-year storm rainfall depth and soil type for the Project area.

Subarea	Area (acres)	%imp	50 Year Storm Depth (in.)	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Volume (cu-ft)
Ex-A	9.54	0.40	7"	2.34	0.77	0.82	18.35	**103,578.3**
Dev-A	9.54	0.40	7"	2.26	0.76	0.82	17.61	**103,549.1**

iii. 85th Percentile Storm Analysis

According to the LID manual from Los Angeles County Department of Public Works, the project is defined as a Designated project. It requires to retain on-site the ΔSWQv through infiltration, evapotranspiration, stormwater runoff harvest and use, or a combination.

The Los Angeles County Department of Public Works "HydroCalc" was also used to determine the 85th Percentile Storm Quantities for the proposed developed site condition. The rainfall depth for the 85th Percentile Analysis, 1.0 inch, was determined using the County's Hydrology GIS Map.

Table II-HydroCalc Results for 85th Percentile Storm Event –Per Subarea

Subarea	Area (acres)	%imp	85th Percentile Rainfall Depth (in.)	Frequency	Intensity (in./hr)	Cu	Cd	Flow rate (cfs)	Volume (cu-ft)
Area A	9.54	0.40	1.00	85%	0.17	0.1	0.44	0.70	**14,425**

Section III Hydraulics

The project site drains overland to the proposed interior streets and then into the infiltration basin via catch basins. The infiltration basin has been designed to capture flows from the 85th Percentile Storm event to the and to mitigate increases in runoff volume. Flows from Area A that exceed the capacity of the on-site infiltration basin shall discharge to E. San Bernardino Rd. through parkway culverts maintained by the HOA.

There are existing off-site "run-on" flows from the backyards of the neighboring property to the east. The existing off-site flows will be captured through weepholes in the proposed perimeter block wall and transported via a dedicated storm drain pipe and small inlet basins, and discharging directly to E. San Bernardino Road through a parkway drain maintained by the HOA.

i. Catch Basin Design

Catch basins are proposed to capture the 85th percentile runoff for treatment purposes. Small inlet basins are being used along the east property line to capture the off-site run-on.

ii. Pipe Flow and Routing

There are proposed storm drains connecting the catch basins to the infiltration basin. An additional storm drain is proposed along the east boundary line, which collects the off-site flows via small inlet basins and ultimately discharges directly to E. San Bernardino Rd through a parkway culvert.

iii. Public Storm Drain Connections

No direct connections to public storm drains are proposed.

Section IV Low Impact Development Concept / Stormwater Quality Management

i. Low Impact Development Feasibility

In accordance with the LID Standards Manual (2014), we are required to incorporate BMP's to our development because the project is disturbing more than one acre and adding more than 10,000 square feet of impervious surface area, making it a Designated Project. The next step in the design process for designated projects, is to apply site specific source control measures. Once the source control measures are chosen, we can calculate the SWQDv that will be 100% retained on-site.

Geotechnical test borings and preliminary percolation tests indicate that site soils are suitable for infiltration of the Water Quality Volume (V_{WQ}), and the groundwater table is much more than 10 feet below the bottom of any proposed infiltration facility (Seismic Hazard Zone Report for the Baldwin Park 7.5 Minute Quadrangle indicates the historic high groundwater table is on the order of 150 feet below existing ground surface). Furthermore, no steep slopes are proposed onsite near the infiltration areas.

ii. Source Control Measures

Per section 5 of the LID Standards Manual (2014), designated projects are required to use source control measures S-1, S-8, and S-9. S-1 is Storm Drain Message and Signage. All storm drain inlets and catch basins on site will be stenciled to prohibit illegal dumping. S-8 is Landscape Irrigation Practices. The landscaping on site will be designed to irrigate the site while minimizing the chance of potential pollutants entering the storm drain system. S-9 is Building Materials Selection. Alternative building materials on site will be used to reduce the risk of pollutant sources entering the storm water runoff and reduce the need to perform maintenance activities.

The source control maintenance schedule is shown in Table III below.

Table III: Source Control Maintenance Schedule

Source Control	Responsible Party	Inspection Frequency	Maintenance Frequency
S-1: Storm Drain Message and Signage	HOA	Once per year	As needed
S-8: Landscape Irrigation Practices	HOA	Once per year	As needed
S-9: Building Materials Selection	HOA	Once per year	As needed

iii. Stormwater Quality Design Flows / Volumes

Stormwater Quality Flows and Volumes (Q_{WQ} and V_{WQ}, respectively) were determined based on 85th Percentile 24-hr storm event (see Table IV below). The Q_{WQ} is determined based on the rational method equation:

$$Q_{WQ} = C\ i\ A$$

Where:
C = 0.9 (IMP) + 0.05
i = See Table III Below (per HydroCalc)
A = Area of Subarea in acres

The V_{WQ} is based on the volume of runoff from the 85th Percentile storm (rainfall depth, d = 1.0 in). V_{WQ} is determined based on the following:

$$V_{WQ} = C\ d_{85th}\ A\ [43{,}560\ ft^2 / Ac]\ [1\ ft / 12\ in]$$

Where:
C = 0.9 (IMP) + 0.05
d_{85th} = design storm depth = 1.0 inch
A = Area of Subarea in acres

Table IV: Stormwater Quality Design Flows/Volumes per Subarea

Subarea	Area (acres)	%imp	Isohyet (in.)	Intensity (in./hr)	C	Q_{WQ} (cfs)	SWQDv (cu-ft)
Area A	9.54	0.40	1.0	0.17	0.1/0.44	0.70	**14,425**

iv. Stormwater Best Management Practices

Infiltration Best Management Practices (BMPs) will be utilized to infiltrate the Stormwater Quality Design Volume (V_{WQ}) onsite. Pretreatment for the Stormwater Quality flows from the 85th Percentile Storm Event will be accomplished using catch basin filters prior to entering the infiltration basin. There will be one infiltration basin along the frontage with E. San Bernardino Rd. Risk of groundwater contamination is minimal due to the lack of groundwater observed in geotechnical test borings and minimum of 150 feet to groundwater per Seismic Hazard Zone Map – Baldwin Park 7.5 Minute Quadrangle. A description of the proposed infiltration BMPs for treatment of the V_{WQ} is provided below.

Runoff from Area A will be infiltrated in an infiltration basin consisting of an 8 ft. deep gravel bed (minimum porosity, $\eta = 0.40$) with 18" of ponding above the bed and a 6 ft wide perforated pipe within the bed. The top and sides of the gravel bed will be wrapped with non-woven geotextile filter fabric to help prevent sediment intrusion.

The off-site “run-on” flows will be transported directly to the proposed discharge point in E. San Bernardino Rd through a proposed parkway culvert. The off-site flows will only be “passed through” and will not be processed through and additional BMP system.

Supporting calculations for the sizing of the infiltration basin can be found in Appendix E of this report.

v. Peak Flow Management

For Area A, peak flows that exceed the capacity of the onsite infiltration BMPs will be discharged overland onto E. San Bernardino Rd.

Hydromodification can be any activity that increases the velocity and volume (flow rate), and often the timing, of runoff. The Los Angeles County Low Impact Development Manual (2014) describes the requirements for Project Proponents to mitigate hydromodification impacts. The LID Manual also describes circumstances in which the Project may be exempt from impact mitigations. Since the Project is a Single-Family Residential Development that is incorporating LID BMPs in accordance with the LID Manual, this Project is exempt from Hydromodification Impact Mitigation.

Section V Conclusions

The 85th Percentile Storm governs the design of the onsite infiltration BMP in the frontage landscaped area of the site (infiltration basin). Hydromodification impacts due to the proposed project are considered negligible since the project is utilizing LID BMPs, designed in accordance with the Los Angeles County Low Impact Development Manual (2014). Onsite infiltration BMPs aid in stormwater pollutant capture / removal and help alleviate the demands on downstream storm drain infrastructure.

Based on the HydroCalc Result for 25 Year Storm Event in Table I, the peak flow from the existing condition is 26.12 cfs (on-site + off-site run-on), and the peak flow from proposed condition is 25.38 cfs (on-site + off-site run-on). The proposed flow is less than the existing flow, mitigation is not required.

Appendices

Appendix A

Los Angeles County Department of Public Works
25-year &
85th Percentile Storm Event "HydroCalc" Results

Peak Flow Hydrologic Analysis

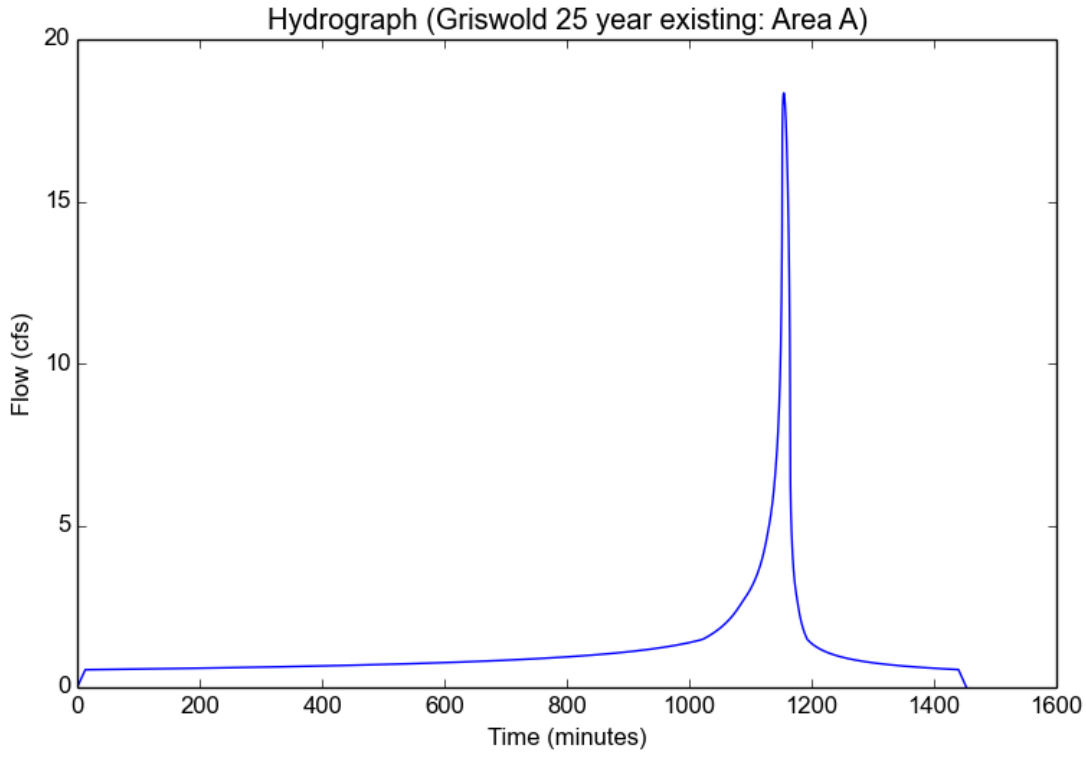
File location: C:/Users/rkatherman/Desktop/Griswold 25 year existing - Area A.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Griswold 25 year existing
Subarea ID	Area A
Area (ac)	9.54
Flow Path Length (ft)	1140.0
Flow Path Slope (vft/hft)	0.0063
50-yr Rainfall Depth (in)	7.0
Percent Impervious	0.4
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.146
Peak Intensity (in/hr)	2.3402
Undeveloped Runoff Coefficient (Cu)	0.7696
Developed Runoff Coefficient (Cd)	0.8218
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	18.3469
Burned Peak Flow Rate (cfs)	18.3469
24-Hr Clear Runoff Volume (ac-ft)	2.3778
24-Hr Clear Runoff Volume (cu-ft)	103578.3354



Peak Flow Hydrologic Analysis

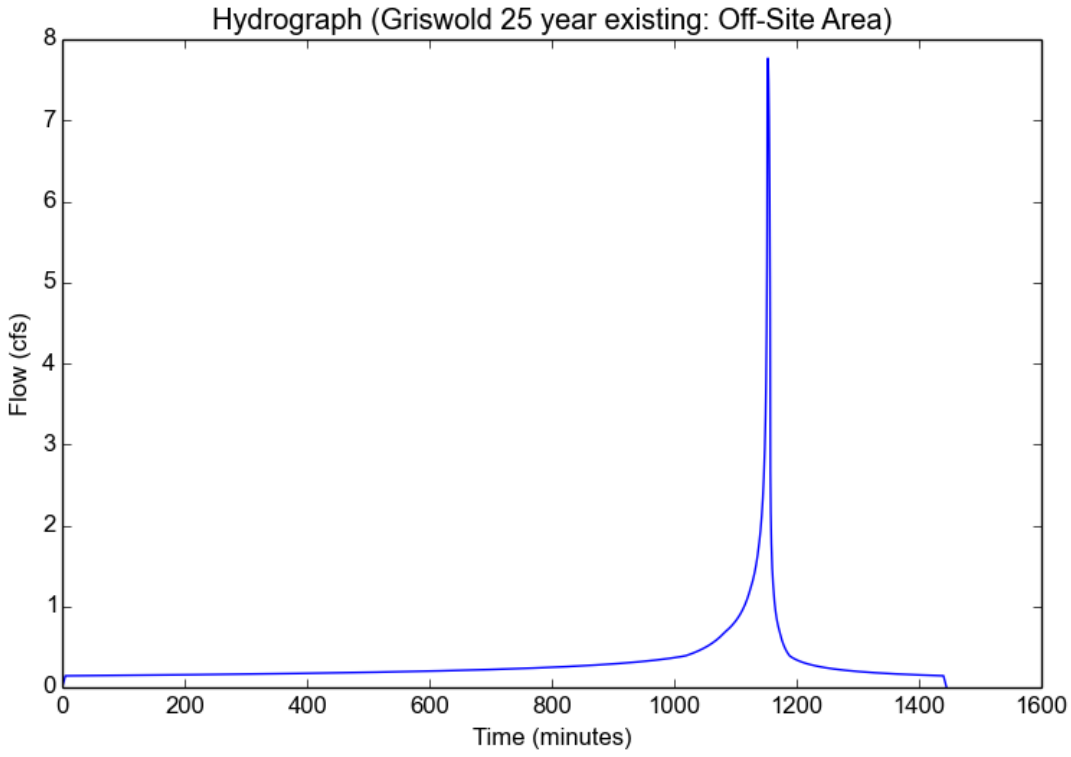
File location: C:/Users/rkatherman/Desktop/Griswold 25 year existing - Off-Site Area.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Griswold 25 year existing
Subarea ID	Off-Site Area
Area (ac)	2.41
Flow Path Length (ft)	135.0
Flow Path Slope (vft/hft)	0.0237
50-yr Rainfall Depth (in)	7.0
Percent Impervious	0.42
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.146
Peak Intensity (in/hr)	3.6669
Undeveloped Runoff Coefficient (Cu)	0.8638
Developed Runoff Coefficient (Cd)	0.879
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	7.7677
Burned Peak Flow Rate (cfs)	7.7677
24-Hr Clear Runoff Volume (ac-ft)	0.6188
24-Hr Clear Runoff Volume (cu-ft)	26956.9392



Peak Flow Hydrologic Analysis

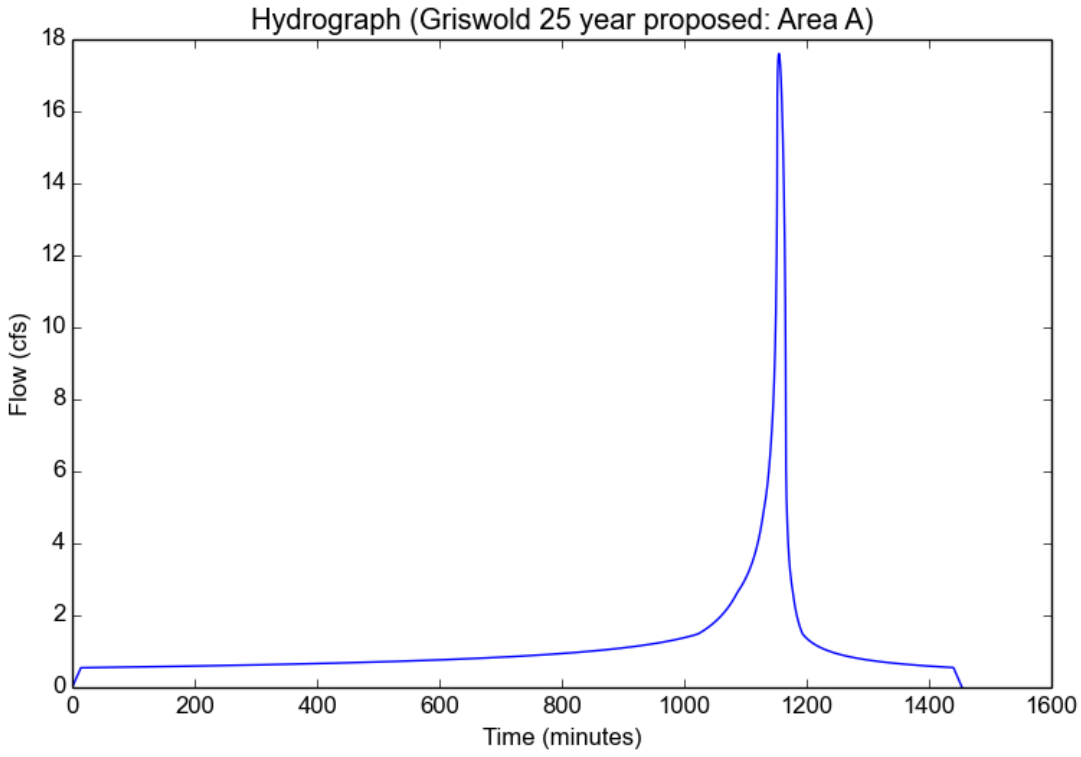
File location: C:/Users/rkatherman/Desktop/Griswold 25 year proposed - Area A.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Griswold 25 year proposed
Subarea ID	Area A
Area (ac)	9.54
Flow Path Length (ft)	1209.0
Flow Path Slope (vft/hft)	0.006
50-yr Rainfall Depth (in)	7.0
Percent Impervious	0.4
Soil Type	6
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	6.146
Peak Intensity (in/hr)	2.2601
Undeveloped Runoff Coefficient (Cu)	0.7608
Developed Runoff Coefficient (Cd)	0.8165
Time of Concentration (min)	14.0
Clear Peak Flow Rate (cfs)	17.6051
Burned Peak Flow Rate (cfs)	17.6051
24-Hr Clear Runoff Volume (ac-ft)	2.3772
24-Hr Clear Runoff Volume (cu-ft)	103549.1092



Peak Flow Hydrologic Analysis

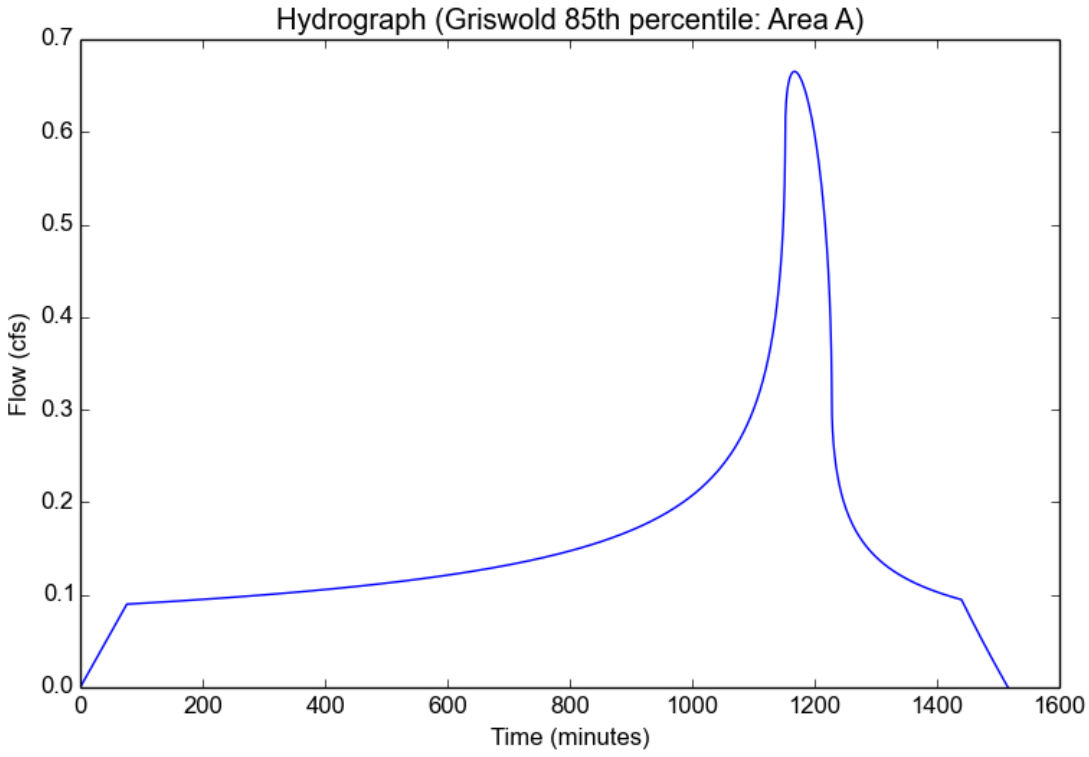
File location: C:/Users/rkatherman/Desktop/Griswold 85th percentile - Area A.pdf
Version: HydroCalc 0.3.1-beta

Input Parameters

Project Name	Griswold 85th percentile
Subarea ID	Area A
Area (ac)	9.54
Flow Path Length (ft)	1209.0
Flow Path Slope (vft/hft)	0.006
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.4
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.166
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.42
Time of Concentration (min)	76.0
Clear Peak Flow Rate (cfs)	0.6653
Burned Peak Flow Rate (cfs)	0.6653
24-Hr Clear Runoff Volume (ac-ft)	0.3312
24-Hr Clear Runoff Volume (cu-ft)	14425.5757



Appendix B

Backup Materials for “HydroCalc” Analysis

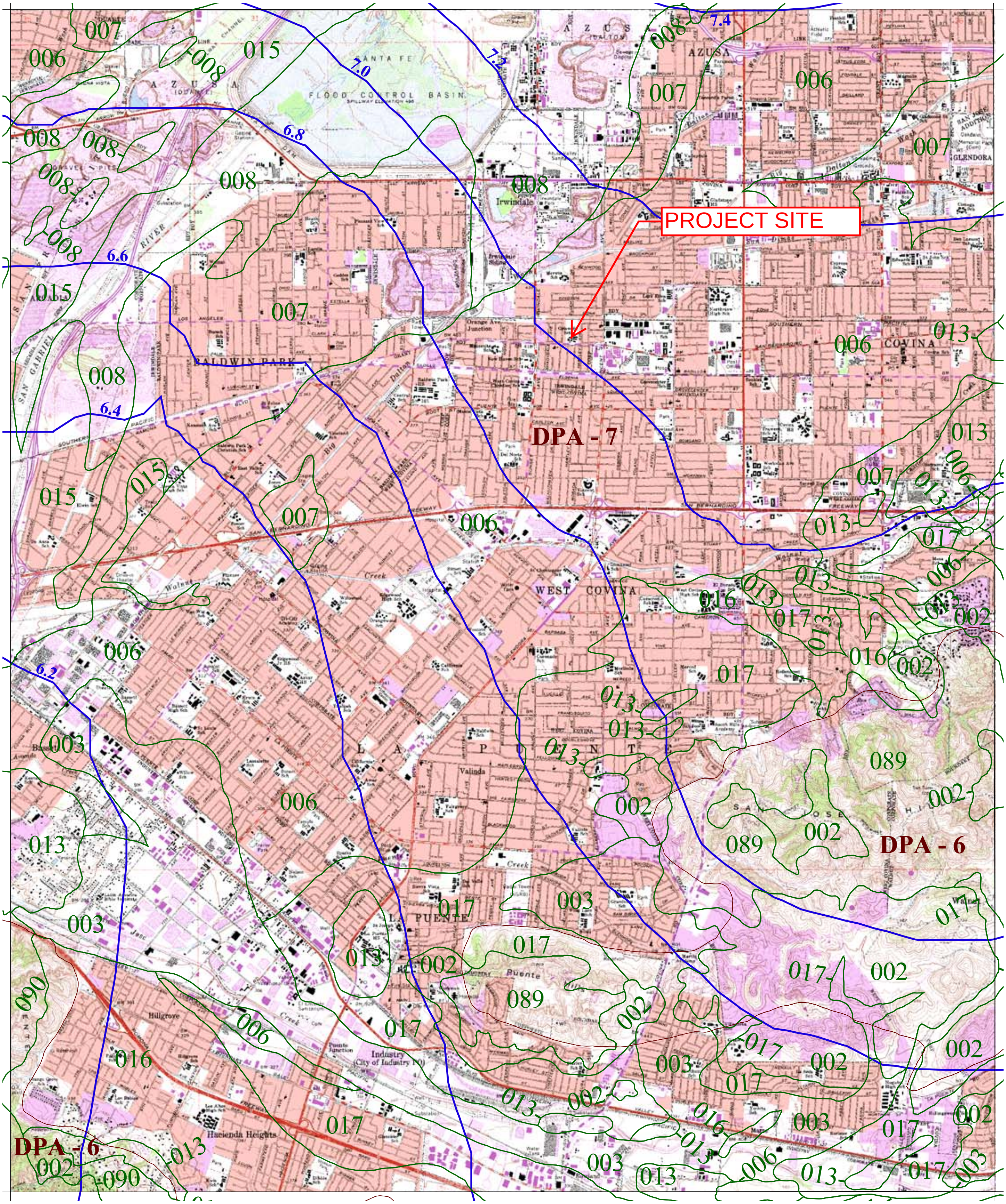
34º 07' 30''

AZUSA 1-H1.31

-118º 00' 00''

EL MONTE 1-H1.20

SAN DIMAS 1-H1.22



-117º 52' 30''

LA HABRA 1-H1.11

34º 00' 00''

016 SOIL CLASSIFICATION AREA

7.2 INCHES OF RAINFALL

DPA - 6 DEBRIS POTENTIAL AREA

N S E W

1 0 1 2 Miles

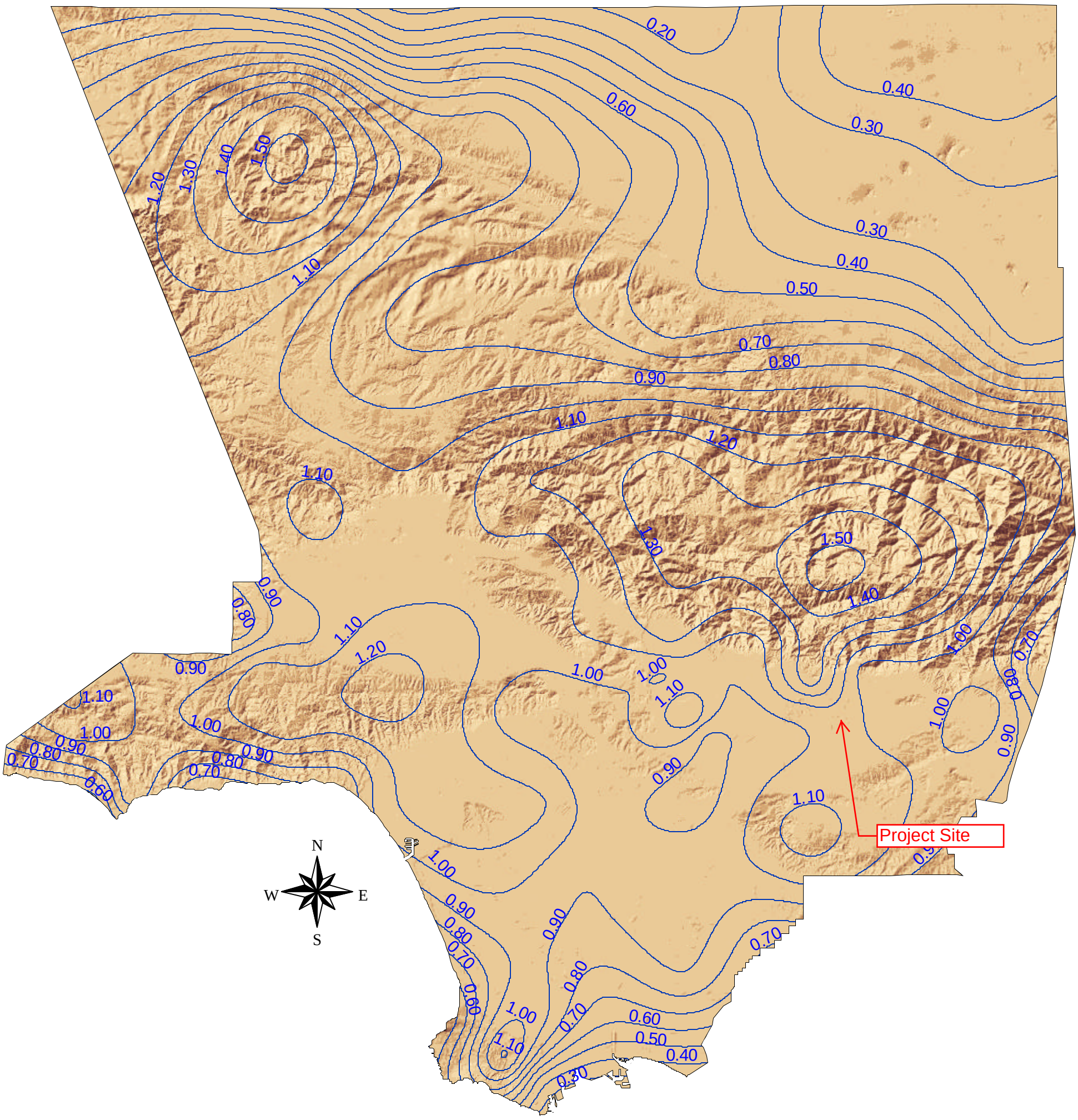
25-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.878
10-YEAR 24-HOUR ISOHYET REDUCTION FACTOR: 0.714

BALDWIN PARK
50-YEAR 24-HOUR ISOHYET

1-H1.21

LOS ANGELES COUNTY PUBLIC WORKS Public Service That Works

85th Percentile 24-hr Rainfall Isohyetal Map



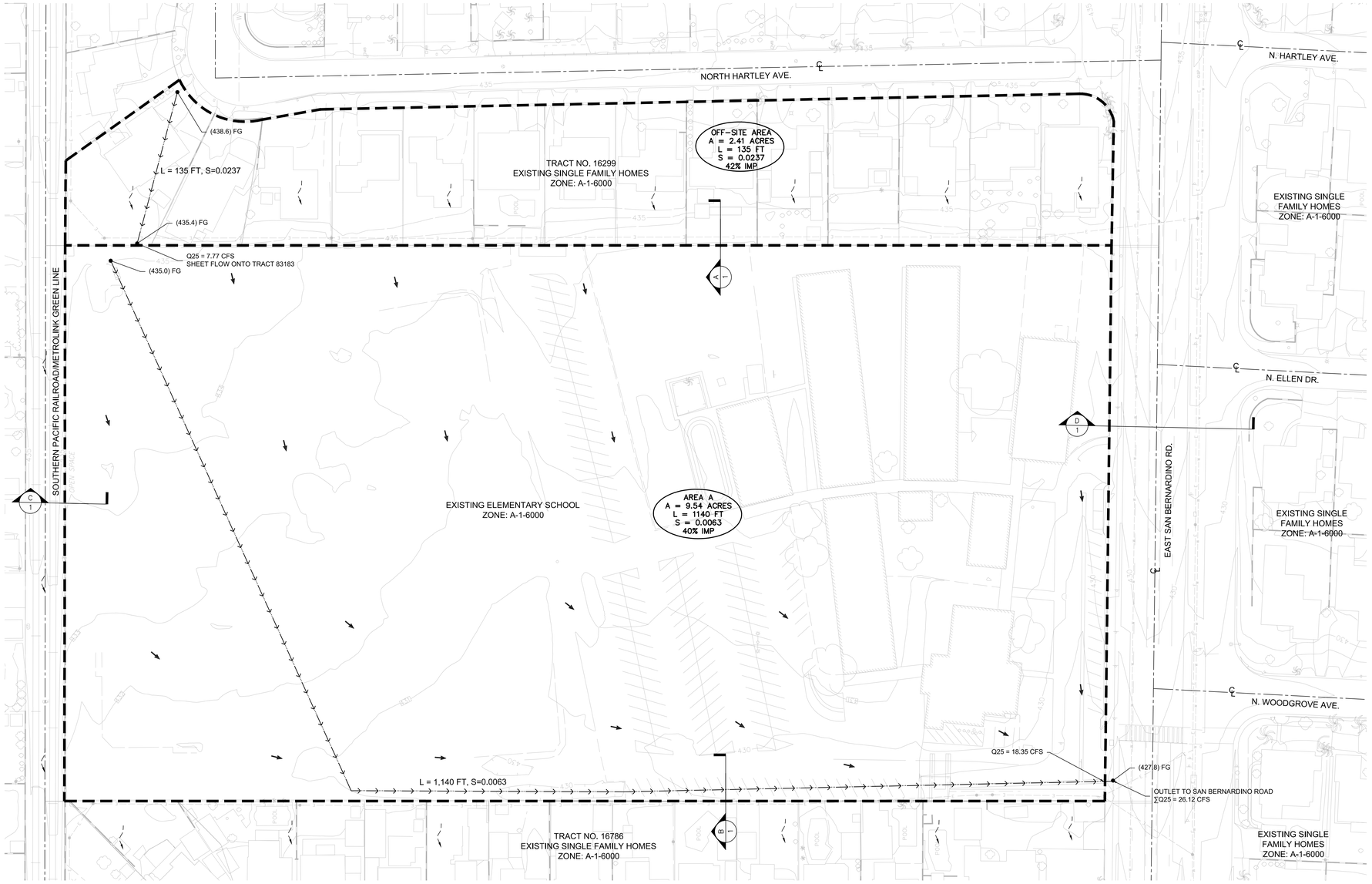
Appendix C

Existing Hydrology Exhibit

EXISTING HYDROLOGY EXHIBIT

"TENTATIVE TRACT NO. 83183"

16209 E SAN BERNARDINO RD, COVINA, CA, 91722



25-YEAR HYDROLOGIC DESIGN DATA:

50-YEAR RAINFALL DEPTH = 7 INCHES
SOIL TYPE: 6
DPA ZONE: 7
FEMA FLOOD ZONE: X
BURN FACTOR: N/A
BULKING FACTOR: N/A

AREA, A = 9.54 ACRES
FLOW PATH LENGTH, L = 1140 FT
FLOW PATH SLOPE, S = 0.0063
IMP = 0.40 (40% IMP)

OFF-SITE AREA = 2.41 ACRES
FLOW PATH LENGTH, L = 135 FT
FLOW PATH SLOPE, S = 0.0237
IMP = 0.42 (42% IMP)

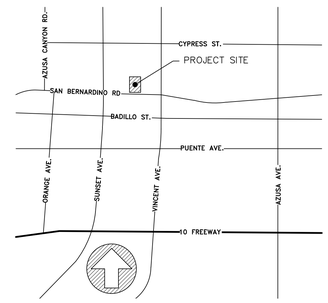
NOTE:

1. NOT WITHIN FEMA FLOOD ZONE A

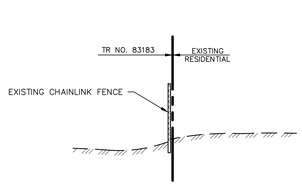
2. NOT WITHIN COUNTY ADOPTED FLOODWAY

LEGEND

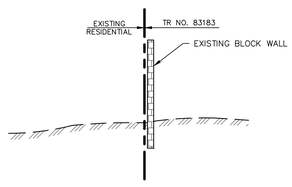
- CENTERLINE
- LONGEST FLOW PATH
- SUBAREA BOUNDARY
- EXISTING OFFSITE FLOWS
- AREA A / A = 9.54 ACRES / L = 1140 FT / S = 0.0063 / 40% IMP — HYDROLOGY INFORMATION



VICINITY MAP:
NOT TO SCALE



TYPICAL CROSS SECTION (EAST)
NOT TO SCALE — A/1



TYPICAL CROSS SECTION (WEST)
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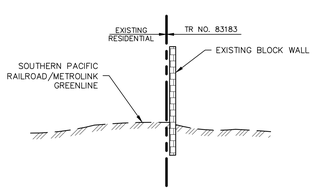

TYPICAL CROSS SECTION (NORTH)
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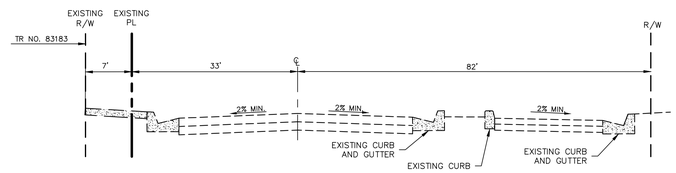


SAN BERNARDINO RD
NOT TO SCALE — D/1

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

CASE NUMBER: ESTU2020000680

DIGALERT — DIAL TOLL FREE 811 — AT LEAST TWO DAYS BEFORE YOU DIG — UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

BASIS OF BEARING:

BEARINGS SHOWN HERE ON ARE BASED ONE THE CENTERLINE OF SAN BERNARDINO AVENUE BEING NORTH 88°05'40" WEST ON TRACT NO. 16786, M.M. 496/23-24.

BASIS OF TOPOGRAPHY:

THE TOPOGRAPHY SHOWN IS BASED ON AERIAL SURVEY PERFORMED BY ROBERT J. LUNG & ASSOCIATES, DATED JANUARY 23, 2020 AND COMPLIES WITH NATIONAL MAPPING ACCURACY STANDARDS.

BENCH MARK

BENCH MARK NO. 4G4955 ELEV. 421.134'

QUAD YEAR: 2005

DESCRIPTION: DEPARTMENT OF PUBLIC WORKS BENCH MARK TAG AT EAST CATCH BASIN 42.7' NORTH OF BCR AT NORTHEAST CORNER IRWINDALE AVE AND SAN BERNARDINO ROAD.

CITY: COVINA

COUNTY: LOS ANGELES

STATE: CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — CESAR MORAN — C72247 Exp. 6/30/22 — CIVIL — STATE OF CALIFORNIA

PREPARED BY:

MORAN CONSULTING CORPORATION
• CIVIL ENGINEERING • SURVEYING • LAND PLANNING
4500 E. Pacific Coast Highway, Suite 210
Long Beach, California 90804
Main (562) 340-4670 Fax (562) 340-4680
E-Mail Address: cmoran@moran-corp.com

CESAR MORAN P.E. C72247 EXP. 6/30/22 DATE

DATE: 1/27/2021 | JOB NO.: 220146 | DRAWN BY: WC

REVISIONS

N°	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			
6			

PLANS PREPARED FOR:

MLC HOLDINGS, INC.
5 PETERS CANYON ROAD SUITE 310
IRVINE, CA 92606
ATTN: STEVEN COOK
PHONE: (949) 372-3319
E-Mail Address:
steven.cook@mlcholdings.net

PROJECT TITLE: GRISWOLD

TRACT NO. 83183

PROJECT ADDRESS: 16209 E SAN BERNARDINO RD COVINA, CA. 91722

SCALE: PER PLAN

LEGAL DESCRIPTION: SEE TENTATIVE MAP

SHEET 1 OF 1

SHEET TITLE: EXISTING HYDROLOGY EXHIBIT

PROJ: 210141 DWG: W:\Projects\220146 - Griswold (MLC Holdings)\Engineering\Sheets\Stormdrain\C-1EX Hydrology.dwg BY: rsothamon Jan 27, 2021 - 2:20:59pm

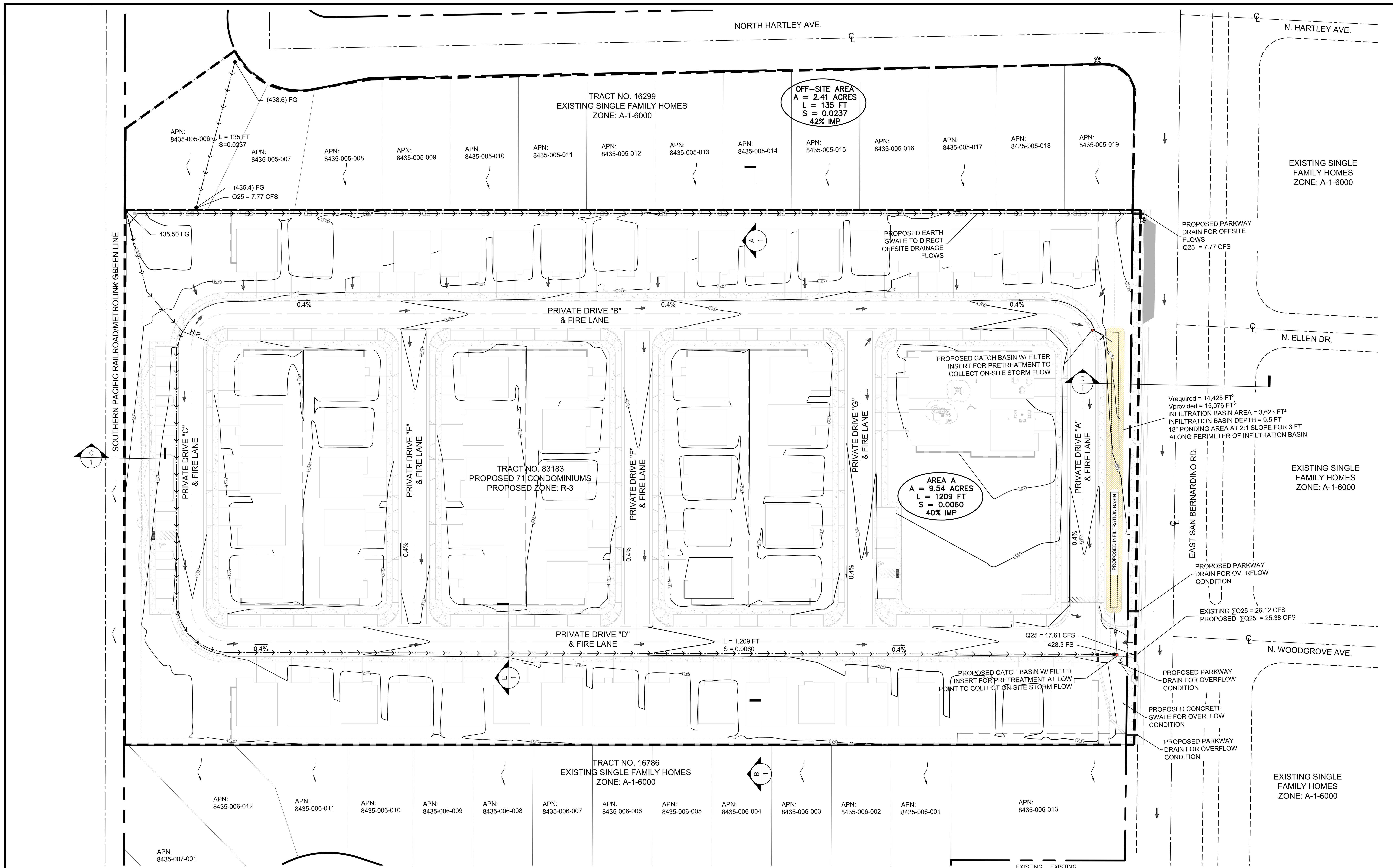
Appendix D

Proposed Hydrology & LID Exhibit

PROPOSED HYDROLOGY AND LID EXHIBIT

"TENTATIVE TRACT NO. 83183"

16209 E SAN BERNARDINO RD, COVINA, CA, 91722



25-YEAR HYDROLOGIC DESIGN DATA:

50-YEAR RAINFALL DEPTH = 7 INCHES
SOIL TYPE: 6
DPA ZONE: 7
FEMA FLOOD ZONE: X
BURN FACTOR: N/A
BULKING FACTOR: N/A

AREA, A = 9.54 ACRES
FLOW PATH LENGTH, L = 1209 FT
FLOW PATH SLOPE, S = 0.0060
IMP = 0.40 (40% IMP)

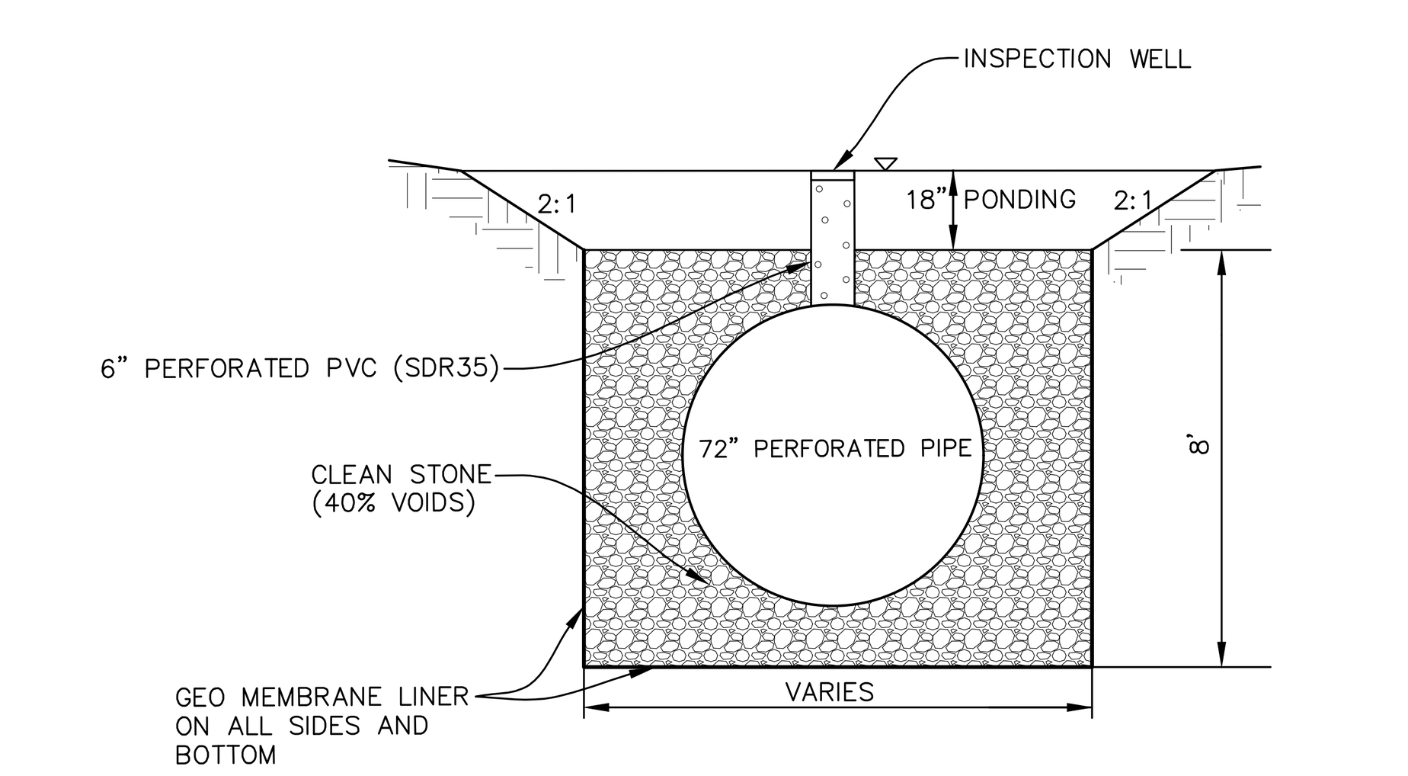
OFF-SITE AREA = 2.41 ACRES
FLOW PATH LENGTH, L = 135 FT
FLOW PATH SLOPE, S = 0.0237
IMP = 0.42 (42% IMP)

NOTE:

1. NOT WITHIN FEMA FLOOD ZONE A
2. NOT WITHIN COUNTY ADOPTED FLOODWAY
3. THE PROPOSED INFRASTRUCTURE ON SITE WILL BE MAINTAINED BY THE HOA

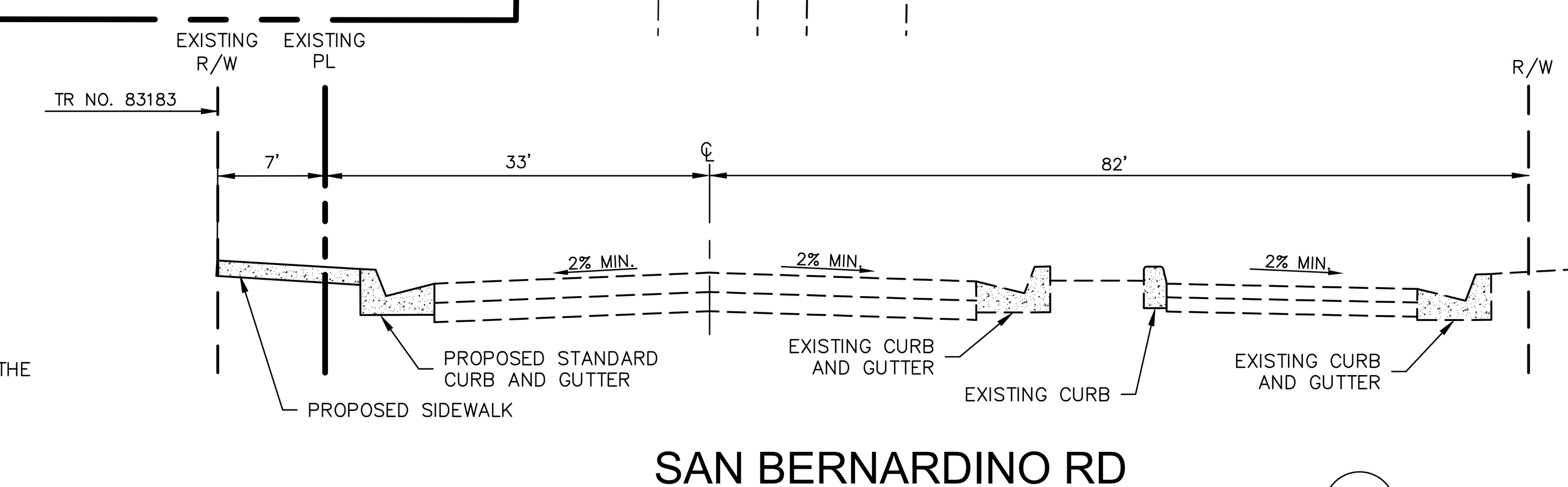
LEGEND

- CENTERLINE
- FLOW PATH
- SUBAREA BOUNDARY
- SD — STORM DRAIN
- GENERAL FLOW DIRECTION
- PROPOSED INFILTRATION BASIN A
- PROPOSED INFILTRATION BASIN B
- EXISTING OFF-SITE FLOWS
- AREA A / A = 9.54 ACRES / L = 1209 FT / S = 0.0060 / 40% IMP — HYDROLOGY INFORMATION
- CATCH BASIN WITH FILTER INSERT FOR PRETREATMENT



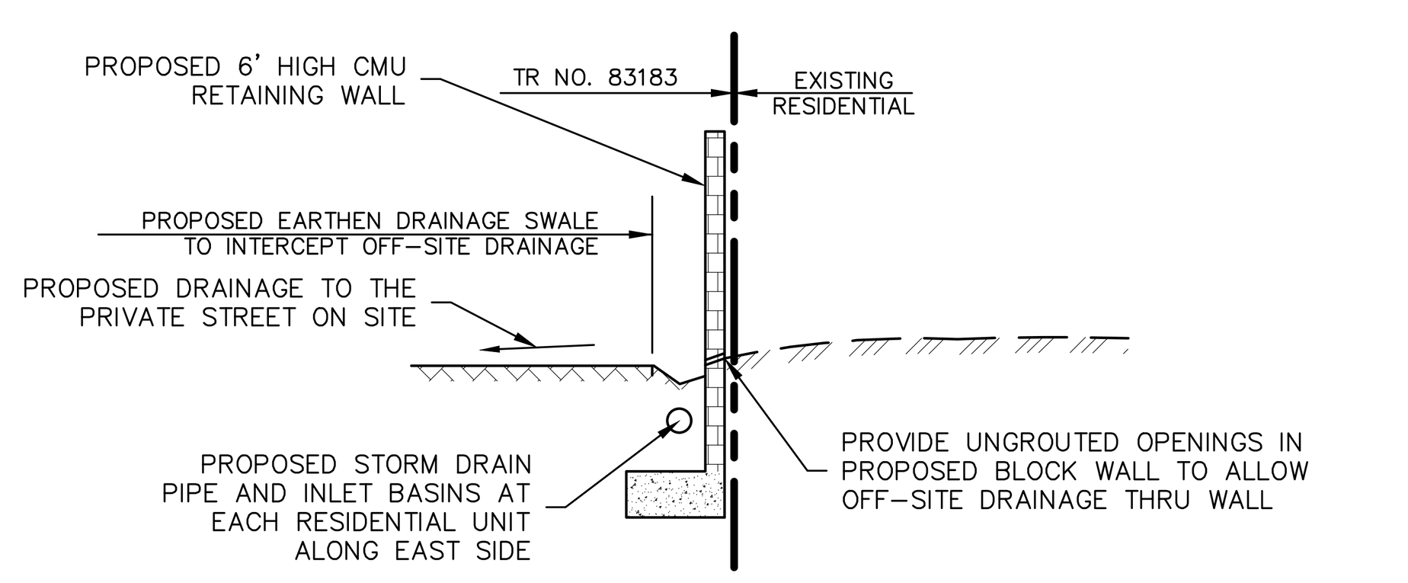
INFILTRATION BASIN DETAIL

NOT TO SCALE



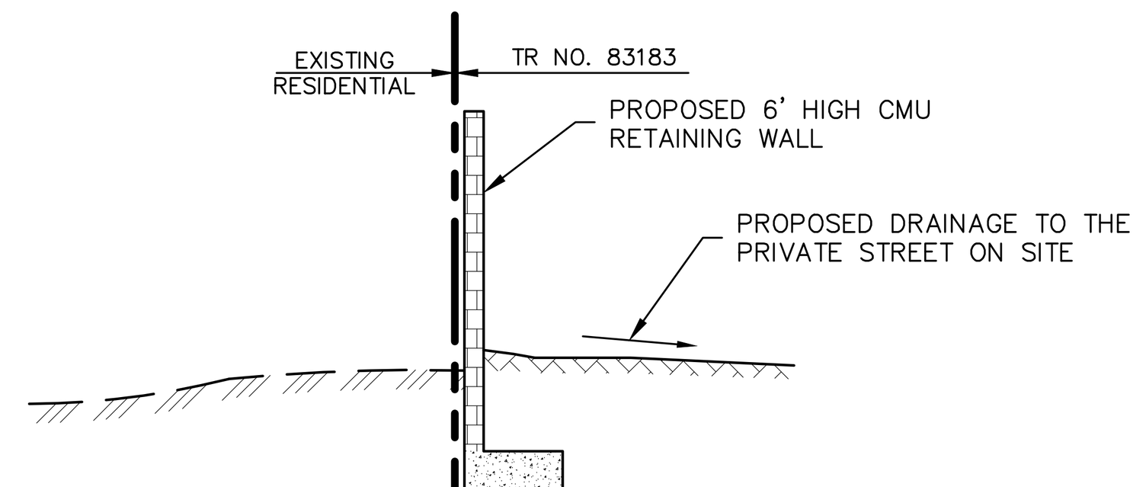
SAN BERNARDINO RD

NOT TO SCALE



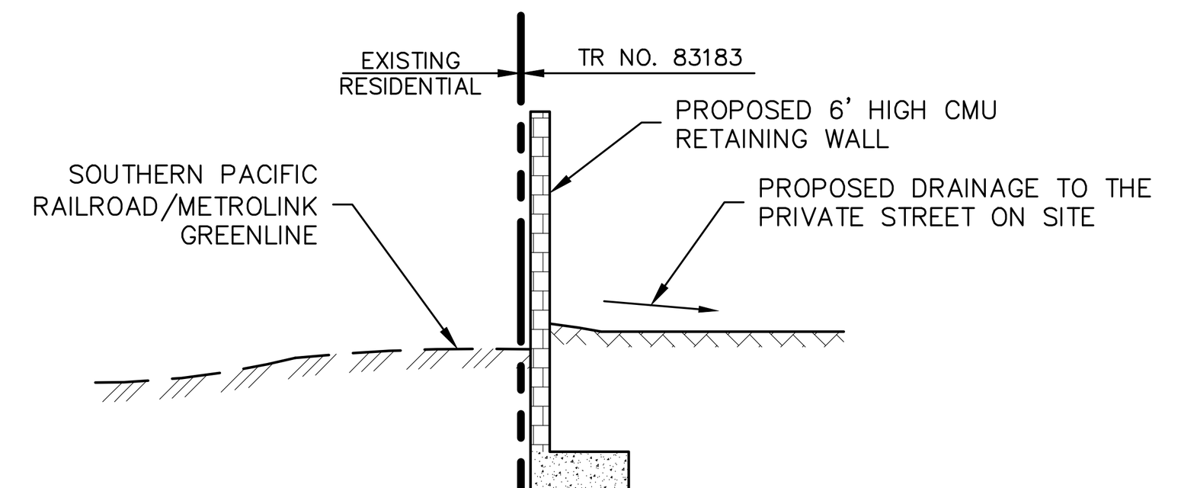
TYPICAL CROSS SECTION (EAST)

NOT TO SCALE



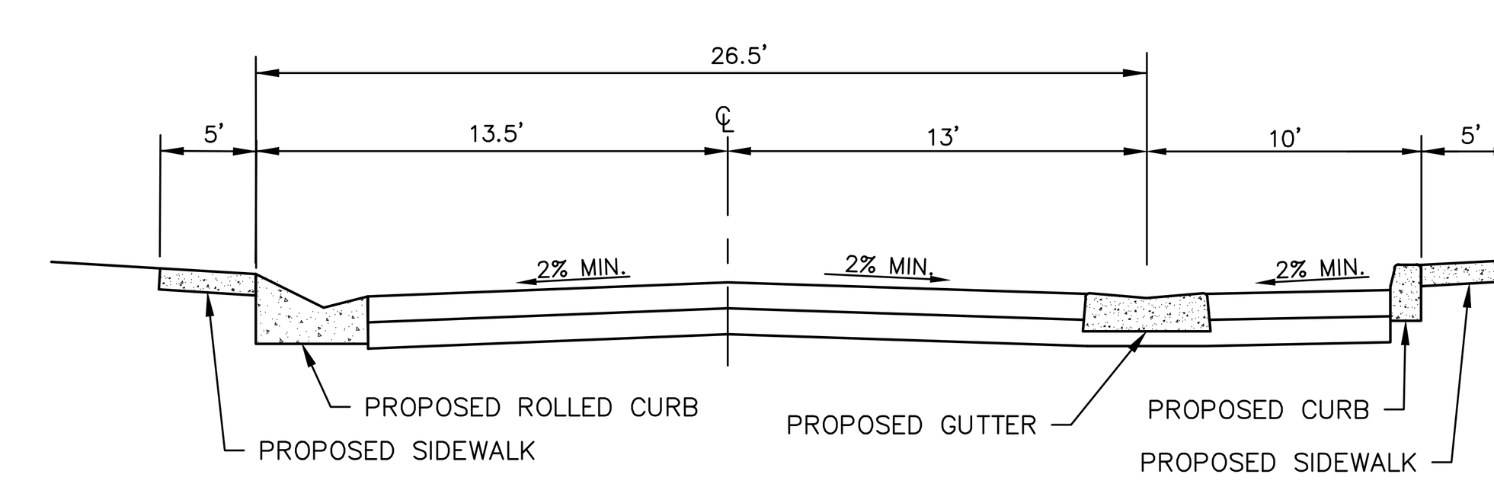
TYPICAL CROSS SECTION (WEST)

NOT TO SCALE



TYPICAL CROSS SECTION (NORTH)

NOT TO SCALE



TYPICAL ONSITE STREET SECTION

NOT TO SCALE

GRAPHIC SCALE

0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

CASE NUMBER: ESTU2020000680

DIGALERT — DIAL TOLL FREE 811 — AT LEAST TWO DAYS BEFORE YOU DIG — UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

BASIS OF BEARING:
BEARINGS SHOWN HERE ON ARE BASED ONE THE CENTERLINE OF SAN BERNARDINO AVENUE BEING NORTH 88°05'40" WEST ON TRACT NO. 16786, M.M. 496/23-24.

BASIS OF TOPOGRAPHY:
THE TOPOGRAPHY SHOWN IS BASED ON AERIAL SURVEY PERFORMED BY ROBERT J. LUNG & ASSOCIATES, DATED JANUARY 23, 2020 AND COMPLIES WITH NATIONAL MAPPING ACCURACY STANDARDS.

BENCH MARK
BENCH MARK NO. 4G4955 ELEV. 421.134'
QUAD YEAR: 2005
DESCRIPTION: DEPARTMENT OF PUBLIC WORKS BENCH MARK TAG AT EAST CATCH BASIN 42.7' NORTH OF BCR AT NORTHEAST CORNER IRWINDALE AVE AND SAN BERNARDINO ROAD.

CITY: COVINA
COUNTY: LOS ANGELES
STATE: CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER — CESAR MORAN — C72247 — Exp. 6/30/22 — CIVIL — STATE OF CALIFORNIA

PREPARED BY:
MORAN CONSULTING CORPORATION
• CIVIL ENGINEERING • SURVEYING • LAND PLANNING
4500 E. Pacific Coast Highway, Suite 210
Long Beach, California 90804
Main (562) 340-4670 Fax (562) 340-4680
E-Mail Address: cmoran@moran-corp.com
CESAR MORAN P.E. C72247 EXP. 6/30/22 DATE

DATE: 4/14/2021 JOB NO.: 220146 DRAWN BY: WC

REVISIONS			
N°	DATE	BY	DESCRIPTION

PLANS PREPARED FOR:
MLC HOLDINGS, INC.
5 PETERS CANYON ROAD SUITE 310
IRVINE, CA 92606
ATTN: STEVEN COOK
PHONE: (949) 372-3319
E-Mail Address:
steven.cook@mlcholdings.net

PROJECT TITLE: GRISWOLD
TRACT NO.: 83183
PROJECT ADDRESS: 16209 E SAN BERNARDINO RD, COVINA, CA. 91722
SCALE: PER PLAN
LEGAL DESCRIPTION: SEE TENTATIVE MAP
SHEET 1 OF 1

SHEET TITLE: PROPOSED HYDROLOGY & LID EXHIBIT

Appendix E

Design Infiltration Rate / Stormwater BMP Sizing Calculations

Stormwater Infiltration Basin Sizing Calculations

DESCRIPTION:

Sizing Calculations for onsite Stormwater BMPs are based on the County of Los Angeles Department of Public Works 2014 Low Impact Development Standards Manual. The design infiltration rate for the underlying soils is based on the "Guidelines for Design, Investigation, and Reporting Low Impact Development Stormwater Infiltration," published by the County of Los Angeles Department of Public Works Geotechnical and Materials Engineering Division (GS200.1).

PROJECT STORMWATER BMPs:

The primary stormwater BMP proposed for the site is an infiltration basin which consists of an 8 ft deep gravel bed filled with clean stone (minimum porosity, $\eta = 0.40$) with 18" of ponding above the bed and a 6 ft wide perforated pipe within the bed. Pretreatment for the Stormwater Quality flows from the 85th Percentile Storm Event will be accomplished using filters within the catch basins prior to entering the infiltration basins.

SIZING CALCULATION PROCEDURE:

Infiltration Basin- Based on the sizing calculations for Infiltration Basins.

Step 1: Calculate the design volume based on 85th Percentile storm $V_{WQ} = V_{85th} = C\, d_{85th}\, A$
Step 2: Determine the design infiltration rate.
Step 3: Calculate minimum infiltration basin area based on a maximum drawdown time of 96 hours.
Step 4: Calculate Storage Volume of the ponding area and gravel bed ($V_{Storage}$). Verify $V_{Storage} > V_{WQ}$.

Infiltration Basin Sizing Calculations:

Step 1: SWQDv

Stormwater Quality Design Flows/Volumes per Subarea

Subarea	Area (acres)	%imp	Isohyet (in.)	Intensity (in./hr)	C	Q_{WQ} (cfs)	SWQDv (cu-ft)
Area A	9.54	0.40	1.0	0.17	0.1/0.44	0.70	**14,425**

Step 2: Design Infiltration Rate, K_{Design}

$K_{Design} = K_{Measured} / CF$

Where:

K_{Design}	=	design infiltration rate (in/hr)
$K_{Measured}$	=	measured infiltration rate (in/hr)
CF	=	correction factor

The Correction Factor, CF, was determined by the soil's engineer per the Additional Infiltration Evaluation Report dated December 18, 2020. The correction factor was determined to be 2.

$$K_{Design} = (8 \text{ in/hr}) / 2$$

$$K_{Design} = \mathbf{4 \text{ in/hr}}$$

3. Calculate the surface area, A

<u>Area A:</u>

$A_{INF} = SWQDv / [(T_{INF})K_{Design}/12] = 14{,}425 \text{ ft}^3 / [(96 \text{ hrs})(4 \text{ in/hr}) / 12]$

$A_{INF} = 451 \text{ ft}^2 \rightarrow A_{BED} = 2{,}088 \text{ ft}^2$

Storage Volume of Pipe, V_{Pipe}
Pipe Dimensions: 6 ft diameter x 242 ft long
$V_{pipe} = ((3 \text{ ft})^2 \times \pi) \times 242 \text{ ft} = \mathbf{6{,}842 \text{ ft}^3}$

Storage Volume of Gravel Bed, V_{Gravel}
Gravel Bed Dimensions: 2,088 ft^2 x 8 ft deep = 16,704 ft^3
$V_{Gravel} = \eta(V_{Bed} - V_{pipe}) = 0.4 (16{,}704 \text{ ft}^3 - 6{,}842 \text{ ft}^3) = \mathbf{3{,}945 \text{ ft}^3}$

Storage Volume of Ponding area, $V_{Ponding}$
18" ponding on top of gravel bed + ponding depth of 2:1 slope for 3 ft
$V_{Ponding} = (1.5 \text{ ft} \times 2{,}088 \text{ ft}^2) + (((3 \text{ ft} \times 1.5 \text{ ft})/2) \times 514 \text{ ft}) = \mathbf{4{,}289 \text{ ft}^3}$

Total Storage Volume, $V_{Storage}$
$V_{Storage} = V_{pipe} + V_{Gravel} + V_{Ponding} = 6{,}842 \text{ ft}^3 + 3{,}945 \text{ ft}^3 + 4{,}289 \text{ ft}^3 = \mathbf{15{,}076 \text{ ft}^3 > V_{WQ} = 14{,}425 \text{ ft}^3}$
$V_{Storage} > V_{WQ}$