March, 2022
2021-502

5355 Airport Drive

City of Ontario, CA

Preliminary Hydrology Report

Prepared For:
Prologis
3546 Concours St., Suite 100
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Prepared By:
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WestLAND Group, Inc.

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APPENDICIES

1. INTRODUCTION

1.1. PURPOSE & SCOPE

The purpose of this study is to demonstrate that the proposed project site can be designed to provide adequate flood protection without adversely impacting existing off-site drainage systems or adjacent properties. The scope of this analysis includes the pre-developed and post-developed runoff analysis.

2. EXISTING SITE DESCRIPTION

2.1. EXISTING SITE TOPOGRAPHY & HYDROLOGIC PATTERNS

The project site, approximately 12.85 acres, is located approximately 0.25 miles east of the intersection of South Wineville Avenue and Airport Drive in the City of Ontario, County of San Bernardino. The site is referenced by the street address 5355 East Airport Avenue. The site is currently bounded to the north by Southern Pacific Transportation Company Railroad, to the east and west by existing industrial development, and to the south by Airport Drive.

The site in the pre-development condition is developed to manufacture and store animal feed grains. The site includes several existing buildings, shed structures, silos, and above-ground storage tanks (ASTs). The existing structures are generally surrounded by asphaltic concrete (AC) pavements, with isolated areas of Portland cement concrete (PCC), aggregate base pavements, and exposed soils in the south-central portion of the site. The existing pavements are in poor condition, with moderate to severe cracking throughout. The site currently consists approximately 92% of impervious areas. The entire site will be demolished prior to grading.

The natural drainage pattern for the existing condition of the site is north to south. There are no existing no public storm drain systems at the frontage of the project site. Stormwater sheet flow south and discharge onto the existing curb and gutter on Airport Drive. Runoff flows east along Airport Drive and discharge into an existing catch basin located approximately 1,500 feet east of the site. This existing catch basin is connected to the Lower Etiwanda Creek Channel, which convey stormwater to the Wineville Basin. See Figure 1 for the pre-development drainage map.

3. PROJECT SITE DESCRIPTION

3.1. PROJECT DESCRIPTION & HYDROLOGIC PATTERNS

The envisioned development is a proposed industrial building with auto parking spaces and trailer parking spaces. Docking areas are located south of the proposed building. Open landscape areas are proposed around the perimeter of the site. The proposed development will consist approximately 89% of impervious areas.

The proposed development will maintain the same natural drainage pattern as the existing condition. Stormwater will sheet flow from north to south and will be captured by proposed on-site catch basins. The proposed on-site storm drain system will convey the flow into a proposed underground infiltration chamber. This system will be designed to meet project's water quality requirements and provide sufficient storage to meet the 100-year storm hydrology requirement. In a large storm event, stormwater will exit the underground chamber system via pipes and will be pumped out through a proposed parkway drain on Airport Drive. Runoff will sheet flow east along Airport Drive and discharge into the existing catch basin to maintain the same point of discharge as the existing condition. See Figure 2 for the prost-development drainage map.

4. RESULTS & ANALYSIS

4.1. METHODOLOGY

The proposed drainage areas were analyzed using the San Bernardino (SB) County Hydrology Manual. The main methods used for this project were the Rational Method, Synthetic Unit Hydrograph Method, and Basin Routing Analysis. Civil Design software was used to compute the data. Solving for the Rational Method returns the peak flow rate. Unit Hydrograph analysis will determine the total volume generated from a storm event. Basin Routing analysis will analyze the storage volume and outflow flow rate for the proposed underground infiltration chamber.

According to the NRCS Soils Map, the site is entirely composed of type A soil (See Appendix E). The proposed land use was analyzed as commercial for both the pre- and post-development condition. According to the county's manual, Antecedent Moisture Condition (AMC) I is used for the 2-year storm event and AMC III was used for the 100-year storm event in order to give more confidence to mitigate any increase runoff, if needed.

For the rational method analysis, the runoff coefficient is determined by the land use for each condition. The rainfall intensities are based on the time of concentration for each drainage area and the intensity-duration curves provided in the county's manual. The flow lengths and terrain elevations were determined using existing topography for the pre-development condition and the conceptual grading plans for the post-development condition.

For the unit hydrograph analysis, the lag time was determined by using the time of concentration based on the rational method analysis. Rainfall depths were obtained from the National Oceanic and Atmospheric Administration (NOAA) Point Precipitation Frequency Estimates. The rainfall depth data are included in Appendix E. The rainfall used in the hydrology calculations are summarized on Table 4.1.

Table 4.1: Rainfall Depths	
Storm Event & Duration	Rainfall Depth (inches)
2-Year, 1-Hour	0.526
2-Year, 6-Hour	1.39
2-Year, 24-Hour	2.51
100-Year, 1-Hour	1.31
100-Year, 6-Hour	3.15
100-Year, 24-Hour	5.74

For the basin routing analysis, the results from the unit hydrograph analysis were used to determine the amount of stormwater entering and existing the proposed underground infiltration chamber at each time interval. The staging data table is provided in Appendix D.

4.2. HYDROLOGY RESULTS & ANALYSIS

The complete rational method analysis and results are included in Appendix B. The complete unit hydrograph analysis and results are included in Appendix C. The tables below provide a summary of the peak flow rate and runoff volume for the pre-developed and post-developed condition for the 2- and 100-year storm.

Table 4.2.1: Pre-Development Hydrology Summary Table					
Storm Event	Area (Acres)	Tc (min.)	Intensity (in/hr)	Flow Rate (cfs) (Rational Method)	Volume (cf) (Unit Hydrograph)
2-Year	12.85	14.77	1.71	14.42	--
100-Year		14.20	3.11	38.03	241,431

Table 4.2.2: Post-Development Hydrology Summary Table					
Storm Event	Area (Acres)	Tc (min.)	Intensity (in/hr)	Flow Rate (cfs) (Rational Method)	Volume (cf) (Unit Hydrograph)
2-Year	12.85	12.60	1.20	12.92	--
100-Year		14.39	3.09	35.24	237,145

Table 4.2.3: Result Analysis Summary Table	
Hydrology Results & Analysis Summary Table:	Project Site Disturbed Area **= 559,755 SF (12.85 Acres)** $Q_{100, PRE}$ = **38.03 CFS** $Q_{100, POST}$ = **35.24 CFS** ΔQ_{100} = **- 2.79 CFS = 0 CFS** ΔV_{100} = **- 4,286 CF = 0 CF** DCV = **51,054 CF** (See Water Quality Management Plan) DCV > ΔV_{100} | **<u>51,054 CF = Site Design Storage Requirement</u>** **Volume Provided = 140,009 CF** (Underground Infiltration Chamber)

Based on the 100-year rational method analysis, the post-development flow rate within the disturbed area decreased compare to the pre-development flow rate. Furthermore, the post-development runoff volume decreased compare to the pre-development runoff volume. The decrease in flow rate and runoff volume was a result from a decrease in impervious areas.

Based on the Water Quality Management Plan for this project, the design capture volume (DCV) for the site is 51,054 cubic feet per second (cfs). Since the DCV is higher than the difference between the pre- and post-development 100-year storm runoff volume (0 cfs), the DCV is the minimum storm runoff storage required for the proposed development.

To satisfy the water quality requirement, an underground infiltration chamber with a storage volume of 140,009 cubic-feet is proposed for the project. Since there are no public storm drain systems around the frontage of the site, the proposed chamber system will provide sufficient storage volume to mitigate the full 100-year storm runoff volume to promote on-site infiltration. In a large storm event, an overflow sump pump is proposed for the project site. The sump pump will be designed to have a maximum outflow flow rate of 4 cfs. This strategy will reduce any potential impacts to the downstream off-site storm drain system and to mitigate any flooding potential.

A basin routing analysis was performed to analyze the proposed chamber system with the sump pump and determine the water surface elevation in a 100-year storm event. The complete results of the basin routing analysis are included in Appendix D and is summarized on Table 4.2.4.

Table 4.2.4: Basin Routing Analysis Summary Table

Basin ID	Peak Flow In – Q_{100} (cfs)	Peak Flow Out – Q_{100} (cfs)	Storage Volume (cf)	Maximum Ponding Depth (ft)	100-year Storm Water Surface Elevation (ft)	Freeboard (ft)
Underground Infiltration Chamber #1	35.24	4.00	140,009	10.00	8.00	2.00

5. CONCLUSION

The proposed development would not create or contribute runoff that would exceed the capacity of the existing downstream storm drain system. Furthermore, the underground infiltration system will be designed to accommodate the 100-year storm event and would not exceed the flow rates and runoff volumes generated by the existing condition. Once construction is complete, there would not be any substantial increase in flood boundaries, levels or frequencies in any areas outside the development. The hydrologic analyses and calculations were designed in accordance with the San Bernardino County Hydrology Manual. The results from the analysis will be the basis for the grading and on-site storm-drain construction documents for the project.

Evaluation of the appropriateness of guidelines and the accuracy of County data was beyond the scope of this study. Usage of this report is limited to address the purpose and scope previously defined by the project owner. The contents of this report are professional opinion and as such, are not to be considered a guaranty or warranty.

6. REFERENCES

1. National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Point Precipitation Frequency Estimates

2. National Resources Conservation Service (NRCS) Web Soil Survey

3. San Bernardino County Hydrology Manual dated August 1986

4. San Bernardino County Technical Guidance Document Water Quality Management Plan dated September 19, 2013

APPENDIX A

HYDROLOGY EXHIBITS

SITE VICINITY MAP

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Job Number: 2021-502
Date: 03/23/2022
Scale: NOT TO SCALE

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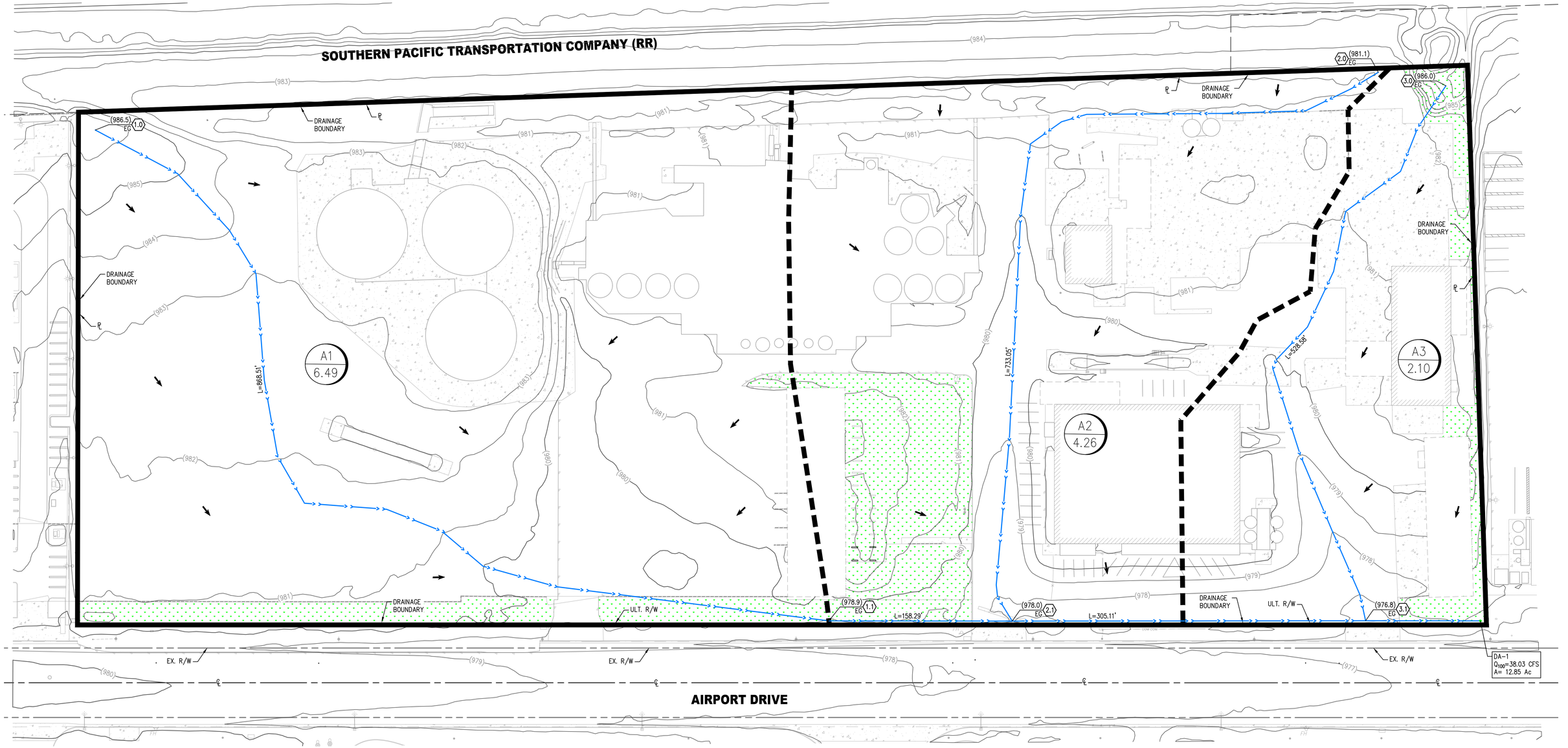

HYDROLOGY SUMMARY TABLE

SUBAREAS ID	RUNOFF COEFFICIENT "C"	TIME OF CONC. "Tc" (MIN.)	RAINFALL INTENSITY "I" (INCH/HOUR)	DRAINAGE AREA (AC)	RUNOFF FLOW RATE "Q_{100}" (CFS)
A1	0.88	11.75	3.485	6.49	19.90
A2	0.88	12.70	3.326	4.26	12.45
A3	0.88	8.40	4.264	2.10	7.91
TOTAL	--	14.20	--	12.85	38.03

GENERAL NOTES

1. SEE PRELIMINARY HYDROLOGY REPORT, PREPARED BY WESTLAND GROUP, FOR THE COMPLETE POST-DEVELOPMENT HYDROLOGY CALCULATIONS.
2. CALCULATIONS WERE BASED ON THE REQUIREMENTS ON THE SAN BERNARDINO HYDROLOGY MANUAL FOR 100 YEAR STORM.
3. ALL EXISTING ELEVATIONS ARE APPROXIMATE.
4. EXISTING TOPOGRAPHIC SURVEY SHOWN ON PLAN WAS PREPARED BY WESTLAND GROUP, DATED NOVEMBER 30, 2021

PROJECT SITE SUMMARY

AREA A

SITE AREA:	12.85 ACRE	
SOIL GROUP:	A	(PER USDA WEB SOIL SURVEY)
IMPERVIOUS:	92%	(PRE-DEVELOPMENT)
ISOHYETALS:	0.526" 1.21"	(2-YEAR 1 HOUR) (100-YEAR 1 HOUR)
CN NUMBER:	32	(SOIL GROUP A)
FREQUENCY:	100 YEAR	(FOR STORM DRAIN DESIGN)
METHOD:	SAN BERNARDINO COUNTY HYDROLOGY MANUAL	

LEGEND

- PROJECT DRAINAGE BOUNDARY/PROPERTY LINE
- SUB-AREA BOUNDARY
- FLOW PATH
- PROPOSED STORM DRAIN (PRELIMINARY)
- SUB-DRAINAGE AREA ID
- X / X — SUB-DRAINAGE AREA IDENTIFIER
- SUB-DRAINAGE SURFACE AREA (ACRE)
- FLOW ARROW
- 1.0 — SURFACE FLOW NODE
- EXISTING PERVIOUS AREA

ABBREVIATIONS

CF	CUBIC FEET
CL OR ℄	CENTERLINE
DA	DRAINAGE AREA
EG	EXISTING GRADE
EX	EXISTING
HR	HOUR
IN	INCH/INCHES
L	LENGTH
R/W	RIGHT OF WAY
PL OR ℙ	PROPERTY LINE
PROP	PROPOSED
SD	STORM DRAIN
ULT	ULTIMATE
V	VOLUME

N

40 0 40 80
scale 1"= 40' feet

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JOB NO: 2021-502

INDUSTRIAL BUILDING

PRE-DEVELOPMENT DRAINAGE MAP

5355 AIRPORT DRIVE

CITY OF ONTARIO

DATE: Mar 2022
FIGURE NO. 1

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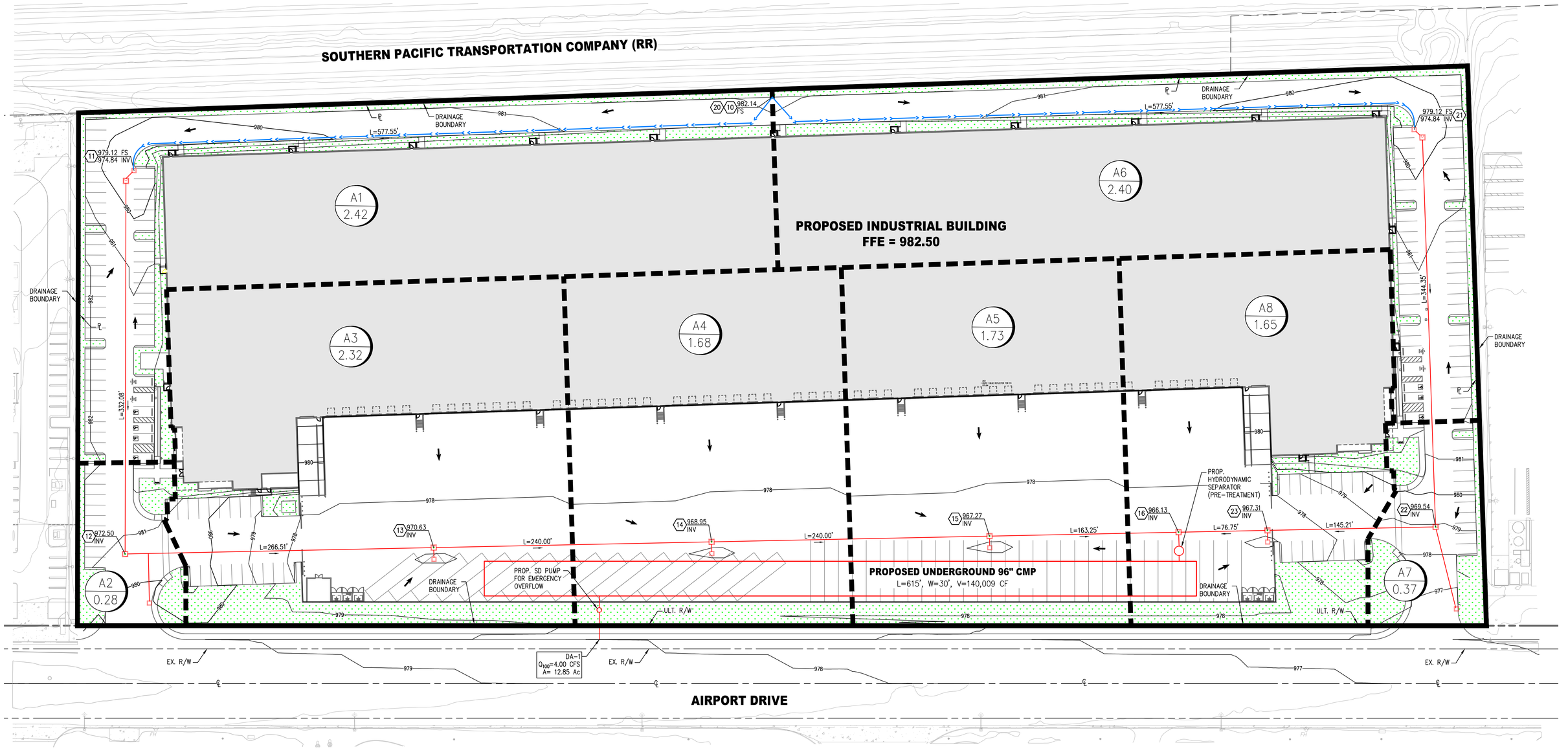

HYDROLOGY SUMMARY TABLE

SUBAREAS ID	RUNOFF COEFFICIENT "C"	TIME OF CONC. "Tc" (MIN.)	RAINFALL INTENSITY "I" (INCH/HOUR)	DRAINAGE AREA (AC)	RUNOFF FLOW RATE "Q_{100}" (CFS)
A1	0.880	11.06	3.613	2.42	7.70
A2	0.879	12.05	3.433	0.28	0.45
A3	0.879	12.83	3.305	2.32	6.43
A4	0.878	13.43	3.215	1.68	4.34
A5	0.877	14.02	3.135	1.73	4.27
A6	0.880	11.06	3.613	2.40	7.63
A7	0.879	11.83	3.470	0.37	0.82
A8	0.879	12.14	3.416	1.65	4.82
TOTAL	--	14.39	--	12.85	35.24

UNDERGROUND INFILTRATION CHAMBER SUMMARY

PEAK FLOW IN-Q_{100} (CFS)	PEAK FLOW OUT-Q_{100} (CFS)	STORAGE VOLUME (CF)	MAXIMUM PONDING DEPTH (FT)	WATER SURFACE ELEVATION (FT)	FREEBOARD (FT)
35.24	4.00	140,009	10.00	8.00	2.00

GENERAL NOTES

1. SEE PRELIMINARY HYDROLOGY REPORT, PREPARED BY WESTLAND GROUP, FOR THE COMPLETE POST-DEVELOPMENT HYDROLOGY CALCULATIONS.
2. CALCULATIONS WERE BASED ON THE REQUIREMENTS ON THE SAN BERNARDINO HYDROLOGY MANUAL FOR 100 YEAR STORM.
3. PROPOSED ON-SITE DRAINAGE SYSTEM LAYOUT IS PRELIMINARY.
4. ALL FINISH ELEVATIONS AND INVERT ELEVATIONS ARE APPROXIMATE.
5. EXISTING TOPOGRAPHIC SURVEY SHOWN ON PLAN WAS PREPARED BY WESTLAND GROUP, DATED NOVEMBER 30, 2021

PROJECT SITE SUMMARY

AREA A

SITE AREA:	12.85 ACRE	
SOIL GROUP:	A	(PER USDA WEB SOIL SURVEY)
IMPERVIOUS:	89%	(POST-DEVELOPMENT)
ISOHYETALS:	0.526" 1.21"	(2-YEAR 1 HOUR) (100-YEAR 1 HOUR)
CN NUMBER:	32	(SOIL GROUP A)
FREQUENCY:	100 YEAR	(FOR STORM DRAIN DESIGN)
METHOD:	SAN BERNARDINO COUNTY HYDROLOGY MANUAL	

LEGEND

- PROJECT DRAINAGE BOUNDARY/PROPERTY LINE
- SUB-AREA BOUNDARY
- FLOW PATH
- PROPOSED STORM DRAIN (PRELIMINARY)
- SUB-DRAINAGE AREA ID
- X / X — SUB-DRAINAGE AREA IDENTIFIER
- SUB-DRAINAGE SURFACE AREA (ACRE)
- FLOW ARROW
- (10) SURFACE FLOW NODE
- PROPOSED BUILDING AREA
- PROPOSED LANDSCAPE AREA

ABBREVIATIONS

CF	CUBIC FEET
CL OR ℄	CENTERLINE
CMP	CORRUGATED METAL PIPE
DA	DRAINAGE AREA
EX	EXISTING
FS	FINISHED SURFACE ELEVATION
HR	HOUR
IN	INCH/INCHES
INV	INVERT ELEVATION
L	LENGTH
R/W	RIGHT OF WAY
PL OR ℙ	PROPERTY LINE
PROP	PROPOSED
SD	STORM DRAIN
TYP	TYPICAL
ULT	ULTIMATE
V	VOLUME
W	WIDTH

N

40 0 40 80
scale
1" = 40'
feet

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JOB NO: 2021-502

INDUSTRIAL BUILDING

POST-DEVELOPMENT DRAINAGE MAP

5355 AIRPORT DRIVE

CITY OF ONTARIO

DATE: Mar 2022

FIGURE NO. 2

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APPENDIX B

RATIONAL METHOD ANALYSIS (2/100 YEAR STORM)

RATIONAL METHOD ANALYSIS

PRE-DEVELOPMENT CONDITIONS

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 03/23/22

Job No. 2021-502
5355 Airport Drive
2 YR STORM RATIONAL METHOD
PRE-CONDITION, AREA A

Program License Serial Number 6277

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.526 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 1

++

Process from Point/Station 1.000 to Point/Station 1.100
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.100(In/Hr)
Initial subarea data:
Initial area flow distance = 868.510(Ft.)
Top (of initial area) elevation = 986.500(Ft.)
Bottom (of initial area) elevation = 978.900(Ft.)
Difference in elevation = 7.600(Ft.)
Slope = 0.00875 s(%)= 0.88
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.748 min.
Rainfall intensity = 1.399(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.836

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Subarea runoff =      7.589(CFS)
Total initial stream area =        6.490(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.100 to Point/Station        2.100
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   978.900(Ft.)
Downstream point elevation =   978.000(Ft.)
Channel length thru subarea  =   158.290(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Manning's 'N'    = 0.011
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      7.589(CFS)
Depth of flow =   0.202(Ft.), Average velocity =   2.491(Ft/s)
Channel flow top width =   25.185(Ft.)
Flow Velocity =    2.49(Ft/s)
Travel time  =    1.06 min.
Time of concentration =   12.81 min.
Critical depth =      0.225(Ft.)


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Process from Point/Station        1.100 to Point/Station        2.100
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.490(Ac.)
Runoff from this stream =      7.589(CFS)
Time of concentration =   12.81 min.
Rainfall intensity =     1.329(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        2.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
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Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Initial subarea data:
Initial area flow distance =   733.050(Ft.)
Top (of initial area) elevation =   981.100(Ft.)
Bottom (of initial area) elevation =   978.000(Ft.)
Difference in elevation =     3.100(Ft.)
Slope =    0.00423  s(%)=       0.42
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.696 min.
Rainfall intensity =      1.336(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.833
Subarea runoff =      4.737(CFS)
Total initial stream area =        4.260(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        2.100
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.260(Ac.)
Runoff from this stream =      4.737(CFS)
Time of concentration =   12.70 min.
Rainfall intensity =     1.336(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1      7.59     6.490     12.81    0.100      1.329
2      4.74     4.260     12.70    0.100      1.336
Qmax(1) =
           1.000 *    1.000 *     7.589) +
           0.994 *    1.000 *     4.737) + =      12.299
Qmax(2) =
           1.006 *    0.991 *     7.589) +
           1.000 *    1.000 *     4.737) + =      12.303

Total of 2 main streams to confluence:
Flow rates before confluence point:
       8.589       5.737
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Maximum flow rates at confluence using above data:
       12.299       12.303
Area of streams before confluence:
        6.490        4.260
Effective area values after confluence:
       10.750       10.694


Results of confluence:
Total flow rate =     12.303(CFS)
Time of concentration =    12.696 min.
Effective stream area after confluence  =     10.694(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.100(In/Hr)
Study area total =      10.75(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.100 to Point/Station        3.100
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =   978.000(Ft.)
Downstream point elevation =   976.800(Ft.)
Channel length thru subarea  =   305.110(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Manning's 'N'    = 0.011
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =     12.303(CFS)
Depth of flow =   0.270(Ft.), Average velocity =   2.458(Ft/s)
Channel flow top width =   32.034(Ft.)
Flow Velocity =    2.46(Ft/s)
Travel time  =    2.07 min.
Time of concentration =   14.77 min.
Critical depth =      0.281(Ft.)


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Process from Point/Station        2.100 to Point/Station        3.100
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.694(Ac.)
Runoff from this stream =     12.303(CFS)
Time of concentration =   14.77 min.
Rainfall intensity =     1.220(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
```

Program is now starting with Main Stream No. 2

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Process from Point/Station 3.000 to Point/Station 3.100
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.100(In/Hr)
Initial subarea data:
Initial area flow distance = 528.580(Ft.)
Top (of initial area) elevation = 986.000(Ft.)
Bottom (of initial area) elevation = 976.800(Ft.)
Difference in elevation = 9.200(Ft.)
Slope = 0.01741 s(%)= 1.74
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.394 min.
Rainfall intensity = 1.712(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.847
Subarea runoff = 3.047(CFS)
Total initial stream area = 2.100(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.100(In/Hr)

++
Process from Point/Station 3.000 to Point/Station 3.100
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 2.100(Ac.)
Runoff from this stream = 3.047(CFS)
Time of concentration = 8.39 min.
Rainfall intensity = 1.712(In/Hr)
Area averaged loss rate (Fm) = 0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	12.30	10.694	14.77	0.100	1.220

```
2      3.05     2.100      8.39    0.100      1.712
Qmax(1) =
           1.000 *    1.000 *    12.303) +
           0.695 *    1.000 *     3.047) + =      14.419
Qmax(2) =
           1.439 *    0.569 *    12.303) +
           1.000 *    1.000 *     3.047) + =      13.114

Total of 2 main streams to confluence:
Flow rates before confluence point:
      13.303       4.047
Maximum flow rates at confluence using above data:
       14.419       13.114
Area of streams before confluence:
       10.694        2.100
Effective area values after confluence:
       12.794        8.179


Results of confluence:
Total flow rate =     14.419(CFS)
Time of concentration =    14.766 min.
Effective stream area after confluence  =     12.794(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.100(In/Hr)
Study area total =      12.79(Ac.)
End of computations, Total Study Area =           12.85 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged SCS curve number =  32.0
```

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 03/22/22

Job No. 2021-502
5355 Airport Drive
100 YR STORM RATIONAL METHOD
PRE-CONDITION, AREA A

Program License Serial Number 6277

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.310 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++

Process from Point/Station 1.000 to Point/Station 1.100
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 868.510(Ft.)
Top (of initial area) elevation = 986.500(Ft.)
Bottom (of initial area) elevation = 978.900(Ft.)
Difference in elevation = 7.600(Ft.)
Slope = 0.00875 s(%)= 0.88
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.748 min.
Rainfall intensity = 3.485(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880

```
Subarea runoff =     19.896(CFS)
Total initial stream area =        6.490(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.100 to Point/Station        2.100
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   978.900(Ft.)
Downstream point elevation =   978.000(Ft.)
Channel length thru subarea  =   158.290(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Manning's 'N'    = 0.011
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =     19.896(CFS)
Depth of flow =   0.307(Ft.), Average velocity =   3.186(Ft/s)
Channel flow top width =   35.692(Ft.)
Flow Velocity =    3.19(Ft/s)
Travel time  =    0.83 min.
Time of concentration =   12.58 min.
Critical depth =      0.352(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.100 to Point/Station        2.100
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.490(Ac.)
Runoff from this stream =     19.896(CFS)
Time of concentration =   12.58 min.
Rainfall intensity =     3.345(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        2.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
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```
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =   733.050(Ft.)
Top (of initial area) elevation =   981.100(Ft.)
Bottom (of initial area) elevation =   978.000(Ft.)
Difference in elevation =     3.100(Ft.)
Slope =    0.00423  s(%)=       0.42
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.696 min.
Rainfall intensity =      3.326(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.879
Subarea runoff =     12.452(CFS)
Total initial stream area =        4.260(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        2.100
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.260(Ac.)
Runoff from this stream =     12.452(CFS)
Time of concentration =   12.70 min.
Rainfall intensity =     3.326(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     19.90     6.490     12.58    0.079      3.345
2     12.45     4.260     12.70    0.079      3.326
Qmax(1) =
           1.000 *    1.000 *    19.896) +
           1.006 *    0.991 *    12.452) + =      32.302
Qmax(2) =
           0.994 *    1.000 *    19.896) +
           1.000 *    1.000 *    12.452) + =      32.232

Total of 2 main streams to confluence:
Flow rates before confluence point:
      20.896      13.452
```

```
Maximum flow rates at confluence using above data:
       32.302       32.232
Area of streams before confluence:
        6.490        4.260
Effective area values after confluence:
       10.710       10.750


Results of confluence:
Total flow rate =     32.302(CFS)
Time of concentration =    12.576 min.
Effective stream area after confluence  =     10.710(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.079(In/Hr)
Study area total =      10.75(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.100 to Point/Station        3.100
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   978.000(Ft.)
Downstream point elevation =   976.800(Ft.)
Channel length thru subarea  =   305.110(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Manning's 'N'    = 0.011
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =     32.302(CFS)
Depth of flow =   0.406(Ft.), Average velocity =   3.138(Ft/s)
Channel flow top width =   45.647(Ft.)
Flow Velocity =    3.14(Ft/s)
Travel time  =    1.62 min.
Time of concentration =   14.20 min.
Critical depth =      0.434(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.100 to Point/Station        3.100
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.710(Ac.)
Runoff from this stream =     32.302(CFS)
Time of concentration =   14.20 min.
Rainfall intensity =     3.111(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
```

Program is now starting with Main Stream No. 2

++
Process from Point/Station 3.000 to Point/Station 3.100
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 528.580(Ft.)
Top (of initial area) elevation = 986.000(Ft.)
Bottom (of initial area) elevation = 976.800(Ft.)
Difference in elevation = 9.200(Ft.)
Slope = 0.01741 s(%)= 1.74
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.394 min.
Rainfall intensity = 4.264(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff = 7.910(CFS)
Total initial stream area = 2.100(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.079(In/Hr)

++
Process from Point/Station 3.000 to Point/Station 3.100
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 2.100(Ac.)
Runoff from this stream = 7.910(CFS)
Time of concentration = 8.39 min.
Rainfall intensity = 4.264(In/Hr)
Area averaged loss rate (Fm) = 0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream No.	Flow rate (CFS)	Area (Ac.)	TC (min)	Fm (In/Hr)	Rainfall Intensity (In/Hr)
1	32.30	10.710	14.20	0.079	3.111

```
2      7.91     2.100      8.39    0.079      4.264
Qmax(1) =
           1.000 *    1.000 *    32.302) +
           0.725 *    1.000 *     7.910) + =      38.033
Qmax(2) =
           1.380 *    0.591 *    32.302) +
           1.000 *    1.000 *     7.910) + =      34.272

Total of 2 main streams to confluence:
Flow rates before confluence point:
      33.302       8.910
Maximum flow rates at confluence using above data:
       38.033       34.272
Area of streams before confluence:
       10.710        2.100
Effective area values after confluence:
       12.810        8.432


Results of confluence:
Total flow rate =     38.033(CFS)
Time of concentration =    14.197 min.
Effective stream area after confluence  =     12.810(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.079(In/Hr)
Study area total =      12.81(Ac.)
End of computations, Total Study Area =           12.85 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged SCS curve number =  32.0
```

RATIONAL METHOD ANALYSIS

POST-DEVELOPMENT CONDITIONS

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 03/23/22

Job No. 2021-502
5355 Airport Drive
2 YR STORM RATIONAL METHOD
POST-CONDITION, AREA A

Program License Serial Number 6277

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 2.0
Computed rainfall intensity:
Storm year = 2.00 1 hour rainfall = 0.526 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 1

++

Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.100(In/Hr)
Initial subarea data:
Initial area flow distance = 577.550(Ft.)
Top (of initial area) elevation = 982.140(Ft.)
Bottom (of initial area) elevation = 979.120(Ft.)
Difference in elevation = 3.020(Ft.)
Slope = 0.00523 s(%)= 0.52
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.062 min.
Rainfall intensity = 1.451(In/Hr) for a 2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.838

```
Subarea runoff =      2.942(CFS)
Total initial stream area =        2.420(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   974.840(Ft.)
Downstream point/station elevation =   972.500(Ft.)
Pipe length  =   332.08(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.942(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.942(CFS)
Normal flow depth in pipe =    9.66(In.)
Flow top width inside pipe =    9.51(In.)
Critical Depth =    8.82(In.)
Pipe flow velocity =      4.34(Ft/s)
Travel time through pipe =    1.28 min.
Time of concentration (TC) =    12.34 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       12.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Time of concentration =    12.34 min.
Rainfall intensity =      1.359(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =      0.117(CFS) for    0.280(Ac.)
Total runoff =      3.059(CFS)
Effective area this stream =        2.70(Ac.)
Total Study Area (Main Stream No. 1) =        2.70(Ac.)
Area averaged Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =   972.500(Ft.)
Downstream point/station elevation =   970.630(Ft.)
Pipe length  =   266.51(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.059(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.059(CFS)
Normal flow depth in pipe =    8.07(In.)
Flow top width inside pipe =   14.96(In.)
Critical Depth =    8.45(In.)
Pipe flow velocity =      4.54(Ft/s)
Travel time through pipe =    0.98 min.
Time of concentration (TC) =    13.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       13.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Time of concentration =    13.31 min.
Rainfall intensity =      1.298(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.831
Subarea runoff =      2.354(CFS) for    2.320(Ac.)
Total runoff =      5.413(CFS)
Effective area this stream =        5.02(Ac.)
Total Study Area (Main Stream No. 1) =        5.02(Ac.)
Area averaged Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   970.630(Ft.)
Downstream point/station elevation =   968.950(Ft.)
Pipe length  =   240.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.413(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.413(CFS)
Normal flow depth in pipe =   10.22(In.)
Flow top width inside pipe =   17.83(In.)
```

```
Critical Depth =   10.76(In.)
Pipe flow velocity =      5.23(Ft/s)
Travel time through pipe =    0.76 min.
Time of concentration (TC) =    14.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       14.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Time of concentration =    14.08 min.
Rainfall intensity =      1.255(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.828
Subarea runoff =      1.553(CFS) for    1.680(Ac.)
Total runoff =      6.966(CFS)
Effective area this stream =        6.70(Ac.)
Total Study Area (Main Stream No. 1) =        6.70(Ac.)
Area averaged Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   968.950(Ft.)
Downstream point/station elevation =   967.270(Ft.)
Pipe length  =   240.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.966(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.966(CFS)
Normal flow depth in pipe =   12.09(In.)
Flow top width inside pipe =   16.90(In.)
Critical Depth =   12.26(In.)
Pipe flow velocity =      5.52(Ft/s)
Travel time through pipe =    0.73 min.
Time of concentration (TC) =    14.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       15.000
**** SUBAREA FLOW ADDITION ****
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```
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Time of concentration =    14.80 min.
Rainfall intensity =      1.218(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.826
Subarea runoff =      1.516(CFS) for    1.730(Ac.)
Total runoff =      8.482(CFS)
Effective area this stream =        8.43(Ac.)
Total Study Area (Main Stream No. 1) =        8.43(Ac.)
Area averaged Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   967.270(Ft.)
Downstream point/station elevation =   966.130(Ft.)
Pipe length  =   163.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.482(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.482(CFS)
Normal flow depth in pipe =   14.23(In.)
Flow top width inside pipe =   14.65(In.)
Critical Depth =   13.54(In.)
Pipe flow velocity =      5.66(Ft/s)
Travel time through pipe =    0.48 min.
Time of concentration (TC) =    15.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.430(Ac.)
Runoff from this stream =      8.482(CFS)
Time of concentration =   15.29 min.
Rainfall intensity =     1.195(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
```

```
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Initial subarea data:
Initial area flow distance =   577.550(Ft.)
Top (of initial area) elevation =   982.140(Ft.)
Bottom (of initial area) elevation =   979.120(Ft.)
Difference in elevation =     3.020(Ft.)
Slope =    0.00523  s(%)=       0.52
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.062 min.
Rainfall intensity =      1.451(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.838
Subarea runoff =      2.918(CFS)
Total initial stream area =        2.400(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   974.840(Ft.)
Downstream point/station elevation =   969.540(Ft.)
Pipe length  =   344.35(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.918(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.918(CFS)
Normal flow depth in pipe =    7.11(In.)
Flow top width inside pipe =   11.79(In.)
Critical Depth =    8.78(In.)
Pipe flow velocity =      6.01(Ft/s)
Travel time through pipe =    0.95 min.
Time of concentration (TC) =    12.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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Process from Point/Station       22.000 to Point/Station       22.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Time of concentration =    12.02 min.
Rainfall intensity =      1.380(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.835
Subarea runoff =      0.275(CFS) for    0.370(Ac.)
Total runoff =      3.192(CFS)
Effective area this stream =        2.77(Ac.)
Total Study Area (Main Stream No. 2) =       11.20(Ac.)
Area averaged Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =   969.540(Ft.)
Downstream point/station elevation =   967.310(Ft.)
Pipe length  =   145.21(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.192(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.192(CFS)
Normal flow depth in pipe =    7.56(In.)
Flow top width inside pipe =   11.59(In.)
Critical Depth =    9.18(In.)
Pipe flow velocity =      6.12(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =    12.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       23.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
```

```
Adjusted SCS curve number for AMC 1 = 16.60
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.100(In/Hr)
Time of concentration =    12.41 min.
Rainfall intensity =      1.354(In/Hr) for a     2.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.834
Subarea runoff =      1.796(CFS) for    1.650(Ac.)
Total runoff =      4.988(CFS)
Effective area this stream =        4.42(Ac.)
Total Study Area (Main Stream No. 2) =       12.85(Ac.)
Area averaged Fm value =    0.100(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   967.310(Ft.)
Downstream point/station elevation =   966.130(Ft.)
Pipe length  =    76.75(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.988(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.988(CFS)
Normal flow depth in pipe =    8.57(In.)
Flow top width inside pipe =   14.85(In.)
Critical Depth =   10.86(In.)
Pipe flow velocity =      6.88(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    12.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.420(Ac.)
Runoff from this stream =      4.988(CFS)
Time of concentration =   12.60 min.
Rainfall intensity =     1.342(In/Hr)
Area averaged loss rate (Fm) =    0.1000(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1      8.48     8.430     15.29    0.100      1.195
```

```
2      4.99     4.420     12.60    0.100      1.342
Qmax(1) =
           1.000 *    1.000 *     8.482) +
           0.882 *    1.000 *     4.988) + =      12.880
Qmax(2) =
           1.134 *    0.824 *     8.482) +
           1.000 *    1.000 *     4.988) + =      12.917

Total of 2 main streams to confluence:
Flow rates before confluence point:
       9.482       5.988
Maximum flow rates at confluence using above data:
       12.880       12.917
Area of streams before confluence:
        8.430        4.420
Effective area values after confluence:
       12.850       11.368


Results of confluence:
Total flow rate =     12.917(CFS)
Time of concentration =    12.598 min.
Effective stream area after confluence  =     11.368(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.100(In/Hr)
Study area total =      12.85(Ac.)
End of computations, Total Study Area =           12.85 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged SCS curve number =  32.0
```

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2005 Version 7.1
Rational Hydrology Study Date: 03/23/22

Job No. 2021-502
5355 Airport Drive
100 YR STORM RATIONAL METHOD
POST-CONDITION, AREA A

Program License Serial Number 6277

********* Hydrology Study Control Information **********

Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.310 (In.)
Slope used for rainfall intensity curve b = 0.6000
Soil antecedent moisture condition (AMC) = 3

++

Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 577.550(Ft.)
Top (of initial area) elevation = 982.140(Ft.)
Bottom (of initial area) elevation = 979.120(Ft.)
Difference in elevation = 3.020(Ft.)
Slope = 0.00523 s(%)= 0.52
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.062 min.
Rainfall intensity = 3.613(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880

```
Subarea runoff =      7.698(CFS)
Total initial stream area =        2.420(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   974.840(Ft.)
Downstream point/station elevation =   972.500(Ft.)
Pipe length  =   332.08(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.698(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.698(CFS)
Normal flow depth in pipe =   13.02(In.)
Flow top width inside pipe =   16.11(In.)
Critical Depth =   12.90(In.)
Pipe flow velocity =      5.62(Ft/s)
Travel time through pipe =    0.98 min.
Time of concentration (TC) =    12.05 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       12.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    12.05 min.
Rainfall intensity =      3.433(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.879
Subarea runoff =      0.453(CFS) for    0.280(Ac.)
Total runoff =      8.151(CFS)
Effective area this stream =        2.70(Ac.)
Total Study Area (Main Stream No. 1) =        2.70(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =   972.500(Ft.)
Downstream point/station elevation =   970.630(Ft.)
Pipe length  =   266.51(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.151(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.151(CFS)
Normal flow depth in pipe =   13.69(In.)
Flow top width inside pipe =   15.37(In.)
Critical Depth =   13.26(In.)
Pipe flow velocity =      5.65(Ft/s)
Travel time through pipe =    0.79 min.
Time of concentration (TC) =    12.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       13.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    12.83 min.
Rainfall intensity =      3.305(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.879
Subarea runoff =      6.427(CFS) for    2.320(Ac.)
Total runoff =     14.578(CFS)
Effective area this stream =        5.02(Ac.)
Total Study Area (Main Stream No. 1) =        5.02(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   970.630(Ft.)
Downstream point/station elevation =   968.950(Ft.)
Pipe length  =   240.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.578(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    14.578(CFS)
Normal flow depth in pipe =   15.80(In.)
Flow top width inside pipe =   22.77(In.)
```

```
Critical Depth =   16.52(In.)
Pipe flow velocity =      6.65(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =    13.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       14.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    13.43 min.
Rainfall intensity =      3.215(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.878
Subarea runoff =      4.338(CFS) for    1.680(Ac.)
Total runoff =     18.916(CFS)
Effective area this stream =        6.70(Ac.)
Total Study Area (Main Stream No. 1) =        6.70(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   968.950(Ft.)
Downstream point/station elevation =   967.270(Ft.)
Pipe length  =   240.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.916(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    18.916(CFS)
Normal flow depth in pipe =   19.64(In.)
Flow top width inside pipe =   18.51(In.)
Critical Depth =   18.77(In.)
Pipe flow velocity =      6.87(Ft/s)
Travel time through pipe =    0.58 min.
Time of concentration (TC) =    14.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       15.000
**** SUBAREA FLOW ADDITION ****
```

```
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    14.02 min.
Rainfall intensity =      3.135(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.877
Subarea runoff =      4.271(CFS) for    1.730(Ac.)
Total runoff =     23.187(CFS)
Effective area this stream =        8.43(Ac.)
Total Study Area (Main Stream No. 1) =        8.43(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =   967.270(Ft.)
Downstream point/station elevation =   966.130(Ft.)
Pipe length  =   163.25(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.187(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    23.187(CFS)
Normal flow depth in pipe =   19.95(In.)
Flow top width inside pipe =   23.72(In.)
Critical Depth =   20.23(In.)
Pipe flow velocity =      7.36(Ft/s)
Travel time through pipe =    0.37 min.
Time of concentration (TC) =    14.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.430(Ac.)
Runoff from this stream =     23.187(CFS)
Time of concentration =   14.39 min.
Rainfall intensity =     3.086(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
```

```
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =   577.550(Ft.)
Top (of initial area) elevation =   982.140(Ft.)
Bottom (of initial area) elevation =   979.120(Ft.)
Difference in elevation =     3.020(Ft.)
Slope =    0.00523  s(%)=       0.52
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.062 min.
Rainfall intensity =      3.613(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.880
Subarea runoff =      7.634(CFS)
Total initial stream area =        2.400(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =   974.840(Ft.)
Downstream point/station elevation =   969.540(Ft.)
Pipe length  =   344.35(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.634(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.634(CFS)
Normal flow depth in pipe =   11.70(In.)
Flow top width inside pipe =   12.43(In.)
Critical Depth =   13.16(In.)
Pipe flow velocity =      7.43(Ft/s)
Travel time through pipe =    0.77 min.
Time of concentration (TC) =    11.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
Process from Point/Station       22.000 to Point/Station       22.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    11.83 min.
Rainfall intensity =      3.470(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.880
Subarea runoff =      0.820(CFS) for    0.370(Ac.)
Total runoff =      8.454(CFS)
Effective area this stream =        2.77(Ac.)
Total Study Area (Main Stream No. 2) =       11.20(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =   969.540(Ft.)
Downstream point/station elevation =   967.310(Ft.)
Pipe length  =   145.21(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.454(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.454(CFS)
Normal flow depth in pipe =   10.57(In.)
Flow top width inside pipe =   17.72(In.)
Critical Depth =   13.51(In.)
Pipe flow velocity =      7.84(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    12.14 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       23.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
```

```
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    12.14 min.
Rainfall intensity =      3.416(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.879
Subarea runoff =      4.824(CFS) for    1.650(Ac.)
Total runoff =     13.278(CFS)
Effective area this stream =        4.42(Ac.)
Total Study Area (Main Stream No. 2) =       12.85(Ac.)
Area averaged Fm value =    0.079(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   967.310(Ft.)
Downstream point/station elevation =   966.130(Ft.)
Pipe length  =    76.75(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.278(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    13.278(CFS)
Normal flow depth in pipe =   12.66(In.)
Flow top width inside pipe =   20.55(In.)
Critical Depth =   16.27(In.)
Pipe flow velocity =      8.77(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    12.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.420(Ac.)
Runoff from this stream =     13.278(CFS)
Time of concentration =   12.29 min.
Rainfall intensity =     3.392(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     23.19     8.430     14.39    0.079      3.086
```

```
2     13.28     4.420     12.29    0.079      3.392
Qmax(1) =
           1.000 *    1.000 *    23.187) +
           0.908 *    1.000 *    13.278) + =      35.239
Qmax(2) =
           1.102 *    0.854 *    23.187) +
           1.000 *    1.000 *    13.278) + =      35.100

Total of 2 main streams to confluence:
Flow rates before confluence point:
      24.187      14.278
Maximum flow rates at confluence using above data:
       35.239       35.100
Area of streams before confluence:
        8.430        4.420
Effective area values after confluence:
       12.850       11.621


Results of confluence:
Total flow rate =     35.239(CFS)
Time of concentration =    14.386 min.
Effective stream area after confluence  =     12.850(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.079(In/Hr)
Study area total =      12.85(Ac.)
End of computations, Total Study Area =           12.85 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged SCS curve number =  32.0
```

APPENDIX C

UNIT HYDROGRAPH ANALYSIS (100-YEAR STORM, 24 HOUR)

UNIT HYDROGRAPH ANALYSIS (100-YEAR STORM, 24 HOUR)

PRE-DEVELOPMENT CONDITION

U n i t H y d r o g r a p h A n a l y s i s

Study date 03/22/22

++

San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6277

Job No. 2021-502
5355 Airport Drive
100 YR STORM UNIT HYDROGRAPH ANALYSIS
PRE-CONDITION, AREA A

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
12.85	1	1.31
Rainfall data for year 100		
12.85	6	3.15
Rainfall data for year 100		
12.85	24	5.74

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	52.0	12.85	1.000	0.785	0.080	0.063

Area-averaged adjusted loss rate Fm (In/Hr) = 0.063

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
1.03	0.080	32.0	52.0	9.23	0.201
11.82	0.920	98.0	98.0	0.20	0.959

Area-averaged catchment yield fraction, Y = 0.898
Area-averaged low loss fraction, Yb = 0.102
User entry of time of concentration = 0.237 (hours)
++
Watershed area = 12.85(Ac.)
Catchment Lag time = 0.189 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 44.0135
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.063(In/Hr)
Average low loss rate fraction (Yb) = 0.102 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.485(In)
Computed peak 30-minute rainfall = 0.993(In)
Specified peak 1-hour rainfall = 1.310(In)
Computed peak 3-hour rainfall = 2.243(In)
Specified peak 6-hour rainfall = 3.150(In)
Specified peak 24-hour rainfall = 5.740(In)

Rainfall depth area reduction factors:
Using a total area of 12.85(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.485(In)
30-minute factor = 0.999 Adjusted rainfall = 0.992(In)
1-hour factor = 0.999 Adjusted rainfall = 1.309(In)
3-hour factor = 1.000 Adjusted rainfall = 2.243(In)
6-hour factor = 1.000 Adjusted rainfall = 3.150(In)
24-hour factor = 1.000 Adjusted rainfall = 5.740(In)

U n i t H y d r o g r a p h
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Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 155.40 (CFS))	
1	3.600	5.594
2	23.452	30.851
3	58.156	53.932
4	83.690	39.680
5	94.204	16.340
6	97.970	5.853
7	98.950	1.522
8	100.000	0.761

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4845	0.4845
2	0.6394	0.1548
3	0.7519	0.1126
4	0.8436	0.0917
5	0.9224	0.0788
6	0.9922	0.0698
7	1.0553	0.0631
8	1.1132	0.0579
9	1.1669	0.0537
10	1.2171	0.0502
11	1.2644	0.0473
12	1.3092	0.0448
13	1.3616	0.0524
14	1.4120	0.0504
15	1.4605	0.0486
16	1.5075	0.0469
17	1.5529	0.0455
18	1.5971	0.0441
19	1.6399	0.0429
20	1.6817	0.0418
21	1.7224	0.0407
22	1.7621	0.0397
23	1.8009	0.0388
24	1.8389	0.0380
25	1.8761	0.0372
26	1.9125	0.0364
27	1.9482	0.0357
28	1.9832	0.0350
29	2.0176	0.0344
30	2.0514	0.0338
31	2.0847	0.0332
32	2.1174	0.0327
33	2.1496	0.0322
34	2.1812	0.0317

35	2.2125	0.0312
36	2.2432	0.0308
37	2.2735	0.0303
38	2.3034	0.0299
39	2.3329	0.0295
40	2.3620	0.0291
41	2.3907	0.0287
42	2.4191	0.0284
43	2.4472	0.0280
44	2.4749	0.0277
45	2.5022	0.0274
46	2.5293	0.0271
47	2.5561	0.0268
48	2.5826	0.0265
49	2.6088	0.0262
50	2.6347	0.0259
51	2.6604	0.0257
52	2.6858	0.0254
53	2.7110	0.0252
54	2.7359	0.0249
55	2.7606	0.0247
56	2.7851	0.0245
57	2.8094	0.0242
58	2.8334	0.0240
59	2.8572	0.0238
60	2.8808	0.0236
61	2.9042	0.0234
62	2.9275	0.0232
63	2.9505	0.0230
64	2.9733	0.0228
65	2.9960	0.0227
66	3.0185	0.0225
67	3.0408	0.0223
68	3.0629	0.0221
69	3.0849	0.0220
70	3.1067	0.0218
71	3.1284	0.0217
72	3.1499	0.0215
73	3.1687	0.0189
74	3.1875	0.0187
75	3.2060	0.0186
76	3.2245	0.0184
77	3.2428	0.0183
78	3.2609	0.0182
79	3.2790	0.0180
80	3.2969	0.0179
81	3.3146	0.0178
82	3.3323	0.0177
83	3.3498	0.0175
84	3.3672	0.0174

85	3.3845	0.0173
86	3.4017	0.0172
87	3.4188	0.0171
88	3.4357	0.0170
89	3.4526	0.0168
90	3.4693	0.0167
91	3.4859	0.0166
92	3.5025	0.0165
93	3.5189	0.0164
94	3.5352	0.0163
95	3.5515	0.0162
96	3.5676	0.0161
97	3.5836	0.0160
98	3.5996	0.0159
99	3.6154	0.0159
100	3.6312	0.0158
101	3.6469	0.0157
102	3.6625	0.0156
103	3.6780	0.0155
104	3.6934	0.0154
105	3.7087	0.0153
106	3.7239	0.0152
107	3.7391	0.0152
108	3.7542	0.0151
109	3.7692	0.0150
110	3.7841	0.0149
111	3.7990	0.0149
112	3.8138	0.0148
113	3.8285	0.0147
114	3.8431	0.0146
115	3.8577	0.0146
116	3.8721	0.0145
117	3.8866	0.0144
118	3.9009	0.0143
119	3.9152	0.0143
120	3.9294	0.0142
121	3.9435	0.0141
122	3.9576	0.0141
123	3.9716	0.0140
124	3.9856	0.0139
125	3.9994	0.0139
126	4.0133	0.0138
127	4.0270	0.0138
128	4.0407	0.0137
129	4.0543	0.0136
130	4.0679	0.0136
131	4.0814	0.0135
132	4.0949	0.0135
133	4.1083	0.0134
134	4.1216	0.0133

135	4.1349	0.0133
136	4.1481	0.0132
137	4.1613	0.0132
138	4.1744	0.0131
139	4.1875	0.0131
140	4.2005	0.0130
141	4.2135	0.0130
142	4.2264	0.0129
143	4.2392	0.0129
144	4.2521	0.0128
145	4.2648	0.0128
146	4.2775	0.0127
147	4.2902	0.0127
148	4.3028	0.0126
149	4.3153	0.0126
150	4.3279	0.0125
151	4.3403	0.0125
152	4.3527	0.0124
153	4.3651	0.0124
154	4.3774	0.0123
155	4.3897	0.0123
156	4.4020	0.0122
157	4.4142	0.0122
158	4.4263	0.0121
159	4.4384	0.0121
160	4.4505	0.0121
161	4.4625	0.0120
162	4.4745	0.0120
163	4.4864	0.0119
164	4.4983	0.0119
165	4.5101	0.0119
166	4.5220	0.0118
167	4.5337	0.0118
168	4.5455	0.0117
169	4.5572	0.0117
170	4.5688	0.0117
171	4.5804	0.0116
172	4.5920	0.0116
173	4.6035	0.0115
174	4.6150	0.0115
175	4.6265	0.0115
176	4.6379	0.0114
177	4.6493	0.0114
178	4.6607	0.0114
179	4.6720	0.0113
180	4.6833	0.0113
181	4.6945	0.0112
182	4.7057	0.0112
183	4.7169	0.0112
184	4.7280	0.0111

185	4.7391	0.0111
186	4.7502	0.0111
187	4.7612	0.0110
188	4.7722	0.0110
189	4.7832	0.0110
190	4.7942	0.0109
191	4.8051	0.0109
192	4.8159	0.0109
193	4.8268	0.0108
194	4.8376	0.0108
195	4.8484	0.0108
196	4.8591	0.0107
197	4.8698	0.0107
198	4.8805	0.0107
199	4.8912	0.0107
200	4.9018	0.0106
201	4.9124	0.0106
202	4.9230	0.0106
203	4.9335	0.0105
204	4.9440	0.0105
205	4.9545	0.0105
206	4.9649	0.0104
207	4.9753	0.0104
208	4.9857	0.0104
209	4.9961	0.0104
210	5.0064	0.0103
211	5.0167	0.0103
212	5.0270	0.0103
213	5.0373	0.0103
214	5.0475	0.0102
215	5.0577	0.0102
216	5.0678	0.0102
217	5.0780	0.0101
218	5.0881	0.0101
219	5.0982	0.0101
220	5.1083	0.0101
221	5.1183	0.0100
222	5.1283	0.0100
223	5.1383	0.0100
224	5.1483	0.0100
225	5.1582	0.0099
226	5.1681	0.0099
227	5.1780	0.0099
228	5.1878	0.0099
229	5.1977	0.0098
230	5.2075	0.0098
231	5.2173	0.0098
232	5.2271	0.0098
233	5.2368	0.0097
234	5.2465	0.0097

235	5.2562	0.0097
236	5.2659	0.0097
237	5.2755	0.0096
238	5.2851	0.0096
239	5.2947	0.0096
240	5.3043	0.0096
241	5.3139	0.0096
242	5.3234	0.0095
243	5.3329	0.0095
244	5.3424	0.0095
245	5.3519	0.0095
246	5.3613	0.0094
247	5.3707	0.0094
248	5.3801	0.0094
249	5.3895	0.0094
250	5.3989	0.0094
251	5.4082	0.0093
252	5.4175	0.0093
253	5.4268	0.0093
254	5.4361	0.0093
255	5.4454	0.0093
256	5.4546	0.0092
257	5.4638	0.0092
258	5.4730	0.0092
259	5.4822	0.0092
260	5.4913	0.0092
261	5.5005	0.0091
262	5.5096	0.0091
263	5.5187	0.0091
264	5.5277	0.0091
265	5.5368	0.0091
266	5.5458	0.0090
267	5.5548	0.0090
268	5.5638	0.0090
269	5.5728	0.0090
270	5.5818	0.0090
271	5.5907	0.0089
272	5.5996	0.0089
273	5.6085	0.0089
274	5.6174	0.0089
275	5.6263	0.0089
276	5.6351	0.0088
277	5.6440	0.0088
278	5.6528	0.0088
279	5.6616	0.0088
280	5.6703	0.0088
281	5.6791	0.0088
282	5.6878	0.0087
283	5.6966	0.0087
284	5.7053	0.0087

285	5.7139	0.0087
286	5.7226	0.0087
287	5.7313	0.0087
288	5.7399	0.0086

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0086	0.0009	0.0078
2	0.0087	0.0009	0.0078
3	0.0087	0.0009	0.0078
4	0.0087	0.0009	0.0078
5	0.0087	0.0009	0.0078
6	0.0088	0.0009	0.0079
7	0.0088	0.0009	0.0079
8	0.0088	0.0009	0.0079
9	0.0088	0.0009	0.0079
10	0.0089	0.0009	0.0080
11	0.0089	0.0009	0.0080
12	0.0089	0.0009	0.0080
13	0.0090	0.0009	0.0080
14	0.0090	0.0009	0.0081
15	0.0090	0.0009	0.0081
16	0.0090	0.0009	0.0081
17	0.0091	0.0009	0.0081
18	0.0091	0.0009	0.0082
19	0.0091	0.0009	0.0082
20	0.0092	0.0009	0.0082
21	0.0092	0.0009	0.0083
22	0.0092	0.0009	0.0083
23	0.0093	0.0009	0.0083
24	0.0093	0.0009	0.0083
25	0.0093	0.0010	0.0084
26	0.0093	0.0010	0.0084
27	0.0094	0.0010	0.0084
28	0.0094	0.0010	0.0084
29	0.0094	0.0010	0.0085
30	0.0095	0.0010	0.0085
31	0.0095	0.0010	0.0085
32	0.0095	0.0010	0.0086
33	0.0096	0.0010	0.0086
34	0.0096	0.0010	0.0086
35	0.0096	0.0010	0.0087
36	0.0097	0.0010	0.0087
37	0.0097	0.0010	0.0087
38	0.0097	0.0010	0.0087
39	0.0098	0.0010	0.0088
40	0.0098	0.0010	0.0088
41	0.0099	0.0010	0.0089

42	0.0099	0.0010	0.0089
43	0.0099	0.0010	0.0089
44	0.0100	0.0010	0.0089
45	0.0100	0.0010	0.0090
46	0.0100	0.0010	0.0090
47	0.0101	0.0010	0.0091
48	0.0101	0.0010	0.0091
49	0.0102	0.0010	0.0091
50	0.0102	0.0010	0.0092
51	0.0103	0.0010	0.0092
52	0.0103	0.0010	0.0092
53	0.0103	0.0011	0.0093
54	0.0104	0.0011	0.0093
55	0.0104	0.0011	0.0094
56	0.0104	0.0011	0.0094
57	0.0105	0.0011	0.0094
58	0.0105	0.0011	0.0095
59	0.0106	0.0011	0.0095
60	0.0106	0.0011	0.0095
61	0.0107	0.0011	0.0096
62	0.0107	0.0011	0.0096
63	0.0108	0.0011	0.0097
64	0.0108	0.0011	0.0097
65	0.0109	0.0011	0.0098
66	0.0109	0.0011	0.0098
67	0.0110	0.0011	0.0099
68	0.0110	0.0011	0.0099
69	0.0111	0.0011	0.0099
70	0.0111	0.0011	0.0100
71	0.0112	0.0011	0.0100
72	0.0112	0.0011	0.0101
73	0.0113	0.0012	0.0101
74	0.0113	0.0012	0.0102
75	0.0114	0.0012	0.0102
76	0.0114	0.0012	0.0103
77	0.0115	0.0012	0.0103
78	0.0115	0.0012	0.0104
79	0.0116	0.0012	0.0104
80	0.0117	0.0012	0.0105
81	0.0117	0.0012	0.0105
82	0.0118	0.0012	0.0106
83	0.0119	0.0012	0.0106
84	0.0119	0.0012	0.0107
85	0.0120	0.0012	0.0108
86	0.0120	0.0012	0.0108
87	0.0121	0.0012	0.0109
88	0.0121	0.0012	0.0109
89	0.0122	0.0012	0.0110
90	0.0123	0.0013	0.0110
91	0.0124	0.0013	0.0111

92	0.0124	0.0013	0.0112
93	0.0125	0.0013	0.0112
94	0.0126	0.0013	0.0113
95	0.0127	0.0013	0.0114
96	0.0127	0.0013	0.0114
97	0.0128	0.0013	0.0115
98	0.0129	0.0013	0.0115
99	0.0130	0.0013	0.0116
100	0.0130	0.0013	0.0117
101	0.0131	0.0013	0.0118
102	0.0132	0.0013	0.0118
103	0.0133	0.0014	0.0119
104	0.0133	0.0014	0.0120
105	0.0135	0.0014	0.0121
106	0.0135	0.0014	0.0121
107	0.0136	0.0014	0.0122
108	0.0137	0.0014	0.0123
109	0.0138	0.0014	0.0124
110	0.0139	0.0014	0.0125
111	0.0140	0.0014	0.0126
112	0.0141	0.0014	0.0126
113	0.0142	0.0014	0.0128
114	0.0143	0.0015	0.0128
115	0.0144	0.0015	0.0129
116	0.0145	0.0015	0.0130
117	0.0146	0.0015	0.0131
118	0.0147	0.0015	0.0132
119	0.0149	0.0015	0.0133
120	0.0149	0.0015	0.0134
121	0.0151	0.0015	0.0135
122	0.0152	0.0015	0.0136
123	0.0153	0.0016	0.0138
124	0.0154	0.0016	0.0138
125	0.0156	0.0016	0.0140
126	0.0157	0.0016	0.0141
127	0.0159	0.0016	0.0142
128	0.0159	0.0016	0.0143
129	0.0161	0.0016	0.0145
130	0.0162	0.0017	0.0146
131	0.0164	0.0017	0.0148
132	0.0165	0.0017	0.0148
133	0.0167	0.0017	0.0150
134	0.0168	0.0017	0.0151
135	0.0171	0.0017	0.0153
136	0.0172	0.0018	0.0154
137	0.0174	0.0018	0.0156
138	0.0175	0.0018	0.0157
139	0.0178	0.0018	0.0160
140	0.0179	0.0018	0.0161
141	0.0182	0.0019	0.0163

142	0.0183	0.0019	0.0164
143	0.0186	0.0019	0.0167
144	0.0187	0.0019	0.0168
145	0.0215	0.0022	0.0193
146	0.0217	0.0022	0.0194
147	0.0220	0.0022	0.0197
148	0.0221	0.0023	0.0199
149	0.0225	0.0023	0.0202
150	0.0227	0.0023	0.0203
151	0.0230	0.0023	0.0207
152	0.0232	0.0024	0.0209
153	0.0236	0.0024	0.0212
154	0.0238	0.0024	0.0214
155	0.0242	0.0025	0.0218
156	0.0245	0.0025	0.0220
157	0.0249	0.0025	0.0224
158	0.0252	0.0026	0.0226
159	0.0257	0.0026	0.0231
160	0.0259	0.0026	0.0233
161	0.0265	0.0027	0.0238
162	0.0268	0.0027	0.0240
163	0.0274	0.0028	0.0246
164	0.0277	0.0028	0.0249
165	0.0284	0.0029	0.0255
166	0.0287	0.0029	0.0258
167	0.0295	0.0030	0.0265
168	0.0299	0.0030	0.0268
169	0.0308	0.0031	0.0276
170	0.0312	0.0032	0.0280
171	0.0322	0.0033	0.0289
172	0.0327	0.0033	0.0294
173	0.0338	0.0034	0.0304
174	0.0344	0.0035	0.0309
175	0.0357	0.0036	0.0321
176	0.0364	0.0037	0.0327
177	0.0380	0.0039	0.0341
178	0.0388	0.0040	0.0349
179	0.0407	0.0042	0.0365
180	0.0418	0.0043	0.0375
181	0.0441	0.0045	0.0396
182	0.0455	0.0046	0.0408
183	0.0486	0.0050	0.0436
184	0.0504	0.0051	0.0452
185	0.0448	0.0046	0.0402
186	0.0473	0.0048	0.0425
187	0.0537	0.0052	0.0485
188	0.0579	0.0052	0.0527
189	0.0698	0.0052	0.0645
190	0.0788	0.0052	0.0735
191	0.1126	0.0052	0.1073

192	0.1548	0.0052	0.1496
193	0.4845	0.0052	0.4793
194	0.0917	0.0052	0.0865
195	0.0631	0.0052	0.0579
196	0.0502	0.0051	0.0451
197	0.0524	0.0052	0.0472
198	0.0469	0.0048	0.0422
199	0.0429	0.0044	0.0385
200	0.0397	0.0041	0.0357
201	0.0372	0.0038	0.0334
202	0.0350	0.0036	0.0315
203	0.0332	0.0034	0.0298
204	0.0317	0.0032	0.0285
205	0.0303	0.0031	0.0272
206	0.0291	0.0030	0.0261
207	0.0280	0.0029	0.0252
208	0.0271	0.0028	0.0243
209	0.0262	0.0027	0.0235
210	0.0254	0.0026	0.0228
211	0.0247	0.0025	0.0222
212	0.0240	0.0025	0.0216
213	0.0234	0.0024	0.0210
214	0.0228	0.0023	0.0205
215	0.0223	0.0023	0.0200
216	0.0218	0.0022	0.0196
217	0.0189	0.0019	0.0169
218	0.0184	0.0019	0.0166
219	0.0180	0.0018	0.0162
220	0.0177	0.0018	0.0159
221	0.0173	0.0018	0.0155
222	0.0170	0.0017	0.0152
223	0.0166	0.0017	0.0149
224	0.0163	0.0017	0.0147
225	0.0160	0.0016	0.0144
226	0.0158	0.0016	0.0142
227	0.0155	0.0016	0.0139
228	0.0152	0.0016	0.0137
229	0.0150	0.0015	0.0135
230	0.0148	0.0015	0.0133
231	0.0146	0.0015	0.0131
232	0.0143	0.0015	0.0129
233	0.0141	0.0014	0.0127
234	0.0139	0.0014	0.0125
235	0.0138	0.0014	0.0124
236	0.0136	0.0014	0.0122
237	0.0134	0.0014	0.0120
238	0.0132	0.0013	0.0119
239	0.0131	0.0013	0.0117
240	0.0129	0.0013	0.0116
241	0.0128	0.0013	0.0115

242	0.0126	0.0013	0.0113
243	0.0125	0.0013	0.0112
244	0.0123	0.0013	0.0111
245	0.0122	0.0012	0.0109
246	0.0121	0.0012	0.0108
247	0.0119	0.0012	0.0107
248	0.0118	0.0012	0.0106
249	0.0117	0.0012	0.0105
250	0.0116	0.0012	0.0104
251	0.0115	0.0012	0.0103
252	0.0114	0.0012	0.0102
253	0.0112	0.0011	0.0101
254	0.0111	0.0011	0.0100
255	0.0110	0.0011	0.0099
256	0.0109	0.0011	0.0098
257	0.0108	0.0011	0.0097
258	0.0107	0.0011	0.0097
259	0.0107	0.0011	0.0096
260	0.0106	0.0011	0.0095
261	0.0105	0.0011	0.0094
262	0.0104	0.0011	0.0093
263	0.0103	0.0011	0.0093
264	0.0102	0.0010	0.0092
265	0.0101	0.0010	0.0091
266	0.0101	0.0010	0.0090
267	0.0100	0.0010	0.0090
268	0.0099	0.0010	0.0089
269	0.0098	0.0010	0.0088
270	0.0098	0.0010	0.0088
271	0.0097	0.0010	0.0087
272	0.0096	0.0010	0.0086
273	0.0096	0.0010	0.0086
274	0.0095	0.0010	0.0085
275	0.0094	0.0010	0.0085
276	0.0094	0.0010	0.0084
277	0.0093	0.0009	0.0083
278	0.0092	0.0009	0.0083
279	0.0092	0.0009	0.0082
280	0.0091	0.0009	0.0082
281	0.0091	0.0009	0.0081
282	0.0090	0.0009	0.0081
283	0.0089	0.0009	0.0080
284	0.0089	0.0009	0.0080
285	0.0088	0.0009	0.0079
286	0.0088	0.0009	0.0079
287	0.0087	0.0009	0.0078
288	0.0087	0.0009	0.0078

Total soil rain loss = 0.51(In)

Total effective rainfall = 5.23(In)
Peak flow rate in flood hydrograph = 37.10(CFS)

++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	10.0	20.0	30.0	40.0
0+ 5	0.0003	0.04	Q				
0+10	0.0022	0.28	Q				
0+15	0.0071	0.70	Q				
0+20	0.0140	1.01	VQ				
0+25	0.0219	1.14	VQ				
0+30	0.0301	1.19	VQ				
0+35	0.0384	1.20	VQ				
0+40	0.0468	1.21	VQ				
0+45	0.0551	1.22	VQ				
0+50	0.0636	1.22	VQ				
0+55	0.0720	1.23	VQ				
1+ 0	0.0805	1.23	VQ				
1+ 5	0.0890	1.23	VQ				
1+10	0.0975	1.24	VQ				
1+15	0.1060	1.24	VQ				
1+20	0.1146	1.24	VQ				
1+25	0.1232	1.25	VQ				
1+30	0.1318	1.25	VQ				
1+35	0.1405	1.26	|Q				
1+40	0.1492	1.26	|Q				
1+45	0.1579	1.27	|Q				
1+50	0.1666	1.27	|Q				
1+55	0.1754	1.27	|Q				
2+ 0	0.1842	1.28	|Q				
2+ 5	0.1930	1.28	|Q				
2+10	0.2019	1.29	|Q				
2+15	0.2108	1.29	|Q				
2+20	0.2197	1.29	|Q				
2+25	0.2286	1.30	|Q				
2+30	0.2376	1.30	|Q				
2+35	0.2466	1.31	|Q				
2+40	0.2557	1.31	|Q				
2+45	0.2647	1.32	|Q				
2+50	0.2738	1.32	|Q				
2+55	0.2830	1.33	|QV				
3+ 0	0.2921	1.33	|QV				
3+ 5	0.3013	1.34	|QV				
3+10	0.3106	1.34	|QV				

3+15	0.3199	1.35	QV				
3+20	0.3292	1.35	QV				
3+25	0.3385	1.36	QV				
3+30	0.3479	1.36	QV				
3+35	0.3573	1.37	QV				
3+40	0.3667	1.37	QV				
3+45	0.3762	1.38	QV				
3+50	0.3857	1.38	QV				
3+55	0.3952	1.39	QV				
4+ 0	0.4048	1.39	QV				
4+ 5	0.4145	1.40	QV				
4+10	0.4241	1.40	Q V				
4+15	0.4338	1.41	Q V				
4+20	0.4436	1.41	Q V				
4+25	0.4533	1.42	Q V				
4+30	0.4631	1.43	Q V				
4+35	0.4730	1.43	Q V				
4+40	0.4829	1.44	Q V				
4+45	0.4928	1.44	Q V				
4+50	0.5028	1.45	Q V				
4+55	0.5128	1.45	Q V				
5+ 0	0.5229	1.46	Q V				
5+ 5	0.5330	1.47	Q V				
5+10	0.5431	1.47	Q V				
5+15	0.5533	1.48	Q V				
5+20	0.5636	1.49	Q V				
5+25	0.5738	1.49	Q V				
5+30	0.5841	1.50	Q V				
5+35	0.5945	1.51	Q V				
5+40	0.6049	1.51	Q V				
5+45	0.6154	1.52	Q V				
5+50	0.6259	1.53	Q V				
5+55	0.6365	1.53	Q V				
6+ 0	0.6471	1.54	Q V				
6+ 5	0.6577	1.55	Q V				
6+10	0.6684	1.55	Q V				
6+15	0.6792	1.56	Q V				
6+20	0.6900	1.57	Q V				
6+25	0.7008	1.58	Q V				
6+30	0.7117	1.58	Q V				
6+35	0.7227	1.59	Q V				
6+40	0.7337	1.60	Q V				
6+45	0.7448	1.61	Q V				
6+50	0.7559	1.62	Q V				
6+55	0.7671	1.62	Q V				
7+ 0	0.7783	1.63	Q V				
7+ 5	0.7896	1.64	Q V				
7+10	0.8010	1.65	Q V				
7+15	0.8124	1.66	Q V				
7+20	0.8239	1.67	Q V				

```
 7+25       0.8354      1.68  |Q    V   |          |          |          |
 7+30       0.8470      1.68  |Q    V   |          |          |          |
 7+35       0.8587      1.69  |Q    V   |          |          |          |
 7+40       0.8704      1.70  |Q    V   |          |          |          |
 7+45       0.8822      1.71  |Q    V   |          |          |          |
 7+50       0.8940      1.72  |Q    V   |          |          |          |
 7+55       0.9060      1.73  |Q    V   |          |          |          |
 8+ 0       0.9180      1.74  |Q    V   |          |          |          |
 8+ 5       0.9300      1.75  |Q    V   |          |          |          |
 8+10       0.9421      1.76  |Q    V   |          |          |          |
 8+15       0.9543      1.77  |Q    V   |          |          |          |
 8+20       0.9666      1.78  |Q    V   |          |          |          |
 8+25       0.9790      1.79  |Q     V  |          |          |          |
 8+30       0.9914      1.80  |Q     V  |          |          |          |
 8+35       1.0039      1.81  |Q     V  |          |          |          |
 8+40       1.0165      1.83  |Q     V  |          |          |          |
 8+45       1.0291      1.84  |Q     V  |          |          |          |
 8+50       1.0419      1.85  |Q     V  |          |          |          |
 8+55       1.0547      1.86  |Q     V  |          |          |          |
 9+ 0       1.0676      1.87  |Q     V  |          |          |          |
 9+ 5       1.0806      1.89  |Q     V  |          |          |          |
 9+10       1.0936      1.90  |Q     V  |          |          |          |
 9+15       1.1068      1.91  |Q     V  |          |          |          |
 9+20       1.1200      1.92  |Q      V |          |          |          |
 9+25       1.1334      1.94  |Q      V |          |          |          |
 9+30       1.1468      1.95  |Q      V |          |          |          |
 9+35       1.1603      1.96  |Q      V |          |          |          |
 9+40       1.1740      1.98  |Q      V |          |          |          |
 9+45       1.1877      1.99  |Q      V |          |          |          |
 9+50       1.2015      2.01  | Q     V |          |          |          |
 9+55       1.2154      2.02  | Q     V |          |          |          |
10+ 0       1.2295      2.04  | Q     V |          |          |          |
10+ 5       1.2436      2.05  | Q     V |          |          |          |
10+10       1.2579      2.07  | Q      V|          |          |          |
10+15       1.2722      2.08  | Q      V|          |          |          |
10+20       1.2867      2.10  | Q      V|          |          |          |
10+25       1.3013      2.12  | Q      V|          |          |          |
10+30       1.3160      2.14  | Q      V|          |          |          |
10+35       1.3308      2.15  | Q      V|          |          |          |
10+40       1.3458      2.17  | Q      V|          |          |          |
10+45       1.3609      2.19  | Q      V|          |          |          |
10+50       1.3761      2.21  | Q      V|          |          |          |
10+55       1.3914      2.23  | Q       V          |          |          |
11+ 0       1.4069      2.25  | Q       V          |          |          |
11+ 5       1.4225      2.27  | Q       V          |          |          |
11+10       1.4383      2.29  | Q       V          |          |          |
11+15       1.4542      2.31  | Q       V          |          |          |
11+20       1.4703      2.33  | Q       V          |          |          |
11+25       1.4865      2.36  | Q       V          |          |          |
11+30       1.5029      2.38  | Q       V          |          |          |
```

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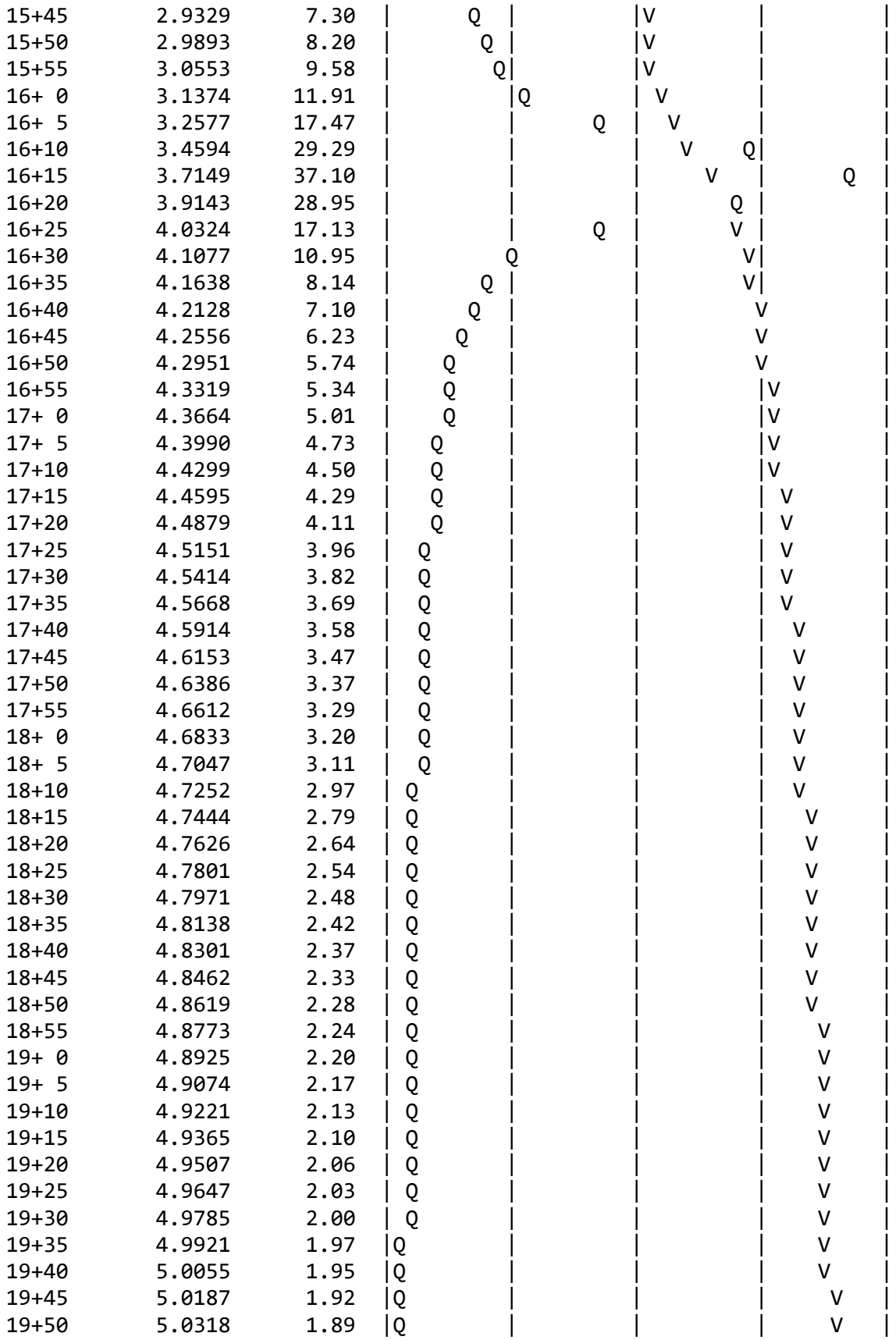
11+35       1.5195      2.40  | Q       V         |         |         |
11+40       1.5362      2.43  | Q       |V        |         |         |
11+45       1.5531      2.45  | Q       |V        |         |         |
11+50       1.5701      2.48  | Q       |V        |         |         |
11+55       1.5874      2.51  | Q       |V        |         |         |
12+ 0       1.6049      2.53  | Q       |V        |         |         |
12+ 5       1.6226      2.57  | Q       |V        |         |         |
12+10       1.6410      2.67  | Q       |V        |         |         |
12+15       1.6605      2.82  | Q       |V        |         |         |
12+20       1.6807      2.94  | Q       | V       |         |         |
12+25       1.7015      3.01  |  Q      | V       |         |         |
12+30       1.7226      3.06  |  Q      | V       |         |         |
12+35       1.7439      3.10  |  Q      | V       |         |         |
12+40       1.7655      3.14  |  Q      | V       |         |         |
12+45       1.7874      3.18  |  Q      | V       |         |         |
12+50       1.8096      3.21  |  Q      |  V      |         |         |
12+55       1.8320      3.26  |  Q      |  V      |         |         |
13+ 0       1.8547      3.30  |  Q      |  V      |         |         |
13+ 5       1.8777      3.34  |  Q      |  V      |         |         |
13+10       1.9010      3.39  |  Q      |  V      |         |         |
13+15       1.9247      3.43  |  Q      |  V      |         |         |
13+20       1.9487      3.48  |  Q      |   V     |         |         |
13+25       1.9730      3.54  |  Q      |   V     |         |         |
13+30       1.9977      3.59  |  Q      |   V     |         |         |
13+35       2.0229      3.65  |  Q      |   V     |         |         |
13+40       2.0484      3.71  |  Q      |   V     |         |         |
13+45       2.0743      3.77  |  Q      |   V     |         |         |
13+50       2.1007      3.83  |  Q      |    V    |         |         |
13+55       2.1276      3.90  |  Q      |    V    |         |         |
14+ 0       2.1550      3.98  |  Q      |    V    |         |         |
14+ 5       2.1829      4.05  |   Q     |    V    |         |         |
14+10       2.2114      4.13  |   Q     |    V    |         |         |
14+15       2.2405      4.22  |   Q     |     V   |         |         |
14+20       2.2702      4.32  |   Q     |     V   |         |         |
14+25       2.3006      4.41  |   Q     |     V   |         |         |
14+30       2.3317      4.52  |   Q     |     V   |         |         |
14+35       2.3636      4.63  |   Q     |     V   |         |         |
14+40       2.3964      4.76  |   Q     |      V  |         |         |
14+45       2.4300      4.89  |   Q     |      V  |         |         |
14+50       2.4647      5.03  |    Q    |      V  |         |         |
14+55       2.5004      5.19  |    Q    |      V  |         |         |
15+ 0       2.5374      5.36  |    Q    |       V |         |         |
15+ 5       2.5756      5.55  |    Q    |       V |         |         |
15+10       2.6153      5.77  |    Q    |       V |         |         |
15+15       2.6567      6.01  |     Q   |        V|         |         |
15+20       2.6999      6.28  |     Q   |        V|         |         |
15+25       2.7450      6.54  |     Q   |        V|         |         |
15+30       2.7906      6.63  |     Q   |         V         |         |
15+35       2.8360      6.59  |     Q   |         V         |         |
15+40       2.8826      6.76  |     Q   |         V         |         |
```



19+55	5.0447	1.87	Q				V
20+ 0	5.0574	1.85	Q				V
20+ 5	5.0699	1.82	Q				V
20+10	5.0823	1.80	Q				V
20+15	5.0946	1.78	Q				V
20+20	5.1067	1.76	Q				V
20+25	5.1186	1.74	Q				V
20+30	5.1305	1.72	Q				V
20+35	5.1422	1.70	Q				V
20+40	5.1537	1.68	Q				V
20+45	5.1652	1.66	Q				V
20+50	5.1765	1.65	Q				V
20+55	5.1877	1.63	Q				V
21+ 0	5.1989	1.61	Q				V
21+ 5	5.2099	1.60	Q				V
21+10	5.2207	1.58	Q				V
21+15	5.2315	1.57	Q				V
21+20	5.2422	1.55	Q				V
21+25	5.2528	1.54	Q				V
21+30	5.2633	1.52	Q				V
21+35	5.2737	1.51	Q				V
21+40	5.2840	1.50	Q				V
21+45	5.2942	1.48	Q				V
21+50	5.3043	1.47	Q				V
21+55	5.3144	1.46	Q				V
22+ 0	5.3244	1.45	Q				V
22+ 5	5.3342	1.43	Q				V
22+10	5.3440	1.42	Q				V
22+15	5.3538	1.41	Q				V
22+20	5.3634	1.40	Q				V
22+25	5.3730	1.39	Q				V
22+30	5.3825	1.38	Q				V
22+35	5.3919	1.37	Q				V
22+40	5.4013	1.36	Q				V
22+45	5.4106	1.35	Q				V
22+50	5.4198	1.34	Q				V
22+55	5.4289	1.33	Q				V
23+ 0	5.4380	1.32	Q				V
23+ 5	5.4471	1.31	Q				V
23+10	5.4560	1.30	Q				V
23+15	5.4649	1.29	Q				V
23+20	5.4738	1.28	Q				V
23+25	5.4826	1.28	Q				V
23+30	5.4913	1.27	Q				V
23+35	5.5000	1.26	Q				V
23+40	5.5086	1.25	Q				V
23+45	5.5172	1.24	Q				V
23+50	5.5257	1.24	Q				V
23+55	5.5341	1.23	Q				V
24+ 0	5.5425	1.22	Q				V

UNIT HYDROGRAPH ANALYSIS (100-YEAR STORM, 24 HOUR)

POST-DEVELOPMENT CONDITION

U n i t H y d r o g r a p h A n a l y s i s

Study date 03/23/22

++

San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6277

Job No. 2021-502
5355 Airport Drive
100 YR STORM UNIT HYDROGRAPH ANALYSIS
POST-CONDITION, AREA A

Storm Event Year = 100

Antecedent Moisture Condition = 3

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 100		
12.85	1	1.31
Rainfall data for year 100		
12.85	6	3.15
Rainfall data for year 100		
12.85	24	5.74

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 3)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
32.0	52.0	12.85	1.000	0.785	0.110	0.086

Area-averaged adjusted loss rate Fm (In/Hr) = 0.086

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC3)	S	Pervious Yield Fr
1.41	0.110	32.0	52.0	9.23	0.201
11.44	0.890	98.0	98.0	0.20	0.959

Area-averaged catchment yield fraction, Y = 0.875
Area-averaged low loss fraction, Yb = 0.125
User entry of time of concentration = 0.240 (hours)
++
Watershed area = 12.85(Ac.)
Catchment Lag time = 0.192 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 43.4450
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.086(In/Hr)
Average low loss rate fraction (Yb) = 0.125 (decimal)
VALLEY DEVELOPED S-Graph Selected
Computed peak 5-minute rainfall = 0.485(In)
Computed peak 30-minute rainfall = 0.993(In)
Specified peak 1-hour rainfall = 1.310(In)
Computed peak 3-hour rainfall = 2.243(In)
Specified peak 6-hour rainfall = 3.150(In)
Specified peak 24-hour rainfall = 5.740(In)

Rainfall depth area reduction factors:
Using a total area of 12.85(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.485(In)
30-minute factor = 0.999 Adjusted rainfall = 0.992(In)
1-hour factor = 0.999 Adjusted rainfall = 1.309(In)
3-hour factor = 1.000 Adjusted rainfall = 2.243(In)
6-hour factor = 1.000 Adjusted rainfall = 3.150(In)
24-hour factor = 1.000 Adjusted rainfall = 5.740(In)

U n i t H y d r o g r a p h
++

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 155.40 (CFS))	
1	3.515	5.462
2	22.886	30.103
3	57.004	53.022
4	82.983	40.372
5	93.828	16.853
6	97.846	6.245
7	98.883	1.611
8	99.657	1.203
9	100.000	0.533

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.4845	0.4845
2	0.6394	0.1548
3	0.7519	0.1126
4	0.8436	0.0917
5	0.9224	0.0788
6	0.9922	0.0698
7	1.0553	0.0631
8	1.1132	0.0579
9	1.1669	0.0537
10	1.2171	0.0502
11	1.2644	0.0473
12	1.3092	0.0448
13	1.3616	0.0524
14	1.4120	0.0504
15	1.4605	0.0486
16	1.5075	0.0469
17	1.5529	0.0455
18	1.5971	0.0441
19	1.6399	0.0429
20	1.6817	0.0418
21	1.7224	0.0407
22	1.7621	0.0397
23	1.8009	0.0388
24	1.8389	0.0380
25	1.8761	0.0372
26	1.9125	0.0364
27	1.9482	0.0357
28	1.9832	0.0350
29	2.0176	0.0344
30	2.0514	0.0338
31	2.0847	0.0332
32	2.1174	0.0327
33	2.1496	0.0322

34	2.1812	0.0317
35	2.2125	0.0312
36	2.2432	0.0308
37	2.2735	0.0303
38	2.3034	0.0299
39	2.3329	0.0295
40	2.3620	0.0291
41	2.3907	0.0287
42	2.4191	0.0284
43	2.4472	0.0280
44	2.4749	0.0277
45	2.5022	0.0274
46	2.5293	0.0271
47	2.5561	0.0268
48	2.5826	0.0265
49	2.6088	0.0262
50	2.6347	0.0259
51	2.6604	0.0257
52	2.6858	0.0254
53	2.7110	0.0252
54	2.7359	0.0249
55	2.7606	0.0247
56	2.7851	0.0245
57	2.8094	0.0242
58	2.8334	0.0240
59	2.8572	0.0238
60	2.8808	0.0236
61	2.9042	0.0234
62	2.9275	0.0232
63	2.9505	0.0230
64	2.9733	0.0228
65	2.9960	0.0227
66	3.0185	0.0225
67	3.0408	0.0223
68	3.0629	0.0221
69	3.0849	0.0220
70	3.1067	0.0218
71	3.1284	0.0217
72	3.1499	0.0215
73	3.1687	0.0189
74	3.1875	0.0187
75	3.2060	0.0186
76	3.2245	0.0184
77	3.2428	0.0183
78	3.2609	0.0182
79	3.2790	0.0180
80	3.2969	0.0179
81	3.3146	0.0178
82	3.3323	0.0177
83	3.3498	0.0175

84	3.3672	0.0174
85	3.3845	0.0173
86	3.4017	0.0172
87	3.4188	0.0171
88	3.4357	0.0170
89	3.4526	0.0168
90	3.4693	0.0167
91	3.4859	0.0166
92	3.5025	0.0165
93	3.5189	0.0164
94	3.5352	0.0163
95	3.5515	0.0162
96	3.5676	0.0161
97	3.5836	0.0160
98	3.5996	0.0159
99	3.6154	0.0159
100	3.6312	0.0158
101	3.6469	0.0157
102	3.6625	0.0156
103	3.6780	0.0155
104	3.6934	0.0154
105	3.7087	0.0153
106	3.7239	0.0152
107	3.7391	0.0152
108	3.7542	0.0151
109	3.7692	0.0150
110	3.7841	0.0149
111	3.7990	0.0149
112	3.8138	0.0148
113	3.8285	0.0147
114	3.8431	0.0146
115	3.8577	0.0146
116	3.8721	0.0145
117	3.8866	0.0144
118	3.9009	0.0143
119	3.9152	0.0143
120	3.9294	0.0142
121	3.9435	0.0141
122	3.9576	0.0141
123	3.9716	0.0140
124	3.9856	0.0139
125	3.9994	0.0139
126	4.0133	0.0138
127	4.0270	0.0138
128	4.0407	0.0137
129	4.0543	0.0136
130	4.0679	0.0136
131	4.0814	0.0135
132	4.0949	0.0135
133	4.1083	0.0134

134	4.1216	0.0133
135	4.1349	0.0133
136	4.1481	0.0132
137	4.1613	0.0132
138	4.1744	0.0131
139	4.1875	0.0131
140	4.2005	0.0130
141	4.2135	0.0130
142	4.2264	0.0129
143	4.2392	0.0129
144	4.2521	0.0128
145	4.2648	0.0128
146	4.2775	0.0127
147	4.2902	0.0127
148	4.3028	0.0126
149	4.3153	0.0126
150	4.3279	0.0125
151	4.3403	0.0125
152	4.3527	0.0124
153	4.3651	0.0124
154	4.3774	0.0123
155	4.3897	0.0123
156	4.4020	0.0122
157	4.4142	0.0122
158	4.4263	0.0121
159	4.4384	0.0121
160	4.4505	0.0121
161	4.4625	0.0120
162	4.4745	0.0120
163	4.4864	0.0119
164	4.4983	0.0119
165	4.5101	0.0119
166	4.5220	0.0118
167	4.5337	0.0118
168	4.5455	0.0117
169	4.5572	0.0117
170	4.5688	0.0117
171	4.5804	0.0116
172	4.5920	0.0116
173	4.6035	0.0115
174	4.6150	0.0115
175	4.6265	0.0115
176	4.6379	0.0114
177	4.6493	0.0114
178	4.6607	0.0114
179	4.6720	0.0113
180	4.6833	0.0113
181	4.6945	0.0112
182	4.7057	0.0112
183	4.7169	0.0112

184	4.7280	0.0111
185	4.7391	0.0111
186	4.7502	0.0111
187	4.7612	0.0110
188	4.7722	0.0110
189	4.7832	0.0110
190	4.7942	0.0109
191	4.8051	0.0109
192	4.8159	0.0109
193	4.8268	0.0108
194	4.8376	0.0108
195	4.8484	0.0108
196	4.8591	0.0107
197	4.8698	0.0107
198	4.8805	0.0107
199	4.8912	0.0107
200	4.9018	0.0106
201	4.9124	0.0106
202	4.9230	0.0106
203	4.9335	0.0105
204	4.9440	0.0105
205	4.9545	0.0105
206	4.9649	0.0104
207	4.9753	0.0104
208	4.9857	0.0104
209	4.9961	0.0104
210	5.0064	0.0103
211	5.0167	0.0103
212	5.0270	0.0103
213	5.0373	0.0103
214	5.0475	0.0102
215	5.0577	0.0102
216	5.0678	0.0102
217	5.0780	0.0101
218	5.0881	0.0101
219	5.0982	0.0101
220	5.1083	0.0101
221	5.1183	0.0100
222	5.1283	0.0100
223	5.1383	0.0100
224	5.1483	0.0100
225	5.1582	0.0099
226	5.1681	0.0099
227	5.1780	0.0099
228	5.1878	0.0099
229	5.1977	0.0098
230	5.2075	0.0098
231	5.2173	0.0098
232	5.2271	0.0098
233	5.2368	0.0097

234	5.2465	0.0097
235	5.2562	0.0097
236	5.2659	0.0097
237	5.2755	0.0096
238	5.2851	0.0096
239	5.2947	0.0096
240	5.3043	0.0096
241	5.3139	0.0096
242	5.3234	0.0095
243	5.3329	0.0095
244	5.3424	0.0095
245	5.3519	0.0095
246	5.3613	0.0094
247	5.3707	0.0094
248	5.3801	0.0094
249	5.3895	0.0094
250	5.3989	0.0094
251	5.4082	0.0093
252	5.4175	0.0093
253	5.4268	0.0093
254	5.4361	0.0093
255	5.4454	0.0093
256	5.4546	0.0092
257	5.4638	0.0092
258	5.4730	0.0092
259	5.4822	0.0092
260	5.4913	0.0092
261	5.5005	0.0091
262	5.5096	0.0091
263	5.5187	0.0091
264	5.5277	0.0091
265	5.5368	0.0091
266	5.5458	0.0090
267	5.5548	0.0090
268	5.5638	0.0090
269	5.5728	0.0090
270	5.5818	0.0090
271	5.5907	0.0089
272	5.5996	0.0089
273	5.6085	0.0089
274	5.6174	0.0089
275	5.6263	0.0089
276	5.6351	0.0088
277	5.6440	0.0088
278	5.6528	0.0088
279	5.6616	0.0088
280	5.6703	0.0088
281	5.6791	0.0088
282	5.6878	0.0087
283	5.6966	0.0087

284	5.7053	0.0087	
285	5.7139	0.0087	
286	5.7226	0.0087	
287	5.7313	0.0087	
288	5.7399	0.0086	

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0086	0.0011	0.0076
2	0.0087	0.0011	0.0076
3	0.0087	0.0011	0.0076
4	0.0087	0.0011	0.0076
5	0.0087	0.0011	0.0076
6	0.0088	0.0011	0.0077
7	0.0088	0.0011	0.0077
8	0.0088	0.0011	0.0077
9	0.0088	0.0011	0.0077
10	0.0089	0.0011	0.0078
11	0.0089	0.0011	0.0078
12	0.0089	0.0011	0.0078
13	0.0090	0.0011	0.0078
14	0.0090	0.0011	0.0079
15	0.0090	0.0011	0.0079
16	0.0090	0.0011	0.0079
17	0.0091	0.0011	0.0079
18	0.0091	0.0011	0.0080
19	0.0091	0.0011	0.0080
20	0.0092	0.0011	0.0080
21	0.0092	0.0011	0.0080
22	0.0092	0.0011	0.0081
23	0.0093	0.0012	0.0081
24	0.0093	0.0012	0.0081
25	0.0093	0.0012	0.0082
26	0.0093	0.0012	0.0082
27	0.0094	0.0012	0.0082
28	0.0094	0.0012	0.0082
29	0.0094	0.0012	0.0083
30	0.0095	0.0012	0.0083
31	0.0095	0.0012	0.0083
32	0.0095	0.0012	0.0083
33	0.0096	0.0012	0.0084
34	0.0096	0.0012	0.0084
35	0.0096	0.0012	0.0084
36	0.0097	0.0012	0.0085
37	0.0097	0.0012	0.0085
38	0.0097	0.0012	0.0085
39	0.0098	0.0012	0.0086
40	0.0098	0.0012	0.0086

41	0.0099	0.0012	0.0086
42	0.0099	0.0012	0.0087
43	0.0099	0.0012	0.0087
44	0.0100	0.0012	0.0087
45	0.0100	0.0012	0.0088
46	0.0100	0.0013	0.0088
47	0.0101	0.0013	0.0088
48	0.0101	0.0013	0.0089
49	0.0102	0.0013	0.0089
50	0.0102	0.0013	0.0089
51	0.0103	0.0013	0.0090
52	0.0103	0.0013	0.0090
53	0.0103	0.0013	0.0090
54	0.0104	0.0013	0.0091
55	0.0104	0.0013	0.0091
56	0.0104	0.0013	0.0091
57	0.0105	0.0013	0.0092
58	0.0105	0.0013	0.0092
59	0.0106	0.0013	0.0093
60	0.0106	0.0013	0.0093
61	0.0107	0.0013	0.0094
62	0.0107	0.0013	0.0094
63	0.0108	0.0013	0.0094
64	0.0108	0.0013	0.0095
65	0.0109	0.0014	0.0095
66	0.0109	0.0014	0.0095
67	0.0110	0.0014	0.0096
68	0.0110	0.0014	0.0096
69	0.0111	0.0014	0.0097
70	0.0111	0.0014	0.0097
71	0.0112	0.0014	0.0098
72	0.0112	0.0014	0.0098
73	0.0113	0.0014	0.0099
74	0.0113	0.0014	0.0099
75	0.0114	0.0014	0.0100
76	0.0114	0.0014	0.0100
77	0.0115	0.0014	0.0101
78	0.0115	0.0014	0.0101
79	0.0116	0.0014	0.0102
80	0.0117	0.0015	0.0102
81	0.0117	0.0015	0.0103
82	0.0118	0.0015	0.0103
83	0.0119	0.0015	0.0104
84	0.0119	0.0015	0.0104
85	0.0120	0.0015	0.0105
86	0.0120	0.0015	0.0105
87	0.0121	0.0015	0.0106
88	0.0121	0.0015	0.0106
89	0.0122	0.0015	0.0107
90	0.0123	0.0015	0.0107

91	0.0124	0.0015	0.0108
92	0.0124	0.0015	0.0109
93	0.0125	0.0016	0.0110
94	0.0126	0.0016	0.0110
95	0.0127	0.0016	0.0111
96	0.0127	0.0016	0.0111
97	0.0128	0.0016	0.0112
98	0.0129	0.0016	0.0113
99	0.0130	0.0016	0.0113
100	0.0130	0.0016	0.0114
101	0.0131	0.0016	0.0115
102	0.0132	0.0016	0.0115
103	0.0133	0.0017	0.0116
104	0.0133	0.0017	0.0117
105	0.0135	0.0017	0.0118
106	0.0135	0.0017	0.0118
107	0.0136	0.0017	0.0119
108	0.0137	0.0017	0.0120
109	0.0138	0.0017	0.0121
110	0.0139	0.0017	0.0121
111	0.0140	0.0017	0.0123
112	0.0141	0.0018	0.0123
113	0.0142	0.0018	0.0124
114	0.0143	0.0018	0.0125
115	0.0144	0.0018	0.0126
116	0.0145	0.0018	0.0127
117	0.0146	0.0018	0.0128
118	0.0147	0.0018	0.0129
119	0.0149	0.0019	0.0130
120	0.0149	0.0019	0.0131
121	0.0151	0.0019	0.0132
122	0.0152	0.0019	0.0133
123	0.0153	0.0019	0.0134
124	0.0154	0.0019	0.0135
125	0.0156	0.0019	0.0136
126	0.0157	0.0020	0.0137
127	0.0159	0.0020	0.0139
128	0.0159	0.0020	0.0140
129	0.0161	0.0020	0.0141
130	0.0162	0.0020	0.0142
131	0.0164	0.0020	0.0144
132	0.0165	0.0021	0.0145
133	0.0167	0.0021	0.0147
134	0.0168	0.0021	0.0147
135	0.0171	0.0021	0.0149
136	0.0172	0.0021	0.0150
137	0.0174	0.0022	0.0152
138	0.0175	0.0022	0.0153
139	0.0178	0.0022	0.0156
140	0.0179	0.0022	0.0157

141	0.0182	0.0023	0.0159
142	0.0183	0.0023	0.0160
143	0.0186	0.0023	0.0163
144	0.0187	0.0023	0.0164
145	0.0215	0.0027	0.0188
146	0.0217	0.0027	0.0190
147	0.0220	0.0027	0.0192
148	0.0221	0.0028	0.0194
149	0.0225	0.0028	0.0197
150	0.0227	0.0028	0.0198
151	0.0230	0.0029	0.0202
152	0.0232	0.0029	0.0203
153	0.0236	0.0029	0.0207
154	0.0238	0.0030	0.0208
155	0.0242	0.0030	0.0212
156	0.0245	0.0031	0.0214
157	0.0249	0.0031	0.0218
158	0.0252	0.0031	0.0220
159	0.0257	0.0032	0.0225
160	0.0259	0.0032	0.0227
161	0.0265	0.0033	0.0232
162	0.0268	0.0033	0.0234
163	0.0274	0.0034	0.0240
164	0.0277	0.0035	0.0243
165	0.0284	0.0035	0.0248
166	0.0287	0.0036	0.0252
167	0.0295	0.0037	0.0258
168	0.0299	0.0037	0.0262
169	0.0308	0.0038	0.0269
170	0.0312	0.0039	0.0273
171	0.0322	0.0040	0.0282
172	0.0327	0.0041	0.0286
173	0.0338	0.0042	0.0296
174	0.0344	0.0043	0.0301
175	0.0357	0.0045	0.0313
176	0.0364	0.0045	0.0319
177	0.0380	0.0047	0.0332
178	0.0388	0.0048	0.0340
179	0.0407	0.0051	0.0356
180	0.0418	0.0052	0.0365
181	0.0441	0.0055	0.0386
182	0.0455	0.0057	0.0398
183	0.0486	0.0061	0.0425
184	0.0504	0.0063	0.0441
185	0.0448	0.0056	0.0392
186	0.0473	0.0059	0.0414
187	0.0537	0.0067	0.0470
188	0.0579	0.0072	0.0507
189	0.0698	0.0072	0.0626
190	0.0788	0.0072	0.0716

191	0.1126	0.0072	0.1054
192	0.1548	0.0072	0.1476
193	0.4845	0.0072	0.4774
194	0.0917	0.0072	0.0845
195	0.0631	0.0072	0.0559
196	0.0502	0.0063	0.0440
197	0.0524	0.0065	0.0459
198	0.0469	0.0059	0.0411
199	0.0429	0.0054	0.0375
200	0.0397	0.0050	0.0348
201	0.0372	0.0046	0.0325
202	0.0350	0.0044	0.0307
203	0.0332	0.0041	0.0291
204	0.0317	0.0040	0.0277
205	0.0303	0.0038	0.0265
206	0.0291	0.0036	0.0255
207	0.0280	0.0035	0.0245
208	0.0271	0.0034	0.0237
209	0.0262	0.0033	0.0229
210	0.0254	0.0032	0.0222
211	0.0247	0.0031	0.0216
212	0.0240	0.0030	0.0210
213	0.0234	0.0029	0.0205
214	0.0228	0.0028	0.0200
215	0.0223	0.0028	0.0195
216	0.0218	0.0027	0.0191
217	0.0189	0.0024	0.0165
218	0.0184	0.0023	0.0161
219	0.0180	0.0022	0.0158
220	0.0177	0.0022	0.0155
221	0.0173	0.0022	0.0151
222	0.0170	0.0021	0.0148
223	0.0166	0.0021	0.0146
224	0.0163	0.0020	0.0143
225	0.0160	0.0020	0.0140
226	0.0158	0.0020	0.0138
227	0.0155	0.0019	0.0136
228	0.0152	0.0019	0.0133
229	0.0150	0.0019	0.0131
230	0.0148	0.0018	0.0129
231	0.0146	0.0018	0.0127
232	0.0143	0.0018	0.0126
233	0.0141	0.0018	0.0124
234	0.0139	0.0017	0.0122
235	0.0138	0.0017	0.0120
236	0.0136	0.0017	0.0119
237	0.0134	0.0017	0.0117
238	0.0132	0.0017	0.0116
239	0.0131	0.0016	0.0114
240	0.0129	0.0016	0.0113

241	0.0128	0.0016	0.0112
242	0.0126	0.0016	0.0110
243	0.0125	0.0016	0.0109
244	0.0123	0.0015	0.0108
245	0.0122	0.0015	0.0107
246	0.0121	0.0015	0.0106
247	0.0119	0.0015	0.0104
248	0.0118	0.0015	0.0103
249	0.0117	0.0015	0.0102
250	0.0116	0.0014	0.0101
251	0.0115	0.0014	0.0100
252	0.0114	0.0014	0.0099
253	0.0112	0.0014	0.0098
254	0.0111	0.0014	0.0098
255	0.0110	0.0014	0.0097
256	0.0109	0.0014	0.0096
257	0.0108	0.0014	0.0095
258	0.0107	0.0013	0.0094
259	0.0107	0.0013	0.0093
260	0.0106	0.0013	0.0092
261	0.0105	0.0013	0.0092
262	0.0104	0.0013	0.0091
263	0.0103	0.0013	0.0090
264	0.0102	0.0013	0.0089
265	0.0101	0.0013	0.0089
266	0.0101	0.0013	0.0088
267	0.0100	0.0012	0.0087
268	0.0099	0.0012	0.0087
269	0.0098	0.0012	0.0086
270	0.0098	0.0012	0.0085
271	0.0097	0.0012	0.0085
272	0.0096	0.0012	0.0084
273	0.0096	0.0012	0.0084
274	0.0095	0.0012	0.0083
275	0.0094	0.0012	0.0082
276	0.0094	0.0012	0.0082
277	0.0093	0.0012	0.0081
278	0.0092	0.0012	0.0081
279	0.0092	0.0011	0.0080
280	0.0091	0.0011	0.0080
281	0.0091	0.0011	0.0079
282	0.0090	0.0011	0.0079
283	0.0089	0.0011	0.0078
284	0.0089	0.0011	0.0078
285	0.0088	0.0011	0.0077
286	0.0088	0.0011	0.0077
287	0.0087	0.0011	0.0076
288	0.0087	0.0011	0.0076

Total soil rain loss = 0.63(In)
Total effective rainfall = 5.11(In)
Peak flow rate in flood hydrograph = 36.53(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	10.0	20.0	30.0	40.0
0+ 5	0.0003	0.04	Q				
0+10	0.0021	0.27	Q				
0+15	0.0068	0.67	Q				
0+20	0.0135	0.98	Q				
0+25	0.0211	1.11	VQ				
0+30	0.0291	1.16	VQ				
0+35	0.0372	1.17	VQ				
0+40	0.0453	1.19	VQ				
0+45	0.0536	1.19	VQ				
0+50	0.0618	1.20	VQ				
0+55	0.0701	1.20	VQ				
1+ 0	0.0784	1.20	VQ				
1+ 5	0.0867	1.21	VQ				
1+10	0.0950	1.21	VQ				
1+15	0.1034	1.22	VQ				
1+20	0.1118	1.22	VQ				
1+25	0.1203	1.22	VQ				
1+30	0.1287	1.23	VQ				
1+35	0.1372	1.23	|Q				
1+40	0.1457	1.24	|Q				
1+45	0.1542	1.24	|Q				
1+50	0.1628	1.24	|Q				
1+55	0.1714	1.25	|Q				
2+ 0	0.1800	1.25	|Q				
2+ 5	0.1887	1.26	|Q				
2+10	0.1974	1.26	|Q				
2+15	0.2061	1.26	|Q				
2+20	0.2148	1.27	|Q				
2+25	0.2236	1.27	|Q				
2+30	0.2324	1.28	|Q				
2+35	0.2412	1.28	|Q				
2+40	0.2501	1.29	|Q				
2+45	0.2590	1.29	|Q				
2+50	0.2679	1.30	|Q				
2+55	0.2768	1.30	|QV				
3+ 0	0.2858	1.30	|QV				
3+ 5	0.2948	1.31	|QV				

3+10	0.3039	1.31	QV				
3+15	0.3130	1.32	QV				
3+20	0.3221	1.32	QV				
3+25	0.3312	1.33	QV				
3+30	0.3404	1.33	QV				
3+35	0.3496	1.34	QV				
3+40	0.3589	1.34	QV				
3+45	0.3682	1.35	QV				
3+50	0.3775	1.35	QV				
3+55	0.3869	1.36	QV				
4+ 0	0.3963	1.36	QV				
4+ 5	0.4057	1.37	QV				
4+10	0.4152	1.37	Q V				
4+15	0.4247	1.38	Q V				
4+20	0.4342	1.39	Q V				
4+25	0.4438	1.39	Q V				
4+30	0.4534	1.40	Q V				
4+35	0.4631	1.40	Q V				
4+40	0.4727	1.41	Q V				
4+45	0.4825	1.41	Q V				
4+50	0.4923	1.42	Q V				
4+55	0.5021	1.43	Q V				
5+ 0	0.5119	1.43	Q V				
5+ 5	0.5218	1.44	Q V				
5+10	0.5318	1.44	Q V				
5+15	0.5418	1.45	Q V				
5+20	0.5518	1.46	Q V				
5+25	0.5619	1.46	Q V				
5+30	0.5720	1.47	Q V				
5+35	0.5821	1.48	Q V				
5+40	0.5923	1.48	Q V				
5+45	0.6026	1.49	Q V				
5+50	0.6129	1.50	Q V				
5+55	0.6232	1.50	Q V				
6+ 0	0.6336	1.51	Q V				
6+ 5	0.6441	1.52	Q V				
6+10	0.6545	1.52	Q V				
6+15	0.6651	1.53	Q V				
6+20	0.6757	1.54	Q V				
6+25	0.6863	1.54	Q V				
6+30	0.6970	1.55	Q V				
6+35	0.7077	1.56	Q V				
6+40	0.7185	1.57	Q V				
6+45	0.7294	1.58	Q V				
6+50	0.7403	1.58	Q V				
6+55	0.7512	1.59	Q V				
7+ 0	0.7623	1.60	Q V				
7+ 5	0.7733	1.61	Q V				
7+10	0.7845	1.62	Q V				
7+15	0.7956	1.62	Q V				

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 7+20       0.8069      1.63  |Q   V    |          |          |          |
 7+25       0.8182      1.64  |Q   V    |          |          |          |
 7+30       0.8296      1.65  |Q    V   |          |          |          |
 7+35       0.8410      1.66  |Q    V   |          |          |          |
 7+40       0.8525      1.67  |Q    V   |          |          |          |
 7+45       0.8640      1.68  |Q    V   |          |          |          |
 7+50       0.8756      1.69  |Q    V   |          |          |          |
 7+55       0.8873      1.70  |Q    V   |          |          |          |
 8+ 0       0.8991      1.71  |Q    V   |          |          |          |
 8+ 5       0.9109      1.72  |Q    V   |          |          |          |
 8+10       0.9228      1.73  |Q    V   |          |          |          |
 8+15       0.9347      1.74  |Q    V   |          |          |          |
 8+20       0.9468      1.75  |Q    V   |          |          |          |
 8+25       0.9589      1.76  |Q     V  |          |          |          |
 8+30       0.9710      1.77  |Q     V  |          |          |          |
 8+35       0.9833      1.78  |Q     V  |          |          |          |
 8+40       0.9956      1.79  |Q     V  |          |          |          |
 8+45       1.0080      1.80  |Q     V  |          |          |          |
 8+50       1.0205      1.81  |Q     V  |          |          |          |
 8+55       1.0330      1.82  |Q     V  |          |          |          |
 9+ 0       1.0457      1.84  |Q     V  |          |          |          |
 9+ 5       1.0584      1.85  |Q     V  |          |          |          |
 9+10       1.0712      1.86  |Q     V  |          |          |          |
 9+15       1.0841      1.87  |Q     V  |          |          |          |
 9+20       1.0971      1.88  |Q      V |          |          |          |
 9+25       1.1102      1.90  |Q      V |          |          |          |
 9+30       1.1233      1.91  |Q      V |          |          |          |
 9+35       1.1366      1.92  |Q      V |          |          |          |
 9+40       1.1499      1.94  |Q      V |          |          |          |
 9+45       1.1634      1.95  |Q      V |          |          |          |
 9+50       1.1769      1.97  |Q      V |          |          |          |
 9+55       1.1906      1.98  |Q      V |          |          |          |
10+ 0       1.2043      2.00  |Q      V |          |          |          |
10+ 5       1.2182      2.01  | Q     V |          |          |          |
10+10       1.2321      2.03  | Q      V|          |          |          |
10+15       1.2462      2.04  | Q      V|          |          |          |
10+20       1.2604      2.06  | Q      V|          |          |          |
10+25       1.2747      2.08  | Q      V|          |          |          |
10+30       1.2891      2.09  | Q      V|          |          |          |
10+35       1.3036      2.11  | Q      V|          |          |          |
10+40       1.3182      2.13  | Q      V|          |          |          |
10+45       1.3330      2.15  | Q      V|          |          |          |
10+50       1.3479      2.16  | Q      V|          |          |          |
10+55       1.3630      2.18  | Q      V|          |          |          |
11+ 0       1.3781      2.20  | Q       V          |          |          |
11+ 5       1.3934      2.22  | Q       V          |          |          |
11+10       1.4089      2.24  | Q       V          |          |          |
11+15       1.4245      2.26  | Q       V          |          |          |
11+20       1.4402      2.29  | Q       V          |          |          |
11+25       1.4561      2.31  | Q       V          |          |          |
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11+30	1.4722	2.33	Q	V			
11+35	1.4884	2.35	Q	V			
11+40	1.5048	2.38	Q	V			
11+45	1.5213	2.40	Q	V			
11+50	1.5381	2.43	Q	V			
11+55	1.5550	2.46	Q	V			
12+ 0	1.5721	2.48	Q	V			
12+ 5	1.5894	2.52	Q	V			
12+10	1.6074	2.62	Q	V			
12+15	1.6265	2.76	Q	V			
12+20	1.6463	2.88	Q	V			
12+25	1.6666	2.95	Q	V			
12+30	1.6873	3.00	Q	V			
12+35	1.7082	3.03	Q	V			
12+40	1.7293	3.07	Q	V			
12+45	1.7507	3.11	Q	V			
12+50	1.7724	3.15	Q	V			
12+55	1.7944	3.19	Q	V			
13+ 0	1.8166	3.23	Q	V			
13+ 5	1.8392	3.27	Q	V			
13+10	1.8620	3.32	Q	V			
13+15	1.8852	3.36	Q	V			
13+20	1.9087	3.41	Q	V			
13+25	1.9325	3.46	Q	V			
13+30	1.9567	3.52	Q	V			
13+35	1.9813	3.57	Q	V			
13+40	2.0063	3.63	Q	V			
13+45	2.0317	3.69	Q	V			
13+50	2.0576	3.75	Q	V			
13+55	2.0839	3.82	Q	V			
14+ 0	2.1107	3.89	Q	V			
14+ 5	2.1381	3.97	Q	V			
14+10	2.1659	4.05	Q	V			
14+15	2.1944	4.13	Q	V			
14+20	2.2235	4.23	Q	V			
14+25	2.2533	4.32	Q	V			
14+30	2.2837	4.42	Q	V			
14+35	2.3150	4.54	Q	V			
14+40	2.3470	4.65	Q	V			
14+45	2.3800	4.78	Q	V			
14+50	2.4139	4.92	Q	V			
14+55	2.4489	5.08	Q	V			
15+ 0	2.4850	5.25	Q	V			
15+ 5	2.5224	5.43	Q	V			
15+10	2.5613	5.64	Q	V			
15+15	2.6017	5.87	Q	V			
15+20	2.6440	6.14	Q	V			
15+25	2.6881	6.40	Q	V			
15+30	2.7328	6.49	Q	V			
15+35	2.7772	6.45	Q	V			

15+40	2.8227	6.61	| Q |	| V |	|	|
15+45	2.8716	7.10	| Q |	| |V |	|	|
15+50	2.9264	7.95	| Q |	| |V |	|	|
15+55	2.9903	9.28	| Q|	| |V |	|	|
16+ 0	3.0701	11.59	|Q |	| V |	|	|
16+ 5	3.1875	17.05	| Q |	| V |	|	|
16+10	3.3849	28.67	| |	| V Q |	|	|
16+15	3.6365	36.53	| |	| V |	| Q |
16+20	3.8365	29.04	| |	| VQ|	|	|
16+25	3.9550	17.21	| Q |	| V |	|	|
16+30	4.0308	11.00	|Q |	| V|	|	|
16+35	4.0867	8.12	| Q |	| V|	|	|
16+40	4.1365	7.23	| Q |	| V |	|	|
16+45	4.1803	6.37	| Q |	| V |	|	|
16+50	4.2194	5.67	| Q |	| V |	|	|
16+55	4.2556	5.26	| Q |	| |V |	|	|
17+ 0	4.2895	4.93	| Q |	| |V |	|	|
17+ 5	4.3216	4.66	| Q |	| |V |	|	|
17+10	4.3521	4.43	| Q |	| |V |	|	|
17+15	4.3812	4.22	| Q |	| | V |	|	|
17+20	4.4091	4.05	| Q |	| | V |	|	|
17+25	4.4358	3.89	| Q |	| | V |	|	|
17+30	4.4617	3.75	| Q |	| | V |	|	|
17+35	4.4866	3.63	| Q |	| | V |	|	|
17+40	4.5108	3.51	| Q |	| | | V |	|	|
17+45	4.5343	3.41	| Q |	| | | V |	|	|
17+50	4.5571	3.31	| Q |	| | | V |	|	|
17+55	4.5793	3.23	| Q |	| | | V |	|	|
18+ 0	4.6010	3.15	| Q |	| | | V |	|	|
18+ 5	4.6221	3.06	| Q |	| | | V |	|	|
18+10	4.6422	2.92	| Q |	| | | V |	|	|
18+15	4.6611	2.74	| Q |	| | | | V |	|	|
18+20	4.6789	2.59	| Q |	| | | | V |	|	|
18+25	4.6962	2.50	| Q |	| | | | V |	|	|
18+30	4.7129	2.43	| Q |	| | | | V |	|	|
18+35	4.7293	2.38	| Q |	| | | | V |	|	|
18+40	4.7453	2.33	| Q |	| | | | V |	|	|
18+45	4.7611	2.28	| Q |	| | | | V |	|	|
18+50	4.7765	2.24	| Q |	| | | | V |	|	|
18+55	4.7916	2.20	| Q |	| | | | | V |	|
19+ 0	4.8065	2.16	| Q |	| | | | | V |	|
19+ 5	4.8212	2.13	| Q |	| | | | | V |	|
19+10	4.8356	2.09	| Q |	| | | | | V |	|
19+15	4.8497	2.06	| Q |	| | | | | V |	|
19+20	4.8637	2.02	| Q |	| | | | | V |	|
19+25	4.8774	1.99	|Q |	| | | | | V |	|
19+30	4.8909	1.96	|Q |	| | | | | V |	|
19+35	4.9043	1.94	|Q |	| | | | | V |	|
19+40	4.9174	1.91	|Q |	| | | | | V |	|
19+45	4.9304	1.88	|Q |	| | | | | V |	|

19+50	4.9432	1.86	Q				V
19+55	4.9558	1.83	Q				V
20+ 0	4.9683	1.81	Q				V
20+ 5	4.9806	1.79	Q				V
20+10	4.9927	1.77	Q				V
20+15	5.0048	1.74	Q				V
20+20	5.0166	1.72	Q				V
20+25	5.0284	1.70	Q				V
20+30	5.0400	1.69	Q				V
20+35	5.0515	1.67	Q				V
20+40	5.0628	1.65	Q				V
20+45	5.0741	1.63	Q				V
20+50	5.0852	1.61	Q				V
20+55	5.0962	1.60	Q				V
21+ 0	5.1071	1.58	Q				V
21+ 5	5.1179	1.57	Q				V
21+10	5.1285	1.55	Q				V
21+15	5.1391	1.54	Q				V
21+20	5.1496	1.52	Q				V
21+25	5.1600	1.51	Q				V
21+30	5.1703	1.49	Q				V
21+35	5.1805	1.48	Q				V
21+40	5.1906	1.47	Q				V
21+45	5.2006	1.45	Q				V
21+50	5.2105	1.44	Q				V
21+55	5.2204	1.43	Q				V
22+ 0	5.2301	1.42	Q				V
22+ 5	5.2398	1.41	Q				V
22+10	5.2494	1.40	Q				V
22+15	5.2590	1.38	Q				V
22+20	5.2684	1.37	Q				V
22+25	5.2778	1.36	Q				V
22+30	5.2871	1.35	Q				V
22+35	5.2964	1.34	Q				V
22+40	5.3056	1.33	Q				V
22+45	5.3147	1.32	Q				V
22+50	5.3237	1.31	Q				V
22+55	5.3327	1.30	Q				V
23+ 0	5.3416	1.29	Q				V
23+ 5	5.3505	1.29	Q				V
23+10	5.3593	1.28	Q				V
23+15	5.3680	1.27	Q				V
23+20	5.3767	1.26	Q				V
23+25	5.3853	1.25	Q				V
23+30	5.3939	1.24	Q				V
23+35	5.4024	1.24	Q				V
23+40	5.4108	1.23	Q				V
23+45	5.4192	1.22	Q				V
23+50	5.4276	1.21	Q				V
23+55	5.4359	1.20	Q				V

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   24+ 0       5.4441      1.20  |Q        |         |         V|
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APPENDIX D

BASIN ROUTING ANALYSIS

CONTECH ENGINEERED SOLUTIONS

CMP: Underground Detention System
Storage Volume Estimation

Date: 03-22-2022
Project Name: 5355 Airport Drive

City / County: Ontario
State: California

Designed By: JL
Company: WLG
Telephone:

=Adjustable Input Cells

Contech Engineered Solutions, LLC is pleased to offer the following estimate of storage volume for the above named project. The results are submitted as an estimate only, without liability on the part of Contech Engineered Solutions, LLC for accuracy or suitability to any particular applicaton and are subject to verification of the Engineer of Record. **This tool is only applicable for rectangular shaped systems.**

Summary of Inputs

System Information		Backfill Information		Pipe & Analysis Information	
Out-to-out length (ft):	615.0	Backfill Porosity (%):	40%	System Diameter (in):	96
Out-to-out width (ft):	30.0	Depth Above Pipe (in):	12.0	Pipe Spacing (in):	2
Number of Manifolds (ea):	1.0	Depth Below Pipe (in):	12.0	Incremental Analysis (in):	2
Number of Barrels (ea):	3.0	Width At Ends (ft):	2.0	System Invert (Elevation):	966
		Width At Sides (ft):	2.0		

Storage Volume Estimation

System		Pipe		Stone		Total System		Miscellaneous		Staging	
Depth (ft)	Elevation (ft)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Incremental Storage (cf)	Cumulative Storage (cf)	Percent Open Storage (%)	Ave. Surface Area (sf)	Cumulative Storage (Ac-ft)	Outflow (cfs)
0.00	966.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0%	8,418.4		
0.17	966.16	0.0	0.0	1,403.1	1,403.1	1,403.1	1,403.1	0.0%	8,418.4		
0.33	966.33	0.0	0.0	1,403.1	2,806.1	1,403.1	2,806.1	0.0%	8,418.4		
0.50	966.50	0.0	0.0	1,403.1	4,209.2	1,403.1	4,209.2	0.0%	8,418.4		
0.67	966.66	0.0	0.0	1,403.1	5,612.3	1,403.1	5,612.3	0.0%	8,418.4		
0.83	966.83	0.0	0.0	1,403.1	7,015.3	1,403.1	7,015.3	0.0%	8,418.4		
1.00	967.00	0.0	0.0	1,403.1	8,418.4	1,403.1	8,418.4	0.0%	8,418.4	0.19	0.00
1.17	967.16	472.0	472.0	1,214.3	9,632.7	1,686.3	10,104.7	4.7%	10,956.4		
1.33	967.33	854.5	1,326.5	1,061.3	10,693.9	1,915.8	12,020.4	11.0%	11,969.2		
1.50	967.50	1,094.7	2,421.2	965.2	11,659.1	2,059.9	14,080.3	17.2%	12,719.7		
1.67	967.66	1,282.1	3,703.3	890.2	12,549.4	2,172.3	16,252.6	22.8%	13,329.7		
1.83	967.83	1,437.8	5,141.1	827.9	13,377.3	2,265.8	18,518.4	27.8%	13,846.6		
2.00	968.00	1,571.5	6,712.6	774.5	14,151.7	2,346.0	20,864.4	32.2%	14,295.1	0.48	0.00
2.17	968.16	1,688.4	8,401.0	727.7	14,879.5	2,416.1	23,280.5	36.1%	14,690.0		
2.33	968.33	1,791.8	10,192.8	686.4	15,565.8	2,478.1	25,758.6	39.6%	15,040.7		
2.50	968.50	1,883.9	12,076.6	649.5	16,215.3	2,533.4	28,292.0	42.7%	15,354.1		
2.67	968.66	1,966.3	14,042.9	616.5	16,831.9	2,582.8	30,874.8	45.5%	15,634.9		
2.83	968.83	2,040.2	16,083.2	587.0	17,418.9	2,627.2	33,502.0	48.0%	15,886.9		
3.00	969.00	2,106.5	18,189.7	560.4	17,979.3	2,667.0	36,169.0	50.3%	16,112.9	0.83	0.00
3.17	969.16	2,166.0	20,355.7	536.7	18,516.0	2,702.6	38,871.7	52.4%	16,315.0		
3.33	969.33	2,219.0	22,574.7	515.5	19,031.5	2,734.5	41,606.1	54.3%	16,495.2		
3.50	969.50	2,266.2	24,840.9	496.6	19,528.1	2,762.8	44,368.9	56.0%	16,654.8		
3.67	969.66	2,307.8	27,148.7	479.9	20,008.0	2,787.8	47,156.7	57.6%	16,795.1		
3.83	969.83	2,344.2	29,492.9	465.4	20,473.4	2,809.6	49,966.3	59.0%	16,916.9		
4.00	970.00	2,375.6	31,868.4	452.8	20,926.2	2,828.4	52,794.7	60.4%	17,021.1	1.21	0.00
4.17	970.16	2,402.1	34,270.6	442.2	21,368.4	2,844.3	55,639.0	61.6%	17,108.2		
4.33	970.33	2,424.0	36,694.6	433.5	21,801.9	2,857.5	58,496.5	62.7%	17,178.9		
4.50	970.50	2,441.4	39,136.0	426.5	22,228.4	2,867.9	61,364.4	63.8%	17,233.5		
4.67	970.66	2,454.4	41,590.4	421.3	22,649.7	2,875.7	64,240.1	64.7%	17,272.3		
4.83	970.83	2,463.0	44,053.4	417.9	23,067.6	2,880.9	67,121.0	65.6%	17,295.5		
5.00	971.00	2,467.3	46,520.7	416.2	23,483.7	2,883.4	70,004.4	66.5%	17,303.2	1.61	4.00
5.17	971.16	2,467.3	48,988.0	416.2	23,899.9	2,883.4	72,887.9	67.2%	17,295.5		
5.33	971.33	2,463.0	51,451.0	417.9	24,317.7	2,880.9	75,768.7	67.9%	17,272.3		
5.50	971.50	2,454.4	53,905.4	421.3	24,739.0	2,875.7	78,644.4	68.5%	17,233.5		
5.67	971.66	2,441.4	56,346.8	426.5	25,165.5	2,867.9	81,512.4	69.1%	17,178.9		
5.83	971.83	2,424.0	58,770.8	433.5	25,599.0	2,857.5	84,369.8	69.7%	17,108.2		
6.00	972.00	2,402.1	61,173.0	442.2	26,041.2	2,844.3	87,214.2	70.1%	17,021.1	2.00	4.00
6.17	972.16	2,375.6	63,548.5	452.8	26,494.1	2,828.4	90,042.6	70.6%	16,916.9		
6.33	972.33	2,344.2	65,892.7	465.4	26,959.4	2,809.6	92,852.2	71.0%	16,795.1		
6.50	972.50	2,307.8	68,200.5	479.9	27,439.4	2,787.8	95,639.9	71.3%	16,654.8		
6.67	972.66	2,266.2	70,466.7	496.6	27,936.0	2,762.8	98,402.7	71.6%	16,495.2		
6.83	972.83	2,219.0	72,685.8	515.5	28,451.4	2,734.5	101,137.2	71.9%	16,315.0		
7.00	973.00	2,166.0	74,851.7	536.7	28,988.1	2,702.6	103,839.8	72.1%	16,112.9	2.38	4.00
7.17	973.16	2,106.5	76,958.3	560.4	29,548.6	2,667.0	106,506.8	72.3%	15,886.9		
7.33	973.33	2,040.2	78,998.5	587.0	30,135.5	2,627.2	109,134.0	72.4%	15,634.9		
7.50	973.50	1,966.3	80,964.8	616.5	30,752.1	2,582.8	111,716.9	72.5%	15,354.1		
7.67	973.66	1,883.9	82,848.6	649.5	31,401.6	2,533.4	114,250.2	72.5%	15,040.7		
7.83	973.83	1,791.8	84,640.4	686.4	32,088.0	2,478.1	116,728.4	72.5%	14,690.0		
8.00	974.00	1,688.4	86,328.8	727.7	32,815.7	2,416.1	119,144.5	72.5%	14,295.1	2.74	4.00
8.17	974.16	1,571.5	87,900.3	774.5	33,590.2	2,346.0	121,490.4	72.4%	13,846.6		
8.33	974.33	1,437.8	89,338.1	827.9	34,418.1	2,265.8	123,756.2	72.2%	13,329.7		
8.50	974.50	1,282.1	90,620.2	890.2	35,308.3	2,172.3	125,928.5	72.0%	12,719.7		
8.67	974.66	1,094.7	91,714.9	965.2	36,273.5	2,059.9	127,988.4	71.7%	11,969.2		
8.83	974.83	854.5	92,569.4	1,061.3	37,334.8	1,915.8	129,904.2	71.3%	10,956.4		
9.00	975.00	472.0	93,041.4	1,214.3	38,549.0	1,686.3	131,590.4	70.7%	8,418.4	3.02	4.00

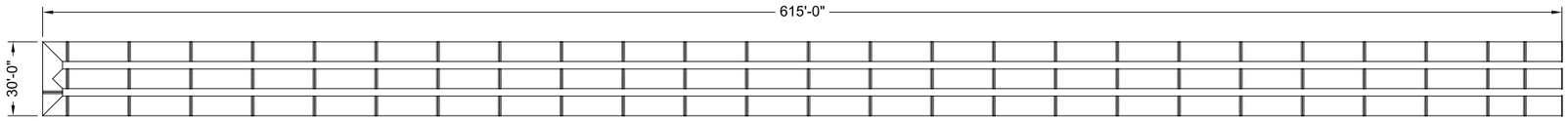
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 1,851 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 140,000 CF
- PIPE STORAGE VOLUME = 93,041 CF
- BACKFILL STORAGE VOLUME = 46,967 CF
- TOTAL STORAGE PROVIDED = 140,009 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = PERFORATED
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 24"
- ABOVE PIPE = 12"
- WIDTH AT SIDES = 24"
- BELOW PIPE = 12"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 60'

DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

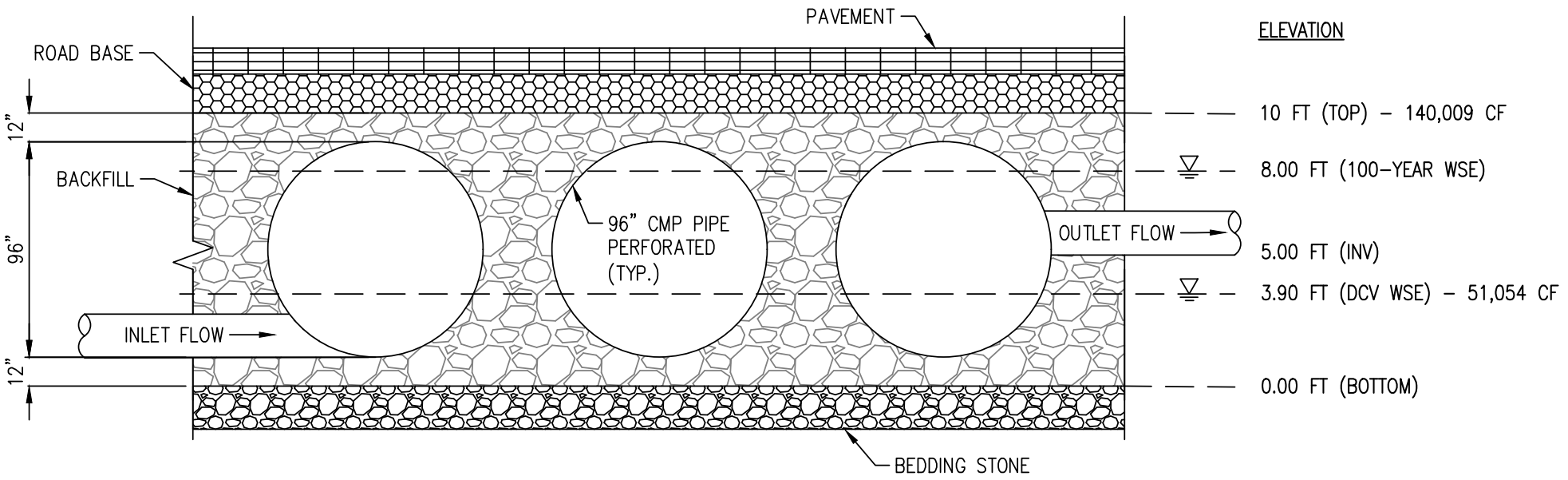
CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO14828 5355 Airport Drive
Underground Infiltration Chamber #1
Ontario, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
9371	14828	3/23/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

C:\EXPORTS\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

CHAMBER SECTION DETAIL



FLOOD HYDROGRAPH ROUTING PROGRAM

Study date: 03/23/22

Job No. 2021-502
5355 Airport Drive
100 YR BASIN ROUTING ANALYSIS
UNDERGROUND INFILTRATION CHAMBER No. 1

Program License Serial Number 6277

********** HYDROGRAPH INFORMATION **********

From study/file name: 2021502UH100POST.rte
**********HYDROGRAPH DATA**********
Number of intervals = 296
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 36.529 (CFS)
Total volume = 5.464 (Ac.Ft)
Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

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Process from Point/Station 16.000 to Point/Station 16.000
**** RETARDING BASIN ROUTING ****
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User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 296
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
1.000	0.190	0.001	0.190	0.190
2.000	0.480	0.001	0.480	0.480
3.000	0.830	0.001	0.830	0.830
4.000	1.210	0.001	1.210	1.210
5.000	1.610	4.000	1.596	1.624
6.000	2.000	4.000	1.986	2.014
7.000	2.380	4.000	2.366	2.394
8.000	2.740	4.000	2.726	2.754
9.000	3.020	4.000	3.006	3.034

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	9.1	18.26	27.40	36.53	Depth (Ft.)
0.083	0.04	0.00	0.000	O	|	|	|	|	0.00
0.167	0.27	0.00	0.001	O	|	|	|	|	0.01
0.250	0.67	0.00	0.004	O	|	|	|	|	0.02
0.333	0.98	0.00	0.010	O	|	|	|	|	0.05
0.417	1.11	0.00	0.017	O	|	|	|	|	0.09
0.500	1.16	0.00	0.025	OI	|	|	|	|	0.13
0.583	1.17	0.00	0.033	OI	|	|	|	|	0.17
0.667	1.19	0.00	0.041	OI	|	|	|	|	0.22
0.750	1.19	0.00	0.049	OI	|	|	|	|	0.26
0.833	1.20	0.00	0.058	OI	|	|	|	|	0.30
0.917	1.20	0.00	0.066	OI	|	|	|	|	0.35
1.000	1.20	0.00	0.074	OI	|	|	|	|	0.39
1.083	1.21	0.00	0.083	OI	|	|	|	|	0.43
1.167	1.21	0.00	0.091	OI	|	|	|	|	0.48
1.250	1.22	0.00	0.099	OI	|	|	|	|	0.52
1.333	1.22	0.00	0.108	OI	|	|	|	|	0.57
1.417	1.22	0.00	0.116	OI	|	|	|	|	0.61
1.500	1.23	0.00	0.124	OI	|	|	|	|	0.66
1.583	1.23	0.00	0.133	OI	|	|	|	|	0.70
1.667	1.24	0.00	0.141	OI	|	|	|	|	0.74
1.750	1.24	0.00	0.150	OI	|	|	|	|	0.79
1.833	1.24	0.00	0.158	OI	|	|	|	|	0.83
1.917	1.25	0.00	0.167	OI	|	|	|	|	0.88
2.000	1.25	0.00	0.176	OI	|	|	|	|	0.92
2.083	1.26	0.00	0.184	OI	|	|	|	|	0.97
2.167	1.26	0.00	0.193	OI	|	|	|	|	1.01

2.250	1.26	0.00	0.202	OI				1.04
2.333	1.27	0.00	0.210	OI				1.07
2.417	1.27	0.00	0.219	OI				1.10
2.500	1.28	0.00	0.228	OI				1.13
2.583	1.28	0.00	0.237	OI				1.16
2.667	1.29	0.00	0.246	OI				1.19
2.750	1.29	0.00	0.254	OI				1.22
2.833	1.30	0.00	0.263	OI				1.25
2.917	1.30	0.00	0.272	OI				1.28
3.000	1.30	0.00	0.281	OI				1.31
3.083	1.31	0.00	0.290	OI				1.35
3.167	1.31	0.00	0.299	OI				1.38
3.250	1.32	0.00	0.308	OI				1.41
3.333	1.32	0.00	0.317	OI				1.44
3.417	1.33	0.00	0.326	OI				1.47
3.500	1.33	0.00	0.336	OI				1.50
3.583	1.34	0.00	0.345	OI				1.53
3.667	1.34	0.00	0.354	OI				1.57
3.750	1.35	0.00	0.363	OI				1.60
3.833	1.35	0.00	0.373	OI				1.63
3.917	1.36	0.00	0.382	OI				1.66
4.000	1.36	0.00	0.391	OI				1.69
4.083	1.37	0.00	0.401	OI				1.73
4.167	1.37	0.00	0.410	OI				1.76
4.250	1.38	0.00	0.420	OI				1.79
4.333	1.39	0.00	0.429	OI				1.82
4.417	1.39	0.00	0.439	OI				1.86
4.500	1.40	0.00	0.448	OI				1.89
4.583	1.40	0.00	0.458	OI				1.92
4.667	1.41	0.00	0.468	OI				1.96
4.750	1.41	0.00	0.477	OI				1.99
4.833	1.42	0.00	0.487	OI				2.02
4.917	1.43	0.00	0.497	OI				2.05
5.000	1.43	0.00	0.507	OI				2.08
5.083	1.44	0.00	0.517	OI				2.10
5.167	1.44	0.00	0.526	OI				2.13
5.250	1.45	0.00	0.536	OI				2.16
5.333	1.46	0.00	0.546	OI				2.19
5.417	1.46	0.00	0.556	OI				2.22
5.500	1.47	0.00	0.567	OI				2.25
5.583	1.48	0.00	0.577	OI				2.28
5.667	1.48	0.00	0.587	OI				2.31
5.750	1.49	0.00	0.597	OI				2.33
5.833	1.50	0.00	0.607	OI				2.36
5.917	1.50	0.00	0.618	OI				2.39
6.000	1.51	0.00	0.628	OI				2.42
6.083	1.52	0.00	0.638	OI				2.45
6.167	1.52	0.00	0.649	OI				2.48
6.250	1.53	0.00	0.659	OI				2.51
6.333	1.54	0.00	0.670	OI				2.54

6.417	1.54	0.00	0.681	OI				2.57
6.500	1.55	0.00	0.691	OI				2.60
6.583	1.56	0.00	0.702	OI				2.63
6.667	1.57	0.00	0.713	OI				2.66
6.750	1.58	0.00	0.724	OI				2.70
6.833	1.58	0.00	0.734	OI				2.73
6.917	1.59	0.00	0.745	OI				2.76
7.000	1.60	0.00	0.756	OI				2.79
7.083	1.61	0.00	0.767	OI				2.82
7.167	1.62	0.00	0.778	OI				2.85
7.250	1.62	0.00	0.790	OI				2.88
7.333	1.63	0.00	0.801	OI				2.92
7.417	1.64	0.00	0.812	OI				2.95
7.500	1.65	0.00	0.823	OI				2.98
7.583	1.66	0.00	0.835	OI				3.01
7.667	1.67	0.00	0.846	OI				3.04
7.750	1.68	0.00	0.858	OI				3.07
7.833	1.69	0.00	0.869	OI				3.10
7.917	1.70	0.00	0.881	OI				3.13
8.000	1.71	0.00	0.893	OI				3.16
8.083	1.72	0.00	0.904	OI				3.20
8.167	1.73	0.00	0.916	OI				3.23
8.250	1.74	0.00	0.928	OI				3.26
8.333	1.75	0.00	0.940	OI				3.29
8.417	1.76	0.00	0.952	OI				3.32
8.500	1.77	0.00	0.964	OI				3.35
8.583	1.78	0.00	0.977	OI				3.39
8.667	1.79	0.00	0.989	OI				3.42
8.750	1.80	0.00	1.001	OI				3.45
8.833	1.81	0.00	1.014	OI				3.48
8.917	1.82	0.00	1.026	OI				3.52
9.000	1.84	0.00	1.039	OI				3.55
9.083	1.85	0.00	1.051	OI				3.58
9.167	1.86	0.00	1.064	OI				3.62
9.250	1.87	0.00	1.077	OI				3.65
9.333	1.88	0.00	1.090	OI				3.68
9.417	1.90	0.00	1.103	OI				3.72
9.500	1.91	0.00	1.116	OI				3.75
9.583	1.92	0.00	1.129	OI				3.79
9.667	1.94	0.00	1.143	OI				3.82
9.750	1.95	0.00	1.156	OI				3.86
9.833	1.97	0.00	1.169	OI				3.89
9.917	1.98	0.00	1.183	OI				3.93
10.000	2.00	0.00	1.197	OI				3.96
10.083	2.01	0.01	1.210	OI				4.00
10.167	2.03	0.14	1.224	OI				4.03
10.250	2.04	0.27	1.236	OI				4.07
10.333	2.06	0.38	1.248	OI				4.10
10.417	2.08	0.50	1.260	OI				4.12
10.500	2.09	0.60	1.270	OI				4.15

10.583	2.11	0.70	1.280	OI	|	|	|	4.18
10.667	2.13	0.80	1.290	OI	|	|	|	4.20
10.750	2.15	0.89	1.298	OI	|	|	|	4.22
10.833	2.16	0.97	1.307	OI	|	|	|	4.24
10.917	2.18	1.05	1.315	OI	|	|	|	4.26
11.000	2.20	1.13	1.323	OI	|	|	|	4.28
11.083	2.22	1.20	1.330	|O	|	|	|	4.30
11.167	2.24	1.27	1.337	|O	|	|	|	4.32
11.250	2.26	1.33	1.343	|O	|	|	|	4.33
11.333	2.29	1.40	1.350	|OI	|	|	|	4.35
11.417	2.31	1.46	1.356	|OI	|	|	|	4.36
11.500	2.33	1.51	1.361	|OI	|	|	|	4.38
11.583	2.35	1.57	1.367	|OI	|	|	|	4.39
11.667	2.38	1.62	1.372	|OI	|	|	|	4.41
11.750	2.40	1.67	1.377	|OI	|	|	|	4.42
11.833	2.43	1.72	1.382	|OI	|	|	|	4.43
11.917	2.46	1.77	1.387	|OI	|	|	|	4.44
12.000	2.48	1.82	1.392	|OI	|	|	|	4.45
12.083	2.52	1.86	1.396	|OI	|	|	|	4.47
12.167	2.62	1.91	1.401	|OI	|	|	|	4.48
12.250	2.76	1.96	1.406	|OI	|	|	|	4.49
12.333	2.88	2.02	1.412	|OI	|	|	|	4.50
12.417	2.95	2.08	1.418	|OI	|	|	|	4.52
12.500	3.00	2.14	1.424	|OI	|	|	|	4.53
12.583	3.03	2.20	1.430	|OI	|	|	|	4.55
12.667	3.07	2.25	1.435	|OI	|	|	|	4.56
12.750	3.11	2.31	1.441	| O	|	|	|	4.58
12.833	3.15	2.36	1.446	| O	|	|	|	4.59
12.917	3.19	2.42	1.452	| O	|	|	|	4.60
13.000	3.23	2.47	1.457	| O	|	|	|	4.62
13.083	3.27	2.52	1.462	| O	|	|	|	4.63
13.167	3.32	2.57	1.467	| O	|	|	|	4.64
13.250	3.36	2.62	1.472	| O	|	|	|	4.66
13.333	3.41	2.68	1.478	| O	|	|	|	4.67
13.417	3.46	2.73	1.483	| OI	|	|	|	4.68
13.500	3.52	2.78	1.488	| OI	|	|	|	4.69
13.583	3.57	2.83	1.493	| OI	|	|	|	4.71
13.667	3.63	2.88	1.498	| OI	|	|	|	4.72
13.750	3.69	2.93	1.503	| OI	|	|	|	4.73
13.833	3.75	2.98	1.508	| OI	|	|	|	4.75
13.917	3.82	3.04	1.514	| OI	|	|	|	4.76
14.000	3.89	3.09	1.519	| OI	|	|	|	4.77
14.083	3.97	3.15	1.525	| OI	|	|	|	4.79
14.167	4.05	3.20	1.530	| OI	|	|	|	4.80
14.250	4.13	3.26	1.536	| OI	|	|	|	4.82
14.333	4.23	3.32	1.542	| OI	|	|	|	4.83
14.417	4.32	3.39	1.549	| OI	|	|	|	4.85
14.500	4.42	3.45	1.555	| O	|	|	|	4.86
14.583	4.54	3.52	1.562	| O	|	|	|	4.88
14.667	4.65	3.59	1.569	| OI	|	|	|	4.90

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14.750    4.78    3.67      1.577   |  OI   |       |       |       |     4.92
14.833    4.92    3.75      1.585   |  OI   |       |       |       |     4.94
14.917    5.08    3.83      1.593   |  OI   |       |       |       |     4.96
15.000    5.25    3.92      1.602   |  OI   |       |       |       |     4.98
15.083    5.43    4.00      1.611   |  OI   |       |       |       |     5.00
15.167    5.64    4.00      1.622   |  OI   |       |       |       |     5.03
15.250    5.87    4.00      1.634   |  O I  |       |       |       |     5.06
15.333    6.14    4.00      1.648   |  O I  |       |       |       |     5.10
15.417    6.40    4.00      1.664   |  O I  |       |       |       |     5.14
15.500    6.49    4.00      1.680   |  O I  |       |       |       |     5.18
15.583    6.45    4.00      1.697   |  O I  |       |       |       |     5.22
15.667    6.61    4.00      1.715   |  O I  |       |       |       |     5.27
15.750    7.10    4.00      1.735   |  O  I |       |       |       |     5.32
15.833    7.95    4.00      1.759   |  O  I |       |       |       |     5.38
15.917    9.28    4.00      1.791   |  O    I       |       |       |     5.46
16.000   11.59    4.00      1.835   |  O    | I     |       |       |     5.58
16.083   17.05    4.00      1.906   |  O    |     I |       |       |     5.76
16.167   28.67    4.00      2.036   |  O    |       |       |I      |     6.09
16.250   36.53    4.00      2.233   |  O    |       |       |       I     6.61
16.333   29.04    4.00      2.431   |  O    |       |       |I      |     7.14
16.417   17.21    4.00      2.563   |  O    |      I|       |       |     7.51
16.500   11.00    4.00      2.632   |  O    |I      |       |       |     7.70
16.583    8.12    4.00      2.671   |  O   I|       |       |       |     7.81
16.667    7.23    4.00      2.696   |  O  I |       |       |       |     7.88
16.750    6.37    4.00      2.715   |  O I  |       |       |       |     7.93
16.833    5.67    4.00      2.729   |  OI   |       |       |       |     7.97
16.917    5.26    4.00      2.739   |  OI   |       |       |       |     8.00
17.000    4.93    4.00      2.747   |  OI   |       |       |       |     8.02
17.083    4.66    4.00      2.752   |  OI   |       |       |       |     8.04
17.167    4.43    4.00      2.756   |  O    |       |       |       |     8.06
17.250    4.22    4.00      2.758   |  O    |       |       |       |     8.06
17.333    4.05    4.00      2.759   |  O    |       |       |       |     8.07
17.417    3.89    4.00      2.759   |  O    |       |       |       |     8.07
17.500    3.75    4.00      2.758   |  O    |       |       |       |     8.06
17.583    3.63    4.00      2.755   |  O    |       |       |       |     8.06
17.667    3.51    4.00      2.752   |  O    |       |       |       |     8.04
17.750    3.41    4.00      2.749   | IO    |       |       |       |     8.03
17.833    3.31    4.00      2.744   | IO    |       |       |       |     8.02
17.917    3.23    4.00      2.739   | IO    |       |       |       |     8.00
18.000    3.15    4.00      2.734   | IO    |       |       |       |     7.98
18.083    3.06    4.00      2.728   | IO    |       |       |       |     7.97
18.167    2.92    4.00      2.721   | IO    |       |       |       |     7.95
18.250    2.74    4.00      2.713   | IO    |       |       |       |     7.92
18.333    2.59    4.00      2.703   | IO    |       |       |       |     7.90
18.417    2.50    4.00      2.693   | IO    |       |       |       |     7.87
18.500    2.43    4.00      2.683   | IO    |       |       |       |     7.84
18.583    2.38    4.00      2.672   | IO    |       |       |       |     7.81
18.667    2.33    4.00      2.660   | IO    |       |       |       |     7.78
18.750    2.28    4.00      2.649   | IO    |       |       |       |     7.75
18.833    2.24    4.00      2.637   |I O    |       |       |       |     7.71
```

18.917	2.20	4.00	2.625	I O				7.68
19.000	2.16	4.00	2.612	I O				7.64
19.083	2.13	4.00	2.599	I O				7.61
19.167	2.09	4.00	2.586	I O				7.57
19.250	2.06	4.00	2.573	I O				7.54
19.333	2.02	4.00	2.559	I O				7.50
19.417	1.99	4.00	2.546	I O				7.46
19.500	1.96	4.00	2.532	I O				7.42
19.583	1.94	4.00	2.518	I O				7.38
19.667	1.91	4.00	2.503	I O				7.34
19.750	1.88	4.00	2.489	I O				7.30
19.833	1.86	4.00	2.474	I O				7.26
19.917	1.83	4.00	2.459	I O				7.22
20.000	1.81	4.00	2.444	I O				7.18
20.083	1.79	4.00	2.429	I O				7.14
20.167	1.77	4.00	2.414	I O				7.09
20.250	1.74	4.00	2.398	I O				7.05
20.333	1.72	4.00	2.383	I O				7.01
20.417	1.70	4.00	2.367	I O				6.97
20.500	1.69	4.00	2.351	I O				6.92
20.583	1.67	4.00	2.335	I O				6.88
20.667	1.65	4.00	2.319	I O				6.84
20.750	1.63	4.00	2.303	I O				6.80
20.833	1.61	4.00	2.287	I O				6.75
20.917	1.60	4.00	2.270	I O				6.71
21.000	1.58	4.00	2.253	I O				6.67
21.083	1.57	4.00	2.237	I O				6.62
21.167	1.55	4.00	2.220	I O				6.58
21.250	1.54	4.00	2.203	I O				6.53
21.333	1.52	4.00	2.186	I O				6.49
21.417	1.51	4.00	2.169	I O				6.44
21.500	1.49	4.00	2.152	I O				6.40
21.583	1.48	4.00	2.134	I O				6.35
21.667	1.47	4.00	2.117	I O				6.31
21.750	1.45	4.00	2.099	I O				6.26
21.833	1.44	4.00	2.082	I O				6.22
21.917	1.43	4.00	2.064	I O				6.17
22.000	1.42	4.00	2.046	I O				6.12
22.083	1.41	4.00	2.029	I O				6.08
22.167	1.40	4.00	2.011	I O				6.03
22.250	1.38	4.00	1.993	I O				5.98
22.333	1.37	4.00	1.975	I O				5.94
22.417	1.36	4.00	1.957	I O				5.89
22.500	1.35	4.00	1.938	I O				5.84
22.583	1.34	4.00	1.920	I O				5.80
22.667	1.33	4.00	1.902	I O				5.75
22.750	1.32	4.00	1.883	I O				5.70
22.833	1.31	4.00	1.865	I O				5.65
22.917	1.30	4.00	1.846	I O				5.61
23.000	1.29	4.00	1.828	I O				5.56

23.083	1.29	4.00	1.809	|I O	|	|	|	5.51
23.167	1.28	4.00	1.790	|I O	|	|	|	5.46
23.250	1.27	4.00	1.772	|I O	|	|	|	5.41
23.333	1.26	4.00	1.753	|I O	|	|	|	5.37
23.417	1.25	4.00	1.734	|I O	|	|	|	5.32
23.500	1.24	4.00	1.715	|I O	|	|	|	5.27
23.583	1.24	4.00	1.696	|I O	|	|	|	5.22
23.667	1.23	4.00	1.677	|I O	|	|	|	5.17
23.750	1.22	4.00	1.658	|I O	|	|	|	5.12
23.833	1.21	4.00	1.639	|I O	|	|	|	5.07
23.917	1.20	4.00	1.619	|I O	|	|	|	5.02
24.000	1.20	3.90	1.600	|I O	|	|	|	4.98
24.083	1.15	3.72	1.582	|I O	|	|	|	4.93
24.167	0.91	3.54	1.564	I O	|	|	|	4.89
24.250	0.51	3.35	1.545	I O	|	|	|	4.84
24.333	0.20	3.15	1.525	I O	|	|	|	4.79
24.417	0.07	2.95	1.505	I O	|	|	|	4.74
24.500	0.03	2.76	1.486	I O	|	|	|	4.69
24.583	0.01	2.58	1.468	I O	|	|	|	4.64
24.667	0.00	2.41	1.451	I O	|	|	|	4.60
24.750	0.00	2.25	1.435	IO	|	|	|	4.56
24.833	0.00	2.10	1.420	IO	|	|	|	4.52
24.917	0.00	1.96	1.406	IO	|	|	|	4.49
25.000	0.00	1.83	1.393	IO	|	|	|	4.46
25.083	0.00	1.71	1.381	IO	|	|	|	4.43
25.167	0.00	1.59	1.369	IO	|	|	|	4.40
25.250	0.00	1.49	1.359	IO	|	|	|	4.37
25.333	0.00	1.39	1.349	IO	|	|	|	4.35
25.417	0.00	1.30	1.339	IO	|	|	|	4.32
25.500	0.00	1.21	1.331	IO	|	|	|	4.30
25.583	0.00	1.13	1.323	O	|	|	|	4.28
25.667	0.00	1.05	1.315	O	|	|	|	4.26
25.750	0.00	0.98	1.308	O	|	|	|	4.25
25.833	0.00	0.92	1.302	O	|	|	|	4.23
25.917	0.00	0.86	1.296	O	|	|	|	4.21
26.000	0.00	0.80	1.290	O	|	|	|	4.20
26.083	0.00	0.75	1.285	O	|	|	|	4.19
26.167	0.00	0.70	1.280	O	|	|	|	4.17
26.250	0.00	0.65	1.275	O	|	|	|	4.16
26.333	0.00	0.61	1.271	O	|	|	|	4.15
26.417	0.00	0.57	1.267	O	|	|	|	4.14
26.500	0.00	0.53	1.263	O	|	|	|	4.13
26.583	0.00	0.49	1.259	O	|	|	|	4.12
26.667	0.00	0.46	1.256	O	|	|	|	4.11
26.750	0.00	0.43	1.253	O	|	|	|	4.11
26.833	0.00	0.40	1.250	O	|	|	|	4.10
26.917	0.00	0.37	1.247	O	|	|	|	4.09
27.000	0.00	0.35	1.245	O	|	|	|	4.09
27.083	0.00	0.33	1.243	O	|	|	|	4.08
27.167	0.00	0.30	1.240	O	|	|	|	4.08

27.250	0.00	0.28	1.238	O				4.07
27.333	0.00	0.27	1.236	O				4.07
27.417	0.00	0.25	1.235	O				4.06
27.500	0.00	0.23	1.233	O				4.06
27.583	0.00	0.22	1.232	O				4.05
27.667	0.00	0.20	1.230	O				4.05
27.750	0.00	0.19	1.229	O				4.05
27.833	0.00	0.18	1.227	O				4.04
27.917	0.00	0.16	1.226	O				4.04
28.000	0.00	0.15	1.225	O				4.04
28.083	0.00	0.14	1.224	O				4.04
28.167	0.00	0.13	1.223	O				4.03
28.250	0.00	0.12	1.222	O				4.03
28.333	0.00	0.12	1.222	O				4.03
28.417	0.00	0.11	1.221	O				4.03
28.500	0.00	0.10	1.220	O				4.03
28.583	0.00	0.09	1.219	O				4.02
28.667	0.00	0.09	1.219	O				4.02
28.750	0.00	0.08	1.218	O				4.02
28.833	0.00	0.08	1.218	O				4.02
28.917	0.00	0.07	1.217	O				4.02
29.000	0.00	0.07	1.217	O				4.02
29.083	0.00	0.06	1.216	O				4.02
29.167	0.00	0.06	1.216	O				4.01
29.250	0.00	0.05	1.215	O				4.01
29.333	0.00	0.05	1.215	O				4.01
29.417	0.00	0.05	1.215	O				4.01
29.500	0.00	0.04	1.214	O				4.01
29.583	0.00	0.04	1.214	O				4.01
29.667	0.00	0.04	1.214	O				4.01
29.750	0.00	0.04	1.214	O				4.01
29.833	0.00	0.03	1.213	O				4.01
29.917	0.00	0.03	1.213	O				4.01
30.000	0.00	0.03	1.213	O				4.01
30.083	0.00	0.03	1.213	O				4.01
30.167	0.00	0.03	1.212	O				4.01
30.250	0.00	0.02	1.212	O				4.01
30.333	0.00	0.02	1.212	O				4.01
30.417	0.00	0.02	1.212	O				4.00
30.500	0.00	0.02	1.212	O				4.00
30.583	0.00	0.02	1.212	O				4.00
30.667	0.00	0.02	1.212	O				4.00
30.750	0.00	0.02	1.211	O				4.00
30.833	0.00	0.01	1.211	O				4.00
30.917	0.00	0.01	1.211	O				4.00
31.000	0.00	0.01	1.211	O				4.00
31.083	0.00	0.01	1.211	O				4.00
31.167	0.00	0.01	1.211	O				4.00
31.250	0.00	0.01	1.211	O				4.00
31.333	0.00	0.01	1.211	O				4.00

31.417	0.00	0.01	1.211	O	|	|	|	4.00
31.500	0.00	0.01	1.211	O	|	|	|	4.00
31.583	0.00	0.01	1.211	O	|	|	|	4.00
31.667	0.00	0.01	1.211	O	|	|	|	4.00
31.750	0.00	0.01	1.211	O	|	|	|	4.00
31.833	0.00	0.01	1.211	O	|	|	|	4.00
31.917	0.00	0.01	1.211	O	|	|	|	4.00
32.000	0.00	0.01	1.210	O	|	|	|	4.00
32.083	0.00	0.01	1.210	O	|	|	|	4.00
32.167	0.00	0.00	1.210	O	|	|	|	4.00
32.250	0.00	0.00	1.210	O	|	|	|	4.00
32.333	0.00	0.00	1.210	O	|	|	|	4.00
32.417	0.00	0.00	1.210	O	|	|	|	4.00
32.500	0.00	0.00	1.210	O	|	|	|	4.00
32.583	0.00	0.00	1.210	O	|	|	|	4.00
32.667	0.00	0.00	1.210	O	|	|	|	4.00
32.750	0.00	0.00	1.210	O	|	|	|	4.00
32.833	0.00	0.00	1.210	O	|	|	|	4.00
32.917	0.00	0.00	1.210	O	|	|	|	4.00
33.000	0.00	0.00	1.210	O	|	|	|	4.00
33.083	0.00	0.00	1.210	O	|	|	|	4.00
33.167	0.00	0.00	1.210	O	|	|	|	4.00
33.250	0.00	0.00	1.210	O	|	|	|	4.00
33.333	0.00	0.00	1.210	O	|	|	|	4.00
33.417	0.00	0.00	1.210	O	|	|	|	4.00
33.500	0.00	0.00	1.210	O	|	|	|	4.00
33.583	0.00	0.00	1.210	O	|	|	|	4.00
33.667	0.00	0.00	1.210	O	|	|	|	4.00
33.750	0.00	0.00	1.210	O	|	|	|	4.00
33.833	0.00	0.00	1.210	O	|	|	|	4.00
33.917	0.00	0.00	1.210	O	|	|	|	4.00
34.000	0.00	0.00	1.210	O	|	|	|	4.00
34.083	0.00	0.00	1.210	O	|	|	|	4.00
34.167	0.00	0.00	1.210	O	|	|	|	4.00

Remaining water in basin = 1.21 (Ac.Ft)

**********HYDROGRAPH DATA**********

Number of intervals = 410
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 4.000 (CFS)
Total volume = 4.254 (Ac.Ft)

Status of hydrographs being held in storage

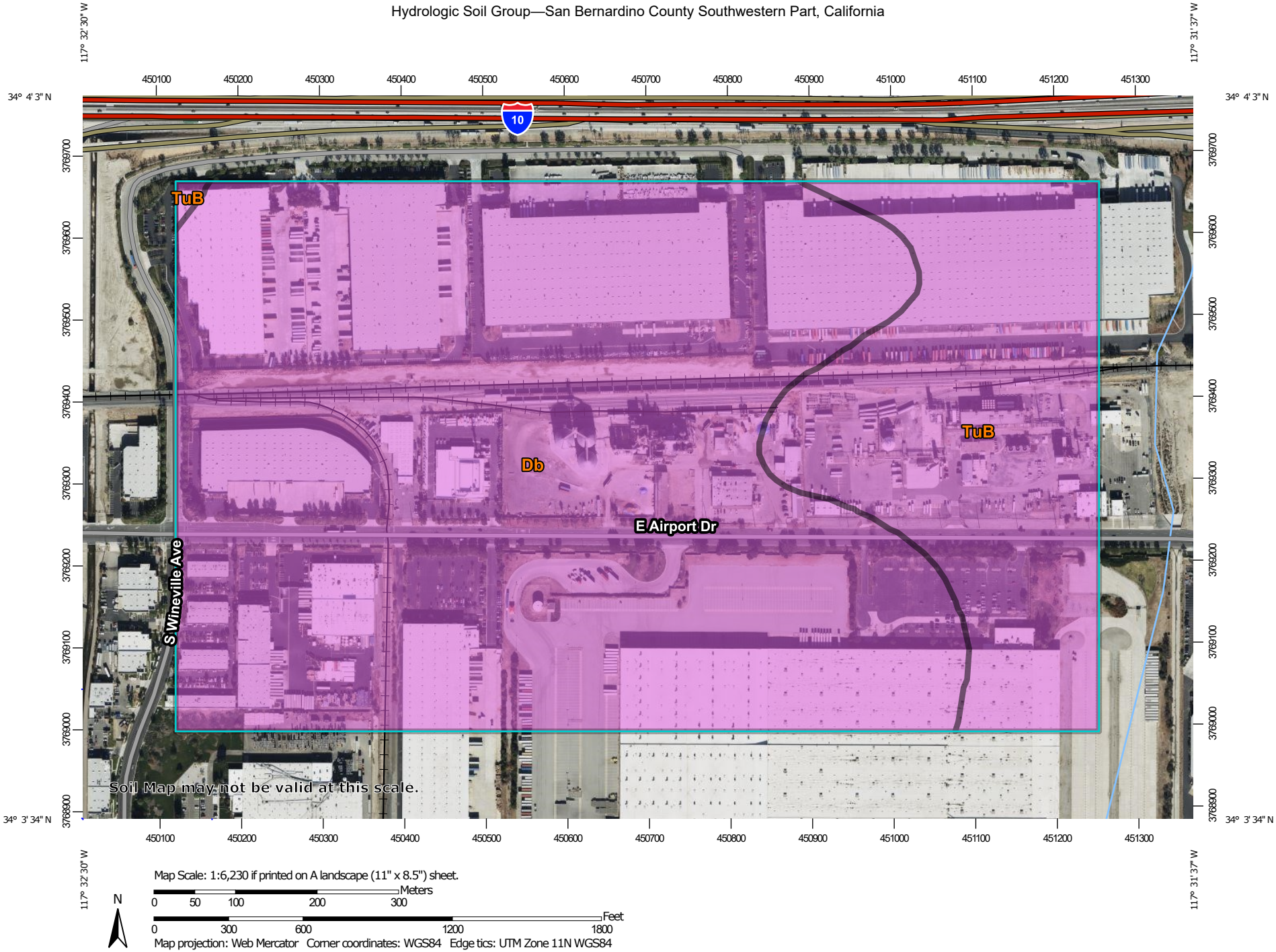
	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

****

APPENDIX E

SUPPORTING DOCUMENTS

SOILS MAP



Map Scale: 1:6,230 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 13, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 5, 2020—Feb 6, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Db	Delhi fine sand	A	143.7	76.2%
TuB	Tujunga loamy sand, 0 to 5 percent slopes	A	44.9	23.8%
Totals for Area of Interest			**188.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

NOAA ATLAS 14 DATA

NOAA Atlas 14, Volume 6, Version 2
Location name: Ontario, California, USA*
Latitude: 34.0635°, Longitude: -117.5335°
Elevation: 983.19 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.104 (0.087-0.126)	0.137 (0.114-0.166)	0.181 (0.150-0.220)	0.216 (0.178-0.265)	0.265 (0.210-0.336)	0.302 (0.235-0.392)	0.341 (0.258-0.454)	0.381 (0.281-0.522)	0.436 (0.307-0.623)	0.479 (0.326-0.710)
10-min	0.149 (0.124-0.180)	0.196 (0.164-0.238)	0.259 (0.215-0.315)	0.310 (0.255-0.380)	0.379 (0.302-0.482)	0.433 (0.337-0.562)	0.488 (0.370-0.650)	0.546 (0.402-0.748)	0.624 (0.441-0.894)	0.686 (0.467-1.02)
15-min	0.180 (0.150-0.218)	0.237 (0.198-0.288)	0.313 (0.260-0.381)	0.375 (0.308-0.460)	0.459 (0.365-0.583)	0.524 (0.408-0.680)	0.591 (0.448-0.787)	0.660 (0.486-0.905)	0.755 (0.533-1.08)	0.830 (0.565-1.23)
30-min	0.270 (0.225-0.327)	0.356 (0.297-0.432)	0.470 (0.390-0.571)	0.562 (0.463-0.690)	0.689 (0.548-0.875)	0.786 (0.612-1.02)	0.886 (0.672-1.18)	0.991 (0.730-1.36)	1.13 (0.800-1.62)	1.25 (0.848-1.85)
60-min	0.399 (0.332-0.483)	0.526 (0.438-0.638)	0.693 (0.576-0.843)	0.830 (0.683-1.02)	1.02 (0.808-1.29)	1.16 (0.903-1.51)	1.31 (0.993-1.74)	1.46 (1.08-2.00)	1.67 (1.18-2.39)	1.84 (1.25-2.73)
2-hr	0.598 (0.498-0.724)	0.777 (0.647-0.943)	1.01 (0.838-1.23)	1.20 (0.986-1.47)	1.45 (1.15-1.84)	1.65 (1.28-2.14)	1.84 (1.40-2.45)	2.05 (1.51-2.80)	2.32 (1.64-3.32)	2.54 (1.73-3.76)
3-hr	0.757 (0.631-0.917)	0.979 (0.815-1.19)	1.26 (1.05-1.54)	1.49 (1.23-1.83)	1.80 (1.43-2.29)	2.04 (1.58-2.64)	2.27 (1.72-3.02)	2.51 (1.85-3.45)	2.84 (2.00-4.06)	3.09 (2.11-4.58)
6-hr	1.08 (0.898-1.31)	1.39 (1.16-1.69)	1.79 (1.49-2.18)	2.11 (1.73-2.58)	2.52 (2.01-3.21)	2.84 (2.21-3.68)	3.15 (2.39-4.20)	3.47 (2.55-4.75)	3.89 (2.74-5.56)	4.20 (2.86-6.24)
12-hr	1.42 (1.18-1.72)	1.85 (1.54-2.24)	2.39 (1.98-2.90)	2.81 (2.31-3.45)	3.36 (2.67-4.26)	3.76 (2.93-4.88)	4.15 (3.15-5.53)	4.55 (3.35-6.23)	5.06 (3.57-7.24)	5.43 (3.70-8.06)
24-hr	1.89 (1.67-2.18)	2.51 (2.22-2.89)	3.27 (2.89-3.79)	3.87 (3.39-4.51)	4.64 (3.93-5.59)	5.20 (4.31-6.39)	5.74 (4.65-7.24)	6.28 (4.95-8.13)	6.97 (5.27-9.40)	7.48 (5.47-10.4)
2-day	2.31 (2.04-2.66)	3.13 (2.77-3.61)	4.17 (3.68-4.83)	4.99 (4.37-5.82)	6.07 (5.14-7.32)	6.87 (5.70-8.45)	7.66 (6.21-9.66)	8.46 (6.66-11.0)	9.50 (7.18-12.8)	10.3 (7.52-14.3)
3-day	2.52 (2.23-2.91)	3.47 (3.07-4.01)	4.70 (4.14-5.44)	5.68 (4.97-6.63)	6.99 (5.92-8.43)	7.98 (6.62-9.82)	8.98 (7.27-11.3)	9.99 (7.87-12.9)	11.3 (8.58-15.3)	12.4 (9.05-17.3)
4-day	2.76 (2.44-3.18)	3.84 (3.39-4.43)	5.23 (4.62-6.06)	6.36 (5.57-7.42)	7.89 (6.68-9.51)	9.05 (7.51-11.1)	10.2 (8.29-12.9)	11.4 (9.01-14.8)	13.1 (9.88-17.6)	14.3 (10.5-20.0)
7-day	3.24 (2.87-3.74)	4.54 (4.02-5.24)	6.26 (5.52-7.24)	7.66 (6.70-8.93)	9.57 (8.10-11.5)	11.0 (9.16-13.6)	12.6 (10.2-15.8)	14.1 (11.1-18.3)	16.2 (12.3-21.9)	17.9 (13.1-25.0)
10-day	3.50 (3.10-4.03)	4.93 (4.36-5.69)	6.83 (6.03-7.91)	8.40 (7.35-9.80)	10.6 (8.93-12.7)	12.2 (10.1-15.0)	13.9 (11.3-17.6)	15.7 (12.4-20.4)	18.2 (13.8-24.5)	20.1 (14.7-28.1)
20-day	4.07 (3.60-4.69)	5.82 (5.15-6.72)	8.18 (7.22-9.47)	10.2 (8.89-11.9)	12.9 (10.9-15.6)	15.1 (12.5-18.6)	17.4 (14.1-21.9)	19.8 (15.6-25.6)	23.2 (17.5-31.2)	25.8 (18.9-36.1)
30-day	4.80 (4.25-5.54)	6.90 (6.10-7.96)	9.75 (8.60-11.3)	12.2 (10.6-14.2)	15.6 (13.2-18.8)	18.3 (15.2-22.5)	21.2 (17.1-26.7)	24.2 (19.1-31.4)	28.5 (21.6-38.5)	32.0 (23.4-44.6)
45-day	5.71 (5.05-6.58)	8.17 (7.22-9.43)	11.6 (10.2-13.4)	14.5 (12.6-16.9)	18.6 (15.7-22.4)	21.9 (18.2-27.0)	25.5 (20.6-32.1)	29.3 (23.1-37.9)	34.7 (26.3-46.8)	39.1 (28.6-54.6)
60-day	6.64 (5.88-7.65)	9.42 (8.33-10.9)	13.3 (11.7-15.4)	16.6 (14.5-19.4)	21.4 (18.1-25.8)	25.3 (21.0-31.1)	29.5 (23.9-37.1)	33.9 (26.7-44.0)	40.4 (30.5-54.5)	45.7 (33.4-63.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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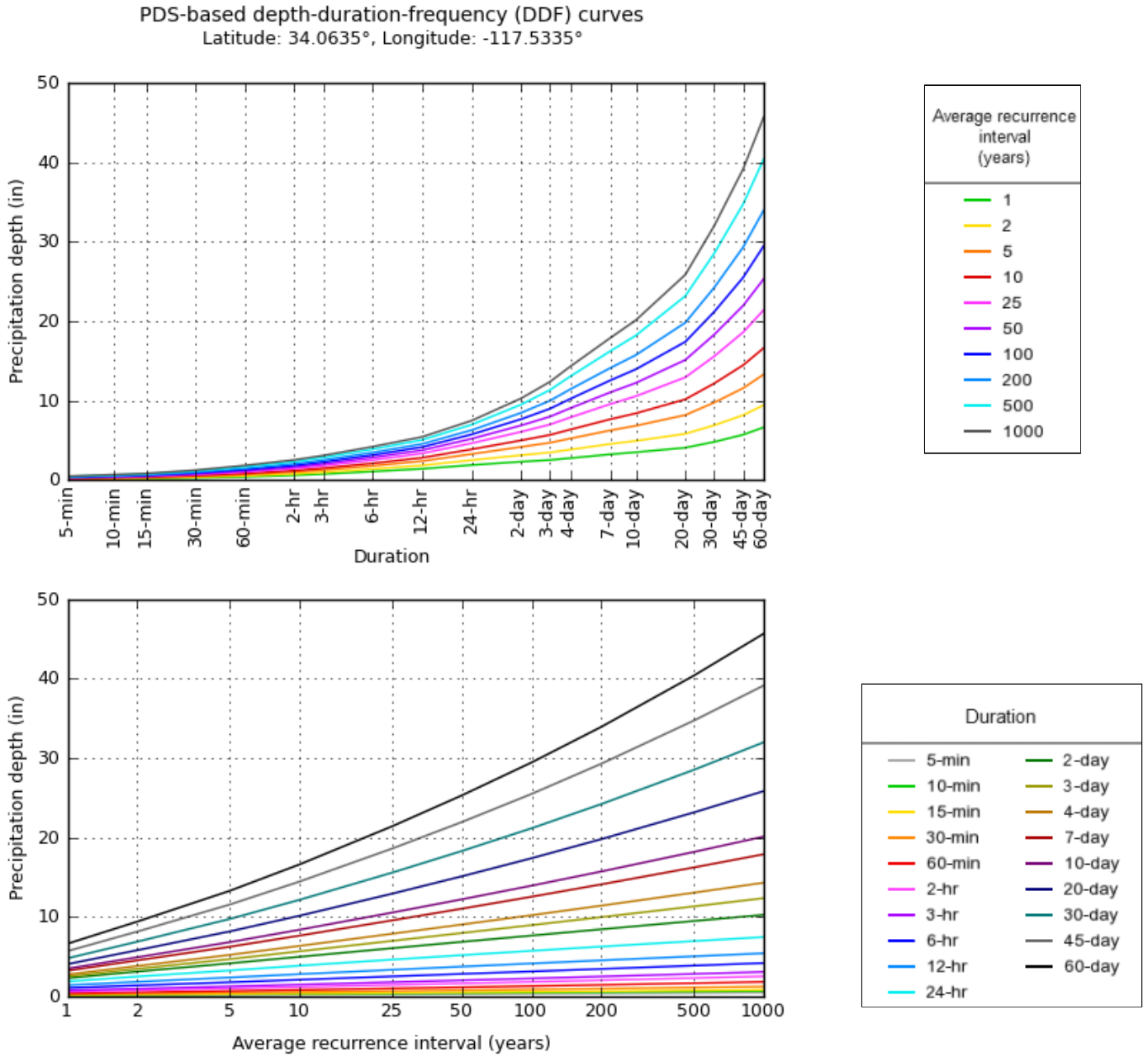
PF graphical



NOAA Atlas 14, Volume 6, Version 2

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Maps & aerials

Small scale terrain

APPENDIX F

INFILTRATION REPORT

March 9, 2022

Prologis
17777 Center Court Drive North, Suite 100
Cerritos, California 90703

Attention: Mr. John Carter
Director, Project Management

Project No.: **22G128-2**

Subject: **Results of Infiltration Testing**
Proposed Warehouse
5355 East Airport Drive
Ontario, California

Reference: Geotechnical Investigation, Proposed Warehouse, 5355 East Airport Drive, Ontario, California, prepared by Southern California Geotechnical, Inc. (SCG) for Prologis, SCG Project No. 22G128-1, dated March 9, 2022.

Dear Mr. Carter:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 22P129, dated January 21, 2022. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with the guidelines published in the Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A, prepared for the Riverside County Department of Environmental Health (RCDEH), dated December, 2013. The San Bernardino County standards defer to the guidelines published by the RCDEH.

Site and Project Description

The subject site is located on the north side of East Airport Drive, 1,310± feet east of the intersection of South Wineville Avenue and East Airport Drive in Ontario, California. The site is also referenced by the street address 5355 East Airport Drive. The site is bounded to the north by Union Pacific railroad tracks, to the east and west by an industrial development, and to the south by East Airport Drive. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The site consists of an irregular-shaped property, 14.58± acres in size. The site is developed to manufacture and store animal feed grains. The development includes several buildings and shed structures ranging in size from 2,200± ft^2 to 20,175± ft^2, and several silos and above-ground

storage tanks (ASTs) primarily located in the north-central region of the site. The existing structures are generally of concrete tilt-up and/or metal-framed construction, and are presumed to be supported on conventional shallow foundations with concrete slab-on-grade floors. The existing structures are generally surrounded by asphaltic concrete (AC) pavements, with isolated areas of Portland cement concrete (PCC), aggregate base pavements, and exposed soils in the south-central portion of the site. The existing pavements are in poor condition, with moderate to severe cracking throughout. Two medium-size trees are present in the south-central region of the site.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth and visual observations made at the time of the subsurface investigation, the site slopes gently to the south-southeast at a gradient of less than 1 percent.

Proposed Development

A preliminary site plan, identified as Scheme 01 and prepared by RGA, for the proposed development was provided to our office by the client. Based on this plan, the subject site will be developed with a 259,189± ft² warehouse, located in the north-central region of the site. Dock-high doors will be constructed along a portion of the south building wall. The proposed building is expected to be surrounded by AC pavements in the parking and drive areas, PCC pavements in the loading dock area, and concrete flatwork and landscaped planters throughout the site.

We understand that the proposed development will include on-site stormwater infiltration. Based on our experience with similar projects in the area, the infiltration systems are expected to be below-grade chambers. The bottoms of the infiltration systems are expected to be 10 to 12± feet below the existing site grades.

Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site, referenced above. As a part of this study, five (5) borings (identified as Boring Nos. B-1 through B-5) were advanced to depths of 20 to 30± feet below the existing site grades.

AC pavements were encountered at the ground surface of Boring Nos. B-1 through B-4. The pavement sections generally consist of 0 to 2½± inches of AC, underlain by 1 to 3½± inches of aggregate base. Artificial fill soils were encountered beneath the existing pavements at Boring Nos. B-1 through B-4 and at the ground surface at Boring No. B-5, extending to depths of 2½ to 6½± feet below the existing site grades. The fill soils generally consist of loose to medium dense sands and silty sands, with occasional dense silty sands. Native alluvium was encountered beneath the artificial fill soils at all of the boring locations, extending to at least the maximum depth explored of 30± feet. The near-surface alluvium generally consists of loose to medium dense sands and sandy silts, extending to depths of 6½ to 12± feet. At greater depths, the alluvium generally consists of medium dense to dense sands, silty sands and sandy silts. Boring No. B-3 encountered a stratum of dense silty sands at a depth of 14½ to 17± feet. Boring No. B-5 encountered a stratum of loose well-graded sands at a depth of 12 to 17± feet.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the lack of any water within the borings, and the moisture contents of the recovered soil samples, the static groundwater table is considered to have existed at a depth in excess of 30± feet at the time of the subsurface exploration.

As part of our research, we reviewed available groundwater data in order to determine groundwater levels for the site. Water level data was obtained from the California Department of Water Resources Water Data Library website, https://wdl.water.ca.gov/waterdatalibrary/. The nearest monitoring well on record (identified as State Well Number: 01S06W29H001S) is located 3,400± feet southeast of the project site. Water level readings within this monitoring well indicate a high groundwater level of 277± feet below the ground surface in April 2019.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for the infiltration testing consisted of six (6) infiltration test borings, advanced to depths of 10 to 12± feet below the existing site grades. The infiltration borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow-stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration test borings (identified as I-1 through I-6) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

AC pavements were encountered at the ground surface of Infiltration Test Nos. I-1 through I-5. The pavement sections generally consist of 0 to 6± inches of AC, underlain by 0 to 9± inches of aggregate base. An 8±-inch-thick PCC section was encountered at the ground surface at Infiltration Test Nos. I-6. Steel reinforcement was not encountered at this location. Artificial fill soils were encountered beneath the existing pavements at all of the infiltration boring location, extending to depths of 3 to 4± feet below the existing site grades. The fill soils generally consist of medium dense to dense silty sands, with occasional loose sands. The fill soils possess a disturbed mottled appearance resulting in their classification as artificial fill. Native alluvial soils were encountered beneath the fill soils at all of the infiltration boring locations, extending to at least the maximum depth explored of 12± feet. The alluvium generally consists of loose sands, silty sands and silty sands to sandy silts, with occasional medium dense silty sands. The Boring Logs, which illustrate the conditions encountered at the boring locations, are included with this report.

Infiltration Testing

As previously mentioned, the infiltration testing was performed in general accordance with the guidelines published in Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A, which apply to San Bernardino County.

Pre-soaking

In accordance with the county infiltration standards for sandy soils, all infiltration test borings were pre-soaked 2 hours prior to the infiltration testing or until all of the water had percolated through the test holes. The pre-soaking process consisted of filling test borings by inverting a full 5-gallon bottle of clear water supported over each hole so that the water flow into the hole holds constant at a level at least 5 times the hole's radius above the gravel at the bottom of each hole. Pre-soaking was completed after all of the water had percolated through the test holes.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. Each test hole was filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of the test holes. In accordance with the Riverside County guidelines, since "sandy soils" (where 6 inches of water infiltrated into the surrounding soils in less than 25 minutes for two consecutive readings) were encountered at the bottom of the infiltration test borings, readings were taken at 10-minute intervals for a total of 1 hour. After each reading, water was added to the borings so that the depth of the water was at least 5 times the radius of the hole. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the tests are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-1	10	Silty fine Sand, little medium Sand	3.9
I-2	12	Silty fine to medium Sand	3.0
I-3	12	Silty fine to medium Sand, trace coarse Sand	4.6
I-4	12	Silty fine Sand to fine Sandy Silt, trace medium Sand	3.1
I-5	10	Silty fine Sand, little medium Sand, trace fine Gravel	3.5
I-6	10	Silty fine Sand to fine Sandy Silt, trace medium Sand, trace fine Gravel	3.0

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the base of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-6 of this report.

Design Recommendations

Six (6) infiltration tests were performed at the subject site. As noted above, the infiltration rates at these locations vary from 3.0 to 4.6 inches per hour. The major factor affecting the difference in infiltration rates at the infiltration test locations is the presence of silt in the soils at the tested depths. Based on the infiltration test results, we recommend an infiltration rate of 3.0 inches per hour be used in the design of the infiltration systems, if the bottom of the infiltration systems extend between 10 to 12± feet below the existing site grades.

The design of the storm water infiltration systems should be performed by the project civil engineer, in accordance with the City of Ontario and/or County of San Bernardino guidelines. It is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the systems. The presence of such materials would decrease the effective infiltration rates. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above is based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rate.** It should be noted that the recommended infiltration rates are based on infiltration testing at six (6) discrete locations and that the overall infiltration rates of the proposed infiltration systems could vary considerably.

Infiltration Rate Considerations

The infiltration rates presented herein was determined in accordance with the San Bernardino County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Compaction of the soils at the bottom of the infiltration system can significantly reduce the infiltration ability of the basins. Therefore, the subgrade soils within proposed infiltration system areas should not be over-excavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the basin bottom, or at levels lower than 2 feet above the bottom of the system, particularly within basins. As such, the bottom 24 inches of the infiltration systems should be excavated with non-rubber-tired equipment, such as excavators.

Basin Maintenance

The proposed project may include infiltration basins. Water flowing into these basins will carry some level of sediment. Wind-blown sediments and erosion of the basin side walls will also contribute to sediment deposition at the bottom of the basin. This layer has the potential to significantly reduce the infiltration rate of the basin subgrade soils. Therefore, a formal basin maintenance program should be established to ensure that these silt and clay deposits are removed from the basin on a regular basis. Appropriate vegetation on the basin sidewalls and bottom may reduce erosion and sediment deposition.

Basin maintenance should also include measures to prevent animal burrows, and to repair any burrows or damage caused by such. Animal burrows in the basin sidewalls can significantly increase the risk of erosion and piping failures.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

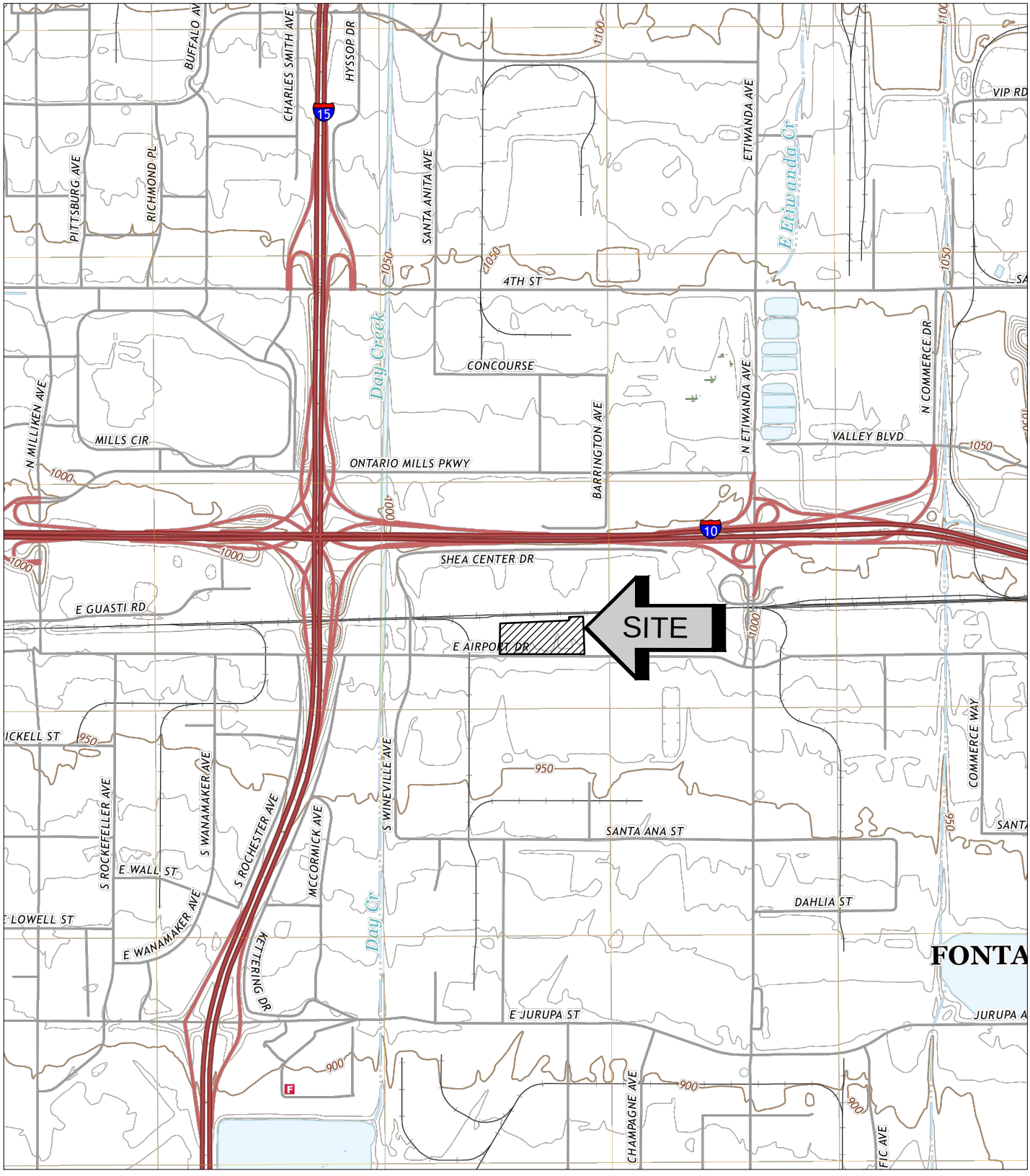
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Joseph Lozano Leon
Staff Engineer

Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (8 pages)
Infiltration Test Results Spreadsheets (6 pages)
Grain Size Distribution Graphs (6 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE GUASTI QUADRANGLE, SAN BERNARDINO COUNTY, CALIFORNIA, 2021.

SITE LOCATION MAP

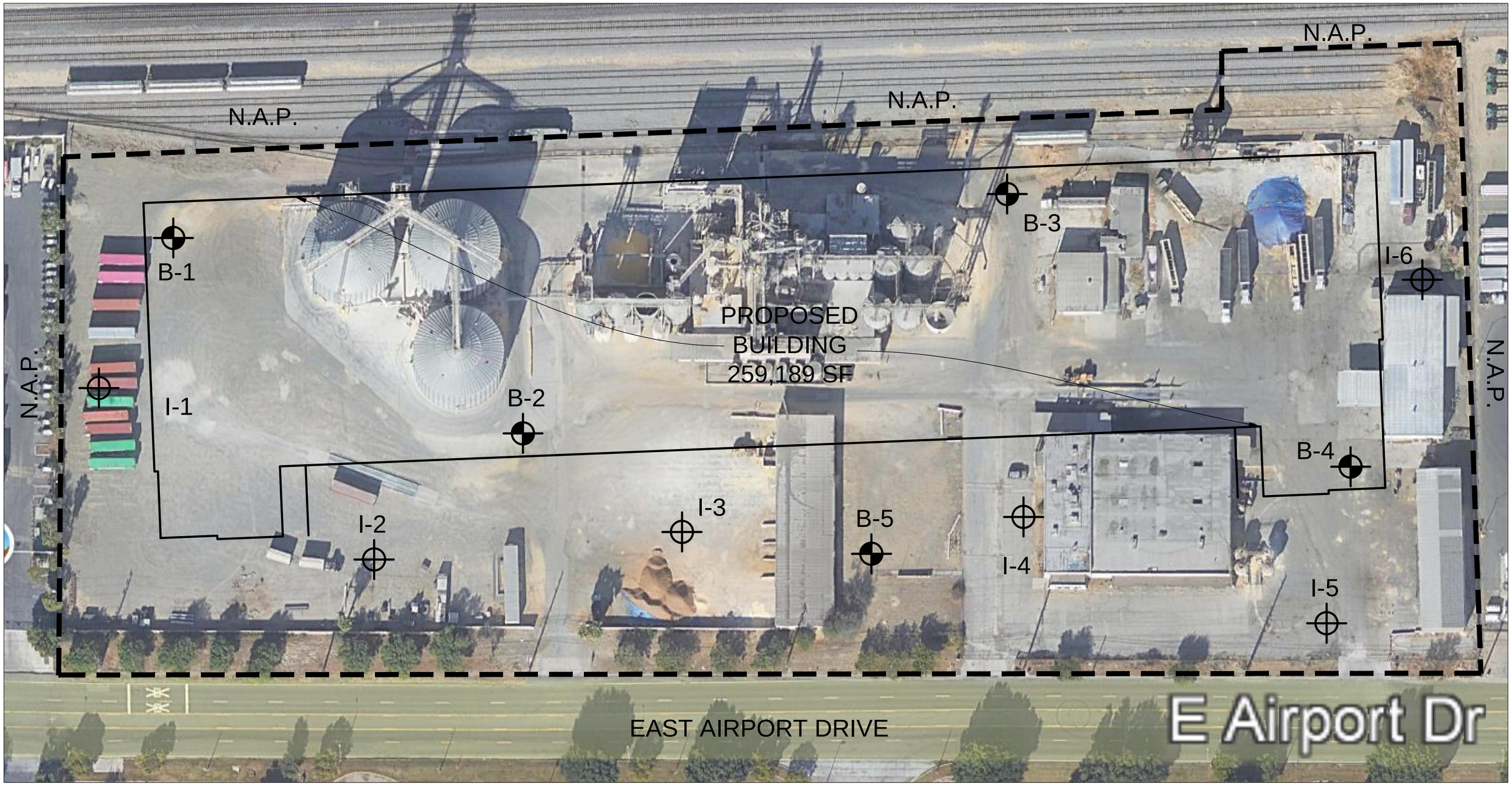
PROPOSED WAREHOUSE

ONTARIO, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: JLL CHKD: RGT	
SCG PROJECT 22G128-2	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- APPROXIMATE BORING LOCATION FROM CONCURRENT STUDY (SCG PROJECT NO. 22G128-1)
- PROPERTY LINE

NORTH

SoCalGeo

NOTE: PRELIMINARY SITE PLAN PREPARED BY RGA.
AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH.

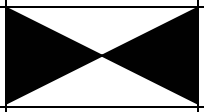
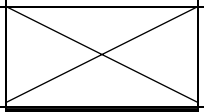
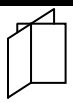
INFILTRATION TEST LOCATION PLAN

PROPOSED WAREHOUSE

ONTARIO, CALIFORNIA

SCALE: 1" = 80'	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JLL CHKD: RGT	
SCG PROJECT 22G128-2	
PLATE 2	

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

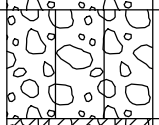
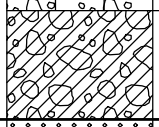
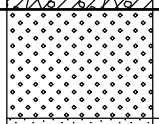
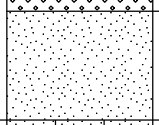
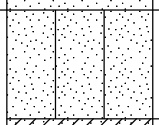
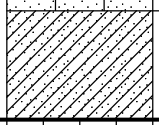
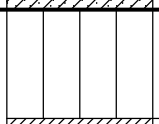
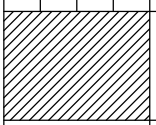
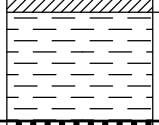
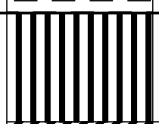
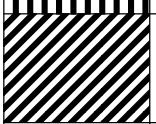
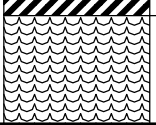
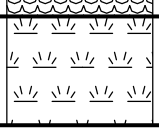
LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-1

JOB NO.: 22G128-2
PROJECT: Proposed Warehouse
LOCATION: Ontario, California

DRILLING DATE: 2/10/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Joseph Lozano Leon

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					8± inches Aggregate Base							
		26			FILL: Gray Brown Silty fine to coarse Sand, little fine Gravel, medium dense-moist		10					
					ALLUVIUM: Light Brown to Brown Silty fine Sand, loose-damp							
5		7					4					
		9			@ 8½ feet, little medium Sand		5			31		
10					Boring Terminated at 10'							

TBL 22G128-2.GPJ SOCALGEO.GDT 3/9/22

TEST BORING LOG

PLATE B-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-2

JOB NO.: 22G128-2
PROJECT: Proposed Warehouse
LOCATION: Ontario, California

DRILLING DATE: 2/10/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Joseph Lozano Leon

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					5½± inches Aggregate Base							
		30			FILL: Brown Silty fine Sand, little medium Sand, trace coarse Sand, trace fine Gravel, dense-dry to damp		2					
		4			ALLUVIUM: Gray Brown Silty fine Sand, little medium Sand, trace coarse Sand, loose-damp		6					
5												
		6			Brown Silty fine Sand, trace medium Sand, loose-damp to moist		7					
					Brown Silty fine to medium Sand, medium dense-moist							
10		23					8			33		
					Boring Terminated at 12'							

TBL 22G128-2.GPJ SOCALGEO.GDT 3/9/22

TEST BORING LOG **PLATE B-2**

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-3

JOB NO.: 22G128-2
PROJECT: Proposed Warehouse
LOCATION: Ontario, California

DRILLING DATE: 2/10/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Joseph Lozano Leon

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					6± inches Asphaltic Concrete							
		8			FILL: Brown fine to medium Sand, little Silt, loose-damp to moist		7					
		4			ALLUVIUM: Brown fine to medium Sand, little Silt, loose-damp		5					
5		7					5					
10		6			Brown to Dark Brown Silty fine to medium Sand, trace coarse Sand, loose-damp to moist		7			20		
					Boring Terminated at 12'							

TBL 22G128-2.GPJ SOCALGEO.GDT 3/9/22

TEST BORING LOG

PLATE B-3

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-4

JOB NO.: 22G128-2
PROJECT: Proposed Warehouse
LOCATION: Ontario, California

DRILLING DATE: 2/10/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Joseph Lozano Leon

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					3± inches Asphaltic Concrete, 9± inches of Aggregate Base							
		19			FILL: Gray Brown Silty fine to medium Sand, trace coarse Sand, medium dense-damp		5					
		4			ALLUVIUM: Gray Brown Silty fine Sand, little medium Sand, loose, damp to moist		7					
5		9					7					
10		6			Gray Brown Silty fine Sand to fine Sandy Silt, trace medium Sand, loose-very moist		13			52		
					Boring Terminated at 12'							

TBL 22G128-2.GPJ SOCALGEO.GDT 3/9/22

TEST BORING LOG

PLATE B-4

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-5

JOB NO.: 22G128-2
PROJECT: Proposed Warehouse
LOCATION: Ontario, California

DRILLING DATE: 2/10/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Joseph Lozano Leon

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					2½± inches Asphaltic Concrete, 3½± inches of Aggregate Base							
		12			FILL: Brown Silty fine Sand, trace to little medium Sand, trace coarse Sand, medium dense-moist		8					
5		4			ALLUVIUM: Brown Silty fine Sand, trace to little medium Sand, loose-damp		6					
		9			Gray Brown to Dark Gray Brown Silty fine Sand to fine Sandy Silt, loose-very moist		14					
10					Gray Brown Silty fine Sand, little medium Sand, trace fine Gravel, loose-moist		9			24		
					Boring Terminated at 10'							

TBL 22G128-2.GPJ SOCALGEO.GDT 3/9/22

TEST BORING LOG

PLATE B-5

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. I-6

JOB NO.: 22G128-2
PROJECT: Proposed Warehouse
LOCATION: Ontario, California

DRILLING DATE: 2/10/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Joseph Lozano Leon

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					8± inches Portland Cement Concrete							
		43			FILL: Gray Brown Silty fine Sand, little medium Sand, trace coarse Sand, dense-moist		9					
5		8			ALLUVIUM: Gray Brown Silty fine Sand, trace medium Sand, loose-moist		9					
		6			Gray Brown Silty fine Sand to fine Sandy Silt, trace medium Sand, trace fine Gravel, loose-very moist		14			43		
10					Boring Terminated at 10'							

TBL 22G128-2.GPJ SOCALGEO.GDT 3/9/22

TEST BORING LOG

PLATE B-6

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Ontario, California
Project Number	22G128-2
Engineer	Caleb Brackett

Test Hole Radius	4	(in)
Test Depth	10.20	(ft)

Infiltration Test Hole	I-1

Soil Criteria Test

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (in)	Did 6 inches of water seep away in less than 25 minutes?	Sandy Soils or Non-Sandy Soils?
1	Initial	8:28 AM	25.00	8.10	24.00	YES	SANDY SOILS
	Final	8:53 AM		10.10			
2	Initial	8:55 AM	25.00	8.10	24.00	YES	SANDY SOILS
	Final	9:20 AM		10.10			

Test Data

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	9:21 AM	10.00	8.20	0.80	1.60	5.43
	Final	9:31 AM		9.00			
2	Initial	9:31 AM	10.00	8.20	0.70	1.65	4.62
	Final	9:41 AM		8.90			
3	Initial	9:41 AM	10.00	8.20	0.60	1.70	3.86
	Final	9:51 AM		8.80			
4	Initial	9:51 AM	10.00	8.30	0.60	1.60	4.08
	Final	10:01 AM		8.90			
5	Initial	10:01 AM	10.00	8.20	0.60	1.70	3.86
	Final	10:11 AM		8.80			
6	Initial	10:11 AM	10.00	8.20	0.60	1.70	3.86
	Final	10:21 AM		8.80			
7	Initial	10:21 AM	10.00	8.20	0.60	1.70	3.86
	Final	10:31 AM		8.80			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:

Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Ontario, California
Project Number	22G128-2
Engineer	Caleb Brackett

Test Hole Radius	4	(in)
Test Depth	12.00	(ft)

Infiltration Test Hole	I-2

Soil Criteria Test

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (in)	Did 6 inches of water seep away in less than 25 minutes?	Sandy Soils or Non-Sandy Soils?
1	Initial	7:07 AM	25.00	9.00	24.00	YES	SANDY SOILS
	Final	7:32 AM		11.00			
2	Initial	7:33 AM	25.00	9.00	22.80	YES	SANDY SOILS
	Final	7:58 AM		10.90			

Test Data

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	7:58 AM	10.00	9.00	0.80	2.60	3.47
	Final	8:08 AM		9.80			
2	Initial	8:09 AM	10.00	9.00	0.80	2.60	3.47
	Final	8:19 AM		9.80			
3	Initial	8:20 AM	10.00	9.00	0.70	2.65	2.98
	Final	8:30 AM		9.70			
4	Initial	8:30 AM	10.00	9.00	0.80	2.60	3.47
	Final	8:40 AM		9.80			
5	Initial	8:40 AM	10.00	9.00	0.70	2.65	2.98
	Final	8:50 AM		9.70			
6	Initial	8:50 AM	10.00	9.00	0.70	2.65	2.98
	Final	9:00 AM		9.70			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:

Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Ontario, California
Project Number	22G128-2
Engineer	Sam Bergeland

Test Hole Radius	4	(in)
Test Depth	12.40	(ft)

Infiltration Test Hole: I-3

Soil Criteria Test

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (in)	Did 6 inches of water seep away in less than 25 minutes?	Sandy Soils or Non-Sandy Soils?
1	Initial	10:15 AM	25.00	10.40	24.00	YES	SANDY SOILS
	Final	10:40 AM		12.40			
2	Initial	10:42 AM	25.00	10.40	24.00	YES	SANDY SOILS
	Final	11:07 AM		12.40			

Test Data

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	11:08 AM	10.00	10.40	0.80	1.60	5.43
	Final	11:18 AM		11.20			
2	Initial	11:20 AM	10.00	10.40	0.90	1.55	6.29
	Final	11:30 AM		11.30			
3	Initial	11:31 AM	10.00	10.40	0.80	1.60	5.43
	Final	11:41 AM		11.20			
4	Initial	11:42 AM	10.00	10.40	0.80	1.60	5.43
	Final	11:52 AM		11.20			
5	Initial	11:55 AM	10.00	10.40	0.70	1.65	4.62
	Final	12:05 PM		11.10			
6	Initial	12:06 PM	10.00	10.40	0.70	1.65	4.62
	Final	12:16 PM		11.10			
7	Initial	12:18 PM	10.00	10.40	0.70	1.65	4.62
	Final	12:28 PM		11.10			
8	Initial	12:29 PM	10.00	10.40	0.70	1.65	4.62
	Final	12:39 PM		11.10			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:

- Q = Infiltration Rate (in inches per hour)
- ΔH = Change in Height (Water Level) over the time interval
- r = Test Hole (Borehole) Radius
- Δt = Time Interval
- H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Ontario, California
Project Number	22G128-2
Engineer	Sam Bergeland

Test Hole Radius	4	(in)
Test Depth	11.70	(ft)

Infiltration Test Hole	I-4

Soil Criteria Test

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (in)	Did 6 inches of water seep away in less than 25 minutes?	Sandy Soils or Non-Sandy Soils?
1	Initial	7:56 AM	25.00	10.00	20.40	YES	SANDY SOILS
	Final	8:21 AM		11.70			
2	Initial	8:22 AM	25.00	10.00	20.40	YES	SANDY SOILS
	Final	8:47 AM		11.70			

Test Data

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	8:48 AM	10.00	10.30	0.50	1.15	4.56
	Final	8:58 AM		10.80			
2	Initial	8:59 AM	10.00	10.30	0.40	1.20	3.51
	Final	9:09 AM		10.70			
3	Initial	9:10 AM	10.00	10.30	0.30	1.25	2.54
	Final	9:20 AM		10.60			
4	Initial	9:20 AM	10.00	10.30	0.20	1.30	1.64
	Final	9:30 AM		10.50			
5	Initial	9:31 AM	10.00	10.10	0.50	1.35	3.96
	Final	9:41 AM		10.60			
6	Initial	9:42 AM	10.00	10.10	0.40	1.40	3.06
	Final	9:52 AM		10.50			
7	Initial	9:24 AM	10.00	10.10	0.40	1.40	3.06
	Final	9:34 AM		10.50			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:

Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Ontario, California
Project Number	22G128-2
Engineer	Sam Bergeland

Test Hole Radius	4	(in)
Test Depth	10.20	(ft)

Infiltration Test Hole	I-5

Soil Criteria Test

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (in)	Did 6 inches of water seep away in less than 25 minutes?	Sandy Soils or Non-Sandy Soils?
1	Initial	7:42 AM	25.00	8.10	20.40	YES	SANDY SOILS
	Final	8:07 AM		9.80			
2	Initial	8:08 AM	25.00	8.10	21.60	YES	SANDY SOILS
	Final	8:33 AM		9.90			

Test Data

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	8:35 AM	10.00	8.30	0.80	1.50	5.76
	Final	8:45 AM		9.10			
2	Initial	8:46 AM	10.00	8.80	0.60	1.10	5.68
	Final	8:56 AM		9.40			
3	Initial	8:57 AM	10.00	8.80	0.50	1.15	4.56
	Final	9:07 AM		9.30			
4	Initial	9:08 AM	10.00	8.80	0.50	1.15	4.56
	Final	9:18 AM		9.30			
5	Initial	9:19 AM	10.00	8.80	0.40	1.20	3.51
	Final	9:29 AM		9.20			
6	Initial	9:30 AM	10.00	8.80	0.40	1.20	3.51
	Final	9:40 AM		9.20			
7	Initial	9:42 AM	10.00	8.80	0.40	1.20	3.51
	Final	9:52 AM		9.20			
8	Initial	9:53 AM	10.00	8.80	0.40	1.20	3.51
	Final	10:03 AM		9.20			

Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:

Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval
H_{avg} = Average Head Height over the time interval

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Ontario, California
Project Number	22G128-2
Engineer	Sam Bergeland

Test Hole Radius	4	(in)
Test Depth	10.20	(ft)

Infiltration Test Hole	I-6

Soil Criteria Test

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (in)	Did 6 inches of water seep away in less than 25 minutes?	Sandy Soils or Non-Sandy Soils?
1	Initial	7:49 AM	25.00	8.10	19.20	YES	SANDY SOILS
	Final	8:14 AM		9.70			
2	Initial	8:15 AM	25.00	8.10	20.40	YES	SANDY SOILS
	Final	8:40 AM		9.80			

Test Data

Interval Number		Time	Time Interval (min)	Water Depth (ft)	Change in Water Level (ft)	Average Head Height (ft)	Infiltration Rate Q (in/hr)
1	Initial	10:17 AM	10.00	8.10	0.60	1.80	3.66
	Final	10:27 AM		8.70			
2	Initial	10:28 AM	10.00	8.10	0.70	1.75	4.38
	Final	10:38 AM		8.80			
3	Initial	10:39 AM	10.00	8.10	0.50	1.85	2.98
	Final	10:49 AM		8.60			
4	Initial	10:50 AM	10.00	8.10	0.60	1.80	3.66
	Final	11:00 AM		8.70			
5	Initial	11:05 AM	10.00	8.10	0.50	1.85	2.98
	Final	11:15 AM		8.60			
6	Initial	11:16 AM	10.00	8.10	0.50	1.85	2.98
	Final	11:26 AM		8.60			
7	Initial	11:27 AM	10.00	8.10	0.50	1.85	2.98
	Final	11:37 AM		8.60			

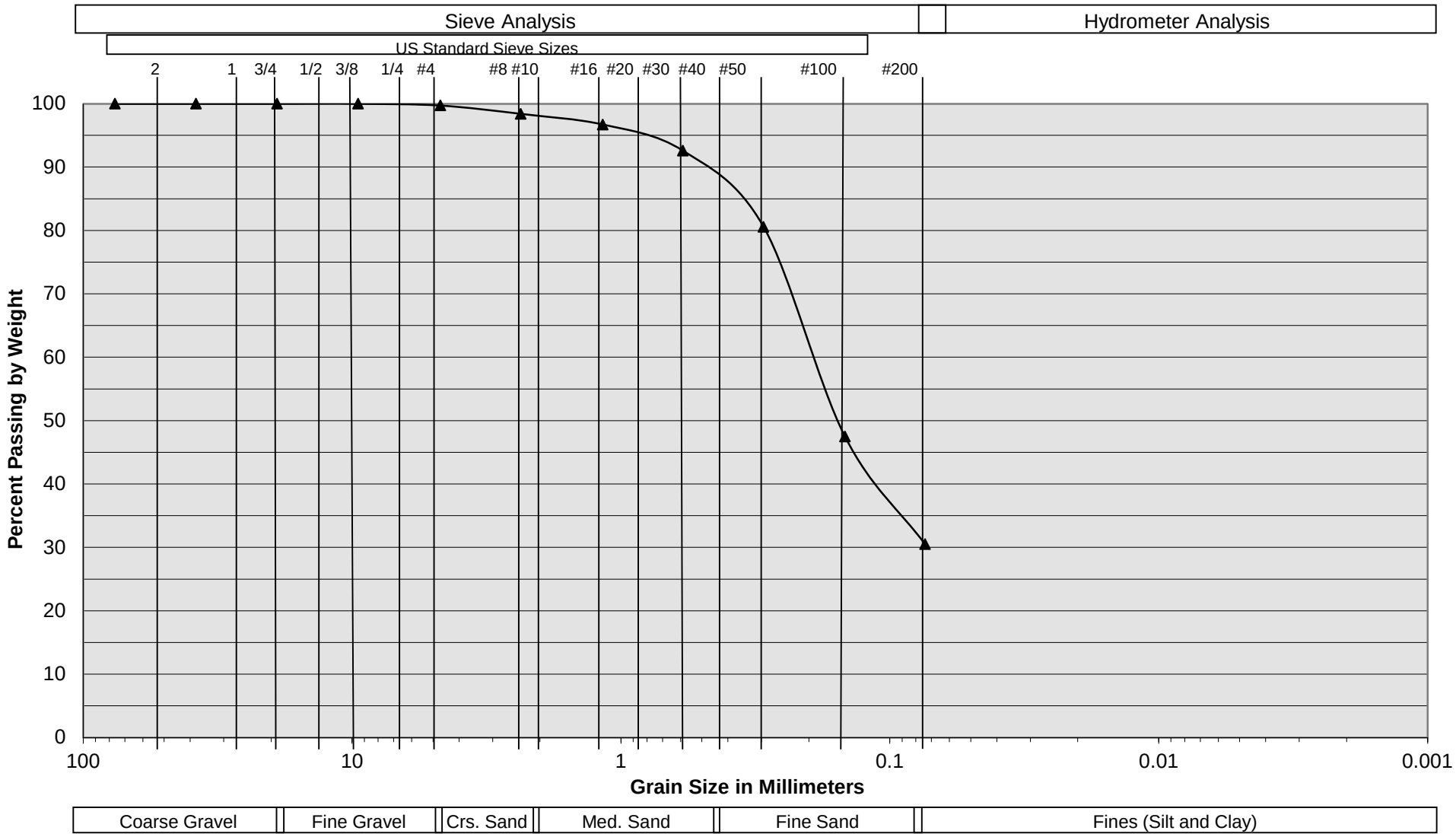
Per County Standards, Infiltration Rate calculated as follows:

$$Q = \frac{\Delta H(60r)}{\Delta t(r + 2H_{avg})}$$

Where:

Q = Infiltration Rate (in inches per hour)
ΔH = Change in Height (Water Level) over the time interval
r = Test Hole (Borehole) Radius
Δt = Time Interval
H_{avg} = Average Head Height over the time interval

Grain Size Distribution



Sample Description	I-1 @ 8½'
Soil Classification	Light Brown to Brown Silty fine Sand, little medium Sand

Proposed Warehouse
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PLATE C- 1

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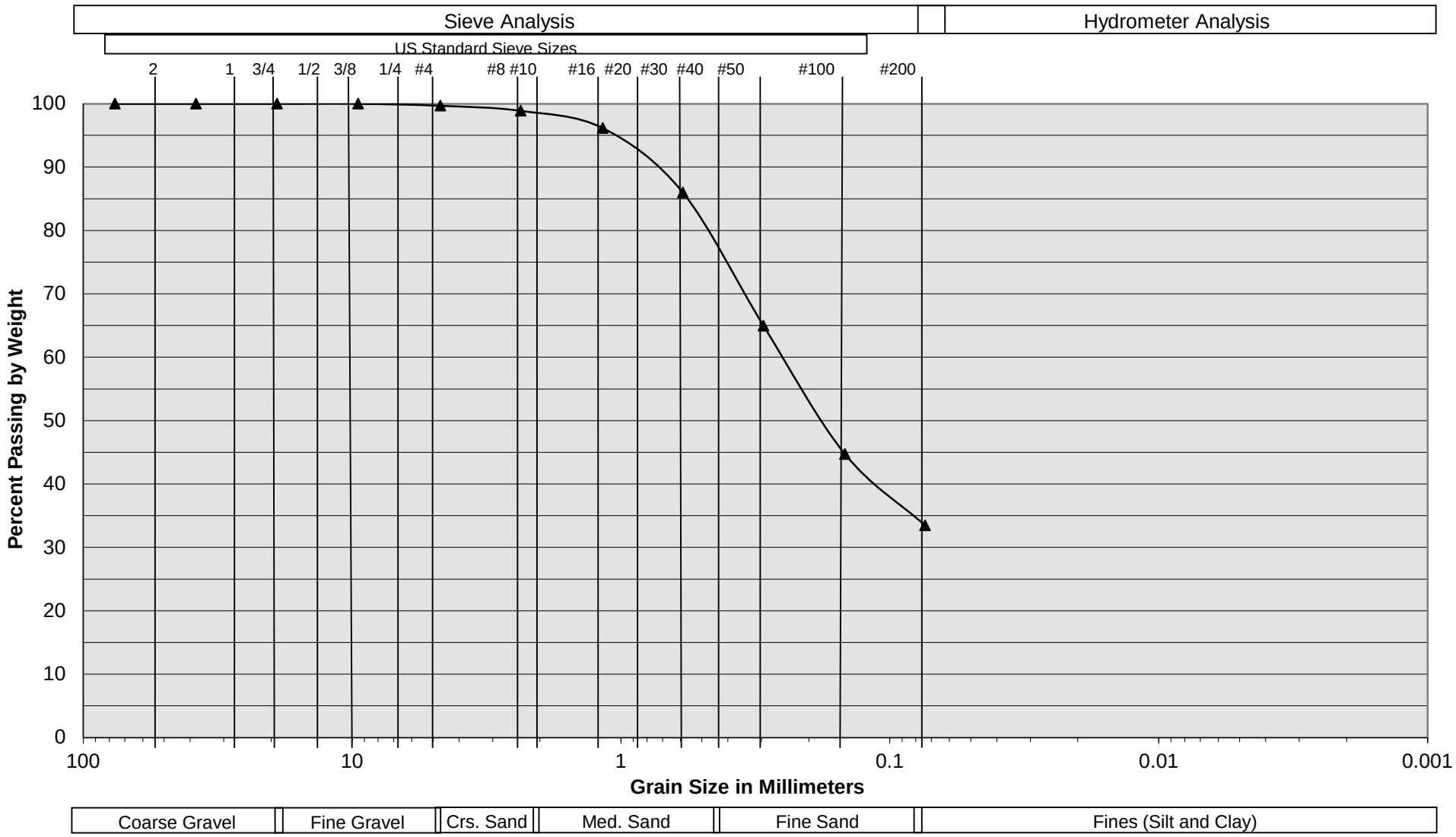

Sample Description	I-2 @ 10½'
Soil Classification	Brown Silty fine to medium Sand

Proposed Warehouse
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PLATE C- 2

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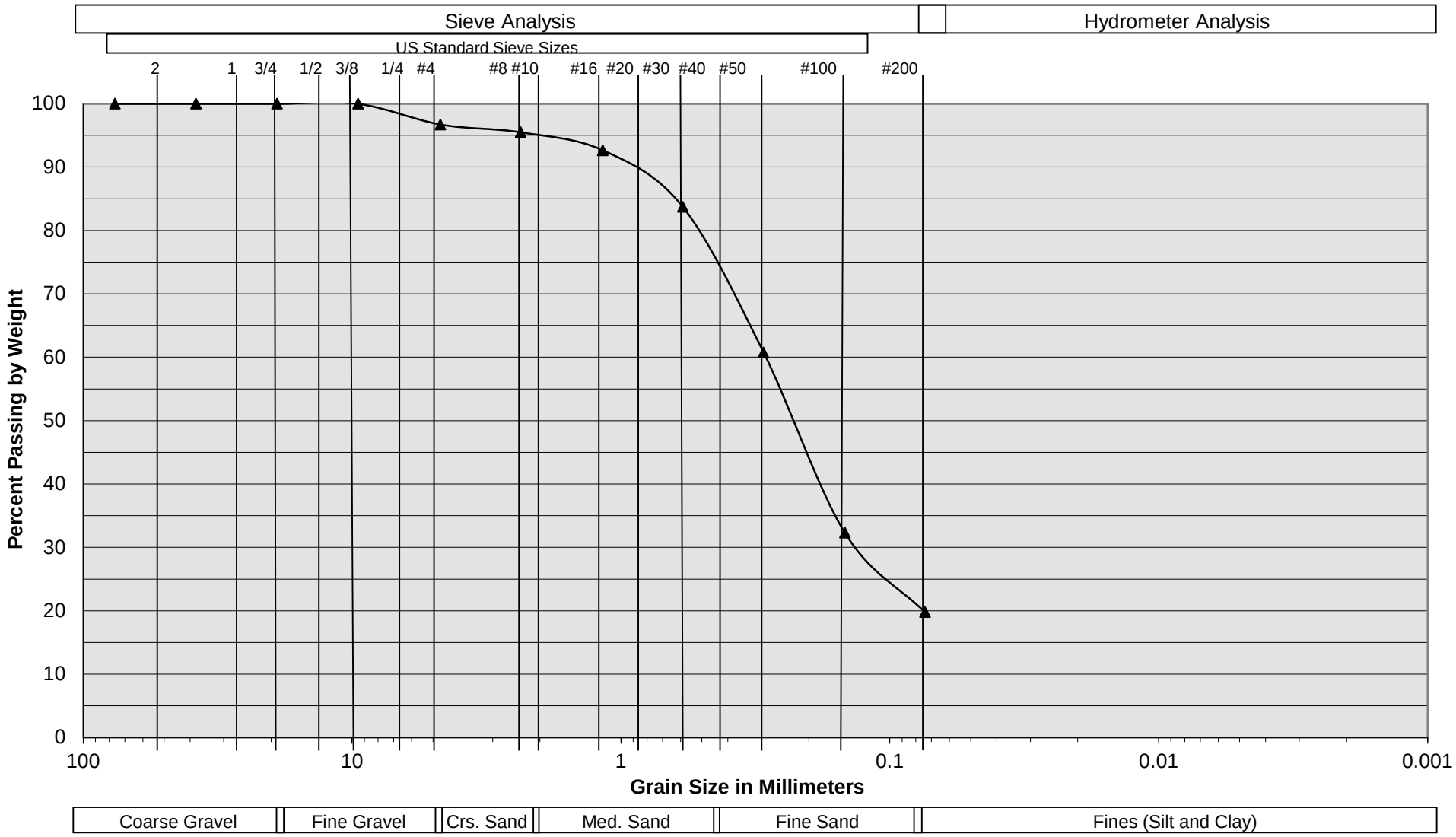

Sample Description	I-3 @ 10½'
Soil Classification	Brown to Dark Brown Silty fine to medium Sand, trace coarse Sand

Proposed Warehouse
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PLATE C- 3

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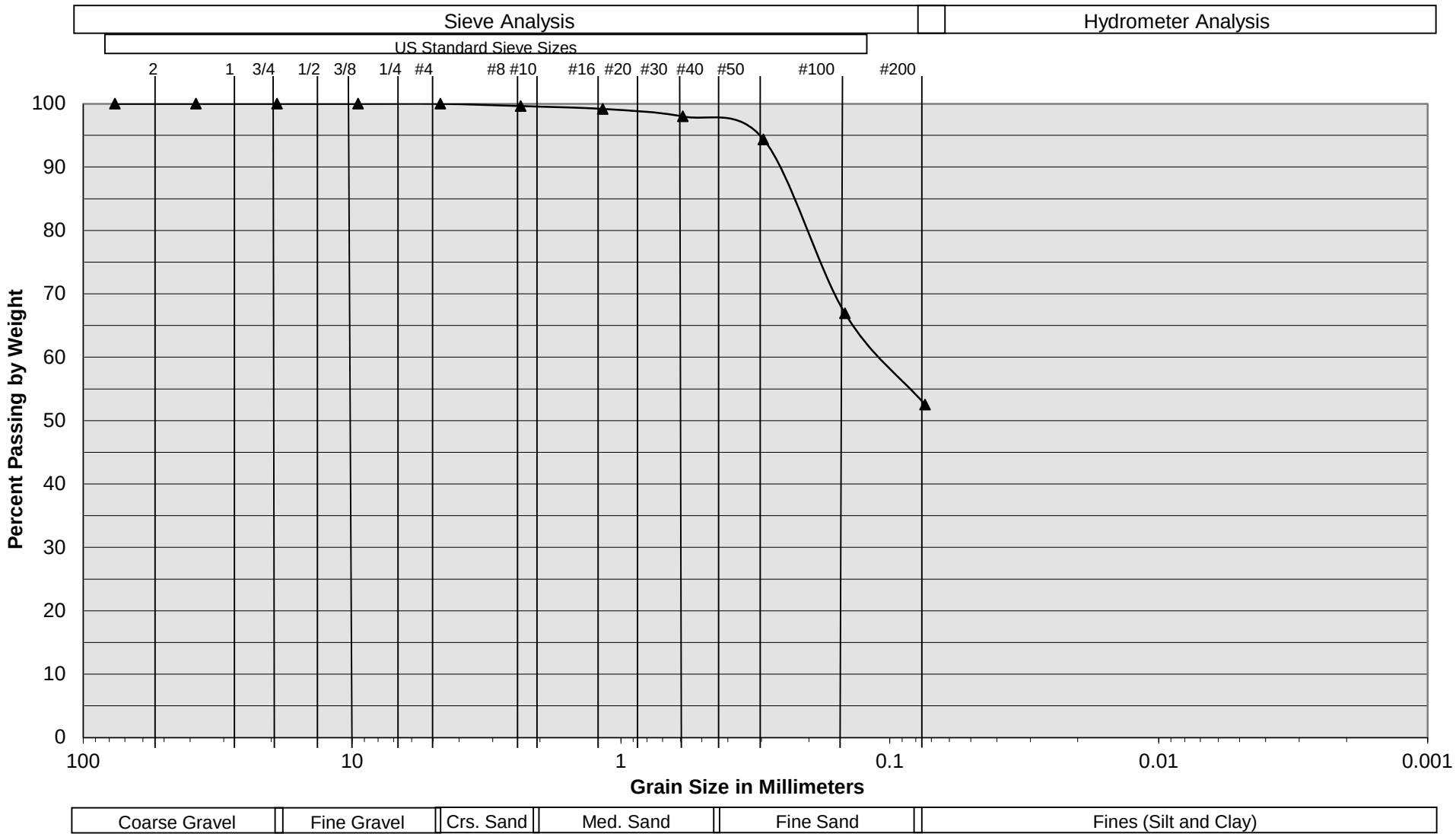
Grain Size Distribution



Sample Description	I-4 @ 10½'
Soil Classification	Gray Brown Silty fine Sand to fine Sandy Silt, trace medium Sand

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PLATE C- 4

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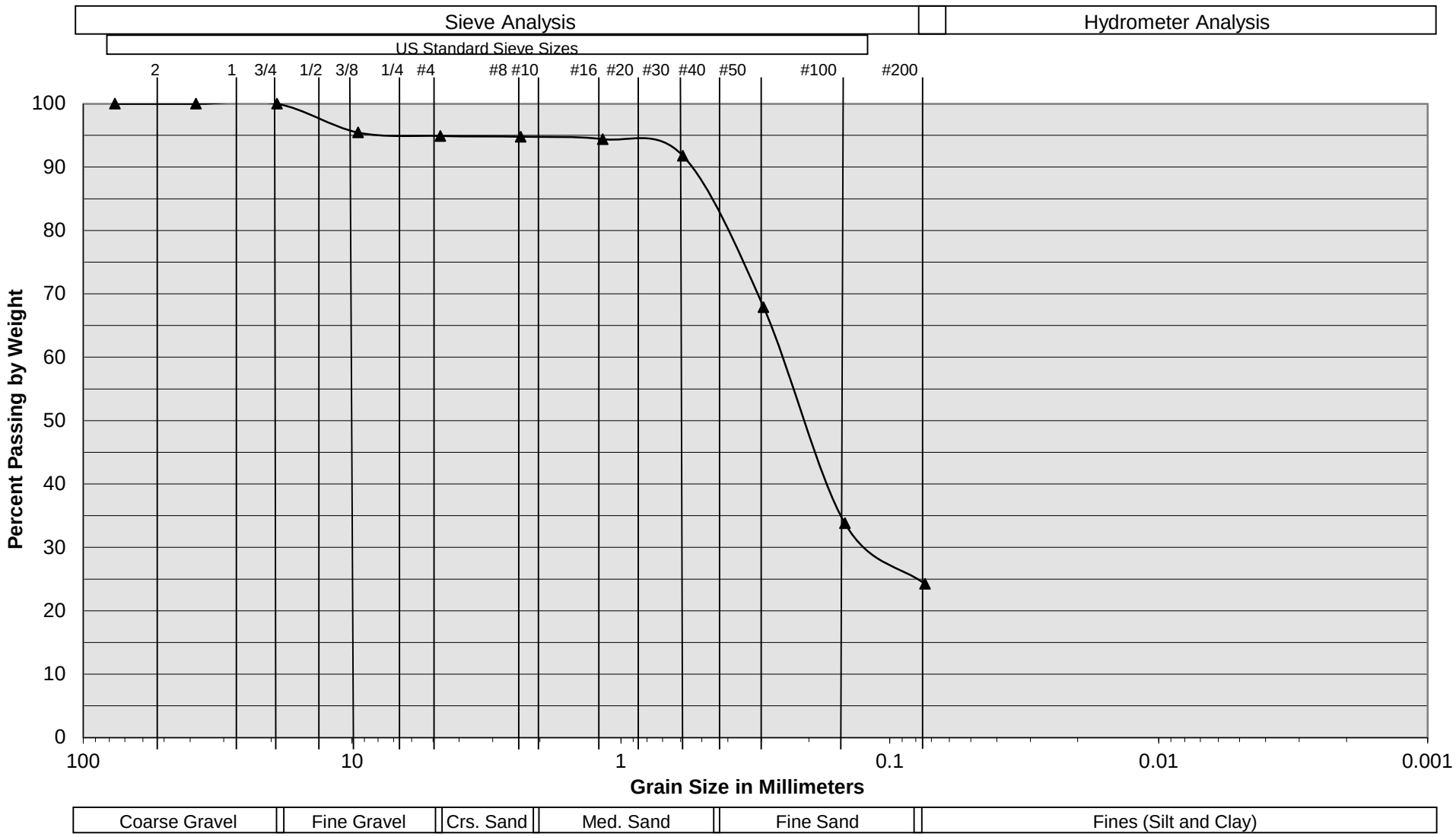

Sample Description	I-5 @ 9½'
Soil Classification	Gray Brown Silty fine Sand, little medium Sand, trace fine Gravel

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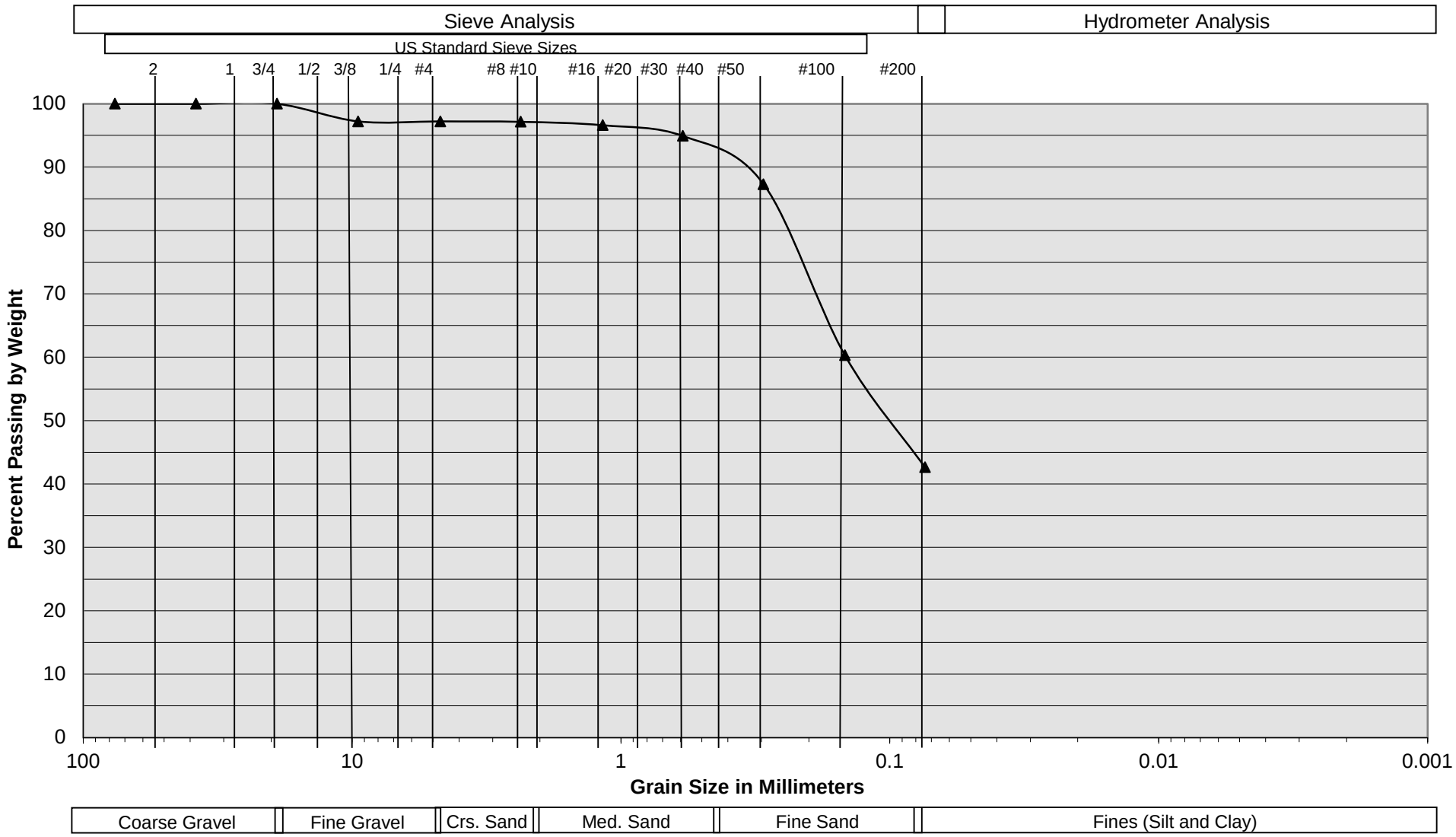
Grain Size Distribution



Sample Description	I-6 @ 8½'
Soil Classification	Gray Brown Silty fine Sand to fine Sandy Silt, trace medium Sand, trace fine Gravel

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