



Thienes Engineering, Inc.

CIVIL ENGINEERING • LAND SURVEYING

**PRELIMINARY HYDROLOGY
CALCULATIONS**

FOR

SAN BERNARDINO GATEWAY BUSINESS PARK
119 S. ARROWHEAD AVENUE
SAN BERNARDINO, CA

PREPARED FOR

PROFICIENCY CAPITAL
11777 SAN VICENTE BLVD. STE. 780
LOS ANGELES, CA 90049
PHONE: (949) 296-7006

NOVEMBER 1, 2021
REVISED DECEMBER 21, 2021
REVISED OCTOBER 5, 2022

JOB NO. 4029

PREPARED BY

THIENES ENGINEERING
14349 FIRESTONE BLVD.
LA MIRADA, CALIFORNIA 90639
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**PRELIMINARY HYDROLOGY
CALCULATIONS**

FOR

SAN BERNARDINO GATEWAY BUSINESS PARK

PREPARED UNDER
THE SUPERVISION OF

REINHARD STENZEL
R.C.E. 56155
EXP. 12/31/2022

DATE:

INTRODUCTION

A: PROJECT LOCATION

The project site is located on the southwest corner of Sierra Way and Rialto Avenue in the San Bernardino, California. Please see the next page for a vicinity map.

B: STUDY PURPOSE

The purpose of this study is to determine the 100-year peak flow rate for the project site that will ultimately discharge to the existing storm drains in Rialto Avenue and Sierra Way.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Reinhard Stenzel
Kristie Ferronato
Morgan Holve



Google Earth

TEI Thienes Engineering, Inc.
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VICINITY MAP
FOR
119 S. ARROWHEAD AVENUE
SAN BERNARDINO, CA

Last Update: 12/10/21
O: \\4000-4099\4029\4029VicMap.dwg



N
S

DISCUSSION

Project Description

The project site encompasses approximately 10.36 acres. Proposed improvements include three warehouse-style buildings, approximately 106,820 square feet for Building 1, approximately 50,610 square feet for Building 2 and approximately 70,080 square feet for Building 3. There is vehicle parking, truck parking and landscaping located throughout the site.

Existing Condition

The site is currently an undeveloped dirt lot. It generally sheet flows southwesterly.

The northeast corner of the site (Nodes 100-101 on Existing Condition Hydrology Map) sheet flows easterly and continues southerly along Sierra Way. Flows will ultimately discharge in an existing catch basin in Sierra Way. The 100-year peak flow rate from this area is approximately 1.9 cfs.

The southeast corner of the site (Nodes 110-111) also sheet flows easterly to Sierra Way and discharges into an existing catch basin. The 100-year peak flow rate from the area is approximately 2.8 cfs.

The total 100-year peak flow rate to the existing catch basin in Sierra Way is approximately 4.7 cfs.

The westerly portion of the site (Nodes 200- 202) sheet flows westerly to Arrowhead Avenue. Flows will continue northerly and ultimately discharge into an existing catch basin on the southeast corner of Arrowhead Avenue and Rialto Avenue. The 100-year peak flow rate to the existing catch basin is approximately 14.9 cfs.

See Appendix “B” for existing condition hydrology calculations and Appendix “D” for existing condition hydrology map.

Proposed Condition

The proposed conditions will continue to drain to existing storm drains in Rialto Avenue and Sierra Way.

The easterly portion of the drive aisle between Building 1 and Building 2 and southerly portion of Building 2 (Nodes 100-101 on Proposed Condition Hydrology Map) will drain to a catch basin on the south side of Building 2. Flows will be conveyed westerly in a proposed on-site storm drain. Runoff from the westerly portion of the middle drive aisle, Building 1 and its truck yard (Nodes 110-122) drains to catch basins located in the Building 1 truck yard. Flows are confluenced with the proposed storm drain systems and conveyed westerly then northerly around Building 1. Runoff from the westerly drive aisle

(Node 123) is collected in a catch basin located in the westerly drive aisle and added to the same storm drain system. The proposed on-site system will connect with the existing catch basin on the corner of Arrowhead Avenue and Rialto Avenue.

The landscaped areas fronting Rialto Avenue will sheet flow off-site to Rialto Avenue. Flows will be conveyed westerly in the street and be collected in the existing catch basin on the corner of Arrowhead Avenue and Rialto Avenue.

The 100-year peak flow rate to this catch basin is approximately 22.2 cfs.

The northerly portion of Building 2, the drive aisle between Building 2 and 3 and the westerly portion of Building 3 (Nodes 200-201) drain to a catch basin located in the Building 3 truck yard. Flows are conveyed in a proposed on-site storm drain system southerly then easterly around Building 3. Runoff from the easterly half of Building 3 and the easterly drive aisle (Node 202) is collected in a catch basin located in the easterly drive aisle. Flows are confluent in the on-site storm drain and conveyed easterly. The system will connect with an existing catch basin in Sierra Way.

The landscaped area in the southeasterly corner of the site sheet flows off-site to Sierra Way. Flows will be conveyed northerly and collected in the existing catch basin in Sierra Way.

The 100-year peak flow rate to the Sierra catch basin is approximately 11.9 cfs.

The total 100-year peak flow rate from the site is approximately 34.1 cfs.

See Appendix “B” for proposed condition hydrology calculations and Appendix “D” for proposed condition hydrology map.

Detention

The peak flow rate for the proposed condition is higher than the peak flow rate for the existing condition, therefore, detention will be required for this site. Similarly, runoff to the existing Sierra Way catch basin will be limited to the existing condition peak flow rate of 4.7 cfs. Runoff to the existing Rialto Avenue catch basin will be limited to the existing condition peak flow rate of 14.9 cfs.

Both proposed on-site storm drain systems convey flows that must bubble out into their respective existing catch basins. This means that water is required to pond in each truck yard to yield a sufficient head to “push” flows through the storm drain system. A sump pump will drain the remaining flows stored in the catch basin and pipe.

The easterly portion of Building 3, the easterly drive aisle and southeasterly landscaped area (Node 202-203) will leave the site undetained. Therefore, the allowable discharge from the Building 3 truck yard to the Sierra Way catch basin will be limited to 1.0 cfs

(4.7 cfs- 3.7 cfs). Remaining flows will spill over from the truck yard at approximately 0.35 ft of ponding and flow into the Building 1 truck yard.

The total discharge to the Sierra Way catch basin, with detention, is approximately 4.8 cfs.

The westerly drive aisle (Node 113) leaves the site undetained. Therefore, the allowable discharge from the truck yard is approximately 13.8 cfs (14.9 cfs- 1.1 cfs). Remaining flows will be detained in the Building 1 truck yard at a ponding depth of 1.1 ft and a storage volume of .29 acre-ft. This includes the spillover flows from Building 3. The discharge from the truck yard will be limited to approximately 12.7 cfs.

The total discharge to the Rialto Avenue catch basin, with detention, is approximately 13.8 cfs.

See Appendix “C” for detention calculations.

Methodology

Hydrology calculations were computed using the San Bernardino Rational Method program (by AES Software). The soil type is “B” per the San Bernardino County Hydrology Manual. See Appendix “A” for pertinent reference materials.

APPENDIX

DESCRIPTION

A

REFERENCE MATERIAL

B

HYDROLOGY CALCULATIONS

C

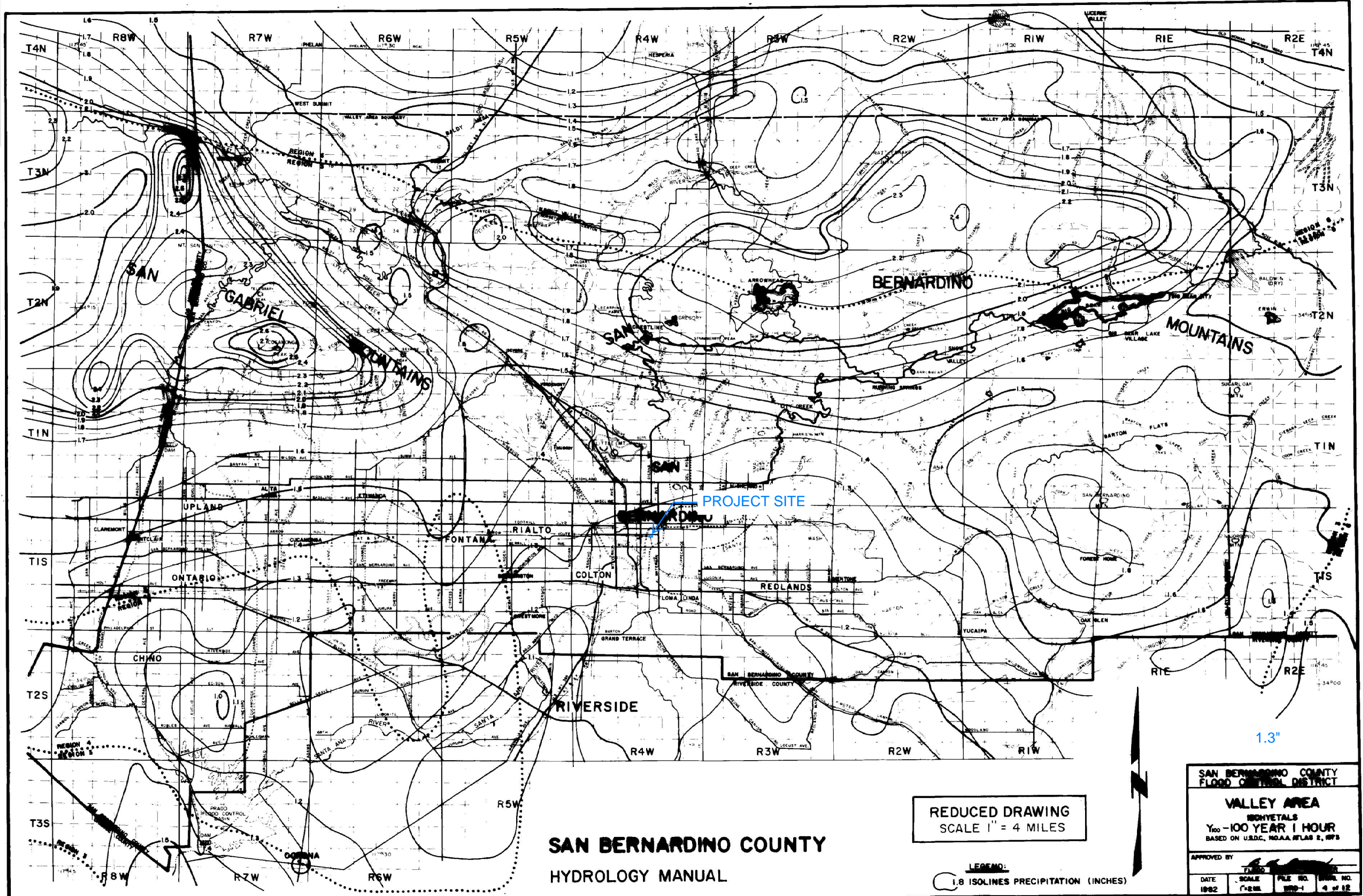
DETENTION ANALYSIS

D

HYDROLOGY MAPS

APPENDIX A

REFERENCE MATERIALS



**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

REDUCED DRAWING
SCALE 1" = 4 MILES

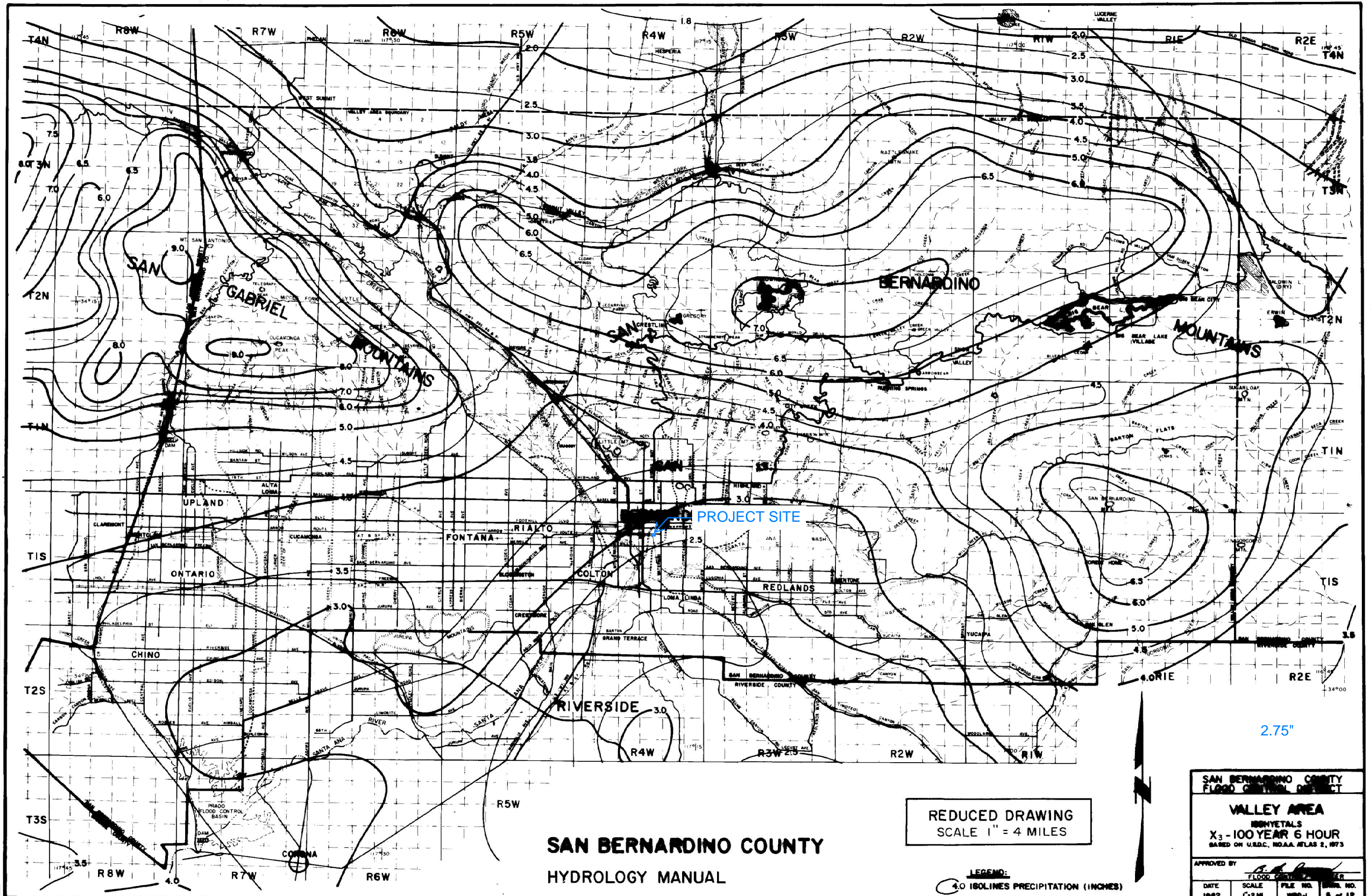
LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
180HYETALS
Y₁₀₀ - 100 YEAR 1 HOUR
BASED ON U.S.D.C. NOAA ATLAS 2, 1973

APPROVED BY: _____

DATE	SCALE	FILE NO.	DRAW. NO.
1982	1"=4M	100-1	4 of 12



**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

REDUCED DRAWING
SCALE 1" = 4 MILES

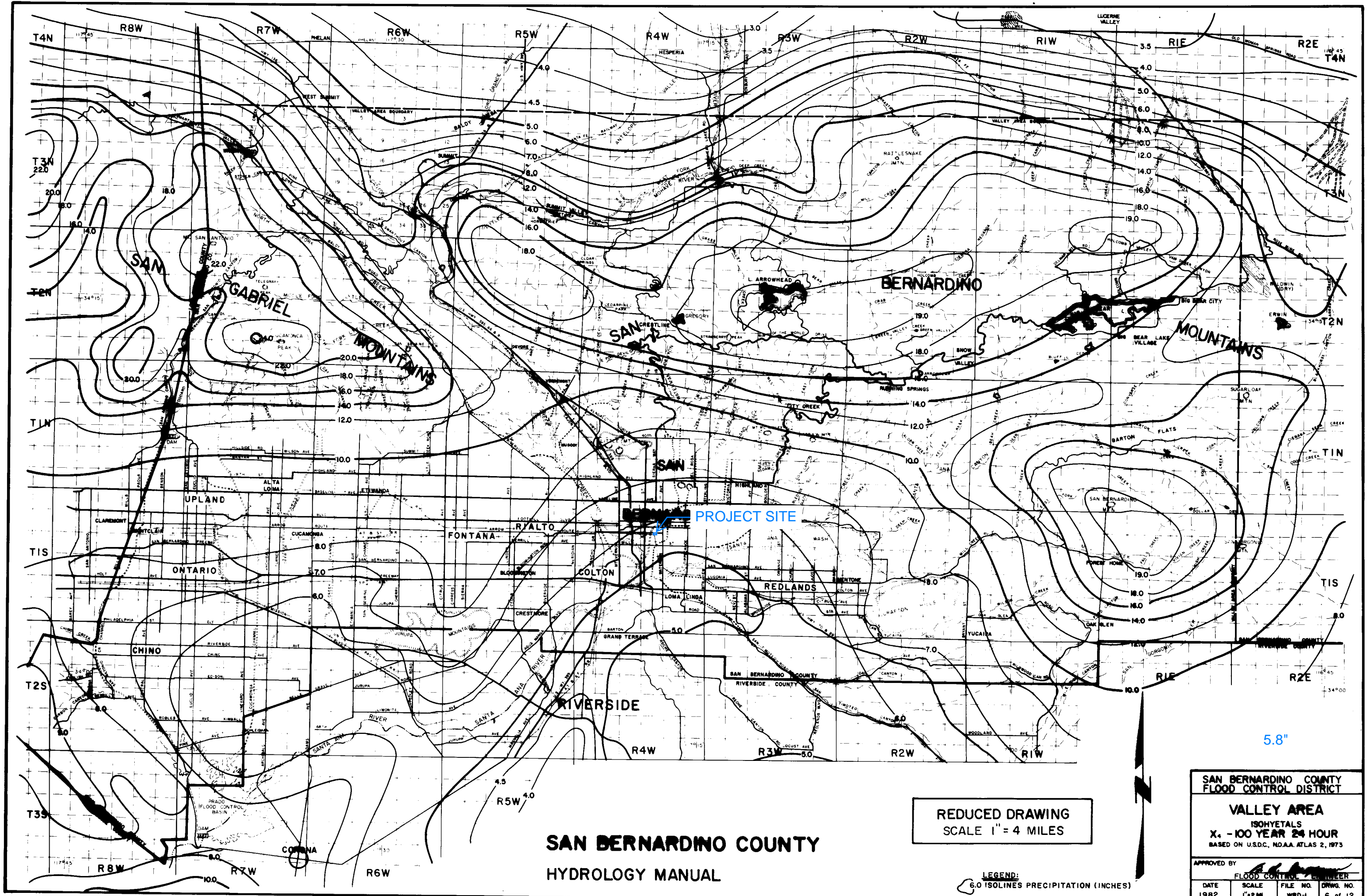
LEGEND:
4.0 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
100-YEAR 6 HOUR
X₃-100 YEAR 6 HOUR
BASED ON U.S.D.C. NOAA ATLAS 2, 1973

APPROVED BY: _____
FLOOD CONTROL DISTRICT

DATE	SCALE	FILE NO.	SHEET NO.
1982	1"=2 MI.	WB-1	8 of 12



**SAN BERNARDINO COUNTY
HYDROLOGY MANUAL**

**REDUCED DRAWING
SCALE 1" = 4 MILES**

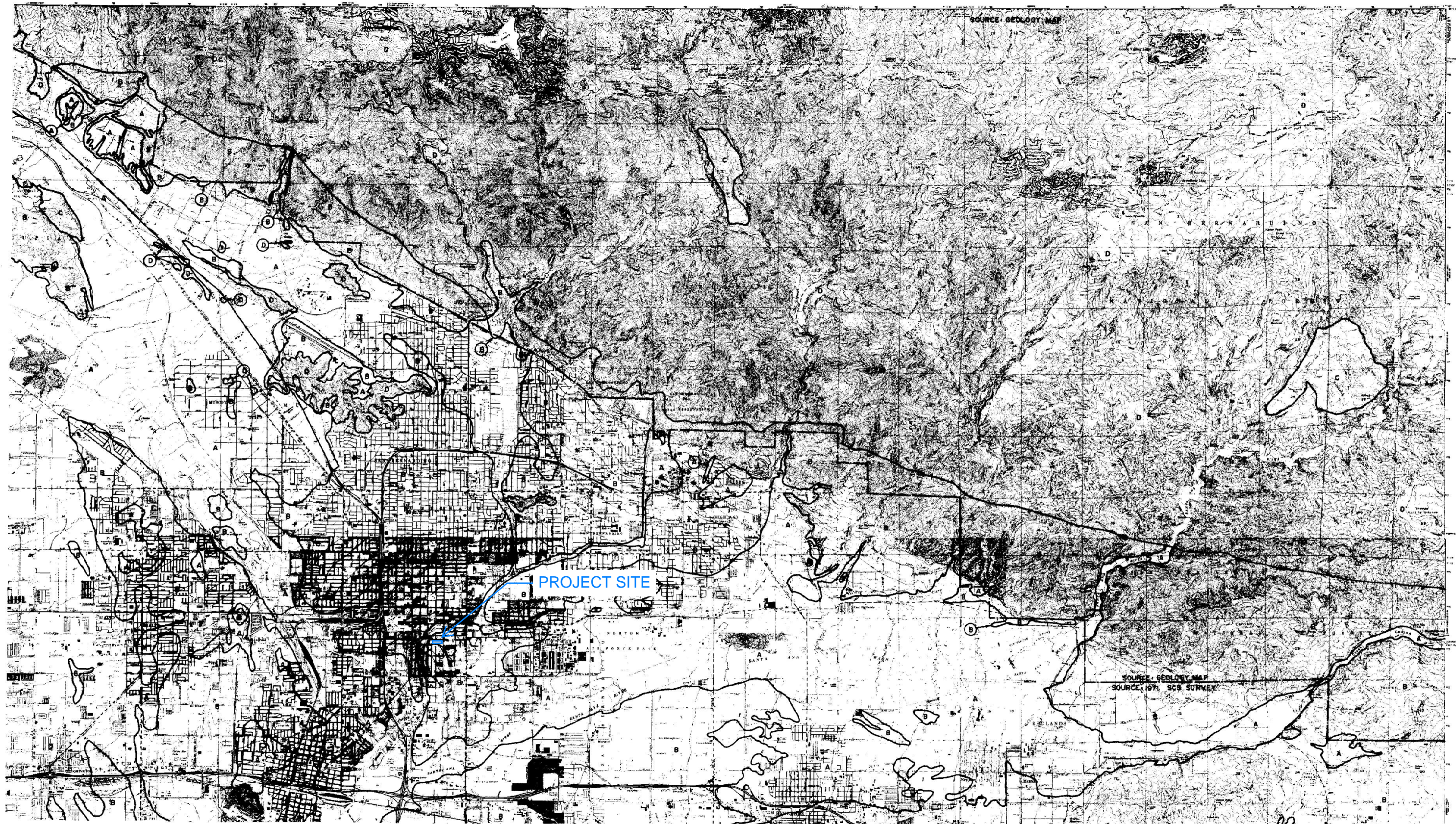
LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)

**SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT**

VALLEY AREA
ISOHYETALS
X₄ - 100 YEAR 24 HOUR
BASED ON U.S.D.C., NOAA ATLAS 2, 1973

APPROVED BY _____

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1" = 2 MI.	WRD-1	6 of 12



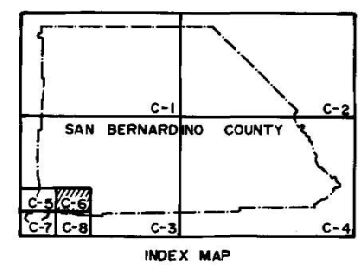
SOURCE: GEOLOGY MAP

SOURCE: GEOLOGY MAP
SOURCE: 1971 SCS SURVEY

PROJECT SITE

SOIL GROUP B

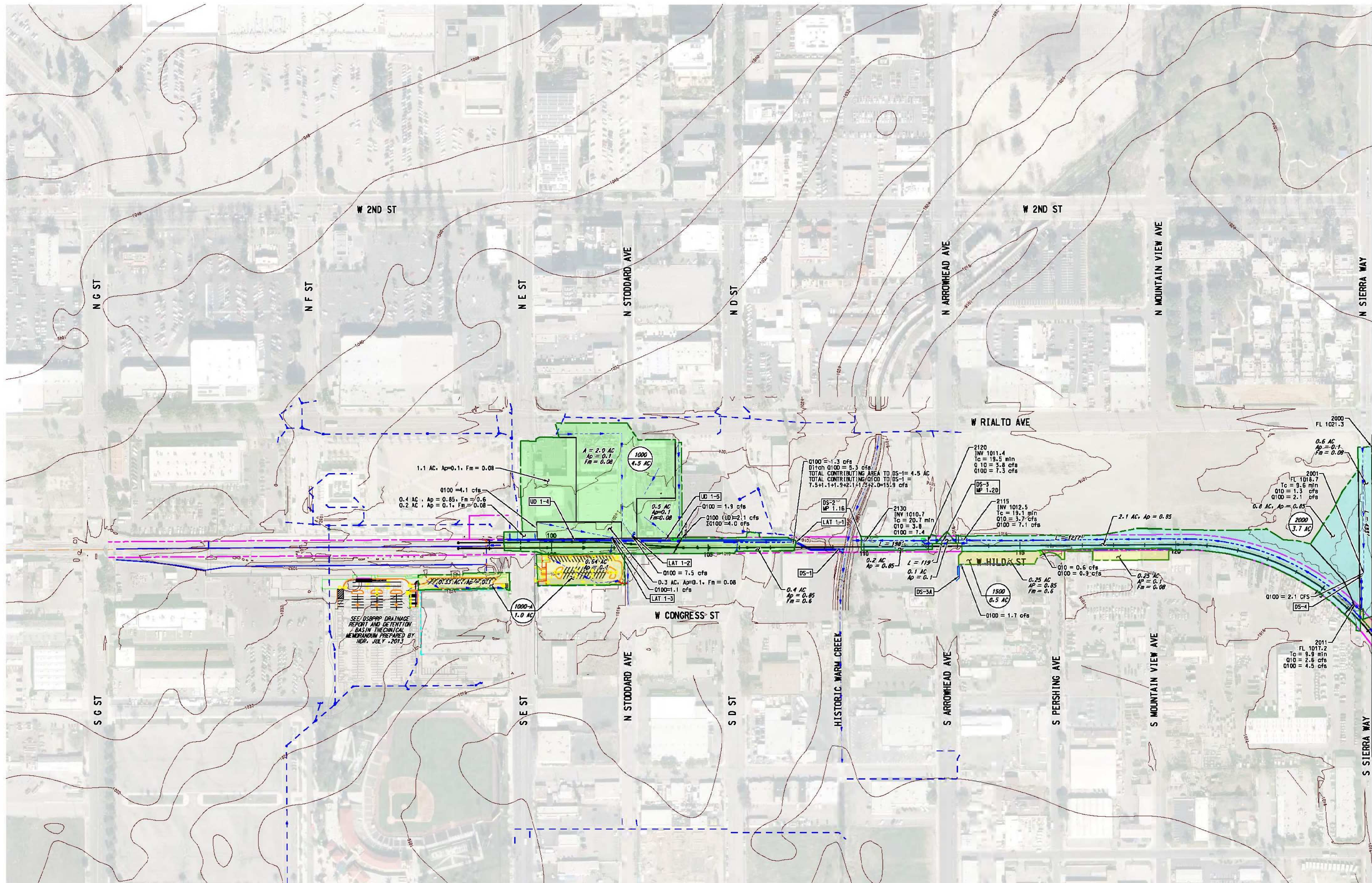
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL



- LEGEND
- SOIL GROUP BOUNDARY
 - A SOIL GROUP DESIGNATION
 - - - BOUNDARY OF INDICATED SOURCE

SCALE REDUCED BY 1/2
SCALE 1:48,000

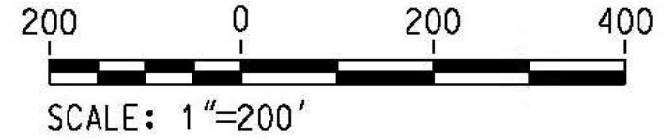
HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-B AREA



LEGEND

	RAIL TRACK
	MAJOR DRAINAGE AREA
	DRAINAGE SUB AREA
	RIGHT OF WAY
	NODE LOCATION
	DRAINAGE DIRECTION
	FLOW PATH
	PROPOSED SUBDRAIN
	PROPOSED STORM DRAIN
	EXISTING STORM DRAIN
	CATCHMENT NAME CATCHMENT ACREAGE
X.X AC	SUBAREA ACREAGE
FL	ELEVATION AT SURFACE
Fm	CATCHMENT MAXIMUM LOSS RATE
INV	PIPE FLOWLINE ELEVATION
Q	SUBAREA Q
ΣQ	TOTAL Q
Ap	PERVIOUS AREA
Tc	TIME OF CONCENTRATION

NOTE:
THE FOLLOWING WERE USED TO CALCULATE THE DISCHARGE RATES FOR CATCHMENTS 1000, 1000A, 1500, AND 2000:
1- $Q = 0.91(1 - Fm)A$
2- $(15 \text{ min } / 100 \text{ yr}) = 4.27 \text{ in/hr}$



REDLANDS PASSENGER RAIL PROJECT
PROPOSED HYDROLOGY MAP
SHEET 1 OF 14

SCALE: 1"=200'
DATE: 12-20-2017

APPENDIX B

HYDROLOGY CALCULATIONS

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
(c) Copyright 1983-2016 Advanced Engineering Software (aes)
Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

THIENES ENGINEERING, INC.
14349 FIRESTONE BLVD
LA MIRIADA, CA 90638
714-521-4811

***** DESCRIPTION OF STUDY *****
* TEI JOB NUMBER 4029 *
* EXISTING CONDITIONS *
* 100-YEAR STORM EVENT *

FILE NAME: W:\4029\X100.DAT
TIME/DATE OF STUDY: 16:11 10/27/2021

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN CROSSFALL (FT)	STREET-CROSSFALL IN- / SIDE (FT)	STREET-CROSSFALL OUT- / SIDE (FT)	PARK- / WAY (FT)	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018	0.018/0.020	0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 349.00
ELEVATION DATA: UPSTREAM(FEET) = 1017.86 DOWNSTREAM(FEET) = 1017.43

$T_c = K * [(LENGTH * 3.00) / (ELEVATION CHANGE)] * 0.20$

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 20.853

* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.451

SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
NATURAL POOR COVER "BARREN"	B	0.90	0.11	1.000	97	20.85
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11						
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000						
SUBAREA RUNOFF(CFS) = 1.90						
TOTAL AREA(ACRES) = 0.90 PEAK FLOW RATE(CFS) = 1.90						

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 0.9 TC(MIN.) = 20.85
EFFECTIVE AREA(ACRES) = 0.90 AREA-AVERAGED Fm(INCH/HR) = 0.11
AREA-AVERAGED Fp(INCH/HR) = 0.11 AREA-AVERAGED Ap = 1.000
PEAK FLOW RATE(CFS) = 1.90

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

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***** DESCRIPTION OF STUDY *****
* TEI JOB NUMBER 4029 *
* EXISTING CONDITIONS *
* 100-YEAR STORM EVENT *

FILE NAME: W:\4029\X110.DAT
TIME/DATE OF STUDY: 16:10 10/27/2021

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL
HALF- CROWN TO STREET-CROSSFALL: CURB GUTTER-GEOMETRIES: MANNING
WIDTH CROSSFALL IN- / OUT-/PARK- HEIGHT WIDTH LIP HIKE FACTOR
NO. (FT) (FT) SIDE / SIDE/ WAY (FT) (FT) (FT) (FT) (n)
=== =====
1 30.0 20.0 0.018/0.018/0.020 0.67 2.00 0.0312 0.167 0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 202.00
ELEVATION DATA: UPSTREAM(FEET) = 1018.06 DOWNSTREAM(FEET) = 1016.74

$T_c = K * [(LENGTH * 3.00) / (ELEVATION CHANGE)] * 0.20$
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.002
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.414
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
NATURAL POOR COVER
"BARREN" B 0.95 0.11 1.000 97 12.00
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA RUNOFF(CFS) = 2.83
TOTAL AREA(ACRES) = 0.95 PEAK FLOW RATE(CFS) = 2.83

=====

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 0.9 TC(MIN.) = 12.00
EFFECTIVE AREA(ACRES) = 0.95 AREA-AVERAGED Fm(INCH/HR) = 0.11
AREA-AVERAGED Fp(INCH/HR) = 0.11 AREA-AVERAGED Ap = 1.000
PEAK FLOW RATE(CFS) = 2.83

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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LA MIRIADA, CA 90638
714-521-4811

***** DESCRIPTION OF STUDY *****
* TEI JOB NUMBER 4029 *
* EXISTING CONDITIONS *
* 100-YEAR STORM EVENT *

FILE NAME: W:\4029\X200.DAT
TIME/DATE OF STUDY: 16:13 10/27/2021

===== USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION: =====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF-WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER WIDTH (FT)	GEOMETRIES LIP (FT)	MANNING HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)
*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

***** FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21 *****

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<
>>>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

===== INITIAL SUBAREA FLOW-LENGTH(FEET) = 692.00
ELEVATION DATA: UPSTREAM(FEET) = 1018.03 DOWNSTREAM(FEET) = 1013.90

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 20.000
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.513
SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
NATURAL POOR COVER "BARREN"	B	4.20	0.11	1.000	97	20.00

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA RUNOFF(CFS) = 9.10
TOTAL AREA(ACRES) = 4.20 PEAK FLOW RATE(CFS) = 9.10

***** FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 52 *****

>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<<
>>>>TRAVELTIME THRU SUBAREA<<<<<<

```

=====
ELEVATION DATA: UPSTREAM(FEET) = 1013.90 DOWNSTREAM(FEET) = 1012.78
CHANNEL LENGTH THRU SUBAREA(FEET) = 535.00 CHANNEL SLOPE = 0.0021
CHANNEL FLOW THRU SUBAREA(CFS) = 9.10
FLOW VELOCITY(FEET/SEC) = 1.12 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) = 7.99 Tc(MIN.) = 27.99
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 1227.00 FEET.

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*****
FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 IS CODE = 81

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>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<

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=====
MAINLINE Tc(MIN.) = 27.99
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 2.054
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp        Ap      SCS
LAND USE                GROUP  (ACRES)  (INCH/HR) (DECIMAL) CN
NATURAL POOR COVER
"BARREN"                B        4.30     0.11     1.000    97
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.11
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000
SUBAREA AREA(ACRES) = 4.30 SUBAREA RUNOFF(CFS) = 7.54
EFFECTIVE AREA(ACRES) = 8.50 AREA-AVERAGED Fm(INCH/HR) = 0.11
AREA-AVERAGED Fp(INCH/HR) = 0.11 AREA-AVERAGED Ap = 1.000
TOTAL AREA(ACRES) = 8.5 PEAK FLOW RATE(CFS) = 14.90

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=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 8.5 TC(MIN.) = 27.99
EFFECTIVE AREA(ACRES) = 8.50 AREA-AVERAGED Fm(INCH/HR)= 0.11
AREA-AVERAGED Fp(INCH/HR) = 0.11 AREA-AVERAGED Ap = 1.000
PEAK FLOW RATE(CFS) = 14.90

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=====
END OF RATIONAL METHOD ANALYSIS

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RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

THIENES ENGINEERING, INC.
14349 FIRESTONE BLVD
LA MIRIADA, CA 90638
714-521-4811

***** DESCRIPTION OF STUDY *****
* TEI JOB NUMBER 4029 *
* PROPOSED CONDITIONS *
* 100-YEAR STORM EVENT *

FILE NAME: W:\4029\P100.DAT
TIME/DATE OF STUDY: 11:43 10/05/2022

===== USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION: =====
--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	(FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT-/PARK- SIDE / SIDE/ WAY	HEIGHT (FT)	GUTTER WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

SIZE PIPE WITH A FLOW CAPACITY GREATER THAN OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 100.00 TO NODE 101.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

===== INITIAL SUBAREA FLOW-LENGTH(FEET) = 278.00
ELEVATION DATA: UPSTREAM(FEET) = 1016.30 DOWNSTREAM(FEET) = 1013.16

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.078
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.687
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL B 1.98 0.42 0.100 76 7.08
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 8.28
TOTAL AREA(ACRES) = 1.98 PEAK FLOW RATE(CFS) = 8.28

FLOW PROCESS FROM NODE 101.00 TO NODE 112.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

===== ELEVATION DATA: UPSTREAM(FEET) = 1010.16 DOWNSTREAM(FEET) = 1008.46
FLOW LENGTH(FEET) = 340.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 21.0 INCH PIPE IS 12.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.32
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 8.28
PIPE TRAVEL TIME(MIN.) = 1.07 Tc(MIN.) = 8.14
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 112.00 = 618.00 FEET.

FLOW PROCESS FROM NODE 112.00 TO NODE 112.00 IS CODE = 1

```

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 8.14
RAINFALL INTENSITY(INCH/HR) = 4.31
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 1.98
TOTAL STREAM AREA(ACRES) = 1.98
PEAK FLOW RATE(CFS) AT CONFLUENCE = 8.28

```

```

*****
FLOW PROCESS FROM NODE 110.00 TO NODE 111.00 IS CODE = 21
-----

```

```

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=====
INITIAL SUBAREA FLOW-LENGTH(FEET) = 500.00
ELEVATION DATA: UPSTREAM(FEET) = 1016.30 DOWNSTREAM(FEET) = 1011.33

```

```

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.183
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.009
SUBAREA Tc AND LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS Tc
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN (MIN.)
COMMERCIAL B 4.07 0.42 0.100 76 9.18
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 14.53
TOTAL AREA(ACRES) = 4.07 PEAK FLOW RATE(CFS) = 14.53

```

```

*****
FLOW PROCESS FROM NODE 111.00 TO NODE 112.00 IS CODE = 31
-----

```

```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1008.50 DOWNSTREAM(FEET) = 1008.46
FLOW LENGTH(FEET) = 21.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 30.0 INCH PIPE IS 19.7 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.25
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 14.53
PIPE TRAVEL TIME(MIN.) = 0.08 Tc(MIN.) = 9.27
LONGEST FLOWPATH FROM NODE 110.00 TO NODE 112.00 = 521.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 112.00 TO NODE 112.00 IS CODE = 1
-----

```

```

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<
>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<
=====

```

```

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 9.27
RAINFALL INTENSITY(INCH/HR) = 3.99
AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42
AREA-AVERAGED Ap = 0.10
EFFECTIVE STREAM AREA(ACRES) = 4.07
TOTAL STREAM AREA(ACRES) = 4.07
PEAK FLOW RATE(CFS) AT CONFLUENCE = 14.53

```

```

** CONFLUENCE DATA **

```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	8.28	8.14	4.309	0.42(0.04)	0.10	2.0	100.00
2	14.53	9.27	3.988	0.42(0.04)	0.10	4.1	110.00

```

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

```

```

** PEAK FLOW RATE TABLE **

```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	22.09	8.14	4.309	0.42(0.04)	0.10	5.6	100.00
2	22.18	9.27	3.988	0.42(0.04)	0.10	6.1	110.00

```

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 22.18 Tc(MIN.) = 9.27
EFFECTIVE AREA(ACRES) = 6.05 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 6.1
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 112.00 = 618.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 112.00 TO NODE 113.00 IS CODE = 31
-----

```

```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1008.46 DOWNSTREAM(FEET) = 1007.71
FLOW LENGTH(FEET) = 477.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 36.0 INCH PIPE IS 24.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.38
ESTIMATED PIPE DIAMETER(INCH) = 36.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 22.18
PIPE TRAVEL TIME(MIN.) = 1.81 Tc(MIN.) = 11.08
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 113.00 = 1095.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 113.00 TO NODE 113.00 IS CODE = 81
-----

```

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 11.08
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.582
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 0.34 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.34 SUBAREA RUNOFF(CFS) = 1.08
EFFECTIVE AREA(ACRES) = 6.39 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 6.4 PEAK FLOW RATE(CFS) = 22.18
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

```

```

*****
FLOW PROCESS FROM NODE 113.00 TO NODE 114.00 IS CODE = 31
-----

```

```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====
ELEVATION DATA: UPSTREAM(FEET) = 1009.02 DOWNSTREAM(FEET) = 1008.92
FLOW LENGTH(FEET) = 33.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 30.0 INCH PIPE IS 22.9 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.52
ESTIMATED PIPE DIAMETER(INCH) = 30.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 22.18
PIPE TRAVEL TIME(MIN.) = 0.10 Tc(MIN.) = 11.18
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 114.00 = 1128.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 124.00 TO NODE 124.00 IS CODE = 81
-----

```

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 11.18
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.563
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 0.27 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.27 SUBAREA RUNOFF(CFS) = 0.86
EFFECTIVE AREA(ACRES) = 6.66 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 6.7 PEAK FLOW RATE(CFS) = 22.18
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

```

```

*****
FLOW PROCESS FROM NODE 124.00 TO NODE 124.00 IS CODE = 81
-----

```

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 11.18
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.563
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/ SCS SOIL AREA Fp Ap SCS
LAND USE GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL B 0.27 0.42 0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.27 SUBAREA RUNOFF(CFS) = 0.86
EFFECTIVE AREA(ACRES) = 6.93 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 6.9 PEAK FLOW RATE(CFS) = 22.18
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

```

```

=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 6.9 Tc(MIN.) = 11.18
EFFECTIVE AREA(ACRES) = 6.93 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.100
PEAK FLOW RATE(CFS) = 22.18

```

```

** PEAK FLOW RATE TABLE **

```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	22.09	10.11	3.784	0.42(0.04)	0.10	6.4	100.00
2	22.18	11.18	3.563	0.42(0.04)	0.10	6.9	110.00

=====

END OF RATIONAL METHOD ANALYSIS

▲

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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Ver. 23.0 Release Date: 07/01/2016 License ID 1435

Analysis prepared by:

THIENES ENGINEERING, INC.
14349 FIRESTONE BLVD
LA MIRIADA, CA 90638
714-521-4811

***** DESCRIPTION OF STUDY *****

* TEI JOB NUMBER 4029 *
* PROPOSED CONDITIONS *
* 100-YEAR STORM EVENT *

FILE NAME: W:\4029\P200.DAT
TIME/DATE OF STUDY: 11:48 10/05/2022

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

--*TIME-OF-CONCENTRATION MODEL*--

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 12.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL

SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.3000

ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	(FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL IN- / OUT-/PARK- SIDE / SIDE/ WAY	HEIGHT (FT)	CURB GUTTER-GEOMETRIES: MANNING WIDTH (FT)	LIP (FT)	HIKE (FT)	FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0312	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

SIZE PIPE WITH A FLOW CAPACITY GREATER THAN OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.

*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

FLOW PROCESS FROM NODE 200.00 TO NODE 201.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 304.00
ELEVATION DATA: UPSTREAM(FEET) = 1018.97 DOWNSTREAM(FEET) = 1016.55

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 7.867
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.399
SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	2.09	0.42	0.100	76	7.87

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 8.19
TOTAL AREA(ACRES) = 2.09 PEAK FLOW RATE(CFS) = 8.19

FLOW PROCESS FROM NODE 201.00 TO NODE 202.00 IS CODE = 31

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<

=====

ELEVATION DATA: UPSTREAM(FEET) = 1012.55 DOWNSTREAM(FEET) = 1011.36
FLOW LENGTH(FEET) = 397.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 21.0 INCH PIPE IS 15.5 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 4.30
ESTIMATED PIPE DIAMETER(INCH) = 21.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 8.19
PIPE TRAVEL TIME(MIN.) = 1.54 Tc(MIN.) = 9.40
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 202.00 = 701.00 FEET.

FLOW PROCESS FROM NODE 202.00 TO NODE 202.00 IS CODE = 81

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 9.40
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.952
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          B      1.12   0.42  0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 1.12   SUBAREA RUNOFF(CFS) = 3.94
EFFECTIVE AREA(ACRES) = 3.21   AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42   AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.2     PEAK FLOW RATE(CFS) = 11.30

```

```

*****
FLOW PROCESS FROM NODE 202.00 TO NODE 203.00 IS CODE = 31
-----

```

```

>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<
>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<
=====

```

```

ELEVATION DATA: UPSTREAM(FEET) = 1011.36 DOWNSTREAM(FEET) = 1011.10
FLOW LENGTH(FEET) = 59.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.0 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.48
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 11.30
PIPE TRAVEL TIME(MIN.) = 0.18 Tc(MIN.) = 9.58
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 203.00 = 760.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE 203.00 TO NODE 203.00 IS CODE = 81
-----

```

```

>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
MAINLINE Tc(MIN.) = 9.58
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.908
SUBAREA LOSS RATE DATA(AMC III):
DEVELOPMENT TYPE/   SCS SOIL   AREA   Fp   Ap   SCS
LAND USE            GROUP (ACRES) (INCH/HR) (DECIMAL) CN
COMMERCIAL          B      0.22   0.42  0.100 76
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.42
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA AREA(ACRES) = 0.22   SUBAREA RUNOFF(CFS) = 0.77
EFFECTIVE AREA(ACRES) = 3.43   AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42   AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 3.4     PEAK FLOW RATE(CFS) = 11.93

```

```

=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 3.4 TC(MIN.) = 9.58
EFFECTIVE AREA(ACRES) = 3.43 AREA-AVERAGED Fm(INCH/HR) = 0.04
AREA-AVERAGED Fp(INCH/HR) = 0.42 AREA-AVERAGED Ap = 0.100
PEAK FLOW RATE(CFS) = 11.93
=====

```

```

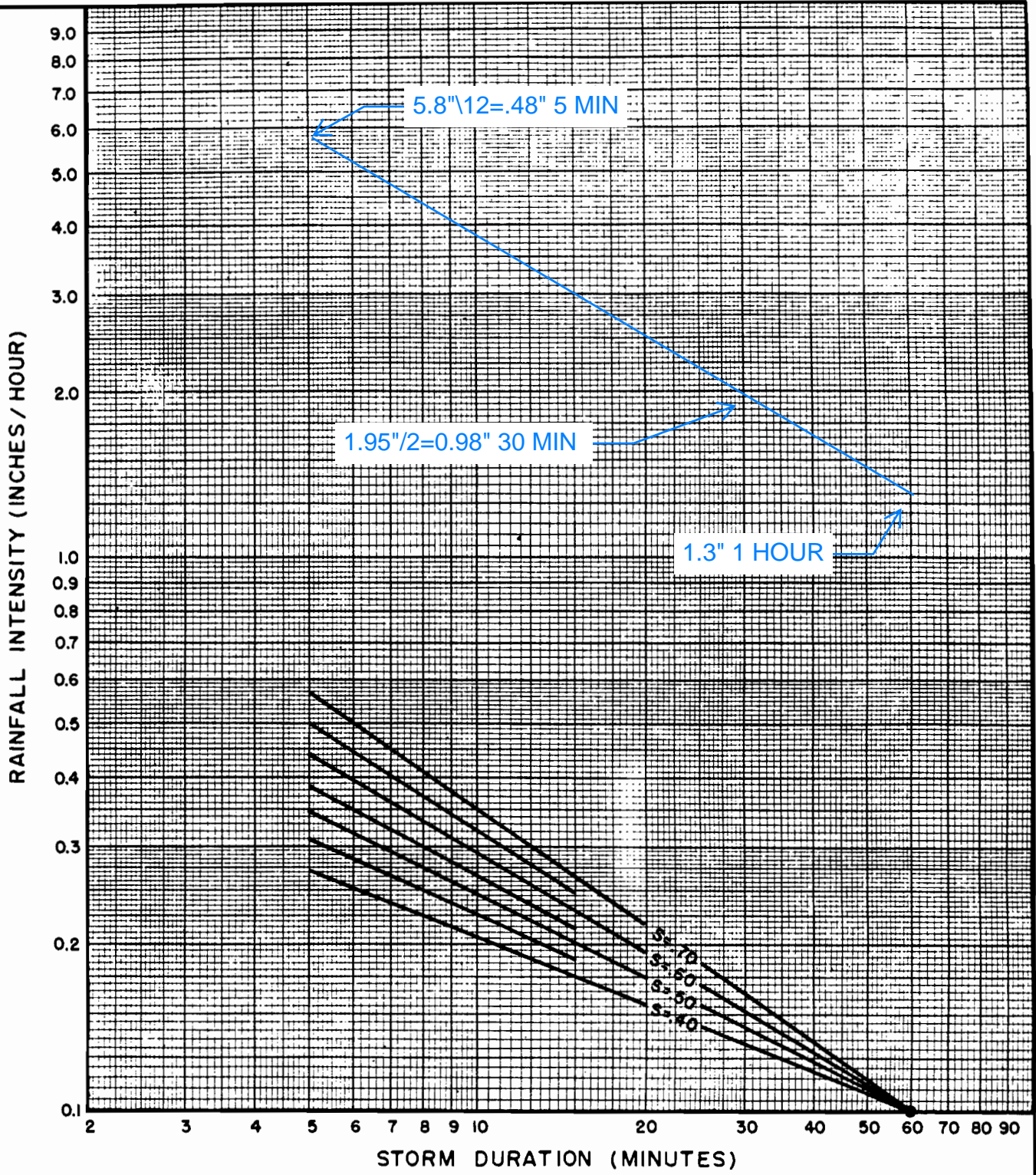
END OF RATIONAL METHOD ANALYSIS

```



APPENDIX C

DETENTION ANALYSIS



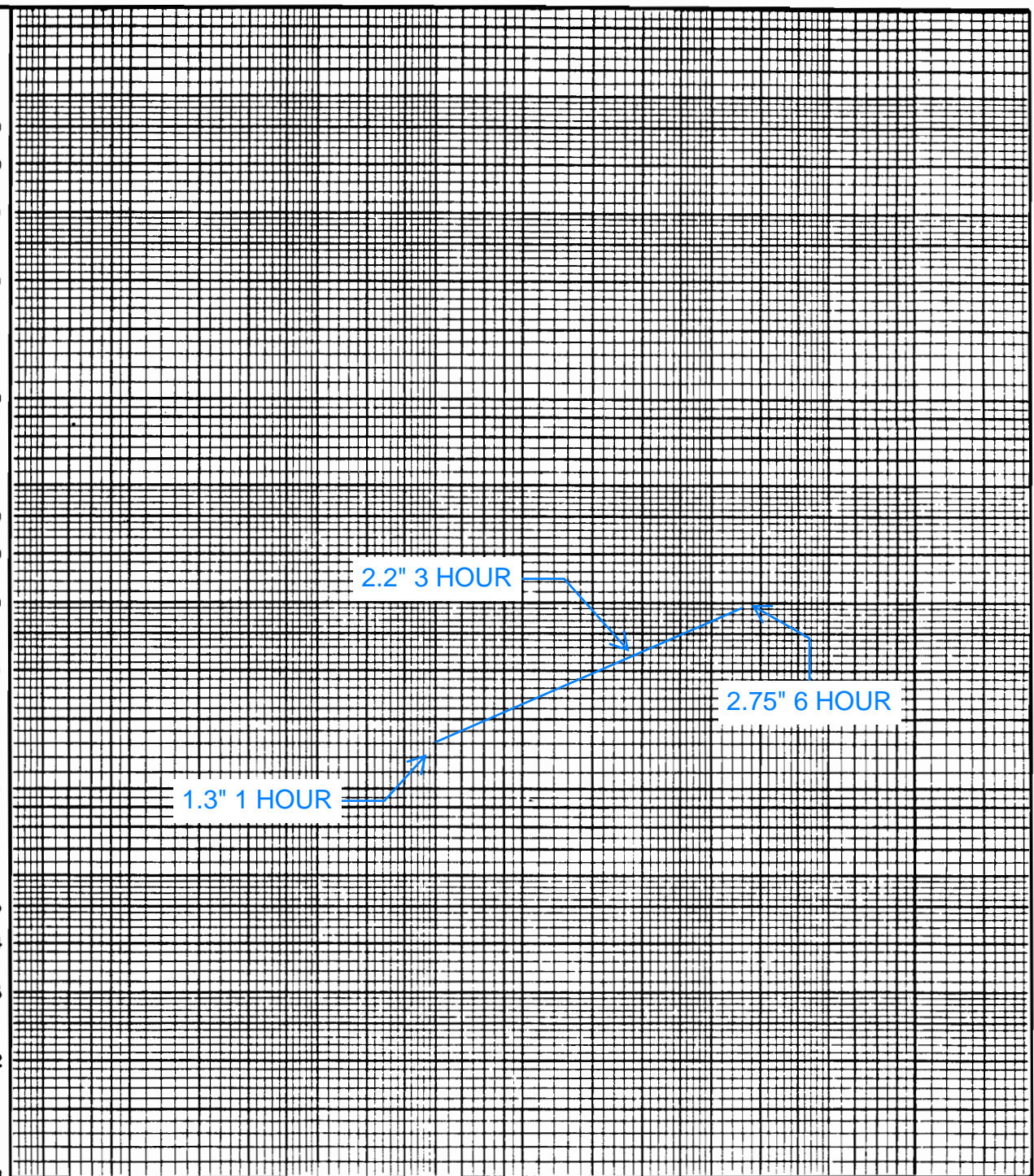
DESIGN STORM FREQUENCY = 100 YEARS
 ONE HOUR POINT RAINFALL = 1.3 INCHES
 LOG-LOG SLOPE = 0.6
 PROJECT LOCATION = SIERRA & RIALTO

SAN BERNARDINO COUNTY
 HYDROLOGY MANUAL

**INTENSITY - DURATION
 CURVES
 CALCULATION SHEET**

POINT RAINFALL - INCHES

50.0
40.0
30.0
20.0
10.0
5.0
4.0
3.0
2.0
1.0
0.5
0.4
0.3
0.2
0.1



STORM DURATION - MINUTES

PROJECT LOCATION SIERRA AND RIALTO

NOTES TEI JOB NUMBER 4029

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

AREA - AVERAGED
MASS RAINFALL
PLOTING SHEET

115

SAN BERNARDINO GATEWAY BUSINESS PARK
PONDING AT BUILDING 1 TRUCKYARD

Elevation	Depth (feet)	Area (sq. ft.)	Volume (c.f.)	Σ Volume (c.f.)	Σ Volume (ac-ft)	Qdischage (cfs)
1011.33	0.00	0				
			437	437	0.01	10.40
1011.60	0.27	3234				
			1240	1,676	0.04	11.10
1011.80	0.47	9162				
			2443	4,119	0.09	11.70
1012.00	0.67	15268				
			3468	7,587	0.17	12.40
1012.20	0.87	19412				
			4312	11,900	0.27	12.90
1012.40	1.07	23712				
			5152	17,052	0.39	13.50
1012.60	1.27	27809				
			5827	22,879	0.53	14.00
1012.80	1.47	30462				
			6304	29,183	0.67	14.5
1013.00	1.67	32580				

SAN BERNARDINO GATEWAY BUSINESS PARK
PONDING AT BUILDING 3 TRUCKYARD

Elevation	Depth (feet)	Area (sq. ft.)	Volume (c.f.)	Σ Volume (c.f.)	Σ Volume (ac-ft)	Qdischage (cfs)
1016.55	0.00	0	4	4	0.00	
1016.60	0.05	168	85	90	0.00	
1016.70	0.15	1538	290	379	0.01	
1016.80	0.25	4261	617	997	0.02	
1016.90	0.35	8087				

 NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
 AND LOW LOSS FRACTION ESTIMATIONS
 =====

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Analysis prepared by:

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Problem Descriptions:

TEI JOB NUMBER 4029
 PONDING IN BUILDINGS 1 TRUCK YARD
 100-YEAR STORM EVENT

 *** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
 AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:
 =====

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 5.80 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	8.14	10.00	56.(AMC II)	0.423	0.918

TOTAL AREA (Acres) = 8.14

AREA-AVERAGED LOSS RATE, \bar{F}_m (in./hr.) = 0.042

AREA-AVERAGED LOW LOSS FRACTION, \bar{Y} = 0.082
 =====

Problem Descriptions:

TEI JOB NUMBER 4029
 PONDING IN BUILDINGS 1 TRUCK YARD
 100-YEAR STORM EVENT

RATIONAL METHOD CALIBRATION COEFFICIENT = 0.90
 TOTAL CATCHMENT AREA(ACRES) = 8.14
 SOIL-LOSS RATE, F_m , (INCH/HR) = 0.042
 LOW LOSS FRACTION = 0.082
 TIME OF CONCENTRATION(MIN.) = 9.30
 SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
 USER SPECIFIED RAINFALL VALUES ARE USED
 RETURN FREQUENCY(YEARS) = 100
 5-MINUTE POINT RAINFALL VALUE(INCHES) = 0.48
 30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.98
 1-HOUR POINT RAINFALL VALUE(INCHES) = 1.30
 3-HOUR POINT RAINFALL VALUE(INCHES) = 2.20
 6-HOUR POINT RAINFALL VALUE(INCHES) = 2.75
 24-HOUR POINT RAINFALL VALUE(INCHES) = 5.80

TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 3.27
 TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.67

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	7.5	15.0	22.5	30.0
0.03	0.0000	0.00	Q	.	.	.	.
0.19	0.0056	0.88	.Q	.	.	.	.
0.34	0.0169	0.88	.Q	.	.	.	.

0.50	0.0282	0.88	.Q	.	.	.	.
0.65	0.0395	0.89	.Q	.	.	.	.
0.81	0.0509	0.89	.Q	.	.	.	.
0.96	0.0624	0.90	.Q	.	.	.	.
1.12	0.0739	0.90	.Q	.	.	.	.
1.27	0.0855	0.91	.Q	.	.	.	.
1.43	0.0971	0.91	.Q	.	.	.	.
1.58	0.1088	0.92	.Q	.	.	.	.
1.74	0.1205	0.92	.Q	.	.	.	.
1.89	0.1323	0.92	.Q	.	.	.	.
2.05	0.1442	0.93	.Q	.	.	.	.
2.20	0.1561	0.93	.Q	.	.	.	.
2.36	0.1681	0.94	.Q	.	.	.	.
2.51	0.1801	0.94	.Q	.	.	.	.
2.67	0.1922	0.95	.Q	.	.	.	.
2.82	0.2044	0.95	.Q	.	.	.	.
2.98	0.2167	0.96	.Q	.	.	.	.
3.13	0.2290	0.96	.Q	.	.	.	.
3.29	0.2413	0.97	.Q	.	.	.	.
3.44	0.2538	0.97	.Q	.	.	.	.
3.60	0.2663	0.98	.Q	.	.	.	.
3.75	0.2789	0.99	.Q	.	.	.	.
3.91	0.2915	0.99	.Q	.	.	.	.
4.06	0.3042	1.00	.Q	.	.	.	.
4.22	0.3171	1.00	.Q	.	.	.	.
4.38	0.3299	1.01	.Q	.	.	.	.
4.53	0.3429	1.01	.Q	.	.	.	.
4.68	0.3559	1.02	.Q	.	.	.	.
4.84	0.3691	1.03	.Q	.	.	.	.
4.99	0.3823	1.04	.Q	.	.	.	.
5.15	0.3956	1.04	.Q	.	.	.	.
5.30	0.4089	1.05	.Q	.	.	.	.
5.46	0.4224	1.05	.Q	.	.	.	.
5.61	0.4360	1.06	.Q	.	.	.	.
5.77	0.4496	1.07	.Q	.	.	.	.
5.93	0.4634	1.08	.Q	.	.	.	.
6.08	0.4772	1.08	.Q	.	.	.	.
6.23	0.4912	1.09	.Q	.	.	.	.
6.39	0.5052	1.10	.Q	.	.	.	.
6.54	0.5193	1.11	.Q	.	.	.	.
6.70	0.5336	1.12	.Q	.	.	.	.
6.86	0.5480	1.13	.Q	.	.	.	.
7.01	0.5624	1.13	.Q	.	.	.	.
7.16	0.5770	1.14	.Q	.	.	.	.
7.32	0.5917	1.15	.Q	.	.	.	.
7.47	0.6065	1.16	.Q	.	.	.	.
7.63	0.6215	1.17	.Q	.	.	.	.
7.78	0.6366	1.18	.Q	.	.	.	.
7.94	0.6518	1.19	.Q	.	.	.	.
8.09	0.6671	1.20	.Q	.	.	.	.
8.25	0.6826	1.21	.Q	.	.	.	.
8.40	0.6982	1.23	.Q	.	.	.	.
8.56	0.7140	1.23	.Q	.	.	.	.
8.71	0.7299	1.25	.Q	.	.	.	.
8.87	0.7459	1.26	.Q	.	.	.	.
9.02	0.7622	1.27	.Q	.	.	.	.
9.18	0.7785	1.28	.Q	.	.	.	.
9.34	0.7951	1.30	.Q	.	.	.	.
9.49	0.8118	1.31	.Q	.	.	.	.
9.65	0.8287	1.33	.Q	.	.	.	.
9.80	0.8458	1.34	.Q	.	.	.	.
9.95	0.8631	1.36	.Q	.	.	.	.
10.11	0.8806	1.37	.Q	.	.	.	.
10.26	0.8983	1.39	.Q	.	.	.	.
10.42	0.9163	1.41	.Q	.	.	.	.
10.57	0.9344	1.43	.Q	.	.	.	.
10.73	0.9528	1.44	.Q	.	.	.	.
10.88	0.9714	1.47	.Q	.	.	.	.
11.04	0.9903	1.48	.Q	.	.	.	.
11.20	1.0095	1.51	.Q	.	.	.	.
11.35	1.0289	1.52	.Q	.	.	.	.
11.51	1.0487	1.56	.Q	.	.	.	.
11.66	1.0687	1.57	.Q	.	.	.	.

11.82	1.0891	1.61	. Q	.	.	.	.
11.97	1.1098	1.63	. Q	.	.	.	.
12.12	1.1278	1.19	.Q	.	.	.	.
12.28	1.1419	1.01	.Q	.	.	.	.
12.43	1.1551	1.05	.Q	.	.	.	.
12.59	1.1687	1.07	.Q	.	.	.	.
12.74	1.1828	1.12	.Q	.	.	.	.
12.90	1.1972	1.14	.Q	.	.	.	.
13.05	1.2122	1.19	.Q	.	.	.	.
13.21	1.2276	1.22	.Q	.	.	.	.
13.37	1.2437	1.28	.Q	.	.	.	.
13.52	1.2603	1.32	.Q	.	.	.	.
13.68	1.2777	1.39	.Q	.	.	.	.
13.83	1.2958	1.43	.Q	.	.	.	.
13.98	1.3148	1.53	. Q	.	.	.	.
14.14	1.3364	1.86	. Q	.	.	.	.
14.30	1.3642	2.49	. Q	.	.	.	.
14.45	1.3966	2.57	. Q	.	.	.	.
14.60	1.4307	2.75	. Q	.	.	.	.
14.76	1.4665	2.85	. Q	.	.	.	.
14.91	1.5046	3.10	. Q	.	.	.	.
15.07	1.5453	3.25	. Q	.	.	.	.
15.23	1.5894	3.64	. Q	.	.	.	.
15.38	1.6378	3.91	. Q	.	.	.	.
15.53	1.6883	3.97	. Q	.	.	.	.
15.69	1.7425	4.51	. Q	.	.	.	.
15.85	1.8124	6.40	. Q	.	.	.	.
16.00	1.9106	8.93	. Q	.	.	.	.
16.16	2.1519	28.74	. Q	.	.	.	.
16.31	2.3697	5.26	. Q	.	.	.	.
16.47	2.4285	3.93	. Q	.	.	.	.
16.62	2.4756	3.42	. Q	.	.	.	.
16.77	2.5166	2.97	. Q	.	.	.	.
16.93	2.5526	2.65	. Q	.	.	.	.
17.08	2.5850	2.42	. Q	.	.	.	.
17.24	2.6100	1.48	.Q	.	.	.	.
17.39	2.6281	1.35	.Q	.	.	.	.
17.55	2.6448	1.25	.Q	.	.	.	.
17.70	2.6603	1.17	.Q	.	.	.	.
17.86	2.6748	1.09	.Q	.	.	.	.
18.02	2.6884	1.03	.Q	.	.	.	.
18.17	2.7055	1.64	. Q	.	.	.	.
18.33	2.7263	1.59	. Q	.	.	.	.
18.48	2.7463	1.54	. Q	.	.	.	.
18.64	2.7657	1.50	.Q	.	.	.	.
18.79	2.7846	1.45	.Q	.	.	.	.
18.94	2.8030	1.42	.Q	.	.	.	.
19.10	2.8209	1.38	.Q	.	.	.	.
19.26	2.8384	1.35	.Q	.	.	.	.
19.41	2.8556	1.32	.Q	.	.	.	.
19.57	2.8723	1.29	.Q	.	.	.	.
19.72	2.8887	1.27	.Q	.	.	.	.
19.88	2.9047	1.24	.Q	.	.	.	.
20.03	2.9205	1.22	.Q	.	.	.	.
20.18	2.9360	1.20	.Q	.	.	.	.
20.34	2.9512	1.18	.Q	.	.	.	.
20.49	2.9661	1.16	.Q	.	.	.	.
20.65	2.9808	1.14	.Q	.	.	.	.
20.81	2.9953	1.12	.Q	.	.	.	.
20.96	3.0096	1.10	.Q	.	.	.	.
21.11	3.0236	1.09	.Q	.	.	.	.
21.27	3.0375	1.07	.Q	.	.	.	.
21.42	3.0511	1.06	.Q	.	.	.	.
21.58	3.0646	1.04	.Q	.	.	.	.
21.73	3.0779	1.03	.Q	.	.	.	.
21.89	3.0910	1.02	.Q	.	.	.	.
22.05	3.1040	1.01	.Q	.	.	.	.
22.20	3.1168	0.99	.Q	.	.	.	.
22.36	3.1294	0.98	.Q	.	.	.	.
22.51	3.1419	0.97	.Q	.	.	.	.
22.67	3.1543	0.96	.Q	.	.	.	.
22.82	3.1665	0.95	.Q	.	.	.	.
22.98	3.1787	0.94	.Q	.	.	.	.

23.13	3.1906	0.93	.Q	.	.	.	.
23.28	3.2025	0.92	.Q	.	.	.	.
23.44	3.2142	0.91	.Q	.	.	.	.
23.59	3.2259	0.90	.Q	.	.	.	.
23.75	3.2374	0.89	.Q	.	.	.	.
23.91	3.2488	0.89	.Q	.	.	.	.
24.06	3.2601	0.88	.Q	.	.	.	.
24.22	3.2657	0.00	Q	.	.	.	.

 TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
 (Note: 100% of Peak Flow Rate estimate assumed to have
 an instantaneous time duration)

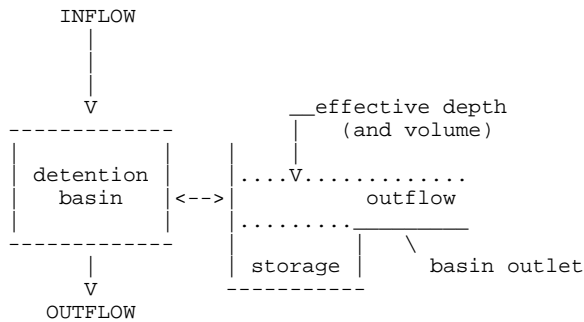
Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1441.5
10%	120.9
20%	27.9
30%	18.6
40%	9.3
50%	9.3
60%	9.3
70%	9.3
80%	9.3
90%	9.3

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FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
 CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 9.300
 DEAD STORAGE(AF) = 0.00
 SPECIFIED DEAD STORAGE(AF) FILLED = 0.00
 ASSUMED INITIAL DEPTH(FEET) IN STORAGE BASIN = 0.00



DEPTH-VS.-STORAGE AND DEPTH-VS.-DISCHARGE INFORMATION:
 TOTAL NUMBER OF BASIN DEPTH INFORMATION ENTRIES = 9

* (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	** (FEET)	**BASIN-DEPTH STORAGE (ACRE-FEET)	OUTFLOW (CFS)
* 0.000	0.000	0.000**	0.270	0.010	10.400*
* 0.470	0.040	11.100**	0.670	0.090	11.700*
* 0.870	0.170	12.400**	1.070	0.270	12.900*
* 1.270	0.390	13.500**	1.470	0.530	14.000*
* 1.670	0.670	14.500**			

 BASIN STORAGE, OUTFLOW AND DEPTH ROUTING VALUES:
 INTERVAL DEPTH {S-O*DT/2} {S+O*DT/2}

NUMBER	(FEET)	(ACRE-FEET)	(ACRE-FEET)
1	0.00	0.00000	0.00000
2	0.27	-0.05661	0.07661
3	0.47	-0.03110	0.11110
4	0.67	0.01506	0.16494
5	0.87	0.09058	0.24942
6	1.07	0.18738	0.35262
7	1.27	0.30353	0.47647
8	1.47	0.44033	0.61967
9	1.67	0.57713	0.76287

WHERE S=STORAGE(AF);O=OUTFLOW(AF/MIN.);DT=UNIT INTERVAL(MIN.)

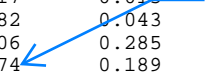
DETENTION BASIN ROUTING RESULTS:

NOTE: COMPUTED BASIN DEPTH, OUTFLOW, AND STORAGE QUANTITIES
OCCUR AT THE GIVEN TIME. BASIN INFLOW VALUES REPRESENT THE
AVERAGE INFLOW DURING THE RECENT HYDROGRAPH UNIT INTERVAL.

TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	EFFECTIVE DEPTH(FT)	OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.035	0.000	0.00	0.00	0.00	0.000
0.190	0.000	0.88	0.04	0.76	0.001
0.345	0.000	0.88	0.04	1.53	0.001
0.500	0.000	0.88	0.04	1.53	0.001
0.655	0.000	0.89	0.04	1.54	0.001
0.810	0.000	0.89	0.04	1.55	0.001
0.965	0.000	0.90	0.04	1.56	0.002
1.120	0.000	0.90	0.04	1.56	0.002
1.275	0.000	0.91	0.04	1.57	0.002
1.430	0.000	0.91	0.04	1.58	0.002
1.585	0.000	0.92	0.04	1.59	0.002
1.740	0.000	0.92	0.04	1.59	0.002
1.895	0.000	0.92	0.04	1.60	0.002
2.050	0.000	0.93	0.04	1.61	0.002
2.205	0.000	0.93	0.04	1.62	0.002
2.360	0.000	0.94	0.04	1.63	0.002
2.515	0.000	0.94	0.04	1.63	0.002
2.670	0.000	0.95	0.04	1.64	0.002
2.825	0.000	0.95	0.04	1.65	0.002
2.980	0.000	0.96	0.04	1.66	0.002
3.135	0.000	0.96	0.04	1.67	0.002
3.290	0.000	0.97	0.04	1.68	0.002
3.445	0.000	0.97	0.04	1.69	0.002
3.600	0.000	0.98	0.04	1.70	0.002
3.755	0.000	0.99	0.04	1.71	0.002
3.910	0.000	0.99	0.04	1.72	0.002
4.065	0.000	1.00	0.05	1.73	0.002
4.220	0.000	1.00	0.05	1.74	0.002
4.375	0.000	1.01	0.05	1.75	0.002
4.530	0.000	1.01	0.05	1.76	0.002
4.685	0.000	1.02	0.05	1.77	0.002
4.840	0.000	1.03	0.05	1.78	0.002
4.995	0.000	1.04	0.05	1.79	0.002
5.150	0.000	1.04	0.05	1.80	0.002
5.305	0.000	1.05	0.05	1.82	0.002
5.460	0.000	1.05	0.05	1.83	0.002
5.615	0.000	1.06	0.05	1.84	0.002
5.770	0.000	1.07	0.05	1.85	0.002
5.925	0.000	1.08	0.05	1.87	0.002
6.080	0.000	1.08	0.05	1.88	0.002
6.235	0.000	1.09	0.05	1.89	0.002
6.390	0.000	1.10	0.05	1.91	0.002
6.545	0.000	1.11	0.05	1.92	0.002
6.700	0.000	1.12	0.05	1.93	0.002
6.855	0.000	1.13	0.05	1.95	0.002
7.010	0.000	1.13	0.05	1.96	0.002
7.165	0.000	1.14	0.05	1.98	0.002
7.320	0.000	1.15	0.05	2.00	0.002
7.475	0.000	1.16	0.05	2.01	0.002
7.630	0.000	1.17	0.05	2.03	0.002
7.785	0.000	1.18	0.05	2.05	0.002
7.940	0.000	1.19	0.05	2.06	0.002
8.095	0.000	1.20	0.05	2.08	0.002

8.250	0.000	1.21	0.05	2.10	0.002
8.405	0.000	1.23	0.06	2.12	0.002
8.560	0.000	1.23	0.06	2.14	0.002
8.715	0.000	1.25	0.06	2.16	0.002
8.870	0.000	1.26	0.06	2.18	0.002
9.025	0.000	1.27	0.06	2.20	0.002
9.180	0.000	1.28	0.06	2.22	0.002
9.335	0.000	1.30	0.06	2.25	0.002
9.490	0.000	1.31	0.06	2.27	0.002
9.645	0.000	1.33	0.06	2.30	0.002
9.800	0.000	1.34	0.06	2.32	0.002
9.955	0.000	1.36	0.06	2.35	0.002
10.110	0.000	1.37	0.06	2.38	0.002
10.265	0.000	1.39	0.06	2.40	0.002
10.420	0.000	1.41	0.06	2.43	0.002
10.575	0.000	1.43	0.06	2.46	0.002
10.730	0.000	1.44	0.07	2.50	0.002
10.885	0.000	1.47	0.07	2.53	0.002
11.040	0.000	1.48	0.07	2.56	0.002
11.195	0.000	1.51	0.07	2.60	0.003
11.350	0.000	1.52	0.07	2.64	0.003
11.505	0.000	1.56	0.07	2.68	0.003
11.660	0.000	1.57	0.07	2.72	0.003
11.815	0.000	1.61	0.07	2.76	0.003
11.970	0.000	1.63	0.07	2.81	0.003
12.125	0.000	1.19	0.05	2.45	0.002
12.280	0.000	1.01	0.05	1.92	0.002
12.435	0.000	1.05	0.05	1.80	0.002
12.590	0.000	1.07	0.05	1.85	0.002
12.745	0.000	1.12	0.05	1.90	0.002
12.900	0.000	1.14	0.05	1.96	0.002
13.055	0.000	1.19	0.05	2.03	0.002
13.210	0.000	1.22	0.06	2.10	0.002
13.365	0.000	1.28	0.06	2.18	0.002
13.520	0.000	1.32	0.06	2.26	0.002
13.675	0.000	1.39	0.06	2.36	0.002
13.830	0.000	1.43	0.06	2.46	0.002
13.985	0.000	1.53	0.07	2.57	0.003
14.140	0.000	1.86	0.08	2.94	0.003
14.295	0.000	2.49	0.11	3.78	0.004
14.450	0.000	2.57	0.12	4.40	0.004
14.605	0.000	2.75	0.12	4.62	0.005
14.760	0.000	2.85	0.13	4.87	0.005
14.915	0.000	3.10	0.14	5.17	0.005
15.070	0.000	3.25	0.15	5.52	0.005
15.225	0.000	3.64	0.16	5.99	0.006
15.380	0.000	3.91	0.18	6.57	0.007
15.535	0.000	3.97	0.18	6.85	0.007
15.690	0.000	4.51	0.20	7.37	0.008
15.845	0.000	6.40	0.30	9.17	0.015
16.000	0.000	8.93	0.48	10.82	0.043
16.155	0.000	28.74	1.10	12.06	0.285
16.310	0.000	5.26	0.91	12.74	0.189
16.465	0.000	3.93	0.65	12.07	0.085
16.620	0.000	3.42	0.19	9.51	0.007
16.775	0.000	2.97	0.13	6.27	0.005
16.930	0.000	2.65	0.12	4.89	0.004
17.085	0.000	2.42	0.11	4.41	0.004
17.240	0.000	1.48	0.07	3.39	0.002
17.395	0.000	1.35	0.06	2.46	0.002
17.550	0.000	1.25	0.06	2.26	0.002
17.705	0.000	1.17	0.05	2.10	0.002
17.860	0.000	1.09	0.05	1.97	0.002
18.015	0.000	1.03	0.05	1.85	0.002
18.170	0.000	1.64	0.07	2.33	0.003
18.325	0.000	1.59	0.07	2.81	0.003
18.480	0.000	1.54	0.07	2.72	0.003
18.635	0.000	1.50	0.07	2.64	0.003
18.790	0.000	1.45	0.07	2.56	0.002
18.945	0.000	1.42	0.06	2.50	0.002
19.100	0.000	1.38	0.06	2.43	0.002
19.255	0.000	1.35	0.06	2.38	0.002
19.410	0.000	1.32	0.06	2.32	0.002

PEAK DISCHARGE



19.565	0.000	1.29	0.06	2.27	0.002
19.720	0.000	1.27	0.06	2.22	0.002
19.875	0.000	1.24	0.06	2.18	0.002
20.030	0.000	1.22	0.06	2.14	0.002
20.185	0.000	1.20	0.05	2.10	0.002
20.340	0.000	1.18	0.05	2.06	0.002
20.495	0.000	1.16	0.05	2.03	0.002
20.650	0.000	1.14	0.05	2.00	0.002
20.805	0.000	1.12	0.05	1.96	0.002
20.960	0.000	1.10	0.05	1.93	0.002
21.115	0.000	1.09	0.05	1.91	0.002
21.270	0.000	1.07	0.05	1.88	0.002
21.425	0.000	1.06	0.05	1.85	0.002
21.580	0.000	1.04	0.05	1.83	0.002
21.735	0.000	1.03	0.05	1.80	0.002
21.890	0.000	1.02	0.05	1.78	0.002
22.045	0.000	1.01	0.05	1.76	0.002
22.200	0.000	0.99	0.04	1.74	0.002
22.355	0.000	0.98	0.04	1.72	0.002
22.510	0.000	0.97	0.04	1.70	0.002
22.665	0.000	0.96	0.04	1.68	0.002
22.820	0.000	0.95	0.04	1.66	0.002
22.975	0.000	0.94	0.04	1.64	0.002
23.130	0.000	0.93	0.04	1.63	0.002
23.285	0.000	0.92	0.04	1.61	0.002
23.440	0.000	0.91	0.04	1.59	0.002
23.595	0.000	0.90	0.04	1.58	0.002
23.750	0.000	0.89	0.04	1.56	0.001
23.905	0.000	0.89	0.04	1.55	0.001
24.060	0.000	0.88	0.04	1.53	0.001
24.215	0.000	0.00	0.00	0.76	0.000
24.370	0.000	0.00	0.00	0.00	0.000

DATE: 10/29/2021
 TIME: 12:31

F0515P
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE WIDTH	PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)	
CD	24	4				2.00															
CD	18	4				1.50															

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

TEI JOB NUMBER 4029

HEADING LINE NO 2 IS -

STORM DRAIN LINE B

HEADING LINE NO 3 IS -

100-YEAR

F 0 5 1 5 P

PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	IS	A	SYSTEM OUTLET	U/S DATA	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
1	IS	A	SYSTEM OUTLET	U/S DATA	1023.05	1011.20	24	1016.62				
2	IS	A	REACH	U/S DATA	1027.05	1011.21	24		0.00	0.00	0.00	1
3	IS	A	REACH	U/S DATA	1052.49	1011.29	24		0.00	0.00	0.00	0
4	IS	A	REACH	U/S DATA	1070.20	1011.34	24		22.50	45.00	0.00	0
5	IS	A	REACH	U/S DATA	1075.71	1011.61	24		0.00	0.00	0.00	0
6	IS	A	JUNCTION	U/S DATA	1075.71	1011.36	24					
THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING THE ABOVE ELEMENT CONTAINED AN INVERT ELEV WHICH WAS NOT GREATER THAN THE PREVIOUS INVERT ELEV -WARNING												
7	IS	A	REACH	U/S DATA	1158.84	1011.61	24		0.00	0.00	0.00	0
8	IS	A	REACH	U/S DATA	1167.95	1011.63	24		22.50	45.00	0.00	0
9	IS	A	REACH	U/S DATA	1322.00	1012.10	24		0.00	0.00	0.00	0
10	IS	A	REACH	U/S DATA	1326.00	1012.11	24		0.00	0.00	0.00	1
11	IS	A	REACH	U/S DATA	1352.23	1012.19	24		22.50	45.00	0.00	0
12	IS	A	REACH	U/S DATA	1447.73	1012.47	24		0.00	0.00	0.00	0

F 0 5 1 5 P

PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

13	IS	A	REACH	U/S DATA	1465.56	1012.53	24		22.50	45.00	0.00	0
14	IS	A	REACH	U/S DATA	1473.38	1012.55	24		0.00	0.00	0.00	0

ELEMENT NO 15 IS A SYSTEM HEADWORKS * *
 U/S DATA STATION INVERT SECT W S ELEV
 1473.38 1012.55 24 0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING

** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
 LICENSEE: THIENES ENGINEERING F0515P PAGE 1

WATER SURFACE PROFILE LISTING

TEI JOB NUMBER 4029
 STORM DRAIN LINE B
 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF					NORM DEPTH		ZR
1023.05	1011.20	5.420	1016.620	4.8	1.53	0.036	1016.656	0.00	0.771	2.00	0.00	0.00	0	0.00
4.00	0.00250					.000384	0.00					0.870		0.00
1027.05	1011.21	5.413	1016.623	4.8	1.53	0.036	1016.659	0.00	0.771	2.00	0.00	0.00	0	0.00
25.44	0.00314					.000384	0.01					0.813		0.00
1052.49	1011.29	5.343	1016.633	4.8	1.53	0.036	1016.669	0.00	0.771	2.00	0.00	0.00	0	0.00
17.71	0.00282					.000384	0.01					0.840		0.00
1070.20	1011.34	5.305	1016.645	4.8	1.53	0.036	1016.681	0.00	0.771	2.00	0.00	0.00	0	0.00
5.51	0.04900					.000384	0.00					0.400		0.00
1075.71	1011.61	5.037	1016.647	4.8	1.53	0.036	1016.683	0.00	0.771	2.00	0.00	0.00	0	0.00
JUNCT STR	0.00000					.000273	0.00							0.00
1075.71	1011.36	5.356	1016.716	1.0	0.32	0.002	1016.718	0.00	0.344	2.00	0.00	0.00	0	0.00
83.13	0.00301					.000017	0.00					0.370		0.00
1158.84	1011.61	5.108	1016.718	1.0	0.32	0.002	1016.720	0.00	0.344	2.00	0.00	0.00	0	0.00
9.11	0.00219					.000017	0.00					0.400		0.00
1167.95	1011.63	5.088	1016.718	1.0	0.32	0.002	1016.720	0.00	0.344	2.00	0.00	0.00	0	0.00
154.05	0.00305					.000017	0.00					0.370		0.00
1322.00	1012.10	4.621	1016.721	1.0	0.32	0.002	1016.723	0.00	0.344	2.00	0.00	0.00	0	0.00
4.00	0.00250					.000017	0.00					0.390		0.00
1326.00	1012.11	4.611	1016.721	1.0	0.32	0.002	1016.723	0.00	0.344	2.00	0.00	0.00	0	0.00
26.23	0.00305					.000017	0.00					0.370		0.00
1352.23	1012.19	4.532	1016.722	1.0	0.32	0.002	1016.724	0.00	0.344	2.00	0.00	0.00	0	0.00
95.50	0.00293					.000017	0.00					0.370		0.00

LICENSEE: THIENES ENGINEERING

F0515P

PAGE 2

WATER SURFACE PROFILE LISTING

TEI JOB NUMBER 4029
 STORM DRAIN LINE B
 100-YEAR

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH	HGT/DIA	BASE/ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF					NORM DEPTH		ZR
1447.73	1012.47	4.253	1016.723	1.0	0.32	0.002	1016.725	0.00	0.344	2.00	0.00	0.00	0	0.00
17.83	0.00336					.000017	0.00					0.360		0.00
1465.56	1012.53	4.194	1016.724	1.0	0.32	0.002	1016.726	0.00	0.344	2.00	0.00	0.00	0	0.00
7.82	0.00256					.000017	0.00					0.380		0.00
1473.38	1012.55	4.174	1016.724	1.0	0.32	0.002	1016.726	0.00	0.344	2.00	0.00	0.00	0	0.00

TEI JOB NUMBER 4029
 STORM DRAIN LINE B
 100-YEAR

1023.05 .I C . H X . R
 1032.24 .I C H X . R
 1041.43

1050.62	.																	.				
1059.81	.	I		C					H									X	.		R	
1069.00	.																		.			
1078.19	.	I		C					H									WE	.		R	
1087.38	.		I		C	C				H		H						WE	.		JX	
1096.57	.	I		C					H									X	.		R	
1105.76	.																		.			
1114.95	.																		.			
1124.14	.																		.			
1133.33	.																		.			
1142.53	.																		.			
1151.72	.																		.			
1160.91	.		I		C													X	.		R	
1170.10	.		I		C													X	.		R	
1179.29	.																		.			
1188.48	.																		.			
1197.67	.																		.			
1206.86	.																		.			
1216.05	.																		.			
1225.24	.																		.			
1234.43	.																		.			
1243.62	.																		.			
1252.81	.																		.			
1262.00	.																		.			
1271.19	.																		.			
1280.38	.																		.			
1289.57	.																		.			
1298.76	.																		.			
1307.95	.																		.			
1317.14	.																		.			
1326.33	.			I		C												X	.		R	
1335.52	.			I		C												X	.		R	
1344.71	.																		.			
1353.90	.			I		C												X	.		R	
1363.10	.																		.			
1372.29	.																		.			
1381.48	.																		.			
1390.67	.																		.			
1399.86	.																		.			
1409.05	.																		.			
1418.24	.																		.			
1427.43	.																		.			
1436.62	.																		.			
1445.81	.																		.			
1455.00	.					I		C											X	.		R
1464.19	.																		.			
1473.38	.					I		C											X	.		R
	.																		.			
		1011.20		1011.75		1012.31		1012.86		1013.41		1013.96		1014.52		1015.07		1015.62		1016.17		1016.73

N O T E S

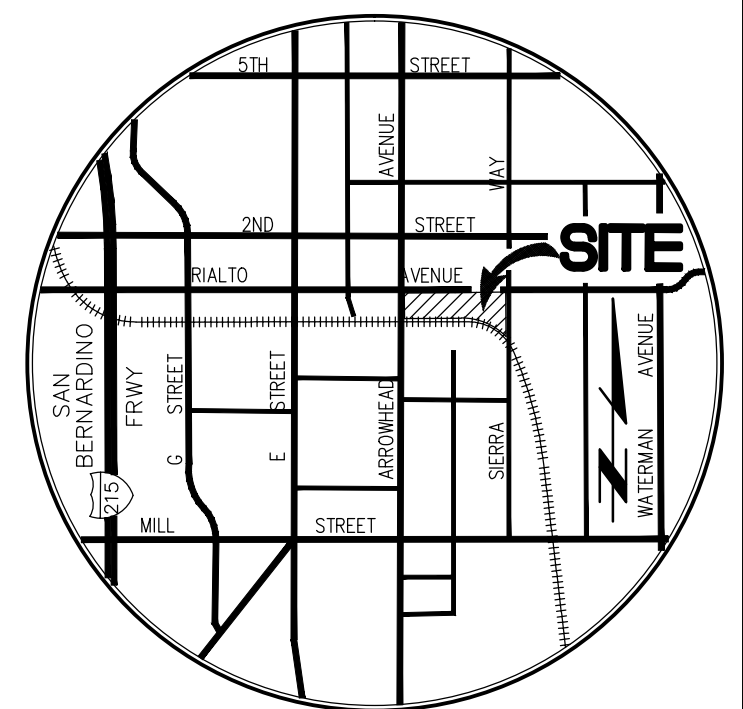
1. GLOSSARY

- I = INVERT ELEVATION
- C = CRITICAL DEPTH
- W = WATER SURFACE ELEVATION
- H = HEIGHT OF CHANNEL
- E = ENERGY GRADE LINE
- X = CURVES CROSSING OVER
- B = BRIDGE ENTRANCE OR EXIT
- Y = WALL ENTRANCE OR EXIT

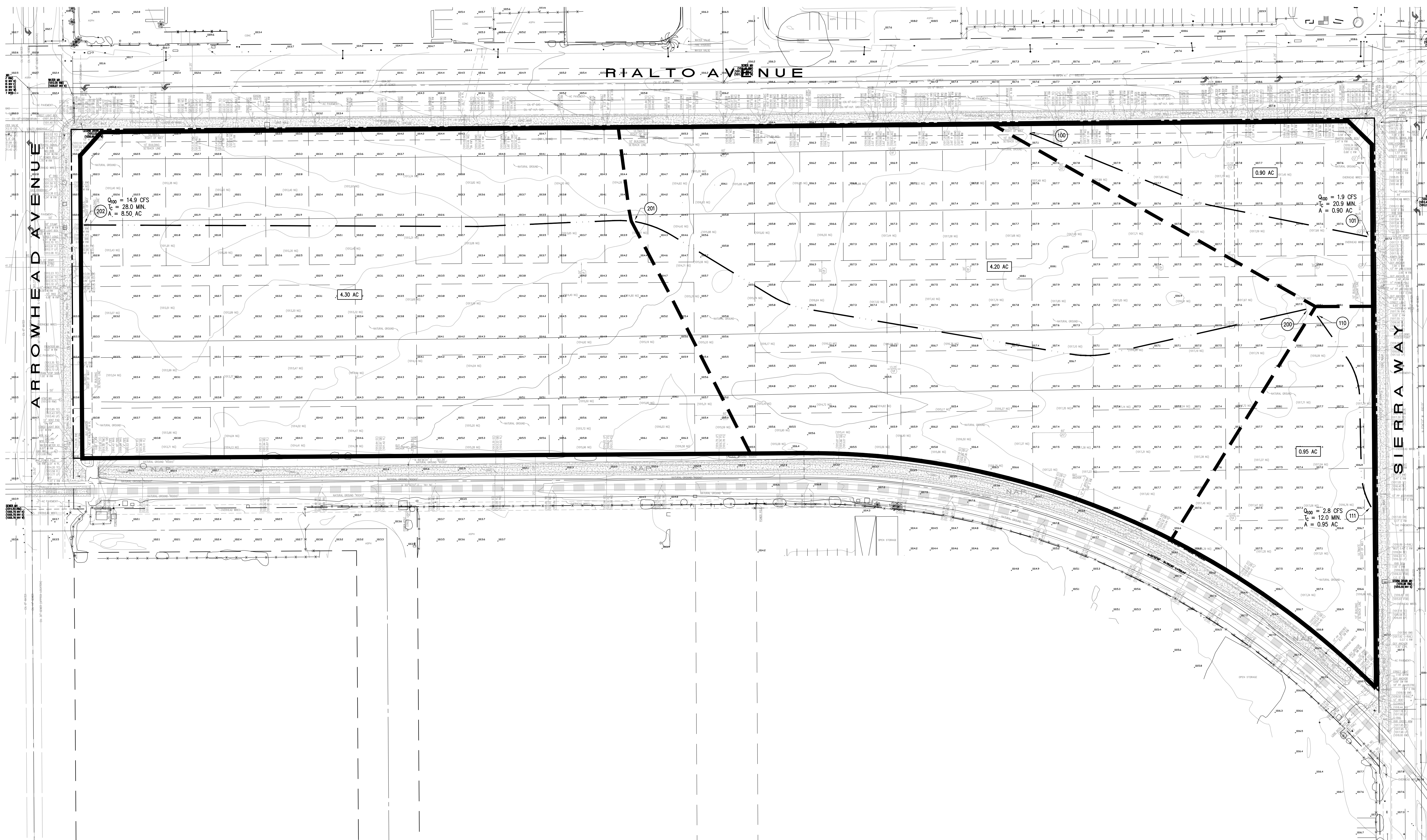
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY▲

APPENDIX D

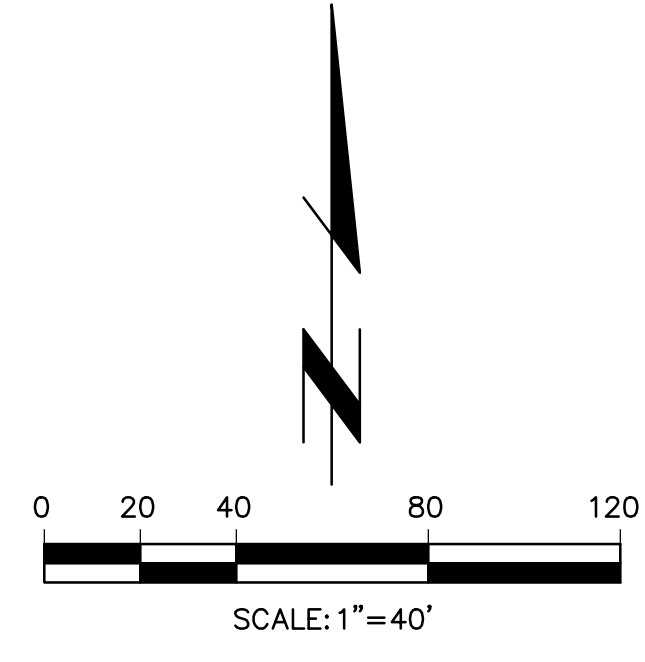
HYDROLOGY MAPS



VICINITY MAP
N.T.S.



LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOW PATH
	SUBAREA AREA
	NODE NUMBER



Last Update: 10/28/21
© 14000-4099-4029-4029r10-EX.dwg

CITY OF SAN BERNARDINO
PUBLIC WORKS DEPARTMENT

**EXISTING CONDITION
HYDROLOGY MAP
SAN BERNARDINO GATEWAY
BUSINESS PARK**

119 S. ARROWHEAD AVENUE

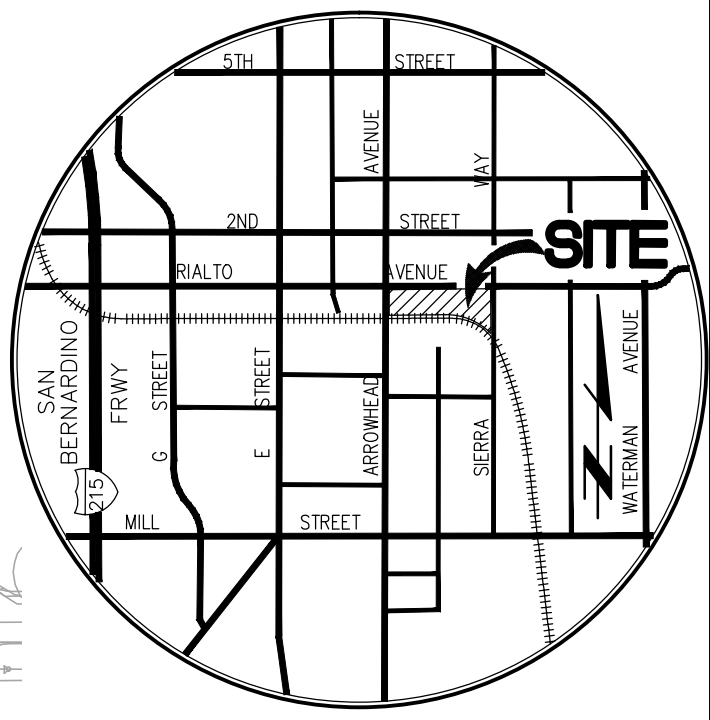
Designed by	_____	Approved by	_____
Checked by	_____	Date	_____
Designed by	_____	Public Works Director	R.C.E. XXXXX
Checked by	_____	Date	_____

Sheet **1** of **1** Sheets

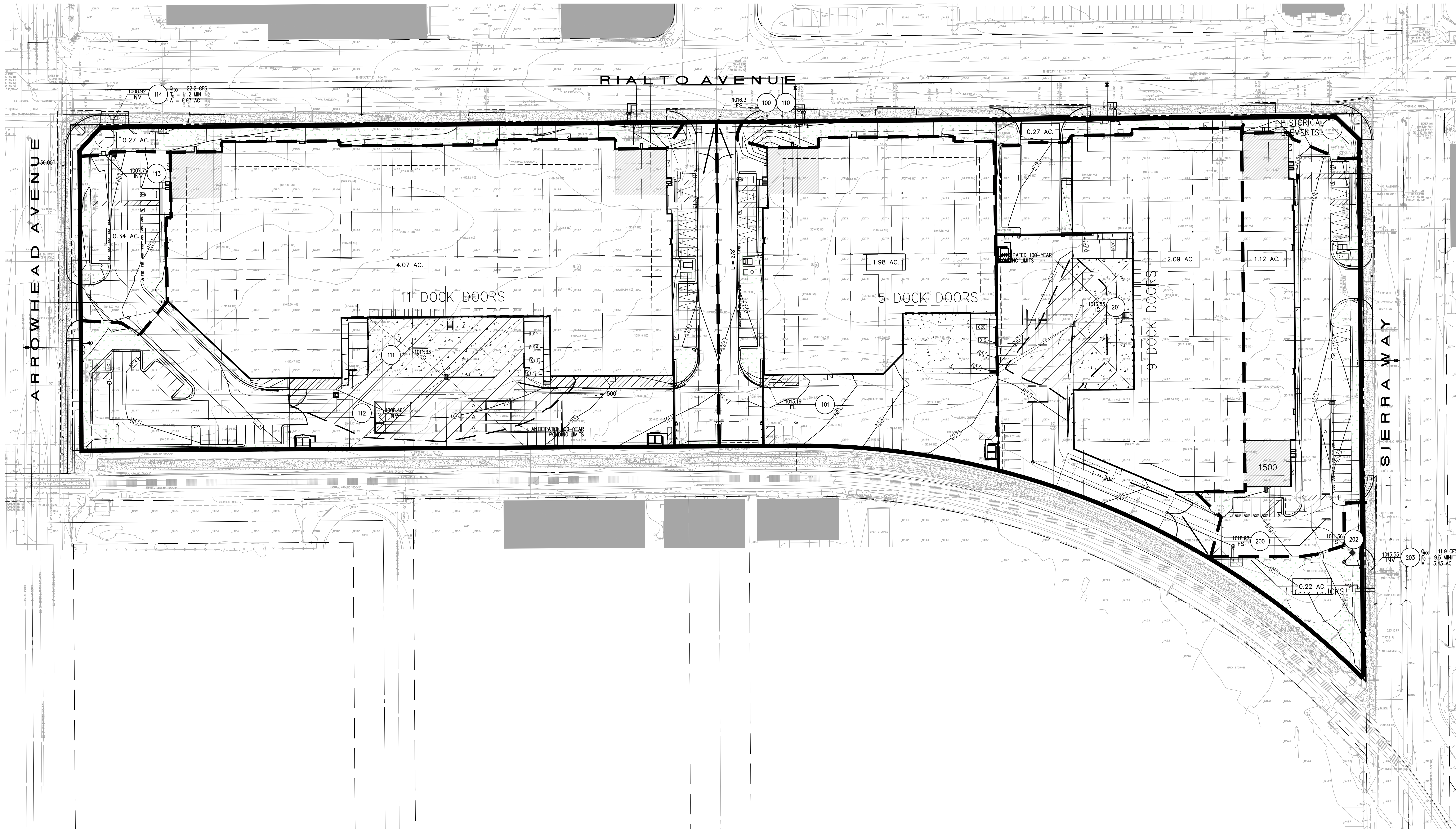
PREPARED FOR:

PROFICIENCY CAPITAL, LLC
11777 SAN VICENTE BLVD, STE. 780
LOS ANGELES CA, 90049
PHONE: (949) 296-7006
CONTACT: MATT ENGLAND

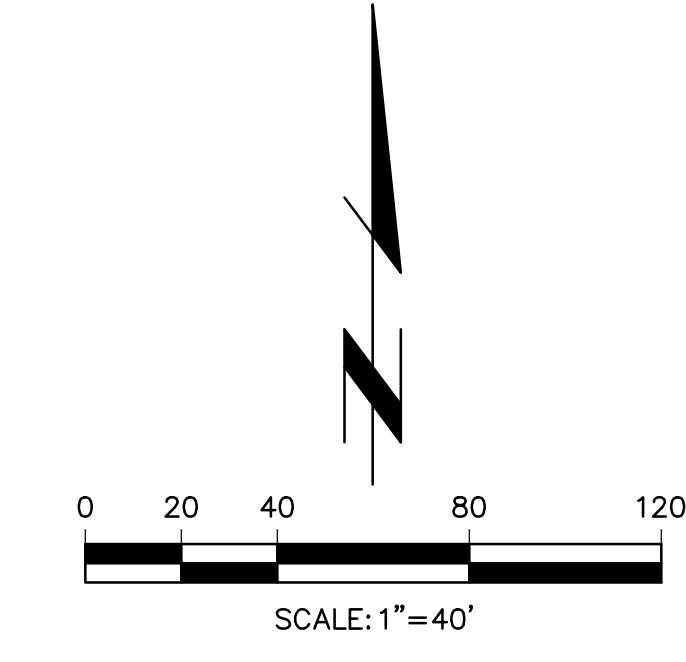




VICINITY MAP
N.T.S.



LEGEND	
	PROJECT BOUNDARY
	SUBAREA BOUNDARY
	FLOW PATH
	SUBAREA AREA
	NODE NUMBER
	PONDING LIMITS



PREPARED FOR:
PROFICIENCY CAPITAL, LLC
11777 SAN VICENTE BLVD, STE. 780
LOS ANGELES, CA, 90049
PHONE: (949) 296-7006
CONTACT: MATT ENGLAND



CITY OF SAN BERNARDINO PUBLIC WORKS DEPARTMENT PROPOSED CONDITION HYDROLOGY MAP SAN BERNARDINO GATEWAY BUSINESS PARK 119 S. ARROWHEAD AVENUE	
Designed by _____ Checked by _____ Date _____ Date _____ Date _____ Date _____	Approved by _____ Date _____ Public Works Director R.C.E. XXXXX Sheet 1 of 1 Sheets

Last Update: 10/5/22
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4029/1 OF 4 SHEET