

# **PRELIMINARY HYDROLOGY REPORT**

For

## **Oakmont – Tippecanoe Industrial**

**APN:** 0278-191-17, 0278-191-25, 0278-191-25, 0278-191-28, and 0278-191-12

**PA21-20**

### **PROJECT LOCATION**

Property on the corner of 9<sup>th</sup> Street and Tippecanoe Avenue  
in City of San Bernardino

### **DEVELOPER**

Oakmont Industrial Group  
3520 Piedmont Road Suite 100  
Atlanta, GA 30305  
949-215-3796

### **PREPARED BY**

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David White, P.E.  
C52921, Exp 12/31/2022

### **PREPARATION DATE**

February 10, 2022

### **HZ PROJECT NUMBER**

R314211.01

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## **Introduction**

This hydrology analysis has been prepared for Tippecanoe Industrial. The project is a new development of an industrial warehouse facility located at the southwest corner of 9<sup>th</sup> Street and Tippecanoe Avenue in the City of San Bernardino, California. The proposed building is approximately 339,600 square feet in size on approximately 14.32 acres of undeveloped land.

## **Purpose**

The purpose of this report is to present the drainage concept for the project and to determine the design flow rates and storm drain sizes for the project site. The hydrology maps and calculations reflect the tributary areas and 100-year storm event runoff flows.

## **Existing Condition**

The project site is a rectangular-shape parcel and is currently undeveloped. The project site generally slopes 0.75% from the northeast side to the southwest side of the property. The maximum site elevation, located at the northeast property corner, is approximately 1067± feet mean sea level (msl). The minimum site elevation located at the southwest property corner is 1060± feet msl. Runoff from the existing site sheet flows onto the adjacent property to the west.

## **Proposed Condition**

For the proposed condition, the project area runoff will be directed to the on-site underground infiltration system located on the west side of the site. The overflow from the underground infiltration system will be directed through Storm Drain Line B to the outlet on Catch Basin #3 and will connect to the existing storm drain lateral on the southwest corner of the site. See Appendix A for proposed on-site hydrology map.

Site runoff from the northern and eastern half of the building roof, northern parking lot, and western truck docks will be collected by catch basin #1-2. The collected runoff will then be conveyed through the proposed on-site storm drain Line A to the underground infiltration system on the west side of the project site.

Site runoff from the southern and eastern half of the building roof and southern drive isle and parking lot will be collected by catch basin #3-4. The collected runoff will then be conveyed through the proposed on-site storm drain Line B to the underground infiltration system on the west of the project site. Overflow from the proposed infiltration system will be discharged into the existing 36" storm drain lateral on the southwest corner of the site.

## **Hydrologic Analysis**

A hydrologic analysis was prepared using the methodology outlined in the San Bernardino County Flood Control Hydrology Manual. A rational method analysis was completed for the proposed 100-year return event using Civild software. The calculations are included in Appendix B and indicate flow data at each node. Existing and Proposed condition Hydrology Maps for this project are included in Appendix A of this report.

Unit Hydrograph calculations were also performed utilizing the Civild software and the results are included in Appendix C.

The 100-year, 1-hour rainfall rates were taken from the isohyetal maps in the San Bernardino County Flood Control Hydrology Manual. The hydrologic soils type for the site is "B" and was taken from the soils map in the San Bernardino County Flood Control Hydrology Manual (see Appendix D for reference maps). A "commercial" land use was used with an AMC of III.

## **Results**

The existing area has an initial subarea of 14.3 Acres and a initial subarea runoff of 29.44 (CFS).

The underground infiltration system provides 60,192 cf of storage for water quality purposes. From the hydrologic analysis (see Appendix B), the proposed  $Q_{100}$  generated from the project site is 46.66 cfs which is within 10% of the allowable discharge.

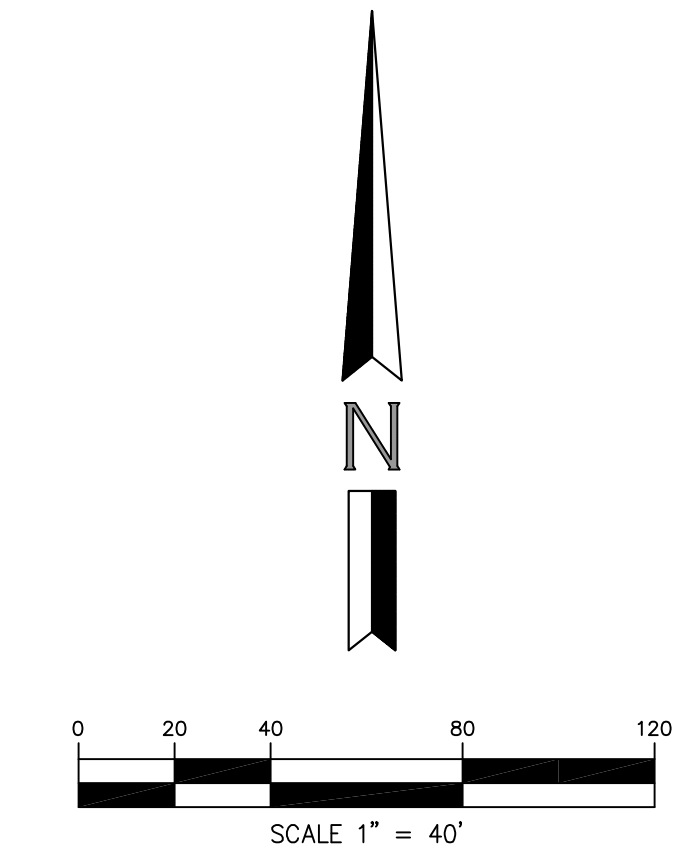
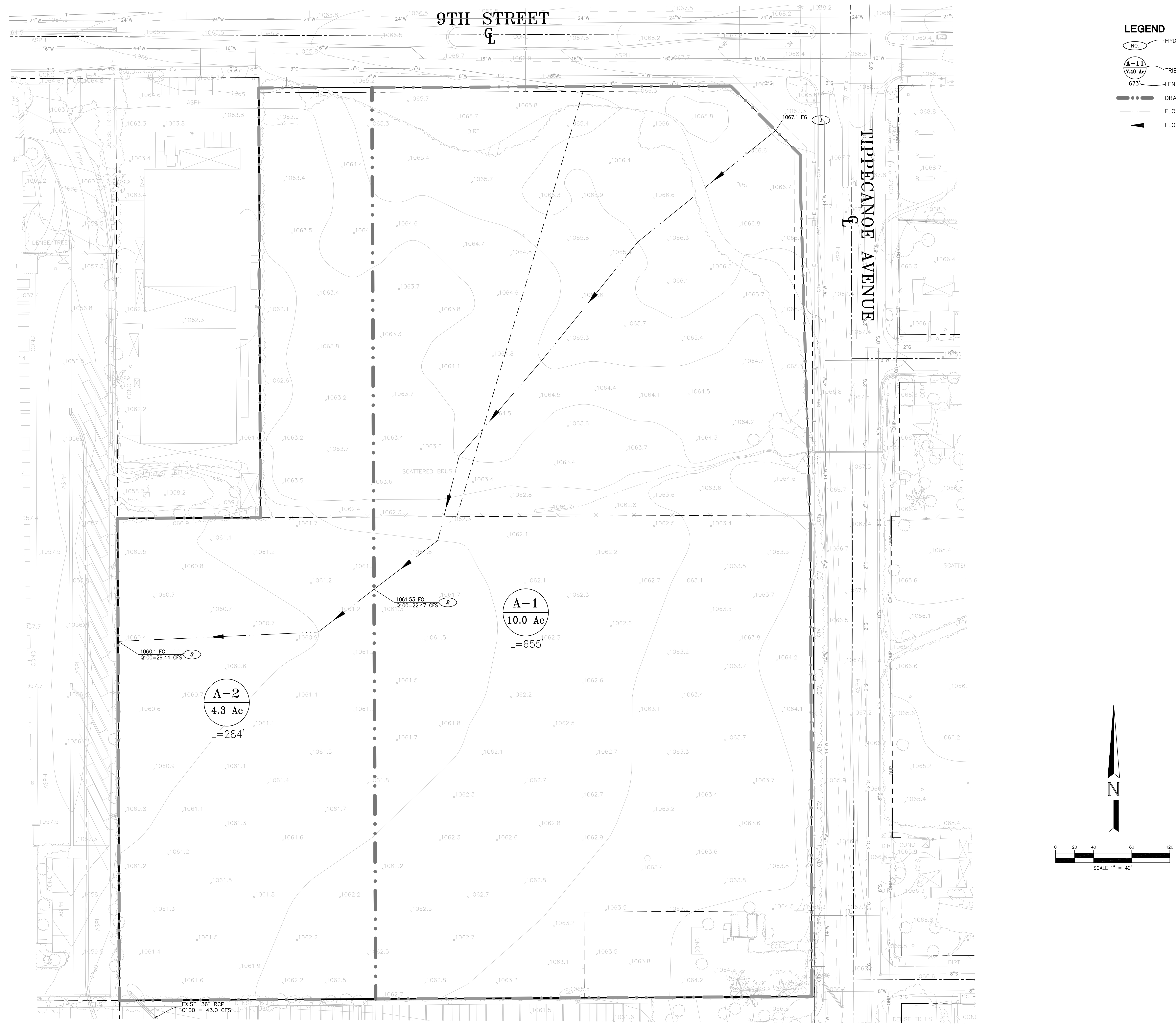
All proposed on-site drainage and storm drain facilities will be sized adequately for the 100-year storm event. Additional calculations will be provided in final drainage report including storm drain hydraulics and catch basin sizing.

Appendix A  
Preliminary Hydrology Map

9TH STREET

TIPPECANOE AVENUE

- LEGEND**
- NO. HYDROLOGY MODEL NODE NUMBER
  - (A-1) 7.40 Ac TRIBUTARY AREA IN ACRES
  - 673' LENGTH OF FLOW
  - DRAINAGE BOUNDARY
  - FLOW LINE
  - ▲ FLOW DIRECTION



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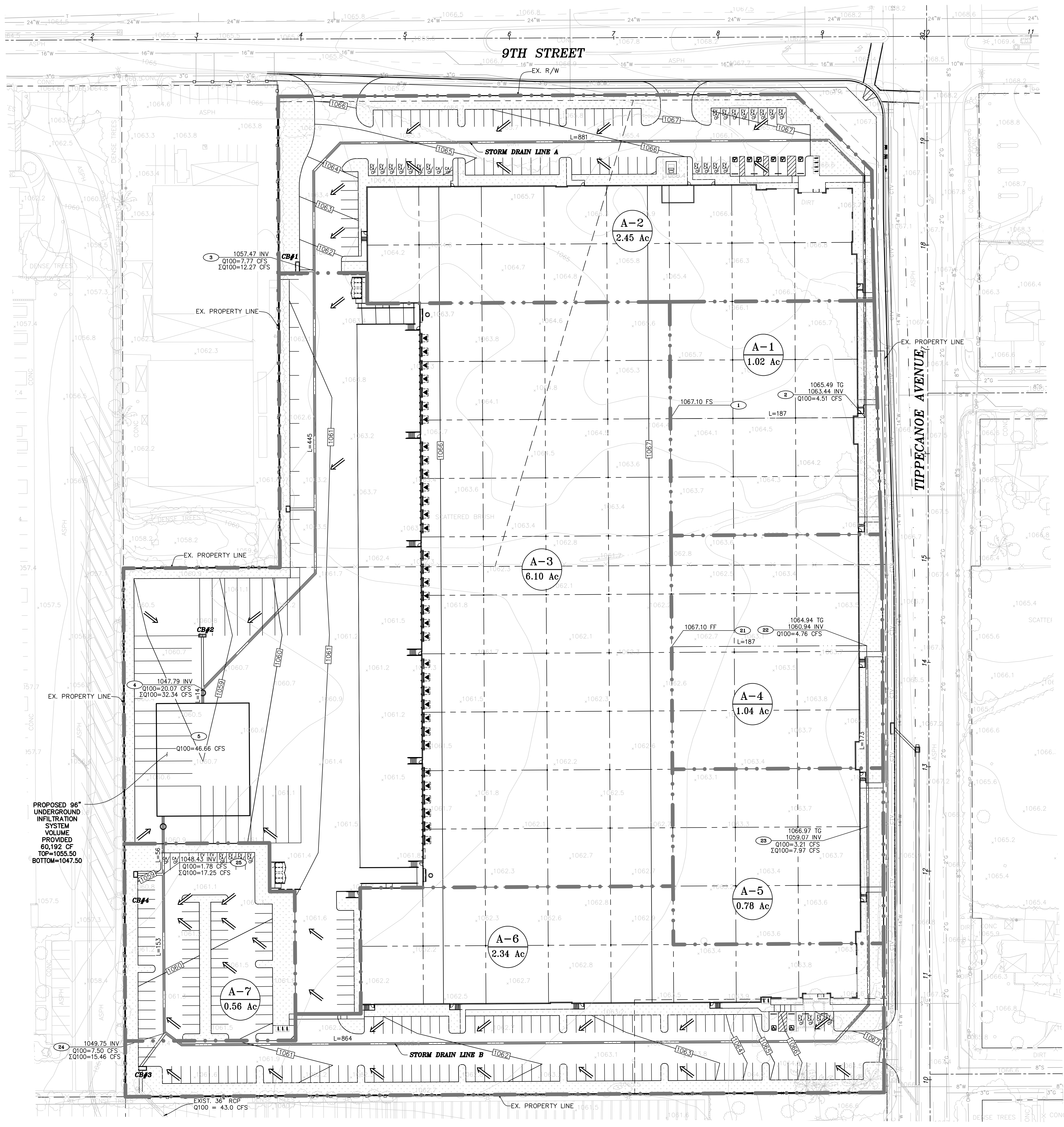
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**EXISTING HYDROLOGY MAP**  
 FOR  
**OAKMONT - TIPPECANOE INDUSTRIAL**  
 CITY OF SAN BERNARDINO

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| CHECKED BY<br>D.W.      | SHEETS               |
| FIELD BOOK              | JOB NO.<br>R31421.01 |



- LEGEND**
- (NO.) HYDROLOGY MODEL NODE NUMBER
  - (A-11) 7.40 Ac TRIBUTARY AREA IN ACRES
  - 673' LENGTH OF FLOW
  - DRAINAGE BOUNDARY
  - FLOW LINE
  - ▲ FLOW DIRECTION

PROPOSED 36" UNDERGROUND INFILTRATION SYSTEM VOLUME PROVIDED 60,192 CF TOP=1055.50 BOTTOM=1047.50

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**PROPOSED HYDROLOGY MAP**  
**FOR**  
**OAKMONT - TIPPECANOE INDUSTRIAL**  
**CITY OF SAN BERNARDINO**

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D:\proj\3231212101 - Oakmont - Tippecanoe V05 - Preliminary Hydrology Map\Light\01-PROP\HZE\Map\_A - Preliminary Hydrology Map\Light\01-PROP\HZE\Map\_A - Preliminary Hydrology Map.dwg, Layout: 01, Nov 03 2022 13:46pm



Appendix B  
100-year Rational Method Hydrologic Analysis

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: 02/10/22

-----  
OAKMONT - TIPPECANOE INDUSTRIAL  
100 YEAR - EXISTING RATIONAL  
4211Q100E  
AC  
-----

Program License Serial Number 6145

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*  
-----

Rational hydrology study storm event year is 100.0  
Computed rainfall intensity:  
Storm year = 100.00 1 hour rainfall = 1.290 (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 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
UNDEVELOPED (poor cover) subarea  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 78.00  
Adjusted SCS curve number for AMC 3 = 92.80  
Pervious ratio(Ap) = 1.0000 Max loss rate(Fm)= 0.140 (In/Hr)  
Initial subarea data:  
Initial area flow distance = 655.000 (Ft.)  
Top (of initial area) elevation = 1067.100 (Ft.)  
Bottom (of initial area) elevation = 1061.530 (Ft.)  
Difference in elevation = 5.570 (Ft.)  
Slope = 0.00850 s(%)= 0.85  
TC = k(0.525)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 18.228 min.  
Rainfall intensity = 2.637 (In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.852  
Subarea runoff = 22.469 (CFS)  
Total initial stream area = 10.000 (Ac.)  
Pervious area fraction = 1.000  
Initial area Fm value = 0.140 (In/Hr)

+++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* IRREGULAR CHANNEL FLOW TRAVEL TIME \*\*\*\*

-----  
Estimated mean flow rate at midpoint of channel = 0.000 (CFS)  
Depth of flow = 0.385 (Ft.), Average velocity = 1.757 (Ft/s)  
\*\*\*\*\* Irregular Channel Data \*\*\*\*\*

-----  
Information entered for subchannel number 1 :

| Point number | 'X' coordinate | 'Y' coordinate |
|--------------|----------------|----------------|
| 1            | 0.00           | 1.00           |
| 2            | 100.00         | 0.00           |
| 3            | 200.00         | 1.00           |

Manning's 'N' friction factor = 0.020  
-----

Sub-Channel flow = 25.997 (CFS)  
' ' flow top width = 76.938 (Ft.)  
' ' velocity = 1.757 (Ft/s)  
' ' area = 14.799 (Sq.Ft)  
' ' Froude number = 0.706

Upstream point elevation = 1061.530 (Ft.)  
Downstream point elevation = 1060.100 (Ft.)  
Flow length = 284.000 (Ft.)  
Travel time = 2.69 min.  
Time of concentration = 20.92 min.  
Depth of flow = 0.385 (Ft.)  
Average velocity = 1.757 (Ft/s)  
Total irregular channel flow = 25.997 (CFS)  
Irregular channel normal depth above invert elev. = 0.385 (Ft.)  
Average velocity of channel(s) = 1.757 (Ft/s)  
Adding area flow to channel  
UNDEVELOPED (poor cover) subarea  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil (AMC 2) = 78.00  
Adjusted SCS curve number for AMC 3 = 92.80  
Pervious ratio (Ap) = 1.0000 Max loss rate (Fm) = 0.140 (In/Hr)  
Rainfall intensity = 2.427 (In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area, (total area with modified  
rational method) (Q=KCIA) is C = 0.848  
Subarea runoff = 6.968 (CFS) for 4.300 (Ac.)  
Total runoff = 29.437 (CFS)  
Effective area this stream = 14.30 (Ac.)  
Total Study Area (Main Stream No. 1) = 14.30 (Ac.)  
Area averaged Fm value = 0.140 (In/Hr)  
Depth of flow = 0.403 (Ft.), Average velocity = 1.812 (Ft/s)  
End of computations, Total Study Area = 14.30 (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) = 1.000  
Area averaged SCS curve number = 78.0

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: 02/10/22

-----  
OAKMONT - TIPPECANOE INDUSTRIAL  
100 YEAR STORM - PROPOSED RATIONAL  
4211Q100P  
AC  
-----

Program License Serial Number 6145

-----  
\*\*\*\*\* Hydrology Study Control Information \*\*\*\*\*  
-----

Rational hydrology study storm event year is 100.0  
Computed rainfall intensity:  
Storm year = 100.00 1 hour rainfall = 1.290 (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 2.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

-----  
COMMERCIAL subarea type  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 56.00  
Adjusted SCS curve number for AMC 3 = 75.80  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044 (In/Hr)  
Initial subarea data:  
Initial area flow distance = 187.000 (Ft.)  
Top (of initial area) elevation = 1067.100 (Ft.)  
Bottom (of initial area) elevation = 1065.490 (Ft.)  
Difference in elevation = 1.610 (Ft.)  
Slope = 0.00861 s(%)= 0.86  
TC = k(0.304)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 6.377 min.  
Rainfall intensity = 4.951 (In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.892  
Subarea runoff = 4.505 (CFS)  
Total initial stream area = 1.020 (Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.044 (In/Hr)

++++  
Process from Point/Station 2.000 to Point/Station 3.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

-----  
Upstream point/station elevation = 1063.440 (Ft.)  
Downstream point/station elevation = 1057.470 (Ft.)  
Pipe length = 881.00 (Ft.) Manning's N = 0.012

No. of pipes = 1 Required pipe flow = 4.505(CFS)  
Nearest computed pipe diameter = 15.00(In.)  
Calculated individual pipe flow = 4.505(CFS)  
Normal flow depth in pipe = 9.98(In.)  
Flow top width inside pipe = 14.15(In.)  
Critical Depth = 10.32(In.)  
Pipe flow velocity = 5.19(Ft/s)  
Travel time through pipe = 2.83 min.  
Time of concentration (TC) = 9.20 min.

++++  
Process from Point/Station 3.000 to Point/Station 3.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 56.00  
Adjusted SCS curve number for AMC 3 = 75.80  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)  
Time of concentration = 9.20 min.  
Rainfall intensity = 3.973(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area, (total area with modified  
rational method) (Q=KCIA) is C = 0.890  
Subarea runoff = 7.765(CFS) for 2.450(Ac.)  
Total runoff = 12.270(CFS)  
Effective area this stream = 3.47(Ac.)  
Total Study Area (Main Stream No. 1) = 3.47(Ac.)  
Area averaged Fm value = 0.044(In/Hr)

++++  
Process from Point/Station 3.000 to Point/Station 4.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1057.470(Ft.)  
Downstream point/station elevation = 1047.790(Ft.)  
Pipe length = 445.00(Ft.) Manning's N = 0.012  
No. of pipes = 1 Required pipe flow = 12.270(CFS)  
Nearest computed pipe diameter = 18.00(In.)  
Calculated individual pipe flow = 12.270(CFS)  
Normal flow depth in pipe = 11.43(In.)  
Flow top width inside pipe = 17.33(In.)  
Critical Depth = 15.90(In.)  
Pipe flow velocity = 10.37(Ft/s)  
Travel time through pipe = 0.72 min.  
Time of concentration (TC) = 9.92 min.

++++  
Process from Point/Station 4.000 to Point/Station 4.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 56.00  
Adjusted SCS curve number for AMC 3 = 75.80

Pervious ratio(Ap) = 0.1000      Max loss rate(Fm)=      0.044(In/Hr)  
Time of concentration =      9.92 min.  
Rainfall intensity =      3.798(In/Hr) for a      100.0 year storm  
Effective runoff coefficient used for area,(total area with modified  
rational method)(Q=KCIA) is C = 0.890  
Subarea runoff =      20.066(CFS) for      6.100(Ac.)  
Total runoff =      32.336(CFS)  
Effective area this stream =      9.57(Ac.)  
Total Study Area (Main Stream No. 1) =      9.57(Ac.)  
Area averaged Fm value =      0.044(In/Hr)

++++  
Process from Point/Station      4.000 to Point/Station      5.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1047.790(Ft.)  
Downstream point/station elevation = 1047.500(Ft.)  
Pipe length = 445.00(Ft.)      Manning's N = 0.012  
No. of pipes = 1      Required pipe flow =      32.336(CFS)  
Nearest computed pipe diameter =      45.00(In.)  
Calculated individual pipe flow =      32.336(CFS)  
Normal flow depth in pipe =      35.63(In.)  
Flow top width inside pipe =      36.55(In.)  
Critical Depth =      20.67(In.)  
Pipe flow velocity =      3.45(Ft/s)  
Travel time through pipe =      2.15 min.  
Time of concentration (TC) =      12.07 min.

++++  
Process from Point/Station      1.000 to Point/Station      5.000  
\*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 1  
Stream flow area =      9.570(Ac.)  
Runoff from this stream =      32.336(CFS)  
Time of concentration =      12.07 min.  
Rainfall intensity =      3.377(In/Hr)  
Area averaged loss rate (Fm) =      0.0440(In/Hr)  
Area averaged Pervious ratio (Ap) = 0.1000  
Program is now starting with Main Stream No. 2

++++  
Process from Point/Station      21.000 to Point/Station      22.000  
\*\*\*\* INITIAL AREA EVALUATION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 56.00  
Adjusted SCS curve number for AMC 3 = 75.80  
Pervious ratio(Ap) = 0.1000      Max loss rate(Fm)=      0.044(In/Hr)  
Initial subarea data:  
Initial area flow distance =      187.000(Ft.)  
Top (of initial area) elevation =      1067.100(Ft.)  
Bottom (of initial area) elevation =      1064.940(Ft.)  
Difference in elevation =      2.160(Ft.)  
Slope =      0.01155      s(%)=      1.16

TC = k(0.304)\*[(length^3)/(elevation change)]^0.2  
Initial area time of concentration = 6.013 min.  
Rainfall intensity = 5.129(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area (Q=KCIA) is C = 0.892  
Subarea runoff = 4.760(CFS)  
Total initial stream area = 1.040(Ac.)  
Pervious area fraction = 0.100  
Initial area Fm value = 0.044(In/Hr)

\*\*\*\*\*  
Process from Point/Station 22.000 to Point/Station 23.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1060.940(Ft.)  
Downstream point/station elevation = 1059.070(Ft.)  
Pipe length = 173.00(Ft.) Manning's N = 0.012  
No. of pipes = 1 Required pipe flow = 4.760(CFS)  
Nearest computed pipe diameter = 15.00(In.)  
Calculated individual pipe flow = 4.760(CFS)  
Normal flow depth in pipe = 8.85(In.)  
Flow top width inside pipe = 14.76(In.)  
Critical Depth = 10.61(In.)  
Pipe flow velocity = 6.32(Ft/s)  
Travel time through pipe = 0.46 min.  
Time of concentration (TC) = 6.47 min.

\*\*\*\*\*  
Process from Point/Station 23.000 to Point/Station 23.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 56.00  
Adjusted SCS curve number for AMC 3 = 75.80  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)  
Time of concentration = 6.47 min.  
Rainfall intensity = 4.909(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area,(total area with modified  
rational method)(Q=KCIA) is C = 0.892  
Subarea runoff = 3.209(CFS) for 0.780(Ac.)  
Total runoff = 7.969(CFS)  
Effective area this stream = 1.82(Ac.)  
Total Study Area (Main Stream No. 2) = 11.39(Ac.)  
Area averaged Fm value = 0.044(In/Hr)

\*\*\*\*\*  
Process from Point/Station 23.000 to Point/Station 24.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1059.070(Ft.)  
Downstream point/station elevation = 1049.750(Ft.)  
Pipe length = 864.00(Ft.) Manning's N = 0.012  
No. of pipes = 1 Required pipe flow = 7.969(CFS)  
Nearest computed pipe diameter = 18.00(In.)  
Calculated individual pipe flow = 7.969(CFS)  
Normal flow depth in pipe = 10.83(In.)  
Flow top width inside pipe = 17.62(In.)

Critical Depth = 13.12(In.)  
Pipe flow velocity = 7.18(Ft/s)  
Travel time through pipe = 2.01 min.  
Time of concentration (TC) = 8.47 min.

++++  
Process from Point/Station 24.000 to Point/Station 24.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 56.00  
Adjusted SCS curve number for AMC 3 = 75.80  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)  
Time of concentration = 8.47 min.  
Rainfall intensity = 4.174(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area,(total area with modified  
rational method) (Q=KCIA) is C = 0.891  
Subarea runoff = 7.496(CFS) for 2.340(Ac.)  
Total runoff = 15.464(CFS)  
Effective area this stream = 4.16(Ac.)  
Total Study Area (Main Stream No. 2) = 13.73(Ac.)  
Area averaged Fm value = 0.044(In/Hr)

++++  
Process from Point/Station 24.000 to Point/Station 25.000  
\*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1049.750(Ft.)  
Downstream point/station elevation = 1048.430(Ft.)  
Pipe length = 122.00(Ft.) Manning's N = 0.012  
No. of pipes = 1 Required pipe flow = 15.464(CFS)  
Nearest computed pipe diameter = 21.00(In.)  
Calculated individual pipe flow = 15.464(CFS)  
Normal flow depth in pipe = 15.09(In.)  
Flow top width inside pipe = 18.88(In.)  
Critical Depth = 17.44(In.)  
Pipe flow velocity = 8.36(Ft/s)  
Travel time through pipe = 0.24 min.  
Time of concentration (TC) = 8.72 min.

++++  
Process from Point/Station 25.000 to Point/Station 25.000  
\*\*\*\* SUBAREA FLOW ADDITION \*\*\*\*

---

COMMERCIAL subarea type  
Decimal fraction soil group A = 0.000  
Decimal fraction soil group B = 1.000  
Decimal fraction soil group C = 0.000  
Decimal fraction soil group D = 0.000  
SCS curve number for soil(AMC 2) = 56.00  
Adjusted SCS curve number for AMC 3 = 75.80  
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.044(In/Hr)  
Time of concentration = 8.72 min.  
Rainfall intensity = 4.104(In/Hr) for a 100.0 year storm  
Effective runoff coefficient used for area,(total area with modified  
rational method) (Q=KCIA) is C = 0.890



Subarea runoff = 1.783(CFS) for 0.560(Ac.)  
 Total runoff = 17.247(CFS)  
 Effective area this stream = 4.72(Ac.)  
 Total Study Area (Main Stream No. 2) = 14.29(Ac.)  
 Area averaged Fm value = 0.044(In/Hr)

Process from Point/Station 25.000 to Point/Station 5.000  
 \*\*\*\* PIPEFLOW TRAVEL TIME (Program estimated size) \*\*\*\*

---

Upstream point/station elevation = 1048.430(Ft.)  
 Downstream point/station elevation = 1047.500(Ft.)  
 Pipe length = 87.00(Ft.) Manning's N = 0.012  
 No. of pipes = 1 Required pipe flow = 17.247(CFS)  
 Nearest computed pipe diameter = 21.00(In.)  
 Calculated individual pipe flow = 17.247(CFS)  
 Normal flow depth in pipe = 16.69(In.)  
 Flow top width inside pipe = 16.97(In.)  
 Critical Depth = 18.24(In.)  
 Pipe flow velocity = 8.41(Ft/s)  
 Travel time through pipe = 0.17 min.  
 Time of concentration (TC) = 8.89 min.

Process from Point/Station 21.000 to Point/Station 5.000  
 \*\*\*\* CONFLUENCE OF MAIN STREAMS \*\*\*\*

---

The following data inside Main Stream is listed:

In Main Stream number: 2  
 Stream flow area = 4.720(Ac.)  
 Runoff from this stream = 17.247(CFS)  
 Time of concentration = 8.89 min.  
 Rainfall intensity = 4.056(In/Hr)  
 Area averaged loss rate (Fm) = 0.0440(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          | 32.34           | 9.570      | 12.07    | 0.044      | 3.377                      |
| 2          | 17.25           | 4.720      | 8.89     | 0.044      | 4.056                      |

Qmax(1) =  
 1.000 \* 1.000 \* 32.336) +  
 0.831 \* 1.000 \* 17.247) + = 46.662  
 Qmax(2) =  
 1.204 \* 0.737 \* 32.336) +  
 1.000 \* 1.000 \* 17.247) + = 45.926

Total of 2 main streams to confluence:  
 Flow rates before confluence point:  
 33.336 18.247  
 Maximum flow rates at confluence using above data:  
 46.662 45.926  
 Area of streams before confluence:  
 9.570 4.720  
 Effective area values after confluence:  
 14.290 11.770

Results of confluence:

Total flow rate = 46.662 (CFS)

Time of concentration = 12.069 min.

Effective stream area after confluence = 14.290 (Ac.)

Study area average Pervious fraction(Ap) = 0.100

Study area average soil loss rate(Fm) = 0.044 (In/Hr)

Study area total = 14.29 (Ac.)

End of computations, Total Study Area = 14.29 (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 = 56.0

Appendix C  
100-year Unit Hydrographs

Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

Study date 02/11/22

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

Program License Serial Number 6145

-----  
OAKMONT - TIPPECANOE INDUSTRIAL  
100 YEAR - EXISTING UNIT HYDROGRAPH  
4211Q100UHE  
AC  
-----

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<br>(Ac.)          | Duration<br>(hours) | Isohyetal<br>(In) |
|----------------------------|---------------------|-------------------|
| Rainfall data for year 100 |                     |                   |
| 14.30                      | 1                   | 1.29              |

-----  
Rainfall data for year 100  
14.30 6 2.90  
-----

-----  
Rainfall data for year 100  
14.30 24 5.58  
-----

+++++

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

| SCS curve<br>No. (AMCII) | SCS curve<br>NO. (AMC 3) | Area<br>(Ac.) | Area<br>Fraction | Fp (Fig C6)<br>(In/Hr) | Ap<br>(dec.) | Fm<br>(In/Hr) |
|--------------------------|--------------------------|---------------|------------------|------------------------|--------------|---------------|
| 78.0                     | 92.8                     | 14.30         | 1.000            | 0.140                  | 1.000        | 0.140         |

Area-averaged adjusted loss rate Fm (In/Hr) = 0.140

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

| Area | Area | SCS CN | SCS CN | S | Pervious |
|------|------|--------|--------|---|----------|
|------|------|--------|--------|---|----------|

|       |       |        |        |            |
|-------|-------|--------|--------|------------|
| (Ac.) | Fract | (AMC2) | (AMC3) | Yield Fr   |
| 14.30 | 1.000 | 78.0   | 92.8   | 0.78 0.851 |

Area-averaged catchment yield fraction, Y = 0.851  
Area-averaged low loss fraction, Yb = 0.149  
User entry of time of concentration = 0.350 (hours)  
++++  
Watershed area = 14.30 (Ac.)  
Catchment Lag time = 0.280 hours  
Unit interval = 5.000 minutes  
Unit interval percentage of lag time = 29.7619  
Hydrograph baseflow = 0.00 (CFS)  
Average maximum watershed loss rate (Fm) = 0.140 (In/Hr)  
Average low loss rate fraction (Yb) = 0.149 (decimal)  
VALLEY UNDEVELOPED S-Graph Selected  
Computed peak 5-minute rainfall = 0.477 (In)  
Computed peak 30-minute rainfall = 0.978 (In)  
Specified peak 1-hour rainfall = 1.290 (In)  
Computed peak 3-hour rainfall = 2.120 (In)  
Specified peak 6-hour rainfall = 2.900 (In)  
Specified peak 24-hour rainfall = 5.580 (In)

Rainfall depth area reduction factors:  
Using a total area of 14.30 (Ac.) (Ref: fig. E-4)

|                          |                                |
|--------------------------|--------------------------------|
| 5-minute factor = 0.999  | Adjusted rainfall = 0.477 (In) |
| 30-minute factor = 0.999 | Adjusted rainfall = 0.977 (In) |
| 1-hour factor = 0.999    | Adjusted rainfall = 1.289 (In) |
| 3-hour factor = 1.000    | Adjusted rainfall = 2.120 (In) |
| 6-hour factor = 1.000    | Adjusted rainfall = 2.900 (In) |
| 24-hour factor = 1.000   | Adjusted rainfall = 5.580 (In) |

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

++++  
Interval 'S' Graph Unit Hydrograph  
Number Mean values ((CFS))  
-----

(K = 172.94 (CFS))

|    |        |        |
|----|--------|--------|
| 1  | 2.869  | 4.962  |
| 2  | 13.346 | 18.119 |
| 3  | 31.685 | 31.717 |
| 4  | 51.789 | 34.768 |
| 5  | 64.738 | 22.394 |
| 6  | 72.210 | 12.921 |
| 7  | 76.998 | 8.281  |
| 8  | 80.728 | 6.450  |
| 9  | 83.733 | 5.197  |
| 10 | 86.243 | 4.341  |
| 11 | 88.249 | 3.468  |
| 12 | 90.022 | 3.066  |
| 13 | 91.469 | 2.503  |
| 14 | 92.723 | 2.168  |
| 15 | 93.710 | 1.707  |
| 16 | 94.639 | 1.607  |
| 17 | 95.527 | 1.537  |
| 18 | 96.258 | 1.264  |
| 19 | 96.897 | 1.105  |
| 20 | 97.446 | 0.950  |
| 21 | 97.940 | 0.854  |
| 22 | 98.357 | 0.721  |

|    |         |       |
|----|---------|-------|
| 23 | 98.696  | 0.587 |
| 24 | 98.994  | 0.515 |
| 25 | 99.292  | 0.515 |
| 26 | 99.589  | 0.515 |
| 27 | 100.000 | 0.257 |

-----  
-----  
-----  
Total soil rain loss = 0.76(In)  
Total effective rainfall = 4.82(In)  
Peak flow rate in flood hydrograph = 26.44(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   | 7.5 | 15.0 | 22.5 | 30.0 |
|-----------|--------------|--------|-----|-----|------|------|------|
| 0+ 5      | 0.0003       | 0.04   | Q   |     |      |      |      |
| 0+10      | 0.0015       | 0.18   | Q   |     |      |      |      |
| 0+15      | 0.0044       | 0.43   | Q   |     |      |      |      |
| 0+20      | 0.0093       | 0.70   | Q   |     |      |      |      |
| 0+25      | 0.0153       | 0.88   | VQ  |     |      |      |      |
| 0+30      | 0.0220       | 0.98   | VQ  |     |      |      |      |
| 0+35      | 0.0292       | 1.05   | VQ  |     |      |      |      |
| 0+40      | 0.0368       | 1.10   | VQ  |     |      |      |      |
| 0+45      | 0.0447       | 1.14   | VQ  |     |      |      |      |
| 0+50      | 0.0528       | 1.18   | VQ  |     |      |      |      |
| 0+55      | 0.0611       | 1.21   | VQ  |     |      |      |      |
| 1+ 0      | 0.0696       | 1.24   | VQ  |     |      |      |      |
| 1+ 5      | 0.0783       | 1.26   | VQ  |     |      |      |      |
| 1+10      | 0.0871       | 1.28   | VQ  |     |      |      |      |
| 1+15      | 0.0961       | 1.30   | VQ  |     |      |      |      |
| 1+20      | 0.1051       | 1.31   | VQ  |     |      |      |      |
| 1+25      | 0.1143       | 1.33   | VQ  |     |      |      |      |
| 1+30      | 0.1235       | 1.34   | VQ  |     |      |      |      |
| 1+35      | 0.1328       | 1.36   | VQ  |     |      |      |      |
| 1+40      | 0.1423       | 1.37   | VQ  |     |      |      |      |
| 1+45      | 0.1518       | 1.38   | IQ  |     |      |      |      |
| 1+50      | 0.1613       | 1.39   | IQ  |     |      |      |      |
| 1+55      | 0.1709       | 1.40   | IQ  |     |      |      |      |
| 2+ 0      | 0.1806       | 1.40   | IQ  |     |      |      |      |
| 2+ 5      | 0.1903       | 1.41   | IQ  |     |      |      |      |
| 2+10      | 0.2001       | 1.42   | IQ  |     |      |      |      |
| 2+15      | 0.2100       | 1.43   | IQ  |     |      |      |      |
| 2+20      | 0.2198       | 1.43   | IQ  |     |      |      |      |
| 2+25      | 0.2297       | 1.44   | IQ  |     |      |      |      |
| 2+30      | 0.2396       | 1.44   | IQ  |     |      |      |      |
| 2+35      | 0.2496       | 1.45   | IQ  |     |      |      |      |
| 2+40      | 0.2596       | 1.45   | IQ  |     |      |      |      |
| 2+45      | 0.2696       | 1.45   | IQ  |     |      |      |      |
| 2+50      | 0.2797       | 1.46   | IQ  |     |      |      |      |
| 2+55      | 0.2897       | 1.46   | IQV |     |      |      |      |
| 3+ 0      | 0.2999       | 1.47   | IQV |     |      |      |      |
| 3+ 5      | 0.3100       | 1.47   | IQV |     |      |      |      |
| 3+10      | 0.3202       | 1.48   | IQV |     |      |      |      |
| 3+15      | 0.3304       | 1.48   | IQV |     |      |      |      |
| 3+20      | 0.3407       | 1.49   | IQV |     |      |      |      |
| 3+25      | 0.3510       | 1.49   | IQV |     |      |      |      |
| 3+30      | 0.3613       | 1.50   | IQV |     |      |      |      |

|      |        |      |     |  |  |  |  |
|------|--------|------|-----|--|--|--|--|
| 3+35 | 0.3716 | 1.50 | Q   |  |  |  |  |
| 3+40 | 0.3820 | 1.51 | Q   |  |  |  |  |
| 3+45 | 0.3925 | 1.51 | Q   |  |  |  |  |
| 3+50 | 0.4029 | 1.52 | Q   |  |  |  |  |
| 3+55 | 0.4134 | 1.52 | Q   |  |  |  |  |
| 4+ 0 | 0.4240 | 1.53 | Q   |  |  |  |  |
| 4+ 5 | 0.4345 | 1.54 | QV  |  |  |  |  |
| 4+10 | 0.4451 | 1.54 | QV  |  |  |  |  |
| 4+15 | 0.4558 | 1.55 | QV  |  |  |  |  |
| 4+20 | 0.4665 | 1.55 | QV  |  |  |  |  |
| 4+25 | 0.4772 | 1.56 | QV  |  |  |  |  |
| 4+30 | 0.4880 | 1.56 | QV  |  |  |  |  |
| 4+35 | 0.4988 | 1.57 | QV  |  |  |  |  |
| 4+40 | 0.5096 | 1.58 | QV  |  |  |  |  |
| 4+45 | 0.5205 | 1.58 | QV  |  |  |  |  |
| 4+50 | 0.5315 | 1.59 | QV  |  |  |  |  |
| 4+55 | 0.5424 | 1.59 | QV  |  |  |  |  |
| 5+ 0 | 0.5535 | 1.60 | QV  |  |  |  |  |
| 5+ 5 | 0.5645 | 1.61 | QV  |  |  |  |  |
| 5+10 | 0.5756 | 1.61 | Q V |  |  |  |  |
| 5+15 | 0.5868 | 1.62 | Q V |  |  |  |  |
| 5+20 | 0.5979 | 1.62 | Q V |  |  |  |  |
| 5+25 | 0.6092 | 1.63 | Q V |  |  |  |  |
| 5+30 | 0.6204 | 1.64 | Q V |  |  |  |  |
| 5+35 | 0.6318 | 1.64 | Q V |  |  |  |  |
| 5+40 | 0.6431 | 1.65 | Q V |  |  |  |  |
| 5+45 | 0.6546 | 1.66 | Q V |  |  |  |  |
| 5+50 | 0.6660 | 1.66 | Q V |  |  |  |  |
| 5+55 | 0.6775 | 1.67 | Q V |  |  |  |  |
| 6+ 0 | 0.6891 | 1.68 | Q V |  |  |  |  |
| 6+ 5 | 0.7007 | 1.69 | Q V |  |  |  |  |
| 6+10 | 0.7123 | 1.69 | Q V |  |  |  |  |
| 6+15 | 0.7240 | 1.70 | Q V |  |  |  |  |
| 6+20 | 0.7358 | 1.71 | Q V |  |  |  |  |
| 6+25 | 0.7476 | 1.71 | Q V |  |  |  |  |
| 6+30 | 0.7595 | 1.72 | Q V |  |  |  |  |
| 6+35 | 0.7714 | 1.73 | Q V |  |  |  |  |
| 6+40 | 0.7834 | 1.74 | Q V |  |  |  |  |
| 6+45 | 0.7954 | 1.75 | Q V |  |  |  |  |
| 6+50 | 0.8074 | 1.75 | Q V |  |  |  |  |
| 6+55 | 0.8196 | 1.76 | Q V |  |  |  |  |
| 7+ 0 | 0.8318 | 1.77 | Q V |  |  |  |  |
| 7+ 5 | 0.8440 | 1.78 | Q V |  |  |  |  |
| 7+10 | 0.8563 | 1.79 | Q V |  |  |  |  |
| 7+15 | 0.8687 | 1.79 | Q V |  |  |  |  |
| 7+20 | 0.8811 | 1.80 | Q V |  |  |  |  |
| 7+25 | 0.8936 | 1.81 | Q V |  |  |  |  |
| 7+30 | 0.9061 | 1.82 | Q V |  |  |  |  |
| 7+35 | 0.9187 | 1.83 | Q V |  |  |  |  |
| 7+40 | 0.9314 | 1.84 | Q V |  |  |  |  |
| 7+45 | 0.9441 | 1.85 | Q V |  |  |  |  |
| 7+50 | 0.9569 | 1.86 | Q V |  |  |  |  |
| 7+55 | 0.9698 | 1.87 | Q V |  |  |  |  |
| 8+ 0 | 0.9827 | 1.88 | Q V |  |  |  |  |
| 8+ 5 | 0.9957 | 1.89 | Q V |  |  |  |  |
| 8+10 | 1.0088 | 1.90 | Q V |  |  |  |  |
| 8+15 | 1.0219 | 1.91 | Q V |  |  |  |  |
| 8+20 | 1.0351 | 1.92 | Q V |  |  |  |  |
| 8+25 | 1.0484 | 1.93 | Q V |  |  |  |  |
| 8+30 | 1.0617 | 1.94 | Q V |  |  |  |  |
| 8+35 | 1.0751 | 1.95 | Q V |  |  |  |  |
| 8+40 | 1.0886 | 1.96 | Q V |  |  |  |  |
| 8+45 | 1.1022 | 1.97 | Q V |  |  |  |  |

|       |        |      |   |   |  |  |  |  |
|-------|--------|------|---|---|--|--|--|--|
| 8+50  | 1.1159 | 1.98 | Q | V |  |  |  |  |
| 8+55  | 1.1296 | 1.99 | Q | V |  |  |  |  |
| 9+ 0  | 1.1434 | 2.01 | Q | V |  |  |  |  |
| 9+ 5  | 1.1573 | 2.02 | Q | V |  |  |  |  |
| 9+10  | 1.1713 | 2.03 | Q | V |  |  |  |  |
| 9+15  | 1.1854 | 2.04 | Q | V |  |  |  |  |
| 9+20  | 1.1995 | 2.05 | Q | V |  |  |  |  |
| 9+25  | 1.2137 | 2.07 | Q | V |  |  |  |  |
| 9+30  | 1.2281 | 2.08 | Q | V |  |  |  |  |
| 9+35  | 1.2425 | 2.09 | Q | V |  |  |  |  |
| 9+40  | 1.2570 | 2.11 | Q | V |  |  |  |  |
| 9+45  | 1.2716 | 2.12 | Q | V |  |  |  |  |
| 9+50  | 1.2863 | 2.14 | Q | V |  |  |  |  |
| 9+55  | 1.3011 | 2.15 | Q | V |  |  |  |  |
| 10+ 0 | 1.3160 | 2.16 | Q | V |  |  |  |  |
| 10+ 5 | 1.3310 | 2.18 | Q | V |  |  |  |  |
| 10+10 | 1.3462 | 2.19 | Q | V |  |  |  |  |
| 10+15 | 1.3614 | 2.21 | Q | V |  |  |  |  |
| 10+20 | 1.3767 | 2.23 | Q | V |  |  |  |  |
| 10+25 | 1.3921 | 2.24 | Q | V |  |  |  |  |
| 10+30 | 1.4077 | 2.26 | Q | V |  |  |  |  |
| 10+35 | 1.4234 | 2.28 | Q | V |  |  |  |  |
| 10+40 | 1.4392 | 2.29 | Q | V |  |  |  |  |
| 10+45 | 1.4551 | 2.31 | Q | V |  |  |  |  |
| 10+50 | 1.4711 | 2.33 | Q | V |  |  |  |  |
| 10+55 | 1.4873 | 2.35 | Q | V |  |  |  |  |
| 11+ 0 | 1.5036 | 2.37 | Q | V |  |  |  |  |
| 11+ 5 | 1.5200 | 2.38 | Q | V |  |  |  |  |
| 11+10 | 1.5365 | 2.40 | Q | V |  |  |  |  |
| 11+15 | 1.5532 | 2.42 | Q | V |  |  |  |  |
| 11+20 | 1.5701 | 2.45 | Q | V |  |  |  |  |
| 11+25 | 1.5871 | 2.47 | Q | V |  |  |  |  |
| 11+30 | 1.6042 | 2.49 | Q | V |  |  |  |  |
| 11+35 | 1.6215 | 2.51 | Q | V |  |  |  |  |
| 11+40 | 1.6390 | 2.53 | Q | V |  |  |  |  |
| 11+45 | 1.6566 | 2.56 | Q | V |  |  |  |  |
| 11+50 | 1.6744 | 2.58 | Q | V |  |  |  |  |
| 11+55 | 1.6923 | 2.61 | Q | V |  |  |  |  |
| 12+ 0 | 1.7104 | 2.63 | Q | V |  |  |  |  |
| 12+ 5 | 1.7287 | 2.66 | Q | V |  |  |  |  |
| 12+10 | 1.7471 | 2.67 | Q | V |  |  |  |  |
| 12+15 | 1.7656 | 2.68 | Q | V |  |  |  |  |
| 12+20 | 1.7840 | 2.68 | Q | V |  |  |  |  |
| 12+25 | 1.8026 | 2.70 | Q | V |  |  |  |  |
| 12+30 | 1.8213 | 2.72 | Q | V |  |  |  |  |
| 12+35 | 1.8402 | 2.74 | Q | V |  |  |  |  |
| 12+40 | 1.8593 | 2.77 | Q | V |  |  |  |  |
| 12+45 | 1.8786 | 2.80 | Q | V |  |  |  |  |
| 12+50 | 1.8982 | 2.84 | Q | V |  |  |  |  |
| 12+55 | 1.9179 | 2.87 | Q | V |  |  |  |  |
| 13+ 0 | 1.9379 | 2.91 | Q | V |  |  |  |  |
| 13+ 5 | 1.9582 | 2.94 | Q | V |  |  |  |  |
| 13+10 | 1.9787 | 2.98 | Q | V |  |  |  |  |
| 13+15 | 1.9996 | 3.02 | Q | V |  |  |  |  |
| 13+20 | 2.0207 | 3.07 | Q | V |  |  |  |  |
| 13+25 | 2.0421 | 3.11 | Q | V |  |  |  |  |
| 13+30 | 2.0639 | 3.16 | Q | V |  |  |  |  |
| 13+35 | 2.0859 | 3.21 | Q | V |  |  |  |  |
| 13+40 | 2.1084 | 3.26 | Q | V |  |  |  |  |
| 13+45 | 2.1312 | 3.31 | Q | V |  |  |  |  |
| 13+50 | 2.1545 | 3.37 | Q | V |  |  |  |  |
| 13+55 | 2.1781 | 3.43 | Q | V |  |  |  |  |
| 14+ 0 | 2.2022 | 3.50 | Q | V |  |  |  |  |



|       |        |       |   |   |   |   |   |   |   |
|-------|--------|-------|---|---|---|---|---|---|---|
| 14+ 5 | 2.2267 | 3.56  | Q |   | V |   |   |   |   |
| 14+10 | 2.2518 | 3.64  | Q |   | V |   |   |   |   |
| 14+15 | 2.2774 | 3.71  | Q |   | V |   |   |   |   |
| 14+20 | 2.3035 | 3.80  | Q |   | V |   |   |   |   |
| 14+25 | 2.3302 | 3.88  | Q |   | V |   |   |   |   |
| 14+30 | 2.3576 | 3.97  | Q |   | V |   |   |   |   |
| 14+35 | 2.3857 | 4.07  | Q |   | V |   |   |   |   |
| 14+40 | 2.4144 | 4.18  | Q |   | V |   |   |   |   |
| 14+45 | 2.4440 | 4.29  | Q |   | V |   |   |   |   |
| 14+50 | 2.4744 | 4.42  | Q |   | V |   |   |   |   |
| 14+55 | 2.5058 | 4.55  | Q |   | V |   |   |   |   |
| 15+ 0 | 2.5382 | 4.70  | Q |   | V |   |   |   |   |
| 15+ 5 | 2.5717 | 4.86  | Q |   | V |   |   |   |   |
| 15+10 | 2.6064 | 5.04  | Q |   | V |   |   |   |   |
| 15+15 | 2.6425 | 5.25  | Q |   | V |   |   |   |   |
| 15+20 | 2.6802 | 5.47  | Q |   | V |   |   |   |   |
| 15+25 | 2.7196 | 5.71  | Q |   | V |   |   |   |   |
| 15+30 | 2.7603 | 5.92  | Q |   | V |   |   |   |   |
| 15+35 | 2.8025 | 6.12  | Q |   | V |   |   |   |   |
| 15+40 | 2.8463 | 6.37  | Q |   | V |   |   |   |   |
| 15+45 | 2.8930 | 6.78  | Q |   | V |   |   |   |   |
| 15+50 | 2.9439 | 7.39  | Q |   | V |   |   |   |   |
| 15+55 | 3.0011 | 8.31  | Q | Q | V |   |   |   |   |
| 16+ 0 | 3.0694 | 9.91  |   | Q | V |   |   |   |   |
| 16+ 5 | 3.1654 | 13.94 |   |   | Q | V |   |   |   |
| 16+10 | 3.3085 | 20.78 |   |   |   | V | Q |   |   |
| 16+15 | 3.4902 | 26.39 |   |   |   | V |   | Q |   |
| 16+20 | 3.6723 | 26.44 |   |   |   | V |   |   | Q |
| 16+25 | 3.8115 | 20.21 |   |   |   |   | Q |   |   |
| 16+30 | 3.9157 | 15.14 |   |   | Q |   | V |   |   |
| 16+35 | 4.0003 | 12.28 |   |   | Q |   | V |   |   |
| 16+40 | 4.0745 | 10.78 |   | Q |   |   | V |   |   |
| 16+45 | 4.1409 | 9.63  |   | Q |   |   | V |   |   |
| 16+50 | 4.2009 | 8.72  |   | Q |   |   | V |   |   |
| 16+55 | 4.2553 | 7.89  |   | Q |   |   | V |   |   |
| 17+ 0 | 4.3056 | 7.30  |   | Q |   |   | V |   |   |
| 17+ 5 | 4.3517 | 6.70  |   | Q |   |   | V |   |   |
| 17+10 | 4.3946 | 6.23  |   | Q |   |   | V |   |   |
| 17+15 | 4.4343 | 5.77  |   | Q |   |   | V |   |   |
| 17+20 | 4.4719 | 5.47  |   | Q |   |   | V |   |   |
| 17+25 | 4.5077 | 5.20  |   | Q |   |   | V |   |   |
| 17+30 | 4.5413 | 4.87  |   | Q |   |   | V |   |   |
| 17+35 | 4.5731 | 4.61  |   | Q |   |   | V |   |   |
| 17+40 | 4.6032 | 4.37  |   | Q |   |   | V |   |   |
| 17+45 | 4.6318 | 4.16  |   | Q |   |   | V |   |   |
| 17+50 | 4.6590 | 3.95  |   | Q |   |   | V |   |   |
| 17+55 | 4.6849 | 3.76  |   | Q |   |   | V |   |   |
| 18+ 0 | 4.7097 | 3.60  | Q |   |   |   | V |   |   |
| 18+ 5 | 4.7336 | 3.47  | Q |   |   |   | V |   |   |
| 18+10 | 4.7567 | 3.35  | Q |   |   |   | V |   |   |
| 18+15 | 4.7784 | 3.15  | Q |   |   |   | V |   |   |
| 18+20 | 4.7988 | 2.97  | Q |   |   |   | V |   |   |
| 18+25 | 4.8187 | 2.89  | Q |   |   |   | V |   |   |
| 18+30 | 4.8382 | 2.83  | Q |   |   |   | V |   |   |
| 18+35 | 4.8572 | 2.76  | Q |   |   |   | V |   |   |
| 18+40 | 4.8758 | 2.70  | Q |   |   |   | V |   |   |
| 18+45 | 4.8941 | 2.65  | Q |   |   |   | V |   |   |
| 18+50 | 4.9119 | 2.59  | Q |   |   |   | V |   |   |
| 18+55 | 4.9294 | 2.54  | Q |   |   |   | V |   |   |
| 19+ 0 | 4.9466 | 2.50  | Q |   |   |   | V |   |   |
| 19+ 5 | 4.9635 | 2.45  | Q |   |   |   | V |   |   |
| 19+10 | 4.9801 | 2.41  | Q |   |   |   | V |   |   |
| 19+15 | 4.9965 | 2.37  | Q |   |   |   | V |   |   |

|       |        |      |   |  |  |  |   |  |
|-------|--------|------|---|--|--|--|---|--|
| 19+20 | 5.0125 | 2.33 | Q |  |  |  | V |  |
| 19+25 | 5.0284 | 2.30 | Q |  |  |  | V |  |
| 19+30 | 5.0439 | 2.26 | Q |  |  |  | V |  |
| 19+35 | 5.0593 | 2.23 | Q |  |  |  | V |  |
| 19+40 | 5.0744 | 2.20 | Q |  |  |  | V |  |
| 19+45 | 5.0894 | 2.17 | Q |  |  |  | V |  |
| 19+50 | 5.1041 | 2.14 | Q |  |  |  | V |  |
| 19+55 | 5.1186 | 2.11 | Q |  |  |  | V |  |
| 20+ 0 | 5.1330 | 2.08 | Q |  |  |  | V |  |
| 20+ 5 | 5.1472 | 2.06 | Q |  |  |  | V |  |
| 20+10 | 5.1612 | 2.03 | Q |  |  |  | V |  |
| 20+15 | 5.1750 | 2.01 | Q |  |  |  | V |  |
| 20+20 | 5.1887 | 1.99 | Q |  |  |  | V |  |
| 20+25 | 5.2022 | 1.96 | Q |  |  |  | V |  |
| 20+30 | 5.2156 | 1.94 | Q |  |  |  | V |  |
| 20+35 | 5.2288 | 1.92 | Q |  |  |  | V |  |
| 20+40 | 5.2419 | 1.90 | Q |  |  |  | V |  |
| 20+45 | 5.2548 | 1.88 | Q |  |  |  | V |  |
| 20+50 | 5.2676 | 1.86 | Q |  |  |  | V |  |
| 20+55 | 5.2803 | 1.84 | Q |  |  |  | V |  |
| 21+ 0 | 5.2928 | 1.82 | Q |  |  |  | V |  |
| 21+ 5 | 5.3052 | 1.80 | Q |  |  |  | V |  |
| 21+10 | 5.3175 | 1.79 | Q |  |  |  | V |  |
| 21+15 | 5.3297 | 1.77 | Q |  |  |  | V |  |
| 21+20 | 5.3418 | 1.75 | Q |  |  |  | V |  |
| 21+25 | 5.3538 | 1.74 | Q |  |  |  | V |  |
| 21+30 | 5.3656 | 1.72 | Q |  |  |  | V |  |
| 21+35 | 5.3774 | 1.71 | Q |  |  |  | V |  |
| 21+40 | 5.3890 | 1.69 | Q |  |  |  | V |  |
| 21+45 | 5.4006 | 1.68 | Q |  |  |  | V |  |
| 21+50 | 5.4121 | 1.66 | Q |  |  |  | V |  |
| 21+55 | 5.4234 | 1.65 | Q |  |  |  | V |  |
| 22+ 0 | 5.4347 | 1.64 | Q |  |  |  | V |  |
| 22+ 5 | 5.4459 | 1.62 | Q |  |  |  | V |  |
| 22+10 | 5.4570 | 1.61 | Q |  |  |  | V |  |
| 22+15 | 5.4680 | 1.60 | Q |  |  |  | V |  |
| 22+20 | 5.4789 | 1.59 | Q |  |  |  | V |  |
| 22+25 | 5.4898 | 1.57 | Q |  |  |  | V |  |
| 22+30 | 5.5005 | 1.56 | Q |  |  |  | V |  |
| 22+35 | 5.5112 | 1.55 | Q |  |  |  | V |  |
| 22+40 | 5.5218 | 1.54 | Q |  |  |  | V |  |
| 22+45 | 5.5324 | 1.53 | Q |  |  |  | V |  |
| 22+50 | 5.5428 | 1.52 | Q |  |  |  | V |  |
| 22+55 | 5.5532 | 1.51 | Q |  |  |  | V |  |
| 23+ 0 | 5.5635 | 1.50 | Q |  |  |  | V |  |
| 23+ 5 | 5.5738 | 1.49 | Q |  |  |  | V |  |
| 23+10 | 5.5840 | 1.48 | Q |  |  |  | V |  |
| 23+15 | 5.5941 | 1.47 | Q |  |  |  | V |  |
| 23+20 | 5.6041 | 1.46 | Q |  |  |  | V |  |
| 23+25 | 5.6141 | 1.45 | Q |  |  |  | V |  |
| 23+30 | 5.6240 | 1.44 | Q |  |  |  | V |  |
| 23+35 | 5.6339 | 1.43 | Q |  |  |  | V |  |
| 23+40 | 5.6437 | 1.42 | Q |  |  |  | V |  |
| 23+45 | 5.6534 | 1.41 | Q |  |  |  | V |  |
| 23+50 | 5.6631 | 1.41 | Q |  |  |  | V |  |
| 23+55 | 5.6727 | 1.40 | Q |  |  |  | V |  |
| 24+ 0 | 5.6823 | 1.39 | Q |  |  |  | V |  |

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Unit Hydrograph Analysis

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004, Version 7.0

Study date 02/11/22

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

Program License Serial Number 6145

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OAKMONT - TIPPECANOE INDUSTRIAL  
100 YEAR - PROPOSED UNIT HYDROGRAPH  
4211Q100UHP  
AC  
-----

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<br>(Ac.)          | Duration<br>(hours) | Isohyetal<br>(In) |
|----------------------------|---------------------|-------------------|
| Rainfall data for year 100 |                     |                   |
| 14.30                      | 1                   | 1.29              |

|                            |   |      |
|----------------------------|---|------|
| -----                      |   |      |
| Rainfall data for year 100 |   |      |
| 14.30                      | 6 | 2.90 |

|                            |    |      |
|----------------------------|----|------|
| -----                      |    |      |
| Rainfall data for year 100 |    |      |
| 14.30                      | 24 | 5.58 |

+++++

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

| SCS curve<br>No. (AMCII) | SCS curve<br>NO. (AMC 3) | Area<br>(Ac.) | Area<br>Fraction | Fp (Fig C6)<br>(In/Hr) | Ap<br>(dec.) | Fm<br>(In/Hr) |
|--------------------------|--------------------------|---------------|------------------|------------------------|--------------|---------------|
| 56.0                     | 75.8                     | 14.30         | 1.000            | 0.440                  | 0.100        | 0.044         |

Area-averaged adjusted loss rate Fm (In/Hr) = 0.044

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

| Area | Area | SCS CN | SCS CN | S | Pervious |
|------|------|--------|--------|---|----------|
|------|------|--------|--------|---|----------|

| (Ac.) | Fract | (AMC2) | (AMC3) |      | Yield Fr |
|-------|-------|--------|--------|------|----------|
| 1.43  | 0.100 | 56.0   | 75.8   | 3.19 | 0.538    |
| 12.87 | 0.900 | 98.0   | 98.0   | 0.20 | 0.957    |

Area-averaged catchment yield fraction, Y = 0.915  
 Area-averaged low loss fraction, Yb = 0.085  
 User entry of time of concentration = 0.200 (hours)  
 +-----+  
 Watershed area = 14.30 (Ac.)  
 Catchment Lag time = 0.160 hours  
 Unit interval = 5.000 minutes  
 Unit interval percentage of lag time = 52.0833  
 Hydrograph baseflow = 0.00 (CFS)  
 Average maximum watershed loss rate (Fm) = 0.044 (In/Hr)  
 Average low loss rate fraction (Yb) = 0.085 (decimal)  
 VALLEY DEVELOPED S-Graph Selected  
 Computed peak 5-minute rainfall = 0.477 (In)  
 Computed peak 30-minute rainfall = 0.978 (In)  
 Specified peak 1-hour rainfall = 1.290 (In)  
 Computed peak 3-hour rainfall = 2.120 (In)  
 Specified peak 6-hour rainfall = 2.900 (In)  
 Specified peak 24-hour rainfall = 5.580 (In)

Rainfall depth area reduction factors:  
 Using a total area of 14.30 (Ac.) (Ref: fig. E-4)

|                          |                                |
|--------------------------|--------------------------------|
| 5-minute factor = 0.999  | Adjusted rainfall = 0.477 (In) |
| 30-minute factor = 0.999 | Adjusted rainfall = 0.977 (In) |
| 1-hour factor = 0.999    | Adjusted rainfall = 1.289 (In) |
| 3-hour factor = 1.000    | Adjusted rainfall = 2.120 (In) |
| 6-hour factor = 1.000    | Adjusted rainfall = 2.900 (In) |
| 24-hour factor = 1.000   | Adjusted rainfall = 5.580 (In) |

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

+-----+  
 Interval 'S' Graph Unit Hydrograph  
 Number Mean values ((CFS))  
 -----  
 (K = 172.94 (CFS))  
  

|   |         |        |
|---|---------|--------|
| 1 | 4.951   | 8.562  |
| 2 | 32.173  | 47.079 |
| 3 | 71.993  | 68.865 |
| 4 | 91.514  | 33.759 |
| 5 | 97.565  | 10.464 |
| 6 | 98.956  | 2.407  |
| 7 | 100.000 | 1.805  |

  
 -----  
 -----  
 -----

Total soil rain loss = 0.41 (In)  
 Total effective rainfall = 5.17 (In)  
 Peak flow rate in flood hydrograph = 43.62 (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    | 12.5 | 25.0 | 37.5 | 50.0 |
|-----------|--------|-------|--------|------|------|------|------|------|
| 0+ 5      | 0.0005 |       | 0.07   | Q    |      |      |      |      |
| 0+10      | 0.0037 |       | 0.47   | Q    |      |      |      |      |
| 0+15      | 0.0109 |       | 1.04   | Q    |      |      |      |      |
| 0+20      | 0.0201 |       | 1.33   | VQ   |      |      |      |      |
| 0+25      | 0.0299 |       | 1.42   | VQ   |      |      |      |      |
| 0+30      | 0.0398 |       | 1.45   | VQ   |      |      |      |      |
| 0+35      | 0.0499 |       | 1.47   | VQ   |      |      |      |      |
| 0+40      | 0.0600 |       | 1.47   | VQ   |      |      |      |      |
| 0+45      | 0.0702 |       | 1.47   | VQ   |      |      |      |      |
| 0+50      | 0.0803 |       | 1.48   | VQ   |      |      |      |      |
| 0+55      | 0.0905 |       | 1.48   | VQ   |      |      |      |      |
| 1+ 0      | 0.1008 |       | 1.49   | VQ   |      |      |      |      |
| 1+ 5      | 0.1110 |       | 1.49   | VQ   |      |      |      |      |
| 1+10      | 0.1213 |       | 1.49   | VQ   |      |      |      |      |
| 1+15      | 0.1317 |       | 1.50   | VQ   |      |      |      |      |
| 1+20      | 0.1420 |       | 1.50   | VQ   |      |      |      |      |
| 1+25      | 0.1524 |       | 1.51   | VQ   |      |      |      |      |
| 1+30      | 0.1628 |       | 1.51   | IQ   |      |      |      |      |
| 1+35      | 0.1733 |       | 1.52   | IQ   |      |      |      |      |
| 1+40      | 0.1837 |       | 1.52   | IQ   |      |      |      |      |
| 1+45      | 0.1943 |       | 1.53   | IQ   |      |      |      |      |
| 1+50      | 0.2048 |       | 1.53   | IQ   |      |      |      |      |
| 1+55      | 0.2154 |       | 1.54   | IQ   |      |      |      |      |
| 2+ 0      | 0.2260 |       | 1.54   | IQ   |      |      |      |      |
| 2+ 5      | 0.2366 |       | 1.55   | IQ   |      |      |      |      |
| 2+10      | 0.2473 |       | 1.55   | IQ   |      |      |      |      |
| 2+15      | 0.2580 |       | 1.55   | IQ   |      |      |      |      |
| 2+20      | 0.2687 |       | 1.56   | IQ   |      |      |      |      |
| 2+25      | 0.2795 |       | 1.56   | IQ   |      |      |      |      |
| 2+30      | 0.2903 |       | 1.57   | IQ   |      |      |      |      |
| 2+35      | 0.3012 |       | 1.57   | IQ   |      |      |      |      |
| 2+40      | 0.3120 |       | 1.58   | IQV  |      |      |      |      |
| 2+45      | 0.3230 |       | 1.58   | IQV  |      |      |      |      |
| 2+50      | 0.3339 |       | 1.59   | IQV  |      |      |      |      |
| 2+55      | 0.3449 |       | 1.60   | IQV  |      |      |      |      |
| 3+ 0      | 0.3559 |       | 1.60   | IQV  |      |      |      |      |
| 3+ 5      | 0.3670 |       | 1.61   | IQV  |      |      |      |      |
| 3+10      | 0.3781 |       | 1.61   | IQV  |      |      |      |      |
| 3+15      | 0.3892 |       | 1.62   | IQV  |      |      |      |      |
| 3+20      | 0.4004 |       | 1.62   | IQV  |      |      |      |      |
| 3+25      | 0.4116 |       | 1.63   | IQV  |      |      |      |      |
| 3+30      | 0.4228 |       | 1.63   | IQV  |      |      |      |      |
| 3+35      | 0.4341 |       | 1.64   | IQV  |      |      |      |      |
| 3+40      | 0.4455 |       | 1.64   | IQV  |      |      |      |      |
| 3+45      | 0.4568 |       | 1.65   | IQV  |      |      |      |      |
| 3+50      | 0.4682 |       | 1.66   | IQ V |      |      |      |      |
| 3+55      | 0.4797 |       | 1.66   | IQ V |      |      |      |      |
| 4+ 0      | 0.4912 |       | 1.67   | IQ V |      |      |      |      |
| 4+ 5      | 0.5027 |       | 1.67   | IQ V |      |      |      |      |
| 4+10      | 0.5143 |       | 1.68   | IQ V |      |      |      |      |
| 4+15      | 0.5259 |       | 1.69   | IQ V |      |      |      |      |
| 4+20      | 0.5376 |       | 1.69   | IQ V |      |      |      |      |
| 4+25      | 0.5493 |       | 1.70   | IQ V |      |      |      |      |
| 4+30      | 0.5610 |       | 1.71   | IQ V |      |      |      |      |
| 4+35      | 0.5728 |       | 1.71   | IQ V |      |      |      |      |
| 4+40      | 0.5846 |       | 1.72   | IQ V |      |      |      |      |
| 4+45      | 0.5965 |       | 1.73   | IQ V |      |      |      |      |
| 4+50      | 0.6084 |       | 1.73   | IQ V |      |      |      |      |
| 4+55      | 0.6204 |       | 1.74   | IQ V |      |      |      |      |
| 5+ 0      | 0.6324 |       | 1.75   | IQ V |      |      |      |      |
| 5+ 5      | 0.6445 |       | 1.75   | IQ V |      |      |      |      |

|       |        |      |   |   |  |  |  |  |  |
|-------|--------|------|---|---|--|--|--|--|--|
| 5+10  | 0.6566 | 1.76 | Q | V |  |  |  |  |  |
| 5+15  | 0.6688 | 1.77 | Q | V |  |  |  |  |  |
| 5+20  | 0.6810 | 1.77 | Q | V |  |  |  |  |  |
| 5+25  | 0.6932 | 1.78 | Q | V |  |  |  |  |  |
| 5+30  | 0.7056 | 1.79 | Q | V |  |  |  |  |  |
| 5+35  | 0.7179 | 1.79 | Q | V |  |  |  |  |  |
| 5+40  | 0.7303 | 1.80 | Q | V |  |  |  |  |  |
| 5+45  | 0.7428 | 1.81 | Q | V |  |  |  |  |  |
| 5+50  | 0.7553 | 1.82 | Q | V |  |  |  |  |  |
| 5+55  | 0.7679 | 1.83 | Q | V |  |  |  |  |  |
| 6+ 0  | 0.7805 | 1.83 | Q | V |  |  |  |  |  |
| 6+ 5  | 0.7932 | 1.84 | Q | V |  |  |  |  |  |
| 6+10  | 0.8059 | 1.85 | Q | V |  |  |  |  |  |
| 6+15  | 0.8187 | 1.86 | Q | V |  |  |  |  |  |
| 6+20  | 0.8316 | 1.87 | Q | V |  |  |  |  |  |
| 6+25  | 0.8445 | 1.87 | Q | V |  |  |  |  |  |
| 6+30  | 0.8574 | 1.88 | Q | V |  |  |  |  |  |
| 6+35  | 0.8705 | 1.89 | Q | V |  |  |  |  |  |
| 6+40  | 0.8835 | 1.90 | Q | V |  |  |  |  |  |
| 6+45  | 0.8967 | 1.91 | Q | V |  |  |  |  |  |
| 6+50  | 0.9099 | 1.92 | Q | V |  |  |  |  |  |
| 6+55  | 0.9231 | 1.93 | Q | V |  |  |  |  |  |
| 7+ 0  | 0.9365 | 1.94 | Q | V |  |  |  |  |  |
| 7+ 5  | 0.9499 | 1.94 | Q | V |  |  |  |  |  |
| 7+10  | 0.9633 | 1.95 | Q | V |  |  |  |  |  |
| 7+15  | 0.9768 | 1.96 | Q | V |  |  |  |  |  |
| 7+20  | 0.9904 | 1.97 | Q | V |  |  |  |  |  |
| 7+25  | 1.0041 | 1.98 | Q | V |  |  |  |  |  |
| 7+30  | 1.0178 | 1.99 | Q | V |  |  |  |  |  |
| 7+35  | 1.0316 | 2.00 | Q | V |  |  |  |  |  |
| 7+40  | 1.0455 | 2.01 | Q | V |  |  |  |  |  |
| 7+45  | 1.0594 | 2.02 | Q | V |  |  |  |  |  |
| 7+50  | 1.0734 | 2.03 | Q | V |  |  |  |  |  |
| 7+55  | 1.0875 | 2.05 | Q | V |  |  |  |  |  |
| 8+ 0  | 1.1017 | 2.06 | Q | V |  |  |  |  |  |
| 8+ 5  | 1.1159 | 2.07 | Q | V |  |  |  |  |  |
| 8+10  | 1.1302 | 2.08 | Q | V |  |  |  |  |  |
| 8+15  | 1.1446 | 2.09 | Q | V |  |  |  |  |  |
| 8+20  | 1.1591 | 2.10 | Q | V |  |  |  |  |  |
| 8+25  | 1.1736 | 2.11 | Q | V |  |  |  |  |  |
| 8+30  | 1.1883 | 2.13 | Q | V |  |  |  |  |  |
| 8+35  | 1.2030 | 2.14 | Q | V |  |  |  |  |  |
| 8+40  | 1.2178 | 2.15 | Q | V |  |  |  |  |  |
| 8+45  | 1.2327 | 2.16 | Q | V |  |  |  |  |  |
| 8+50  | 1.2477 | 2.18 | Q | V |  |  |  |  |  |
| 8+55  | 1.2627 | 2.19 | Q | V |  |  |  |  |  |
| 9+ 0  | 1.2779 | 2.20 | Q | V |  |  |  |  |  |
| 9+ 5  | 1.2932 | 2.21 | Q | V |  |  |  |  |  |
| 9+10  | 1.3085 | 2.23 | Q | V |  |  |  |  |  |
| 9+15  | 1.3240 | 2.24 | Q | V |  |  |  |  |  |
| 9+20  | 1.3395 | 2.26 | Q | V |  |  |  |  |  |
| 9+25  | 1.3551 | 2.27 | Q | V |  |  |  |  |  |
| 9+30  | 1.3709 | 2.29 | Q | V |  |  |  |  |  |
| 9+35  | 1.3867 | 2.30 | Q | V |  |  |  |  |  |
| 9+40  | 1.4027 | 2.32 | Q | V |  |  |  |  |  |
| 9+45  | 1.4188 | 2.33 | Q | V |  |  |  |  |  |
| 9+50  | 1.4349 | 2.35 | Q | V |  |  |  |  |  |
| 9+55  | 1.4512 | 2.36 | Q | V |  |  |  |  |  |
| 10+ 0 | 1.4676 | 2.38 | Q | V |  |  |  |  |  |
| 10+ 5 | 1.4841 | 2.40 | Q | V |  |  |  |  |  |
| 10+10 | 1.5008 | 2.42 | Q | V |  |  |  |  |  |
| 10+15 | 1.5175 | 2.43 | Q | V |  |  |  |  |  |
| 10+20 | 1.5344 | 2.45 | Q | V |  |  |  |  |  |

|       |        |      |   |   |  |  |  |
|-------|--------|------|---|---|--|--|--|
| 10+25 | 1.5514 | 2.47 | Q | V |  |  |  |
| 10+30 | 1.5685 | 2.49 | Q | V |  |  |  |
| 10+35 | 1.5858 | 2.51 | Q | V |  |  |  |
| 10+40 | 1.6032 | 2.53 | Q | V |  |  |  |
| 10+45 | 1.6208 | 2.55 | Q | V |  |  |  |
| 10+50 | 1.6385 | 2.57 | Q | V |  |  |  |
| 10+55 | 1.6563 | 2.59 | Q | V |  |  |  |
| 11+ 0 | 1.6743 | 2.61 | Q | V |  |  |  |
| 11+ 5 | 1.6924 | 2.63 | Q | V |  |  |  |
| 11+10 | 1.7107 | 2.66 | Q | V |  |  |  |
| 11+15 | 1.7292 | 2.68 | Q | V |  |  |  |
| 11+20 | 1.7478 | 2.70 | Q | V |  |  |  |
| 11+25 | 1.7666 | 2.73 | Q | V |  |  |  |
| 11+30 | 1.7855 | 2.75 | Q | V |  |  |  |
| 11+35 | 1.8047 | 2.78 | Q | V |  |  |  |
| 11+40 | 1.8240 | 2.81 | Q | V |  |  |  |
| 11+45 | 1.8435 | 2.83 | Q | V |  |  |  |
| 11+50 | 1.8632 | 2.86 | Q | V |  |  |  |
| 11+55 | 1.8831 | 2.89 | Q | V |  |  |  |
| 12+ 0 | 1.9032 | 2.92 | Q | V |  |  |  |
| 12+ 5 | 1.9235 | 2.95 | Q | V |  |  |  |
| 12+10 | 1.9438 | 2.94 | Q | V |  |  |  |
| 12+15 | 1.9639 | 2.92 | Q | V |  |  |  |
| 12+20 | 1.9841 | 2.93 | Q | V |  |  |  |
| 12+25 | 2.0045 | 2.96 | Q | V |  |  |  |
| 12+30 | 2.0251 | 2.99 | Q | V |  |  |  |
| 12+35 | 2.0460 | 3.03 | Q | V |  |  |  |
| 12+40 | 2.0671 | 3.07 | Q | V |  |  |  |
| 12+45 | 2.0886 | 3.11 | Q | V |  |  |  |
| 12+50 | 2.1102 | 3.15 | Q | V |  |  |  |
| 12+55 | 2.1322 | 3.19 | Q | V |  |  |  |
| 13+ 0 | 2.1545 | 3.24 | Q | V |  |  |  |
| 13+ 5 | 2.1772 | 3.28 | Q | V |  |  |  |
| 13+10 | 2.2001 | 3.33 | Q | V |  |  |  |
| 13+15 | 2.2234 | 3.38 | Q | V |  |  |  |
| 13+20 | 2.2471 | 3.44 | Q | V |  |  |  |
| 13+25 | 2.2711 | 3.49 | Q | V |  |  |  |
| 13+30 | 2.2956 | 3.55 | Q | V |  |  |  |
| 13+35 | 2.3205 | 3.61 | Q | V |  |  |  |
| 13+40 | 2.3458 | 3.67 | Q | V |  |  |  |
| 13+45 | 2.3715 | 3.74 | Q | V |  |  |  |
| 13+50 | 2.3978 | 3.81 | Q | V |  |  |  |
| 13+55 | 2.4246 | 3.89 | Q | V |  |  |  |
| 14+ 0 | 2.4519 | 3.97 | Q | V |  |  |  |
| 14+ 5 | 2.4798 | 4.05 | Q | V |  |  |  |
| 14+10 | 2.5083 | 4.14 | Q | V |  |  |  |
| 14+15 | 2.5374 | 4.24 | Q | V |  |  |  |
| 14+20 | 2.5673 | 4.34 | Q | V |  |  |  |
| 14+25 | 2.5979 | 4.45 | Q | V |  |  |  |
| 14+30 | 2.6293 | 4.56 | Q | V |  |  |  |
| 14+35 | 2.6616 | 4.69 | Q | V |  |  |  |
| 14+40 | 2.6948 | 4.82 | Q | V |  |  |  |
| 14+45 | 2.7290 | 4.97 | Q | V |  |  |  |
| 14+50 | 2.7643 | 5.13 | Q | V |  |  |  |
| 14+55 | 2.8009 | 5.30 | Q | V |  |  |  |
| 15+ 0 | 2.8387 | 5.50 | Q | V |  |  |  |
| 15+ 5 | 2.8781 | 5.71 | Q | V |  |  |  |
| 15+10 | 2.9191 | 5.95 | Q | V |  |  |  |
| 15+15 | 2.9620 | 6.23 | Q | V |  |  |  |
| 15+20 | 3.0071 | 6.54 | Q | V |  |  |  |
| 15+25 | 3.0544 | 6.87 | Q | V |  |  |  |
| 15+30 | 3.1030 | 7.06 | Q | V |  |  |  |
| 15+35 | 3.1527 | 7.22 | Q | V |  |  |  |

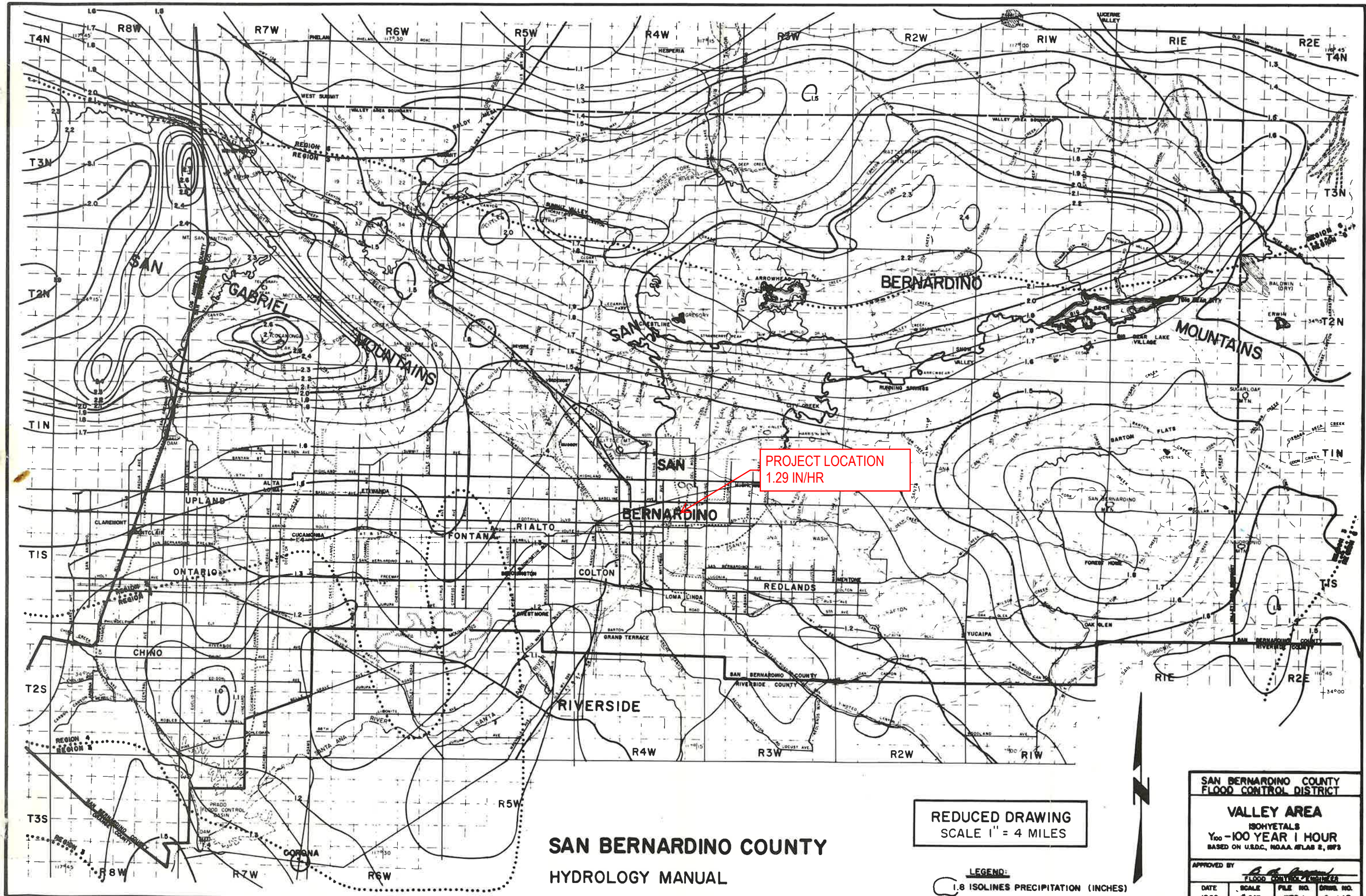
|       |        |       |  |   |   |   |   |   |   |
|-------|--------|-------|--|---|---|---|---|---|---|
| 15+40 | 3.2057 | 7.70  |  | Q |   | V |   |   |   |
| 15+45 | 3.2642 | 8.50  |  | Q |   | V |   |   |   |
| 15+50 | 3.3307 | 9.65  |  |   | Q | V |   |   |   |
| 15+55 | 3.4090 | 11.37 |  |   | Q |   | V |   |   |
| 16+ 0 | 3.5079 | 14.36 |  |   |   |   | V |   |   |
| 16+ 5 | 3.6583 | 21.83 |  |   |   | Q |   | V |   |
| 16+10 | 3.9194 | 37.92 |  |   |   |   | V |   | Q |
| 16+15 | 4.2199 | 43.62 |  |   |   |   |   | V |   |
| 16+20 | 4.4061 | 27.04 |  |   |   | Q |   | V |   |
| 16+25 | 4.5093 | 14.99 |  |   |   |   |   | V |   |
| 16+30 | 4.5771 | 9.84  |  |   | Q |   |   | V |   |
| 16+35 | 4.6347 | 8.37  |  |   | Q |   |   | V |   |
| 16+40 | 4.6819 | 6.85  |  |   | Q |   |   | V |   |
| 16+45 | 4.7245 | 6.18  |  |   | Q |   |   | V |   |
| 16+50 | 4.7635 | 5.67  |  |   | Q |   |   | V |   |
| 16+55 | 4.7998 | 5.27  |  |   | Q |   |   | V |   |
| 17+ 0 | 4.8338 | 4.93  |  |   | Q |   |   | V |   |
| 17+ 5 | 4.8658 | 4.65  |  |   | Q |   |   | V |   |
| 17+10 | 4.8962 | 4.41  |  |   | Q |   |   | V |   |
| 17+15 | 4.9252 | 4.21  |  |   | Q |   |   | V |   |
| 17+20 | 4.9529 | 4.02  |  |   | Q |   |   |   | V |
| 17+25 | 4.9795 | 3.86  |  |   | Q |   |   |   | V |
| 17+30 | 5.0051 | 3.72  |  |   | Q |   |   |   | V |
| 17+35 | 5.0298 | 3.59  |  |   | Q |   |   |   | V |
| 17+40 | 5.0538 | 3.47  |  |   | Q |   |   |   | V |
| 17+45 | 5.0770 | 3.37  |  |   | Q |   |   |   | V |
| 17+50 | 5.0995 | 3.27  |  |   | Q |   |   |   | V |
| 17+55 | 5.1214 | 3.18  |  |   | Q |   |   |   | V |
| 18+ 0 | 5.1427 | 3.09  |  |   | Q |   |   |   | V |
| 18+ 5 | 5.1635 | 3.02  |  |   | Q |   |   |   | V |
| 18+10 | 5.1840 | 2.99  |  |   | Q |   |   |   | V |
| 18+15 | 5.2045 | 2.97  |  |   | Q |   |   |   | V |
| 18+20 | 5.2247 | 2.93  |  |   | Q |   |   |   | V |
| 18+25 | 5.2445 | 2.88  |  |   | Q |   |   |   | V |
| 18+30 | 5.2639 | 2.82  |  |   | Q |   |   |   | V |
| 18+35 | 5.2830 | 2.77  |  |   | Q |   |   |   | V |
| 18+40 | 5.3017 | 2.72  |  |   | Q |   |   |   | V |
| 18+45 | 5.3201 | 2.67  |  |   | Q |   |   |   | V |
| 18+50 | 5.3382 | 2.63  |  |   | Q |   |   |   | V |
| 18+55 | 5.3560 | 2.58  |  |   | Q |   |   |   | V |
| 19+ 0 | 5.3735 | 2.54  |  |   | Q |   |   |   | V |
| 19+ 5 | 5.3907 | 2.50  |  |   | Q |   |   |   | V |
| 19+10 | 5.4076 | 2.46  |  | Q |   |   |   |   | V |
| 19+15 | 5.4244 | 2.43  |  | Q |   |   |   |   | V |
| 19+20 | 5.4408 | 2.39  |  | Q |   |   |   |   | V |
| 19+25 | 5.4571 | 2.36  |  | Q |   |   |   |   | V |
| 19+30 | 5.4731 | 2.33  |  | Q |   |   |   |   | V |
| 19+35 | 5.4889 | 2.30  |  | Q |   |   |   |   | V |
| 19+40 | 5.5045 | 2.27  |  | Q |   |   |   |   | V |
| 19+45 | 5.5199 | 2.24  |  | Q |   |   |   |   | V |
| 19+50 | 5.5351 | 2.21  |  | Q |   |   |   |   | V |
| 19+55 | 5.5502 | 2.18  |  | Q |   |   |   |   | V |
| 20+ 0 | 5.5650 | 2.16  |  | Q |   |   |   |   | V |
| 20+ 5 | 5.5797 | 2.13  |  | Q |   |   |   |   | V |
| 20+10 | 5.5942 | 2.11  |  | Q |   |   |   |   | V |
| 20+15 | 5.6086 | 2.09  |  | Q |   |   |   |   | V |
| 20+20 | 5.6228 | 2.06  |  | Q |   |   |   |   | V |
| 20+25 | 5.6369 | 2.04  |  | Q |   |   |   |   | V |
| 20+30 | 5.6508 | 2.02  |  | Q |   |   |   |   | V |
| 20+35 | 5.6645 | 2.00  |  | Q |   |   |   |   | V |
| 20+40 | 5.6782 | 1.98  |  | Q |   |   |   |   | V |
| 20+45 | 5.6917 | 1.96  |  | Q |   |   |   |   | V |
| 20+50 | 5.7050 | 1.94  |  | Q |   |   |   |   | V |



|       |        |      |   |  |  |  |   |  |
|-------|--------|------|---|--|--|--|---|--|
| 20+55 | 5.7183 | 1.92 | Q |  |  |  | V |  |
| 21+ 0 | 5.7314 | 1.90 | Q |  |  |  | V |  |
| 21+ 5 | 5.7444 | 1.89 | Q |  |  |  | V |  |
| 21+10 | 5.7573 | 1.87 | Q |  |  |  | V |  |
| 21+15 | 5.7700 | 1.85 | Q |  |  |  | V |  |
| 21+20 | 5.7827 | 1.84 | Q |  |  |  | V |  |
| 21+25 | 5.7953 | 1.82 | Q |  |  |  | V |  |
| 21+30 | 5.8077 | 1.81 | Q |  |  |  | V |  |
| 21+35 | 5.8200 | 1.79 | Q |  |  |  | V |  |
| 21+40 | 5.8323 | 1.78 | Q |  |  |  | V |  |
| 21+45 | 5.8444 | 1.76 | Q |  |  |  | V |  |
| 21+50 | 5.8565 | 1.75 | Q |  |  |  | V |  |
| 21+55 | 5.8684 | 1.74 | Q |  |  |  | V |  |
| 22+ 0 | 5.8803 | 1.72 | Q |  |  |  | V |  |
| 22+ 5 | 5.8921 | 1.71 | Q |  |  |  | V |  |
| 22+10 | 5.9037 | 1.70 | Q |  |  |  | V |  |
| 22+15 | 5.9153 | 1.68 | Q |  |  |  | V |  |
| 22+20 | 5.9269 | 1.67 | Q |  |  |  | V |  |
| 22+25 | 5.9383 | 1.66 | Q |  |  |  | V |  |
| 22+30 | 5.9496 | 1.65 | Q |  |  |  | V |  |
| 22+35 | 5.9609 | 1.64 | Q |  |  |  | V |  |
| 22+40 | 5.9721 | 1.63 | Q |  |  |  | V |  |
| 22+45 | 5.9832 | 1.61 | Q |  |  |  | V |  |
| 22+50 | 5.9943 | 1.60 | Q |  |  |  | V |  |
| 22+55 | 6.0053 | 1.59 | Q |  |  |  | V |  |
| 23+ 0 | 6.0162 | 1.58 | Q |  |  |  | V |  |
| 23+ 5 | 6.0270 | 1.57 | Q |  |  |  | V |  |
| 23+10 | 6.0377 | 1.56 | Q |  |  |  | V |  |
| 23+15 | 6.0484 | 1.55 | Q |  |  |  | V |  |
| 23+20 | 6.0591 | 1.54 | Q |  |  |  | V |  |
| 23+25 | 6.0696 | 1.53 | Q |  |  |  | V |  |
| 23+30 | 6.0801 | 1.52 | Q |  |  |  | V |  |
| 23+35 | 6.0906 | 1.52 | Q |  |  |  | V |  |
| 23+40 | 6.1009 | 1.51 | Q |  |  |  | V |  |
| 23+45 | 6.1112 | 1.50 | Q |  |  |  | V |  |
| 23+50 | 6.1215 | 1.49 | Q |  |  |  | V |  |
| 23+55 | 6.1317 | 1.48 | Q |  |  |  | V |  |
| 24+ 0 | 6.1418 | 1.47 | Q |  |  |  | V |  |

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Appendix D  
Soil Group Map and Isohyetal Map



**SAN BERNARDINO COUNTY  
HYDROLOGY MANUAL**

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

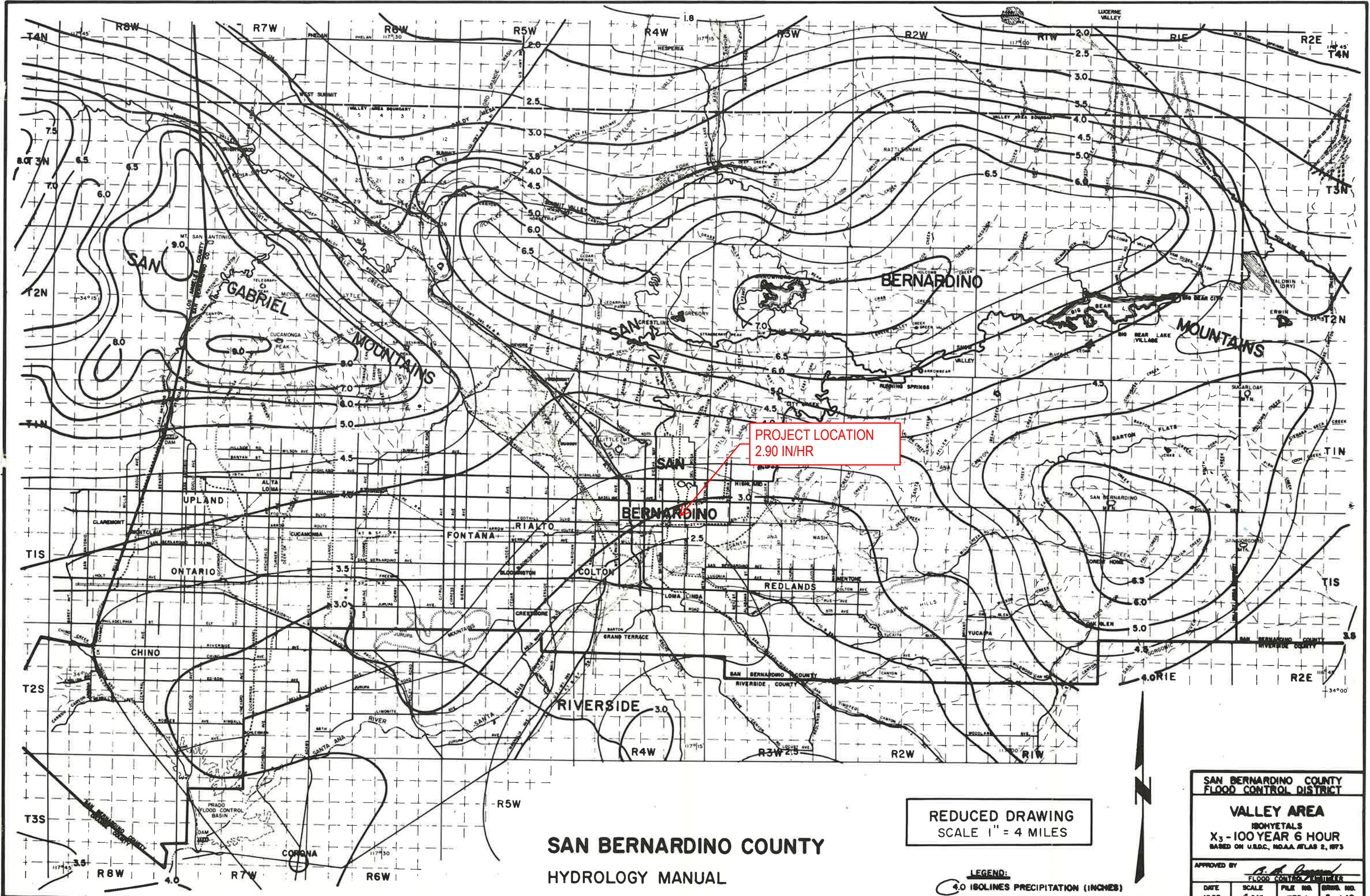
**LEGEND:**  
1.8 ISOLINES PRECIPITATION (INCHES)

**SAN BERNARDINO COUNTY  
FLOOD CONTROL DISTRICT**

**VALLEY AREA  
ISOHYETALS  
Y<sub>100</sub> - 100 YEAR 1 HOUR  
BASED ON U.S.D.C. NOAA ATLAS 2, 1973**

APPROVED BY *[Signature]*  
FLOOD CONTROL ENGINEER

|      |        |          |           |
|------|--------|----------|-----------|
| DATE | SCALE  | FILE NO. | DRWG. NO. |
| 1982 | 1"=4M. | WRD-1    | 4 of 12   |



PROJECT LOCATION  
2.90 IN/HR

REDUCED DRAWING  
SCALE 1" = 4 MILES

**SAN BERNARDINO COUNTY**  
HYDROLOGY MANUAL

LEGEND:  
4.0 ISOLINES PRECIPITATION (INCHES)

|   |          |          |           |
|---|----------|----------|-----------|
| SAN BERNARDINO COUNTY<br>FLOOD CONTROL DISTRICT |          |          |           |
| VALLEY AREA                                     |          |          |           |
| ISOHYETALS                                      |          |          |           |
| X <sub>3</sub> -100 YEAR 6 HOUR                 |          |          |           |
| BASED ON U.S.D.C. NOAA ATLAS 2, 1973            |          |          |           |
| APPROVED BY <i>B. A. [Signature]</i>            |          |          |           |
| FLOOD CONTROL ENGINEER                          |          |          |           |
| DATE  | SCALE    | FILE NO. | DRAW. NO. |
| 1982  | 1"=2 MI. | WB-1     | 8 of 12   |



**NOAA Atlas 14, Volume 6, Version 2**  
**Location name: San Bernardino, California, USA\***  
**Latitude: 34.1144°, Longitude: -117.262°**  
**Elevation: 1066.59 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](#)

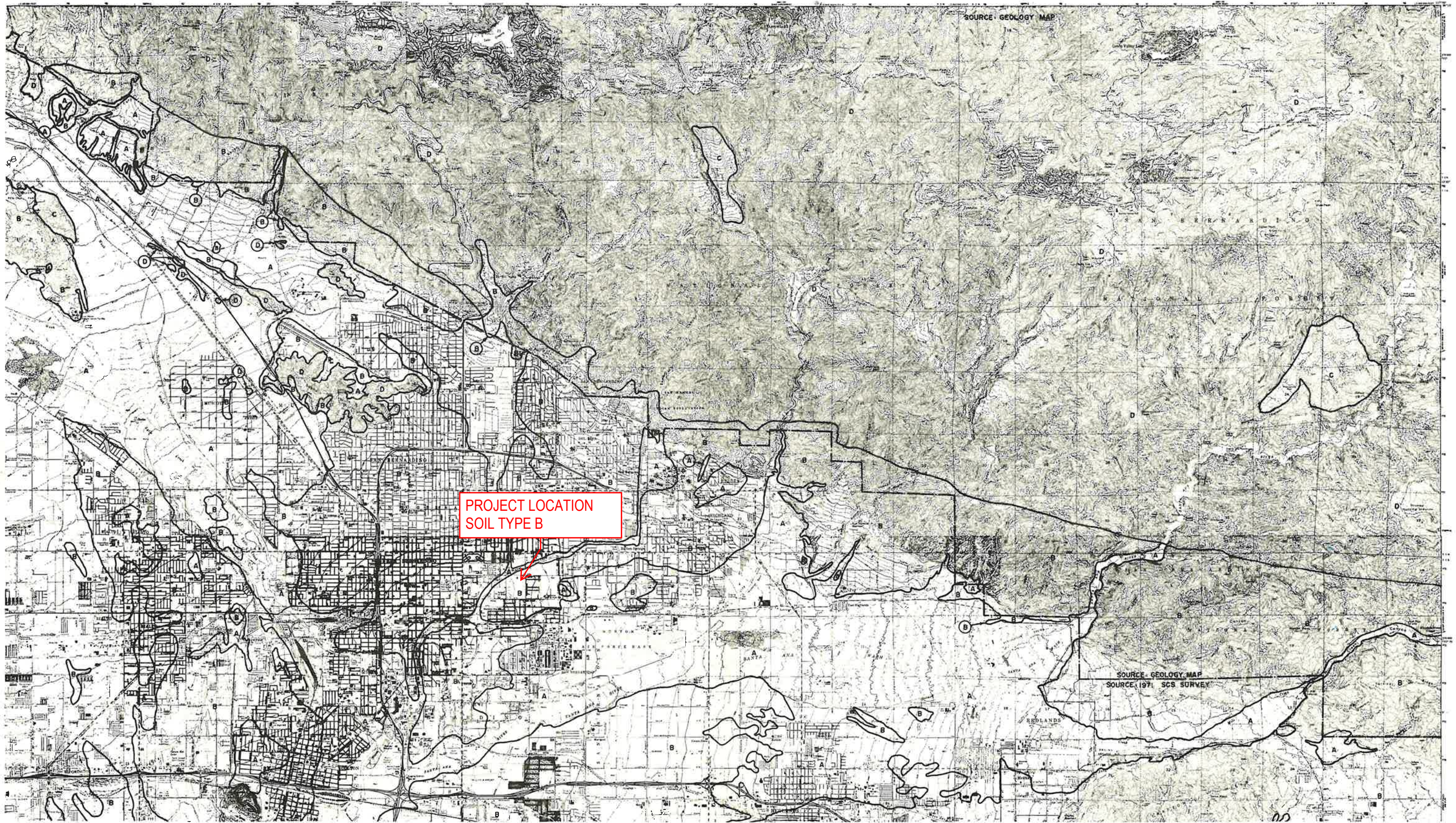
**PF tabular**

| <b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b> |  |                               |                               |                               |                               |                               |                               |                               |                               |                               |
|--|--|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| <b>Duration</b>  | <b>Average recurrence interval (years)</b> |                               |                               |                               |                               |                               |                               |                               |                               |                               |
|  | <b>1</b>                                   | <b>2</b>                      | <b>5</b>                      | <b>10</b>                     | <b>25</b>                     | <b>50</b>                     | <b>100</b>                    | <b>200</b>                    | <b>500</b>                    | <b>1000</b>                   |
| <b>5-min</b>   | <b>0.105</b><br>(0.087-0.127)              | <b>0.140</b><br>(0.117-0.171) | <b>0.187</b><br>(0.155-0.228) | <b>0.225</b><br>(0.185-0.277) | <b>0.277</b><br>(0.220-0.352) | <b>0.317</b><br>(0.246-0.412) | <b>0.358</b><br>(0.271-0.477) | <b>0.400</b><br>(0.295-0.549) | <b>0.458</b><br>(0.323-0.656) | <b>0.504</b><br>(0.343-0.747) |
| <b>10-min</b>  | <b>0.150</b><br>(0.125-0.182)              | <b>0.201</b><br>(0.167-0.245) | <b>0.268</b><br>(0.222-0.327) | <b>0.323</b><br>(0.265-0.397) | <b>0.397</b><br>(0.315-0.505) | <b>0.454</b><br>(0.353-0.591) | <b>0.513</b><br>(0.389-0.684) | <b>0.574</b><br>(0.422-0.787) | <b>0.657</b><br>(0.464-0.940) | <b>0.722</b><br>(0.492-1.07)  |
| <b>15-min</b>  | <b>0.182</b><br>(0.151-0.220)              | <b>0.244</b><br>(0.202-0.296) | <b>0.324</b><br>(0.269-0.396) | <b>0.390</b><br>(0.321-0.480) | <b>0.480</b><br>(0.381-0.611) | <b>0.549</b><br>(0.427-0.714) | <b>0.620</b><br>(0.470-0.827) | <b>0.694</b><br>(0.511-0.951) | <b>0.794</b><br>(0.561-1.14)  | <b>0.873</b><br>(0.595-1.30)  |
| <b>30-min</b>  | <b>0.275</b><br>(0.229-0.334)              | <b>0.369</b><br>(0.306-0.448) | <b>0.491</b><br>(0.407-0.599) | <b>0.591</b><br>(0.485-0.726) | <b>0.727</b><br>(0.577-0.924) | <b>0.831</b><br>(0.646-1.08)  | <b>0.938</b><br>(0.711-1.25)  | <b>1.05</b><br>(0.773-1.44)   | <b>1.20</b><br>(0.848-1.72)   | <b>1.32</b><br>(0.901-1.96)   |
| <b>60-min</b>  | <b>0.407</b><br>(0.339-0.494)              | <b>0.546</b><br>(0.454-0.664) | <b>0.728</b><br>(0.603-0.887) | <b>0.875</b><br>(0.719-1.08)  | <b>1.08</b><br>(0.855-1.37)   | <b>1.23</b><br>(0.957-1.60)   | <b>1.39</b><br>(1.05-1.85)    | <b>1.56</b><br>(1.15-2.13)    | <b>1.78</b><br>(1.26-2.55)    | <b>1.96</b><br>(1.34-2.90)    |
| <b>2-hr</b>  | <b>0.581</b><br>(0.483-0.706)              | <b>0.758</b><br>(0.630-0.922) | <b>0.989</b><br>(0.819-1.21)  | <b>1.18</b><br>(0.967-1.45)   | <b>1.43</b><br>(1.14-1.82)    | <b>1.63</b><br>(1.26-2.12)    | <b>1.83</b><br>(1.38-2.43)    | <b>2.03</b><br>(1.50-2.79)    | <b>2.31</b><br>(1.63-3.30)    | <b>2.52</b><br>(1.72-3.74)    |
| <b>3-hr</b>  | <b>0.710</b><br>(0.590-0.862)              | <b>0.916</b><br>(0.761-1.11)  | <b>1.19</b><br>(0.982-1.45)   | <b>1.40</b><br>(1.15-1.73)    | <b>1.70</b><br>(1.35-2.16)    | <b>1.93</b><br>(1.50-2.51)    | <b>2.16</b><br>(1.64-2.88)    | <b>2.40</b><br>(1.77-3.29)    | <b>2.72</b><br>(1.92-3.89)    | <b>2.97</b><br>(2.02-4.40)    |
| <b>6-hr</b>  | <b>0.983</b><br>(0.818-1.19)               | <b>1.26</b><br>(1.05-1.53)    | <b>1.62</b><br>(1.34-1.97)    | <b>1.91</b><br>(1.57-2.35)    | <b>2.31</b><br>(1.83-2.94)    | <b>2.61</b><br>(2.03-3.39)    | <b>2.92</b><br>(2.21-3.89)    | <b>3.24</b><br>(2.38-4.44)    | <b>3.67</b><br>(2.59-5.25)    | <b>4.00</b><br>(2.73-5.93)    |
| <b>12-hr</b>   | <b>1.30</b><br>(1.08-1.58)                 | <b>1.67</b><br>(1.39-2.03)    | <b>2.16</b><br>(1.79-2.63)    | <b>2.55</b><br>(2.10-3.14)    | <b>3.09</b><br>(2.45-3.93)    | <b>3.50</b><br>(2.72-4.55)    | <b>3.92</b><br>(2.97-5.23)    | <b>4.35</b><br>(3.21-5.97)    | <b>4.94</b><br>(3.48-7.07)    | <b>5.39</b><br>(3.67-7.99)    |
| <b>24-hr</b>   | <b>1.77</b><br>(1.57-2.04)                 | <b>2.30</b><br>(2.04-2.66)    | <b>3.01</b><br>(2.65-3.48)    | <b>3.58</b><br>(3.13-4.17)    | <b>4.36</b><br>(3.69-5.25)    | <b>4.96</b><br>(4.12-6.10)    | <b>5.58</b><br>(4.52-7.03)    | <b>6.21</b><br>(4.90-8.05)    | <b>7.08</b><br>(5.36-9.55)    | <b>7.76</b><br>(5.67-10.8)    |
| <b>2-day</b>   | <b>2.18</b><br>(1.93-2.51)                 | <b>2.88</b><br>(2.55-3.32)    | <b>3.81</b><br>(3.36-4.40)    | <b>4.57</b><br>(4.00-5.33)    | <b>5.62</b><br>(4.76-6.77)    | <b>6.44</b><br>(5.35-7.92)    | <b>7.28</b><br>(5.90-9.17)    | <b>8.16</b><br>(6.43-10.6)    | <b>9.37</b><br>(7.09-12.6)    | <b>10.3</b><br>(7.54-14.4)    |
| <b>3-day</b>   | <b>2.37</b><br>(2.10-2.74)                 | <b>3.17</b><br>(2.80-3.66)    | <b>4.23</b><br>(3.73-4.89)    | <b>5.11</b><br>(4.47-5.96)    | <b>6.33</b><br>(5.36-7.63)    | <b>7.29</b><br>(6.05-8.97)    | <b>8.28</b><br>(6.71-10.4)    | <b>9.31</b><br>(7.34-12.1)    | <b>10.7</b><br>(8.13-14.5)    | <b>11.9</b><br>(8.69-16.6)    |
| <b>4-day</b>   | <b>2.54</b><br>(2.25-2.93)                 | <b>3.42</b><br>(3.03-3.95)    | <b>4.60</b><br>(4.06-5.32)    | <b>5.58</b><br>(4.89-6.51)    | <b>6.95</b><br>(5.89-8.37)    | <b>8.03</b><br>(6.66-9.87)    | <b>9.14</b><br>(7.41-11.5)    | <b>10.3</b><br>(8.13-13.4)    | <b>11.9</b><br>(9.04-16.1)    | <b>13.2</b><br>(9.68-18.5)    |
| <b>7-day</b>   | <b>2.89</b><br>(2.56-3.33)                 | <b>3.97</b><br>(3.51-4.58)    | <b>5.42</b><br>(4.78-6.27)    | <b>6.63</b><br>(5.80-7.73)    | <b>8.33</b><br>(7.06-10.0)    | <b>9.67</b><br>(8.03-11.9)    | <b>11.1</b><br>(8.97-13.9)    | <b>12.6</b><br>(9.89-16.3)    | <b>14.6</b><br>(11.1-19.7)    | <b>16.3</b><br>(11.9-22.7)    |
| <b>10-day</b>  | <b>3.13</b><br>(2.77-3.60)                 | <b>4.34</b><br>(3.84-5.01)    | <b>5.98</b><br>(5.28-6.92)    | <b>7.36</b><br>(6.44-8.58)    | <b>9.28</b><br>(7.86-11.2)    | <b>10.8</b><br>(8.97-13.3)    | <b>12.4</b><br>(10.1-15.6)    | <b>14.1</b><br>(11.1-18.3)    | <b>16.5</b><br>(12.5-22.2)    | <b>18.4</b><br>(13.5-25.7)    |
| <b>20-day</b>  | <b>3.87</b><br>(3.42-4.46)                 | <b>5.44</b><br>(4.81-6.27)    | <b>7.57</b><br>(6.68-8.75)    | <b>9.36</b><br>(8.19-10.9)    | <b>11.9</b><br>(10.1-14.3)    | <b>13.9</b><br>(11.5-17.1)    | <b>16.0</b><br>(13.0-20.2)    | <b>18.3</b><br>(14.4-23.7)    | <b>21.5</b><br>(16.3-29.0)    | <b>24.1</b><br>(17.6-33.6)    |
| <b>30-day</b>  | <b>4.55</b><br>(4.03-5.24)                 | <b>6.38</b><br>(5.65-7.36)    | <b>8.88</b><br>(7.83-10.3)    | <b>11.0</b><br>(9.61-12.8)    | <b>14.0</b><br>(11.8-16.8)    | <b>16.4</b><br>(13.6-20.1)    | <b>18.9</b><br>(15.3-23.8)    | <b>21.6</b><br>(17.0-27.9)    | <b>25.4</b><br>(19.2-34.2)    | <b>28.4</b><br>(20.8-39.7)    |
| <b>45-day</b>  | <b>5.48</b><br>(4.85-6.31)                 | <b>7.58</b><br>(6.71-8.75)    | <b>10.5</b><br>(9.22-12.1)    | <b>12.9</b><br>(11.3-15.0)    | <b>16.3</b><br>(13.8-19.7)    | <b>19.1</b><br>(15.9-23.5)    | <b>22.1</b><br>(17.9-27.8)    | <b>25.2</b><br>(19.9-32.6)    | <b>29.7</b><br>(22.4-40.0)    | <b>33.3</b><br>(24.3-46.4)    |
| <b>60-day</b>  | <b>6.46</b><br>(5.72-7.44)                 | <b>8.79</b><br>(7.78-10.1)    | <b>12.0</b><br>(10.6-13.9)    | <b>14.7</b><br>(12.9-17.1)    | <b>18.6</b><br>(15.7-22.4)    | <b>21.7</b><br>(18.0-26.6)    | <b>24.9</b><br>(20.2-31.4)    | <b>28.5</b><br>(22.4-36.8)    | <b>33.5</b><br>(25.3-45.1)    | <b>37.6</b><br>(27.5-52.4)    |

<sup>1</sup> 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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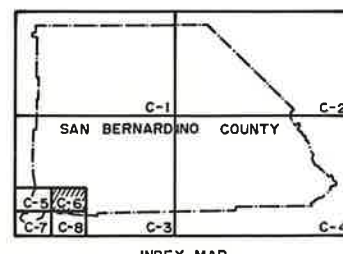
**PF graphical**



SOURCE: GEOLOGY MAP

SOURCE: GEOLOGY MAP  
SOURCE: 1971 SCS SURVEY

PROJECT LOCATION  
SOIL TYPE B



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



**SCALE REDUCED BY 1/2**

**SAN BERNARDINO COUNTY**  
HYDROLOGY MANUAL

**HYDROLOGIC SOILS GROUP MAP**  
FOR  
**SOUTHWEST-B AREA**