SHANDIN MHRC

4164 4th Ave
SAN BERNARDINO, CALIFORNIA
APN 0265141120000
APN 0265141240000
APN 0265141150000
Permit: DRNSTY-2023-00043

PRELIMINARY HYDROLOGY AND HYDRAULICS REPORT

April 2024

Preliminary

04/26/2024 12:56:32 PM

Prepared for:
NewGen Health, LLC
9526 W. Pico Blvd
Los Angeles CA 90035

Prepared by:
Daniel Villines
BKF Engineers
4675 MacArthur Court, Ste. 400
Newport Beach, CA 92660

For Final Drainage Study, provide the FEMA map as an attachment. Sign the document. Update to reflect any revisions to the impervious area and flows, including any revisions reflected in the WQMP review.





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1. Introduction

DSK Architects has requested that BKF Engineers prepare a Preliminary Hydrology and Hydraulics Study for the development of the Shandin Medical Healthcare Rehabilitation Center (Project) located in San Bernardino, California.

The Project site is located at 4164 North 4th Avenue, between 45th Street and 48th Street. The existing site is approximately 5.9 acres, 2.62 acres of which is composed of the existing behavioral health complex and 3.28 is undeveloped open space. In the existing condition, storm water generally sheet flows across the lot towards North 4th Avenue. Flows collect in the gutter along North 4th Avenue and continue south to Devil Creek Channel.

The proposed Project will develop the open space portion of the site, expanding the health complex. The Project will include an approximately 76,000 square foot single story building with additional parking and small landscaped areas. In the proposed condition, storm water will be collected in inlet structures and conveyed in underground pipes to the proposed infiltration basin at the northeast corner of the project. The infiltration basin is sized to infiltrate the entire storm volume up to the 100-year storm event. Flows exceeding this volume will by-pass the infiltration basin and be released to the gutter in an under sidewalk drain at the southeast corner of the project and flow south along North 4th Avenue to Devil Creek Channel.

San Bernardino County has enacted a policy that the 100-year post-development peak flow rate should be less than or equal to 90% of the 100-year pre-development peak flow rate using the 25-year rainfall. The purpose of this preliminary report is to calculate the existing 100-year peak storm runoff flowrate, calculate the proposed 100-year peak storm runoff flowrate, and determine the preliminary infiltration facility size required to satisfy the San Bernardino storm water policy. The preliminary report will also include calculations used to determine the preliminary sizing of proposed onsite drainage systems used to convey stormwater to the infiltration facility.

2. Hydrology and Basin Routing Analysis

A hydrologic analysis of the existing and proposed site was performed in accordance with the San Bernardino County Hydrology Manual dated August of 1982 and Hydrology Addendum dated April of 2010 (Hydrology Manual) for the 2, 10, 25, and 100-year storm events.

A Small Area Unit Hydrograph study was performed to compute the hydrographs and peak flowrate for the existing and proposed conditions. The analysis was performed using Advanced Engineering Software (AES) Small Area Unit Hydrograph Module. AES generates a hydrograph and peak flowrates based on the drainage area, soil-loss rate, low loss fraction, time of concentration, and point rainfall values for various storm durations. These parameters were determined using the methodology described below:

- The drainage boundary for the site was delineated based on the aerial image of the region and the topographic map. It was determined that there are no off-site storm flows that enter the site, therefore the drainage area was comprised only of the Project site.

- The soil-loss rate was calculated using the equation below:

  Fm=apFp

  Where:

  Fm = soil-loss rate in inches/hour
  Ap = pervious area fraction- converted from impervious percentage as shown on Figure C-4 of the Hydrology Manual
  Fp = infiltration rate for the pervious area in inches/hour – from Figure C-6 using Curve Numbers* from Figure C-3 and soil type from the Web Soil Survey Website identified in the Hydrology Manual

- The low-loss fraction was calculated using the equation below:

  $Y_{Bar} = (1-Y)$

  Where:

  Y_{Bar} = low-loss fraction
  Y = Average 24-hour storm yield fraction for Project site = $(Y_1A_1+Y_2A_2\ldots)/(A_1+A_2\ldots)$

  Where:

  A1, A2 = Area of Project site with a particular Curve Number (CN)
  Y_1, Y_2 = 24-hour storm yield fraction for A1, A2
  $= (P_{24}-Ia)^2/((P_{24}-Ia+S)\,P_{24})$
  P_{24} = 24 hour rainfall from NOAA Atlas 14
  Ia = Initial Abstraction = 0.2*S
  S = soil capacity = (1000/CN)-10
  CN = Curve Number* from Figure C-3

  *Note Per Hydrology Manual, Impervious Areas are assigned a CN of 98

- Time of Concentration was calculated using Figure D-1 from the Hydrology Manual

  Where:

  L= Longest flowpath for the drainage area in feet
  H= Difference in elevation between the upstream and downstream ends of the longest flowpath
  PI = percentage of Impervious Cover from Figure C-4 of the Hydrology Map

- Point Rainfall was taken from NOAA Atlas 14 for the Project site.

The drainage areas, longest flowpaths, and upstream and downstream elevations can be found on the Existing Condition Small Area Unit Hydrograph Hydrology Map EXH-01 and Proposed Condition Small Area Unit Hydrograph Hydrology Map EXH-02. Calculations and supporting documentation can be found in Appendix A. Results of the AES Small Area Unit Hydrograph are summarized in Table 2-1, below.

Table 2-1
Results of 100-Year Small Area Unit Hydrograph Analysis

Project Condition	Peak 2-Year Flowrate (CFS)	2-Year Volume (ACFT)	Peak 10-Year Flowrate (CFS)	10-Year Volume (ACFT)	Peak 25-Year Flowrate (CFS)	25-Year Volume (ACFT)	Peak 100-Year Flowrate (CFS)	100-Year Volume (ACFT)
Existing	6.97	1.17	11.83	1.95	15.11	2.42	20.89	3.16
Proposed	8.85	1.47	14.55	2.26	18.39	2.74	25.06	3.47

The hydrograph for the proposed 100-year storm event was then routed through the basin using the AES software routing subroutine. The basin routing subroutine uses a stage-storage-outflow table. The elevations and storage inputs were based on rectangular storage units with a total base area of 25,344 sqft, maximum water quality ponding depth of 2 feet, and a total depth of 5 feet. The outflow was based on an infiltration rate from the Geotechnical Report prepared by LandMark Consultants Inc, see Appendix C. A safety factor of 2 was applied to the 2.18 in/hr infiltration rate, therefore a value of 1.09 in/hr was used over the 25,344 sqft basin bottom. Table 2-2 below summarizes to the results of the basin routing calculations. Table 2-3 below summarizes the water quality requirements for the infiltration basin.

Table 2-2: Results of Routing Analysis

Maximum Basin Inflow (CFS)	Basin Infiltration Rate (CFS)	Basin Storage Depth (FT)	Maximum Basin Depth (FT)	Basin Outflow (cfs)
25.06	0.64	5	4.89	0

Table 2-3: Water Quality Design Capture Volume

Water Quality Design Capture Volume (FT^3)	Maximum Allowable Water Quality Ponding Depth (FT)	Required Infiltrating Surface Area (sqft)	Infiltration Basin Area (SQFT)
25,765	2	12,882.5	25,344

Basin Routing calculations are included in Appendix A.

3. Preliminary Onsite Storm Drain Sizing

A Rational Method study was performed to compute 100-yr 1-hr peak flowrates for areas tributary to each proposed storm drain inlet. The results of the study produce 100-year peak flow rates that were then used in hydraulic analyses to determine preliminary pipe sizes for storm events of up to 100-years in magnitude.

In San Bernardino County, the Rational Method peak discharge is derived from the following equation:

$Q = 0.90 \cdot [I - ApFp] \cdot A$

Where…

Q = Peak Flow Rate
I = Intensity (In/Hr) from Figure D-3, 100-yr 1hr rainfall from NOAA Atlas 14, slope of 0.60 and Tc
Tc=Time of Concentration using Figure D-1 from the Hydrology Manual
Ap = pervious area fraction- converted from impervious percentage as shown on Figure C-4 of the Hydrology Manual = 0.1
Fp = infiltration rate for the pervious area in inches/hour – from Figure C-6 using Curve Numbers* from Figure C-3 and soil type from the Web Soil Survey Website identified in the Hydrology Manual = .02
A = Watershed Area (Acres)

The Rational Method analysis was performed for the 100-year storm event. The drainage areas, longest flowpaths, and upstream and downstream elevations can be found on the Proposed Rational Method Hydrology Map EXH-03. The supporting information and data for the analysis are included in Appendix B and the results are summarized in Table 3-1.

Table 3-1:Rational Method Analysis Data and Results

Inlet	Tributary Area (Ac)	Time of Concentration (Min)	Rainfall Intensity (In/Hr)	Pervious Fraction Ap	Pervious Area Loss Rate Fp (In/Hr)	100-Yr Peak Flow (cfs)
1A	0.481	7.8	6.70	0.1	0.02	2.90
2A	0.058	5.4	8.40	0.1	0.02	0.44
3A	0.275	7.2	7.00	0.1	0.02	1.73
4A	0.455	8	6.60	0.1	0.02	2.70
5A	0.059	5.4	8.40	0.1	0.02	0.45
6A	0.078	4.1	10.00	0.1	0.02	0.70
7A	0.028	2.7	15.50	0.1	0.02	0.39
8A	0.188	4	10.00	0.1	0.02	1.69
9A	1.625	9	6.15	0.1	0.02	8.99
10B	0.280	8	6.60	0.1	0.02	1.66
11B	0.061	5.3	8.50	0.1	0.02	0.47
12B	0.421	7.2	7.00	0.1	0.02	2.65
13B	0.059	5.4	8.40	0.1	0.02	0.45
14B	0.313	7.2	7.00	0.1	0.02	1.97
15B	0.023	5.4	8.40	0.1	0.02	0.18
16B	0.676	9.2	6.05	0.1	0.02	3.68
20C	0.617	6.9	7.20	0.1	0.02	4.00
30D	0.118	5.5	8.30	0.1	0.02	0.88
40E	0.096	5.6	8.20	0.1	0.02	0.71

Hydraulic Analyses were performed to determine preliminary pipe sizes with capacity for storm events of up to 100-years in magnitude using FlowMaster computer software developed by Bentley. FlowMaster can be used to calculate the full flow capacity of a pipe based on pipe diameter, slope, and Manning's Roughness Coefficient. For preliminary sizing purposes, a minimum pipe slope of 0.005 was used, along with a Manning's Roughness Coefficient of 0.010 for PVC pipe. Using the results of the FlowMaster calculations, a table was created with the full flow capacity for typical PVC pipe increments. The table was then used to determine the pipe size required for each pipe segment. The calculations are included in Appendix B.

Table 3-2 and Table 3-3 summarize the results of the hydraulic analysis. Storm Drain line designations can be found on the Proposed Rational Method Hydrology Map EXH-03.

Table 3-2: Full Flow Capacity for Standard PVC Pipe Sizes

Pipe Diameter (in)	Slope %	Manning's Roughness Coefficient	Full Flow Capacity (cfs)
6	0.5	0.010	0.52
8	0.5	0.010	1.11
10	0.5	0.010	2.01
12	0.5	0.010	3.27
14	0.5	0.010	4.94
16	0.5	0.010	7.05
18	0.5	0.010	9.66
20	0.5	0.010	12.79
24	0.5	0.010	20.79

Table 3-3: Preliminary Onsite Storm Drain Sizes

Storm Drain Line	Tributary Inlets	100-Yr Peak Flow (cfs)	Pipe Dia. (in)
IA	1A	2.90	12
2A	2A	0.44	6
2	1A, 2A	3.34	14
3A	3A	1.73	10
3	1A-3A	5.07	16
4A	4A	2.70	12
4	1A- 4A	7.77	18
5A	5A	0.45	6
5	1A-5A	8.22	18
6A	6A	0.70	8
7A	6A, 7A	1.09	8
6	1A-7A	9.31	18
8A	8A	1.69	10
7	1A-8A	11.00	20
9A	9A	8.99	18
8	1A-9A	19.99	24
10B	10B	1.66	10
11B	11B	0.47	6
10	10B, 11B	2.13	12
12B	12B	2.65	12
11	10B-12B	4.78	14
13B	13B	0.45	6
12	10B-13B	5.23	16
14B	14B	1.97	10
13	10B-14B	7.20	18
15B	15B	0.18	6
14	10B-15B	7.38	18
16B	16B	3.68	14
15	10B-16B	11.06	20
20C	20C	4.00	14
30D	30D	0.88	8
40E	40E	0.71	8

4. Conclusion

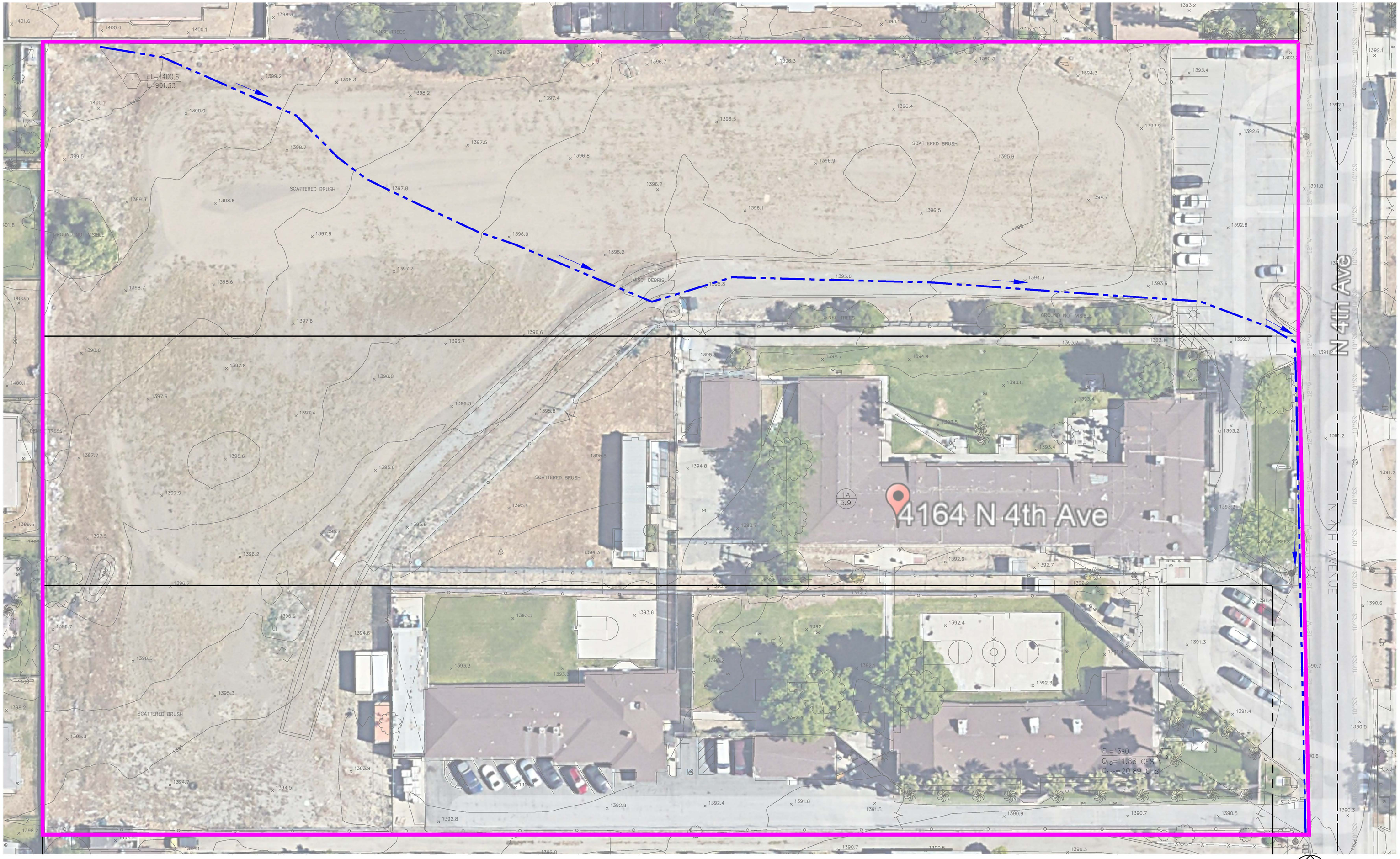
In order to meet the San Bernardino storm drain system policy, the Shandin MHRC must include an infiltration retention facility that is approximately 5 feet deep and has a bottom area of 25,344 sqft. Preliminary sizes have been determined for onsite storm drain pipes that can convey 100-year peak storm flows to the basin for infiltration.

5. Exhibits

Exhibit 1	Existing Condition Small Area Unit Hydrograph Hydrology Map
Exhibit 2	Proposed Condition Small Area Unit Hydrograph Hydrology Map
Exhibit 3	Proposed Condition Rational Method Hydrology Map

LEGEND

1A / 5.9	AREA DESIGNATION AREA (AC)		DRAINAGE AREA BOUNDARY
1	NODE DESIGNATION		FLOWPATH
EL	ELEVATION (FT)		FLOW DIRECTION
L	LENGTH OF FLOWPATH (FT)		
Q_{10}	10-YR STORM EVENT PEAK FLOW (CFS)		
Q_{100}	100-YR STORM EVENT PEAK FLOW (CFS)		



NORTH

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

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AGENCY STAMP

NewGen Health

dsk architects

926 Natoma Street, Suite 200, San Francisco, CA 94103
t: 415.839.6418 / f: 415.839.7584

1539 Sawtelle Blvd, Suite 14, Los Angeles, CA 90025
t: 310.254.2283 / f: 415.839.7584

6700 Koll Center Parkway, Suite 110, Pleasanton, CA 94566
t: 925.484.5245 / f: 925.484.5206

663 Hill Street, San Luis Obispo, CA 93405
t: 805.541.4864 / c: 805.459.0806

:DRAFT, NOT FOR CONSTRUCTION:

CONSULTANT

BKF

REGISTERED PROFESSIONAL ENGINEER
BRUCE W. KIRBY
No. C 42393
CIVIL
STATE OF CALIFORNIA

PROJECT NAME

SHANDIN HILLS MENTAL HEALTH REHABILITATION CENTER (MHRC)

FACILITY INFO
SHANDIN HILLS BEHAVIORAL HEALTH CENTER
4164 N 4TH AVE, SAN BERNARDINO, CA 92407

KEY PLAN

PROJECT NORTH

PROJECT ISSUE DATE: 2022/08/19

DATE	NO.	REVISIONS
08/21/2023		CUP SUBMITTAL

DRAFTER: XX
REVIEWER: RD
PM: KJ
DSK JOB NO: 21025

SHEET TITLE

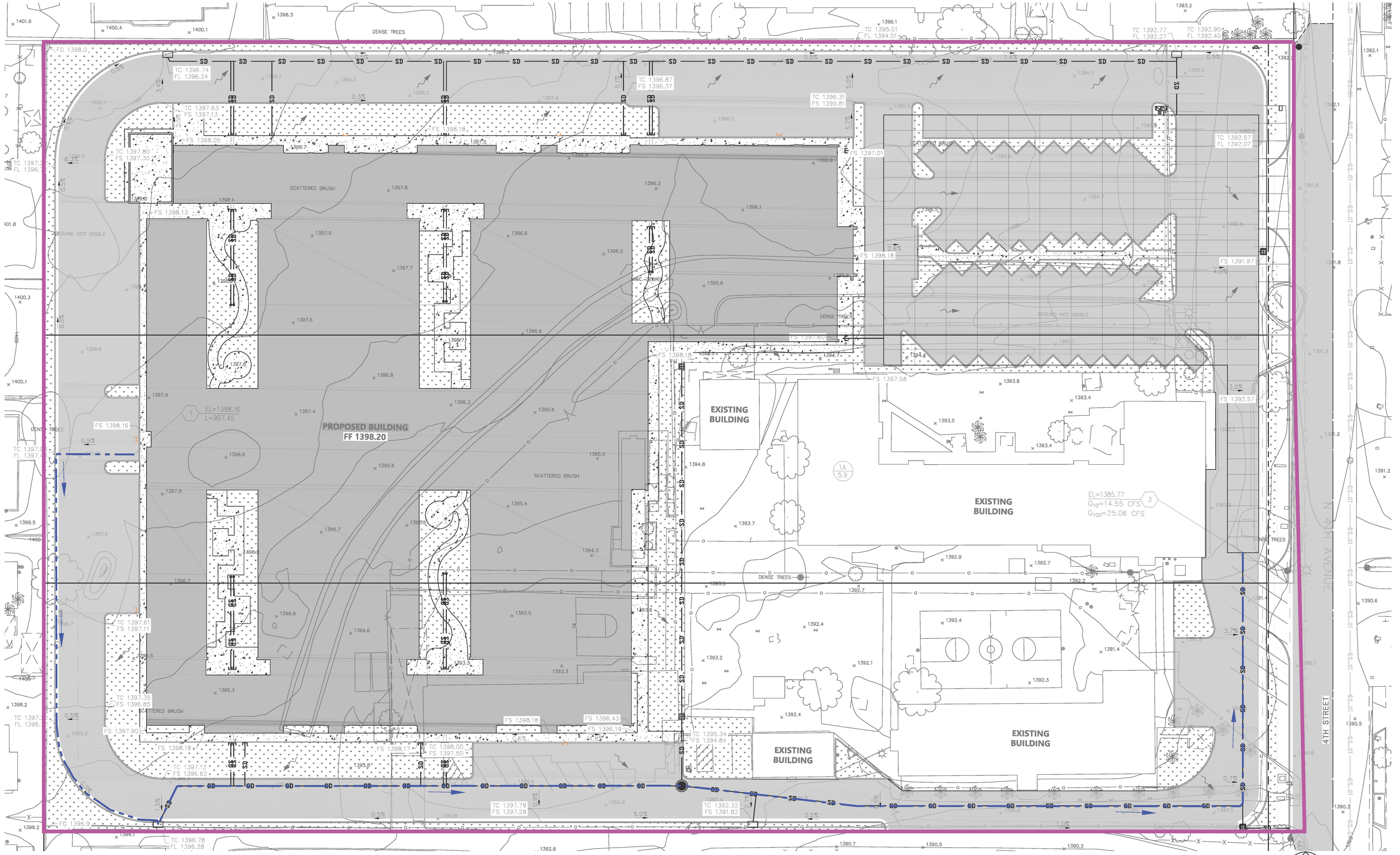
EXISTING CONDITION SMALL AREA UNIT HYDROGRAPH HYDROLOGY MAP

SHEET NUMBER

EXH-01

LEGEND

1A / 5.9	AREA DESIGNATION / AREA (AC)		DRAINAGE AREA BOUNDARY
1	NODE DESIGNATION		FLOWPATH
EL	ELEVATION (FT)		FLOW DIRECTION
L	LENGTH OF FLOWPATH (FT)	SD SD	PROPOSED STORM DRAIN
Q_{10}	10-YR STORM EVENT PEAK FLOW (CFS)		PROPOSED UNDERGROUND WATER QUALITY AND INFILTRATION BASIN
Q_{100}	100-YR STORM EVENT PEAK FLOW (CFS)		



GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

AGENCY STAMP

NewGen Health

dsk architects

926 Natoma Street, Suite 200, San Francisco, CA 94103
t: 415.839.6418 / f: 415.839.7584

1539 Sawtelle Blvd, Suite 14, Los Angeles, CA 90025
t: 310.254.2263 / f: 415.839.7584

6700 Koll Center Parkway, Suite 110, Pleasanton, CA 94566
t: 925.484.5245 / f: 925.484.5206

663 Hill Street, San Luis Obispo, CA 93405
t: 805.541.4864 / c: 805.459.0806

:DRAFT, NOT FOR CONSTRUCTION:

CONSULTANT

BKF

REGISTERED PROFESSIONAL ENGINEER — BRUCE W. KING — No. C 42393 — CIVIL — STATE OF CALIFORNIA

PROJECT NAME

SHANDIN HILLS MENTAL HEALTH REHABILITATION CENTER (MHRC)

FACILITY INFO
SHANDIN HILLS BEHAVIORAL HEALTH CENTER
4164 N 4TH AVE, SAN BERNARDINO, CA 92407

KEY PLAN

PROJECT NORTH

PROJECT ISSUE DATE: 2022/08/19

DATE	NO.	REVISIONS
08/21/2023		CUP SUBMITTAL

DRAFTER: XX — REVIEWER: RD
PM: KJ — DSK JOB NO: 21025

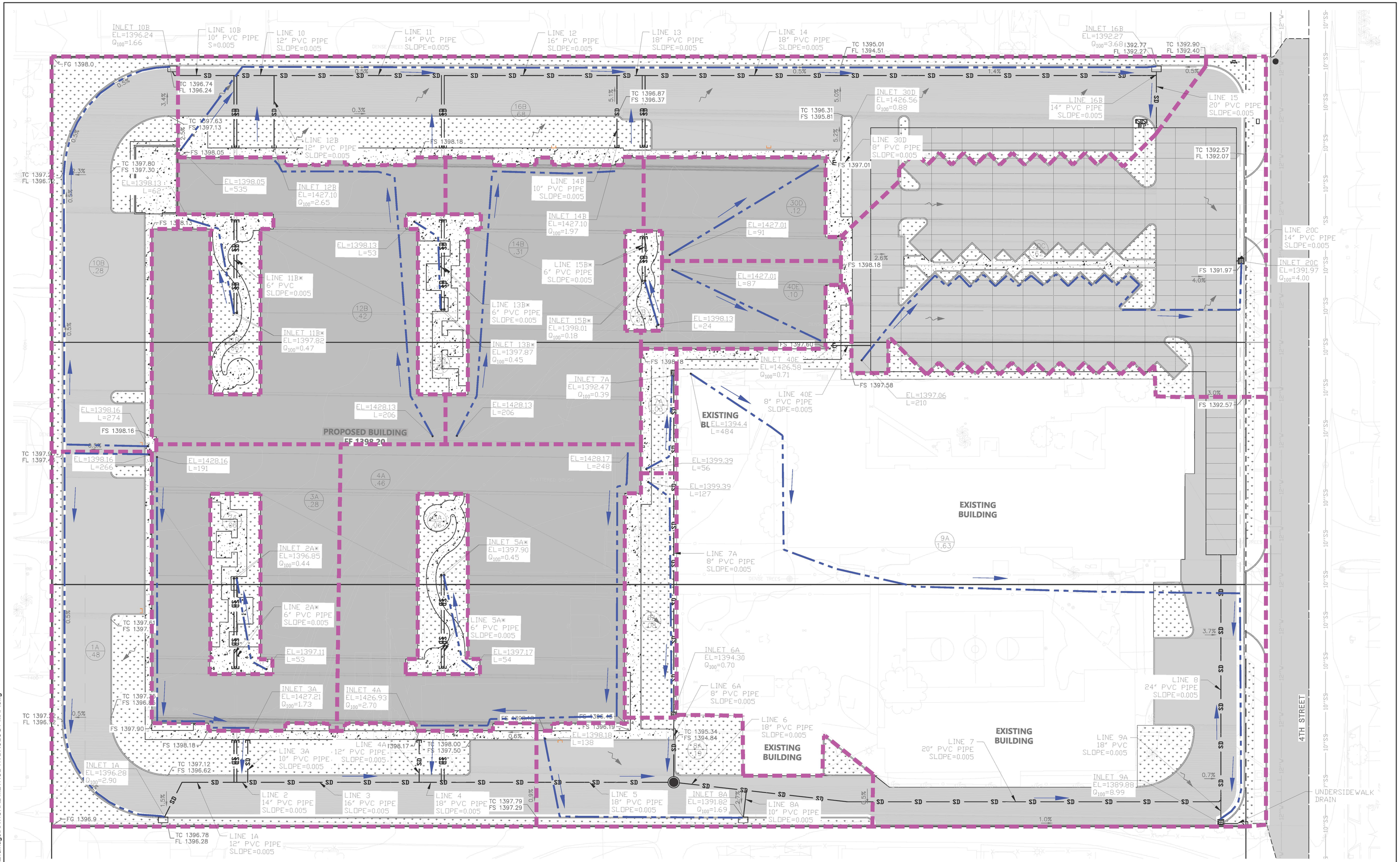
SHEET TITLE

PROPOSED SMALL AREA UNIT HYDROGRAPH HYDROLOGY MAP

SHEET NUMBER

EXH-02

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LEGEND

1A 5.9	AREA DESIGNATION AREA (AC)
EL	ELEVATION (FT)
L	LENGTH OF FLOWPATH (FT)
Q_{100}	100-YR STORM EVENT PEAK FLOW (CFS)
	DRAINAGE AREA BOUNDARY
	FLOWPATH
	FLOW DIRECTION
SD SD	PROPOSED STORM DRAIN
	PROPOSED UNDERGROUND WATER QUALITY AND INFILTRATION BASIN

*NOTE: INLET AND STORM DRAIN DESIGNATIONS 2A, 5A, 11B, 13B, AND 15B INCLUDE BOTH THE MAINLINE AND THE EMERGENCY OVERFLOW FOR THE INTERIOR LANDSCAPED AREAS.

NORTH

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

AGENCY STAMP

NewGen Health

dsk architects
926 Natoma Street, Suite 200, San Francisco, CA 94103
t: 415.839.6418 / f: 415.839.7584
1539 Sawtelle Blvd, Suite 14, Los Angeles, CA 90025
t: 310.254.2263 / f: 415.839.7584
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t: 925.484.5245 / f: 925.484.5206
663 Hill Street, San Luis Obispo, CA 93405
t: 805.541.4864 / c: 805.459.0806

:DRAFT, NOT FOR CONSTRUCTION:

CONSULTANT

BKF

REGISTERED PROFESSIONAL ENGINEER BRUCE W. KING No. C 42393 CIVIL STATE OF CALIFORNIA

PROJECT NAME

SHANDIN HILLS MENTAL HEALTH REHABILITATION CENTER (MHRC)

FACILITY INFO
SHANDIN HILLS BEHAVIORAL HEALTH CENTER
4164 N 4TH AVE, SAN BERNARDINO, CA 92407

KEY PLAN

PROJECT NORTH

PROJECT ISSUE DATE: 2022/08/19

DATE	NO.	REVISIONS
08/21/2023		CUP SUBMITTAL

DRAFTER: XX
REVIEWER: RD
PM: KJ
DSK JOB NO: 21025

SHEET TITLE

PROPOSED RATIONAL METHOD HYDROLOGY MAP

SHEET NUMBER

EXH-03

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6. Technical Appendices

APPENDIX A	Small Area Unit Hydrograph and Basin Routing Calculations
APPENDIX B	Preliminary Onsite Storm Drain Sizing Calculations
APPENDIX C	Geotechnical Report

APPENDIX A: Small Area Unit Hydrograph and Basin Routing Calculations

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent (2)
Natural or Agriculture	0 - 0	0
Public Park	10 - 25	15
School	30 - 50	40
Single Family Residential: (3)		
2.5 acre lots	5 - 15	10
1 acre lots	10 - 25	20
2 dwellings/acre	20 - 40	30
3-4 dwellings/acre	30 - 50	40
5-7 dwellings/acre	35 - 55	50
8-10 dwellings/acre	50 - 70	60
More than 10 dwellings/acre	65 - 90	80
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 - 100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area shall always be made, and a review of aerial photos, where available, may assist in estimating the percentage of impervious cover in developed areas.

3. For typical equestrian subdivisions increase impervious area 5 percent over the values recommended in the table above.

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

ACTUAL IMPERVIOUS COVER FOR DEVELOPED AREAS

Figure C-4

Curve (1) Numbers of Hydrologic Soil-Cover Complexes For Pervious Areas-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparral, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparral, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	71	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent.)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	25	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		77	86	91	94

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

CURVE NUMBERS FOR PERVIOUS AREAS

Figure C-3 (1 of 2)



Map Scale: 1:1,120 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 14, Sep 6, 2022

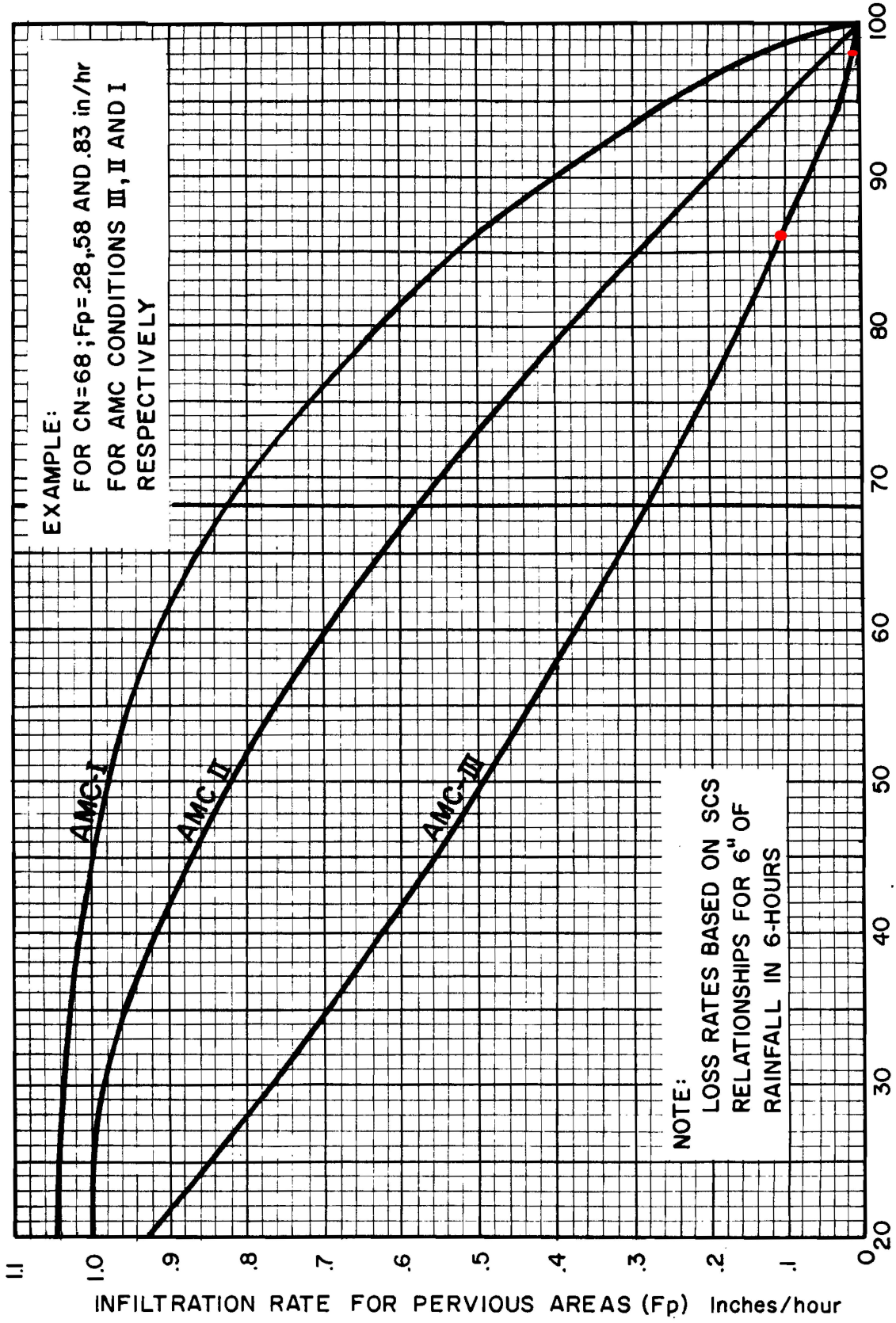
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2022—Jun 12, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
TuB	Tujunga loamy sand, 0 to 5 percent slopes	0.3	4.5%
TvC	Tujunga gravelly loamy sand, 0 to 9 percent slopes	6.0	95.5%
Totals for Area of Interest		**6.3**	**100.0%**



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

INFILTRATION RATE FOR PERVIOUS AREAS VERSUS SCS CURVE NUMBERS

Figure C-6

NOAA Atlas 14, Volume 6, Version 2
Location name: San Bernardino, California, USA*
Latitude: 34.1706°, Longitude: -117.3104°
Elevation: 1393.32 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.136 (0.113-0.165)	0.180 (0.149-0.219)	0.242 (0.200-0.295)	0.296 (0.243-0.364)	0.374 (0.297-0.476)	0.438 (0.340-0.570)	0.507 (0.384-0.677)	0.583 (0.429-0.800)	0.694 (0.489-0.993)	0.786 (0.536-1.17)
10-min	0.194 (0.161-0.236)	0.258 (0.214-0.314)	0.347 (0.287-0.423)	0.424 (0.348-0.521)	0.536 (0.425-0.682)	0.628 (0.488-0.817)	0.727 (0.551-0.970)	0.836 (0.615-1.15)	0.994 (0.702-1.42)	1.13 (0.768-1.67)
15-min	0.235 (0.195-0.285)	0.312 (0.259-0.379)	0.419 (0.347-0.512)	0.513 (0.421-0.631)	0.648 (0.514-0.825)	0.759 (0.590-0.988)	0.879 (0.666-1.17)	1.01 (0.744-1.39)	1.20 (0.848-1.72)	1.36 (0.928-2.02)
30-min	0.349 (0.290-0.424)	0.464 (0.385-0.564)	0.624 (0.516-0.761)	0.762 (0.626-0.938)	0.963 (0.764-1.23)	1.13 (0.877-1.47)	1.31 (0.990-1.74)	1.50 (1.11-2.06)	1.79 (1.26-2.56)	2.03 (1.38-3.01)
60-min	0.525 (0.436-0.638)	0.697 (0.579-0.848)	0.937 (0.776-1.14)	1.15 (0.940-1.41)	1.45 (1.15-1.84)	1.70 (1.32-2.21)	1.97 (1.49-2.62)	2.26 (1.66-3.10)	2.69 (1.90-3.85)	3.05 (2.08-4.52)
2-hr	0.769 (0.639-0.935)	0.987 (0.819-1.20)	1.29 (1.06-1.57)	1.54 (1.26-1.89)	1.90 (1.51-2.42)	2.19 (1.70-2.85)	2.50 (1.89-3.33)	2.83 (2.08-3.88)	3.30 (2.33-4.73)	3.69 (2.51-5.47)
3-hr	0.944 (0.784-1.15)	1.20 (0.993-1.46)	1.54 (1.27-1.88)	1.83 (1.50-2.25)	2.23 (1.77-2.84)	2.55 (1.98-3.32)	2.89 (2.19-3.86)	3.25 (2.40-4.47)	3.76 (2.66-5.39)	4.18 (2.85-6.19)
6-hr	1.35 (1.13-1.64)	1.70 (1.41-2.07)	2.16 (1.79-2.63)	2.54 (2.09-3.13)	3.07 (2.44-3.91)	3.48 (2.70-4.53)	3.91 (2.96-5.22)	4.36 (3.21-5.98)	4.98 (3.51-7.13)	5.47 (3.73-8.12)
12-hr	1.78 (1.48-2.16)	2.25 (1.87-2.74)	2.87 (2.38-3.50)	3.37 (2.77-4.15)	4.06 (3.22-5.17)	4.59 (3.57-5.97)	5.13 (3.89-6.84)	5.69 (4.19-7.80)	6.44 (4.55-9.23)	7.03 (4.79-10.4)
24-hr	2.36 (2.09-2.71)	3.04 (2.69-3.51)	3.93 (3.47-4.55)	4.65 (4.07-5.42)	5.62 (4.76-6.77)	6.36 (5.28-7.83)	7.11 (5.76-8.96)	7.88 (6.21-10.2)	8.91 (6.74-12.0)	9.71 (7.10-13.5)
2-day	2.86 (2.53-3.29)	3.77 (3.34-4.35)	4.96 (4.38-5.74)	5.93 (5.19-6.91)	7.24 (6.13-8.72)	8.24 (6.84-10.1)	9.25 (7.50-11.7)	10.3 (8.11-13.3)	11.7 (8.85-15.8)	12.8 (9.36-17.9)
3-day	3.06 (2.71-3.53)	4.10 (3.63-4.73)	5.47 (4.83-6.33)	6.59 (5.76-7.68)	8.10 (6.87-9.76)	9.27 (7.70-11.4)	10.5 (8.48-13.2)	11.7 (9.22-15.1)	13.4 (10.1-18.0)	14.7 (10.7-20.5)
4-day	3.24 (2.87-3.73)	4.39 (3.88-5.06)	5.90 (5.21-6.83)	7.14 (6.25-8.32)	8.84 (7.48-10.6)	10.1 (8.42-12.5)	11.5 (9.31-14.5)	12.9 (10.2-16.7)	14.8 (11.2-19.9)	16.3 (11.9-22.7)
7-day	3.63 (3.22-4.18)	4.97 (4.40-5.74)	6.76 (5.97-7.82)	8.24 (7.22-9.61)	10.3 (8.72-12.4)	11.9 (9.88-14.6)	13.6 (11.0-17.1)	15.3 (12.1-19.8)	17.7 (13.4-23.9)	19.6 (14.3-27.4)
10-day	4.00 (3.54-4.61)	5.51 (4.87-6.35)	7.54 (6.65-8.72)	9.23 (8.08-10.8)	11.6 (9.82-14.0)	13.5 (11.2-16.6)	15.4 (12.5-19.4)	17.5 (13.8-22.6)	20.3 (15.4-27.4)	22.6 (16.5-31.5)
20-day	5.00 (4.43-5.76)	6.98 (6.17-8.05)	9.66 (8.52-11.2)	11.9 (10.4-13.9)	15.1 (12.8-18.2)	17.6 (14.6-21.7)	20.3 (16.4-25.6)	23.1 (18.2-29.9)	27.1 (20.5-36.5)	30.3 (22.2-42.3)
30-day	5.89 (5.22-6.78)	8.24 (7.29-9.51)	11.4 (10.1-13.2)	14.1 (12.4-16.5)	18.0 (15.2-21.6)	21.0 (17.4-25.8)	24.2 (19.6-30.5)	27.6 (21.8-35.8)	32.5 (24.6-43.8)	36.4 (26.6-50.7)
45-day	7.14 (6.33-8.23)	9.94 (8.79-11.5)	13.8 (12.1-15.9)	17.0 (14.9-19.8)	21.5 (18.2-25.9)	25.2 (20.9-31.0)	29.0 (23.5-36.5)	33.1 (26.1-42.9)	38.9 (29.4-52.4)	43.6 (31.9-60.8)
60-day	8.35 (7.40-9.62)	11.5 (10.2-13.3)	15.8 (13.9-18.3)	19.4 (17.0-22.7)	24.6 (20.8-29.6)	28.7 (23.8-35.3)	33.0 (26.7-41.6)	37.6 (29.6-48.7)	44.1 (33.4-59.5)	49.4 (36.1-68.9)

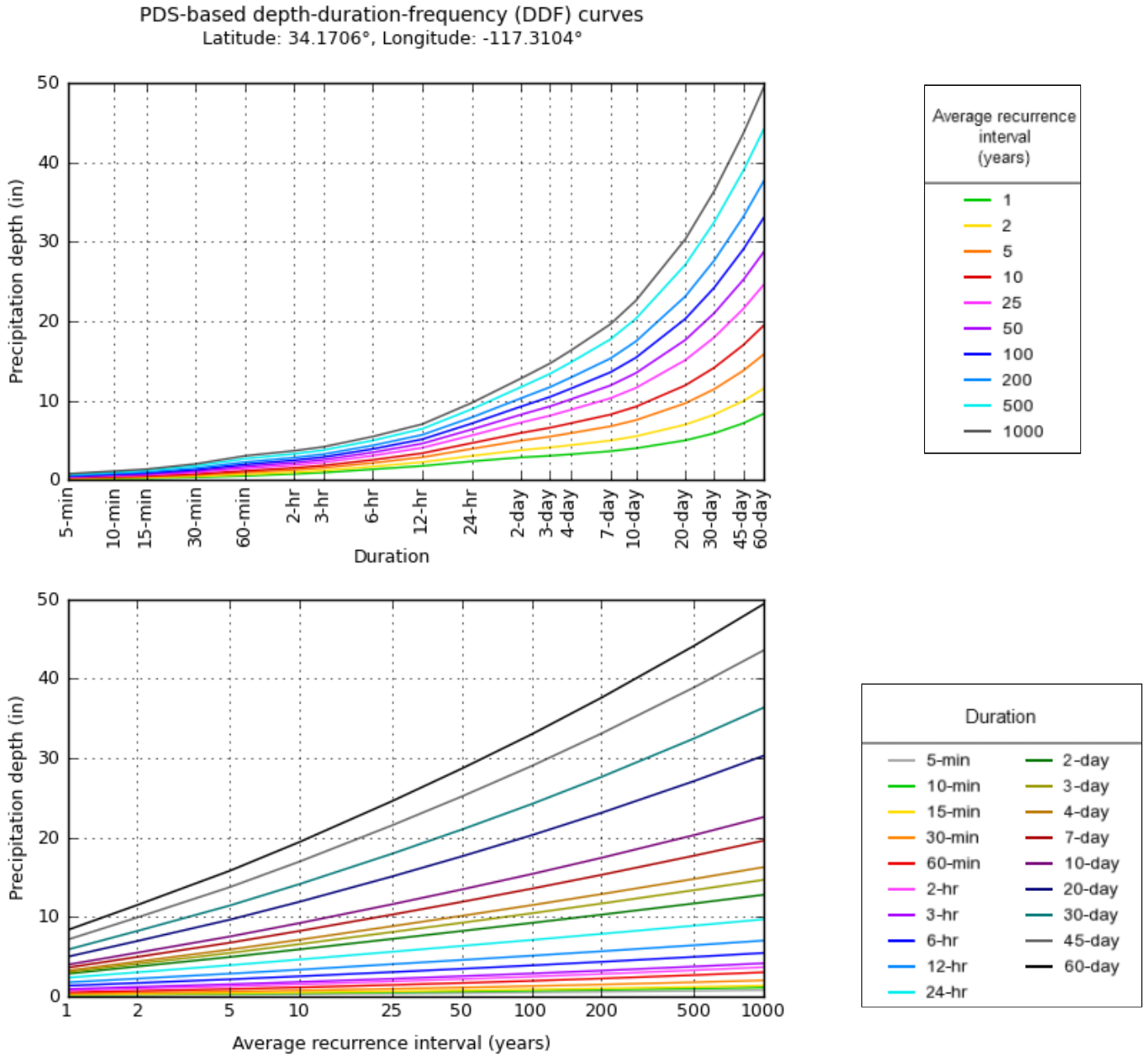
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

Please refer to NOAA Atlas 14 document for more information.

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PF graphical



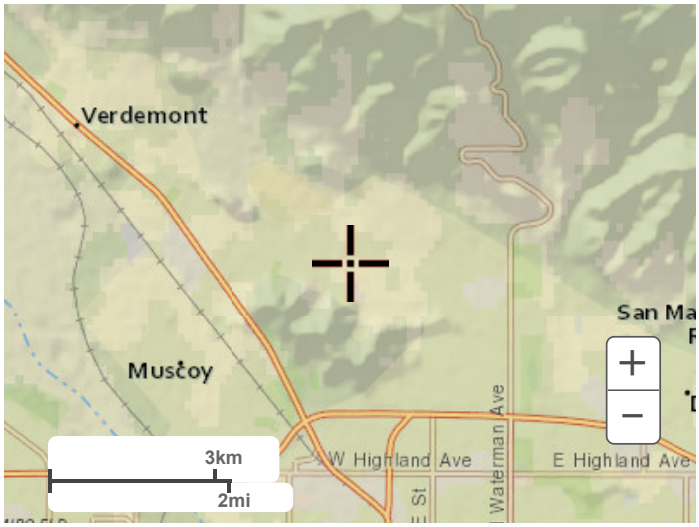
NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Tue Nov 29 21:27:21 2022

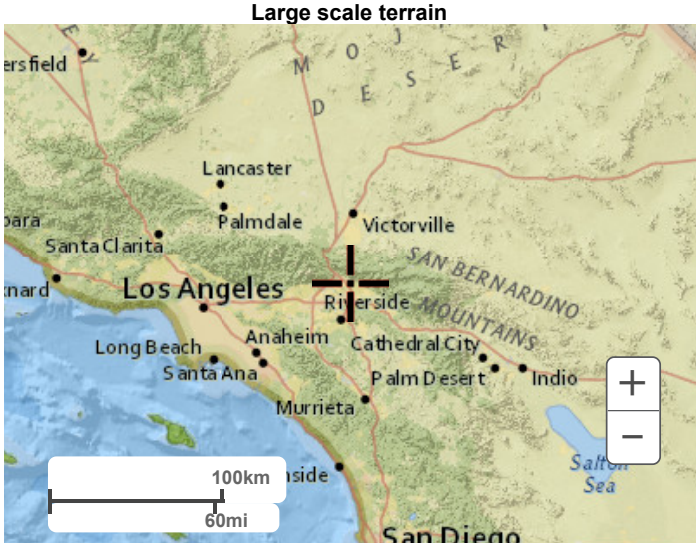
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Maps & aerials

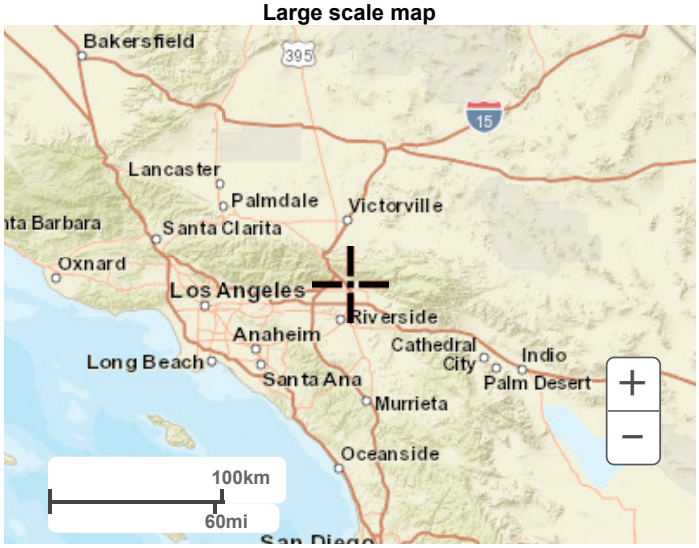
Small scale terrain



Large scale terrain



Large scale map



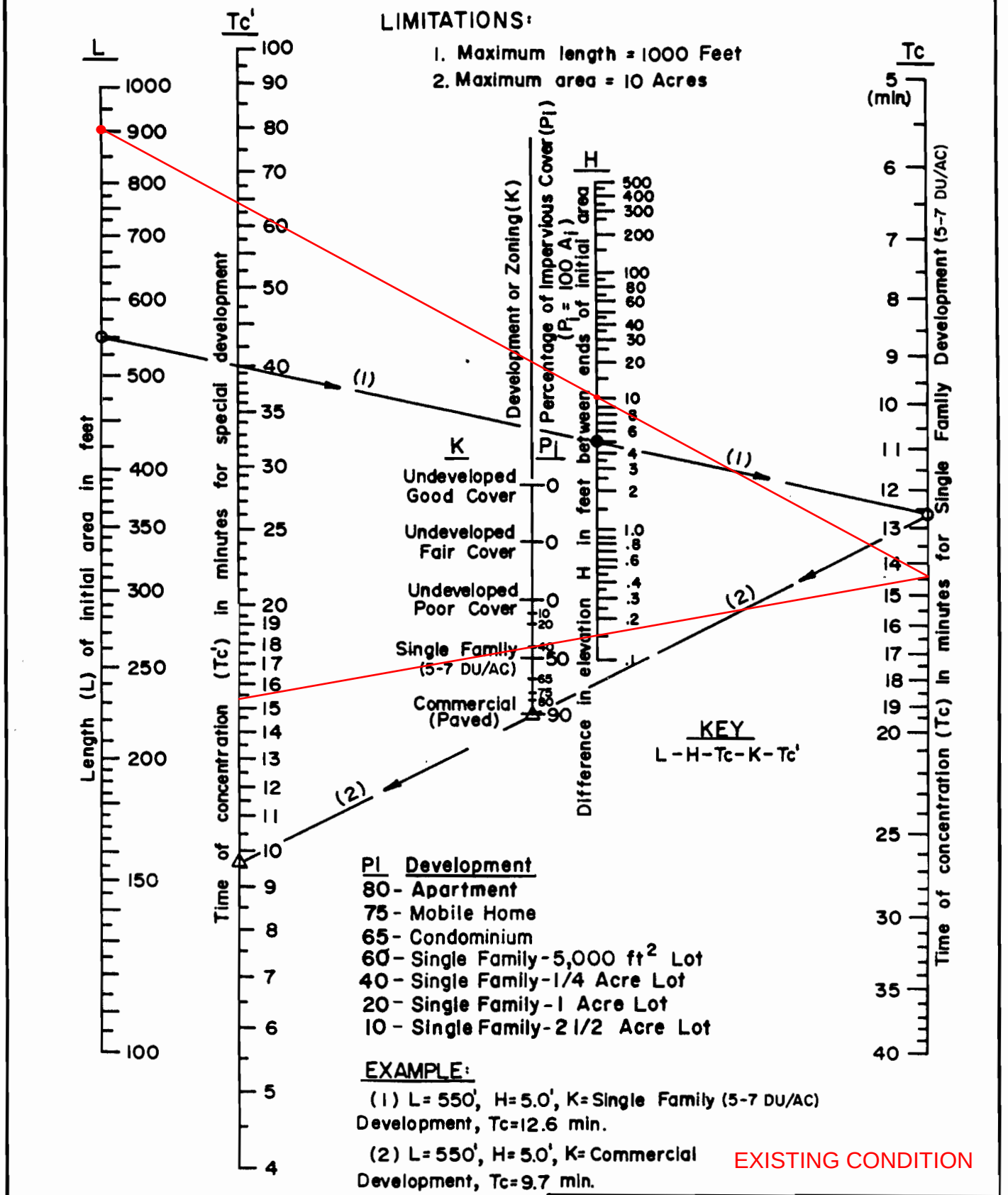
Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

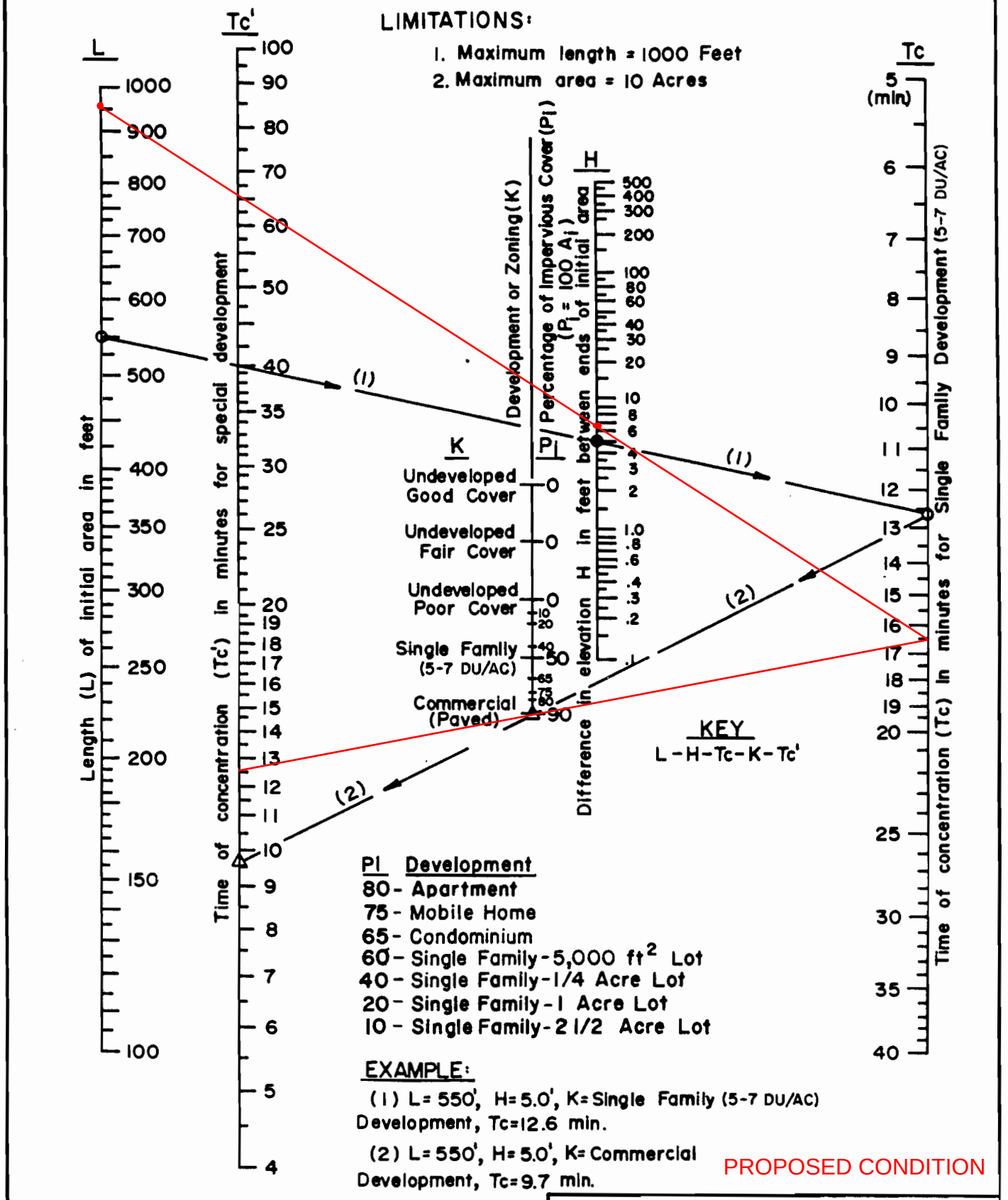
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SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

SAUH CALCULATIONS: EXISTING 2YR

```
**************************************************************************
                     SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
         (C) Copyright 1989-2016 Advanced Engineering Software (aes)
             Ver. 23.0  Release Date: 07/01/2016  License ID 1676

                          Analysis prepared by:




**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  SHANDIN MHRC
  SMALL AREA UNIT HYDROGRAPH
  2 YR EXISTING
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.100
    LOW LOSS FRACTION = 0.239
    TIME OF CONCENTRATION(MIN.) = 15.40
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.18
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.46
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.70
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.20
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.70
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  3.04

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.17
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.33

**************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.09      0.0000      0.00  Q         .         .         .         .
  0.34      0.0026      0.24  Q         .         .         .         .
  0.60      0.0077      0.24  Q         .         .         .         .
  0.86      0.0129      0.25  Q         .         .         .         .
  1.11      0.0182      0.25  Q         .         .         .         .
  1.37      0.0235      0.25  .Q        .         .         .         .
  1.63      0.0288      0.25  .Q        .         .         .         .
  1.88      0.0342      0.26  .Q        .         .         .         .
  2.14      0.0397      0.26  .Q        .         .         .         .
  2.40      0.0452      0.26  .Q        .         .         .         .
  2.65      0.0508      0.26  .Q        .         .         .         .
  2.91      0.0565      0.27  .Q        .         .         .         .
  3.17      0.0622      0.27  .Q        .         .         .         .
```

3.42	0.0679	0.27	.Q	.	.	.	.
3.68	0.0738	0.28	.Q	.	.	.	.
3.94	0.0797	0.28	.Q	.	.	.	.
4.19	0.0857	0.28	.Q	.	.	.	.
4.45	0.0917	0.29	.Q	.	.	.	.
4.71	0.0979	0.29	.Q	.	.	.	.
4.96	0.1041	0.30	.Q	.	.	.	.
5.22	0.1104	0.30	.Q	.	.	.	.
5.48	0.1168	0.30	.Q	.	.	.	.
5.73	0.1233	0.31	.Q	.	.	.	.
5.99	0.1298	0.31	.Q	.	.	.	.
6.25	0.1365	0.32	.Q	.	.	.	.
6.50	0.1433	0.32	.Q	.	.	.	.
6.76	0.1501	0.33	.Q	.	.	.	.
7.02	0.1571	0.33	.Q	.	.	.	.
7.27	0.1642	0.34	.Q	.	.	.	.
7.53	0.1714	0.34	.Q	.	.	.	.
7.79	0.1788	0.35	.Q	.	.	.	.
8.04	0.1862	0.36	.Q	.	.	.	.
8.30	0.1938	0.36	.Q	.	.	.	.
8.56	0.2016	0.37	.Q	.	.	.	.
8.81	0.2095	0.38	.Q	.	.	.	.
9.07	0.2176	0.39	.Q	.	.	.	.
9.33	0.2258	0.39	.Q	.	.	.	.
9.58	0.2342	0.40	.Q	.	.	.	.
9.84	0.2428	0.41	.Q	.	.	.	.
10.10	0.2516	0.42	.Q	.	.	.	.
10.35	0.2606	0.43	.Q	.	.	.	.
10.61	0.2699	0.44	.Q	.	.	.	.
10.87	0.2794	0.45	.Q	.	.	.	.
11.12	0.2892	0.47	.Q	.	.	.	.
11.38	0.2993	0.48	.Q	.	.	.	.
11.64	0.3097	0.50	. Q	.	.	.	.
11.89	0.3204	0.51	. Q	.	.	.	.
12.15	0.3319	0.58	. Q	.	.	.	.
12.41	0.3450	0.66	. Q	.	.	.	.
12.66	0.3593	0.69	. Q	.	.	.	.
12.92	0.3741	0.71	. Q	.	.	.	.
13.18	0.3894	0.74	. Q	.	.	.	.
13.43	0.4055	0.77	. Q	.	.	.	.
13.69	0.4223	0.82	. Q	.	.	.	.
13.95	0.4399	0.85	. Q	.	.	.	.
14.20	0.4586	0.91	. Q	.	.	.	.
14.46	0.4782	0.95	. Q	.	.	.	.
14.72	0.4994	1.05	. Q	.	.	.	.
14.97	0.5225	1.12	. Q	.	.	.	.
15.23	0.5483	1.31	. Q	.	.	.	.
15.49	0.5776	1.45	. Q	.	.	.	.
15.74	0.6179	2.34	. Q.	.	.	.	.
16.00	0.6720	2.77	. .Q	.	.	.	.
16.26	0.7753	6.97	. .	.	.	Q	.
16.51	0.8695	1.91	. Q	.	.	.	.
16.77	0.9026	1.21	. Q	.	.	.	.
17.03	0.9259	0.99	. Q	.	.	.	.
17.28	0.9458	0.88	. Q	.	.	.	.
17.54	0.9635	0.79	. Q	.	.	.	.
17.80	0.9796	0.72	. Q	.	.	.	.
18.05	0.9944	0.67	. Q	.	.	.	.
18.31	1.0071	0.52	. Q	.	.	.	.
18.57	1.0178	0.49	.Q	.	.	.	.
18.82	1.0279	0.46	.Q	.	.	.	.

19.08	1.0374	0.44	.Q	.	.	.	.
19.34	1.0465	0.42	.Q	.	.	.	.
19.59	1.0551	0.40	.Q	.	.	.	.
19.85	1.0633	0.38	.Q	.	.	.	.
20.11	1.0712	0.37	.Q	.	.	.	.
20.36	1.0788	0.35	.Q	.	.	.	.
20.62	1.0862	0.34	.Q	.	.	.	.
20.88	1.0933	0.33	.Q	.	.	.	.
21.13	1.1001	0.32	.Q	.	.	.	.
21.39	1.1068	0.31	.Q	.	.	.	.
21.65	1.1133	0.30	.Q	.	.	.	.
21.90	1.1196	0.29	.Q	.	.	.	.
22.16	1.1257	0.29	.Q	.	.	.	.
22.42	1.1317	0.28	.Q	.	.	.	.
22.67	1.1375	0.27	.Q	.	.	.	.
22.93	1.1433	0.27	.Q	.	.	.	.
23.19	1.1488	0.26	.Q	.	.	.	.
23.44	1.1543	0.26	.Q	.	.	.	.
23.70	1.1597	0.25	Q	.	.	.	.
23.96	1.1649	0.25	Q	.	.	.	.
24.21	1.1701	0.24	Q	.	.	.	.
24.47	1.1726	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%	1447.6
10%	308.0
20%	77.0
30%	46.2
40%	15.4
50%	15.4
60%	15.4
70%	15.4
80%	15.4
90%	15.4

SAUH CALCULATIONS: PROPOSED 2YR

```
**************************************************************************
                     SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1676

                           Analysis prepared by:




**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  SHANDIN MHRC
  SMALL AREA UNIT HYDROGRAPH
  2 YR PROPOSED
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.002
    LOW LOSS FRACTION = 0.076
    TIME OF CONCENTRATION(MIN.) = 11.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.18
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.46
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.70
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.20
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.70
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  3.04

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.47
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.04

**************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.05      0.0000      0.00  Q         .         .         .         .
  0.23      0.0023      0.30  .Q        .         .         .         .
  0.42      0.0069      0.31  .Q        .         .         .         .
  0.60      0.0116      0.31  .Q        .         .         .         .
  0.78      0.0163      0.31  .Q        .         .         .         .
  0.97      0.0211      0.31  .Q        .         .         .         .
  1.15      0.0258      0.32  .Q        .         .         .         .
  1.33      0.0306      0.32  .Q        .         .         .         .
  1.52      0.0355      0.32  .Q        .         .         .         .
  1.70      0.0404      0.32  .Q        .         .         .         .
  1.88      0.0453      0.33  .Q        .         .         .         .
  2.07      0.0502      0.33  .Q        .         .         .         .
  2.25      0.0552      0.33  .Q        .         .         .         .
```

```
 2.43      0.0603      0.33  .Q        .         .         .         .
 2.62      0.0653      0.34  .Q        .         .         .         .
 2.80      0.0705      0.34  .Q        .         .         .         .
 2.98      0.0756      0.34  .Q        .         .         .         .
 3.17      0.0808      0.34  .Q        .         .         .         .
 3.35      0.0861      0.35  .Q        .         .         .         .
 3.53      0.0914      0.35  .Q        .         .         .         .
 3.72      0.0967      0.35  .Q        .         .         .         .
 3.90      0.1021      0.36  .Q        .         .         .         .
 4.08      0.1075      0.36  .Q        .         .         .         .
 4.27      0.1130      0.36  .Q        .         .         .         .
 4.45      0.1185      0.37  .Q        .         .         .         .
 4.63      0.1241      0.37  .Q        .         .         .         .
 4.82      0.1298      0.37  .Q        .         .         .         .
 5.00      0.1355      0.38  .Q        .         .         .         .
 5.18      0.1412      0.38  .Q        .         .         .         .
 5.37      0.1470      0.38  .Q        .         .         .         .
 5.55      0.1529      0.39  .Q        .         .         .         .
 5.73      0.1588      0.39  .Q        .         .         .         .
 5.92      0.1648      0.40  .Q        .         .         .         .
 6.10      0.1709      0.40  .Q        .         .         .         .
 6.28      0.1770      0.41  .Q        .         .         .         .
 6.47      0.1832      0.41  .Q        .         .         .         .
 6.65      0.1895      0.42  .Q        .         .         .         .
 6.83      0.1958      0.42  .Q        .         .         .         .
 7.02      0.2022      0.43  .Q        .         .         .         .
 7.20      0.2087      0.43  .Q        .         .         .         .
 7.38      0.2153      0.44  .Q        .         .         .         .
 7.57      0.2219      0.44  .Q        .         .         .         .
 7.75      0.2286      0.45  .Q        .         .         .         .
 7.93      0.2355      0.45  .Q        .         .         .         .
 8.12      0.2424      0.46  .Q        .         .         .         .
 8.30      0.2494      0.46  .Q        .         .         .         .
 8.48      0.2565      0.47  .Q        .         .         .         .
 8.67      0.2637      0.48  .Q        .         .         .         .
 8.85      0.2710      0.49  .Q        .         .         .         .
 9.03      0.2785      0.49  .Q        .         .         .         .
 9.22      0.2860      0.50  . Q       .         .         .         .
 9.40      0.2937      0.51  . Q       .         .         .         .
 9.58      0.3014      0.52  . Q       .         .         .         .
 9.77      0.3094      0.53  . Q       .         .         .         .
 9.95      0.3174      0.54  . Q       .         .         .         .
10.13      0.3256      0.54  . Q       .         .         .         .
10.32      0.3339      0.56  . Q       .         .         .         .
10.50      0.3424      0.56  . Q       .         .         .         .
10.68      0.3511      0.58  . Q       .         .         .         .
10.87      0.3599      0.59  . Q       .         .         .         .
11.05      0.3690      0.60  . Q       .         .         .         .
11.23      0.3782      0.61  . Q       .         .         .         .
11.42      0.3876      0.63  . Q       .         .         .         .
11.60      0.3972      0.64  . Q       .         .         .         .
11.78      0.4071      0.66  . Q       .         .         .         .
11.97      0.4172      0.67  . Q       .         .         .         .
12.15      0.4284      0.80  .  Q      .         .         .         .
12.33      0.4409      0.85  .  Q      .         .         .         .
12.52      0.4540      0.88  .  Q      .         .         .         .
12.70      0.4675      0.90  .  Q      .         .         .         .
12.88      0.4813      0.93  .  Q      .         .         .         .
13.07      0.4955      0.95  .  Q      .         .         .         .
13.25      0.5102      0.99  .  Q      .         .         .         .
13.43      0.5253      1.01  .   Q     .         .         .         .
```

```
 13.62      0.5410      1.06  .   Q     .         .         .         .
 13.80      0.5572      1.08  .   Q     .         .         .         .
 13.98      0.5741      1.14  .   Q     .         .         .         .
 14.17      0.5916      1.17  .   Q     .         .         .         .
 14.35      0.6099      1.24  .   Q     .         .         .         .
 14.53      0.6290      1.29  .    Q    .         .         .         .
 14.72      0.6493      1.40  .    Q    .         .         .         .
 14.90      0.6710      1.46  .    Q    .         .         .         .
 15.08      0.6944      1.63  .     Q   .         .         .         .
 15.27      0.7198      1.74  .     Q   .         .         .         .
 15.45      0.7497      2.21  .       Q .         .         .         .
 15.63      0.7863      2.63  .         Q         .         .         .
 15.82      0.8299      3.13  .          . Q      .         .         .
 16.00      0.8833      3.91  .          .    Q    .         .         .
 16.18      0.9799      8.85  .          .         .         .    Q    .
 16.37      1.0691      2.92  .         .Q         .         .         .
 16.55      1.1053      1.87  .       Q  .         .         .         .
 16.73      1.1311      1.54  .     Q    .         .         .         .
 16.92      1.1529      1.34  .    Q     .         .         .         .
 17.10      1.1721      1.20  .   Q      .         .         .         .
 17.28      1.1896      1.11  .   Q      .         .         .         .
 17.47      1.2059      1.03  .   Q      .         .         .         .
 17.65      1.2210      0.97  .  Q       .         .         .         .
 17.83      1.2352      0.91  .  Q       .         .         .         .
 18.02      1.2487      0.87  .  Q       .         .         .         .
 18.20      1.2605      0.69  . Q        .         .         .         .
 18.38      1.2706      0.65  . Q        .         .         .         .
 18.57      1.2802      0.62  . Q        .         .         .         .
 18.75      1.2895      0.60  . Q        .         .         .         .
 18.93      1.2983      0.57  . Q        .         .         .         .
 19.12      1.3068      0.55  . Q        .         .         .         .
 19.30      1.3150      0.53  . Q        .         .         .         .
 19.48      1.3229      0.51  . Q        .         .         .         .
 19.67      1.3306      0.50  .Q         .         .         .         .
 19.85      1.3380      0.48  .Q         .         .         .         .
 20.03      1.3452      0.47  .Q         .         .         .         .
 20.22      1.3522      0.46  .Q         .         .         .         .
 20.40      1.3590      0.44  .Q         .         .         .         .
 20.58      1.3657      0.43  .Q         .         .         .         .
 20.77      1.3722      0.42  .Q         .         .         .         .
 20.95      1.3785      0.41  .Q         .         .         .         .
 21.13      1.3847      0.40  .Q         .         .         .         .
 21.32      1.3908      0.40  .Q         .         .         .         .
 21.50      1.3967      0.39  .Q         .         .         .         .
 21.68      1.4025      0.38  .Q         .         .         .         .
 21.87      1.4082      0.37  .Q         .         .         .         .
 22.05      1.4138      0.37  .Q         .         .         .         .
 22.23      1.4193      0.36  .Q         .         .         .         .
 22.42      1.4247      0.35  .Q         .         .         .         .
 22.60      1.4300      0.35  .Q         .         .         .         .
 22.78      1.4352      0.34  .Q         .         .         .         .
 22.97      1.4403      0.33  .Q         .         .         .         .
 23.15      1.4453      0.33  .Q         .         .         .         .
 23.33      1.4503      0.32  .Q         .         .         .         .
 23.52      1.4552      0.32  .Q         .         .         .         .
 23.70      1.4600      0.31  .Q         .         .         .         .
 23.88      1.4647      0.31  .Q         .         .         .         .
 24.07      1.4694      0.31  .Q         .         .         .         .
 24.25      1.4717      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%	1441.0
10%	319.0
20%	77.0
30%	44.0
40%	22.0
50%	11.0
60%	11.0
70%	11.0
80%	11.0
90%	11.0

SAUH CALCULATIONS: EXISTING 10YR

```
**************************************************************************
                     SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1676

                           Analysis prepared by:




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 Problem Descriptions:
  SHANDIN MHRC
  SMALL AREA UNIT HYDROGRAPH
  10 YR EXISTING
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.100
    LOW LOSS FRACTION = 0.172
    TIME OF CONCENTRATION(MIN.) = 15.40
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.30
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.76
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.15
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.83
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.54
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.65

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.95
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.36

**************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.09      0.0000      0.00  Q         .         .         .         .
  0.34      0.0044      0.42  Q         .         .         .         .
  0.60      0.0134      0.42  Q         .         .         .         .
  0.86      0.0224      0.43  Q         .         .         .         .
  1.11      0.0314      0.43  Q         .         .         .         .
  1.37      0.0406      0.44  Q         .         .         .         .
  1.63      0.0499      0.44  Q         .         .         .         .
  1.88      0.0592      0.44  Q         .         .         .         .
  2.14      0.0687      0.45  Q         .         .         .         .
  2.40      0.0782      0.45  Q         .         .         .         .
  2.65      0.0878      0.46  Q         .         .         .         .
  2.91      0.0976      0.46  Q         .         .         .         .
  3.17      0.1075      0.47  Q         .         .         .         .
```

```
 3.42      0.1174      0.47  Q         .         .         .         .
 3.68      0.1275      0.48  Q         .         .         .         .
 3.94      0.1377      0.48  Q         .         .         .         .
 4.19      0.1480      0.49  Q         .         .         .         .
 4.45      0.1584      0.50  Q         .         .         .         .
 4.71      0.1690      0.50  .Q        .         .         .         .
 4.96      0.1797      0.51  .Q        .         .         .         .
 5.22      0.1906      0.51  .Q        .         .         .         .
 5.48      0.2016      0.52  .Q        .         .         .         .
 5.73      0.2127      0.53  .Q        .         .         .         .
 5.99      0.2240      0.54  .Q        .         .         .         .
 6.25      0.2354      0.54  .Q        .         .         .         .
 6.50      0.2470      0.55  .Q        .         .         .         .
 6.76      0.2588      0.56  .Q        .         .         .         .
 7.02      0.2708      0.57  .Q        .         .         .         .
 7.27      0.2830      0.58  .Q        .         .         .         .
 7.53      0.2953      0.59  .Q        .         .         .         .
 7.79      0.3079      0.60  .Q        .         .         .         .
 8.04      0.3207      0.61  .Q        .         .         .         .
 8.30      0.3337      0.62  .Q        .         .         .         .
 8.56      0.3470      0.63  .Q        .         .         .         .
 8.81      0.3605      0.64  .Q        .         .         .         .
 9.07      0.3743      0.66  .Q        .         .         .         .
 9.33      0.3883      0.67  .Q        .         .         .         .
 9.58      0.4027      0.69  .Q        .         .         .         .
 9.84      0.4174      0.70  .Q        .         .         .         .
10.10      0.4324      0.72  .Q        .         .         .         .
10.35      0.4478      0.73  .Q        .         .         .         .
10.61      0.4635      0.76  .Q        .         .         .         .
10.87      0.4797      0.77  .Q        .         .         .         .
11.12      0.4963      0.80  .Q        .         .         .         .
11.38      0.5134      0.81  .Q        .         .         .         .
11.64      0.5310      0.85  .Q        .         .         .         .
11.89      0.5492      0.87  .Q        .         .         .         .
12.15      0.5683      0.94  .Q        .         .         .         .
12.41      0.5889      1.01  . Q       .         .         .         .
12.66      0.6108      1.06  . Q       .         .         .         .
12.92      0.6335      1.09  . Q       .         .         .         .
13.18      0.6572      1.15  . Q       .         .         .         .
13.43      0.6820      1.19  . Q       .         .         .         .
13.69      0.7080      1.27  . Q       .         .         .         .
13.95      0.7355      1.32  . Q       .         .         .         .
14.20      0.7635      1.33  . Q       .         .         .         .
14.46      0.7920      1.35  . Q       .         .         .         .
14.72      0.8225      1.53  .  Q      .         .         .         .
14.97      0.8562      1.64  .  Q      .         .         .         .
15.23      0.8944      1.97  .  Q      .         .         .         .
15.49      0.9387      2.21  .   Q     .         .         .         .
15.74      1.0076      4.29  .      Q  .         .         .         .
16.00      1.1053      4.92  .       Q.         .         .         .
16.26      1.2830     11.83  .        .         .  Q      .         .
16.51      1.4460      3.54  .     Q   .         .         .         .
16.77      1.5024      1.78  .  Q      .         .         .         .
17.03      1.5365      1.43  . Q       .         .         .         .
17.28      1.5663      1.37  . Q       .         .         .         .
17.54      1.5938      1.23  . Q       .         .         .         .
17.80      1.6187      1.12  . Q       .         .         .         .
18.05      1.6414      1.03  . Q       .         .         .         .
18.31      1.6618      0.89  .Q        .         .         .         .
18.57      1.6800      0.83  .Q        .         .         .         .
18.82      1.6971      0.78  .Q        .         .         .         .
```

19.08	1.7133	0.74	.Q	.	.	.	.
19.34	1.7286	0.71	.Q	.	.	.	.
19.59	1.7433	0.68	.Q	.	.	.	.
19.85	1.7574	0.65	.Q	.	.	.	.
20.11	1.7709	0.62	.Q	.	.	.	.
20.36	1.7839	0.60	.Q	.	.	.	.
20.62	1.7965	0.58	.Q	.	.	.	.
20.88	1.8087	0.56	.Q	.	.	.	.
21.13	1.8205	0.55	.Q	.	.	.	.
21.39	1.8319	0.53	.Q	.	.	.	.
21.65	1.8431	0.52	.Q	.	.	.	.
21.90	1.8539	0.50	.Q	.	.	.	.
22.16	1.8645	0.49	Q	.	.	.	.
22.42	1.8748	0.48	Q	.	.	.	.
22.67	1.8849	0.47	Q	.	.	.	.
22.93	1.8947	0.46	Q	.	.	.	.
23.19	1.9044	0.45	Q	.	.	.	.
23.44	1.9138	0.44	Q	.	.	.	.
23.70	1.9231	0.43	Q	.	.	.	.
23.96	1.9322	0.42	Q	.	.	.	.
24.21	1.9411	0.42	Q	.	.	.	.
24.47	1.9455	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%	1447.6
10%	261.8
20%	61.6
30%	46.2
40%	30.8
50%	15.4
60%	15.4
70%	15.4
80%	15.4
90%	15.4

SAUH CALCULATIONS: PROPOSED 10YR

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**************************************************************************
                     SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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                          Analysis prepared by:




**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  SHANDIN MHRC
  SMALL AREA UNIT HYDROGRAPH
  10 YR PROPSED
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.002
    LOW LOSS FRACTION = 0.051
    TIME OF CONCENTRATION(MIN.) = 11.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.30
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.76
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.15
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.83
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.54
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.65

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.26
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.04

**************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.05      0.0000      0.00  Q         .         .         .         .
  0.23      0.0037      0.49  Q         .         .         .         .
  0.42      0.0112      0.50  Q         .         .         .         .
  0.60      0.0187      0.50  Q         .         .         .         .
  0.78      0.0263      0.50  .Q        .         .         .         .
  0.97      0.0340      0.51  .Q        .         .         .         .
  1.15      0.0417      0.51  .Q        .         .         .         .
  1.33      0.0494      0.51  .Q        .         .         .         .
  1.52      0.0572      0.52  .Q        .         .         .         .
  1.70      0.0651      0.52  .Q        .         .         .         .
  1.88      0.0730      0.53  .Q        .         .         .         .
  2.07      0.0810      0.53  .Q        .         .         .         .
  2.25      0.0890      0.53  .Q        .         .         .         .
```

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 2.43      0.0971      0.54  .Q        .         .         .         .
 2.62      0.1053      0.54  .Q        .         .         .         .
 2.80      0.1135      0.54  .Q        .         .         .         .
 2.98      0.1218      0.55  .Q        .         .         .         .
 3.17      0.1301      0.55  .Q        .         .         .         .
 3.35      0.1386      0.56  .Q        .         .         .         .
 3.53      0.1471      0.56  .Q        .         .         .         .
 3.72      0.1556      0.57  .Q        .         .         .         .
 3.90      0.1643      0.57  .Q        .         .         .         .
 4.08      0.1730      0.58  .Q        .         .         .         .
 4.27      0.1818      0.58  .Q        .         .         .         .
 4.45      0.1906      0.59  .Q        .         .         .         .
 4.63      0.1996      0.59  .Q        .         .         .         .
 4.82      0.2086      0.60  .Q        .         .         .         .
 5.00      0.2177      0.60  .Q        .         .         .         .
 5.18      0.2269      0.61  .Q        .         .         .         .
 5.37      0.2362      0.62  .Q        .         .         .         .
 5.55      0.2456      0.62  .Q        .         .         .         .
 5.73      0.2551      0.63  .Q        .         .         .         .
 5.92      0.2647      0.64  .Q        .         .         .         .
 6.10      0.2743      0.64  .Q        .         .         .         .
 6.28      0.2841      0.65  .Q        .         .         .         .
 6.47      0.2940      0.65  .Q        .         .         .         .
 6.65      0.3040      0.66  .Q        .         .         .         .
 6.83      0.3141      0.67  .Q        .         .         .         .
 7.02      0.3243      0.68  .Q        .         .         .         .
 7.20      0.3346      0.68  .Q        .         .         .         .
 7.38      0.3451      0.70  .Q        .         .         .         .
 7.57      0.3556      0.70  .Q        .         .         .         .
 7.75      0.3663      0.71  .Q        .         .         .         .
 7.93      0.3772      0.72  .Q        .         .         .         .
 8.12      0.3882      0.73  .Q        .         .         .         .
 8.30      0.3993      0.74  .Q        .         .         .         .
 8.48      0.4106      0.75  .Q        .         .         .         .
 8.67      0.4220      0.76  .Q        .         .         .         .
 8.85      0.4336      0.77  .Q        .         .         .         .
 9.03      0.4454      0.78  .Q        .         .         .         .
 9.22      0.4573      0.80  .Q        .         .         .         .
 9.40      0.4694      0.80  .Q        .         .         .         .
 9.58      0.4817      0.82  .Q        .         .         .         .
 9.77      0.4942      0.83  .Q        .         .         .         .
 9.95      0.5069      0.85  .Q        .         .         .         .
10.13      0.5199      0.86  .Q        .         .         .         .
10.32      0.5330      0.88  .Q        .         .         .         .
10.50      0.5464      0.89  .Q        .         .         .         .
10.68      0.5601      0.91  .Q        .         .         .         .
10.87      0.5740      0.92  .Q        .         .         .         .
11.05      0.5882      0.95  .Q        .         .         .         .
11.23      0.6027      0.96  .Q        .         .         .         .
11.42      0.6174      0.99  .Q        .         .         .         .
11.60      0.6326      1.01  . Q       .         .         .         .
11.78      0.6481      1.04  . Q       .         .         .         .
11.97      0.6639      1.05  . Q       .         .         .         .
12.15      0.6807      1.16  . Q       .         .         .         .
12.33      0.6986      1.20  . Q       .         .         .         .
12.52      0.7171      1.25  . Q       .         .         .         .
12.70      0.7362      1.27  . Q       .         .         .         .
12.88      0.7558      1.32  . Q       .         .         .         .
13.07      0.7760      1.35  . Q       .         .         .         .
13.25      0.7969      1.41  . Q       .         .         .         .
13.43      0.8184      1.44  . Q       .         .         .         .
```

13.62	0.8408	1.51	. Q . . . .
13.80	0.8640	1.55	. Q . . . .
13.98	0.8883	1.65	. Q . . . .
14.17	0.9131	1.63	. Q . . . .
14.35	0.9378	1.63	. Q . . . .
14.53	0.9631	1.70	. Q . . . .
14.72	0.9902	1.87	. Q . . . .
14.90	1.0193	1.97	. Q . . . .
15.08	1.0511	2.23	. Q . . . .
15.27	1.0861	2.40	. Q . . . .
15.45	1.1301	3.40	. Q . . . .
15.63	1.1891	4.39	. Q . . . .
15.82	1.2614	5.16	. Q . . .
16.00	1.3492	6.42	. . Q . .
16.18	1.5081	14.55	. . . Q. .
16.37	1.6551	4.86	. Q. . . .
16.55	1.7117	2.61	. Q . . . .
16.73	1.7473	2.09	. Q . . . .
16.92	1.7766	1.78	. Q . . . .
17.10	1.8020	1.57	. Q . . . .
17.28	1.8260	1.60	. Q . . . .
17.47	1.8493	1.47	. Q . . . .
17.65	1.8709	1.38	. Q . . . .
17.83	1.8911	1.29	. Q . . . .
18.02	1.9102	1.22	. Q . . . .
18.20	1.9276	1.07	. Q . . . .
18.38	1.9435	1.02	. Q . . . .
18.57	1.9586	0.98	.Q . . . .
18.75	1.9731	0.94	.Q . . . .
18.93	1.9870	0.90	.Q . . . .
19.12	2.0004	0.87	.Q . . . .
19.30	2.0133	0.84	.Q . . . .
19.48	2.0258	0.81	.Q . . . .
19.67	2.0380	0.79	.Q . . . .
19.85	2.0497	0.77	.Q . . . .
20.03	2.0612	0.74	.Q . . . .
20.22	2.0723	0.72	.Q . . . .
20.40	2.0831	0.71	.Q . . . .
20.58	2.0937	0.69	.Q . . . .
20.77	2.1041	0.67	.Q . . . .
20.95	2.1142	0.66	.Q . . . .
21.13	2.1240	0.64	.Q . . . .
21.32	2.1337	0.63	.Q . . . .
21.50	2.1432	0.62	.Q . . . .
21.68	2.1525	0.61	.Q . . . .
21.87	2.1616	0.60	.Q . . . .
22.05	2.1705	0.59	.Q . . . .
22.23	2.1793	0.58	.Q . . . .
22.42	2.1880	0.57	.Q . . . .
22.60	2.1965	0.56	.Q . . . .
22.78	2.2048	0.55	.Q . . . .
22.97	2.2130	0.54	.Q . . . .
23.15	2.2211	0.53	.Q . . . .
23.33	2.2291	0.52	.Q . . . .
23.52	2.2370	0.52	.Q . . . .
23.70	2.2447	0.51	.Q . . . .
23.88	2.2524	0.50	.Q . . . .
24.07	2.2599	0.49	Q . . . .
24.25	2.2636	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%	1441.0
10%	242.0
20%	66.0
30%	55.0
40%	22.0
50%	11.0
60%	11.0
70%	11.0
80%	11.0
90%	11.0

SAUH CALCULATIONS: EXISTING 25YR

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**************************************************************************
                     SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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                           Analysis prepared by:




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 Problem Descriptions:
  SHANDIN MHRC
  SMALL AREA UNIT HYDROGRAPH
  25 YR EXISTING
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.100
    LOW LOSS FRACTION = 0.148
    TIME OF CONCENTRATION(MIN.) = 15.40
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.37
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.96
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.45
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.23
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.07
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  5.62

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.42
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.37

**************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.09      0.0000      0.00  Q         .         .         .         .
  0.34      0.0055      0.52  .Q        .         .         .         .
  0.60      0.0166      0.52  .Q        .         .         .         .
  0.86      0.0278      0.53  .Q        .         .         .         .
  1.11      0.0391      0.53  .Q        .         .         .         .
  1.37      0.0505      0.54  .Q        .         .         .         .
  1.63      0.0620      0.54  .Q        .         .         .         .
  1.88      0.0736      0.55  .Q        .         .         .         .
  2.14      0.0854      0.56  .Q        .         .         .         .
  2.40      0.0973      0.56  .Q        .         .         .         .
  2.65      0.1092      0.57  .Q        .         .         .         .
  2.91      0.1214      0.58  .Q        .         .         .         .
  3.17      0.1336      0.58  .Q        .         .         .         .
```

3.42	0.1460	0.59	.Q . . . .
3.68	0.1585	0.59	.Q . . . .
3.94	0.1712	0.60	.Q . . . .
4.19	0.1841	0.61	.Q . . . .
4.45	0.1970	0.62	.Q . . . .
4.71	0.2102	0.62	.Q . . . .
4.96	0.2235	0.63	.Q . . . .
5.22	0.2370	0.64	.Q . . . .
5.48	0.2506	0.65	.Q . . . .
5.73	0.2645	0.66	.Q . . . .
5.99	0.2785	0.67	.Q . . . .
6.25	0.2928	0.67	.Q . . . .
6.50	0.3072	0.69	.Q . . . .
6.76	0.3219	0.69	.Q . . . .
7.02	0.3368	0.71	.Q . . . .
7.27	0.3519	0.72	.Q . . . .
7.53	0.3673	0.73	.Q . . . .
7.79	0.3829	0.74	.Q . . . .
8.04	0.3988	0.76	.Q . . . .
8.30	0.4150	0.77	.Q . . . .
8.56	0.4315	0.79	.Q . . . .
8.81	0.4483	0.80	.Q . . . .
9.07	0.4654	0.82	.Q . . . .
9.33	0.4829	0.83	.Q . . . .
9.58	0.5008	0.85	.Q . . . .
9.84	0.5190	0.87	.Q . . . .
10.10	0.5377	0.89	.Q . . . .
10.35	0.5568	0.91	.Q . . . .
10.61	0.5764	0.94	.Q . . . .
10.87	0.5965	0.96	.Q . . . .
11.12	0.6172	0.99	.Q . . . .
11.38	0.6384	1.01	. Q . . . .
11.64	0.6604	1.05	. Q . . . .
11.89	0.6830	1.08	. Q . . . .
12.15	0.7066	1.15	. Q . . . .
12.41	0.7318	1.22	. Q . . . .
12.66	0.7584	1.28	. Q . . . .
12.92	0.7860	1.32	. Q . . . .
13.18	0.8148	1.40	. Q . . . .
13.43	0.8449	1.44	. Q . . . .
13.69	0.8767	1.55	. Q . . . .
13.95	0.9101	1.61	. Q . . . .
14.20	0.9439	1.57	. Q . . . .
14.46	0.9773	1.58	. Q . . . .
14.72	1.0130	1.79	. Q . . . .
14.97	1.0525	1.94	. Q . . . .
15.23	1.0979	2.34	. Q . . . .
15.49	1.1507	2.64	. Q . . . .
15.74	1.2375	5.54	. .Q . . .
16.00	1.3639	6.38	. . Q . . .
16.26	1.5917	15.11	. . . Q .
16.51	1.8003	4.56	. Q. . . .
16.77	1.8711	2.11	. Q . . . .
17.03	1.9112	1.68	. Q . . . .
17.28	1.9468	1.68	. Q . . . .
17.54	1.9804	1.49	. Q . . . .
17.80	2.0106	1.36	. Q . . . .
18.05	2.0383	1.25	. Q . . . .
18.31	2.0633	1.10	. Q . . . .
18.57	2.0859	1.03	. Q . . . .
18.82	2.1072	0.97	.Q . . . .

19.08	2.1273	0.92	.Q	.	.	.	.
19.34	2.1464	0.88	.Q	.	.	.	.
19.59	2.1647	0.84	.Q	.	.	.	.
19.85	2.1822	0.81	.Q	.	.	.	.
20.11	2.1990	0.78	.Q	.	.	.	.
20.36	2.2152	0.75	.Q	.	.	.	.
20.62	2.2308	0.72	.Q	.	.	.	.
20.88	2.2460	0.70	.Q	.	.	.	.
21.13	2.2606	0.68	.Q	.	.	.	.
21.39	2.2749	0.66	.Q	.	.	.	.
21.65	2.2887	0.64	.Q	.	.	.	.
21.90	2.3022	0.63	.Q	.	.	.	.
22.16	2.3153	0.61	.Q	.	.	.	.
22.42	2.3282	0.60	.Q	.	.	.	.
22.67	2.3407	0.58	.Q	.	.	.	.
22.93	2.3530	0.57	.Q	.	.	.	.
23.19	2.3650	0.56	.Q	.	.	.	.
23.44	2.3767	0.55	.Q	.	.	.	.
23.70	2.3882	0.54	.Q	.	.	.	.
23.96	2.3995	0.53	.Q	.	.	.	.
24.21	2.4106	0.52	.Q	.	.	.	.
24.47	2.4161	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%	1447.6
10%	231.0
20%	61.6
30%	61.6
40%	30.8
50%	15.4
60%	15.4
70%	15.4
80%	15.4
90%	15.4

SAUH CALCULATIONS: PROPOSED 25YR

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**************************************************************************
                    SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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                          Analysis prepared by:




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 Problem Descriptions:
  SHANDIN MHRC
  SMALL AREA UNIT HYDROGRAPH
  25 YR PROPOSED
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.002
    LOW LOSS FRACTION = 0.042
    TIME OF CONCENTRATION(MIN.) = 11.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.37
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.96
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.45
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.23
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.07
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  5.62

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.74
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.05

**************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.05      0.0000      0.00  Q         .         .         .         .
  0.23      0.0045      0.60  .Q        .         .         .         .
  0.42      0.0136      0.60  .Q        .         .         .         .
  0.60      0.0228      0.60  .Q        .         .         .         .
  0.78      0.0320      0.61  .Q        .         .         .         .
  0.97      0.0412      0.61  .Q        .         .         .         .
  1.15      0.0506      0.62  .Q        .         .         .         .
  1.33      0.0600      0.62  .Q        .         .         .         .
  1.52      0.0694      0.63  .Q        .         .         .         .
  1.70      0.0790      0.63  .Q        .         .         .         .
  1.88      0.0886      0.64  .Q        .         .         .         .
  2.07      0.0983      0.64  .Q        .         .         .         .
  2.25      0.1080      0.65  .Q        .         .         .         .
```

2.43	0.1178	0.65	.Q	.	.	.	.
2.62	0.1277	0.66	.Q	.	.	.	.
2.80	0.1377	0.66	.Q	.	.	.	.
2.98	0.1478	0.67	.Q	.	.	.	.
3.17	0.1579	0.67	.Q	.	.	.	.
3.35	0.1681	0.68	.Q	.	.	.	.
3.53	0.1784	0.68	.Q	.	.	.	.
3.72	0.1888	0.69	.Q	.	.	.	.
3.90	0.1993	0.69	.Q	.	.	.	.
4.08	0.2099	0.70	.Q	.	.	.	.
4.27	0.2205	0.71	.Q	.	.	.	.
4.45	0.2313	0.71	.Q	.	.	.	.
4.63	0.2421	0.72	.Q	.	.	.	.
4.82	0.2531	0.73	.Q	.	.	.	.
5.00	0.2641	0.73	.Q	.	.	.	.
5.18	0.2753	0.74	.Q	.	.	.	.
5.37	0.2866	0.75	.Q	.	.	.	.
5.55	0.2979	0.76	.Q	.	.	.	.
5.73	0.3094	0.76	.Q	.	.	.	.
5.92	0.3210	0.77	.Q	.	.	.	.
6.10	0.3327	0.78	.Q	.	.	.	.
6.28	0.3446	0.79	.Q	.	.	.	.
6.47	0.3566	0.79	.Q	.	.	.	.
6.65	0.3687	0.80	.Q	.	.	.	.
6.83	0.3809	0.81	.Q	.	.	.	.
7.02	0.3933	0.82	.Q	.	.	.	.
7.20	0.4058	0.83	.Q	.	.	.	.
7.38	0.4185	0.84	.Q	.	.	.	.
7.57	0.4313	0.85	.Q	.	.	.	.
7.75	0.4443	0.86	.Q	.	.	.	.
7.93	0.4574	0.87	.Q	.	.	.	.
8.12	0.4707	0.89	.Q	.	.	.	.
8.30	0.4842	0.89	.Q	.	.	.	.
8.48	0.4979	0.91	.Q	.	.	.	.
8.67	0.5117	0.92	.Q	.	.	.	.
8.85	0.5258	0.94	.Q	.	.	.	.
9.03	0.5400	0.95	.Q	.	.	.	.
9.22	0.5545	0.96	.Q	.	.	.	.
9.40	0.5692	0.97	.Q	.	.	.	.
9.58	0.5841	0.99	.Q	.	.	.	.
9.77	0.5993	1.01	. Q	.	.	.	.
9.95	0.6147	1.03	. Q	.	.	.	.
10.13	0.6303	1.04	. Q	.	.	.	.
10.32	0.6463	1.06	. Q	.	.	.	.
10.50	0.6625	1.08	. Q	.	.	.	.
10.68	0.6790	1.10	. Q	.	.	.	.
10.87	0.6959	1.12	. Q	.	.	.	.
11.05	0.7131	1.15	. Q	.	.	.	.
11.23	0.7306	1.17	. Q	.	.	.	.
11.42	0.7485	1.20	. Q	.	.	.	.
11.60	0.7668	1.22	. Q	.	.	.	.
11.78	0.7856	1.26	. Q	.	.	.	.
11.97	0.8048	1.28	. Q	.	.	.	.
12.15	0.8249	1.38	. Q	.	.	.	.
12.33	0.8461	1.42	. Q	.	.	.	.
12.52	0.8680	1.47	. Q	.	.	.	.
12.70	0.8905	1.50	. Q	.	.	.	.
12.88	0.9137	1.56	. Q	.	.	.	.
13.07	0.9376	1.59	. Q	.	.	.	.
13.25	0.9623	1.67	. Q	.	.	.	.
13.43	0.9879	1.71	. Q	.	.	.	.

13.62	1.0144	1.79	. Q . . . .
13.80	1.0420	1.84	. Q . . . .
13.98	1.0708	1.96	. Q . . . .
14.17	1.1000	1.91	. Q . . . .
14.35	1.1285	1.85	. Q . . . .
14.53	1.1572	1.94	. Q . . . .
14.72	1.1881	2.14	. Q . . . .
14.90	1.2214	2.26	. Q . . . .
15.08	1.2580	2.57	. Q . . . .
15.27	1.2985	2.78	. Q . . . .
15.45	1.3508	4.14	. Q . . . .
15.63	1.4239	5.51	. .Q . . . .
15.82	1.5149	6.52	. . Q . . . .
16.00	1.6258	8.12	. . Q . . . .
16.18	1.8267	18.39	. . . . Q .
16.37	2.0123	6.11	. . Q . . . .
16.55	2.0815	3.03	. Q . . . .
16.73	2.1226	2.40	. Q . . . .
16.92	2.1562	2.03	. Q . . . .
17.10	2.1851	1.78	. Q . . . .
17.28	2.2129	1.90	. Q . . . .
17.47	2.2406	1.75	. Q . . . .
17.65	2.2661	1.63	. Q . . . .
17.83	2.2901	1.53	. Q . . . .
18.02	2.3126	1.45	. Q . . . .
18.20	2.3334	1.30	. Q . . . .
18.38	2.3526	1.24	. Q . . . .
18.57	2.3710	1.18	. Q . . . .
18.75	2.3885	1.13	. Q . . . .
18.93	2.4054	1.09	. Q . . . .
19.12	2.4216	1.05	. Q . . . .
19.30	2.4373	1.02	. Q . . . .
19.48	2.4524	0.98	.Q . . . .
19.67	2.4671	0.95	.Q . . . .
19.85	2.4814	0.93	.Q . . . .
20.03	2.4952	0.90	.Q . . . .
20.22	2.5087	0.88	.Q . . . .
20.40	2.5219	0.86	.Q . . . .
20.58	2.5347	0.84	.Q . . . .
20.77	2.5472	0.82	.Q . . . .
20.95	2.5594	0.80	.Q . . . .
21.13	2.5714	0.78	.Q . . . .
21.32	2.5832	0.77	.Q . . . .
21.50	2.5946	0.75	.Q . . . .
21.68	2.6059	0.74	.Q . . . .
21.87	2.6170	0.72	.Q . . . .
22.05	2.6278	0.71	.Q . . . .
22.23	2.6385	0.70	.Q . . . .
22.42	2.6490	0.69	.Q . . . .
22.60	2.6593	0.67	.Q . . . .
22.78	2.6694	0.66	.Q . . . .
22.97	2.6794	0.65	.Q . . . .
23.15	2.6892	0.64	.Q . . . .
23.33	2.6989	0.63	.Q . . . .
23.52	2.7084	0.62	.Q . . . .
23.70	2.7178	0.62	.Q . . . .
23.88	2.7271	0.61	.Q . . . .
24.07	2.7362	0.60	.Q . . . .
24.25	2.7408	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%	1441.0
10%	209.0
20%	66.0
30%	44.0
40%	22.0
50%	11.0
60%	11.0
70%	11.0
80%	11.0
90%	11.0

SAUH CALCULATIONS: EXISTING 100YR

```
**************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                    AND LOW LOSS FRACTION ESTIMATIONS
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1676

                             Analysis prepared by:




**************************************************************************
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 Problem Descriptions:
  SHANDIN MHRC
  SMALL AREA UNIT HYDROGRAPH
  100 YR EXISTING
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.90
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.120
    TIME OF CONCENTRATION(MIN.) = 15.40
    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) =  0.51
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  1.31
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.97
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.91
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  7.11

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     3.16
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.33

**************************************************************************
  TIME     VOLUME       Q    0.        7.5      15.0      22.5      30.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.09      0.0000      0.00  Q         .         .         .         .
  0.34      0.0071      0.67  Q         .         .         .         .
  0.60      0.0213      0.67  Q         .         .         .         .
  0.86      0.0356      0.68  Q         .         .         .         .
  1.11      0.0501      0.68  Q         .         .         .         .
  1.37      0.0647      0.69  Q         .         .         .         .
  1.63      0.0795      0.70  Q         .         .         .         .
  1.88      0.0944      0.71  Q         .         .         .         .
  2.14      0.1094      0.71  Q         .         .         .         .
  2.40      0.1247      0.72  Q         .         .         .         .
  2.65      0.1400      0.73  Q         .         .         .         .
  2.91      0.1556      0.74  Q         .         .         .         .
  3.17      0.1713      0.74  Q         .         .         .         .
  3.42      0.1872      0.75  .Q        .         .         .         .
  3.68      0.2033      0.76  .Q        .         .         .         .
  3.94      0.2195      0.77  .Q        .         .         .         .
  4.19      0.2360      0.78  .Q        .         .         .         .
  4.45      0.2527      0.79  .Q        .         .         .         .
  4.71      0.2695      0.80  .Q        .         .         .         .
  4.96      0.2866      0.81  .Q        .         .         .         .
```

```
 5.22     0.3039     0.82  .Q       .        .        .        .
 5.48     0.3215     0.83  .Q       .        .        .        .
 5.73     0.3392     0.84  .Q       .        .        .        .
 5.99     0.3573     0.86  .Q       .        .        .        .
 6.25     0.3756     0.87  .Q       .        .        .        .
 6.50     0.3941     0.88  .Q       .        .        .        .
 6.76     0.4130     0.89  .Q       .        .        .        .
 7.02     0.4321     0.91  .Q       .        .        .        .
 7.27     0.4515     0.92  .Q       .        .        .        .
 7.53     0.4713     0.94  .Q       .        .        .        .
 7.79     0.4914     0.95  .Q       .        .        .        .
 8.04     0.5118     0.98  .Q       .        .        .        .
 8.30     0.5326     0.99  .Q       .        .        .        .
 8.56     0.5538     1.01  .Q       .        .        .        .
 8.81     0.5754     1.03  .Q       .        .        .        .
 9.07     0.5975     1.05  .Q       .        .        .        .
 9.33     0.6200     1.07  .Q       .        .        .        .
 9.58     0.6430     1.10  .Q       .        .        .        .
 9.84     0.6664     1.12  .Q       .        .        .        .
10.10     0.6905     1.15  .Q       .        .        .        .
10.35     0.7151     1.17  .Q       .        .        .        .
10.61     0.7403     1.21  .Q       .        .        .        .
10.87     0.7662     1.23  .Q       .        .        .        .
11.12     0.7929     1.28  .Q       .        .        .        .
11.38     0.8203     1.30  .Q       .        .        .        .
11.64     0.8485     1.36  .Q       .        .        .        .
11.89     0.8776     1.39  .Q       .        .        .        .
12.15     0.9079     1.46  .Q       .        .        .        .
12.41     0.9394     1.51  . Q      .        .        .        .
12.66     0.9722     1.59  . Q      .        .        .        .
12.92     1.0064     1.63  . Q      .        .        .        .
13.18     1.0422     1.74  . Q      .        .        .        .
13.43     1.0796     1.80  . Q      .        .        .        .
13.69     1.1192     1.93  . Q      .        .        .        .
13.95     1.1611     2.02  . Q      .        .        .        .
14.20     1.2027     1.90  . Q      .        .        .        .
14.46     1.2427     1.87  . Q      .        .        .        .
14.72     1.2856     2.18  . Q      .        .        .        .
14.97     1.3339     2.38  .  Q     .        .        .        .
15.23     1.3908     2.98  .  Q     .        .        .        .
15.49     1.4588     3.43  .   Q    .        .        .        .
15.74     1.5799     7.98  .        Q        .        .        .
16.00     1.7617     9.17  .        . Q      .        .        .
16.26     2.0804    20.89  .        .        .     Q  .        .
16.51     2.3720     6.61  .       Q .       .        .        .
16.77     2.4702     2.64  .  Q     .        .        .        .
17.03     2.5195     2.00  . Q      .        .        .        .
17.28     2.5632     2.12  . Q      .        .        .        .
17.54     2.6055     1.86  . Q      .        .        .        .
17.80     2.6431     1.68  . Q      .        .        .        .
18.05     2.6773     1.55  . Q      .        .        .        .
18.31     2.7088     1.42  .Q       .        .        .        .
18.57     2.7380     1.33  .Q       .        .        .        .
18.82     2.7654     1.25  .Q       .        .        .        .
19.08     2.7913     1.19  .Q       .        .        .        .
19.34     2.8160     1.13  .Q       .        .        .        .
19.59     2.8395     1.08  .Q       .        .        .        .
19.85     2.8620     1.04  .Q       .        .        .        .
20.11     2.8836     1.00  .Q       .        .        .        .
20.36     2.9044     0.96  .Q       .        .        .        .
20.62     2.9245     0.93  .Q       .        .        .        .
20.88     2.9439     0.90  .Q       .        .        .        .
21.13     2.9628     0.87  .Q       .        .        .        .
21.39     2.9811     0.85  .Q       .        .        .        .
21.65     2.9989     0.83  .Q       .        .        .        .
21.90     3.0162     0.81  .Q       .        .        .        .
22.16     3.0330     0.79  .Q       .        .        .        .
22.42     3.0495     0.77  .Q       .        .        .        .
22.67     3.0656     0.75  Q        .        .        .        .
```

22.93	3.0813	0.73	Q	.	.	.	.
23.19	3.0967	0.72	Q	.	.	.	.
23.44	3.1117	0.70	Q	.	.	.	.
23.70	3.1265	0.69	Q	.	.	.	.
23.96	3.1410	0.68	Q	.	.	.	.
24.21	3.1552	0.66	Q	.	.	.	.
24.47	3.1623	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%	1447.6
10%	154.0
20%	61.6
30%	61.6
40%	30.8
50%	15.4
60%	15.4
70%	15.4
80%	15.4
90%	15.4

SAUH CALCULATIONS: PROPOSED 100YR

```
**************************************************************************
                     SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1676

                          Analysis prepared by:




**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  SHANDIN MHRC
   SMALL AREA UNIT HYDROGRAPH
  PROPOSED
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.002
    LOW LOSS FRACTION = 0.030
    TIME OF CONCENTRATION(MIN.) = 11.00
    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) =  0.51
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  1.31
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.97
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.91
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  7.11

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     3.47
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.05

**************************************************************************
  TIME     VOLUME       Q    0.        7.5      15.0      22.5      30.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.05      0.0000      0.00  Q         .         .         .         .
  0.23      0.0057      0.75  Q         .         .         .         .
  0.42      0.0171      0.76  .Q        .         .         .         .
  0.60      0.0286      0.76  .Q        .         .         .         .
  0.78      0.0401      0.77  .Q        .         .         .         .
  0.97      0.0518      0.77  .Q        .         .         .         .
  1.15      0.0635      0.78  .Q        .         .         .         .
  1.33      0.0753      0.78  .Q        .         .         .         .
  1.52      0.0872      0.79  .Q        .         .         .         .
  1.70      0.0992      0.79  .Q        .         .         .         .
  1.88      0.1113      0.80  .Q        .         .         .         .
  2.07      0.1234      0.80  .Q        .         .         .         .
  2.25      0.1357      0.81  .Q        .         .         .         .
```

```
 2.43      0.1480      0.82  .Q        .         .         .         .
 2.62      0.1605      0.83  .Q        .         .         .         .
 2.80      0.1730      0.83  .Q        .         .         .         .
 2.98      0.1857      0.84  .Q        .         .         .         .
 3.17      0.1984      0.84  .Q        .         .         .         .
 3.35      0.2112      0.85  .Q        .         .         .         .
 3.53      0.2242      0.86  .Q        .         .         .         .
 3.72      0.2373      0.87  .Q        .         .         .         .
 3.90      0.2504      0.87  .Q        .         .         .         .
 4.08      0.2637      0.88  .Q        .         .         .         .
 4.27      0.2771      0.89  .Q        .         .         .         .
 4.45      0.2906      0.90  .Q        .         .         .         .
 4.63      0.3043      0.90  .Q        .         .         .         .
 4.82      0.3180      0.91  .Q        .         .         .         .
 5.00      0.3319      0.92  .Q        .         .         .         .
 5.18      0.3460      0.93  .Q        .         .         .         .
 5.37      0.3601      0.94  .Q        .         .         .         .
 5.55      0.3744      0.95  .Q        .         .         .         .
 5.73      0.3889      0.96  .Q        .         .         .         .
 5.92      0.4035      0.97  .Q        .         .         .         .
 6.10      0.4182      0.98  .Q        .         .         .         .
 6.28      0.4331      0.99  .Q        .         .         .         .
 6.47      0.4482      1.00  .Q        .         .         .         .
 6.65      0.4634      1.01  .Q        .         .         .         .
 6.83      0.4788      1.02  .Q        .         .         .         .
 7.02      0.4944      1.04  .Q        .         .         .         .
 7.20      0.5102      1.04  .Q        .         .         .         .
 7.38      0.5261      1.06  .Q        .         .         .         .
 7.57      0.5422      1.07  .Q        .         .         .         .
 7.75      0.5586      1.09  .Q        .         .         .         .
 7.93      0.5751      1.10  .Q        .         .         .         .
 8.12      0.5919      1.12  .Q        .         .         .         .
 8.30      0.6088      1.13  .Q        .         .         .         .
 8.48      0.6260      1.15  .Q        .         .         .         .
 8.67      0.6435      1.16  .Q        .         .         .         .
 8.85      0.6612      1.18  .Q        .         .         .         .
 9.03      0.6791      1.19  .Q        .         .         .         .
 9.22      0.6973      1.21  .Q        .         .         .         .
 9.40      0.7158      1.23  .Q        .         .         .         .
 9.58      0.7346      1.25  .Q        .         .         .         .
 9.77      0.7537      1.27  .Q        .         .         .         .
 9.95      0.7731      1.29  .Q        .         .         .         .
10.13      0.7928      1.31  .Q        .         .         .         .
10.32      0.8129      1.34  .Q        .         .         .         .
10.50      0.8334      1.36  .Q        .         .         .         .
10.68      0.8542      1.39  .Q        .         .         .         .
10.87      0.8754      1.41  .Q        .         .         .         .
11.05      0.8971      1.45  .Q        .         .         .         .
11.23      0.9192      1.47  .Q        .         .         .         .
11.42      0.9418      1.51  . Q       .         .         .         .
11.60      0.9649      1.54  . Q       .         .         .         .
11.78      0.9886      1.59  . Q       .         .         .         .
11.97      1.0128      1.61  . Q       .         .         .         .
12.15      1.0377      1.68  . Q       .         .         .         .
12.33      1.0635      1.72  . Q       .         .         .         .
12.52      1.0899      1.78  . Q       .         .         .         .
12.70      1.1172      1.82  . Q       .         .         .         .
12.88      1.1453      1.89  . Q       .         .         .         .
13.07      1.1743      1.93  . Q       .         .         .         .
13.25      1.2043      2.03  . Q       .         .         .         .
13.43      1.2354      2.08  . Q       .         .         .         .
```

13.62	1.2677	2.19	. Q . . . .
13.80	1.3014	2.25	. Q . . . .
13.98	1.3366	2.40	. Q . . . .
14.17	1.3721	2.29	. Q . . . .
14.35	1.4058	2.15	. Q . . . .
14.53	1.4392	2.25	. Q . . . .
14.72	1.4752	2.50	. Q . . . .
14.90	1.5143	2.66	. Q . . . .
15.08	1.5576	3.05	. Q . . . .
15.27	1.6058	3.31	. Q . . . .
15.45	1.6714	5.34	. Q . . . .
15.63	1.7684	7.46	. Q. . . .
15.82	1.8920	8.85	. .Q . . .
16.00	2.0426	11.03	. . Q . . .
16.18	2.3160	25.06	. . . . Q .
16.37	2.5686	8.29	. .Q . . .
16.55	2.6589	3.64	. Q . . . .
16.73	2.7080	2.84	. Q . . . .
16.92	2.7474	2.37	. Q . . . .
17.10	2.7810	2.06	. Q . . . .
17.28	2.8142	2.32	. Q . . . .
17.47	2.8479	2.13	. Q . . . .
17.65	2.8791	1.98	. Q . . . .
17.83	2.9081	1.85	. Q . . . .
18.02	2.9354	1.75	. Q . . . .
18.20	2.9610	1.64	. Q . . . .
18.38	2.9853	1.56	. Q . . . .
18.57	3.0084	1.49	.Q . . . .
18.75	3.0305	1.43	.Q . . . .
18.93	3.0517	1.37	.Q . . . .
19.12	3.0722	1.33	.Q . . . .
19.30	3.0919	1.28	.Q . . . .
19.48	3.1110	1.24	.Q . . . .
19.67	3.1295	1.20	.Q . . . .
19.85	3.1475	1.17	.Q . . . .
20.03	3.1649	1.14	.Q . . . .
20.22	3.1819	1.11	.Q . . . .
20.40	3.1985	1.08	.Q . . . .
20.58	3.2146	1.05	.Q . . . .
20.77	3.2303	1.03	.Q . . . .
20.95	3.2457	1.01	.Q . . . .
21.13	3.2608	0.98	.Q . . . .
21.32	3.2756	0.96	.Q . . . .
21.50	3.2900	0.94	.Q . . . .
21.68	3.3042	0.93	.Q . . . .
21.87	3.3181	0.91	.Q . . . .
22.05	3.3317	0.89	.Q . . . .
22.23	3.3451	0.88	.Q . . . .
22.42	3.3583	0.86	.Q . . . .
22.60	3.3712	0.85	.Q . . . .
22.78	3.3840	0.83	.Q . . . .
22.97	3.3965	0.82	.Q . . . .
23.15	3.4089	0.81	.Q . . . .
23.33	3.4210	0.80	.Q . . . .
23.52	3.4330	0.79	.Q . . . .
23.70	3.4448	0.77	.Q . . . .
23.88	3.4565	0.76	.Q . . . .
24.07	3.4680	0.75	.Q . . . .
24.25	3.4737	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%	1441.0
10%	121.0
20%	66.0
30%	44.0
40%	22.0
50%	11.0
60%	11.0
70%	11.0
80%	11.0
90%	11.0

INFILTRATION BASIN ROUTING: 2YR

```
**************************************************************************
                     SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1676

                          Analysis prepared by:




**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  SHANDIN MHRC
  INFILTRATION BASIN ROUTING
  2 YR
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.002
    LOW LOSS FRACTION = 0.076
    TIME OF CONCENTRATION(MIN.) = 11.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.18
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.46
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.70
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.20
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.70
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  3.04

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.47
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.04

**************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.05      0.0000      0.00  Q         .         .         .         .
  0.23      0.0023      0.30  .Q        .         .         .         .
  0.42      0.0069      0.31  .Q        .         .         .         .
  0.60      0.0116      0.31  .Q        .         .         .         .
  0.78      0.0163      0.31  .Q        .         .         .         .
  0.97      0.0211      0.31  .Q        .         .         .         .
  1.15      0.0258      0.32  .Q        .         .         .         .
  1.33      0.0306      0.32  .Q        .         .         .         .
  1.52      0.0355      0.32  .Q        .         .         .         .
  1.70      0.0404      0.32  .Q        .         .         .         .
  1.88      0.0453      0.33  .Q        .         .         .         .
  2.07      0.0502      0.33  .Q        .         .         .         .
  2.25      0.0552      0.33  .Q        .         .         .         .
```

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 2.43      0.0603      0.33  .Q        .         .         .         .
 2.62      0.0653      0.34  .Q        .         .         .         .
 2.80      0.0705      0.34  .Q        .         .         .         .
 2.98      0.0756      0.34  .Q        .         .         .         .
 3.17      0.0808      0.34  .Q        .         .         .         .
 3.35      0.0861      0.35  .Q        .         .         .         .
 3.53      0.0914      0.35  .Q        .         .         .         .
 3.72      0.0967      0.35  .Q        .         .         .         .
 3.90      0.1021      0.36  .Q        .         .         .         .
 4.08      0.1075      0.36  .Q        .         .         .         .
 4.27      0.1130      0.36  .Q        .         .         .         .
 4.45      0.1185      0.37  .Q        .         .         .         .
 4.63      0.1241      0.37  .Q        .         .         .         .
 4.82      0.1298      0.37  .Q        .         .         .         .
 5.00      0.1355      0.38  .Q        .         .         .         .
 5.18      0.1412      0.38  .Q        .         .         .         .
 5.37      0.1470      0.38  .Q        .         .         .         .
 5.55      0.1529      0.39  .Q        .         .         .         .
 5.73      0.1588      0.39  .Q        .         .         .         .
 5.92      0.1648      0.40  .Q        .         .         .         .
 6.10      0.1709      0.40  .Q        .         .         .         .
 6.28      0.1770      0.41  .Q        .         .         .         .
 6.47      0.1832      0.41  .Q        .         .         .         .
 6.65      0.1895      0.42  .Q        .         .         .         .
 6.83      0.1958      0.42  .Q        .         .         .         .
 7.02      0.2022      0.43  .Q        .         .         .         .
 7.20      0.2087      0.43  .Q        .         .         .         .
 7.38      0.2153      0.44  .Q        .         .         .         .
 7.57      0.2219      0.44  .Q        .         .         .         .
 7.75      0.2286      0.45  .Q        .         .         .         .
 7.93      0.2355      0.45  .Q        .         .         .         .
 8.12      0.2424      0.46  .Q        .         .         .         .
 8.30      0.2494      0.46  .Q        .         .         .         .
 8.48      0.2565      0.47  .Q        .         .         .         .
 8.67      0.2637      0.48  .Q        .         .         .         .
 8.85      0.2710      0.49  .Q        .         .         .         .
 9.03      0.2785      0.49  .Q        .         .         .         .
 9.22      0.2860      0.50  . Q       .         .         .         .
 9.40      0.2937      0.51  . Q       .         .         .         .
 9.58      0.3014      0.52  . Q       .         .         .         .
 9.77      0.3094      0.53  . Q       .         .         .         .
 9.95      0.3174      0.54  . Q       .         .         .         .
10.13      0.3256      0.54  . Q       .         .         .         .
10.32      0.3339      0.56  . Q       .         .         .         .
10.50      0.3424      0.56  . Q       .         .         .         .
10.68      0.3511      0.58  . Q       .         .         .         .
10.87      0.3599      0.59  . Q       .         .         .         .
11.05      0.3690      0.60  . Q       .         .         .         .
11.23      0.3782      0.61  . Q       .         .         .         .
11.42      0.3876      0.63  . Q       .         .         .         .
11.60      0.3972      0.64  . Q       .         .         .         .
11.78      0.4071      0.66  . Q       .         .         .         .
11.97      0.4172      0.67  . Q       .         .         .         .
12.15      0.4284      0.80  .  Q      .         .         .         .
12.33      0.4409      0.85  .  Q      .         .         .         .
12.52      0.4540      0.88  .  Q      .         .         .         .
12.70      0.4675      0.90  .  Q      .         .         .         .
12.88      0.4813      0.93  .  Q      .         .         .         .
13.07      0.4955      0.95  .  Q      .         .         .         .
13.25      0.5102      0.99  .  Q      .         .         .         .
13.43      0.5253      1.01  .   Q     .         .         .         .
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 13.62      0.5410      1.06  .   Q     .         .         .         .
 13.80      0.5572      1.08  .   Q     .         .         .         .
 13.98      0.5741      1.14  .   Q     .         .         .         .
 14.17      0.5916      1.17  .   Q     .         .         .         .
 14.35      0.6099      1.24  .   Q     .         .         .         .
 14.53      0.6290      1.29  .    Q    .         .         .         .
 14.72      0.6493      1.40  .    Q    .         .         .         .
 14.90      0.6710      1.46  .    Q    .         .         .         .
 15.08      0.6944      1.63  .     Q   .         .         .         .
 15.27      0.7198      1.74  .     Q   .         .         .         .
 15.45      0.7497      2.21  .       Q .         .         .         .
 15.63      0.7863      2.63  .         Q         .         .         .
 15.82      0.8299      3.13  .          . Q      .         .         .
 16.00      0.8833      3.91  .          .    Q    .         .         .
 16.18      0.9799      8.85  .          .         .         .    Q    .
 16.37      1.0691      2.92  .         .Q         .         .         .
 16.55      1.1053      1.87  .       Q  .         .         .         .
 16.73      1.1311      1.54  .     Q    .         .         .         .
 16.92      1.1529      1.34  .    Q     .         .         .         .
 17.10      1.1721      1.20  .   Q      .         .         .         .
 17.28      1.1896      1.11  .   Q      .         .         .         .
 17.47      1.2059      1.03  .   Q      .         .         .         .
 17.65      1.2210      0.97  .  Q       .         .         .         .
 17.83      1.2352      0.91  .  Q       .         .         .         .
 18.02      1.2487      0.87  .  Q       .         .         .         .
 18.20      1.2605      0.69  . Q        .         .         .         .
 18.38      1.2706      0.65  . Q        .         .         .         .
 18.57      1.2802      0.62  . Q        .         .         .         .
 18.75      1.2895      0.60  . Q        .         .         .         .
 18.93      1.2983      0.57  . Q        .         .         .         .
 19.12      1.3068      0.55  . Q        .         .         .         .
 19.30      1.3150      0.53  . Q        .         .         .         .
 19.48      1.3229      0.51  . Q        .         .         .         .
 19.67      1.3306      0.50  .Q         .         .         .         .
 19.85      1.3380      0.48  .Q         .         .         .         .
 20.03      1.3452      0.47  .Q         .         .         .         .
 20.22      1.3522      0.46  .Q         .         .         .         .
 20.40      1.3590      0.44  .Q         .         .         .         .
 20.58      1.3657      0.43  .Q         .         .         .         .
 20.77      1.3722      0.42  .Q         .         .         .         .
 20.95      1.3785      0.41  .Q         .         .         .         .
 21.13      1.3847      0.40  .Q         .         .         .         .
 21.32      1.3908      0.40  .Q         .         .         .         .
 21.50      1.3967      0.39  .Q         .         .         .         .
 21.68      1.4025      0.38  .Q         .         .         .         .
 21.87      1.4082      0.37  .Q         .         .         .         .
 22.05      1.4138      0.37  .Q         .         .         .         .
 22.23      1.4193      0.36  .Q         .         .         .         .
 22.42      1.4247      0.35  .Q         .         .         .         .
 22.60      1.4300      0.35  .Q         .         .         .         .
 22.78      1.4352      0.34  .Q         .         .         .         .
 22.97      1.4403      0.33  .Q         .         .         .         .
 23.15      1.4453      0.33  .Q         .         .         .         .
 23.33      1.4503      0.32  .Q         .         .         .         .
 23.52      1.4552      0.32  .Q         .         .         .         .
 23.70      1.4600      0.31  .Q         .         .         .         .
 23.88      1.4647      0.31  .Q         .         .         .         .
 24.07      1.4694      0.31  .Q         .         .         .         .
 24.25      1.4717      0.00  Q          .         .         .         .
-------------------------------------------------------------------------
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TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

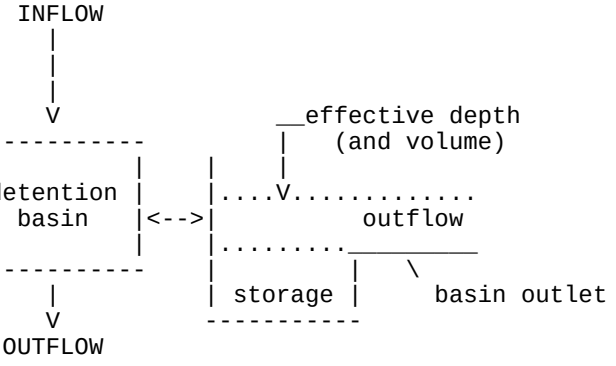
Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1441.0
10%	319.0
20%	77.0
30%	44.0
40%	22.0
50%	11.0
60%	11.0
70%	11.0
80%	11.0
90%	11.0

Problem Descriptions:
SHANDIN MHRC
INFILTRATION BASIN ROUTING
2 YR

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FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 11.000
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 = 20

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	**	BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	*
0.000	0.000	0.000**		0.500	0.239	0.640*	
1.000	0.477	0.640**		1.500	0.716	0.640*	
2.000	0.955	0.640**		2.500	1.193	0.640*	
3.000	1.432	0.640**		3.500	1.670	0.640*	
4.000	1.909	0.640**		4.500	2.148	0.640*	
5.000	2.386	0.640**		5.500	2.625	0.640*	

```
     *      6.000      2.864      0.640**      6.500      1.994      0.340*
     *      7.000      2.148      0.340**      7.500      2.301      0.340*
     *      8.000      2.455      0.340**      8.500      2.608      0.340*
     *      9.000      2.761      0.340**      9.500      2.915      0.340*
-------------------------------------------------------------------------------
     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     0.50       0.23415      0.24385
           3     1.00       0.47215      0.48185
           4     1.50       0.71115      0.72085
           5     2.00       0.95015      0.95985
           6     2.50       1.18815      1.19785
           7     3.00       1.42715      1.43685
           8     3.50       1.66515      1.67485
           9     4.00       1.90415      1.91385
          10     4.50       2.14315      2.15285
          11     5.00       2.38115      2.39085
          12     5.50       2.62015      2.62985
          13     6.00       2.85915      2.86885
          14     6.50       1.99142      1.99658
          15     7.00       2.14542      2.15058
          16     7.50       2.29842      2.30358
          17     8.00       2.45242      2.45758
          18     8.50       2.60542      2.61058
          19     9.00       2.75842      2.76358
          20     9.50       2.91242      2.91758
     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  DEAD-STORAGE  INFLOW  EFFECTIVE  OUTFLOW  EFFECTIVE
       (HRS)   FILLED(AF)    (CFS)  DEPTH(FT)   (CFS)   VOLUME(AF)
-------------------------------------------------------------------------------
       0.050        0.000     0.00      0.00     0.00      0.000
       0.233        0.000     0.30      0.01     0.01      0.005
       0.417        0.000     0.31      0.02     0.02      0.009
       0.600        0.000     0.31      0.03     0.03      0.013
       0.783        0.000     0.31      0.04     0.04      0.017
       0.967        0.000     0.31      0.04     0.05      0.021
       1.150        0.000     0.32      0.05     0.06      0.025
       1.333        0.000     0.32      0.06     0.07      0.029
       1.517        0.000     0.32      0.07     0.08      0.032
       1.700        0.000     0.32      0.08     0.09      0.036
       1.883        0.000     0.33      0.08     0.10      0.039
       2.067        0.000     0.33      0.09     0.11      0.043
       2.250        0.000     0.33      0.10     0.12      0.046
       2.433        0.000     0.33      0.10     0.13      0.049
       2.617        0.000     0.34      0.11     0.14      0.052
       2.800        0.000     0.34      0.12     0.14      0.055
       2.983        0.000     0.34      0.12     0.15      0.058
       3.167        0.000     0.34      0.13     0.16      0.061
       3.350        0.000     0.35      0.13     0.17      0.063
       3.533        0.000     0.35      0.14     0.17      0.066
       3.717        0.000     0.35      0.14     0.18      0.069
       3.900        0.000     0.36      0.15     0.19      0.071
       4.083        0.000     0.36      0.15     0.19      0.074
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4.267	0.000	0.36	0.16	0.20	0.076
4.450	0.000	0.37	0.16	0.21	0.079
4.633	0.000	0.37	0.17	0.21	0.081
4.817	0.000	0.37	0.17	0.22	0.083
5.000	0.000	0.38	0.18	0.23	0.086
5.183	0.000	0.38	0.18	0.23	0.088
5.367	0.000	0.38	0.19	0.24	0.090
5.550	0.000	0.39	0.19	0.24	0.092
5.733	0.000	0.39	0.20	0.25	0.095
5.917	0.000	0.40	0.20	0.26	0.097
6.100	0.000	0.40	0.21	0.26	0.099
6.283	0.000	0.41	0.21	0.27	0.101
6.467	0.000	0.41	0.22	0.27	0.103
6.650	0.000	0.42	0.22	0.28	0.105
6.833	0.000	0.42	0.22	0.28	0.107
7.017	0.000	0.43	0.23	0.29	0.109
7.200	0.000	0.43	0.23	0.30	0.111
7.383	0.000	0.44	0.24	0.30	0.113
7.567	0.000	0.44	0.24	0.31	0.115
7.750	0.000	0.45	0.25	0.31	0.117
7.933	0.000	0.45	0.25	0.32	0.120
8.117	0.000	0.46	0.25	0.32	0.122
8.300	0.000	0.46	0.26	0.33	0.124
8.483	0.000	0.47	0.26	0.33	0.126
8.667	0.000	0.48	0.27	0.34	0.128
8.850	0.000	0.49	0.27	0.35	0.130
9.033	0.000	0.49	0.28	0.35	0.132
9.217	0.000	0.50	0.28	0.36	0.134
9.400	0.000	0.51	0.29	0.36	0.137
9.583	0.000	0.52	0.29	0.37	0.139
9.767	0.000	0.53	0.30	0.37	0.141
9.950	0.000	0.54	0.30	0.38	0.144
10.133	0.000	0.54	0.31	0.39	0.146
10.317	0.000	0.56	0.31	0.39	0.148
10.500	0.000	0.56	0.32	0.40	0.151
10.683	0.000	0.58	0.32	0.41	0.153
10.867	0.000	0.59	0.33	0.41	0.156
11.050	0.000	0.60	0.33	0.42	0.159
11.233	0.000	0.61	0.34	0.43	0.162
11.417	0.000	0.63	0.34	0.44	0.165
11.600	0.000	0.64	0.35	0.44	0.168
11.783	0.000	0.66	0.36	0.45	0.171
11.967	0.000	0.67	0.36	0.46	0.174
12.150	0.000	0.80	0.37	0.47	0.179
12.333	0.000	0.85	0.39	0.49	0.184
12.517	0.000	0.88	0.40	0.50	0.190
12.700	0.000	0.90	0.41	0.52	0.196
12.883	0.000	0.93	0.42	0.53	0.202
13.067	0.000	0.95	0.44	0.55	0.208
13.250	0.000	0.99	0.45	0.57	0.214
13.433	0.000	1.01	0.46	0.58	0.221
13.617	0.000	1.06	0.48	0.60	0.228
13.800	0.000	1.08	0.49	0.62	0.235
13.983	0.000	1.14	0.51	0.63	0.242
14.167	0.000	1.17	0.52	0.64	0.251
14.350	0.000	1.24	0.54	0.64	0.260
14.533	0.000	1.29	0.56	0.64	0.269
14.717	0.000	1.40	0.59	0.64	0.281
14.900	0.000	1.46	0.61	0.64	0.293
15.083	0.000	1.63	0.65	0.64	0.308
15.267	0.000	1.74	0.68	0.64	0.325

15.450	0.000	2.21	0.73	0.64	0.349
15.633	0.000	2.63	0.79	0.64	0.379
15.817	0.000	3.13	0.87	0.64	0.416
16.000	0.000	3.91	0.98	0.64	0.466
16.183	0.000	8.85	1.24	0.64	0.590
16.367	0.000	2.92	1.31	0.64	0.625
16.550	0.000	1.87	1.35	0.64	0.643
16.733	0.000	1.54	1.38	0.64	0.657
16.917	0.000	1.34	1.40	0.64	0.668
17.100	0.000	1.20	1.42	0.64	0.676
17.283	0.000	1.11	1.43	0.64	0.683
17.467	0.000	1.03	1.44	0.64	0.689
17.650	0.000	0.97	1.45	0.64	0.694
17.833	0.000	0.91	1.46	0.64	0.698
18.017	0.000	0.87	1.47	0.64	0.702
18.200	0.000	0.69	1.47	0.64	0.702
18.383	0.000	0.65	1.47	0.64	0.703
18.567	0.000	0.62	1.47	0.64	0.702
18.750	0.000	0.60	1.47	0.64	0.702
18.933	0.000	0.57	1.47	0.64	0.701
19.117	0.000	0.55	1.46	0.64	0.699
19.300	0.000	0.53	1.46	0.64	0.698
19.483	0.000	0.51	1.46	0.64	0.696
19.667	0.000	0.50	1.45	0.64	0.693
19.850	0.000	0.48	1.45	0.64	0.691
20.033	0.000	0.47	1.44	0.64	0.689
20.217	0.000	0.46	1.44	0.64	0.686
20.400	0.000	0.44	1.43	0.64	0.683
20.583	0.000	0.43	1.42	0.64	0.680
20.767	0.000	0.42	1.42	0.64	0.676
20.950	0.000	0.41	1.41	0.64	0.673
21.133	0.000	0.40	1.40	0.64	0.669
21.317	0.000	0.40	1.39	0.64	0.666
21.500	0.000	0.39	1.39	0.64	0.662
21.683	0.000	0.38	1.38	0.64	0.658
21.867	0.000	0.37	1.37	0.64	0.654
22.050	0.000	0.37	1.36	0.64	0.650
22.233	0.000	0.36	1.35	0.64	0.645
22.417	0.000	0.35	1.34	0.64	0.641
22.600	0.000	0.35	1.33	0.64	0.637
22.783	0.000	0.34	1.32	0.64	0.632
22.967	0.000	0.33	1.31	0.64	0.627
23.150	0.000	0.33	1.30	0.64	0.623
23.333	0.000	0.32	1.29	0.64	0.618
23.517	0.000	0.32	1.28	0.64	0.613
23.700	0.000	0.31	1.27	0.64	0.608
23.883	0.000	0.31	1.26	0.64	0.603
24.067	0.000	0.31	1.25	0.64	0.598
24.250	0.000	0.00	1.23	0.64	0.588
24.433	0.000	0.00	1.21	0.64	0.579
24.617	0.000	0.00	1.19	0.64	0.569
24.800	0.000	0.00	1.17	0.64	0.559
24.983	0.000	0.00	1.15	0.64	0.550
25.167	0.000	0.00	1.13	0.64	0.540
25.350	0.000	0.00	1.11	0.64	0.530
25.533	0.000	0.00	1.09	0.64	0.521
25.717	0.000	0.00	1.07	0.64	0.511
25.900	0.000	0.00	1.05	0.64	0.501
26.083	0.000	0.00	1.03	0.64	0.491
26.267	0.000	0.00	1.01	0.64	0.482
26.450	0.000	0.00	0.99	0.64	0.472

26.633	0.000	0.00	0.97	0.64	0.462
26.817	0.000	0.00	0.95	0.64	0.453
27.000	0.000	0.00	0.93	0.64	0.443
27.183	0.000	0.00	0.91	0.64	0.433
27.367	0.000	0.00	0.89	0.64	0.424
27.550	0.000	0.00	0.87	0.64	0.414
27.733	0.000	0.00	0.85	0.64	0.404
27.917	0.000	0.00	0.83	0.64	0.394
28.100	0.000	0.00	0.81	0.64	0.385
28.283	0.000	0.00	0.79	0.64	0.375
28.467	0.000	0.00	0.77	0.64	0.365
28.650	0.000	0.00	0.75	0.64	0.356
28.833	0.000	0.00	0.72	0.64	0.346
29.017	0.000	0.00	0.70	0.64	0.336
29.200	0.000	0.00	0.68	0.64	0.327
29.383	0.000	0.00	0.66	0.64	0.317
29.567	0.000	0.00	0.64	0.64	0.307
29.750	0.000	0.00	0.62	0.64	0.298
29.933	0.000	0.00	0.60	0.64	0.288
30.117	0.000	0.00	0.58	0.64	0.278
30.300	0.000	0.00	0.56	0.64	0.268
30.483	0.000	0.00	0.54	0.64	0.259
30.667	0.000	0.00	0.52	0.64	0.249
30.850	0.000	0.00	0.50	0.64	0.239
31.033	0.000	0.00	0.48	0.63	0.230
31.217	0.000	0.00	0.46	0.60	0.221
31.400	0.000	0.00	0.44	0.58	0.212
31.583	0.000	0.00	0.43	0.56	0.203
31.767	0.000	0.00	0.41	0.53	0.195
31.950	0.000	0.00	0.39	0.51	0.188
32.133	0.000	0.00	0.38	0.49	0.180
32.317	0.000	0.00	0.36	0.47	0.173
32.500	0.000	0.00	0.35	0.45	0.166
32.683	0.000	0.00	0.33	0.44	0.160
32.867	0.000	0.00	0.32	0.42	0.153
33.050	0.000	0.00	0.31	0.40	0.147
33.233	0.000	0.00	0.30	0.39	0.141
33.417	0.000	0.00	0.28	0.37	0.136
33.600	0.000	0.00	0.27	0.36	0.130
33.783	0.000	0.00	0.26	0.34	0.125
33.967	0.000	0.00	0.25	0.33	0.120
34.150	0.000	0.00	0.24	0.32	0.115
34.333	0.000	0.00	0.23	0.30	0.111
34.517	0.000	0.00	0.22	0.29	0.106
34.700	0.000	0.00	0.21	0.28	0.102
34.883	0.000	0.00	0.21	0.27	0.098
35.067	0.000	0.00	0.20	0.26	0.094
35.250	0.000	0.00	0.19	0.25	0.090
35.433	0.000	0.00	0.18	0.24	0.087
35.617	0.000	0.00	0.17	0.23	0.083
35.800	0.000	0.00	0.17	0.22	0.080
35.983	0.000	0.00	0.16	0.21	0.077
36.167	0.000	0.00	0.15	0.20	0.074
36.350	0.000	0.00	0.15	0.19	0.071
36.533	0.000	0.00	0.14	0.19	0.068
36.717	0.000	0.00	0.14	0.18	0.065
36.900	0.000	0.00	0.13	0.17	0.063
37.083	0.000	0.00	0.13	0.16	0.060
37.267	0.000	0.00	0.12	0.16	0.058
37.450	0.000	0.00	0.12	0.15	0.056
37.633	0.000	0.00	0.11	0.15	0.053

37.817	0.000	0.00	0.11	0.14	0.051
38.000	0.000	0.00	0.10	0.13	0.049
38.183	0.000	0.00	0.10	0.13	0.047
38.367	0.000	0.00	0.09	0.12	0.045
38.550	0.000	0.00	0.09	0.12	0.044
38.733	0.000	0.00	0.09	0.11	0.042
38.917	0.000	0.00	0.08	0.11	0.040
39.100	0.000	0.00	0.08	0.11	0.039
39.283	0.000	0.00	0.08	0.10	0.037
39.467	0.000	0.00	0.07	0.10	0.036
39.650	0.000	0.00	0.07	0.09	0.034
39.833	0.000	0.00	0.07	0.09	0.033
40.017	0.000	0.00	0.07	0.09	0.031
40.200	0.000	0.00	0.06	0.08	0.030
40.383	0.000	0.00	0.06	0.08	0.029
40.567	0.000	0.00	0.06	0.08	0.028
40.750	0.000	0.00	0.06	0.07	0.027
40.933	0.000	0.00	0.05	0.07	0.026
41.117	0.000	0.00	0.05	0.07	0.025
41.300	0.000	0.00	0.05	0.06	0.024
41.483	0.000	0.00	0.05	0.06	0.023
41.667	0.000	0.00	0.05	0.06	0.022
41.850	0.000	0.00	0.04	0.06	0.021
42.033	0.000	0.00	0.04	0.06	0.020
42.217	0.000	0.00	0.04	0.05	0.019
42.400	0.000	0.00	0.04	0.05	0.019
42.583	0.000	0.00	0.04	0.05	0.018
42.767	0.000	0.00	0.04	0.05	0.017
42.950	0.000	0.00	0.03	0.04	0.016
43.133	0.000	0.00	0.03	0.04	0.016
43.317	0.000	0.00	0.03	0.04	0.015
43.500	0.000	0.00	0.03	0.04	0.015
43.683	0.000	0.00	0.03	0.04	0.014
43.867	0.000	0.00	0.03	0.04	0.013
44.050	0.000	0.00	0.03	0.04	0.013
44.233	0.000	0.00	0.03	0.03	0.012
44.417	0.000	0.00	0.02	0.03	0.012
44.600	0.000	0.00	0.02	0.03	0.011
44.783	0.000	0.00	0.02	0.03	0.011
44.967	0.000	0.00	0.02	0.03	0.011
45.150	0.000	0.00	0.02	0.03	0.010
45.333	0.000	0.00	0.02	0.03	0.010
45.517	0.000	0.00	0.02	0.03	0.009
45.700	0.000	0.00	0.02	0.02	0.009
45.883	0.000	0.00	0.02	0.02	0.009
46.067	0.000	0.00	0.02	0.02	0.008
46.250	0.000	0.00	0.02	0.02	0.008
46.433	0.000	0.00	0.02	0.02	0.008
46.617	0.000	0.00	0.02	0.02	0.007
46.800	0.000	0.00	0.01	0.02	0.007
46.983	0.000	0.00	0.01	0.02	0.007
47.167	0.000	0.00	0.01	0.02	0.006
47.350	0.000	0.00	0.01	0.02	0.006
47.533	0.000	0.00	0.01	0.02	0.006
47.717	0.000	0.00	0.01	0.02	0.006
47.900	0.000	0.00	0.01	0.02	0.005
48.083	0.000	0.00	0.01	0.01	0.005
48.267	0.000	0.00	0.01	0.01	0.005
48.450	0.000	0.00	0.01	0.01	0.005
48.633	0.000	0.00	0.01	0.01	0.005
48.817	0.000	0.00	0.01	0.01	0.004

49.000	0.000	0.00	0.01	0.01	0.004
49.183	0.000	0.00	0.01	0.01	0.004
49.367	0.000	0.00	0.01	0.01	0.004
49.550	0.000	0.00	0.01	0.01	0.004
49.733	0.000	0.00	0.01	0.01	0.004
49.917	0.000	0.00	0.01	0.01	0.004
50.100	0.000	0.00	0.01	0.01	0.003
50.283	0.000	0.00	0.01	0.01	0.003
50.467	0.000	0.00	0.01	0.01	0.003
50.650	0.000	0.00	0.01	0.01	0.003
50.833	0.000	0.00	0.01	0.01	0.003
51.017	0.000	0.00	0.01	0.01	0.003
51.200	0.000	0.00	0.01	0.01	0.003
51.383	0.000	0.00	0.01	0.01	0.003
51.567	0.000	0.00	0.01	0.01	0.002
51.750	0.000	0.00	0.00	0.01	0.002
51.933	0.000	0.00	0.00	0.01	0.002
52.117	0.000	0.00	0.00	0.01	0.002
52.300	0.000	0.00	0.00	0.01	0.002
52.483	0.000	0.00	0.00	0.01	0.002
52.667	0.000	0.00	0.00	0.01	0.002
52.850	0.000	0.00	0.00	0.01	0.002
53.033	0.000	0.00	0.00	0.00	0.002
53.217	0.000	0.00	0.00	0.00	0.002
53.400	0.000	0.00	0.00	0.00	0.002
53.583	0.000	0.00	0.00	0.00	0.002
53.767	0.000	0.00	0.00	0.00	0.002
53.950	0.000	0.00	0.00	0.00	0.001
54.133	0.000	0.00	0.00	0.00	0.001
54.317	0.000	0.00	0.00	0.00	0.001
54.500	0.000	0.00	0.00	0.00	0.001
54.683	0.000	0.00	0.00	0.00	0.001
54.867	0.000	0.00	0.00	0.00	0.001
55.050	0.000	0.00	0.00	0.00	0.001
55.233	0.000	0.00	0.00	0.00	0.001
55.417	0.000	0.00	0.00	0.00	0.001
55.600	0.000	0.00	0.00	0.00	0.001

INFILTRATION BASIN ROUTING: 10YR

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**************************************************************************
                     SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1676

                          Analysis prepared by:




**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  SHANDIN MHRC
  INFILTRATION BASIN ROUTING
  10 YR
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.002
    LOW LOSS FRACTION = 0.051
    TIME OF CONCENTRATION(MIN.) = 11.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  10
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.30
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.76
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.15
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.83
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.54
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.65

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.26
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.04

**************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.05      0.0000      0.00  Q         .         .         .         .
  0.23      0.0037      0.49  Q         .         .         .         .
  0.42      0.0112      0.50  Q         .         .         .         .
  0.60      0.0187      0.50  Q         .         .         .         .
  0.78      0.0263      0.50  .Q        .         .         .         .
  0.97      0.0340      0.51  .Q        .         .         .         .
  1.15      0.0417      0.51  .Q        .         .         .         .
  1.33      0.0494      0.51  .Q        .         .         .         .
  1.52      0.0572      0.52  .Q        .         .         .         .
  1.70      0.0651      0.52  .Q        .         .         .         .
  1.88      0.0730      0.53  .Q        .         .         .         .
  2.07      0.0810      0.53  .Q        .         .         .         .
  2.25      0.0890      0.53  .Q        .         .         .         .
```

```
 2.43      0.0971      0.54  .Q        .         .         .         .
 2.62      0.1053      0.54  .Q        .         .         .         .
 2.80      0.1135      0.54  .Q        .         .         .         .
 2.98      0.1218      0.55  .Q        .         .         .         .
 3.17      0.1301      0.55  .Q        .         .         .         .
 3.35      0.1386      0.56  .Q        .         .         .         .
 3.53      0.1471      0.56  .Q        .         .         .         .
 3.72      0.1556      0.57  .Q        .         .         .         .
 3.90      0.1643      0.57  .Q        .         .         .         .
 4.08      0.1730      0.58  .Q        .         .         .         .
 4.27      0.1818      0.58  .Q        .         .         .         .
 4.45      0.1906      0.59  .Q        .         .         .         .
 4.63      0.1996      0.59  .Q        .         .         .         .
 4.82      0.2086      0.60  .Q        .         .         .         .
 5.00      0.2177      0.60  .Q        .         .         .         .
 5.18      0.2269      0.61  .Q        .         .         .         .
 5.37      0.2362      0.62  .Q        .         .         .         .
 5.55      0.2456      0.62  .Q        .         .         .         .
 5.73      0.2551      0.63  .Q        .         .         .         .
 5.92      0.2647      0.64  .Q        .         .         .         .
 6.10      0.2743      0.64  .Q        .         .         .         .
 6.28      0.2841      0.65  .Q        .         .         .         .
 6.47      0.2940      0.65  .Q        .         .         .         .
 6.65      0.3040      0.66  .Q        .         .         .         .
 6.83      0.3141      0.67  .Q        .         .         .         .
 7.02      0.3243      0.68  .Q        .         .         .         .
 7.20      0.3346      0.68  .Q        .         .         .         .
 7.38      0.3451      0.70  .Q        .         .         .         .
 7.57      0.3556      0.70  .Q        .         .         .         .
 7.75      0.3663      0.71  .Q        .         .         .         .
 7.93      0.3772      0.72  .Q        .         .         .         .
 8.12      0.3882      0.73  .Q        .         .         .         .
 8.30      0.3993      0.74  .Q        .         .         .         .
 8.48      0.4106      0.75  .Q        .         .         .         .
 8.67      0.4220      0.76  .Q        .         .         .         .
 8.85      0.4336      0.77  .Q        .         .         .         .
 9.03      0.4454      0.78  .Q        .         .         .         .
 9.22      0.4573      0.80  .Q        .         .         .         .
 9.40      0.4694      0.80  .Q        .         .         .         .
 9.58      0.4817      0.82  .Q        .         .         .         .
 9.77      0.4942      0.83  .Q        .         .         .         .
 9.95      0.5069      0.85  .Q        .         .         .         .
10.13      0.5199      0.86  .Q        .         .         .         .
10.32      0.5330      0.88  .Q        .         .         .         .
10.50      0.5464      0.89  .Q        .         .         .         .
10.68      0.5601      0.91  .Q        .         .         .         .
10.87      0.5740      0.92  .Q        .         .         .         .
11.05      0.5882      0.95  .Q        .         .         .         .
11.23      0.6027      0.96  .Q        .         .         .         .
11.42      0.6174      0.99  .Q        .         .         .         .
11.60      0.6326      1.01  . Q       .         .         .         .
11.78      0.6481      1.04  . Q       .         .         .         .
11.97      0.6639      1.05  . Q       .         .         .         .
12.15      0.6807      1.16  . Q       .         .         .         .
12.33      0.6986      1.20  . Q       .         .         .         .
12.52      0.7171      1.25  . Q       .         .         .         .
12.70      0.7362      1.27  . Q       .         .         .         .
12.88      0.7558      1.32  . Q       .         .         .         .
13.07      0.7760      1.35  . Q       .         .         .         .
13.25      0.7969      1.41  . Q       .         .         .         .
13.43      0.8184      1.44  . Q       .         .         .         .
```

13.62	0.8408	1.51	. Q . . . .
13.80	0.8640	1.55	. Q . . . .
13.98	0.8883	1.65	. Q . . . .
14.17	0.9131	1.63	. Q . . . .
14.35	0.9378	1.63	. Q . . . .
14.53	0.9631	1.70	. Q . . . .
14.72	0.9902	1.87	. Q . . . .
14.90	1.0193	1.97	. Q . . . .
15.08	1.0511	2.23	. Q . . . .
15.27	1.0861	2.40	. Q . . . .
15.45	1.1301	3.40	. Q . . . .
15.63	1.1891	4.39	. Q . . . .
15.82	1.2614	5.16	. Q . . .
16.00	1.3492	6.42	. . Q . .
16.18	1.5081	14.55	. . . Q. .
16.37	1.6551	4.86	. Q. . . .
16.55	1.7117	2.61	. Q . . . .
16.73	1.7473	2.09	. Q . . . .
16.92	1.7766	1.78	. Q . . . .
17.10	1.8020	1.57	. Q . . . .
17.28	1.8260	1.60	. Q . . . .
17.47	1.8493	1.47	. Q . . . .
17.65	1.8709	1.38	. Q . . . .
17.83	1.8911	1.29	. Q . . . .
18.02	1.9102	1.22	. Q . . . .
18.20	1.9276	1.07	. Q . . . .
18.38	1.9435	1.02	. Q . . . .
18.57	1.9586	0.98	.Q . . . .
18.75	1.9731	0.94	.Q . . . .
18.93	1.9870	0.90	.Q . . . .
19.12	2.0004	0.87	.Q . . . .
19.30	2.0133	0.84	.Q . . . .
19.48	2.0258	0.81	.Q . . . .
19.67	2.0380	0.79	.Q . . . .
19.85	2.0497	0.77	.Q . . . .
20.03	2.0612	0.74	.Q . . . .
20.22	2.0723	0.72	.Q . . . .
20.40	2.0831	0.71	.Q . . . .
20.58	2.0937	0.69	.Q . . . .
20.77	2.1041	0.67	.Q . . . .
20.95	2.1142	0.66	.Q . . . .
21.13	2.1240	0.64	.Q . . . .
21.32	2.1337	0.63	.Q . . . .
21.50	2.1432	0.62	.Q . . . .
21.68	2.1525	0.61	.Q . . . .
21.87	2.1616	0.60	.Q . . . .
22.05	2.1705	0.59	.Q . . . .
22.23	2.1793	0.58	.Q . . . .
22.42	2.1880	0.57	.Q . . . .
22.60	2.1965	0.56	.Q . . . .
22.78	2.2048	0.55	.Q . . . .
22.97	2.2130	0.54	.Q . . . .
23.15	2.2211	0.53	.Q . . . .
23.33	2.2291	0.52	.Q . . . .
23.52	2.2370	0.52	.Q . . . .
23.70	2.2447	0.51	.Q . . . .
23.88	2.2524	0.50	.Q . . . .
24.07	2.2599	0.49	Q . . . .
24.25	2.2636	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)

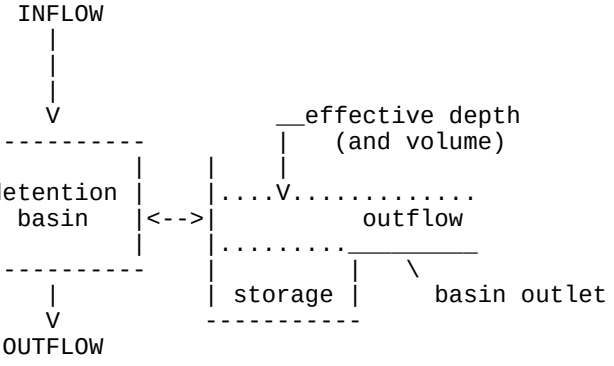
Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1441.0
10%	242.0
20%	66.0
30%	55.0
40%	22.0
50%	11.0
60%	11.0
70%	11.0
80%	11.0
90%	11.0

Problem Descriptions:
SHANDIN MHRC
INFILTRATION BASIN ROUTING
10 YR

==========

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 11.000
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 = 20

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	**	BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	*
0.000	0.000	0.000**		0.500	0.239	0.640*	
1.000	0.477	0.640**		1.500	0.716	0.640*	
2.000	0.955	0.640**		2.500	1.193	0.640*	
3.000	1.432	0.640**		3.500	1.670	0.640*	
4.000	1.909	0.640**		4.500	2.148	0.640*	
5.000	2.386	0.640**		5.500	2.625	0.640*	

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*      6.000      2.864      0.640**      6.500      1.994      0.340*
*      7.000      2.148      0.340**      7.500      2.301      0.340*
*      8.000      2.455      0.340**      8.500      2.608      0.340*
*      9.000      2.761      0.340**      9.500      2.915      0.340*
-------------------------------------------------------------------------------
     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     0.50       0.23415      0.24385
           3     1.00       0.47215      0.48185
           4     1.50       0.71115      0.72085
           5     2.00       0.95015      0.95985
           6     2.50       1.18815      1.19785
           7     3.00       1.42715      1.43685
           8     3.50       1.66515      1.67485
           9     4.00       1.90415      1.91385
          10     4.50       2.14315      2.15285
          11     5.00       2.38115      2.39085
          12     5.50       2.62015      2.62985
          13     6.00       2.85915      2.86885
          14     6.50       1.99142      1.99658
          15     7.00       2.14542      2.15058
          16     7.50       2.29842      2.30358
          17     8.00       2.45242      2.45758
          18     8.50       2.60542      2.61058
          19     9.00       2.75842      2.76358
          20     9.50       2.91242      2.91758
     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  DEAD-STORAGE  INFLOW  EFFECTIVE  OUTFLOW  EFFECTIVE
       (HRS)   FILLED(AF)    (CFS)  DEPTH(FT)   (CFS)   VOLUME(AF)
-------------------------------------------------------------------------------
       0.050        0.000     0.00      0.00     0.00      0.000
       0.233        0.000     0.49      0.02     0.01      0.007
       0.417        0.000     0.50      0.03     0.03      0.014
       0.600        0.000     0.50      0.04     0.05      0.021
       0.783        0.000     0.50      0.06     0.07      0.028
       0.967        0.000     0.51      0.07     0.08      0.034
       1.150        0.000     0.51      0.08     0.10      0.040
       1.333        0.000     0.51      0.10     0.12      0.046
       1.517        0.000     0.52      0.11     0.13      0.052
       1.700        0.000     0.52      0.12     0.15      0.058
       1.883        0.000     0.53      0.13     0.16      0.063
       2.067        0.000     0.53      0.14     0.18      0.069
       2.250        0.000     0.53      0.15     0.19      0.074
       2.433        0.000     0.54      0.17     0.20      0.079
       2.617        0.000     0.54      0.18     0.22      0.084
       2.800        0.000     0.54      0.19     0.23      0.089
       2.983        0.000     0.55      0.20     0.24      0.093
       3.167        0.000     0.55      0.20     0.26      0.098
       3.350        0.000     0.56      0.21     0.27      0.102
       3.533        0.000     0.56      0.22     0.28      0.106
       3.717        0.000     0.57      0.23     0.29      0.111
       3.900        0.000     0.57      0.24     0.30      0.115
       4.083        0.000     0.58      0.25     0.31      0.119
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4.267	0.000	0.58	0.26	0.32	0.123
4.450	0.000	0.59	0.26	0.33	0.127
4.633	0.000	0.59	0.27	0.34	0.130
4.817	0.000	0.60	0.28	0.35	0.134
5.000	0.000	0.60	0.29	0.36	0.138
5.183	0.000	0.61	0.30	0.37	0.141
5.367	0.000	0.62	0.30	0.38	0.145
5.550	0.000	0.62	0.31	0.39	0.148
5.733	0.000	0.63	0.32	0.40	0.152
5.917	0.000	0.64	0.32	0.41	0.155
6.100	0.000	0.64	0.33	0.42	0.158
6.283	0.000	0.65	0.34	0.43	0.162
6.467	0.000	0.65	0.35	0.44	0.165
6.650	0.000	0.66	0.35	0.45	0.168
6.833	0.000	0.67	0.36	0.46	0.172
7.017	0.000	0.68	0.37	0.46	0.175
7.200	0.000	0.68	0.37	0.47	0.178
7.383	0.000	0.70	0.38	0.48	0.181
7.567	0.000	0.70	0.39	0.49	0.185
7.750	0.000	0.71	0.39	0.50	0.188
7.933	0.000	0.72	0.40	0.51	0.191
8.117	0.000	0.73	0.41	0.52	0.194
8.300	0.000	0.74	0.41	0.52	0.197
8.483	0.000	0.75	0.42	0.53	0.201
8.667	0.000	0.76	0.43	0.54	0.204
8.850	0.000	0.77	0.43	0.55	0.207
9.033	0.000	0.78	0.44	0.56	0.211
9.217	0.000	0.80	0.45	0.57	0.214
9.400	0.000	0.80	0.46	0.58	0.218
9.583	0.000	0.82	0.46	0.59	0.221
9.767	0.000	0.83	0.47	0.60	0.225
9.950	0.000	0.85	0.48	0.61	0.228
10.133	0.000	0.86	0.49	0.62	0.232
10.317	0.000	0.88	0.49	0.63	0.236
10.500	0.000	0.89	0.50	0.64	0.240
10.683	0.000	0.91	0.51	0.64	0.244
10.867	0.000	0.92	0.52	0.64	0.248
11.050	0.000	0.95	0.53	0.64	0.253
11.233	0.000	0.96	0.54	0.64	0.258
11.417	0.000	0.99	0.55	0.64	0.263
11.600	0.000	1.01	0.56	0.64	0.269
11.783	0.000	1.04	0.57	0.64	0.275
11.967	0.000	1.05	0.59	0.64	0.281
12.150	0.000	1.16	0.60	0.64	0.289
12.333	0.000	1.20	0.62	0.64	0.297
12.517	0.000	1.25	0.64	0.64	0.306
12.700	0.000	1.27	0.66	0.64	0.316
12.883	0.000	1.32	0.68	0.64	0.326
13.067	0.000	1.35	0.71	0.64	0.337
13.250	0.000	1.41	0.73	0.64	0.349
13.433	0.000	1.44	0.76	0.64	0.361
13.617	0.000	1.51	0.78	0.64	0.374
13.800	0.000	1.55	0.81	0.64	0.388
13.983	0.000	1.65	0.84	0.64	0.403
14.167	0.000	1.63	0.88	0.64	0.418
14.350	0.000	1.63	0.91	0.64	0.433
14.533	0.000	1.70	0.94	0.64	0.449
14.717	0.000	1.87	0.98	0.64	0.468
14.900	0.000	1.97	1.02	0.64	0.488
15.083	0.000	2.23	1.07	0.64	0.512
15.267	0.000	2.40	1.13	0.64	0.539

15.450	0.000	3.40	1.22	0.64	0.581
15.633	0.000	4.39	1.34	0.64	0.637
15.817	0.000	5.16	1.48	0.64	0.706
16.000	0.000	6.42	1.66	0.64	0.793
16.183	0.000	14.55	2.10	0.64	1.004
16.367	0.000	4.86	2.24	0.64	1.068
16.550	0.000	2.61	2.30	0.64	1.098
16.733	0.000	2.09	2.35	0.64	1.120
16.917	0.000	1.78	2.38	0.64	1.137
17.100	0.000	1.57	2.41	0.64	1.151
17.283	0.000	1.60	2.44	0.64	1.166
17.467	0.000	1.47	2.47	0.64	1.178
17.650	0.000	1.38	2.49	0.64	1.190
17.833	0.000	1.29	2.51	0.64	1.200
18.017	0.000	1.22	2.53	0.64	1.208
18.200	0.000	1.07	2.55	0.64	1.215
18.383	0.000	1.02	2.56	0.64	1.221
18.567	0.000	0.98	2.57	0.64	1.226
18.750	0.000	0.94	2.58	0.64	1.230
18.933	0.000	0.90	2.59	0.64	1.234
19.117	0.000	0.87	2.59	0.64	1.238
19.300	0.000	0.84	2.60	0.64	1.241
19.483	0.000	0.81	2.61	0.64	1.243
19.667	0.000	0.79	2.61	0.64	1.246
19.850	0.000	0.77	2.61	0.64	1.247
20.033	0.000	0.74	2.62	0.64	1.249
20.217	0.000	0.72	2.62	0.64	1.250
20.400	0.000	0.71	2.62	0.64	1.251
20.583	0.000	0.69	2.62	0.64	1.252
20.767	0.000	0.67	2.62	0.64	1.253
20.950	0.000	0.66	2.63	0.64	1.253
21.133	0.000	0.64	2.63	0.64	1.253
21.317	0.000	0.63	2.63	0.64	1.253
21.500	0.000	0.62	2.62	0.64	1.253
21.683	0.000	0.61	2.62	0.64	1.252
21.867	0.000	0.60	2.62	0.64	1.251
22.050	0.000	0.59	2.62	0.64	1.251
22.233	0.000	0.58	2.62	0.64	1.250
22.417	0.000	0.57	2.62	0.64	1.248
22.600	0.000	0.56	2.61	0.64	1.247
22.783	0.000	0.55	2.61	0.64	1.246
22.967	0.000	0.54	2.61	0.64	1.244
23.150	0.000	0.53	2.60	0.64	1.243
23.333	0.000	0.52	2.60	0.64	1.241
23.517	0.000	0.52	2.60	0.64	1.239
23.700	0.000	0.51	2.59	0.64	1.237
23.883	0.000	0.50	2.59	0.64	1.235
24.067	0.000	0.49	2.58	0.64	1.233
24.250	0.000	0.00	2.56	0.64	1.223
24.433	0.000	0.00	2.54	0.64	1.213
24.617	0.000	0.00	2.52	0.64	1.203
24.800	0.000	0.00	2.50	0.64	1.194
24.983	0.000	0.00	2.48	0.64	1.184
25.167	0.000	0.00	2.46	0.64	1.174
25.350	0.000	0.00	2.44	0.64	1.165
25.533	0.000	0.00	2.42	0.64	1.155
25.717	0.000	0.00	2.40	0.64	1.145
25.900	0.000	0.00	2.38	0.64	1.136
26.083	0.000	0.00	2.36	0.64	1.126
26.267	0.000	0.00	2.34	0.64	1.116
26.450	0.000	0.00	2.32	0.64	1.107

26.633	0.000	0.00	2.30	0.64	1.097
26.817	0.000	0.00	2.28	0.64	1.087
27.000	0.000	0.00	2.26	0.64	1.077
27.183	0.000	0.00	2.24	0.64	1.068
27.367	0.000	0.00	2.22	0.64	1.058
27.550	0.000	0.00	2.20	0.64	1.048
27.733	0.000	0.00	2.18	0.64	1.039
27.917	0.000	0.00	2.16	0.64	1.029
28.100	0.000	0.00	2.13	0.64	1.019
28.283	0.000	0.00	2.11	0.64	1.010
28.467	0.000	0.00	2.09	0.64	1.000
28.650	0.000	0.00	2.07	0.64	0.990
28.833	0.000	0.00	2.05	0.64	0.980
29.017	0.000	0.00	2.03	0.64	0.971
29.200	0.000	0.00	2.01	0.64	0.961
29.383	0.000	0.00	1.99	0.64	0.951
29.567	0.000	0.00	1.97	0.64	0.942
29.750	0.000	0.00	1.95	0.64	0.932
29.933	0.000	0.00	1.93	0.64	0.922
30.117	0.000	0.00	1.91	0.64	0.913
30.300	0.000	0.00	1.89	0.64	0.903
30.483	0.000	0.00	1.87	0.64	0.893
30.667	0.000	0.00	1.85	0.64	0.883
30.850	0.000	0.00	1.83	0.64	0.874
31.033	0.000	0.00	1.81	0.64	0.864
31.217	0.000	0.00	1.79	0.64	0.854
31.400	0.000	0.00	1.77	0.64	0.845
31.583	0.000	0.00	1.75	0.64	0.835
31.767	0.000	0.00	1.73	0.64	0.825
31.950	0.000	0.00	1.71	0.64	0.816
32.133	0.000	0.00	1.69	0.64	0.806
32.317	0.000	0.00	1.67	0.64	0.796
32.500	0.000	0.00	1.65	0.64	0.787
32.683	0.000	0.00	1.63	0.64	0.777
32.867	0.000	0.00	1.61	0.64	0.767
33.050	0.000	0.00	1.59	0.64	0.757
33.233	0.000	0.00	1.57	0.64	0.748
33.417	0.000	0.00	1.55	0.64	0.738
33.600	0.000	0.00	1.53	0.64	0.728
33.783	0.000	0.00	1.51	0.64	0.719
33.967	0.000	0.00	1.49	0.64	0.709
34.150	0.000	0.00	1.46	0.64	0.699
34.333	0.000	0.00	1.44	0.64	0.690
34.517	0.000	0.00	1.42	0.64	0.680
34.700	0.000	0.00	1.40	0.64	0.670
34.883	0.000	0.00	1.38	0.64	0.660
35.067	0.000	0.00	1.36	0.64	0.651
35.250	0.000	0.00	1.34	0.64	0.641
35.433	0.000	0.00	1.32	0.64	0.631
35.617	0.000	0.00	1.30	0.64	0.622
35.800	0.000	0.00	1.28	0.64	0.612
35.983	0.000	0.00	1.26	0.64	0.602
36.167	0.000	0.00	1.24	0.64	0.593
36.350	0.000	0.00	1.22	0.64	0.583
36.533	0.000	0.00	1.20	0.64	0.573
36.717	0.000	0.00	1.18	0.64	0.563
36.900	0.000	0.00	1.16	0.64	0.554
37.083	0.000	0.00	1.14	0.64	0.544
37.267	0.000	0.00	1.12	0.64	0.534
37.450	0.000	0.00	1.10	0.64	0.525
37.633	0.000	0.00	1.08	0.64	0.515

37.817	0.000	0.00	1.06	0.64	0.505
38.000	0.000	0.00	1.04	0.64	0.496
38.183	0.000	0.00	1.02	0.64	0.486
38.367	0.000	0.00	1.00	0.64	0.476
38.550	0.000	0.00	0.98	0.64	0.467
38.733	0.000	0.00	0.96	0.64	0.457
38.917	0.000	0.00	0.94	0.64	0.447
39.100	0.000	0.00	0.92	0.64	0.437
39.283	0.000	0.00	0.90	0.64	0.428
39.467	0.000	0.00	0.88	0.64	0.418
39.650	0.000	0.00	0.86	0.64	0.408
39.833	0.000	0.00	0.84	0.64	0.399
40.017	0.000	0.00	0.81	0.64	0.389
40.200	0.000	0.00	0.79	0.64	0.379
40.383	0.000	0.00	0.77	0.64	0.370
40.567	0.000	0.00	0.75	0.64	0.360
40.750	0.000	0.00	0.73	0.64	0.350
40.933	0.000	0.00	0.71	0.64	0.340
41.117	0.000	0.00	0.69	0.64	0.331
41.300	0.000	0.00	0.67	0.64	0.321
41.483	0.000	0.00	0.65	0.64	0.311
41.667	0.000	0.00	0.63	0.64	0.302
41.850	0.000	0.00	0.61	0.64	0.292
42.033	0.000	0.00	0.59	0.64	0.282
42.217	0.000	0.00	0.57	0.64	0.273
42.400	0.000	0.00	0.55	0.64	0.263
42.583	0.000	0.00	0.53	0.64	0.253
42.767	0.000	0.00	0.51	0.64	0.243
42.950	0.000	0.00	0.49	0.63	0.234
43.133	0.000	0.00	0.47	0.61	0.225
43.317	0.000	0.00	0.45	0.59	0.216
43.500	0.000	0.00	0.43	0.57	0.207
43.683	0.000	0.00	0.42	0.54	0.199
43.867	0.000	0.00	0.40	0.52	0.191
44.050	0.000	0.00	0.38	0.50	0.183
44.233	0.000	0.00	0.37	0.48	0.176
44.417	0.000	0.00	0.35	0.46	0.169
44.600	0.000	0.00	0.34	0.44	0.162
44.783	0.000	0.00	0.33	0.43	0.156
44.967	0.000	0.00	0.31	0.41	0.150
45.150	0.000	0.00	0.30	0.39	0.144
45.333	0.000	0.00	0.29	0.38	0.138
45.517	0.000	0.00	0.28	0.36	0.133
45.700	0.000	0.00	0.27	0.35	0.127
45.883	0.000	0.00	0.26	0.33	0.122
46.067	0.000	0.00	0.25	0.32	0.117
46.250	0.000	0.00	0.24	0.31	0.113
46.433	0.000	0.00	0.23	0.30	0.108
46.617	0.000	0.00	0.22	0.28	0.104
46.800	0.000	0.00	0.21	0.27	0.100
46.983	0.000	0.00	0.20	0.26	0.096
47.167	0.000	0.00	0.19	0.25	0.092
47.350	0.000	0.00	0.18	0.24	0.088
47.533	0.000	0.00	0.18	0.23	0.085
47.717	0.000	0.00	0.17	0.22	0.081
47.900	0.000	0.00	0.16	0.21	0.078
48.083	0.000	0.00	0.16	0.21	0.075
48.267	0.000	0.00	0.15	0.20	0.072
48.450	0.000	0.00	0.14	0.19	0.069
48.633	0.000	0.00	0.14	0.18	0.066
48.817	0.000	0.00	0.13	0.17	0.064

49.000	0.000	0.00	0.13	0.17	0.061
49.183	0.000	0.00	0.12	0.16	0.059
49.367	0.000	0.00	0.12	0.15	0.057
49.550	0.000	0.00	0.11	0.15	0.054
49.733	0.000	0.00	0.11	0.14	0.052
49.917	0.000	0.00	0.10	0.14	0.050
50.100	0.000	0.00	0.10	0.13	0.048
50.283	0.000	0.00	0.10	0.13	0.046
50.467	0.000	0.00	0.09	0.12	0.044
50.650	0.000	0.00	0.09	0.12	0.043
50.833	0.000	0.00	0.09	0.11	0.041
51.017	0.000	0.00	0.08	0.11	0.039
51.200	0.000	0.00	0.08	0.10	0.038
51.383	0.000	0.00	0.08	0.10	0.036
51.567	0.000	0.00	0.07	0.09	0.035
51.750	0.000	0.00	0.07	0.09	0.033
51.933	0.000	0.00	0.07	0.09	0.032
52.117	0.000	0.00	0.06	0.08	0.031
52.300	0.000	0.00	0.06	0.08	0.030
52.483	0.000	0.00	0.06	0.08	0.028
52.667	0.000	0.00	0.06	0.07	0.027
52.850	0.000	0.00	0.05	0.07	0.026
53.033	0.000	0.00	0.05	0.07	0.025
53.217	0.000	0.00	0.05	0.07	0.024
53.400	0.000	0.00	0.05	0.06	0.023
53.583	0.000	0.00	0.05	0.06	0.022
53.767	0.000	0.00	0.04	0.06	0.021
53.950	0.000	0.00	0.04	0.06	0.020
54.133	0.000	0.00	0.04	0.05	0.020
54.317	0.000	0.00	0.04	0.05	0.019
54.500	0.000	0.00	0.04	0.05	0.018
54.683	0.000	0.00	0.04	0.05	0.017
54.867	0.000	0.00	0.04	0.05	0.017
55.050	0.000	0.00	0.03	0.04	0.016
55.233	0.000	0.00	0.03	0.04	0.015
55.417	0.000	0.00	0.03	0.04	0.015
55.600	0.000	0.00	0.03	0.04	0.014
55.783	0.000	0.00	0.03	0.04	0.014
55.967	0.000	0.00	0.03	0.04	0.013
56.150	0.000	0.00	0.03	0.03	0.013
56.333	0.000	0.00	0.03	0.03	0.012
56.517	0.000	0.00	0.02	0.03	0.012
56.700	0.000	0.00	0.02	0.03	0.011
56.883	0.000	0.00	0.02	0.03	0.011
57.067	0.000	0.00	0.02	0.03	0.010
57.250	0.000	0.00	0.02	0.03	0.010
57.433	0.000	0.00	0.02	0.03	0.009
57.617	0.000	0.00	0.02	0.02	0.009
57.800	0.000	0.00	0.02	0.02	0.009
57.983	0.000	0.00	0.02	0.02	0.008
58.167	0.000	0.00	0.02	0.02	0.008
58.350	0.000	0.00	0.02	0.02	0.008
58.533	0.000	0.00	0.02	0.02	0.007
58.717	0.000	0.00	0.01	0.02	0.007
58.900	0.000	0.00	0.01	0.02	0.007
59.083	0.000	0.00	0.01	0.02	0.007
59.267	0.000	0.00	0.01	0.02	0.006
59.450	0.000	0.00	0.01	0.02	0.006
59.633	0.000	0.00	0.01	0.02	0.006
59.817	0.000	0.00	0.01	0.02	0.006
60.000	0.000	0.00	0.01	0.01	0.005

60.183	0.000	0.00	0.01	0.01	0.005
60.367	0.000	0.00	0.01	0.01	0.005
60.550	0.000	0.00	0.01	0.01	0.005
60.733	0.000	0.00	0.01	0.01	0.005
60.917	0.000	0.00	0.01	0.01	0.004
61.100	0.000	0.00	0.01	0.01	0.004
61.283	0.000	0.00	0.01	0.01	0.004
61.467	0.000	0.00	0.01	0.01	0.004
61.650	0.000	0.00	0.01	0.01	0.004
61.833	0.000	0.00	0.01	0.01	0.004
62.017	0.000	0.00	0.01	0.01	0.003
62.200	0.000	0.00	0.01	0.01	0.003
62.383	0.000	0.00	0.01	0.01	0.003
62.567	0.000	0.00	0.01	0.01	0.003
62.750	0.000	0.00	0.01	0.01	0.003
62.933	0.000	0.00	0.01	0.01	0.003
63.117	0.000	0.00	0.01	0.01	0.003
63.300	0.000	0.00	0.01	0.01	0.003
63.483	0.000	0.00	0.01	0.01	0.002
63.667	0.000	0.00	0.00	0.01	0.002
63.850	0.000	0.00	0.00	0.01	0.002
64.033	0.000	0.00	0.00	0.01	0.002
64.217	0.000	0.00	0.00	0.01	0.002
64.400	0.000	0.00	0.00	0.01	0.002
64.583	0.000	0.00	0.00	0.01	0.002
64.767	0.000	0.00	0.00	0.01	0.002
64.950	0.000	0.00	0.00	0.00	0.002
65.133	0.000	0.00	0.00	0.00	0.002
65.317	0.000	0.00	0.00	0.00	0.002
65.500	0.000	0.00	0.00	0.00	0.002
65.683	0.000	0.00	0.00	0.00	0.002
65.867	0.000	0.00	0.00	0.00	0.001
66.050	0.000	0.00	0.00	0.00	0.001
66.233	0.000	0.00	0.00	0.00	0.001
66.417	0.000	0.00	0.00	0.00	0.001
66.600	0.000	0.00	0.00	0.00	0.001
66.783	0.000	0.00	0.00	0.00	0.001
66.967	0.000	0.00	0.00	0.00	0.001
67.150	0.000	0.00	0.00	0.00	0.001
67.333	0.000	0.00	0.00	0.00	0.001
67.517	0.000	0.00	0.00	0.00	0.001

INFILTRATION BASIN ROUTING: 25YR

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**************************************************************************
                     SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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                          Analysis prepared by:




**************************************************************************
--------------------------------------------------------------------------

 Problem Descriptions:
  SHANDIN MHRC
  INFILTRATION BASIN ROUTING
  25 YR
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.002
    LOW LOSS FRACTION = 0.042
    TIME OF CONCENTRATION(MIN.) = 11.00
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.37
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.96
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.45
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.23
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.07
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  5.62

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     2.74
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.05

**************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.05      0.0000      0.00  Q         .         .         .         .
  0.23      0.0045      0.60  .Q        .         .         .         .
  0.42      0.0136      0.60  .Q        .         .         .         .
  0.60      0.0228      0.60  .Q        .         .         .         .
  0.78      0.0320      0.61  .Q        .         .         .         .
  0.97      0.0412      0.61  .Q        .         .         .         .
  1.15      0.0506      0.62  .Q        .         .         .         .
  1.33      0.0600      0.62  .Q        .         .         .         .
  1.52      0.0694      0.63  .Q        .         .         .         .
  1.70      0.0790      0.63  .Q        .         .         .         .
  1.88      0.0886      0.64  .Q        .         .         .         .
  2.07      0.0983      0.64  .Q        .         .         .         .
  2.25      0.1080      0.65  .Q        .         .         .         .
```

2.43	0.1178	0.65	.Q	.	.	.	.
2.62	0.1277	0.66	.Q	.	.	.	.
2.80	0.1377	0.66	.Q	.	.	.	.
2.98	0.1478	0.67	.Q	.	.	.	.
3.17	0.1579	0.67	.Q	.	.	.	.
3.35	0.1681	0.68	.Q	.	.	.	.
3.53	0.1784	0.68	.Q	.	.	.	.
3.72	0.1888	0.69	.Q	.	.	.	.
3.90	0.1993	0.69	.Q	.	.	.	.
4.08	0.2099	0.70	.Q	.	.	.	.
4.27	0.2205	0.71	.Q	.	.	.	.
4.45	0.2313	0.71	.Q	.	.	.	.
4.63	0.2421	0.72	.Q	.	.	.	.
4.82	0.2531	0.73	.Q	.	.	.	.
5.00	0.2641	0.73	.Q	.	.	.	.
5.18	0.2753	0.74	.Q	.	.	.	.
5.37	0.2866	0.75	.Q	.	.	.	.
5.55	0.2979	0.76	.Q	.	.	.	.
5.73	0.3094	0.76	.Q	.	.	.	.
5.92	0.3210	0.77	.Q	.	.	.	.
6.10	0.3327	0.78	.Q	.	.	.	.
6.28	0.3446	0.79	.Q	.	.	.	.
6.47	0.3566	0.79	.Q	.	.	.	.
6.65	0.3687	0.80	.Q	.	.	.	.
6.83	0.3809	0.81	.Q	.	.	.	.
7.02	0.3933	0.82	.Q	.	.	.	.
7.20	0.4058	0.83	.Q	.	.	.	.
7.38	0.4185	0.84	.Q	.	.	.	.
7.57	0.4313	0.85	.Q	.	.	.	.
7.75	0.4443	0.86	.Q	.	.	.	.
7.93	0.4574	0.87	.Q	.	.	.	.
8.12	0.4707	0.89	.Q	.	.	.	.
8.30	0.4842	0.89	.Q	.	.	.	.
8.48	0.4979	0.91	.Q	.	.	.	.
8.67	0.5117	0.92	.Q	.	.	.	.
8.85	0.5258	0.94	.Q	.	.	.	.
9.03	0.5400	0.95	.Q	.	.	.	.
9.22	0.5545	0.96	.Q	.	.	.	.
9.40	0.5692	0.97	.Q	.	.	.	.
9.58	0.5841	0.99	.Q	.	.	.	.
9.77	0.5993	1.01	. Q	.	.	.	.
9.95	0.6147	1.03	. Q	.	.	.	.
10.13	0.6303	1.04	. Q	.	.	.	.
10.32	0.6463	1.06	. Q	.	.	.	.
10.50	0.6625	1.08	. Q	.	.	.	.
10.68	0.6790	1.10	. Q	.	.	.	.
10.87	0.6959	1.12	. Q	.	.	.	.
11.05	0.7131	1.15	. Q	.	.	.	.
11.23	0.7306	1.17	. Q	.	.	.	.
11.42	0.7485	1.20	. Q	.	.	.	.
11.60	0.7668	1.22	. Q	.	.	.	.
11.78	0.7856	1.26	. Q	.	.	.	.
11.97	0.8048	1.28	. Q	.	.	.	.
12.15	0.8249	1.38	. Q	.	.	.	.
12.33	0.8461	1.42	. Q	.	.	.	.
12.52	0.8680	1.47	. Q	.	.	.	.
12.70	0.8905	1.50	. Q	.	.	.	.
12.88	0.9137	1.56	. Q	.	.	.	.
13.07	0.9376	1.59	. Q	.	.	.	.
13.25	0.9623	1.67	. Q	.	.	.	.
13.43	0.9879	1.71	. Q	.	.	.	.

13.62	1.0144	1.79	. Q . . . .
13.80	1.0420	1.84	. Q . . . .
13.98	1.0708	1.96	. Q . . . .
14.17	1.1000	1.91	. Q . . . .
14.35	1.1285	1.85	. Q . . . .
14.53	1.1572	1.94	. Q . . . .
14.72	1.1881	2.14	. Q . . . .
14.90	1.2214	2.26	. Q . . . .
15.08	1.2580	2.57	. Q . . . .
15.27	1.2985	2.78	. Q . . . .
15.45	1.3508	4.14	. Q . . . .
15.63	1.4239	5.51	. .Q . . . .
15.82	1.5149	6.52	. . Q . . . .
16.00	1.6258	8.12	. . Q . . . .
16.18	1.8267	18.39	. . . . Q .
16.37	2.0123	6.11	. . Q . . . .
16.55	2.0815	3.03	. Q . . . .
16.73	2.1226	2.40	. Q . . . .
16.92	2.1562	2.03	. Q . . . .
17.10	2.1851	1.78	. Q . . . .
17.28	2.2129	1.90	. Q . . . .
17.47	2.2406	1.75	. Q . . . .
17.65	2.2661	1.63	. Q . . . .
17.83	2.2901	1.53	. Q . . . .
18.02	2.3126	1.45	. Q . . . .
18.20	2.3334	1.30	. Q . . . .
18.38	2.3526	1.24	. Q . . . .
18.57	2.3710	1.18	. Q . . . .
18.75	2.3885	1.13	. Q . . . .
18.93	2.4054	1.09	. Q . . . .
19.12	2.4216	1.05	. Q . . . .
19.30	2.4373	1.02	. Q . . . .
19.48	2.4524	0.98	.Q . . . .
19.67	2.4671	0.95	.Q . . . .
19.85	2.4814	0.93	.Q . . . .
20.03	2.4952	0.90	.Q . . . .
20.22	2.5087	0.88	.Q . . . .
20.40	2.5219	0.86	.Q . . . .
20.58	2.5347	0.84	.Q . . . .
20.77	2.5472	0.82	.Q . . . .
20.95	2.5594	0.80	.Q . . . .
21.13	2.5714	0.78	.Q . . . .
21.32	2.5832	0.77	.Q . . . .
21.50	2.5946	0.75	.Q . . . .
21.68	2.6059	0.74	.Q . . . .
21.87	2.6170	0.72	.Q . . . .
22.05	2.6278	0.71	.Q . . . .
22.23	2.6385	0.70	.Q . . . .
22.42	2.6490	0.69	.Q . . . .
22.60	2.6593	0.67	.Q . . . .
22.78	2.6694	0.66	.Q . . . .
22.97	2.6794	0.65	.Q . . . .
23.15	2.6892	0.64	.Q . . . .
23.33	2.6989	0.63	.Q . . . .
23.52	2.7084	0.62	.Q . . . .
23.70	2.7178	0.62	.Q . . . .
23.88	2.7271	0.61	.Q . . . .
24.07	2.7362	0.60	.Q . . . .
24.25	2.7408	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)

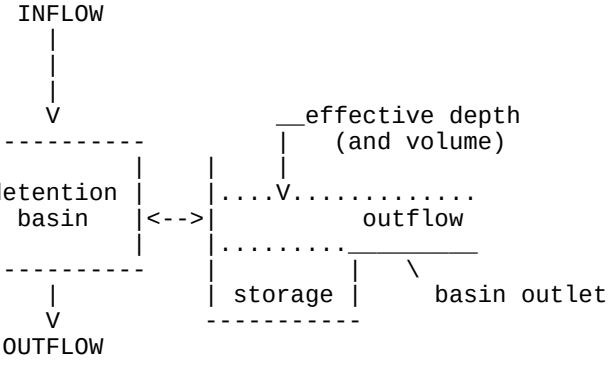
Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1441.0
10%	209.0
20%	66.0
30%	44.0
40%	22.0
50%	11.0
60%	11.0
70%	11.0
80%	11.0
90%	11.0

Problem Descriptions:
SHANDIN MHRC
INFILTRATION BASIN ROUTING
25 YR

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FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 11.000
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 = 20

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS) **	**BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS) *
* 0.000	0.000	0.000**	0.500	0.239	0.640*
* 1.000	0.477	0.640**	1.500	0.716	0.640*
* 2.000	0.955	0.640**	2.500	1.193	0.640*
* 3.000	1.432	0.640**	3.500	1.670	0.640*
* 4.000	1.909	0.640**	4.500	2.148	0.640*
* 5.000	2.386	0.640**	5.500	2.625	0.640*

```
     *      6.000      2.864      0.640**      6.500      1.994      0.340*
     *      7.000      2.148      0.340**      7.500      2.301      0.340*
     *      8.000      2.455      0.340**      8.500      2.608      0.340*
     *      9.000      2.761      0.340**      9.500      2.915      0.340*
-------------------------------------------------------------------------------
     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     0.50       0.23415      0.24385
           3     1.00       0.47215      0.48185
           4     1.50       0.71115      0.72085
           5     2.00       0.95015      0.95985
           6     2.50       1.18815      1.19785
           7     3.00       1.42715      1.43685
           8     3.50       1.66515      1.67485
           9     4.00       1.90415      1.91385
          10     4.50       2.14315      2.15285
          11     5.00       2.38115      2.39085
          12     5.50       2.62015      2.62985
          13     6.00       2.85915      2.86885
          14     6.50       1.99142      1.99658
          15     7.00       2.14542      2.15058
          16     7.50       2.29842      2.30358
          17     8.00       2.45242      2.45758
          18     8.50       2.60542      2.61058
          19     9.00       2.75842      2.76358
          20     9.50       2.91242      2.91758
     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  DEAD-STORAGE  INFLOW  EFFECTIVE  OUTFLOW  EFFECTIVE
       (HRS)   FILLED(AF)    (CFS)  DEPTH(FT)   (CFS)   VOLUME(AF)
-------------------------------------------------------------------------------
       0.050        0.000     0.00      0.00     0.00      0.000
       0.233        0.000     0.60      0.02     0.01      0.009
       0.417        0.000     0.60      0.04     0.04      0.017
       0.600        0.000     0.60      0.05     0.06      0.026
       0.783        0.000     0.61      0.07     0.08      0.034
       0.967        0.000     0.61      0.09     0.10      0.042
       1.150        0.000     0.62      0.10     0.12      0.049
       1.333        0.000     0.62      0.12     0.14      0.056
       1.517        0.000     0.63      0.13     0.16      0.063
       1.700        0.000     0.63      0.15     0.18      0.070
       1.883        0.000     0.64      0.16     0.20      0.077
       2.067        0.000     0.64      0.17     0.21      0.083
       2.250        0.000     0.65      0.19     0.23      0.090
       2.433        0.000     0.65      0.20     0.25      0.096
       2.617        0.000     0.66      0.21     0.26      0.102
       2.800        0.000     0.66      0.22     0.28      0.107
       2.983        0.000     0.67      0.24     0.30      0.113
       3.167        0.000     0.67      0.25     0.31      0.119
       3.350        0.000     0.68      0.26     0.32      0.124
       3.533        0.000     0.68      0.27     0.34      0.129
       3.717        0.000     0.69      0.28     0.35      0.134
       3.900        0.000     0.69      0.29     0.37      0.139
       4.083        0.000     0.70      0.30     0.38      0.144
```

4.267	0.000	0.71	0.31	0.39	0.149
4.450	0.000	0.71	0.32	0.40	0.154
4.633	0.000	0.72	0.33	0.42	0.158
4.817	0.000	0.73	0.34	0.43	0.163
5.000	0.000	0.73	0.35	0.44	0.167
5.183	0.000	0.74	0.36	0.45	0.171
5.367	0.000	0.75	0.37	0.46	0.176
5.550	0.000	0.76	0.38	0.48	0.180
5.733	0.000	0.76	0.38	0.49	0.184
5.917	0.000	0.77	0.39	0.50	0.188
6.100	0.000	0.78	0.40	0.51	0.192
6.283	0.000	0.79	0.41	0.52	0.196
6.467	0.000	0.79	0.42	0.53	0.200
6.650	0.000	0.80	0.43	0.54	0.204
6.833	0.000	0.81	0.44	0.55	0.208
7.017	0.000	0.82	0.44	0.56	0.212
7.200	0.000	0.83	0.45	0.57	0.216
7.383	0.000	0.84	0.46	0.58	0.220
7.567	0.000	0.85	0.47	0.59	0.224
7.750	0.000	0.86	0.48	0.60	0.228
7.933	0.000	0.87	0.48	0.61	0.232
8.117	0.000	0.89	0.49	0.63	0.236
8.300	0.000	0.89	0.50	0.64	0.239
8.483	0.000	0.91	0.51	0.64	0.244
8.667	0.000	0.92	0.52	0.64	0.248
8.850	0.000	0.94	0.53	0.64	0.252
9.033	0.000	0.95	0.54	0.64	0.257
9.217	0.000	0.96	0.55	0.64	0.262
9.400	0.000	0.97	0.56	0.64	0.267
9.583	0.000	0.99	0.57	0.64	0.272
9.767	0.000	1.01	0.58	0.64	0.278
9.950	0.000	1.03	0.59	0.64	0.284
10.133	0.000	1.04	0.61	0.64	0.290
10.317	0.000	1.06	0.62	0.64	0.296
10.500	0.000	1.08	0.63	0.64	0.303
10.683	0.000	1.10	0.65	0.64	0.310
10.867	0.000	1.12	0.66	0.64	0.317
11.050	0.000	1.15	0.68	0.64	0.325
11.233	0.000	1.17	0.70	0.64	0.333
11.417	0.000	1.20	0.71	0.64	0.341
11.600	0.000	1.22	0.73	0.64	0.350
11.783	0.000	1.26	0.75	0.64	0.359
11.967	0.000	1.28	0.77	0.64	0.369
12.150	0.000	1.38	0.80	0.64	0.380
12.333	0.000	1.42	0.82	0.64	0.392
12.517	0.000	1.47	0.85	0.64	0.405
12.700	0.000	1.50	0.88	0.64	0.418
12.883	0.000	1.56	0.90	0.64	0.432
13.067	0.000	1.59	0.93	0.64	0.446
13.250	0.000	1.67	0.97	0.64	0.462
13.433	0.000	1.71	1.00	0.64	0.478
13.617	0.000	1.79	1.04	0.64	0.495
13.800	0.000	1.84	1.08	0.64	0.513
13.983	0.000	1.96	1.12	0.64	0.533
14.167	0.000	1.91	1.16	0.64	0.553
14.350	0.000	1.85	1.20	0.64	0.571
14.533	0.000	1.94	1.24	0.64	0.591
14.717	0.000	2.14	1.29	0.64	0.613
14.900	0.000	2.26	1.34	0.64	0.638
15.083	0.000	2.57	1.40	0.64	0.667
15.267	0.000	2.78	1.47	0.64	0.699

15.450	0.000	4.14	1.58	0.64	0.752
15.633	0.000	5.51	1.73	0.64	0.826
15.817	0.000	6.52	1.92	0.64	0.915
16.000	0.000	8.12	2.15	0.64	1.029
16.183	0.000	18.39	2.72	0.64	1.297
16.367	0.000	6.11	2.89	0.64	1.380
16.550	0.000	3.03	2.97	0.64	1.417
16.733	0.000	2.40	3.02	0.64	1.443
16.917	0.000	2.03	3.07	0.64	1.464
17.100	0.000	1.78	3.10	0.64	1.482
17.283	0.000	1.90	3.14	0.64	1.501
17.467	0.000	1.75	3.18	0.64	1.517
17.650	0.000	1.63	3.21	0.64	1.532
17.833	0.000	1.53	3.24	0.64	1.546
18.017	0.000	1.45	3.26	0.64	1.558
18.200	0.000	1.30	3.29	0.64	1.568
18.383	0.000	1.24	3.30	0.64	1.577
18.567	0.000	1.18	3.32	0.64	1.585
18.750	0.000	1.13	3.34	0.64	1.593
18.933	0.000	1.09	3.35	0.64	1.600
19.117	0.000	1.05	3.37	0.64	1.606
19.300	0.000	1.02	3.38	0.64	1.612
19.483	0.000	0.98	3.39	0.64	1.617
19.667	0.000	0.95	3.40	0.64	1.622
19.850	0.000	0.93	3.41	0.64	1.626
20.033	0.000	0.90	3.42	0.64	1.630
20.217	0.000	0.88	3.42	0.64	1.634
20.400	0.000	0.86	3.43	0.64	1.637
20.583	0.000	0.84	3.44	0.64	1.640
20.767	0.000	0.82	3.44	0.64	1.642
20.950	0.000	0.80	3.45	0.64	1.645
21.133	0.000	0.78	3.45	0.64	1.647
21.317	0.000	0.77	3.46	0.64	1.649
21.500	0.000	0.75	3.46	0.64	1.651
21.683	0.000	0.74	3.46	0.64	1.652
21.867	0.000	0.72	3.46	0.64	1.653
22.050	0.000	0.71	3.47	0.64	1.654
22.233	0.000	0.70	3.47	0.64	1.655
22.417	0.000	0.69	3.47	0.64	1.656
22.600	0.000	0.67	3.47	0.64	1.656
22.783	0.000	0.66	3.47	0.64	1.657
22.967	0.000	0.65	3.47	0.64	1.657
23.150	0.000	0.64	3.47	0.64	1.657
23.333	0.000	0.63	3.47	0.64	1.657
23.517	0.000	0.62	3.47	0.64	1.657
23.700	0.000	0.62	3.47	0.64	1.656
23.883	0.000	0.61	3.47	0.64	1.656
24.067	0.000	0.60	3.47	0.64	1.655
24.250	0.000	0.00	3.45	0.64	1.646
24.433	0.000	0.00	3.43	0.64	1.636
24.617	0.000	0.00	3.41	0.64	1.626
24.800	0.000	0.00	3.39	0.64	1.616
24.983	0.000	0.00	3.37	0.64	1.607
25.167	0.000	0.00	3.35	0.64	1.597
25.350	0.000	0.00	3.33	0.64	1.587
25.533	0.000	0.00	3.31	0.64	1.578
25.717	0.000	0.00	3.29	0.64	1.568
25.900	0.000	0.00	3.27	0.64	1.558
26.083	0.000	0.00	3.24	0.64	1.549
26.267	0.000	0.00	3.22	0.64	1.539
26.450	0.000	0.00	3.20	0.64	1.529

26.633	0.000	0.00	3.18	0.64	1.520
26.817	0.000	0.00	3.16	0.64	1.510
27.000	0.000	0.00	3.14	0.64	1.500
27.183	0.000	0.00	3.12	0.64	1.490
27.367	0.000	0.00	3.10	0.64	1.481
27.550	0.000	0.00	3.08	0.64	1.471
27.733	0.000	0.00	3.06	0.64	1.461
27.917	0.000	0.00	3.04	0.64	1.452
28.100	0.000	0.00	3.02	0.64	1.442
28.283	0.000	0.00	3.00	0.64	1.432
28.467	0.000	0.00	2.98	0.64	1.423
28.650	0.000	0.00	2.96	0.64	1.413
28.833	0.000	0.00	2.94	0.64	1.403
29.017	0.000	0.00	2.92	0.64	1.393
29.200	0.000	0.00	2.90	0.64	1.384
29.383	0.000	0.00	2.88	0.64	1.374
29.567	0.000	0.00	2.86	0.64	1.364
29.750	0.000	0.00	2.84	0.64	1.355
29.933	0.000	0.00	2.82	0.64	1.345
30.117	0.000	0.00	2.80	0.64	1.335
30.300	0.000	0.00	2.78	0.64	1.326
30.483	0.000	0.00	2.76	0.64	1.316
30.667	0.000	0.00	2.74	0.64	1.306
30.850	0.000	0.00	2.72	0.64	1.296
31.033	0.000	0.00	2.70	0.64	1.287
31.217	0.000	0.00	2.68	0.64	1.277
31.400	0.000	0.00	2.66	0.64	1.267
31.583	0.000	0.00	2.64	0.64	1.258
31.767	0.000	0.00	2.62	0.64	1.248
31.950	0.000	0.00	2.59	0.64	1.238
32.133	0.000	0.00	2.57	0.64	1.229
32.317	0.000	0.00	2.55	0.64	1.219
32.500	0.000	0.00	2.53	0.64	1.209
32.683	0.000	0.00	2.51	0.64	1.200
32.867	0.000	0.00	2.49	0.64	1.190
33.050	0.000	0.00	2.47	0.64	1.180
33.233	0.000	0.00	2.45	0.64	1.170
33.417	0.000	0.00	2.43	0.64	1.161
33.600	0.000	0.00	2.41	0.64	1.151
33.783	0.000	0.00	2.39	0.64	1.141
33.967	0.000	0.00	2.37	0.64	1.132
34.150	0.000	0.00	2.35	0.64	1.122
34.333	0.000	0.00	2.33	0.64	1.112
34.517	0.000	0.00	2.31	0.64	1.103
34.700	0.000	0.00	2.29	0.64	1.093
34.883	0.000	0.00	2.27	0.64	1.083
35.067	0.000	0.00	2.25	0.64	1.073
35.250	0.000	0.00	2.23	0.64	1.064
35.433	0.000	0.00	2.21	0.64	1.054
35.617	0.000	0.00	2.19	0.64	1.044
35.800	0.000	0.00	2.17	0.64	1.035
35.983	0.000	0.00	2.15	0.64	1.025
36.167	0.000	0.00	2.13	0.64	1.015
36.350	0.000	0.00	2.11	0.64	1.006
36.533	0.000	0.00	2.09	0.64	0.996
36.717	0.000	0.00	2.07	0.64	0.986
36.900	0.000	0.00	2.05	0.64	0.976
37.083	0.000	0.00	2.02	0.64	0.967
37.267	0.000	0.00	2.00	0.64	0.957
37.450	0.000	0.00	1.98	0.64	0.947
37.633	0.000	0.00	1.96	0.64	0.938

37.817	0.000	0.00	1.94	0.64	0.928
38.000	0.000	0.00	1.92	0.64	0.918
38.183	0.000	0.00	1.90	0.64	0.909
38.367	0.000	0.00	1.88	0.64	0.899
38.550	0.000	0.00	1.86	0.64	0.889
38.733	0.000	0.00	1.84	0.64	0.880
38.917	0.000	0.00	1.82	0.64	0.870
39.100	0.000	0.00	1.80	0.64	0.860
39.283	0.000	0.00	1.78	0.64	0.850
39.467	0.000	0.00	1.76	0.64	0.841
39.650	0.000	0.00	1.74	0.64	0.831
39.833	0.000	0.00	1.72	0.64	0.821
40.017	0.000	0.00	1.70	0.64	0.812
40.200	0.000	0.00	1.68	0.64	0.802
40.383	0.000	0.00	1.66	0.64	0.792
40.567	0.000	0.00	1.64	0.64	0.783
40.750	0.000	0.00	1.62	0.64	0.773
40.933	0.000	0.00	1.60	0.64	0.763
41.117	0.000	0.00	1.58	0.64	0.753
41.300	0.000	0.00	1.56	0.64	0.744
41.483	0.000	0.00	1.54	0.64	0.734
41.667	0.000	0.00	1.52	0.64	0.724
41.850	0.000	0.00	1.50	0.64	0.715
42.033	0.000	0.00	1.48	0.64	0.705
42.217	0.000	0.00	1.46	0.64	0.695
42.400	0.000	0.00	1.44	0.64	0.686
42.583	0.000	0.00	1.42	0.64	0.676
42.767	0.000	0.00	1.40	0.64	0.666
42.950	0.000	0.00	1.38	0.64	0.656
43.133	0.000	0.00	1.36	0.64	0.647
43.317	0.000	0.00	1.33	0.64	0.637
43.500	0.000	0.00	1.31	0.64	0.627
43.683	0.000	0.00	1.29	0.64	0.618
43.867	0.000	0.00	1.27	0.64	0.608
44.050	0.000	0.00	1.25	0.64	0.598
44.233	0.000	0.00	1.23	0.64	0.589
44.417	0.000	0.00	1.21	0.64	0.579
44.600	0.000	0.00	1.19	0.64	0.569
44.783	0.000	0.00	1.17	0.64	0.560
44.967	0.000	0.00	1.15	0.64	0.550
45.150	0.000	0.00	1.13	0.64	0.540
45.333	0.000	0.00	1.11	0.64	0.530
45.517	0.000	0.00	1.09	0.64	0.521
45.700	0.000	0.00	1.07	0.64	0.511
45.883	0.000	0.00	1.05	0.64	0.501
46.067	0.000	0.00	1.03	0.64	0.492
46.250	0.000	0.00	1.01	0.64	0.482
46.433	0.000	0.00	0.99	0.64	0.472
46.617	0.000	0.00	0.97	0.64	0.463
46.800	0.000	0.00	0.95	0.64	0.453
46.983	0.000	0.00	0.93	0.64	0.443
47.167	0.000	0.00	0.91	0.64	0.433
47.350	0.000	0.00	0.89	0.64	0.424
47.533	0.000	0.00	0.87	0.64	0.414
47.717	0.000	0.00	0.85	0.64	0.404
47.900	0.000	0.00	0.83	0.64	0.395
48.083	0.000	0.00	0.81	0.64	0.385
48.267	0.000	0.00	0.79	0.64	0.375
48.450	0.000	0.00	0.77	0.64	0.366
48.633	0.000	0.00	0.75	0.64	0.356
48.817	0.000	0.00	0.73	0.64	0.346

49.000	0.000	0.00	0.70	0.64	0.336
49.183	0.000	0.00	0.68	0.64	0.327
49.367	0.000	0.00	0.66	0.64	0.317
49.550	0.000	0.00	0.64	0.64	0.307
49.733	0.000	0.00	0.62	0.64	0.298
49.917	0.000	0.00	0.60	0.64	0.288
50.100	0.000	0.00	0.58	0.64	0.278
50.283	0.000	0.00	0.56	0.64	0.269
50.467	0.000	0.00	0.54	0.64	0.259
50.650	0.000	0.00	0.52	0.64	0.249
50.833	0.000	0.00	0.50	0.64	0.240
51.017	0.000	0.00	0.48	0.63	0.230
51.200	0.000	0.00	0.46	0.60	0.221
51.383	0.000	0.00	0.44	0.58	0.212
51.567	0.000	0.00	0.43	0.56	0.204
51.750	0.000	0.00	0.41	0.53	0.196
51.933	0.000	0.00	0.39	0.51	0.188
52.117	0.000	0.00	0.38	0.49	0.180
52.300	0.000	0.00	0.36	0.47	0.173
52.483	0.000	0.00	0.35	0.45	0.166
52.667	0.000	0.00	0.33	0.44	0.160
52.850	0.000	0.00	0.32	0.42	0.153
53.033	0.000	0.00	0.31	0.40	0.147
53.217	0.000	0.00	0.30	0.39	0.141
53.400	0.000	0.00	0.28	0.37	0.136
53.583	0.000	0.00	0.27	0.36	0.130
53.767	0.000	0.00	0.26	0.34	0.125
53.950	0.000	0.00	0.25	0.33	0.120
54.133	0.000	0.00	0.24	0.32	0.115
54.317	0.000	0.00	0.23	0.30	0.111
54.500	0.000	0.00	0.22	0.29	0.106
54.683	0.000	0.00	0.21	0.28	0.102
54.867	0.000	0.00	0.21	0.27	0.098
55.050	0.000	0.00	0.20	0.26	0.094
55.233	0.000	0.00	0.19	0.25	0.090
55.417	0.000	0.00	0.18	0.24	0.087
55.600	0.000	0.00	0.17	0.23	0.083
55.783	0.000	0.00	0.17	0.22	0.080
55.967	0.000	0.00	0.16	0.21	0.077
56.150	0.000	0.00	0.15	0.20	0.074
56.333	0.000	0.00	0.15	0.19	0.071
56.517	0.000	0.00	0.14	0.19	0.068
56.700	0.000	0.00	0.14	0.18	0.065
56.883	0.000	0.00	0.13	0.17	0.063
57.067	0.000	0.00	0.13	0.16	0.060
57.250	0.000	0.00	0.12	0.16	0.058
57.433	0.000	0.00	0.12	0.15	0.056
57.617	0.000	0.00	0.11	0.15	0.053
57.800	0.000	0.00	0.11	0.14	0.051
57.983	0.000	0.00	0.10	0.13	0.049
58.167	0.000	0.00	0.10	0.13	0.047
58.350	0.000	0.00	0.09	0.12	0.045
58.533	0.000	0.00	0.09	0.12	0.044
58.717	0.000	0.00	0.09	0.11	0.042
58.900	0.000	0.00	0.08	0.11	0.040
59.083	0.000	0.00	0.08	0.11	0.039
59.267	0.000	0.00	0.08	0.10	0.037
59.450	0.000	0.00	0.07	0.10	0.036
59.633	0.000	0.00	0.07	0.09	0.034
59.817	0.000	0.00	0.07	0.09	0.033
60.000	0.000	0.00	0.07	0.09	0.031

60.183	0.000	0.00	0.06	0.08	0.030
60.367	0.000	0.00	0.06	0.08	0.029
60.550	0.000	0.00	0.06	0.08	0.028
60.733	0.000	0.00	0.06	0.07	0.027
60.917	0.000	0.00	0.05	0.07	0.026
61.100	0.000	0.00	0.05	0.07	0.025
61.283	0.000	0.00	0.05	0.06	0.024
61.467	0.000	0.00	0.05	0.06	0.023
61.650	0.000	0.00	0.05	0.06	0.022
61.833	0.000	0.00	0.04	0.06	0.021
62.017	0.000	0.00	0.04	0.06	0.020
62.200	0.000	0.00	0.04	0.05	0.019
62.383	0.000	0.00	0.04	0.05	0.019
62.567	0.000	0.00	0.04	0.05	0.018
62.750	0.000	0.00	0.04	0.05	0.017
62.933	0.000	0.00	0.03	0.04	0.016
63.117	0.000	0.00	0.03	0.04	0.016
63.300	0.000	0.00	0.03	0.04	0.015
63.483	0.000	0.00	0.03	0.04	0.015
63.667	0.000	0.00	0.03	0.04	0.014
63.850	0.000	0.00	0.03	0.04	0.013
64.033	0.000	0.00	0.03	0.04	0.013
64.217	0.000	0.00	0.03	0.03	0.012
64.400	0.000	0.00	0.02	0.03	0.012
64.583	0.000	0.00	0.02	0.03	0.011
64.767	0.000	0.00	0.02	0.03	0.011
64.950	0.000	0.00	0.02	0.03	0.011
65.133	0.000	0.00	0.02	0.03	0.010
65.317	0.000	0.00	0.02	0.03	0.010
65.500	0.000	0.00	0.02	0.03	0.009
65.683	0.000	0.00	0.02	0.02	0.009
65.867	0.000	0.00	0.02	0.02	0.009
66.050	0.000	0.00	0.02	0.02	0.008
66.233	0.000	0.00	0.02	0.02	0.008
66.417	0.000	0.00	0.02	0.02	0.008
66.600	0.000	0.00	0.02	0.02	0.007
66.783	0.000	0.00	0.01	0.02	0.007
66.967	0.000	0.00	0.01	0.02	0.007
67.150	0.000	0.00	0.01	0.02	0.006
67.333	0.000	0.00	0.01	0.02	0.006
67.517	0.000	0.00	0.01	0.02	0.006
67.700	0.000	0.00	0.01	0.02	0.006
67.883	0.000	0.00	0.01	0.02	0.006
68.067	0.000	0.00	0.01	0.01	0.005
68.250	0.000	0.00	0.01	0.01	0.005
68.433	0.000	0.00	0.01	0.01	0.005
68.617	0.000	0.00	0.01	0.01	0.005
68.800	0.000	0.00	0.01	0.01	0.004
68.983	0.000	0.00	0.01	0.01	0.004
69.167	0.000	0.00	0.01	0.01	0.004
69.350	0.000	0.00	0.01	0.01	0.004
69.534	0.000	0.00	0.01	0.01	0.004
69.717	0.000	0.00	0.01	0.01	0.004
69.900	0.000	0.00	0.01	0.01	0.004
70.084	0.000	0.00	0.01	0.01	0.003
70.267	0.000	0.00	0.01	0.01	0.003
70.450	0.000	0.00	0.01	0.01	0.003
70.634	0.000	0.00	0.01	0.01	0.003
70.817	0.000	0.00	0.01	0.01	0.003
71.000	0.000	0.00	0.01	0.01	0.003
71.184	0.000	0.00	0.01	0.01	0.003

71.367	0.000	0.00	0.01	0.01	0.003
71.550	0.000	0.00	0.01	0.01	0.002
71.734	0.000	0.00	0.00	0.01	0.002
71.917	0.000	0.00	0.00	0.01	0.002
72.100	0.000	0.00	0.00	0.01	0.002
72.284	0.000	0.00	0.00	0.01	0.002
72.467	0.000	0.00	0.00	0.01	0.002
72.650	0.000	0.00	0.00	0.01	0.002
72.834	0.000	0.00	0.00	0.01	0.002
73.017	0.000	0.00	0.00	0.00	0.002
73.200	0.000	0.00	0.00	0.00	0.002
73.384	0.000	0.00	0.00	0.00	0.002
73.567	0.000	0.00	0.00	0.00	0.002
73.750	0.000	0.00	0.00	0.00	0.002
73.934	0.000	0.00	0.00	0.00	0.001
74.117	0.000	0.00	0.00	0.00	0.001
74.300	0.000	0.00	0.00	0.00	0.001
74.484	0.000	0.00	0.00	0.00	0.001
74.667	0.000	0.00	0.00	0.00	0.001
74.850	0.000	0.00	0.00	0.00	0.001
75.034	0.000	0.00	0.00	0.00	0.001
75.217	0.000	0.00	0.00	0.00	0.001
75.400	0.000	0.00	0.00	0.00	0.001
75.584	0.000	0.00	0.00	0.00	0.001

INFILTRATION BASIN ROUTING: 100YR

```
**************************************************************************
                      SMALL AREA UNIT HYDROGRAPH MODEL
==========================================================================
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                           Analysis prepared by:




**************************************************************************
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 Problem Descriptions:
  SHANDIN MHRC
  ROUTING ANALYSIS
  25344 SQFT BASE FOR INF, INF=1.09, 20790 SQFT FOR VOLUME
--------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    5.95
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.002
    LOW LOSS FRACTION = 0.030
    TIME OF CONCENTRATION(MIN.) = 11.00
    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) =  0.51
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  1.31
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.97
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.91
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  7.11

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

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     3.47
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.05

**************************************************************************
  TIME     VOLUME       Q    0.        7.5      15.0      22.5      30.0
 (HOURS)    (AF)      (CFS)
--------------------------------------------------------------------------
  0.05      0.0000      0.00  Q         .         .         .         .
  0.23      0.0057      0.75  Q         .         .         .         .
  0.42      0.0171      0.76  .Q        .         .         .         .
  0.60      0.0286      0.76  .Q        .         .         .         .
  0.78      0.0401      0.77  .Q        .         .         .         .
  0.97      0.0518      0.77  .Q        .         .         .         .
  1.15      0.0635      0.78  .Q        .         .         .         .
  1.33      0.0753      0.78  .Q        .         .         .         .
  1.52      0.0872      0.79  .Q        .         .         .         .
  1.70      0.0992      0.79  .Q        .         .         .         .
  1.88      0.1113      0.80  .Q        .         .         .         .
  2.07      0.1234      0.80  .Q        .         .         .         .
  2.25      0.1357      0.81  .Q        .         .         .         .
```

```
 2.43      0.1480      0.82  .Q        .         .         .         .
 2.62      0.1605      0.83  .Q        .         .         .         .
 2.80      0.1730      0.83  .Q        .         .         .         .
 2.98      0.1857      0.84  .Q        .         .         .         .
 3.17      0.1984      0.84  .Q        .         .         .         .
 3.35      0.2112      0.85  .Q        .         .         .         .
 3.53      0.2242      0.86  .Q        .         .         .         .
 3.72      0.2373      0.87  .Q        .         .         .         .
 3.90      0.2504      0.87  .Q        .         .         .         .
 4.08      0.2637      0.88  .Q        .         .         .         .
 4.27      0.2771      0.89  .Q        .         .         .         .
 4.45      0.2906      0.90  .Q        .         .         .         .
 4.63      0.3043      0.90  .Q        .         .         .         .
 4.82      0.3180      0.91  .Q        .         .         .         .
 5.00      0.3319      0.92  .Q        .         .         .         .
 5.18      0.3460      0.93  .Q        .         .         .         .
 5.37      0.3601      0.94  .Q        .         .         .         .
 5.55      0.3744      0.95  .Q        .         .         .         .
 5.73      0.3889      0.96  .Q        .         .         .         .
 5.92      0.4035      0.97  .Q        .         .         .         .
 6.10      0.4182      0.98  .Q        .         .         .         .
 6.28      0.4331      0.99  .Q        .         .         .         .
 6.47      0.4482      1.00  .Q        .         .         .         .
 6.65      0.4634      1.01  .Q        .         .         .         .
 6.83      0.4788      1.02  .Q        .         .         .         .
 7.02      0.4944      1.04  .Q        .         .         .         .
 7.20      0.5102      1.04  .Q        .         .         .         .
 7.38      0.5261      1.06  .Q        .         .         .         .
 7.57      0.5422      1.07  .Q        .         .         .         .
 7.75      0.5586      1.09  .Q        .         .         .         .
 7.93      0.5751      1.10  .Q        .         .         .         .
 8.12      0.5919      1.12  .Q        .         .         .         .
 8.30      0.6088      1.13  .Q        .         .         .         .
 8.48      0.6260      1.15  .Q        .         .         .         .
 8.67      0.6435      1.16  .Q        .         .         .         .
 8.85      0.6612      1.18  .Q        .         .         .         .
 9.03      0.6791      1.19  .Q        .         .         .         .
 9.22      0.6973      1.21  .Q        .         .         .         .
 9.40      0.7158      1.23  .Q        .         .         .         .
 9.58      0.7346      1.25  .Q        .         .         .         .
 9.77      0.7537      1.27  .Q        .         .         .         .
 9.95      0.7731      1.29  .Q        .         .         .         .
10.13      0.7928      1.31  .Q        .         .         .         .
10.32      0.8129      1.34  .Q        .         .         .         .
10.50      0.8334      1.36  .Q        .         .         .         .
10.68      0.8542      1.39  .Q        .         .         .         .
10.87      0.8754      1.41  .Q        .         .         .         .
11.05      0.8971      1.45  .Q        .         .         .         .
11.23      0.9192      1.47  .Q        .         .         .         .
11.42      0.9418      1.51  . Q       .         .         .         .
11.60      0.9649      1.54  . Q       .         .         .         .
11.78      0.9886      1.59  . Q       .         .         .         .
11.97      1.0128      1.61  . Q       .         .         .         .
12.15      1.0377      1.68  . Q       .         .         .         .
12.33      1.0635      1.72  . Q       .         .         .         .
12.52      1.0899      1.78  . Q       .         .         .         .
12.70      1.1172      1.82  . Q       .         .         .         .
12.88      1.1453      1.89  . Q       .         .         .         .
13.07      1.1743      1.93  . Q       .         .         .         .
13.25      1.2043      2.03  . Q       .         .         .         .
13.43      1.2354      2.08  . Q       .         .         .         .
```

13.62	1.2677	2.19	. Q . . . .
13.80	1.3014	2.25	. Q . . . .
13.98	1.3366	2.40	. Q . . . .
14.17	1.3721	2.29	. Q . . . .
14.35	1.4058	2.15	. Q . . . .
14.53	1.4392	2.25	. Q . . . .
14.72	1.4752	2.50	. Q . . . .
14.90	1.5143	2.66	. Q . . . .
15.08	1.5576	3.05	. Q . . . .
15.27	1.6058	3.31	. Q . . . .
15.45	1.6714	5.34	. Q . . . .
15.63	1.7684	7.46	. Q. . . .
15.82	1.8920	8.85	. .Q . . .
16.00	2.0426	11.03	. . Q . . .
16.18	2.3160	25.06	. . . . Q .
16.37	2.5686	8.29	. .Q . . .
16.55	2.6589	3.64	. Q . . . .
16.73	2.7080	2.84	. Q . . . .
16.92	2.7474	2.37	. Q . . . .
17.10	2.7810	2.06	. Q . . . .
17.28	2.8142	2.32	. Q . . . .
17.47	2.8479	2.13	. Q . . . .
17.65	2.8791	1.98	. Q . . . .
17.83	2.9081	1.85	. Q . . . .
18.02	2.9354	1.75	. Q . . . .
18.20	2.9610	1.64	. Q . . . .
18.38	2.9853	1.56	. Q . . . .
18.57	3.0084	1.49	.Q . . . .
18.75	3.0305	1.43	.Q . . . .
18.93	3.0517	1.37	.Q . . . .
19.12	3.0722	1.33	.Q . . . .
19.30	3.0919	1.28	.Q . . . .
19.48	3.1110	1.24	.Q . . . .
19.67	3.1295	1.20	.Q . . . .
19.85	3.1475	1.17	.Q . . . .
20.03	3.1649	1.14	.Q . . . .
20.22	3.1819	1.11	.Q . . . .
20.40	3.1985	1.08	.Q . . . .
20.58	3.2146	1.05	.Q . . . .
20.77	3.2303	1.03	.Q . . . .
20.95	3.2457	1.01	.Q . . . .
21.13	3.2608	0.98	.Q . . . .
21.32	3.2756	0.96	.Q . . . .
21.50	3.2900	0.94	.Q . . . .
21.68	3.3042	0.93	.Q . . . .
21.87	3.3181	0.91	.Q . . . .
22.05	3.3317	0.89	.Q . . . .
22.23	3.3451	0.88	.Q . . . .
22.42	3.3583	0.86	.Q . . . .
22.60	3.3712	0.85	.Q . . . .
22.78	3.3840	0.83	.Q . . . .
22.97	3.3965	0.82	.Q . . . .
23.15	3.4089	0.81	.Q . . . .
23.33	3.4210	0.80	.Q . . . .
23.52	3.4330	0.79	.Q . . . .
23.70	3.4448	0.77	.Q . . . .
23.88	3.4565	0.76	.Q . . . .
24.07	3.4680	0.75	.Q . . . .
24.25	3.4737	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)

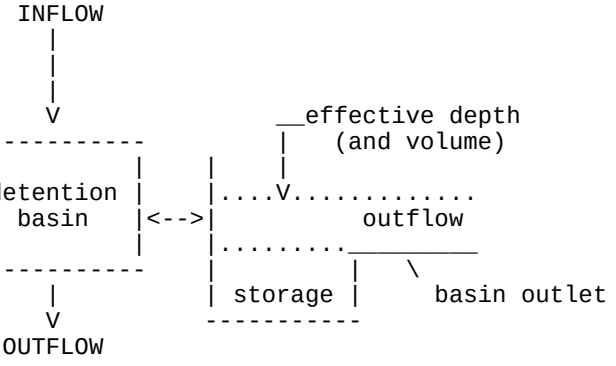
Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1441.0
10%	121.0
20%	66.0
30%	44.0
40%	22.0
50%	11.0
60%	11.0
70%	11.0
80%	11.0
90%	11.0

Problem Descriptions:
SHANDIN MHRC
ROUTING ANALYSIS
25344 SQFT BASE FOR INF, INF=1.09, 20790 SQFT FOR VOLUME

==========

FLOW-THROUGH DETENTION BASIN MODEL

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 11.000
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 = 20

*BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	**	BASIN-DEPTH (FEET)	STORAGE (ACRE-FEET)	OUTFLOW (CFS)	*
0.000	0.000	0.000**		0.500	0.239	0.640*	
1.000	0.477	0.640**		1.500	0.716	0.640*	
2.000	0.955	0.640**		2.500	1.193	0.640*	
3.000	1.432	0.640**		3.500	1.670	0.640*	
4.000	1.909	0.640**		4.500	2.148	0.640*	
5.000	2.396	0.640**		5.500	2.625	0.640*	

```
     *      6.000      2.864      0.640**      6.500      1.994      0.340*
     *      7.000      2.148      0.340**      7.500      2.301      0.340*
     *      8.000      2.455      0.340**      8.500      2.608      0.340*
     *      9.000      2.761      0.340**      9.500      2.915      0.340*
-------------------------------------------------------------------------------
     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     0.50       0.23415      0.24385
           3     1.00       0.47215      0.48185
           4     1.50       0.71115      0.72085
           5     2.00       0.95015      0.95985
           6     2.50       1.18815      1.19785
           7     3.00       1.42715      1.43685
           8     3.50       1.66515      1.67485
           9     4.00       1.90415      1.91385
          10     4.50       2.14315      2.15285
          11     5.00       2.39115      2.40085
          12     5.50       2.62015      2.62985
          13     6.00       2.85915      2.86885
          14     6.50       1.99142      1.99658
          15     7.00       2.14542      2.15058
          16     7.50       2.29842      2.30358
          17     8.00       2.45242      2.45758
          18     8.50       2.60542      2.61058
          19     9.00       2.75842      2.76358
          20     9.50       2.91242      2.91758
     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  DEAD-STORAGE  INFLOW  EFFECTIVE  OUTFLOW  EFFECTIVE
       (HRS)   FILLED(AF)    (CFS)  DEPTH(FT)   (CFS)   VOLUME(AF)
-------------------------------------------------------------------------------
       0.050        0.000     0.00      0.00     0.00      0.000
       0.233        0.000     0.75      0.02     0.01      0.011
       0.417        0.000     0.76      0.05     0.04      0.022
       0.600        0.000     0.76      0.07     0.07      0.032
       0.783        0.000     0.77      0.09     0.10      0.042
       0.967        0.000     0.77      0.11     0.13      0.052
       1.150        0.000     0.78      0.13     0.15      0.062
       1.333        0.000     0.78      0.15     0.18      0.071
       1.517        0.000     0.79      0.17     0.20      0.080
       1.700        0.000     0.79      0.18     0.22      0.088
       1.883        0.000     0.80      0.20     0.25      0.097
       2.067        0.000     0.80      0.22     0.27      0.105
       2.250        0.000     0.81      0.24     0.29      0.113
       2.433        0.000     0.82      0.25     0.31      0.120
       2.617        0.000     0.83      0.27     0.33      0.128
       2.800        0.000     0.83      0.28     0.35      0.135
       2.983        0.000     0.84      0.30     0.37      0.142
       3.167        0.000     0.84      0.31     0.39      0.149
       3.350        0.000     0.85      0.33     0.41      0.156
       3.533        0.000     0.86      0.34     0.43      0.162
       3.717        0.000     0.87      0.35     0.44      0.169
       3.900        0.000     0.87      0.37     0.46      0.175
       4.083        0.000     0.88      0.38     0.48      0.181
```

4.267	0.000	0.89	0.39	0.49	0.187
4.450	0.000	0.90	0.40	0.51	0.193
4.633	0.000	0.90	0.42	0.52	0.199
4.817	0.000	0.91	0.43	0.54	0.204
5.000	0.000	0.92	0.44	0.55	0.210
5.183	0.000	0.93	0.45	0.57	0.215
5.367	0.000	0.94	0.46	0.58	0.221
5.550	0.000	0.95	0.47	0.60	0.226
5.733	0.000	0.96	0.48	0.61	0.231
5.917	0.000	0.97	0.49	0.63	0.237
6.100	0.000	0.98	0.51	0.64	0.242
6.283	0.000	0.99	0.52	0.64	0.247
6.467	0.000	1.00	0.53	0.64	0.252
6.650	0.000	1.01	0.54	0.64	0.258
6.833	0.000	1.02	0.55	0.64	0.264
7.017	0.000	1.04	0.56	0.64	0.270
7.200	0.000	1.04	0.58	0.64	0.276
7.383	0.000	1.06	0.59	0.64	0.282
7.567	0.000	1.07	0.60	0.64	0.289
7.750	0.000	1.09	0.62	0.64	0.296
7.933	0.000	1.10	0.63	0.64	0.302
8.117	0.000	1.12	0.65	0.64	0.310
8.300	0.000	1.13	0.66	0.64	0.317
8.483	0.000	1.15	0.68	0.64	0.325
8.667	0.000	1.16	0.70	0.64	0.333
8.850	0.000	1.18	0.71	0.64	0.341
9.033	0.000	1.19	0.73	0.64	0.349
9.217	0.000	1.21	0.75	0.64	0.358
9.400	0.000	1.23	0.77	0.64	0.367
9.583	0.000	1.25	0.79	0.64	0.376
9.767	0.000	1.27	0.81	0.64	0.385
9.950	0.000	1.29	0.83	0.64	0.395
10.133	0.000	1.31	0.85	0.64	0.405
10.317	0.000	1.34	0.87	0.64	0.416
10.500	0.000	1.36	0.89	0.64	0.427
10.683	0.000	1.39	0.92	0.64	0.438
10.867	0.000	1.41	0.94	0.64	0.450
11.050	0.000	1.45	0.97	0.64	0.462
11.233	0.000	1.47	1.00	0.64	0.475
11.417	0.000	1.51	1.02	0.64	0.488
11.600	0.000	1.54	1.05	0.64	0.502
11.783	0.000	1.59	1.08	0.64	0.516
11.967	0.000	1.61	1.11	0.64	0.531
12.150	0.000	1.68	1.15	0.64	0.546
12.333	0.000	1.72	1.18	0.64	0.563
12.517	0.000	1.78	1.22	0.64	0.580
12.700	0.000	1.82	1.25	0.64	0.598
12.883	0.000	1.89	1.29	0.64	0.617
13.067	0.000	1.93	1.33	0.64	0.636
13.250	0.000	2.03	1.38	0.64	0.657
13.433	0.000	2.08	1.42	0.64	0.679
13.617	0.000	2.19	1.47	0.64	0.703
13.800	0.000	2.25	1.52	0.64	0.727
13.983	0.000	2.40	1.58	0.64	0.754
14.167	0.000	2.29	1.63	0.64	0.779
14.350	0.000	2.15	1.68	0.64	0.802
14.533	0.000	2.25	1.73	0.64	0.826
14.717	0.000	2.50	1.79	0.64	0.854
14.900	0.000	2.66	1.85	0.64	0.885
15.083	0.000	3.05	1.93	0.64	0.922
15.267	0.000	3.31	2.01	0.64	0.962

15.450	0.000	5.34	2.16	0.64	1.033
15.633	0.000	7.46	2.38	0.64	1.137
15.817	0.000	8.85	2.64	0.64	1.261
16.000	0.000	11.03	2.97	0.64	1.419
16.183	0.000	25.06	3.75	0.64	1.788
16.367	0.000	8.29	3.99	0.64	1.904
16.550	0.000	3.64	4.09	0.64	1.950
16.733	0.000	2.84	4.15	0.64	1.983
16.917	0.000	2.37	4.21	0.64	2.009
17.100	0.000	2.06	4.25	0.64	2.031
17.283	0.000	2.32	4.31	0.64	2.056
17.467	0.000	2.13	4.36	0.64	2.079
17.650	0.000	1.98	4.40	0.64	2.099
17.833	0.000	1.85	4.44	0.64	2.118
18.017	0.000	1.75	4.47	0.64	2.134
18.200	0.000	1.64	4.50	0.64	2.149
18.383	0.000	1.56	4.53	0.64	2.163
18.567	0.000	1.49	4.56	0.64	2.176
18.750	0.000	1.43	4.58	0.64	2.188
18.933	0.000	1.37	4.60	0.64	2.199
19.117	0.000	1.33	4.62	0.64	2.210
19.300	0.000	1.28	4.64	0.64	2.219
19.483	0.000	1.24	4.66	0.64	2.229
19.667	0.000	1.20	4.68	0.64	2.237
19.850	0.000	1.17	4.70	0.64	2.245
20.033	0.000	1.14	4.71	0.64	2.253
20.217	0.000	1.11	4.73	0.64	2.260
20.400	0.000	1.08	4.74	0.64	2.266
20.583	0.000	1.05	4.75	0.64	2.273
20.767	0.000	1.03	4.76	0.64	2.278
20.950	0.000	1.01	4.77	0.64	2.284
21.133	0.000	0.98	4.78	0.64	2.289
21.317	0.000	0.96	4.79	0.64	2.294
21.500	0.000	0.94	4.80	0.64	2.299
21.683	0.000	0.93	4.81	0.64	2.303
21.867	0.000	0.91	4.82	0.64	2.307
22.050	0.000	0.89	4.83	0.64	2.311
22.233	0.000	0.88	4.84	0.64	2.314
22.417	0.000	0.86	4.84	0.64	2.318
22.600	0.000	0.85	4.85	0.64	2.321
22.783	0.000	0.83	4.85	0.64	2.324
22.967	0.000	0.82	4.86	0.64	2.327
23.150	0.000	0.81	4.87	0.64	2.329
23.333	0.000	0.80	4.87	0.64	2.332
23.517	0.000	0.79	4.87	0.64	2.334
23.700	0.000	0.77	4.88	0.64	2.336
23.883	0.000	0.76	4.88	0.64	2.338
24.067	0.000	0.75	4.89	0.64	2.339
24.250	0.000	0.00	4.87	0.64	2.330
24.433	0.000	0.00	4.85	0.64	2.320
24.617	0.000	0.00	4.83	0.64	2.310
24.800	0.000	0.00	4.81	0.64	2.301
24.983	0.000	0.00	4.79	0.64	2.291
25.167	0.000	0.00	4.77	0.64	2.281
25.350	0.000	0.00	4.75	0.64	2.272
25.533	0.000	0.00	4.73	0.64	2.262
25.717	0.000	0.00	4.71	0.64	2.252
25.900	0.000	0.00	4.69	0.64	2.242
26.083	0.000	0.00	4.67	0.64	2.233
26.267	0.000	0.00	4.65	0.64	2.223
26.450	0.000	0.00	4.63	0.64	2.213

26.633	0.000	0.00	4.61	0.64	2.204
26.817	0.000	0.00	4.59	0.64	2.194
27.000	0.000	0.00	4.57	0.64	2.184
27.183	0.000	0.00	4.55	0.64	2.175
27.367	0.000	0.00	4.53	0.64	2.165
27.550	0.000	0.00	4.51	0.64	2.155
27.733	0.000	0.00	4.49	0.64	2.145
27.917	0.000	0.00	4.47	0.64	2.136
28.100	0.000	0.00	4.45	0.64	2.126
28.283	0.000	0.00	4.43	0.64	2.116
28.467	0.000	0.00	4.41	0.64	2.107
28.650	0.000	0.00	4.39	0.64	2.097
28.833	0.000	0.00	4.37	0.64	2.087
29.017	0.000	0.00	4.35	0.64	2.078
29.200	0.000	0.00	4.33	0.64	2.068
29.383	0.000	0.00	4.31	0.64	2.058
29.567	0.000	0.00	4.29	0.64	2.048
29.750	0.000	0.00	4.27	0.64	2.039
29.933	0.000	0.00	4.25	0.64	2.029
30.117	0.000	0.00	4.23	0.64	2.019
30.300	0.000	0.00	4.21	0.64	2.010
30.483	0.000	0.00	4.19	0.64	2.000
30.667	0.000	0.00	4.17	0.64	1.990
30.850	0.000	0.00	4.15	0.64	1.981
31.033	0.000	0.00	4.13	0.64	1.971
31.217	0.000	0.00	4.11	0.64	1.961
31.400	0.000	0.00	4.09	0.64	1.952
31.583	0.000	0.00	4.07	0.64	1.942
31.767	0.000	0.00	4.05	0.64	1.932
31.950	0.000	0.00	4.03	0.64	1.922
32.133	0.000	0.00	4.01	0.64	1.913
32.317	0.000	0.00	3.99	0.64	1.903
32.500	0.000	0.00	3.97	0.64	1.893
32.683	0.000	0.00	3.95	0.64	1.884
32.867	0.000	0.00	3.93	0.64	1.874
33.050	0.000	0.00	3.91	0.64	1.864
33.233	0.000	0.00	3.89	0.64	1.855
33.417	0.000	0.00	3.87	0.64	1.845
33.600	0.000	0.00	3.85	0.64	1.835
33.783	0.000	0.00	3.83	0.64	1.825
33.967	0.000	0.00	3.80	0.64	1.816
34.150	0.000	0.00	3.78	0.64	1.806
34.333	0.000	0.00	3.76	0.64	1.796
34.517	0.000	0.00	3.74	0.64	1.787
34.700	0.000	0.00	3.72	0.64	1.777
34.883	0.000	0.00	3.70	0.64	1.767
35.067	0.000	0.00	3.68	0.64	1.758
35.250	0.000	0.00	3.66	0.64	1.748
35.433	0.000	0.00	3.64	0.64	1.738
35.617	0.000	0.00	3.62	0.64	1.728
35.800	0.000	0.00	3.60	0.64	1.719
35.983	0.000	0.00	3.58	0.64	1.709
36.167	0.000	0.00	3.56	0.64	1.699
36.350	0.000	0.00	3.54	0.64	1.690
36.533	0.000	0.00	3.52	0.64	1.680
36.717	0.000	0.00	3.50	0.64	1.670
36.900	0.000	0.00	3.48	0.64	1.661
37.083	0.000	0.00	3.46	0.64	1.651
37.267	0.000	0.00	3.44	0.64	1.641
37.450	0.000	0.00	3.42	0.64	1.632
37.633	0.000	0.00	3.40	0.64	1.622

37.817	0.000	0.00	3.38	0.64	1.612
38.000	0.000	0.00	3.36	0.64	1.602
38.183	0.000	0.00	3.34	0.64	1.593
38.367	0.000	0.00	3.32	0.64	1.583
38.550	0.000	0.00	3.30	0.64	1.573
38.733	0.000	0.00	3.28	0.64	1.564
38.917	0.000	0.00	3.26	0.64	1.554
39.100	0.000	0.00	3.24	0.64	1.544
39.283	0.000	0.00	3.22	0.64	1.535
39.467	0.000	0.00	3.20	0.64	1.525
39.650	0.000	0.00	3.17	0.64	1.515
39.833	0.000	0.00	3.15	0.64	1.505
40.017	0.000	0.00	3.13	0.64	1.496
40.200	0.000	0.00	3.11	0.64	1.486
40.383	0.000	0.00	3.09	0.64	1.476
40.567	0.000	0.00	3.07	0.64	1.467
40.750	0.000	0.00	3.05	0.64	1.457
40.933	0.000	0.00	3.03	0.64	1.447
41.117	0.000	0.00	3.01	0.64	1.438
41.300	0.000	0.00	2.99	0.64	1.428
41.483	0.000	0.00	2.97	0.64	1.418
41.667	0.000	0.00	2.95	0.64	1.408
41.850	0.000	0.00	2.93	0.64	1.399
42.033	0.000	0.00	2.91	0.64	1.389
42.217	0.000	0.00	2.89	0.64	1.379
42.400	0.000	0.00	2.87	0.64	1.370
42.583	0.000	0.00	2.85	0.64	1.360
42.767	0.000	0.00	2.83	0.64	1.350
42.950	0.000	0.00	2.81	0.64	1.341
43.133	0.000	0.00	2.79	0.64	1.331
43.317	0.000	0.00	2.77	0.64	1.321
43.500	0.000	0.00	2.75	0.64	1.312
43.683	0.000	0.00	2.73	0.64	1.302
43.867	0.000	0.00	2.71	0.64	1.292
44.050	0.000	0.00	2.69	0.64	1.282
44.233	0.000	0.00	2.67	0.64	1.273
44.417	0.000	0.00	2.65	0.64	1.263
44.600	0.000	0.00	2.63	0.64	1.253
44.783	0.000	0.00	2.61	0.64	1.244
44.967	0.000	0.00	2.59	0.64	1.234
45.150	0.000	0.00	2.57	0.64	1.224
45.333	0.000	0.00	2.55	0.64	1.215
45.517	0.000	0.00	2.52	0.64	1.205
45.700	0.000	0.00	2.50	0.64	1.195
45.883	0.000	0.00	2.48	0.64	1.185
46.067	0.000	0.00	2.46	0.64	1.176
46.250	0.000	0.00	2.44	0.64	1.166
46.433	0.000	0.00	2.42	0.64	1.156
46.617	0.000	0.00	2.40	0.64	1.147
46.800	0.000	0.00	2.38	0.64	1.137
46.983	0.000	0.00	2.36	0.64	1.127
47.167	0.000	0.00	2.34	0.64	1.118
47.350	0.000	0.00	2.32	0.64	1.108
47.533	0.000	0.00	2.30	0.64	1.098
47.717	0.000	0.00	2.28	0.64	1.088
47.900	0.000	0.00	2.26	0.64	1.079
48.083	0.000	0.00	2.24	0.64	1.069
48.267	0.000	0.00	2.22	0.64	1.059
48.450	0.000	0.00	2.20	0.64	1.050
48.633	0.000	0.00	2.18	0.64	1.040
48.817	0.000	0.00	2.16	0.64	1.030

49.000	0.000	0.00	2.14	0.64	1.021
49.183	0.000	0.00	2.12	0.64	1.011
49.367	0.000	0.00	2.10	0.64	1.001
49.550	0.000	0.00	2.08	0.64	0.992
49.733	0.000	0.00	2.06	0.64	0.982
49.917	0.000	0.00	2.04	0.64	0.972
50.100	0.000	0.00	2.02	0.64	0.962
50.283	0.000	0.00	2.00	0.64	0.953
50.467	0.000	0.00	1.97	0.64	0.943
50.650	0.000	0.00	1.95	0.64	0.933
50.833	0.000	0.00	1.93	0.64	0.924
51.017	0.000	0.00	1.91	0.64	0.914
51.200	0.000	0.00	1.89	0.64	0.904
51.383	0.000	0.00	1.87	0.64	0.895
51.567	0.000	0.00	1.85	0.64	0.885
51.750	0.000	0.00	1.83	0.64	0.875
51.933	0.000	0.00	1.81	0.64	0.865
52.117	0.000	0.00	1.79	0.64	0.856
52.300	0.000	0.00	1.77	0.64	0.846
52.483	0.000	0.00	1.75	0.64	0.836
52.667	0.000	0.00	1.73	0.64	0.827
52.850	0.000	0.00	1.71	0.64	0.817
53.033	0.000	0.00	1.69	0.64	0.807
53.217	0.000	0.00	1.67	0.64	0.798
53.400	0.000	0.00	1.65	0.64	0.788
53.583	0.000	0.00	1.63	0.64	0.778
53.767	0.000	0.00	1.61	0.64	0.768
53.950	0.000	0.00	1.59	0.64	0.759
54.133	0.000	0.00	1.57	0.64	0.749
54.317	0.000	0.00	1.55	0.64	0.739
54.500	0.000	0.00	1.53	0.64	0.730
54.683	0.000	0.00	1.51	0.64	0.720
54.867	0.000	0.00	1.49	0.64	0.710
55.050	0.000	0.00	1.47	0.64	0.701
55.233	0.000	0.00	1.45	0.64	0.691
55.417	0.000	0.00	1.43	0.64	0.681
55.600	0.000	0.00	1.41	0.64	0.672
55.783	0.000	0.00	1.39	0.64	0.662
55.967	0.000	0.00	1.37	0.64	0.652
56.150	0.000	0.00	1.35	0.64	0.642
56.333	0.000	0.00	1.33	0.64	0.633
56.517	0.000	0.00	1.31	0.64	0.623
56.700	0.000	0.00	1.29	0.64	0.613
56.883	0.000	0.00	1.26	0.64	0.604
57.067	0.000	0.00	1.24	0.64	0.594
57.250	0.000	0.00	1.22	0.64	0.584
57.433	0.000	0.00	1.20	0.64	0.575
57.617	0.000	0.00	1.18	0.64	0.565
57.800	0.000	0.00	1.16	0.64	0.555
57.983	0.000	0.00	1.14	0.64	0.545
58.167	0.000	0.00	1.12	0.64	0.536
58.350	0.000	0.00	1.10	0.64	0.526
58.533	0.000	0.00	1.08	0.64	0.516
58.717	0.000	0.00	1.06	0.64	0.507
58.900	0.000	0.00	1.04	0.64	0.497
59.083	0.000	0.00	1.02	0.64	0.487
59.267	0.000	0.00	1.00	0.64	0.478
59.450	0.000	0.00	0.98	0.64	0.468
59.633	0.000	0.00	0.96	0.64	0.458
59.817	0.000	0.00	0.94	0.64	0.448
60.000	0.000	0.00	0.92	0.64	0.439

60.183	0.000	0.00	0.90	0.64	0.429
60.367	0.000	0.00	0.88	0.64	0.419
60.550	0.000	0.00	0.86	0.64	0.410
60.733	0.000	0.00	0.84	0.64	0.400
60.917	0.000	0.00	0.82	0.64	0.390
61.100	0.000	0.00	0.80	0.64	0.381
61.283	0.000	0.00	0.78	0.64	0.371
61.467	0.000	0.00	0.76	0.64	0.361
61.650	0.000	0.00	0.74	0.64	0.352
61.833	0.000	0.00	0.72	0.64	0.342
62.017	0.000	0.00	0.70	0.64	0.332
62.200	0.000	0.00	0.68	0.64	0.322
62.383	0.000	0.00	0.65	0.64	0.313
62.567	0.000	0.00	0.63	0.64	0.303
62.750	0.000	0.00	0.61	0.64	0.293
62.933	0.000	0.00	0.59	0.64	0.284
63.117	0.000	0.00	0.57	0.64	0.274
63.300	0.000	0.00	0.55	0.64	0.264
63.483	0.000	0.00	0.53	0.64	0.255
63.667	0.000	0.00	0.51	0.64	0.245
63.850	0.000	0.00	0.49	0.63	0.235
64.033	0.000	0.00	0.47	0.62	0.226
64.217	0.000	0.00	0.45	0.59	0.217
64.400	0.000	0.00	0.44	0.57	0.208
64.583	0.000	0.00	0.42	0.55	0.200
64.767	0.000	0.00	0.40	0.52	0.192
64.950	0.000	0.00	0.39	0.50	0.184
65.133	0.000	0.00	0.37	0.48	0.177
65.317	0.000	0.00	0.36	0.46	0.170
65.500	0.000	0.00	0.34	0.45	0.163
65.683	0.000	0.00	0.33	0.43	0.157
65.867	0.000	0.00	0.31	0.41	0.151
66.050	0.000	0.00	0.30	0.40	0.145
66.233	0.000	0.00	0.29	0.38	0.139
66.417	0.000	0.00	0.28	0.36	0.133
66.600	0.000	0.00	0.27	0.35	0.128
66.783	0.000	0.00	0.26	0.34	0.123
66.967	0.000	0.00	0.25	0.32	0.118
67.150	0.000	0.00	0.24	0.31	0.113
67.333	0.000	0.00	0.23	0.30	0.109
67.517	0.000	0.00	0.22	0.29	0.104
67.700	0.000	0.00	0.21	0.27	0.100
67.883	0.000	0.00	0.20	0.26	0.096
68.067	0.000	0.00	0.19	0.25	0.093
68.250	0.000	0.00	0.19	0.24	0.089
68.433	0.000	0.00	0.18	0.23	0.085
68.617	0.000	0.00	0.17	0.22	0.082
68.800	0.000	0.00	0.16	0.21	0.079
68.983	0.000	0.00	0.16	0.21	0.076
69.167	0.000	0.00	0.15	0.20	0.073
69.350	0.000	0.00	0.15	0.19	0.070
69.534	0.000	0.00	0.14	0.18	0.067
69.717	0.000	0.00	0.13	0.18	0.064
69.900	0.000	0.00	0.13	0.17	0.062
70.084	0.000	0.00	0.12	0.16	0.059
70.267	0.000	0.00	0.12	0.16	0.057
70.450	0.000	0.00	0.11	0.15	0.055
70.634	0.000	0.00	0.11	0.14	0.052
70.817	0.000	0.00	0.11	0.14	0.050
71.000	0.000	0.00	0.10	0.13	0.048
71.184	0.000	0.00	0.10	0.13	0.046

71.367	0.000	0.00	0.09	0.12	0.045
71.550	0.000	0.00	0.09	0.12	0.043
71.734	0.000	0.00	0.09	0.11	0.041
71.917	0.000	0.00	0.08	0.11	0.039
72.100	0.000	0.00	0.08	0.10	0.038
72.284	0.000	0.00	0.08	0.10	0.036
72.467	0.000	0.00	0.07	0.10	0.035
72.650	0.000	0.00	0.07	0.09	0.034
72.834	0.000	0.00	0.07	0.09	0.032
73.017	0.000	0.00	0.06	0.08	0.031
73.200	0.000	0.00	0.06	0.08	0.030
73.384	0.000	0.00	0.06	0.08	0.029
73.567	0.000	0.00	0.06	0.07	0.027
73.750	0.000	0.00	0.06	0.07	0.026
73.934	0.000	0.00	0.05	0.07	0.025
74.117	0.000	0.00	0.05	0.07	0.024
74.300	0.000	0.00	0.05	0.06	0.023
74.484	0.000	0.00	0.05	0.06	0.022
74.667	0.000	0.00	0.04	0.06	0.021
74.850	0.000	0.00	0.04	0.06	0.021
75.034	0.000	0.00	0.04	0.05	0.020
75.217	0.000	0.00	0.04	0.05	0.019
75.400	0.000	0.00	0.04	0.05	0.018
75.584	0.000	0.00	0.04	0.05	0.018
75.767	0.000	0.00	0.04	0.05	0.017
75.950	0.000	0.00	0.03	0.04	0.016
76.134	0.000	0.00	0.03	0.04	0.016
76.317	0.000	0.00	0.03	0.04	0.015
76.500	0.000	0.00	0.03	0.04	0.014
76.684	0.000	0.00	0.03	0.04	0.014
76.867	0.000	0.00	0.03	0.04	0.013
77.050	0.000	0.00	0.03	0.03	0.013
77.234	0.000	0.00	0.03	0.03	0.012
77.417	0.000	0.00	0.02	0.03	0.012
77.600	0.000	0.00	0.02	0.03	0.011
77.784	0.000	0.00	0.02	0.03	0.011
77.967	0.000	0.00	0.02	0.03	0.010
78.150	0.000	0.00	0.02	0.03	0.010
78.334	0.000	0.00	0.02	0.03	0.010
78.517	0.000	0.00	0.02	0.03	0.009
78.700	0.000	0.00	0.02	0.02	0.009
78.884	0.000	0.00	0.02	0.02	0.008
79.067	0.000	0.00	0.02	0.02	0.008
79.250	0.000	0.00	0.02	0.02	0.008
79.434	0.000	0.00	0.02	0.02	0.007
79.617	0.000	0.00	0.02	0.02	0.007
79.800	0.000	0.00	0.01	0.02	0.007
79.984	0.000	0.00	0.01	0.02	0.007
80.167	0.000	0.00	0.01	0.02	0.006
80.350	0.000	0.00	0.01	0.02	0.006
80.534	0.000	0.00	0.01	0.02	0.006
80.717	0.000	0.00	0.01	0.02	0.006
80.900	0.000	0.00	0.01	0.01	0.005
81.084	0.000	0.00	0.01	0.01	0.005
81.267	0.000	0.00	0.01	0.01	0.005
81.450	0.000	0.00	0.01	0.01	0.005
81.634	0.000	0.00	0.01	0.01	0.005
81.817	0.000	0.00	0.01	0.01	0.004
82.000	0.000	0.00	0.01	0.01	0.004
82.184	0.000	0.00	0.01	0.01	0.004
82.367	0.000	0.00	0.01	0.01	0.004

82.550	0.000	0.00	0.01	0.01	0.004
82.734	0.000	0.00	0.01	0.01	0.004
82.917	0.000	0.00	0.01	0.01	0.003
83.100	0.000	0.00	0.01	0.01	0.003
83.284	0.000	0.00	0.01	0.01	0.003
83.467	0.000	0.00	0.01	0.01	0.003
83.650	0.000	0.00	0.01	0.01	0.003
83.834	0.000	0.00	0.01	0.01	0.003
84.017	0.000	0.00	0.01	0.01	0.003
84.200	0.000	0.00	0.01	0.01	0.003
84.384	0.000	0.00	0.01	0.01	0.002
84.567	0.000	0.00	0.01	0.01	0.002
84.750	0.000	0.00	0.00	0.01	0.002
84.934	0.000	0.00	0.00	0.01	0.002
85.117	0.000	0.00	0.00	0.01	0.002
85.300	0.000	0.00	0.00	0.01	0.002
85.484	0.000	0.00	0.00	0.01	0.002
85.667	0.000	0.00	0.00	0.01	0.002
85.850	0.000	0.00	0.00	0.00	0.002
86.034	0.000	0.00	0.00	0.00	0.002
86.217	0.000	0.00	0.00	0.00	0.002
86.400	0.000	0.00	0.00	0.00	0.002
86.584	0.000	0.00	0.00	0.00	0.002
86.767	0.000	0.00	0.00	0.00	0.001
86.950	0.000	0.00	0.00	0.00	0.001
87.134	0.000	0.00	0.00	0.00	0.001
87.317	0.000	0.00	0.00	0.00	0.001
87.500	0.000	0.00	0.00	0.00	0.001
87.684	0.000	0.00	0.00	0.00	0.001
87.867	0.000	0.00	0.00	0.00	0.001
88.050	0.000	0.00	0.00	0.00	0.001
88.234	0.000	0.00	0.00	0.00	0.001
88.417	0.000	0.00	0.00	0.00	0.001
88.600	0.000	0.00	0.00	0.00	0.001

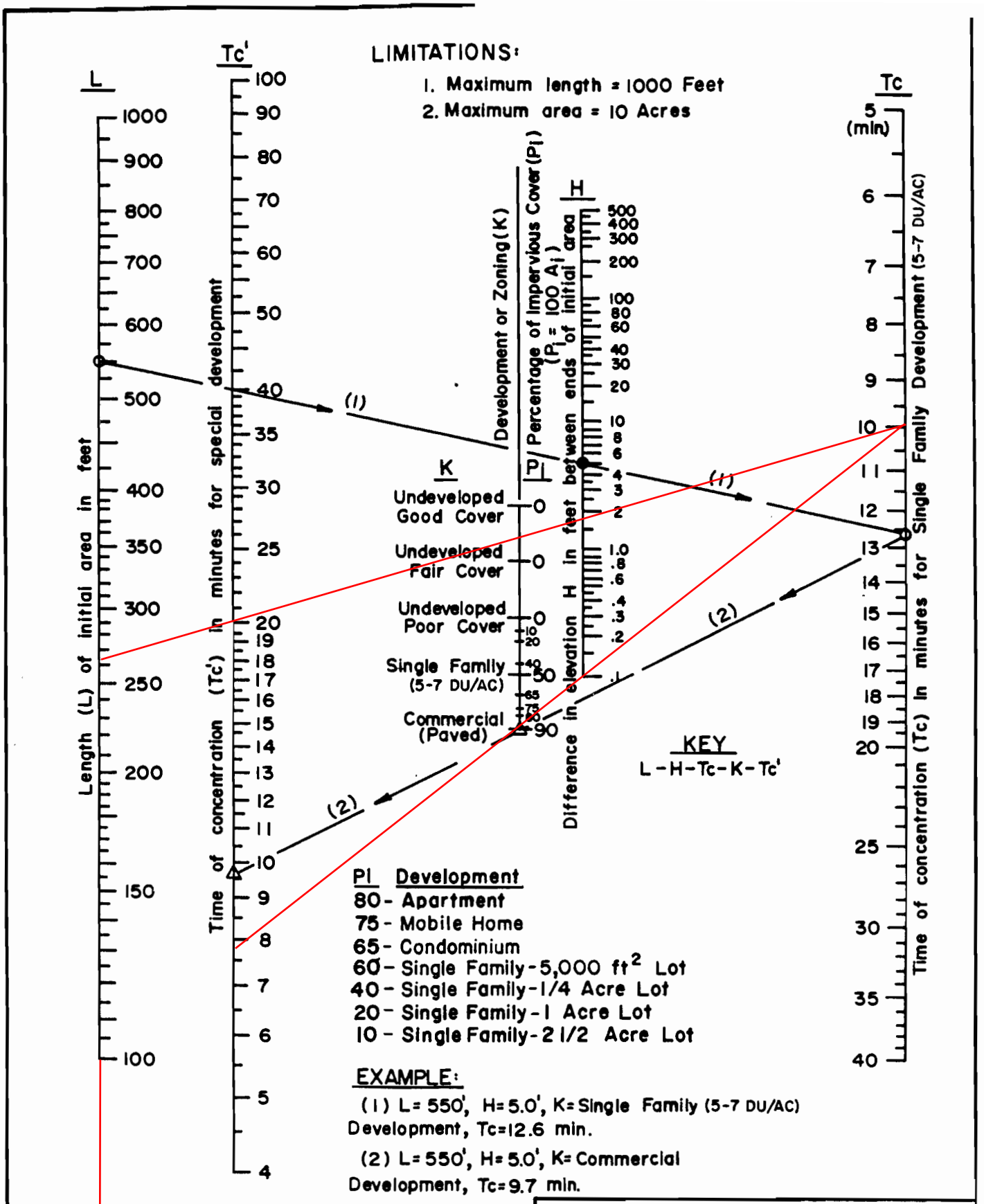
APPENDIX B: Preliminary Onsite Storm Drain Sizing Calculations

RATIONAL METHOD CALCULATIONS

Rational Method Analysis Data and Results

Inlet	Tributary Area (Ac)	Time of Concentration (Min)	Rainfall Intensity (In/Hr)	Pervious Fraction Ap	Pervious Area Loss Rate Fp (In/Hr)	100-Yr Peak Flow (cfs)
1A	0.481	7.8	6.70	0.1	0.02	2.90
2A	0.058	5.4	8.40	0.1	0.02	0.44
3A	0.275	7.2	7.00	0.1	0.02	1.73
4A	0.455	8	6.60	0.1	0.02	2.70
5A	0.059	5.4	8.40	0.1	0.02	0.45
6A	0.078	4.1	10.00	0.1	0.02	0.70
7A	0.028	2.7	15.50	0.1	0.02	0.39
8A	0.188	4	10.00	0.1	0.02	1.69
9A	1.625	9	6.15	0.1	0.02	8.99
10B	0.280	8	6.60	0.1	0.02	1.66
11B	0.061	5.3	8.50	0.1	0.02	0.47
12B	0.421	7.2	7.00	0.1	0.02	2.65
13B	0.059	5.4	8.40	0.1	0.02	0.45
14B	0.313	7.2	7.00	0.1	0.02	1.97
15B	0.023	5.4	8.40	0.1	0.02	0.18
16B	0.676	9.2	6.05	0.1	0.02	3.68
20C	0.617	6.9	7.20	0.1	0.02	4.00
30D	0.118	5.5	8.30	0.1	0.02	0.88
40E	0.096	5.6	8.20	0.1	0.02	0.71

Inlet	Area sqft	Area Ac	L	El1	El2	Delta	TC
1A	20933	0.481	266	1398.16	1396.28	1.88	7.8
2A	2538	0.058	53	1397.11	1396.845	0.265	5.4
3A	11998	0.275	191	1428.16	1427.205	0.955	7.2
4A	19813	0.455	248	1428.17	1426.93	1.24	8
5A	2590	0.059	54	1398.17	1397.9	0.27	5.4
6A	3408	0.078	127	1399.39	1394.3	5.09	4.1
7A	1222	0.028	56	1399.39	1392.47	6.92	2.7
8A	8175	0.188	138	1398.18	1391.82	6.36	4
9A	70782	1.625	484	1394.4	1389.88	4.52	9
10B	12176	0.280	274	1398.16	1396.24	1.92	8
11B	2670	0.061	62	1398.13	1397.82	0.31	5.3
12B	18329	0.421	206	1428.13	1427.1	1.03	7.2
13B	2587	0.059	53	1398.13	1397.865	0.265	5.4
14B	13650	0.313	206	1428.13	1427.1	1.03	7.2
15B	1010	0.023	24	1398.13	1398.01	0.12	5.4
16B	29438	0.676	535	1398.05	1392.27	5.78	9.2
20C	26875	0.617	310	1397.06	1391.97	5.09	6.9
30D	5141	0.118	91	1427.01	1426.555	0.455	5.5
40E	4171	0.096	87	1427.01	1426.575	0.435	5.6



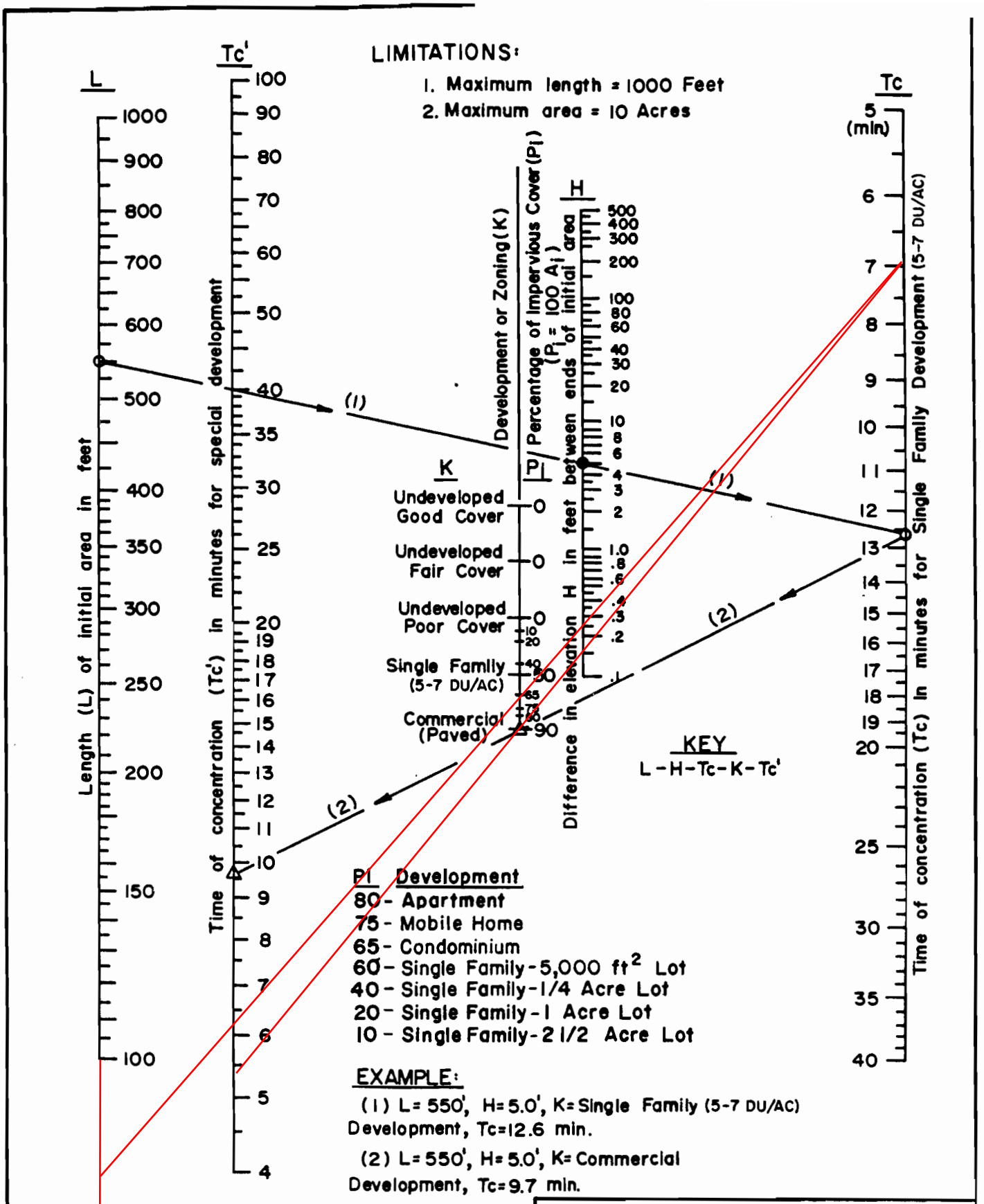
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

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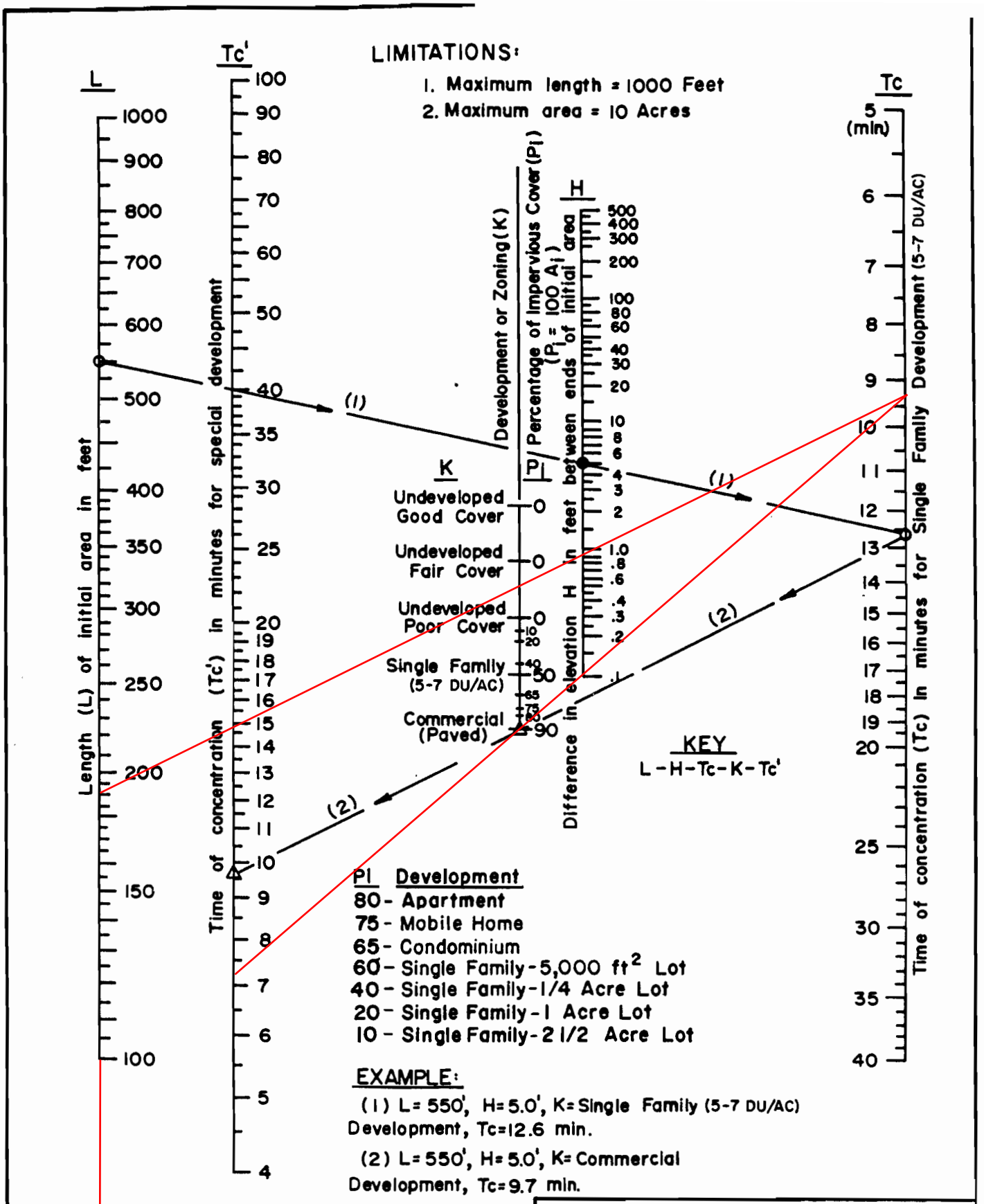
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SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1



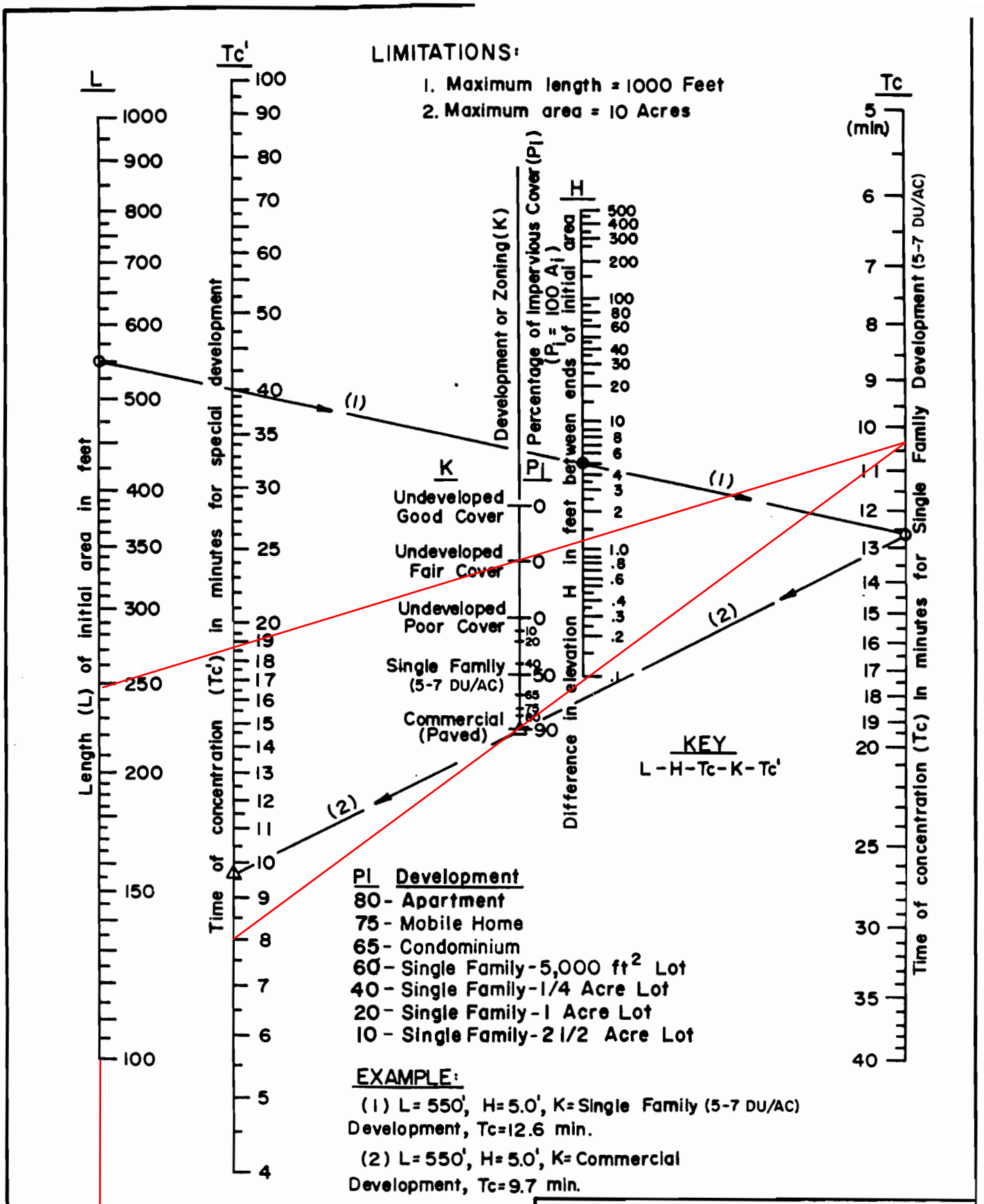
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

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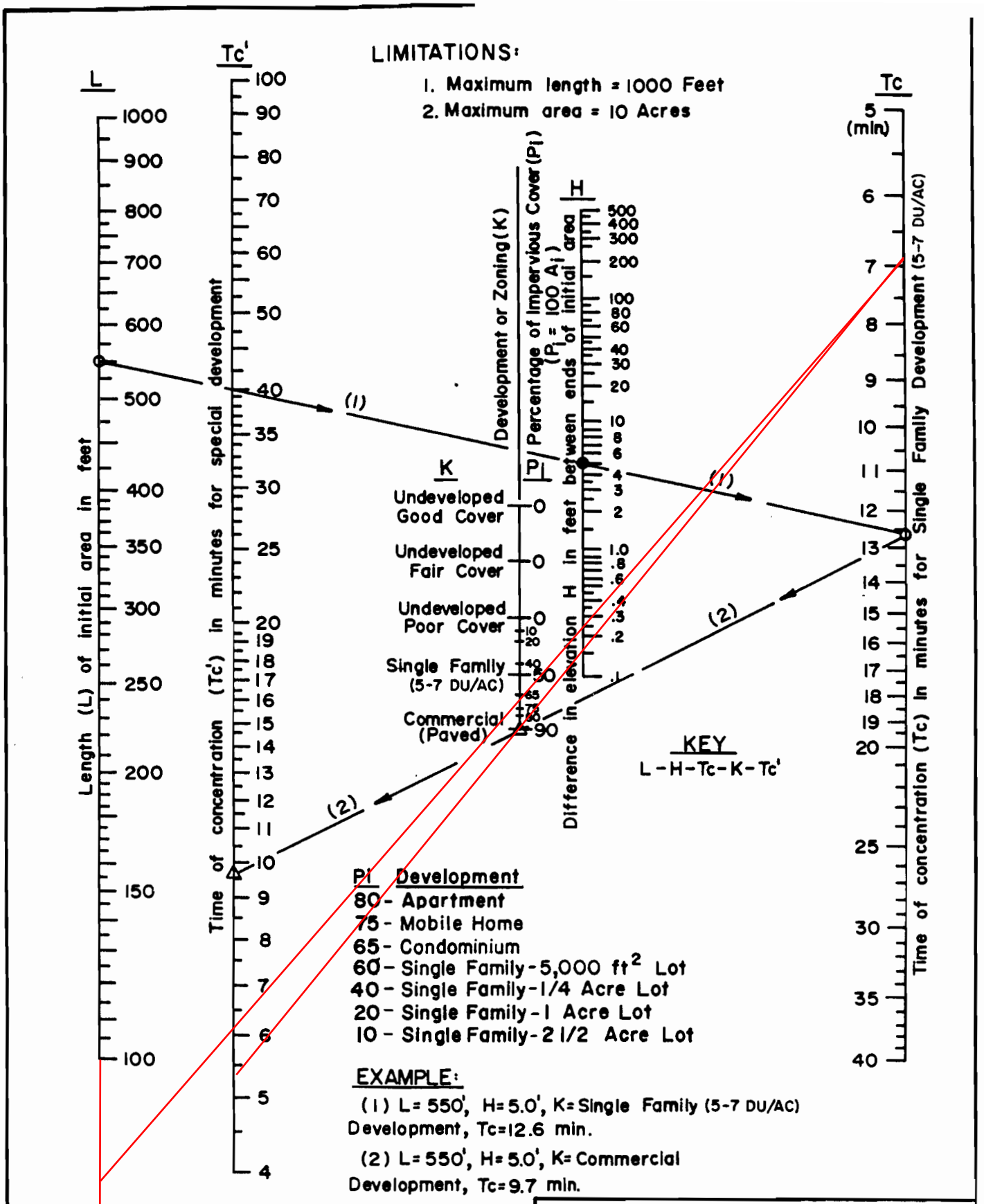
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SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1



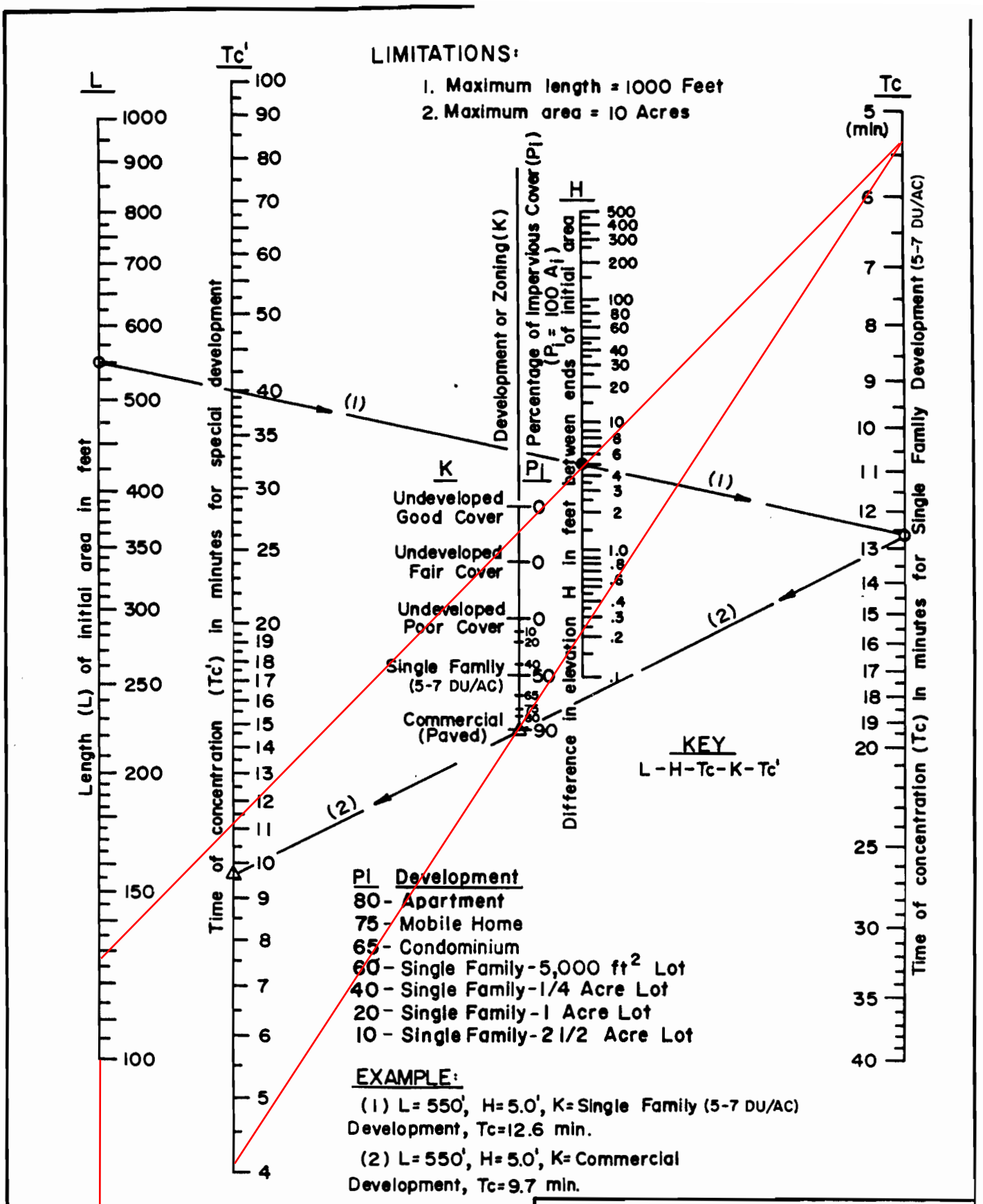
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

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5A



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

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6A

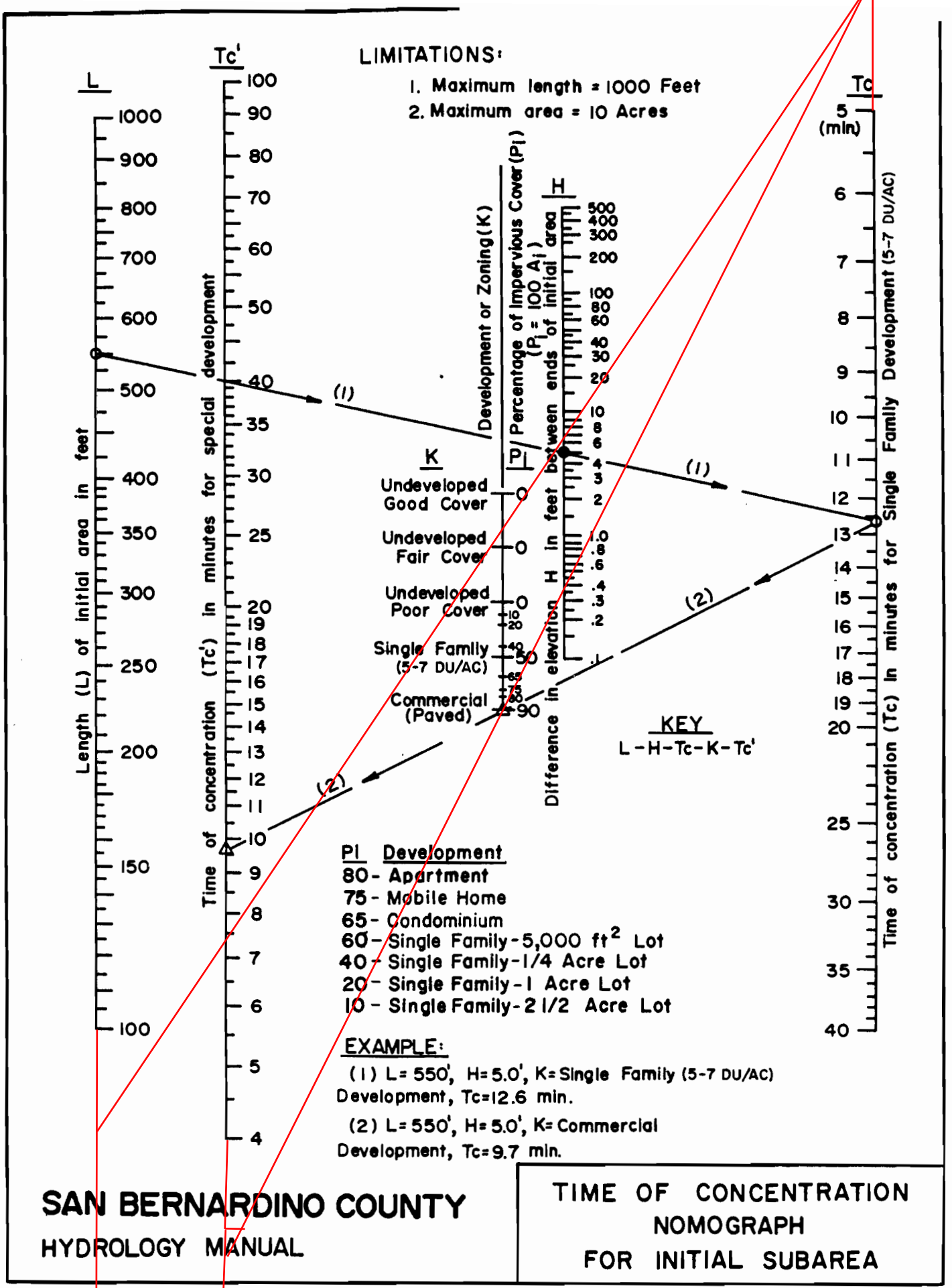
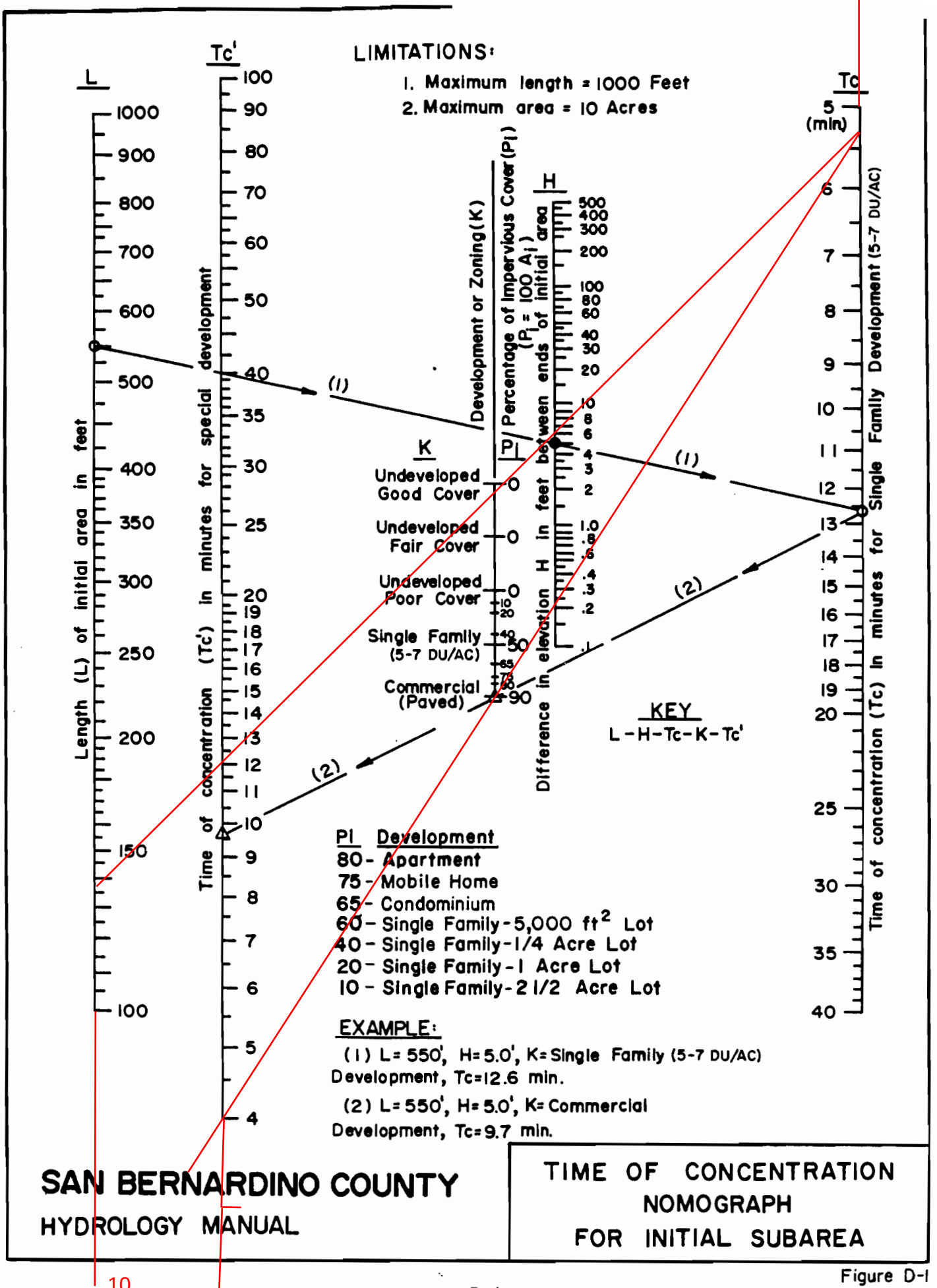

LIMITATIONS:
1. Maximum length = 1000 Feet
2. Maximum area = 10 Acres
L
Length (L) of initial area in feet
Tc'
Time of concentration (Tc') in minutes for special development
Development or Zoning (K)
Pi Percentage of Impervious Cover (Pi)
(Pi = 100 Ai)
H
Difference in elevation H in feet between ends of initial area
K
Undeveloped Good Cover
Undeveloped Fair Cover
Undeveloped Poor Cover
Single Family (5-7 DU/AC)
Commercial (Paved)
Tc
Time of concentration (Tc) in minutes for Single Family Development (5-7 DU/AC)
(1)
(2)
KEY
L-H-Tc-K-Tc'
Pi Development
80 - Apartment
75 - Mobile Home
65 - Condominium
60 - Single Family - 5,000 ft2 Lot
40 - Single Family - 1/4 Acre Lot
20 - Single Family - 1 Acre Lot
10 - Single Family - 2 1/2 Acre Lot
EXAMPLE:
(1) L = 550', H = 5.0', K = Single Family (5-7 DU/AC) Development, Tc = 12.6 min.
(2) L = 550', H = 5.0', K = Commercial Development, Tc = 9.7 min.
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1



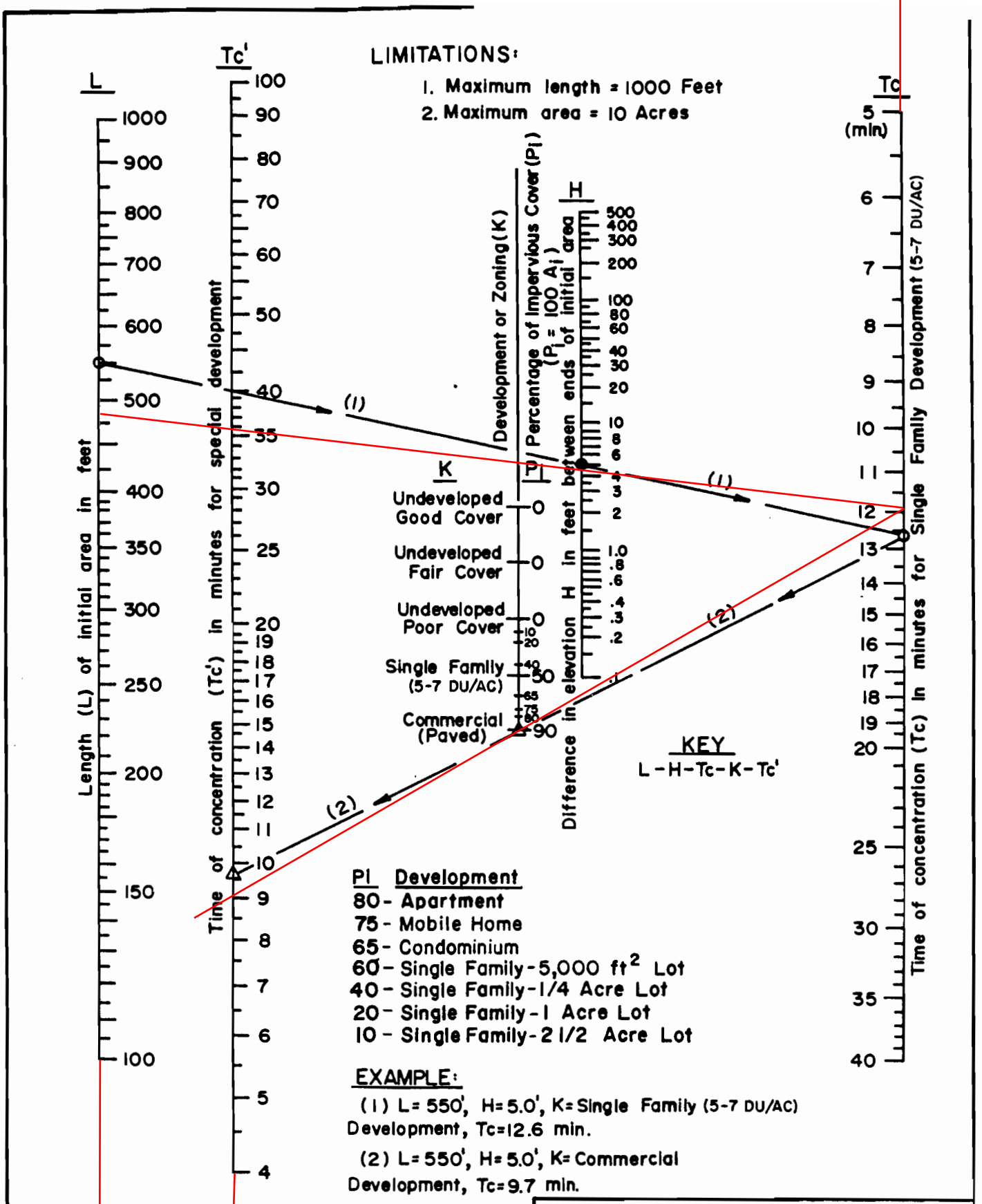
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

10

8A



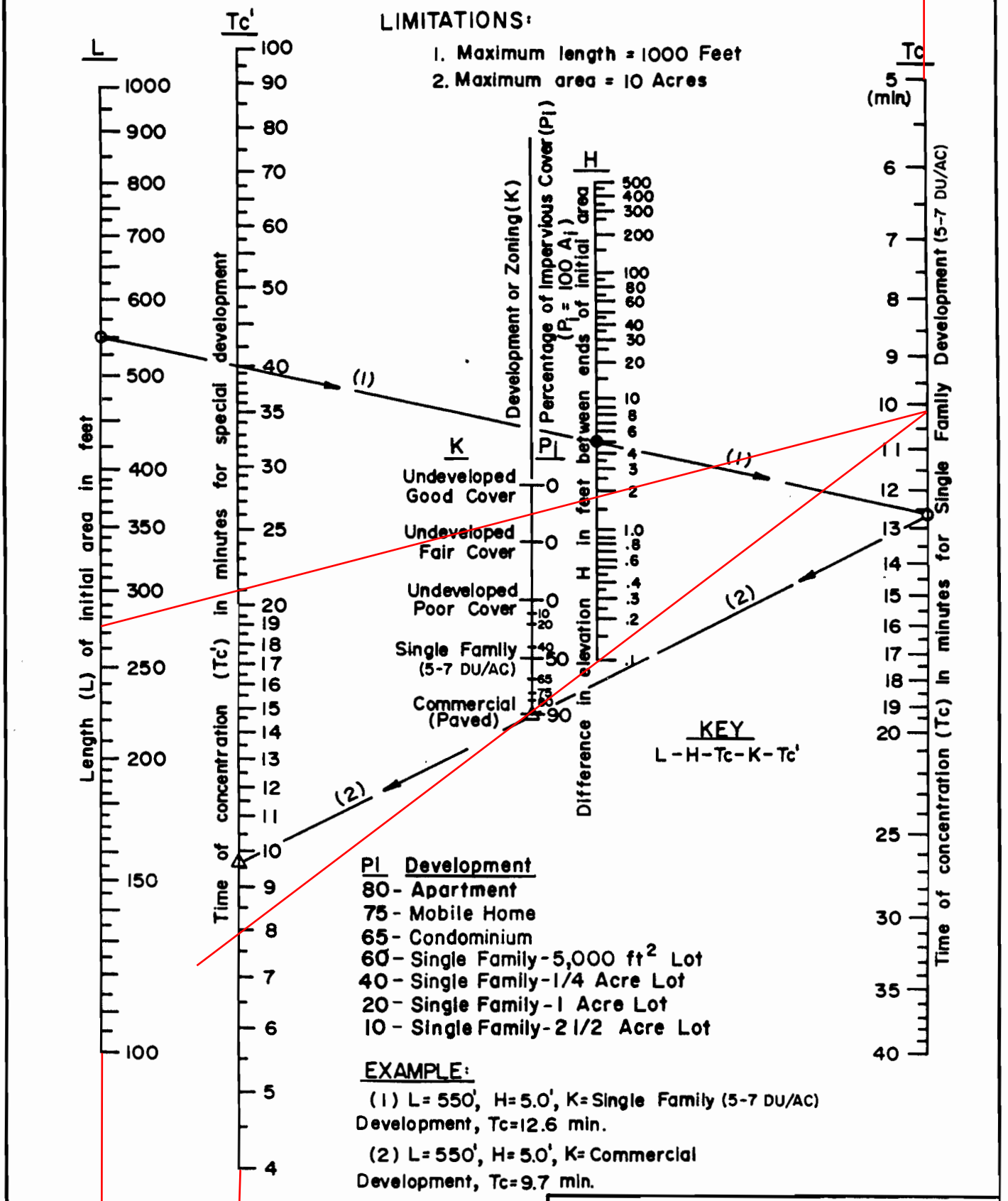
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

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9A



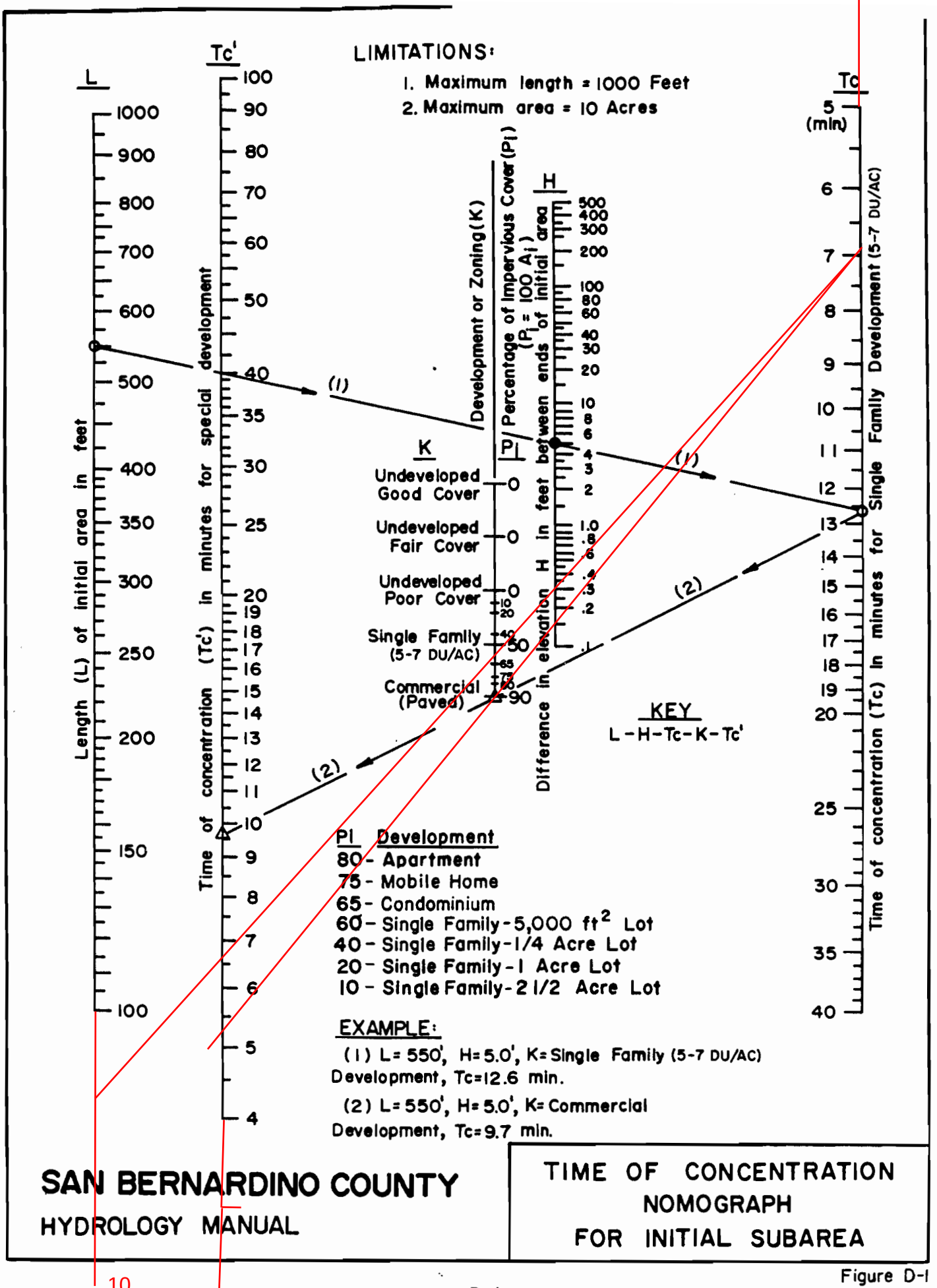
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

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10B



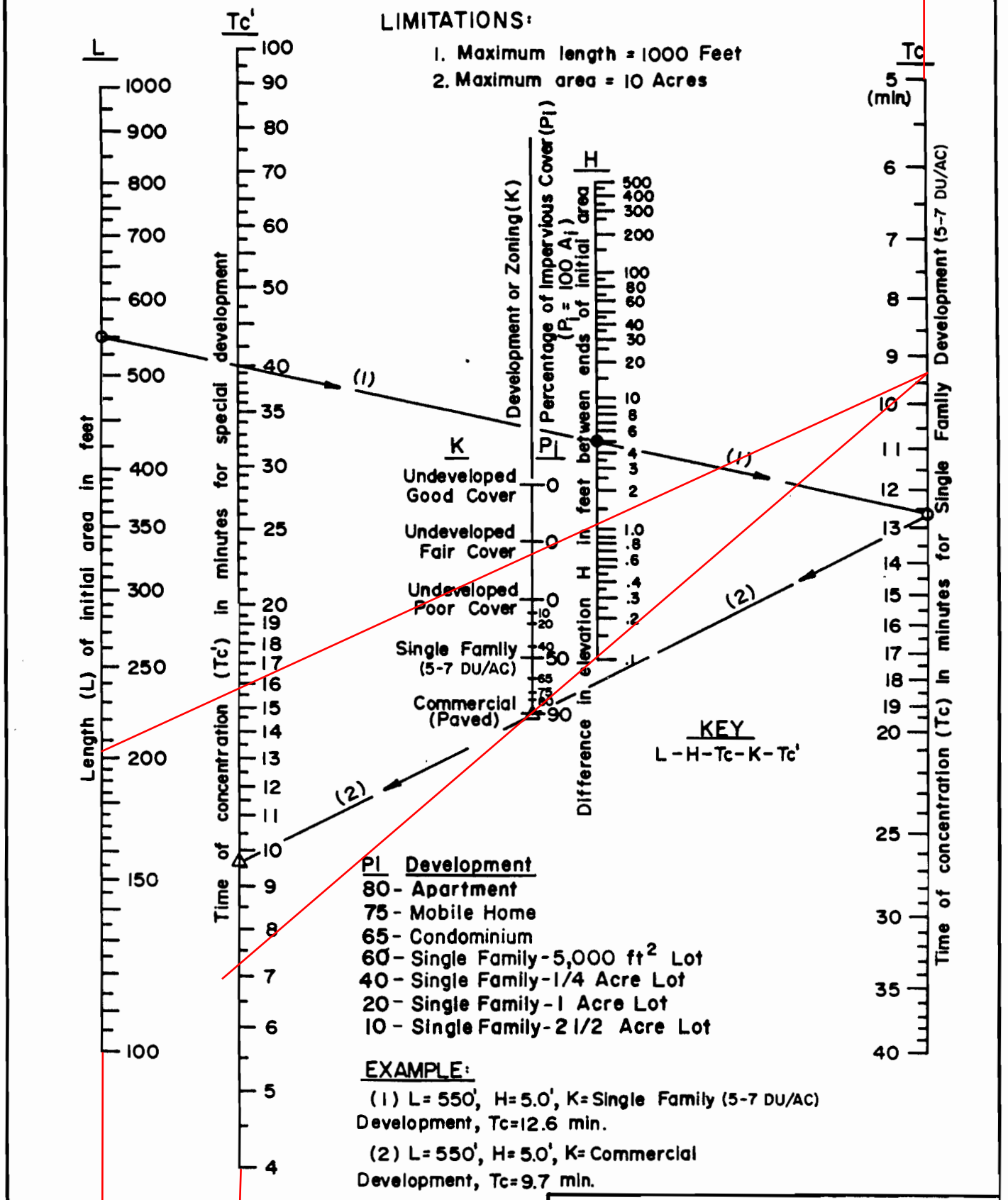
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

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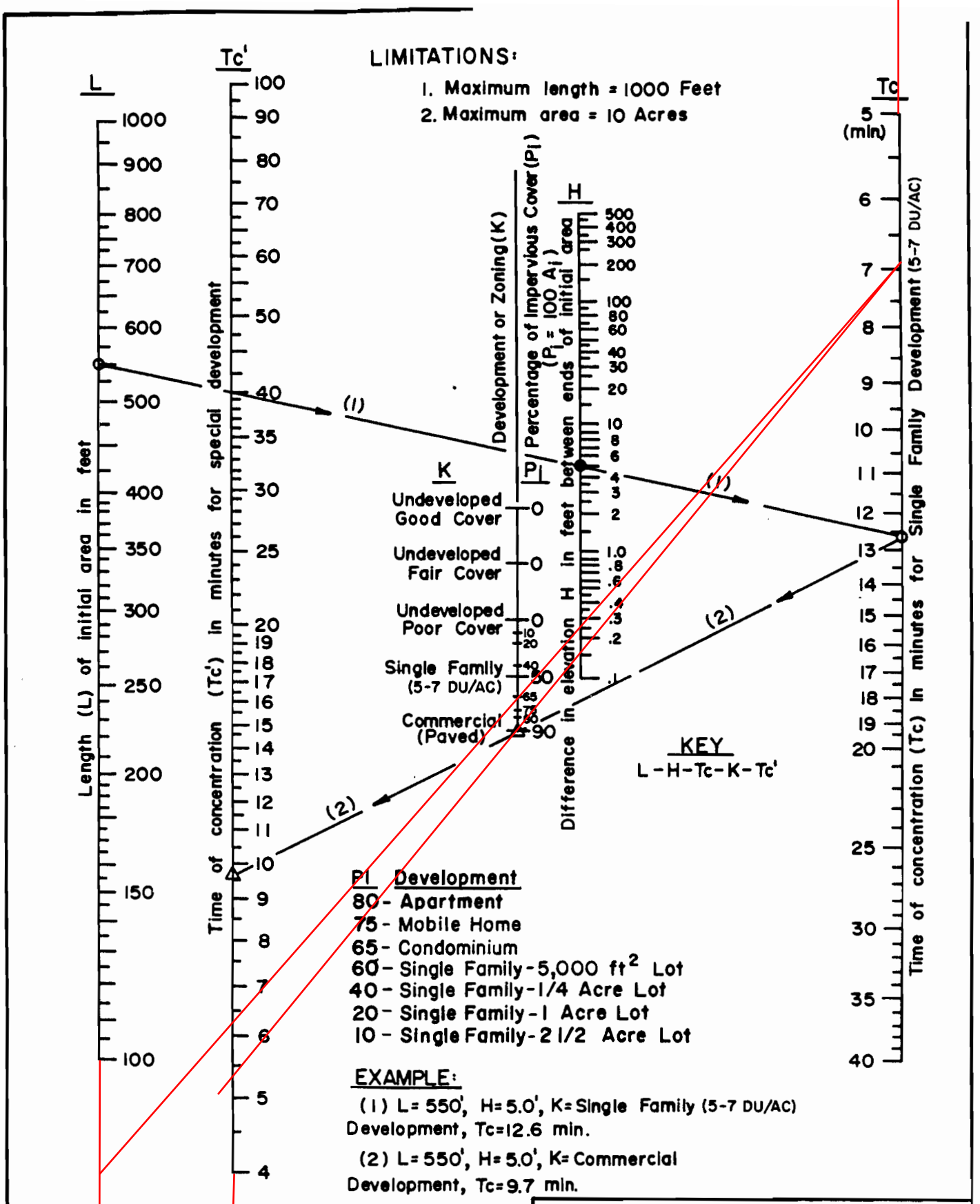
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SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1



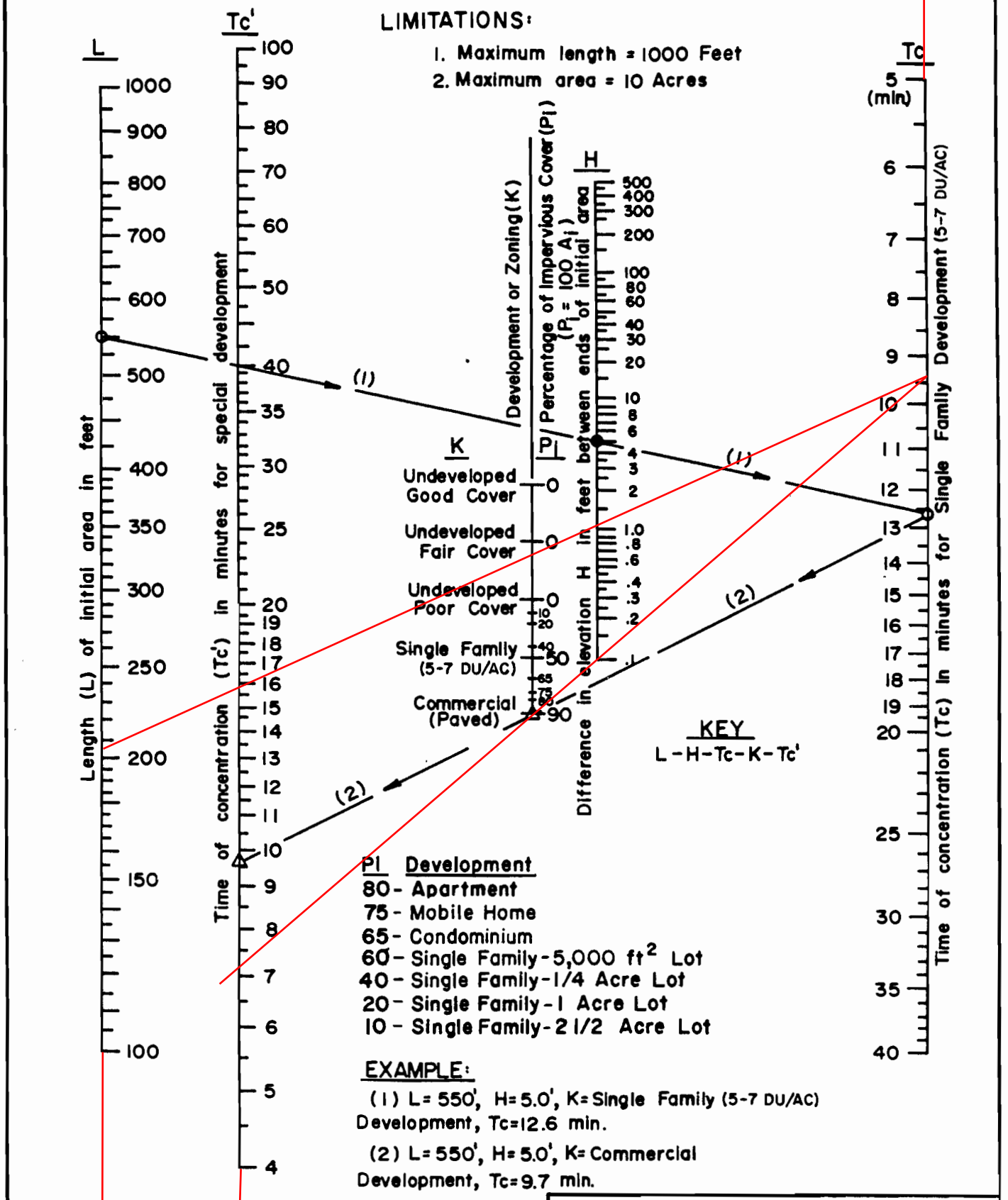
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

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13B



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

10

14B

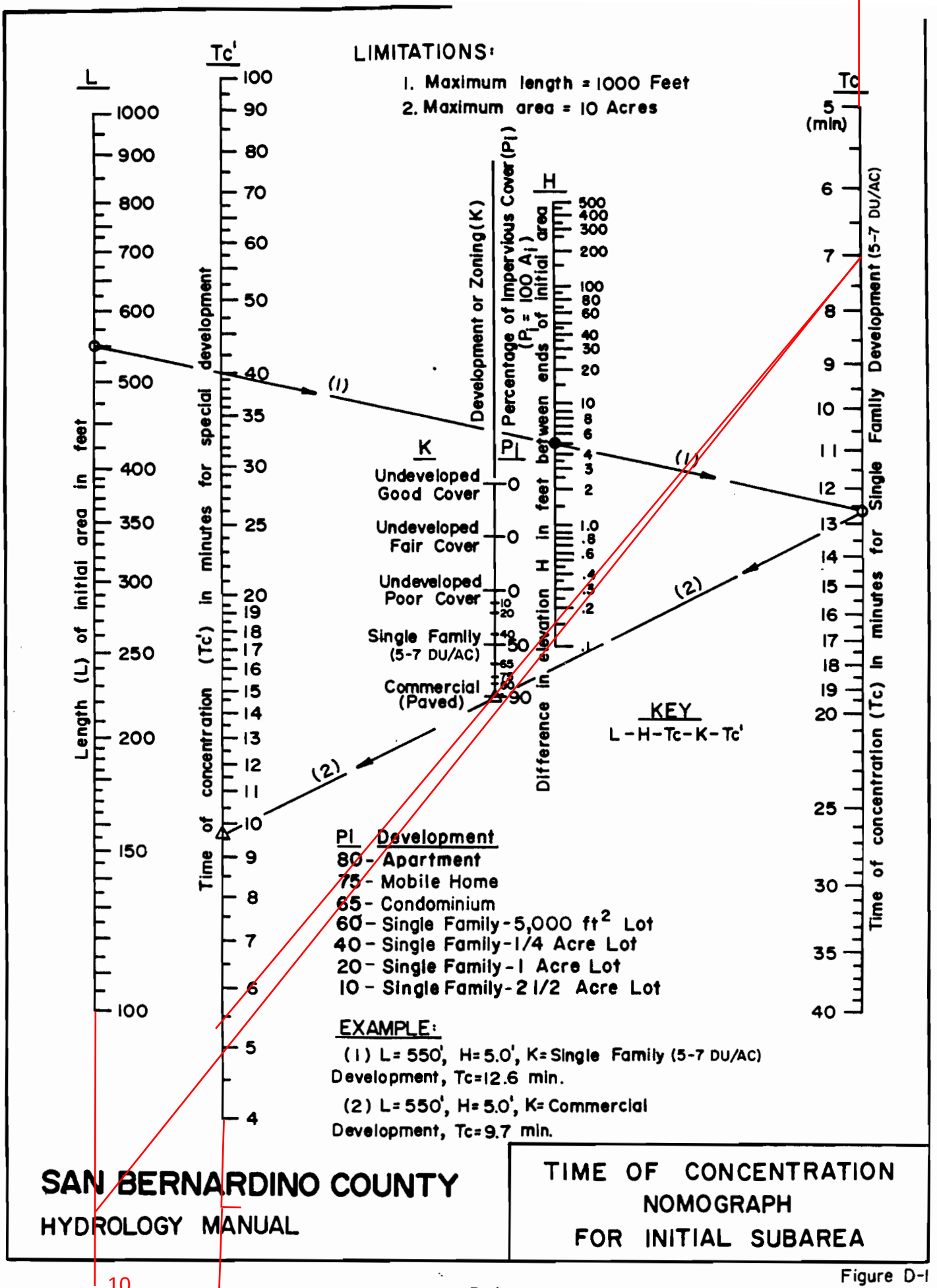
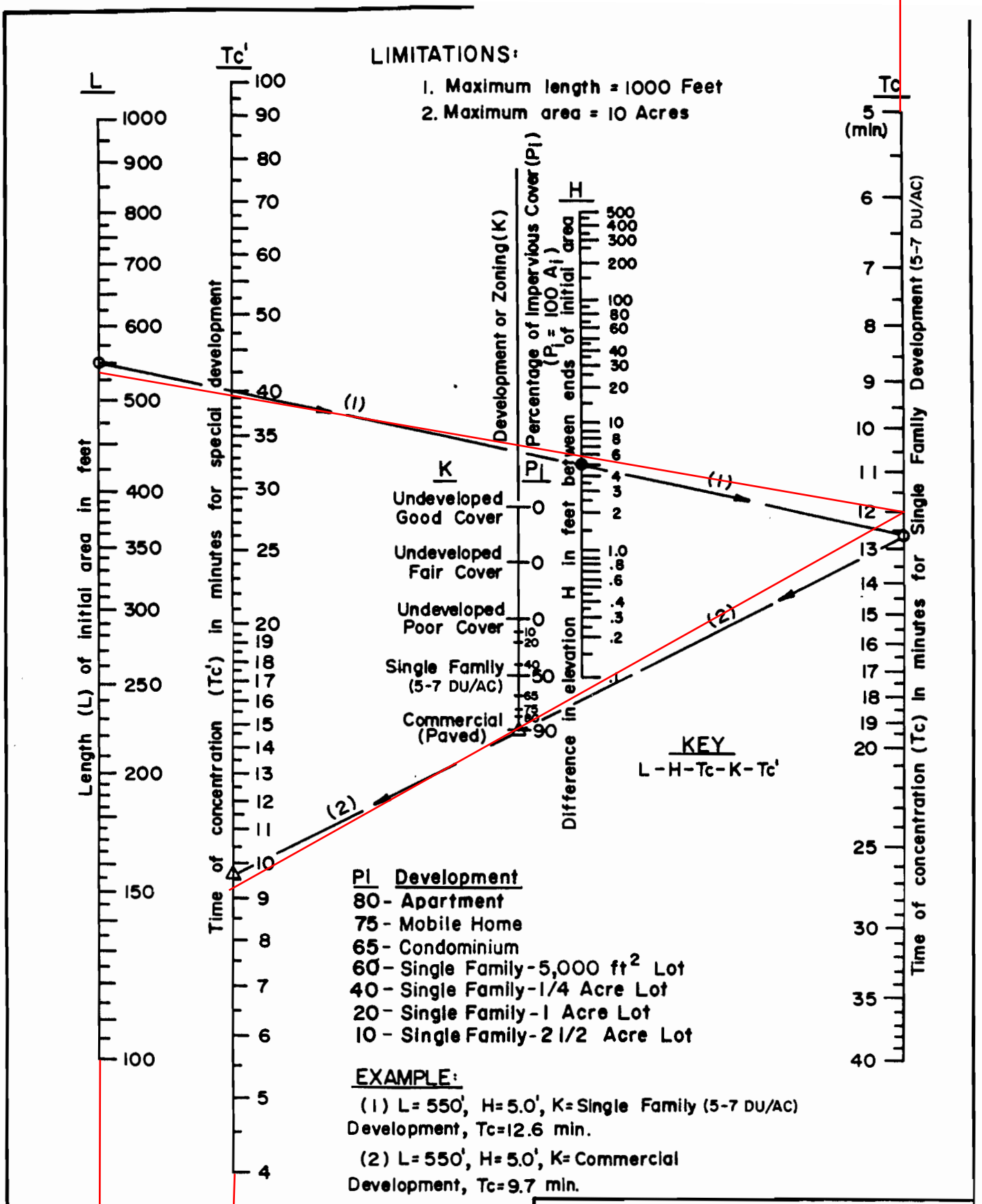

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Tc'
Time of concentration (Tc') in minutes for special development
Development or Zoning (K)
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H
Difference in elevation H in feet between ends of initial area
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Undeveloped Good Cover
Undeveloped Fair Cover
Undeveloped Poor Cover
Single Family (5-7 DU/AC)
Commercial (Paved)
Tc
Time of concentration (Tc) in minutes for Single Family Development (5-7 DU/AC)
(1)
(2)
KEY
L-H-Tc-K-Tc'
Pi Development
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75 - Mobile Home
65 - Condominium
60 - Single Family - 5,000 ft2 Lot
40 - Single Family - 1/4 Acre Lot
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10 - Single Family - 2 1/2 Acre Lot
EXAMPLE:
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(2) L= 550', H= 5.0', K= Commercial Development, Tc=9.7 min.
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1



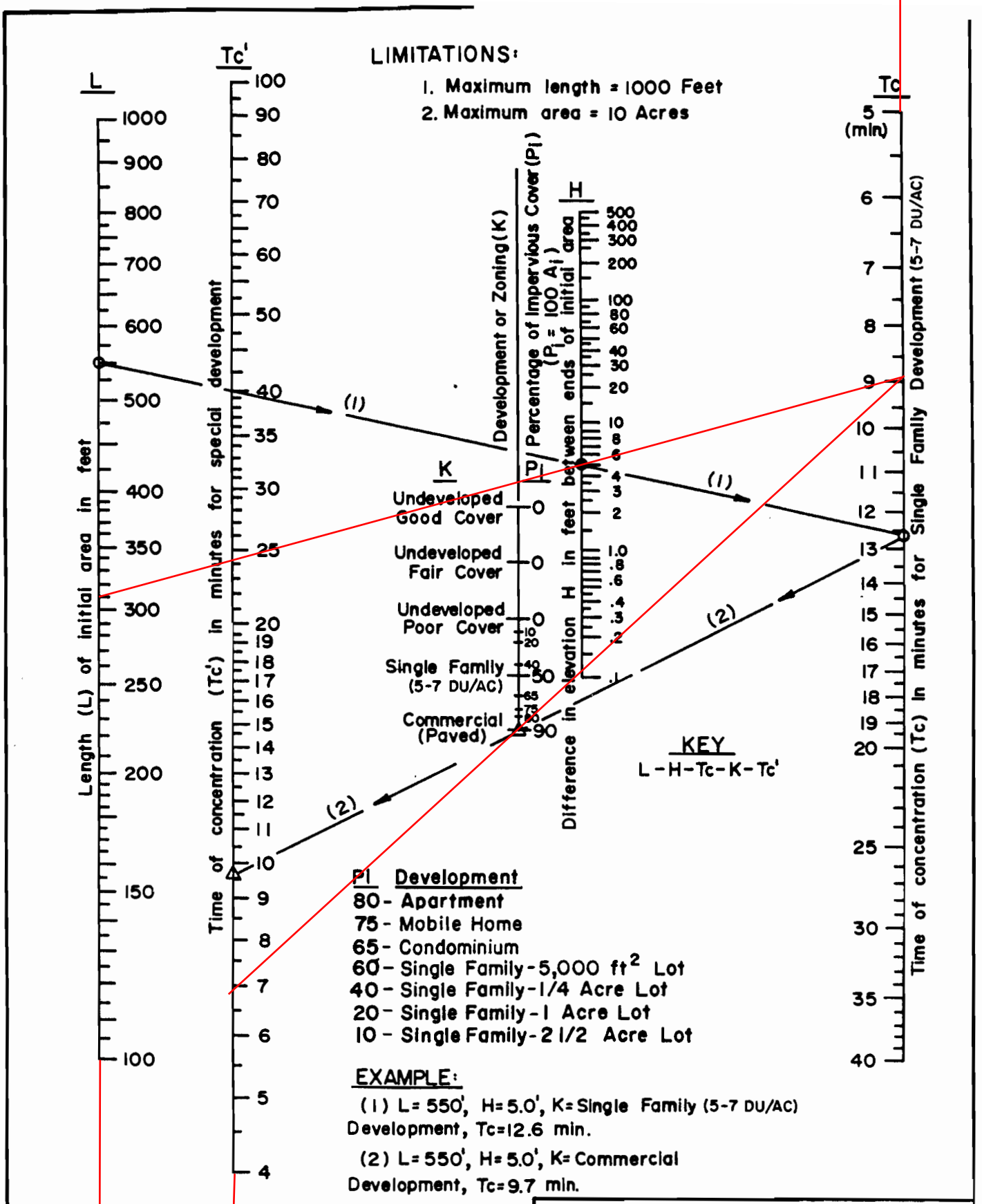
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

10

16B



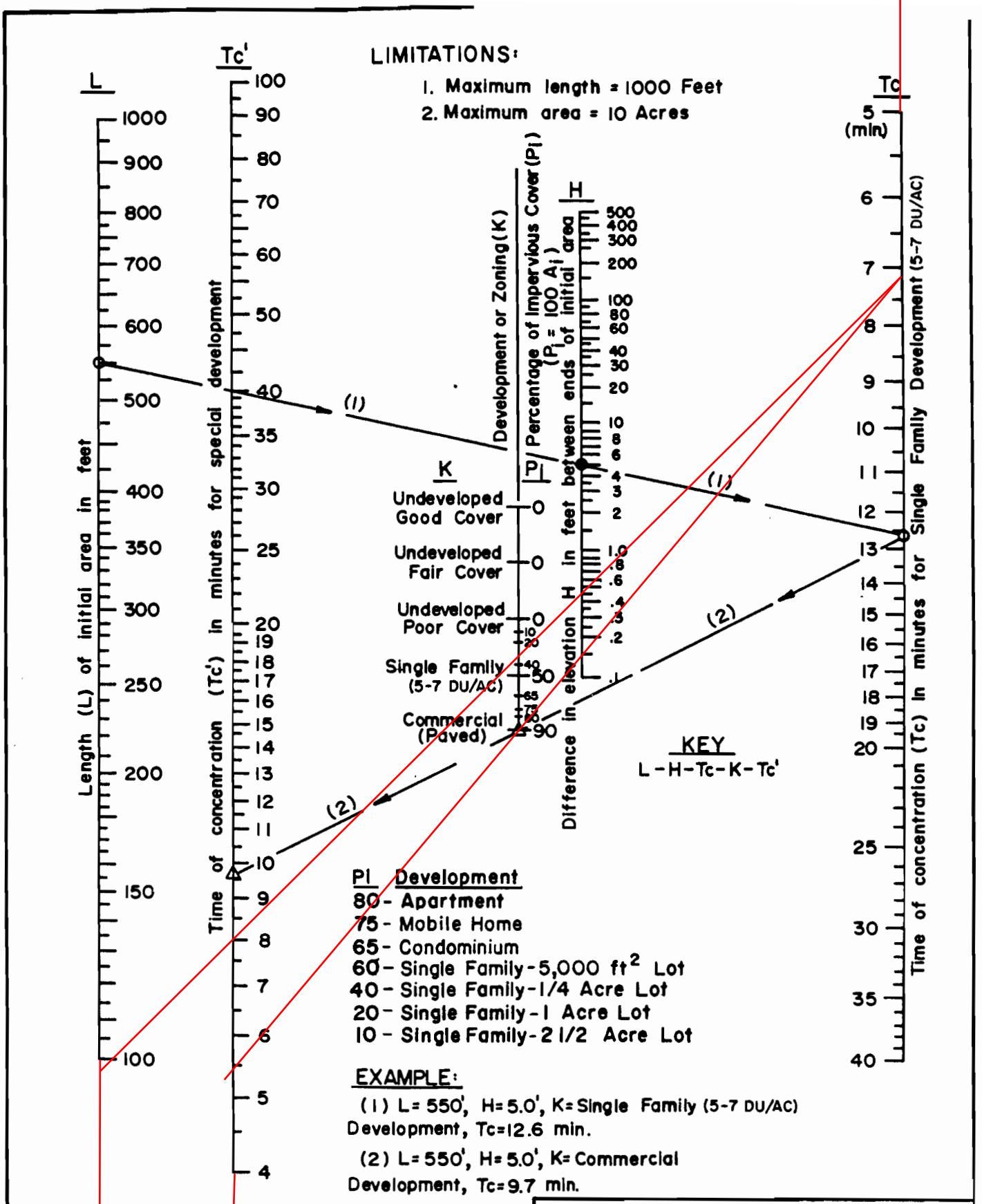
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

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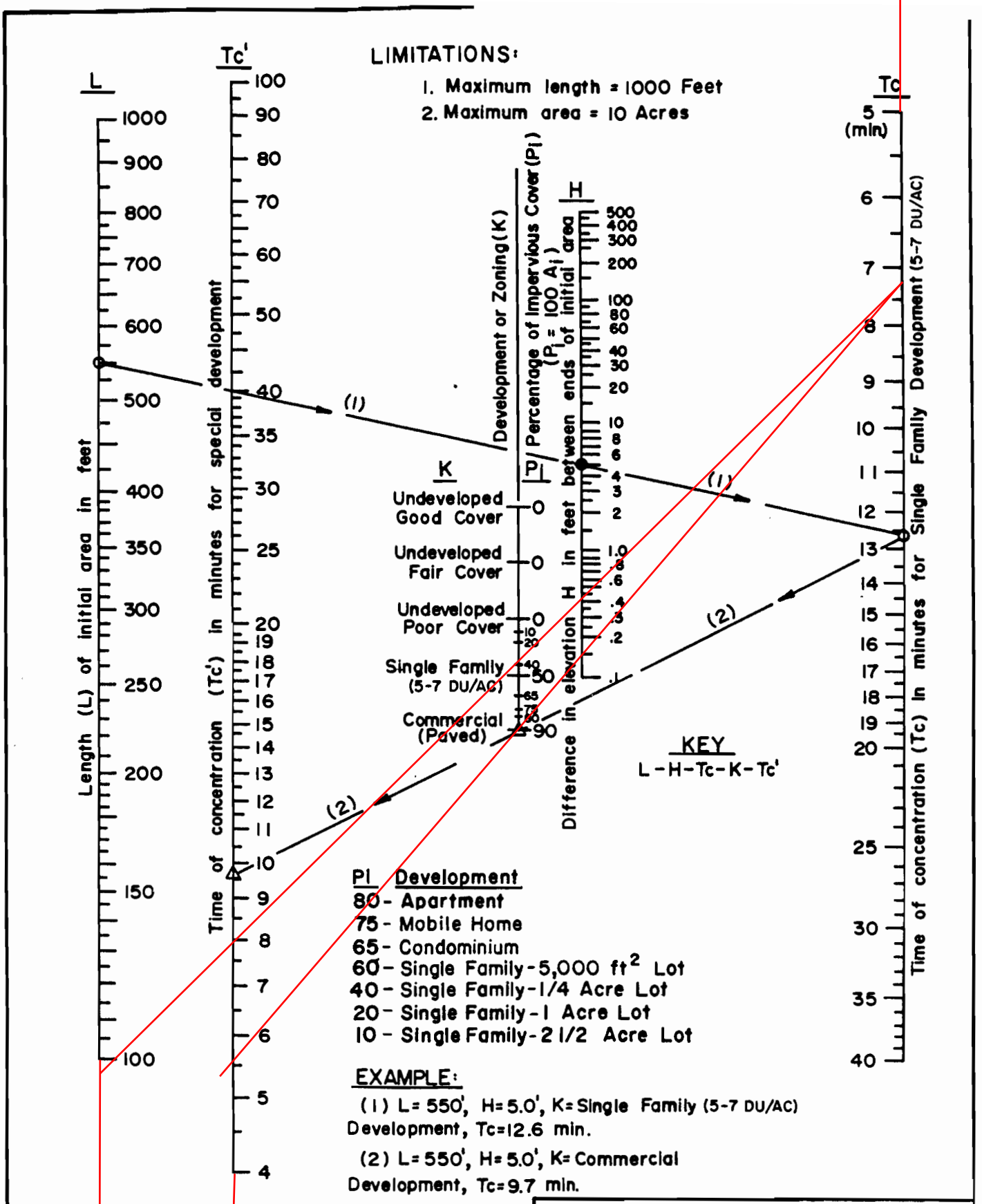
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SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

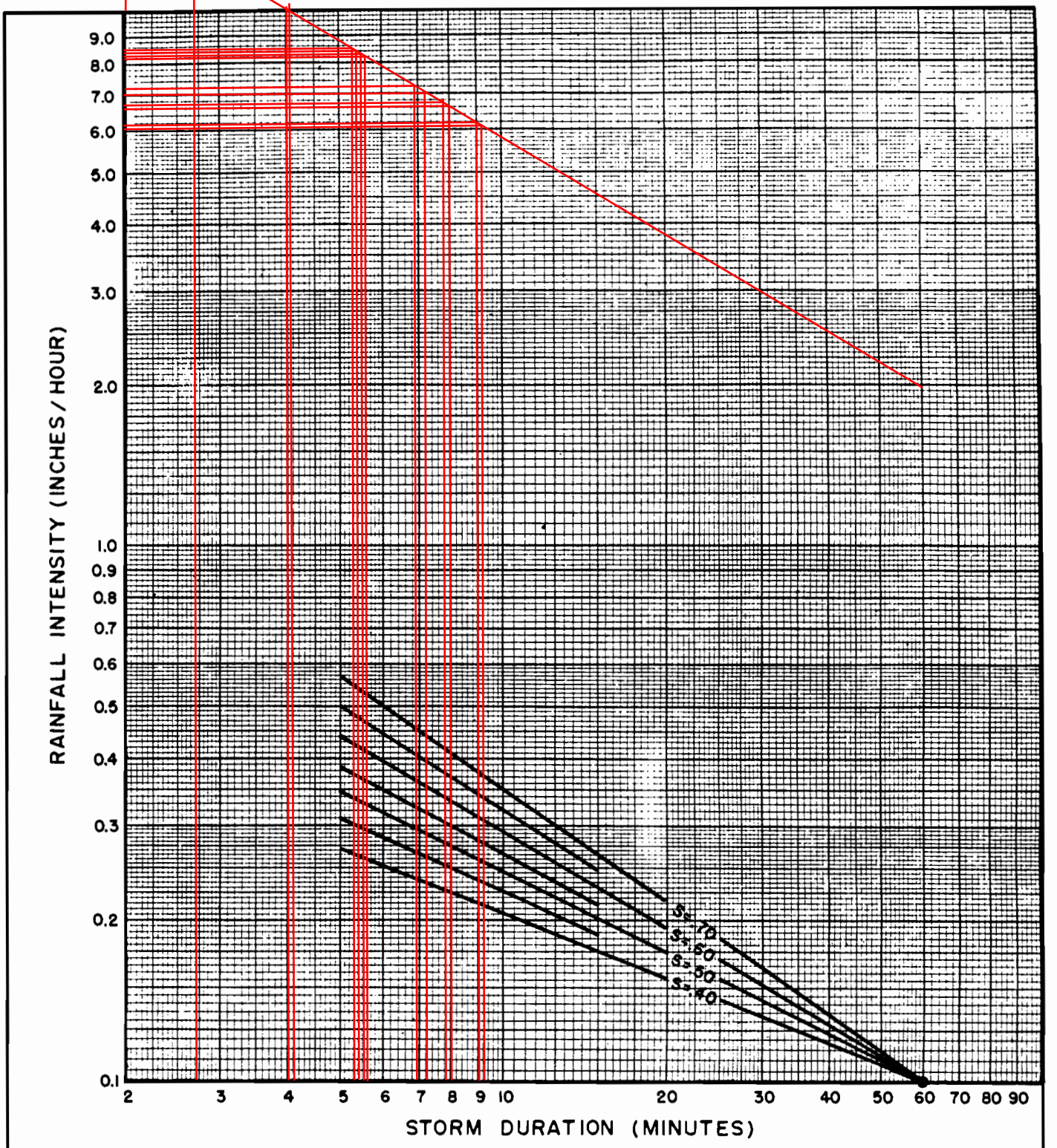
Figure D-1



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1



DESIGN STORM FREQUENCY = 100 YEARS

ONE HOUR POINT RAINFALL = 1.97 INCHES

LOG-LOG SLOPE = 0.6

PROJECT LOCATION = 4164 North 4th Ave, San Bernardino

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

FIGURE D-3

PIPE SIZING CALCULATIONS

Normal Depth Summary Table

Pipe Diameter (in)	Slope %	Manning's Roughness Coefficient	Full Flow Capacity (cfs)
6	0.5	0.010	0.52
8	0.5	0.010	1.11
10	0.5	0.010	2.01
12	0.5	0.010	3.27
14	0.5	0.010	4.94
16	0.5	0.010	7.05
18	0.5	0.010	9.66
20	0.5	0.010	12.79
24	0.5	0.010	20.79

Worksheet for Circular Pipe - 6

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Normal Depth	6.0 in
Diameter	6.0 in
Discharge	0.52 cfs

Results	
Discharge	0.52 cfs
Normal Depth	6.0 in
Flow Area	0.2 ft²
Wetted Perimeter	1.6 ft
Hydraulic Radius	1.5 in
Top Width	0.00 ft
Critical Depth	4.4 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	2.63 ft/s
Velocity Head	0.11 ft
Specific Energy	0.61 ft
Froude Number	(N/A)
Maximum Discharge	0.55 cfs
Discharge Full	0.52 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	6.0 in
Critical Depth	4.4 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Circular Pipe - 8

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Normal Depth	8.0 in
Diameter	8.0 in
Discharge	1.11 cfs

Results	
Discharge	1.11 cfs
Normal Depth	8.0 in
Flow Area	0.3 ft²
Wetted Perimeter	2.1 ft
Hydraulic Radius	2.0 in
Top Width	0.00 ft
Critical Depth	6.0 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	3.18 ft/s
Velocity Head	0.16 ft
Specific Energy	0.82 ft
Froude Number	(N/A)
Maximum Discharge	1.19 cfs
Discharge Full	1.11 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	8.0 in
Critical Depth	6.0 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Circular Pipe - 10

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Normal Depth	10.0 in
Diameter	10.0 in
Discharge	2.01 cfs

Results	
Discharge	2.01 cfs
Normal Depth	10.0 in
Flow Area	0.5 ft²
Wetted Perimeter	2.6 ft
Hydraulic Radius	2.5 in
Top Width	0.00 ft
Critical Depth	7.6 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	3.69 ft/s
Velocity Head	0.21 ft
Specific Energy	1.05 ft
Froude Number	(N/A)
Maximum Discharge	2.17 cfs
Discharge Full	2.01 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	10.0 in
Critical Depth	7.6 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Circular Pipe - 12

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Normal Depth	12.0 in
Diameter	12.0 in
Discharge	3.27 cfs

Results	
Discharge	3.27 cfs
Normal Depth	12.0 in
Flow Area	0.8 ft²
Wetted Perimeter	3.1 ft
Hydraulic Radius	3.0 in
Top Width	0.00 ft
Critical Depth	9.3 in
Percent Full	100.0 %
Critical Slope	0.006 ft/ft
Velocity	4.17 ft/s
Velocity Head	0.27 ft
Specific Energy	1.27 ft
Froude Number	(N/A)
Maximum Discharge	3.52 cfs
Discharge Full	3.27 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	12.0 in
Critical Depth	9.3 in
Channel Slope	0.005 ft/ft
Critical Slope	0.006 ft/ft

Worksheet for Circular Pipe - 14

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Normal Depth	14.0 in
Diameter	14.0 in
Discharge	4.94 cfs

Results	
Discharge	4.94 cfs
Normal Depth	14.0 in
Flow Area	1.1 ft²
Wetted Perimeter	3.7 ft
Hydraulic Radius	3.5 in
Top Width	0.00 ft
Critical Depth	11.0 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	4.62 ft/s
Velocity Head	0.33 ft
Specific Energy	1.50 ft
Froude Number	(N/A)
Maximum Discharge	5.31 cfs
Discharge Full	4.94 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	14.0 in
Critical Depth	11.0 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Circular Pipe - 16

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Normal Depth	16.0 in
Diameter	16.0 in
Discharge	7.05 cfs

Results	
Discharge	7.05 cfs
Normal Depth	16.0 in
Flow Area	1.4 ft²
Wetted Perimeter	4.2 ft
Hydraulic Radius	4.0 in
Top Width	0.00 ft
Critical Depth	12.7 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	5.05 ft/s
Velocity Head	0.40 ft
Specific Energy	1.73 ft
Froude Number	(N/A)
Maximum Discharge	7.59 cfs
Discharge Full	7.05 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	16.0 in
Critical Depth	12.7 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Circular Pipe - 18

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Diameter	18.0 in
Discharge	9.66 cfs

Results	
Discharge	9.66 cfs
Normal Depth	18.0 in
Flow Area	1.8 ft²
Wetted Perimeter	4.7 ft
Hydraulic Radius	4.5 in
Top Width	0.00 ft
Critical Depth	14.4 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	5.46 ft/s
Velocity Head	0.46 ft
Specific Energy	1.96 ft
Froude Number	(N/A)
Maximum Discharge	10.39 cfs
Discharge Full	9.66 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	18.0 in
Critical Depth	14.4 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Circular Pipe - 20

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Normal Depth	20.0 in
Diameter	20.0 in
Discharge	12.79 cfs

Results	
Discharge	12.79 cfs
Normal Depth	20.0 in
Flow Area	2.2 ft²
Wetted Perimeter	5.2 ft
Hydraulic Radius	5.0 in
Top Width	0.00 ft
Critical Depth	16.1 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	5.86 ft/s
Velocity Head	0.53 ft
Specific Energy	2.20 ft
Froude Number	(N/A)
Maximum Discharge	13.76 cfs
Discharge Full	12.79 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	20.0 in
Critical Depth	16.1 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

Worksheet for Circular Pipe - 24

Project Description	
Friction Method	Manning Formula
Solve For	Full Flow Capacity

Input Data	
Roughness Coefficient	0.010
Channel Slope	0.005 ft/ft
Normal Depth	24.0 in
Diameter	24.0 in
Discharge	20.79 cfs

Results	
Discharge	20.79 cfs
Normal Depth	24.0 in
Flow Area	3.1 ft²
Wetted Perimeter	6.3 ft
Hydraulic Radius	6.0 in
Top Width	0.00 ft
Critical Depth	19.6 in
Percent Full	100.0 %
Critical Slope	0.005 ft/ft
Velocity	6.62 ft/s
Velocity Head	0.68 ft
Specific Energy	2.68 ft
Froude Number	(N/A)
Maximum Discharge	22.37 cfs
Discharge Full	20.79 cfs
Slope Full	0.005 ft/ft
Flow Type	Undefined

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	0.0 %
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	24.0 in
Critical Depth	19.6 in
Channel Slope	0.005 ft/ft
Critical Slope	0.005 ft/ft

Storm Drain Sizing Summary Table

Storm Drain Line	Tributary Inlets	100-Yr Peak Flow (cfs)	Pipe Dia. (in)
IA	1A	2.90	12
2A	2A	0.44	6
2	1A, 2A	3.34	14
3A	3A	1.73	10
3	1A-3A	5.07	16
4A	4A	2.70	12
4	1A- 4A	7.77	18
5A	5A	0.45	6
5	1A-5A	8.22	18
6A	6A	0.70	8
7A	6A, 7A	1.09	8
6	1A-7A	9.31	18
8A	8A	1.69	10
7	1A-8A	11.00	20
9A	9A	8.99	18
8	1A-9A	19.99	24
10B	10B	1.66	10
11B	11B	0.47	6
10	10B, 11B	2.13	12
12B	12B	2.65	12
11	10B-12B	4.78	14
13B	13B	0.45	6
12	10B-13B	5.23	16
14B	14B	1.97	10
13	10B-14B	7.20	18
15B	15B	0.18	6
14	10B-15B	7.38	18
16B	16B	3.68	14
15	10B-16B	11.06	20
20C	20C	4.00	14
30D	30D	0.88	8
40E	40E	0.71	8

APPENDIX C: Geotechnical Report

Geotechnical Report

Shandin Hills MHRC
4164 N. 4th Avenue
San Bernardino, California

Prepared for:

New Gen HC
9526 W. Pico Blvd.
Los Angeles, CA 90035



LANDMARK
Geo-Engineers and Geologists

Prepared by:

LandMark Consultants, Inc.
77-948 Wildcat Drive
Palm Desert, CA 92211
(760) 360-0665

July 2023

LANDMARK
Geo-Engineers and Geologists
a MBE Company

780 N. 4th Street
El Centro, CA 92243
(760) 370-3000
landmark@landmark-ca.com

77-948 Wildcat Drive
Palm Desert, CA 92211
(760) 360-0665
gchandra@landmark-ca.com

July 28, 2023

Mr. Abe Tress
New Gen HC
9526 W. Pico Blvd.
Los Angeles, CA 90035

Geotechnical Report
Shandin Hills MHRC
4164 N. 4th Avenue
San Bernardino, California
LCI Report No.: LP23116

Dear Mr. Tress:

As per your request, ***LandMark Consultants, Inc.*** is providing the following geotechnical report for the proposed private mental health center project located at 4164 N. 4th Avenue in the city of San Bernardino, California. The proposed development will consist of a new 72,000 sq-ft building on approximately 5.93 acres west of the existing mental health rehabilitation complex. This new structure is planned to be single tory, wood/metal-framed, with shallow reinforced concrete foundations and slab-on-grade.

Purpose of Work

The purpose of this study was to investigate the upper 41.5 feet of subsurface soil at selected locations within the site for evaluation of physical/engineering properties. From the analysis of the field and laboratory data, professional opinions were developed and are provided in this report regarding geotechnical conditions at this site and the effect on design and construction.

Authorization

Mr. John Tanori provided authorization by written agreement to proceed with our work on May 24, 2023. We conducted our work in general accordance with our written proposal dated May 18, 2023.

Field Exploration

Subsurface exploration was performed on June 22, 2023, using 2R Drilling of Ontario, California to advance five (5) borings to depths of 21.5 to 41.5 feet below existing ground surface. The borings were advanced with a truck-mounted, CME 75 drill rig using 8-inch diameter, hollow-stem, continuous-flight augers. The approximate boring locations were established in the field and plotted on the site map by sighting to discernible site features. The boring locations are shown on the Site and Exploration Plan (Plate A-2).

A geo-technician observed the drilling operations and maintained logs of the soil encountered with sampling depths. Soils were classified during drilling according to the Unified Soil Classification System using the visual-manual procedure in accordance with ASTM D2488. Relatively undisturbed and bulk samples of the subsurface materials were obtained at selected intervals. The relatively undisturbed soil samples were retrieved using a 2-inch outside diameter (OD) split-spoon sampler or a 3-inch OD Modified California Split-Barrel (ring) sampler lined with 6-inch stainless-steel sleeves.

In addition, Standard Penetration Tests (SPT) were performed in accordance with ASTM D1586 and ASTM D6066. The samples were obtained by driving the samplers ahead of the auger tip at selected depths using a 140-pound CME automatic hammer with a 30-inch drop. The number of blows required to drive the samplers the last 12 inches of an 18-inch drive depth into the soil is recorded on the boring logs as “blows per foot”. Blow counts (N values) reported on the boring logs represent the field blow counts. No corrections have been applied to the blow counts shown on the boring logs for effects of overburden pressure, automatic hammer drive energy, drill rod lengths, liners, and sampler diameter.

After logging and sampling the soil, the exploratory borings were backfilled with the excavated material. The backfill was loosely placed and was not compacted to the requirements specified for engineered fill.

The subsurface logs are presented on Plates B-1 through B-5 in Appendix B. A key to the log symbols is presented on Plate B-6. The stratification lines shown on the subsurface logs represent the approximate boundaries between the various strata. However, the transition from one stratum to another may be gradual over some range of depth.

Laboratory Testing

Laboratory tests were conducted on selected bulk soil samples to aid in classification and evaluation of selected properties of the site soils. The tests were conducted in general conformance to the procedures of the American Society for Testing and Materials (ASTM) or other standardized methods as referenced below. The laboratory testing program consisted of the following tests:

- Particle Size Analyses (ASTM D6913/D7928)
- Unit Dry Densities (ASTM D2937)
- Moisture Contents (ASTM D2216)
- Moisture-Density Relationship (ASTM D1557)
- Chemical Analyses (soluble sulfates & chlorides, pH, and resistivity) (Caltrans Methods)

The laboratory test results are presented on the subsurface logs (Appendix B) and in Appendix C. Engineering parameters of soil strength, compressibility, and relative density utilized for developing design criteria provided within this report were extrapolated from data obtained from the field and laboratory testing program.

Site Conditions

The project site is roughly rectangular shaped in plan view, elongated in the east-west direction, and is relatively flat-lying. The project site is currently occupied by the existing mental rehabilitation building in the southeast corner of the site. Adjacent properties are flat-lying and are approximately at the same elevation as this site. Single family residences are located surrounding the site. The project site is bounded on the east by N. 4th Avenue.

The project site lies at an elevation of approximately 1400 feet above mean sea level (AMSL) in the Inland Empire region of Southern California. Annual rainfall in this arid region is less than 4 inches per year with four months of average summertime temperatures above 100 ^{o}F. Winter temperatures are mild, seldom reaching freezing.

Geologic Setting

The project site is located within the eastern portion of the San Bernardino Basin or San Bernardino Valley Block. The valley is situated between the Transverse Range (San Bernardino Mountains) and the San Andreas Fault zone to the northeast, the Peninsular Range (San Jacinto Mountains) and the San Jacinto Fault zone to the southwest and the Perris Block further to the south-southwest.

The San Bernardino Mountains are the loftiest range within the Transverse Range province, with the highest peak, Mount San Gorgonio at 11,502 feet (3,508 m). The San Bernardino Mountains are about 65 miles (105 km) long, with a maximum width of 40 miles (65 km). They are bounded on the west and southwest by the Cajon Pass and the San Andreas Fault, on the north by the Mojave Desert, on the east by Twentynine Palms Valley, and on the southeast by Morongo and Coachella Valleys.

The San Andreas Fault Zone is located along the southern flanks of the San Bernardino Mountains, which have been uplifted along its trace (Norris & Webb, 1990). The flanks of the range are cut by deep, narrow canyons and are drained by several permanent streams. The Santa Ana River, located to the north of the site, has the largest drainage basin in southern California. It drains both the San Bernardino and eastern San Gabriel Mountains, and the northern Peninsular Ranges (Norris & Webb, 1990).

Subsurface Soils

Subsurface soils encountered during the field exploration conducted on June 22, 2023, consist of silty sand (SM), sand (SP-SM) and sand (SP). The near surface soils are non-expansive in nature. The subsurface logs (Plates B-1 through B-5) depict the stratigraphic relationships of the various soil types.

Groundwater

Groundwater was not encountered in the boring during the time of exploration. Based on available information from the Western Municipal Water District Cooperative Well Measuring Program, the nearest groundwater well with data (Well No. 01N04W21B002S) is located less than 1-mile southwest of the project site. The most recent measurement was recorded approximately 140-feet bgs.

There is uncertainty in the accuracy of short-term water level measurements. Groundwater levels may fluctuate with precipitation, irrigation of adjacent properties, drainage, and site grading. The groundwater level noted should not be interpreted to represent an accurate or permanent condition. Based on the regional topography, groundwater flow is assumed to be generally towards the south within the site area. Flow directions may vary locally in the vicinity of the site.

Faulting

The project site is located within the seismically active San Bernardino Valley of southern California and is considered likely to be subjected strong ground motion from earthquakes in the region. We have performed a computer-aided search of known faults or seismic zones that lie within a 36-mile radius of the project site (Table 1).

A fault map illustrating known active faults relative to the site is presented on Figure 1, *Regional Fault Map*. Figure 2 shows the project site in relation to local faults. The criterion for fault classification adopted by the California Geological Survey defines Earthquake Fault Zones along Holocene-active or pre-Holocene faults (CGS, 2023b). Earthquake Fault Zones are regulatory zones that address the hazard of surface fault rupture. A Holocene-active fault is one that has ruptured during Holocene time (within the last 11,700 years). A pre-Holocene fault is a fault that has not ruptured in the last 11,700 years. Pre-Holocene faults may still be capable of surface rupture in the future, but are not regulated by the Alquist-Priolo Act (AP).

Review of the current Alquist-Priolo Earthquake Fault Zone maps (CGS, 2023a) indicates that the nearest mapped Earthquake Fault Zone is the San Andreas – San Bernardino (south) fault located approximately 1.7 miles north of the project site.

General Ground Motion Analysis

The project site is considered likely to be subjected to moderate to strong ground motion from earthquakes in the region. Ground motions are dependent primarily on the earthquake magnitude and distance to the seismogenic (rupture) zone. Acceleration magnitudes also are dependent upon attenuation by rock and soil deposits, direction of rupture and type of fault; therefore, ground motions may vary considerably in the same general area.

2022 CBC General Ground Motion Parameters: The California Building Code (CBC) requires that a site-specific ground motion hazard analysis be performed in accordance with ASCE 7-16 Section 11.4.8 (ASCE, 2016) for structures on Site Class D with S_1 greater than or equal to 0.2 and Site Class E sites with S_s greater than or equal to 1.0 (CBC, 2019). **This project site has been classified as Site Class C which would require a site-specific ground motion hazard analysis**.

The 2022 CBC general ground motion parameters are based on the Risk-Targeted Maximum Considered Earthquake (MCE_R). The Structural Engineers Association of California (SEAOC) and Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps Web Application (SEAOC, 2020) was used to obtain the site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters. Design spectral response acceleration parameters are defined as the earthquake ground motions that are two-thirds (2/3) of the corresponding MCE_R ground motions. The Maximum Considered Earthquake Geometric Mean (MCE_G) peak ground acceleration adjusted for soil site class effects (PGA_M) value to be used for liquefaction and seismic settlement analysis in accordance with 2022 CBC Section 1803.5.12.2 is estimated at 1.2g for the project site. ***Design earthquake ground motion parameters are provided in Table 2.***

Seismic and Other Hazards

► **Groundshaking.** The primary seismic hazard at the project site is the potential for strong groundshaking during earthquakes along the Cucamonga, San Jacinto, San Andreas and other nearby faults. A further discussion of groundshaking mentioned above.

► **Surface Rupture.** The project site does not lie within a State of California, Alquist-Priolo Earthquake Fault Zone or County of San Bernardino Fault Zone. Surface fault rupture is considered to be unlikely at the project site because of the well-delineated fault lines through the San Bernardino Valley as shown on USGS and CDMG maps.

However, because of the high tectonic activity and deep alluvium of the region, we cannot preclude the potential for surface rupture on undiscovered or new faults that may underlie the site.

► **Liquefaction.** Liquefaction is unlikely to be a potential hazard at the site, due to groundwater deeper than 50 feet (the maximum depth that liquefaction is known to occur).

<u>Other Potential Geologic Hazards.</u>

► **Landsliding.** The hazard of landsliding is unlikely due to the regional planar topography. No ancient landslides are shown on geologic maps of the region and no indications of landslides were observed during our site investigation.

► **Volcanic hazards.** The site is not located in proximity to any known volcanically active area and the risk of volcanic hazards is considered very low.

► **Tsunamis, sieches, and flooding.** The site does not lie near any large bodies of water, so the threat of tsunami, sieches, or other seismically-induced flooding is unlikely.

► **Expansive soil.** The near surface soils at the project site consist of sands which are non-expansive.

Hydroconsolidation

In arid climatic regions, granular soils have a potential to collapse upon wetting. This collapse (hydro-consolidation) phenomena is the result of the lubrication of soluble cements (carbonates) in the soil matrix causing the soil to densify from its loose configuration during deposition. Based on our experience in the vicinity of the project site, there is a slight risk of collapse upon inundation from at the site. Therefore, development of building foundation is not required to include provisions for mitigating the hydro-consolidation caused by soil saturation from landscape irrigation or broken utility lines.

Soil Infiltration Rate

A total of two (2) infiltration tests were conducted on July 10, 2023, at these proposed locations for the on-site storm-water retention basin as shown on the Site and Exploration Plan (Plate A-2). The infiltration tests were performed to the guideline from Design Handbook for Low Impact Development Best Management Practices, prepared by State Water Conservation District, Appendix A, Section 2.3, dated September 2011.

The tests were performed using 6-inch perforated pipe inside an 8-inch diameter flight auger borehole made to depths of approximately 5.0 feet below the existing ground surface, corresponding to the anticipated bottom depth of the stormwater retention basin. The pipes were filled with water and successive readings of drops in water levels were made every 10 minutes for a total elapsed time of 60 minutes, until a stabilization drop was recorded.

The test results indicate that the stabilized soil infiltration rate for the soil ranges from 2.2 to 2.5 inches per hour. A maximum soil infiltration rate of 2.2 inches per hour may be used for the on-site storm-water retention basin design. An oil/water separator should be installed at inlets to the stormwater retention basin to prevent sealing of the basin bottom with silt and oil residues. The field and conversion calculation worksheets are included in Appendix D.

We recommend additional testing should be performed after the completion of rough grading operations, to verify the soil infiltration rate.

Site Preparation

Pre-grade Meeting: Prior to site preparation, a meeting should be held at the site with as a minimum, the owner's representative, grading contractor and geotechnical engineer in attendance.

Clearing and Grubbing: Any surface improvements, debris or vegetation including grass, trees, and weeds on the site at the time of construction should be removed from the construction area. Root balls should be completely excavated. Organic stripping should be hauled from the site and not used as fill. *Any trash, construction debris, concrete slabs, old pavement, landfill, and buried obstructions such as old foundations, un-controlled fills and utility lines exposed during rough grading should be traced to the limits of the foreign material by the grading contractor and removed under our supervision.* Any excavations resulting from site clearing should be dish-shaped to the lowest depth of disturbance and backfilled under the observation of the geotechnical engineer's representative.

Building Pad Preparation: The existing surface soil within the proposed building pad areas should be removed to 48 inches below the original grade or 24 inches below the lowest foundation grade (whichever deeper), extending five feet beyond all exterior wall/column lines (including adjacent concrete areas). Exposed sub-grade should be scarified to a depth of 6 to 8 inches, uniformly moisture conditioned to at least 2% over optimum moisture content, and re-compacted to a minimum of 90% of the maximum density determined in accordance with ASTM D1557 methods.

Auxiliary Structures Foundation Preparation: Auxiliary structures such as free standing or retaining walls should have footings extended to a minimum of 18 inches below grade. The existing soil beneath the structure foundation prepared in the manner described for the house pad except the preparation needs only to extend 18 inches below and beyond the footing.

Sidewalk and Concrete Hardscape Areas: In areas other than the building pad which are to receive concrete slabs, the ground surface should be over-excavated to a depth of 8 to 12 inches, uniformly moisture conditioned to at least 2% over optimum moisture, and re-compacted to at least 90% of ASTM D1557 maximum density.

Street Subgrade Preparation: The native soils in street areas should be removed and recompacted to 12 inches below the design subgrade elevation. Engineered fill in street areas should be uniformly moisture conditioned to at least 2% over optimum moisture, placed in layers not more than 6 to 8 inches in thickness and mechanically compacted to a minimum of 90% of the ASTM D1557 maximum dry density.

The on-site soils are suitable for use as compacted fill and utility trench backfill. Imported fill soil (if required) should be like onsite soil or non-expansive, granular soil meeting the USCS classifications of SM, SP-SM, or SW-SM with a maximum rock size of 6 inches and no less than 5% passing the No. 200 sieve. ***The geotechnical engineer should approve imported fill soil sources before hauling material to the site***. Native and imported materials should be placed in lifts no greater than 8 inches in loose thickness, uniformly moisture conditioned to at least 2% over optimum moisture, and re-compacted to at least 90% of ASTM D1557 maximum density.

Moisture Control and Drainage: The moisture condition of the house pad should be maintained during trenching and utility installation until concrete is placed or should be rewetted before initiating delayed construction. Adequate site drainage is essential to the future performance of the project. Infiltration of excess irrigation water and stormwaters can adversely affect the performance of the subsurface soil at the site. Positive drainage should be maintained away from all structures (5% for 10 feet minimum across unpaved areas) to prevent ponding and subsequent saturation of the native soil. Gutters and downspouts may be considered as a means to convey water away from foundations. If landscape irrigation is allowed next to the building, drip irrigation systems or lined planter boxes should be used. The subgrade soil should be maintained in a moist, but not saturated state, and not allowed to dry out. Drainage should be maintained without ponding.

Utility Trench Backfill

On-site soil free of debris, vegetation, and other deleterious matter may be suitable for use as utility trench backfill. Backfill within roadways should be placed in layers not more than 6 to 8 inches in thickness, uniformly moisture conditioned to at least 2% over optimum moisture and mechanically compacted to a minimum of 90% of the ASTM D1557 maximum dry density except for the top 12 inches of the trench which shall be compacted to at least 95%. Native backfill should only be placed and compacted after encapsulating buried pipes with suitable bedding and pipe envelope material. Pipe envelope/bedding should be clean sand (Sand Equivalent SE>30). Precautions should be taken in the compaction of the backfill to avoid damage to the pipes and structures.

Soil Bearing Values and Lateral Loads

Shallow column footings and continuous wall footings are suitable to support the structures provided they are founded on a layer of properly prepared and compacted soil as described above. The foundations may be designed using an allowable soil bearing pressure of 1,800 psf. The allowable soil pressure may be increased by 20% for each foot of embedment depth more than 18 inches and by one-third for short term loads induced by winds or seismic events. The maximum allowable soil pressure at increased embedment depths shall not exceed 2,800 psf.

All exterior and interior foundations should be embedded a minimum of 18 inches below the building support pad or lowest adjacent final grade, whichever is deeper. Continuous wall footings should have a minimum width of 12 inches. Isolated column footings should have a minimum width of 24 inches. ***Recommended concrete reinforcement and sizing for all footings should be provided by the structural engineer.***

Resistance to horizontal loads will be developed by passive earth pressure on the sides of footings and frictional resistance developed along the bases of footings and concrete slabs. Passive resistance to lateral earth pressure may be calculated using an equivalent fluid pressure of 300 pcf to resist lateral loadings. The top one foot of embedment should not be considered in computing passive resistance unless the adjacent area is confined by a slab or pavement. An allowable friction coefficient of 0.35 may also be used at the base of the footings to resist lateral loading.

Foundation movement under the estimated static (non-seismic) loadings and static site conditions are estimated to not exceed ¾ inch with differential movement of about two-thirds of total movement for the loading assumptions stated above when the subgrade preparation guidelines given above are followed.

Slabs-on-Grade

Concrete slabs and flatwork should be a minimum of 5 inches thick. The concrete floor slabs may either be monolithically placed with the foundation or dowelled after footing placement. The concrete slabs may be placed on granular subgrade that has been compacted at least 90% relative compaction (ASTM D1557). ***Slab thickness and steel reinforcement should be determined by the design engineer.***

American Concrete Institute (ACI) guidelines (ACI 302.1R-15 Chapter 5, Section 5.2.3) provide recommendations regarding the use of moisture barriers beneath concrete slabs. The concrete floor slabs should be underlain by a 10-mil polyethylene vapor retarder that works as a capillary break to reduce moisture migration into the slab section.

All laps and seams should be overlapped 6-inches or as recommended by the manufacturer. The vapor retarder should be protected from puncture. The joints and penetrations should be sealed with the manufacturer's recommended adhesive, pressure-sensitive tape, or both. The vapor retarder should extend a minimum of 12 inches into the footing excavations. The vapor retarder may lie directly on the granular fill with 2 inches of clean sand cover. Placing sand over the vapor retarder may increase moisture transmission through the slab, because it provides a reservoir for bleed water from the concrete to collect. The sand placed over the vapor retarder may also move and mound prior to concrete placement, resulting in an irregular slab thickness.

For areas with moisture sensitive flooring materials, ACI recommends that concrete slabs be placed without a sand cover directly over the vapor retarder, provided that the concrete mix uses a low-water cement ratio and concrete curing methods are employed to compensate for release of bleed water through the top of the slab. The vapor retarder should have a minimum thickness of 15-mil (Stego-Wrap or equivalent).

All independent concrete flatwork should be underlain by 12 inches of moisture conditioned and compacted soils. All flatworks should be jointed in square patterns and at irregularities in shape at a maximum spacing of 10 feet or the least width of the sidewalk.

Concrete Mixes and Corrosivity

Selected chemical analyses for corrosivity were conducted on bulk samples of the near surface soil from the project site (Plate C-2). The native soils have low levels of sulfate and low to moderate levels of chloride ion concentrations. Resistivity determinations on the soil indicate a moderate potential for metal loss because of electrochemical corrosion processes. A minimum of 2,500 psi concrete of Type II Portland Cement with a maximum water/cement ratio of 0.60 (by weight) should be used for concrete placed in contact with native soil on this project (sitework including sidewalks, driveways, patios, and foundations).

Landmark does not practice corrosion engineering. We recommend that a qualified corrosion engineer evaluate the corrosion potential on metal construction materials and concrete at the site.

Excavations

All site excavations should conform to CalOSHA requirements for Type C soil. The contractor is solely responsible for the safety of workers entering trenches. Temporary excavations with depths of 4 feet or less may be cut nearly vertical for short duration. Temporary slopes should be no steeper than 1.5:1 (horizontal:vertical). Sandy soil slopes should be kept moist, but not saturated, to reduce the potential of raveling or sloughing. Excavations deeper than 4 feet will require shoring or slope inclinations in conformance to CAL/OSHA regulations for Type C soil. Surcharge loads of stockpiled soil or construction materials should be set back from the top of the slope a minimum distance equal to the height of the slope. All permanent slopes should not be steeper than 3:1 to reduce wind and rain erosion. Protected slopes with ground cover may be as steep as 2:1. However, maintenance with motorized equipment may not be possible at this inclination.

Lateral Earth Pressures

Earth retaining structures, such as retaining walls, should be designed to resist the soil pressure imposed by the retained soil mass. Walls with granular drained backfill may be designed for an assumed static earth pressure equivalent to that exerted by a fluid weighing 30 pcf for unrestrained (active) conditions (able to rotate 0.1% of wall height), and 50 pcf for restrained (at-rest) conditions. These values should be verified at the actual wall locations during construction. When applicable seismic earth pressure on walls may be assumed to exert a uniform pressure distribution of 7.5H psf against the back of the wall, where H is the height of the backfill. The total seismic load is assumed to act as a point load at 0.6H above the base of the wall.

Surcharge loads should be considered if loads are applied within a zone between the face of the wall and a plane projected behind the wall 45 degrees upward from the base of the wall. The increase in lateral earth pressure acting uniformly against the back of the wall should be taken as 50% of the surcharge load within this zone. Areas of the retaining wall subjected to traffic loads should be designed for a uniform surcharge load equivalent to two feet of native soil.

Walls should be provided with back drains to reduce the potential for the buildup of hydrostatic pressure. The drainage system should consist of a composite HDPE drainage panel or a 2-foot-wide zone of free draining crushed rock placed adjacent to the wall and extending 2/3 the height of the wall. The gravel should be completely enclosed in an approved filter fabric to separate the gravel and backfill soil. A perforated pipe should be placed perforations down at the base of the permeable material at least six inches below finished floor elevations.

The pipe should be sloped to drain to an appropriate outlet that is protected against erosion. Walls should be properly waterproofed. The project geotechnical engineer should approve any alternative drain system.

Pavements

Pavements should be designed according to the 2022 Caltrans Highway Design Manual or other acceptable methods. Traffic indices were not provided by the project engineer or owner; therefore, we have provided structural sections for several traffic indices for comparative evaluation. The public agency or design engineer should decide the appropriate traffic index for the site. Maintenance of proper drainage is necessary to prolong the service life of the pavements. Based on the current Caltrans method, an estimated R-value of 60 for the subgrade soil and assumed traffic indices, the following table provides our estimates for asphaltic concrete (AC pavement sections.

PAVEMENT STUCTURAL SECTIONS

R-Value of Subgrade Soil - 60 (estimated) Design Method - CALTRANS 2022

Traffic Index (assumed)	Flexible Pavements	
	Asphaltic Concrete Thickness (in.)	Aggregate Base Thickness (in.)
5.0	3.0	4.0
6.0	3.5	4.0
7.0	4.5	4.0
8.0	5.0	4.0

Notes:

1) Asphaltic concrete shall be Caltrans, Type A HMA (Hot Mix Asphalt), ¾ inch maximum (½ inch maximum for parking areas), with PG70-10 PG64-16 asphalt concrete, compacted to a minimum of 95% of the Hveem density (CAL 308) or a minimum of 92% of the Maximum Theoretical Density (ASTM D2041).
2) Aggregate base shall conform to Caltrans Class 2 (¾ in. maximum), compacted to a minimum of 95% of ASTM D1557 maximum dry density.
3) Place pavements on 12 inches of moisture conditioned (at least 2% of over optimum) native soil compacted to a minimum of 95% of the maximum dry density determined by ASTM D1557, or the governing agency requirements.

Final pavement sections may need to be determined by sampling and R-Value testing during grading operations when actual subgrade soils are exposed.

Observation and Density Testing

Site preparation and fill placement should be continuously observed and tested by a representative of a qualified geotechnical engineering firm. Near full-time observation services during the excavation and scarification process is necessary to detect undesirable materials or conditions and soft areas that may be encountered in the construction area. The geotechnical firm that provides observation and testing during construction shall assume the responsibility of "***geotechnical engineer of record***" and, as such, shall perform additional tests and investigation as necessary to satisfy themselves as to the site conditions and the recommendations for site development.

Additional Services

We recommend that ***Landmark Consultants, Inc.*** be retained to provide tests and observations services during construction. *The geotechnical engineering firm providing such tests and observations shall become the geotechnical engineer of record and assume responsibility for the project.*

Landmark Consultants, Inc. *recommendations for this site are, to a high degree, dependent upon appropriate quality control of subgrade preparation, fill placement, and foundation construction. Accordingly, the findings and professional opinions in this report are made contingent upon the opportunity for* ***Landmark Consultants, Inc.*** *to observe grading operations and foundation excavations for the proposed construction.*

If parties other than ***Landmark Consultants, Inc.*** *are engaged to provide observation and testing services during construction, such parties must be notified that they will be required to assume complete responsibility as the geotechnical engineer of record for the geotechnical phase of the project by concurring with the recommendations in this report and/or by providing alternative recommendations.*

Closure

Additional information concerning the scope and cost of these services can be obtained from our office. We did not encounter soil conditions that would preclude implementation of the proposed project provided the recommendations contained in this report are implemented in the design and construction of this project.

We appreciate the opportunity to provide our findings and professional opinions regarding geotechnical conditions at the site. Please provide our office with a set of the foundation plans and civil plans for review to insure that the geotechnical site constraints have been included in the design documents. If you have any questions or comments regarding our findings, please call our office at (760) 360-0665.

Respectfully Submitted,
LandMark Consultants, Inc.



Greg M. Chandra, PE, M.ASCE
Principal Engineer

Attachments:

Appendix A: Vicinity and Site Maps
Appendix B: Subsurface Soil Logs and Soil Key
Appendix C: Laboratory Test Results
Appendix D: Soil Infiltration Test Results

TABLES

Table 1
Summary of Characteristics of Closest Known Active Faults

Fault Name	Approximate Distance (miles)	Approximate Distance (km)	Maximum Moment Magnitude (Mw)	Fault Length (km)	Slip Rate (mm/yr)
San Andreas - San Bernardino (South)	1.7	2.7	7.4	103 ± 10	30 ± 7
San Jacinto - San Bernardino	3.9	6.2	6.7	36 ± 4	12 ± 6
Cucamonga	7.3	11.6	6.9	28 ± 3	5 ± 2
Cleghorn	7.3	11.7	6.5	25 ± 3	3 ± 2
North Frontal Fault Zone - Western	9.6	15.3	7.2	51 ± 5	1 ± 0.5
San Jacinto - San Jacinto Valley	11.2	17.9	6.9	43 ± 4	12 ± 6
San Andreas - Mojave	13.7	21.9	7.1	39 ± 4	3 ± 3
San Jose	22.1	35.3	6.4	20 ± 2	0.5 ± 0.5
Sierra Madre	24.9	39.9	7.2	57 ± 6	2 ± 1
Chino Avenue	25.8	41.3	6.7	28 ± 3	1 ± 1
Helendale - S. Lockhart	28.2	45.2	7.3	97 ± 10	0.6 ± 0.4
Elsinore - Glen Ivy	28.6	45.8	6.8	36 ± 4	5 ± 2
Whittier	28.6	45.8	6.8	38 ± 4	2.5 ± 1
Clamshell-Sawpit	31.1	49.7	6.5	16 ± 2	0.5 ± 0.5
North Frontal Fault Zone - Eastern	32.3	51.7	6.7	27 ± 3	0.5 ± 0.3
Pinto Mtn.	34.6	55.4	7.2	74 ± 7	2.5 ± 2
Elsinore - Temecula	34.8	55.7	6.8	43 ± 4	5 ± 2
Puente Hills Blind Thrust	36.0	57.7	7.1	44 ± 4	0.7 ± 0.4
San Jacinto - Anza	37.2	59.5	7.2	91 ± 9	12 ± 6
Lenwood - Lockhart - Old Woman Springs	37.4	59.9	7.5	145 ± 15	0.6 ± 0.4
Garnet Hill *	38.9	62.3			
Morongo *	40.8	65.2			

* Note: Faults not included in CGS database.

Table 2
2022 California Building Code (CBC) and ASCE 7-16 Seismic Parameters

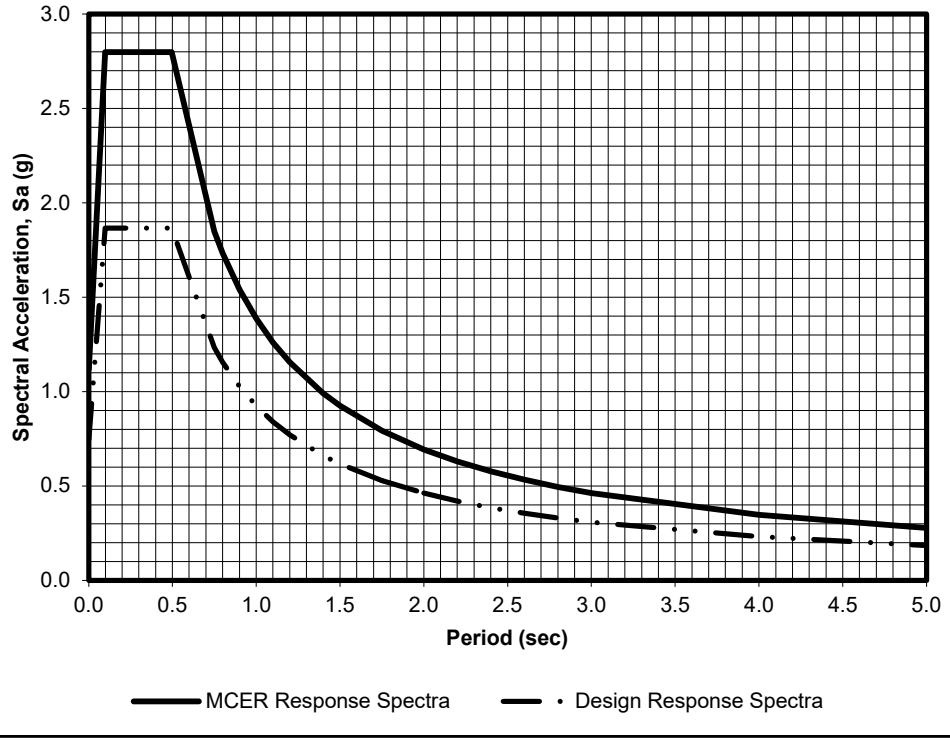
			ASCE 7-16 Reference
Soil Site Class:	**C**		Table 20.3-1
Latitude:	34.1706	N	
Longitude:	-117.3108	W	
Risk Category:	II		
Seismic Design Category:	E		

Maximum Considered Earthquake (MCE) Ground Motion

Mapped MCE_R Short Period Spectral Response	S_s	2.332 g	ASCE Figure 22-1	
Mapped MCE_R 1 second Spectral Response	S_1	0.991 g	ASCE Figure 22-2	
Short Period (0.2 s) Site Coefficient	F_a	1.20	ASCE Table 11.4-1	
Long Period (1.0 s) Site Coefficient	F_v	1.40	ASCE Table 11.4-2	
MCE_R Spectral Response Acceleration Parameter (0.2 s)	S_{MS}	2.798 g	= Fa * S_s	ASCE Equation 11.4-1
MCE_R Spectral Response Acceleration Parameter (1.0 s)	S_{M1}	1.387 g	= Fv * S_1	ASCE Equation 11.4-2

Design Earthquake Ground Motion

Design Spectral Response Acceleration Parameter (0.2 s)	S_{DS}	1.866 g	= 2/3*S_{MS}	ASCE Equation 11.4-3
Design Spectral Response Acceleration Parameter (1.0 s)	S_{D1}	0.925 g	= 2/3*S_{M1}	ASCE Equation 11.4-4
Risk Coefficient at Short Periods (less than 0.2 s)	C_{RS}	0.904		ASCE Figure 22-17
Risk Coefficient at Long Periods (greater than 1.0 s)	C_{R1}	0.883		ASCE Figure 22-18
	T_L	8.00 sec		ASCE Figure 22-12
	T_O	0.10 sec	=0.2*S_{D1}/S_{DS}	
	T_S	0.50 sec	=S_{D1}/S_{DS}	
Peak Ground Acceleration	PGA_M	1.20 g		ASCE Equation 11.8-1



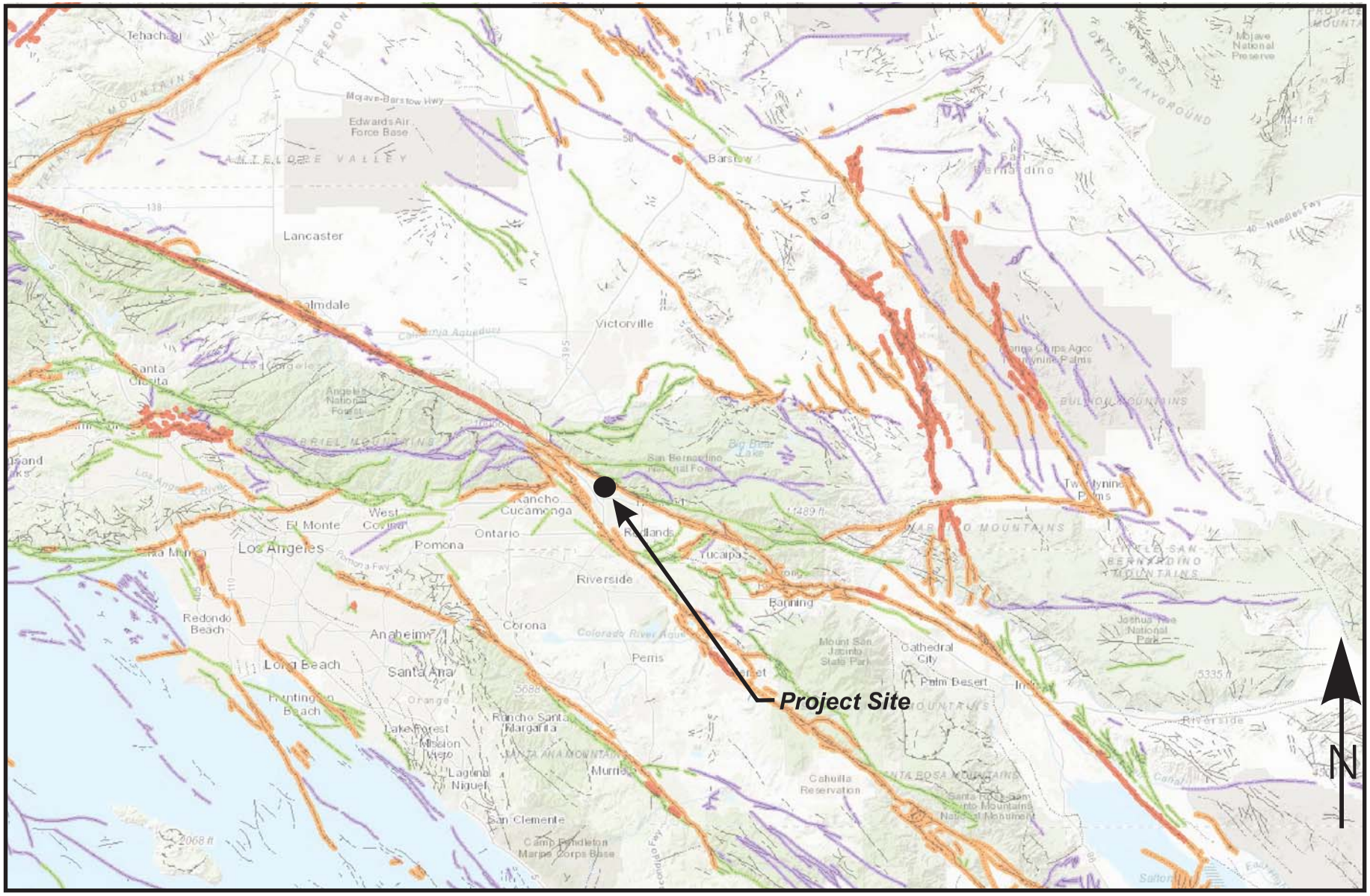
Period T (sec)	Sa (g)	MCE_R Sa (g)
0.00	0.75	1.12
0.10	1.87	2.80
0.50	1.87	2.80
0.75	1.23	1.85
0.80	1.16	1.73
0.90	1.03	1.54
1.00	0.92	1.39
1.10	0.84	1.26
1.20	0.77	1.16
1.20	0.77	1.16
1.40	0.66	0.99
1.50	0.62	0.92
1.75	0.53	0.79
2.00	0.46	0.69
2.20	0.42	0.63
2.40	0.39	0.58
2.60	0.36	0.53
2.80	0.33	0.50
3.00	0.31	0.46
4.00	0.23	0.35
5.00	0.18	0.28

Table 3
Soil Site Class Determination per ASCE 7-16, Section 20.4
Shandin Hills MHRC - San Bernardino, CA
LCI Project No. LP23116

Boring B-1

Sample Depth	SPT Blow Count	di/Ni	Sum di/Ni	Avg. Nch
0				
5	35	0.14	0.65	**62**
10	26	0.19		
15	100	0.05		
20	100	0.05		
25	83	0.06		
30	100	0.05		
35	100	0.05		
40	100	0.05		

FIGURES



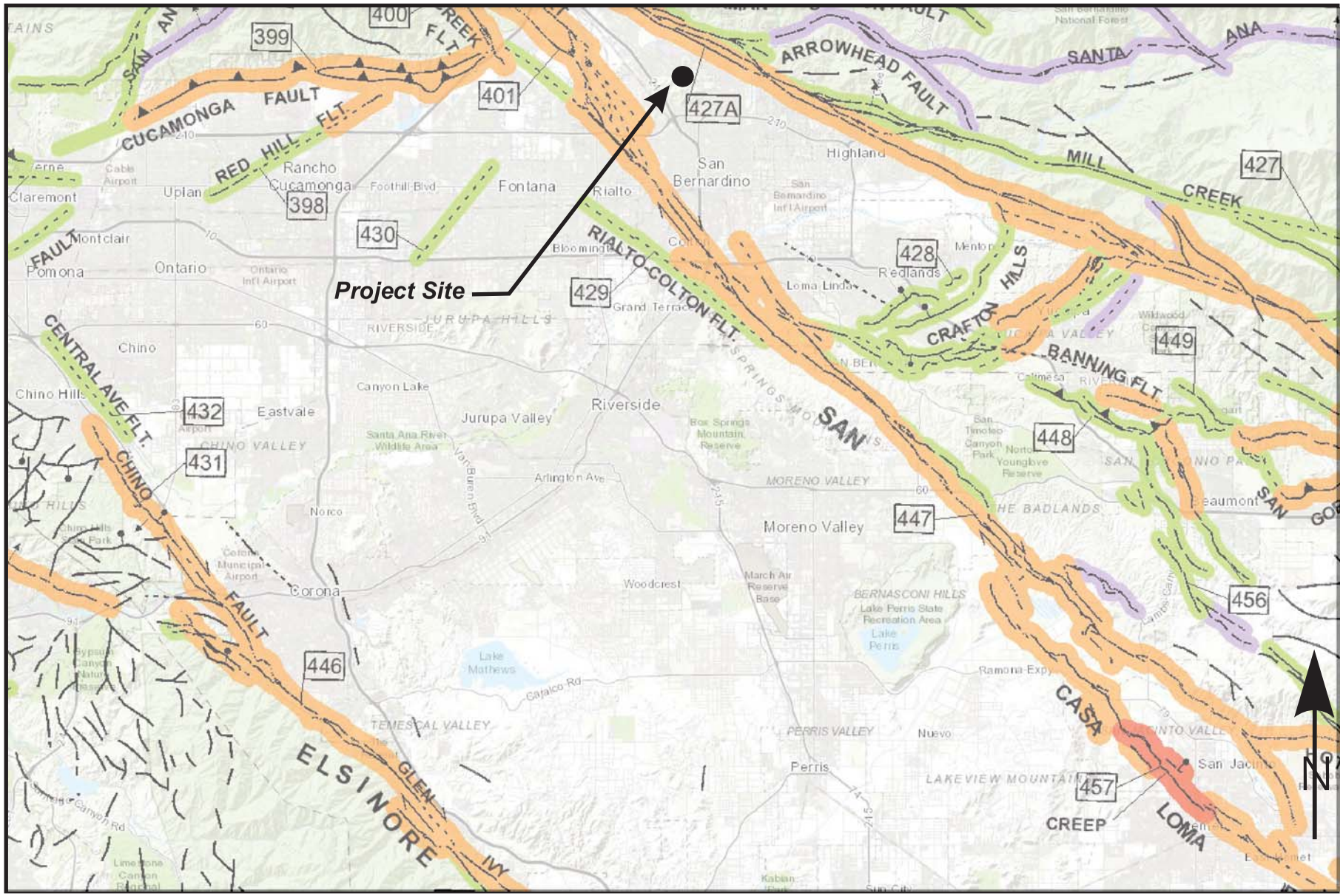
Source: California Geological Survey 2010 Fault Activity Map of California https://maps.conservation.ca.gov/cgs/fam/

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Regional Fault Map

Figure 1



Source: California Geological Survey 2010 Fault Activity Map of California
https://maps.conservation.ca.gov/cgs/fam/App/index.html

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Map of Local Faults

Figure 2

EXPLANATION

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain. Concealed faults in the Great Valley are based on maps of selected subsurface horizons, so locations shown are approximate and may indicate structural trend only. All offshore faults based on seismic reflection profile records are shown as solid lines where well defined, dashed where inferred, queried where uncertain.

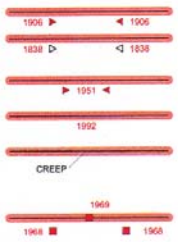
FAULT CLASSIFICATION COLOR CODE
(Indicating Recency of Movement)

Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:

(a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g. extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952). The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.

(b) fault creep slippage - slow ground displacement usually without accompanying earthquakes.

(c) displaced survey lines.



A triangle to the right or left of the date indicates termination point of observed surface displacement. Solid red triangle indicates known location of rupture termination point. Open black triangle indicates uncertain or estimated location of rupture termination point.

Date bracketed by triangles indicates local fault break.

No triangle by date indicates an intermediate point along fault break.

Fault that exhibits fault creep slippage. Hachures indicate linear extent of fault creep. Annotation (creep with leader) indicates representative locations where fault creep has been observed and recorded.

Square on fault indicates where fault creep slippage has occured that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points).

Holocene fault displacement (during past 11,700 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting.

Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.

Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.

Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissnce nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

ADDITIONAL FAULT SYMBOLS

Bar and ball on downthrown side (relative or apparent).

Arrows along fault indicate relative or apparent direction of lateral movement.

Arrow on fault indicates direction of dip.

Low angle fault (barbs on upper plate). Fault surface generally dips less than 45° but locally may have been subsequently steepened. On offshore faults, barbs simply indicate a reverse fault regardless of steepness of dip.

OTHER SYMBOLS



Numbers refer to annotations listed in the appendices of the accompanying report. Annotations include fault name, age of fault displacement, and pertinent references including Earthquake Fault Zone maps where a fault has been zoned by the Alquist-Priolo Earthquake Fault Zoning Act. This Act requires the State Geologist to delineate zones to encompass faults with Holocene displacement.

Structural discontinuity (offshore) separating differing Neogene structural domains. May indicate discontinuities between basement rocks.

Brawley Seismic Zone, a linear zone of seismicity locally up to 10 km wide associated with the releasing step between the Imperial and San Andreas faults.

Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION	
						ON LAND	OFFSHORE
Quaternary	Late Quaternary	Historic	200			Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	11,700			Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
	Early Quaternary	Pleistocene	700,000			Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
			1,600,000*			Undivided Quaternary faults – most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			4.5 billion (Age of Earth)			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.6 Ma criterion.

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Fault Map Legend

Figure 3

APPENDIX A

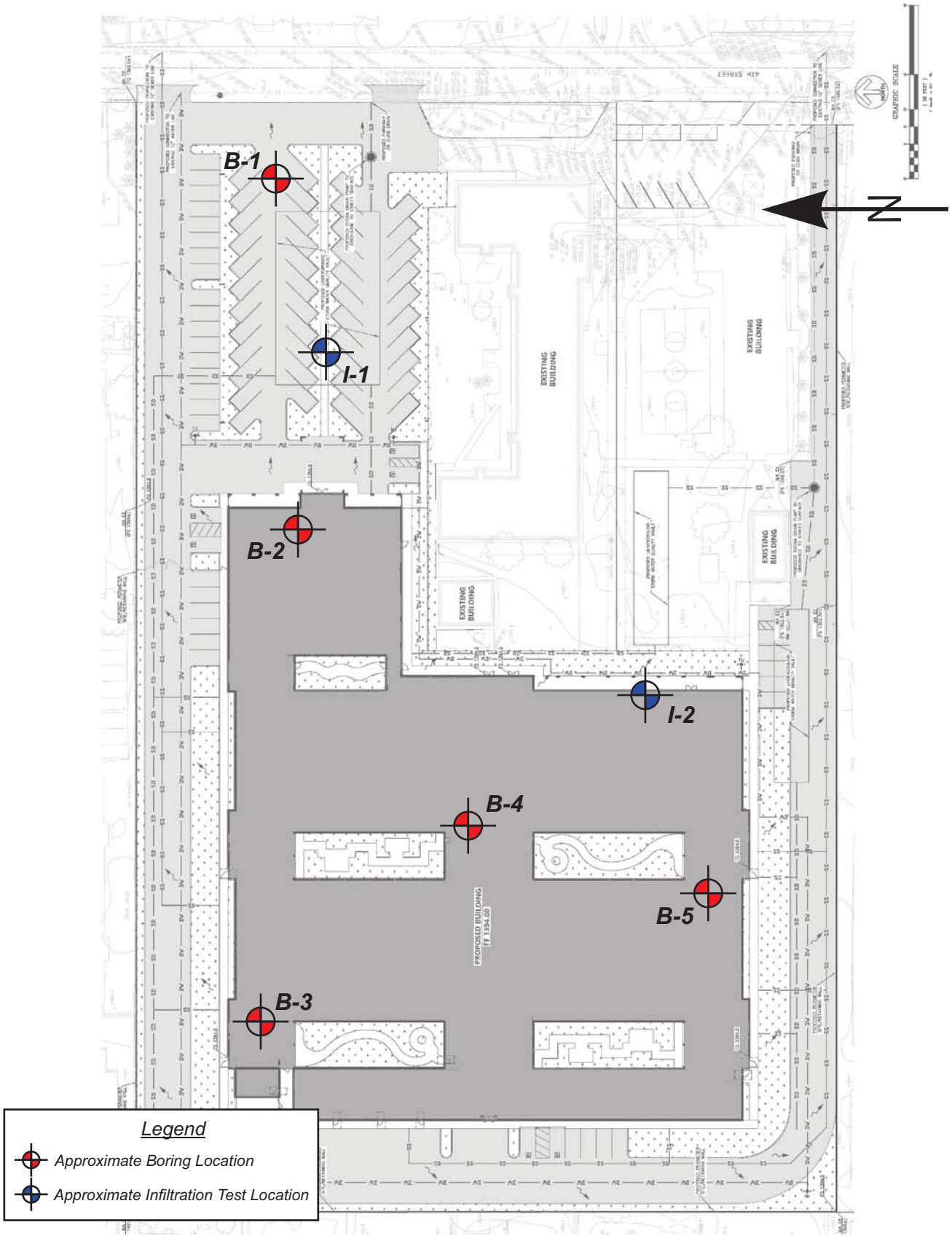


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Vicinity Map

Plate A-1



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Site and Exploration Map

Plate A-2



117° 18' 44" W

N

Map Scale: 1:2,540 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 35, 70, 140, 210

Feet: 0, 100, 200, 400, 600

Map projection: Web Mercator Corner coordinates: WGS84

117° 18' 29" W

N

USDA Natural Resources Conservation Service

Web Soil Survey
National Cooperative Soil Survey

7/24/2023
Page 1 of 3

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USDA Soil Conservation Soil Service Map

Plate A-3

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Bernardino County Southwestern Part, California
Survey Area Data: Version 14, Sep 6, 2022

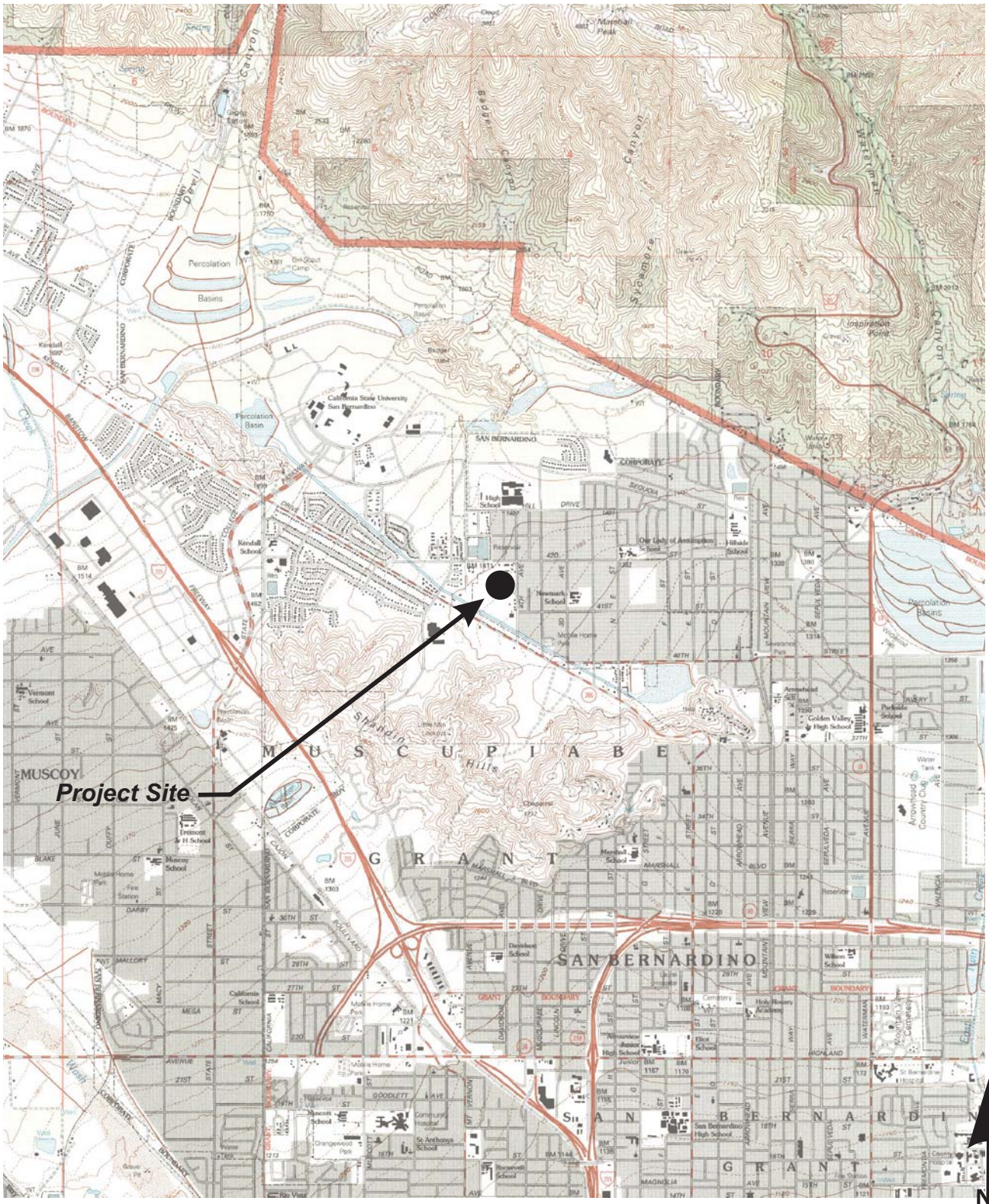
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 17, 2022—Jun 12, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
SpC	Soboba stony loamy sand, 2 to 9 percent slopes	0.1	0.3%
TuB	Tujunga loamy sand, 0 to 5 percent slopes	5.6	17.5%
TvC	Tujunga gravelly loamy sand, 0 to 9 percent slopes	26.4	82.2%
Totals for Area of Interest		**32.1**	**100.0%**



Reference: USGS Topographic Map
San Bernardino North, CA Quadrangle
Scale 1:25,000

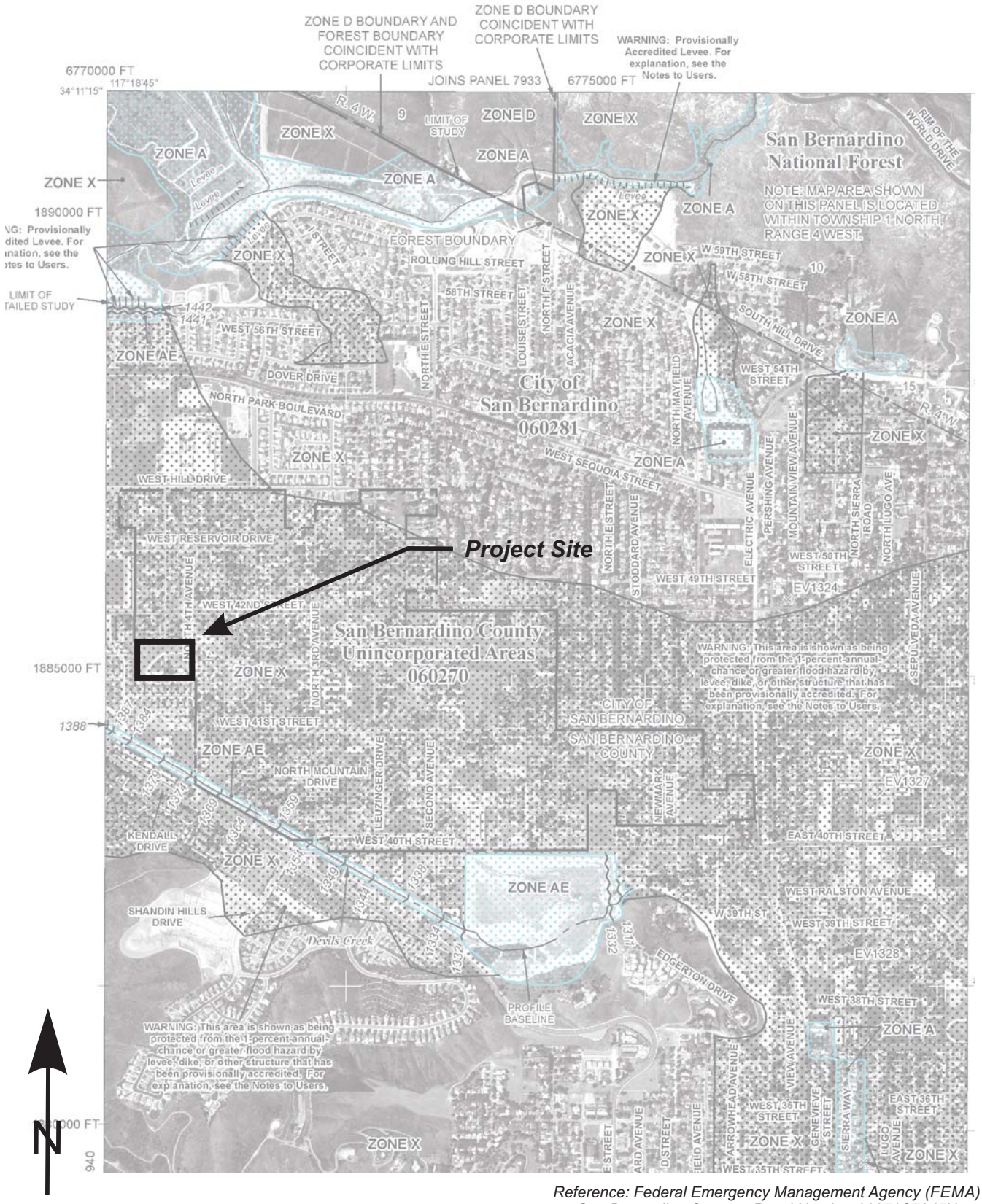
Site Coordinates
Lat: 34.1706N
Long: -117.3108W

LANDMARK
Geo-Engineers and Geologists

Project No.: LP23116

Topographic Map

Plate A-4



Reference: Federal Emergency Management Agency (FEMA)
San Bernardino County - Panel Number 06071C7945H

LANDMARK Geo-Engineers and Geologists		Plate
Project No.: LP23116	**FEMA Flood Insurance Rate Map (FIRM)**	**A-5**

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A — Cross section line

23 — 23 — Transect line

87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

$^{24}76^{000m}$N — 1000-meter Universal Transverse Mercator grid values, zone 11N

600000 FT — 5000-foot grid ticks: California State Plane coordinate system, zone VI (FIPSZONE 0406), Lambert Conformal Conic projection

DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)

● M1.5 — River Mile

APPENDIX B

LOG OF BORING No. B-1

SHEET 1 OF 1

DEPTH	FIELD: SAMPLE	FIELD: USCS CLASS.	FIELD: BLOW COUNT	FIELD: POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	LABORATORY: DRY DENSITY (pcf)	LABORATORY: MOISTURE CONTENT (% dry wt.)	LABORATORY: OTHER TESTS
					SILTY SAND (SP): Reddish gray, dry, medium dense, fine to coarse grained			Passing #200 = 15.4%
5			20		SAND (SP): Reddish brown, dry, medium dense, fine to coarse grained, some fine gravel	103.6	3.0	
10			15				3.3	Passing #200 = 4.9%
15			52		SAND (SP-SM): Brown, dry, medium dense to dense, fine to coarse grained, some fine gravel	122.9	2.6	
20			29				2.	Passing #200 = 5.4%
25								
30								
35								
40								
45								
50								
55								
60					Groundwater was encountered at time of drilling. This is not considered the stabilized groundwater depth as groundwater may rise to a level higher than that measured in borehole.			

DATE DRILLED: 6/22/23

LOGGED BY: L. Jackson

SURFACE ELEVATION: Approximately 1395 ft

TOTAL DEPTH: 21.5 feet

TYPE OF BIT: Hollow Stem Auger

HAMMER WT.: 140 lbs.

DEPTH TO WATER: NA

DIAMETER: 8 in.

DROP: 30 in.

PROJECT NO. LP23116

LANDMARK Geo-Engineers and Geologists

PLATE B-1

LOG OF BORING No. B-2

SHEET 1 OF 1

DEPTH	FIELD: SAMPLE	FIELD: USCS CLASS.	FIELD: BLOW COUNT	FIELD: POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	LABORATORY: DRY DENSITY (pcf)	LABORATORY: MOISTURE CONTENT (% dry wt.)	LABORATORY: OTHER TESTS
5			60		SAND (SP-SM): Reddish brown to brown, dry, dense to very dense, fine to coarse grained, some fine gravel	99.9	1.5	Passing #200 = 9.8%
10			34				1.7	Passing #200 = 8.7%
15			33		moist	109.3	8.8	
20			40				3.1	Passing #200 = 7.7%
25			50/5”			125.6	2.4	
30			50/6”				2.2	Passing #200 = 6.2%
35								
40								
45								
50								
55								
60					Groundwater was encountered at time of drilling. This is not considered the stabilized groundwater depth as groundwater may rise to a level higher than that measured in borehole.			

DATE DRILLED: 6/22/23

LOGGED BY: L. Jackson

SURFACE ELEVATION: Approximately 1396 ft

TOTAL DEPTH: 31.5 feet

TYPE OF BIT: Hollow Stem Auger

HAMMER WT.: 140 lbs.

DEPTH TO WATER: NA

DIAMETER: 8 in.

DROP: 30 in.

PROJECT NO. LP23116

LANDMARK Geo-Engineers and Geologists

PLATE B-2

LOG OF BORING No. B-3

SHEET 1 OF 1

DEPTH	FIELD: SAMPLE	FIELD: USCS CLASS.	FIELD: BLOW COUNT	FIELD: POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	LABORATORY: DRY DENSITY (pcf)	LABORATORY: MOISTURE CONTENT (% dry wt.)	LABORATORY: OTHER TESTS
5			26		SAND (SP): Reddish brown, dry, medium dense, fine to coarse grained, some fine gravel	116.9	2.7	Passing #200 = 2.2%
10			16		No recovery			
15			68		SAND (SP-SM): Reddish gray to brown, dry, dense to very dense, fine to coarse grained, some fine gravel	132.5	1.6	Passing #200 = 5.4%
20			38				2.5	
25								
30								
35								
40								
45								
50								
55								
60								

Groundwater was encountered at time of drilling. This is not considered the stabilized groundwater depth as groundwater may rise to a level higher than that measured in borehole.

DATE DRILLED: 6/22/23

LOGGED BY: L. Jackson

SURFACE ELEVATION: Approximately 1400 ft

TOTAL DEPTH: 21.5 feet

TYPE OF BIT: Hollow Stem Auger

HAMMER WT.: 140 lbs.

DEPTH TO WATER: NA

DIAMETER: 8 in.

DROP: 30 in.

PROJECT NO. LP23116

LANDMARK Geo-Engineers and Geologists

PLATE B-3

LOG OF BORING No. B-4

SHEET 1 OF 1

DEPTH	FIELD: SAMPLE	FIELD: USCS CLASS.	FIELD: BLOW COUNT	FIELD: POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	LABORATORY: DRY DENSITY (pcf)	LABORATORY: MOISTURE CONTENT (% dry wt.)	LABORATORY: OTHER TESTS
5			35		SAND (SP-SM): Reddish brown to dark brown, dry, medium dense to very dense, fine to coarse grained, some fine gravel	125.4	2.1	
10			26				2.1	Passing #200 = 9.6%
15			50/6”			132.5	2.9	
20			50/4”				1.9	Passing #200 = 6.5%
25			83			114.0	2.4	
30			50/6”				2.7	Passing #200 = 7.5%
35			50/3”				2.6	
40			50/6”				2.9	Passing #200 = 6.1%
45								
50								
55								
60					Groundwater was encountered at time of drilling. This is not considered the stabilized groundwater depth as groundwater may rise to a level higher than that measured in borehole.			

DATE DRILLED: 6/22/23 | TOTAL DEPTH: 41.5 feet | DEPTH TO WATER: NA

LOGGED BY: L. Jackson | TYPE OF BIT: Hollow Stem Auger | DIAMETER: 8 in.

SURFACE ELEVATION: Approximately 1398 ft | HAMMER WT.: 140 lbs. | DROP: 30 in.

PROJECT NO. LP23116

LANDMARK Geo-Engineers and Geologists

PLATE B-4

LOG OF BORING No. B-5

SHEET 1 OF 1

DEPTH	FIELD: SAMPLE	FIELD: USCS CLASS.	FIELD: BLOW COUNT	FIELD: POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	LABORATORY: DRY DENSITY (pcf)	LABORATORY: MOISTURE CONTENT (% dry wt.)	LABORATORY: OTHER TESTS
5			32		SAND (SP): Reddish brown to gray brown, dry, medium dense to very dense, fine to coarse grained, some fine gravel	123.2	2.9	Passing #200 = 4.3%
10			18				3.3	
15			63			105.6	3.2	Passing #200 = 2.5%
20			75/9”				1.4	
25								
30								
35								
40								
45								
50								
55								
60								

Groundwater was encountered at time of drilling. This is not considered the stabilized groundwater depth as groundwater may rise to a level higher than that measured in borehole.

DATE DRILLED: 6/22/23

LOGGED BY: L. Jackson

SURFACE ELEVATION: Approximately 1394 ft

TOTAL DEPTH: 21.5 feet

TYPE OF BIT: Hollow Stem Auger

HAMMER WT.: 140 lbs.

DEPTH TO WATER: NA

DIAMETER: 8 in.

DROP: 30 in.

PROJECT NO. LP23116

LANDMARK Geo-Engineers and Geologists

PLATE B-5

DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS	SECONDARY DIVISIONS
Coarse grained soils More than half of material is larger that No. 200 sieve	**Gravels** More than half of coarse fraction is larger than No. 4 sieve	Clean gravels (less than 5% fines)	**GW**	Well graded gravels, gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels, or gravel-sand mixtures, little or no fines
		Gravel with fines	**GM**	Silty gravels, gravel-sand-silt mixtures, non-plastic fines
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines
	Sands More than half of coarse fraction is smaller than No. 4 sieve	Clean sands (less than 5% fines)	**SW**	Well graded sands, gravelly sands, little or no fines
			SP	Poorly graded sands or gravelly sands, little or no fines
		Sands with fines	**SM**	Silty sands, sand-silt mixtures, non-plastic fines
			SC	Clayey sands, sand-clay mixtures, plastic fines
Fine grained soils More than half of material is smaller than No. 200 sieve	**Silts and clays** Liquid limit is less than 50%		**ML**	Inorganic silts, clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravely, sandy, or lean clays
			OL	Organic silts and organic clays of low plasticity
	Silts and clays Liquid limit is more than 50%		**MH**	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
Highly organic soils			**PT**	Peat and other highly organic soils

GRAIN SIZES

Silts and Clays	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

200 40 10 4 3/4" 3" 12"

US Standard Series Sieve — Clear Square Openings

Sands, Gravels, etc.	Blows/ft. *
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Clays & Plastic Silts	Strength **	Blows/ft. *
Very Soft	0-0.25	0-2
Soft	0.25-0.5	2-4
Firm	0.5-1.0	4-8
Stiff	1.0-2.0	8-16
Very Stiff	2.0-4.0	16-32
Hard	Over 4.0	Over 32

* Number of blows of 140 lb. hammer falling 30 inches to drive a 2 inch O.D. (1 3/8 in. I.D.) split spoon (ASTM D1586).

** Unconfined compressive strength in tons/s.f. as determined by laboratory testing or approximated by the Standard Penetration Test (ASTM D1586), Pocket Penetrometer, Torvane, or visual observation.

Type of Samples:

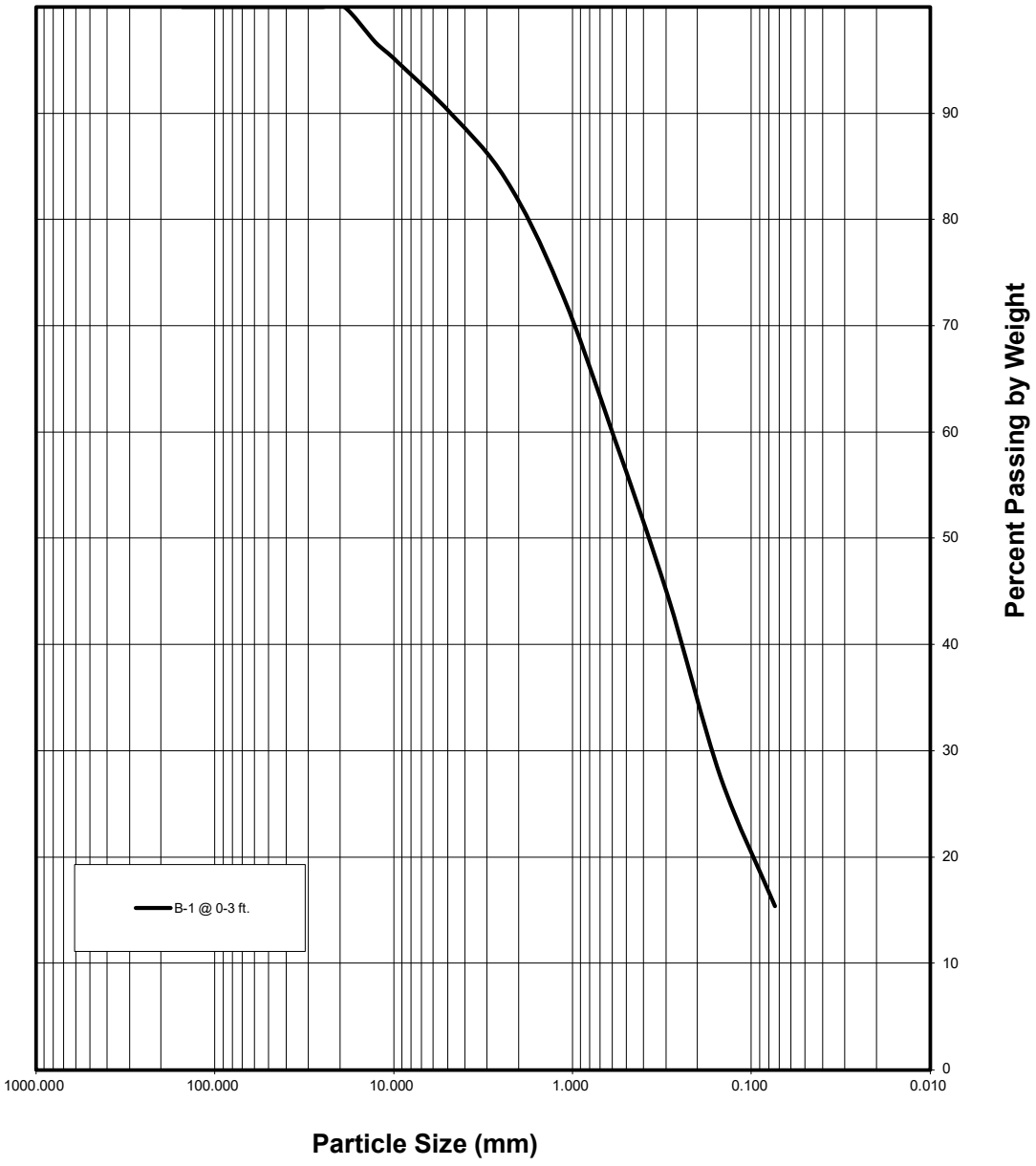
Ring Sample Standard Penetration Test Shelby Tube Bulk (Bag) Sample

Drilling Notes:

1. Sampling and Blow Counts
   - Ring Sampler - Number of blows per foot of a 140 lb. hammer falling 30 inches.
   - Standard Penetration Test - Number of blows per foot.
   - Shelby Tube - Three (3) inch nominal diameter tube hydraulically pushed.
2. P. P. = Pocket Penetrometer (tons/s.f.).
3. NR = No recovery.
4. GWT = Ground Water Table observed @ specified time.

APPENDIX C

SIEVE ANALYSIS						
Cobbles and Boulders	Gravel		Sand			Silt and Clay
	Coarse	Fine	Coarse	Medium	Fine	



LANDMARK
Geo-Engineers and Geologists

Project No.: LP23116

Grain Size Analysis

Plate C-1

LANDMARK CONSULTANTS, INC.

CLIENT: New Gen HC
PROJECT: Shandin Hills MHRC - San Bernardino, CA
JOB No.: LP23116
DATE: 06/23/23

CHEMICAL ANALYSIS

Boring:	B-1	**Caltrans**
Sample Depth, ft:	0-3	**Method**
pH:	7.8	**643**
Electrical Conductivity (mmhos):	--	**424**
Resistivity (ohm-cm):	9,300	**643**
Chloride (Cl), ppm:	80	**422**
Sulfate (SO4), ppm:	23	**417**

General Guidelines for Soil Corrosivity

Material Affected	Chemical Agent	Amount in Soil (ppm)	Degree of Corrosivity
Concrete	Soluble Sulfates	0 - 1,000	Low
		1,000 - 2,000	Moderate
		2,000 - 20,000	Severe
		> 20,000	Very Severe
Normal Grade Steel	Soluble Chlorides	0 - 200	Low
		200 - 700	Moderate
		700 - 1,500	Severe
		> 1,500	Very Severe
Normal Grade Steel	Resistivity	1 - 1,000	Very Severe
		1,000 - 2,000	Severe
		2,000 - 10,000	Moderate
		> 10,000	Low

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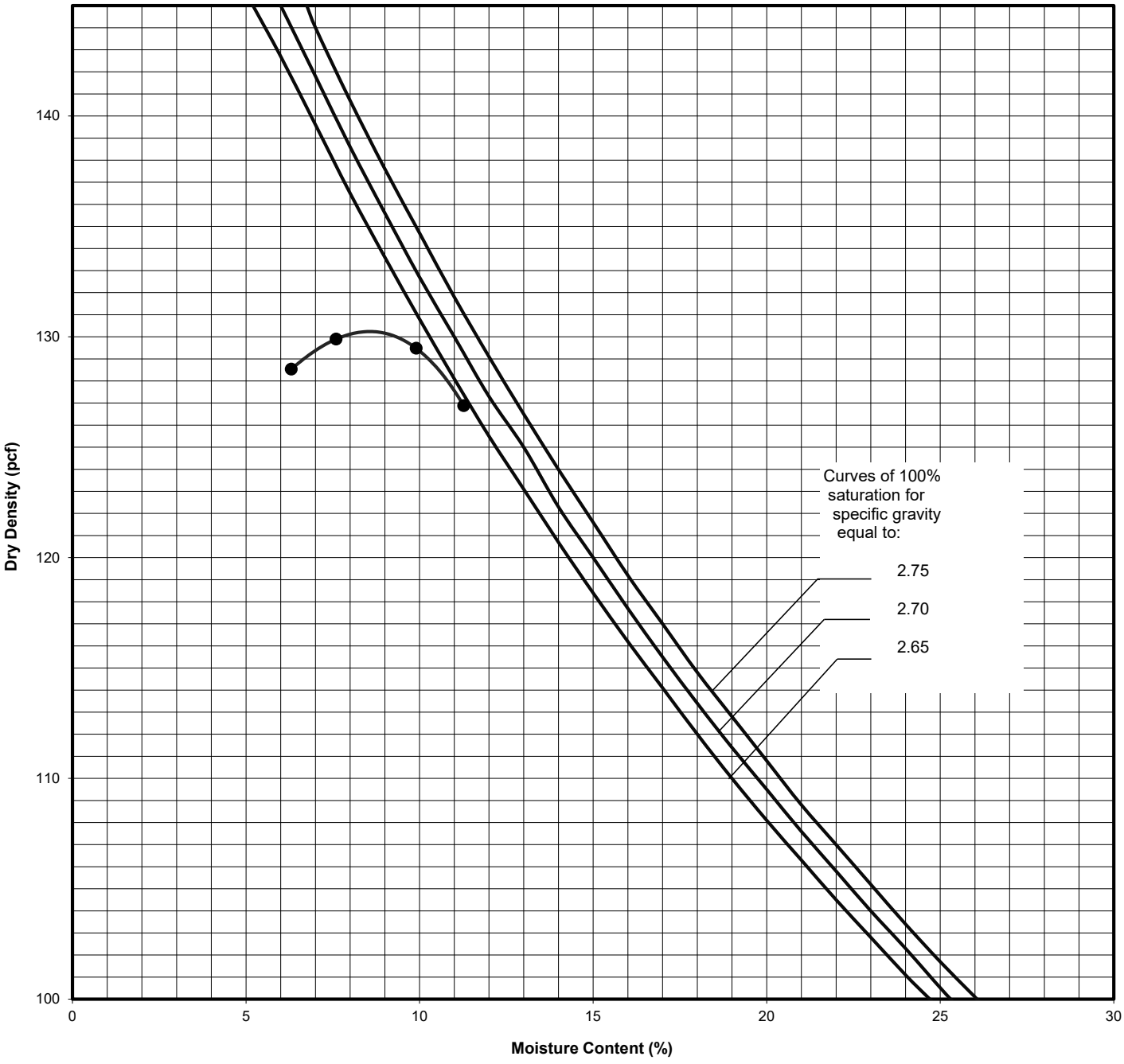
Project No.: LP23116

Selected Chemical Test Results

Plate C-2

Client: New GEN HC
Project: Shandin Hills MHRC - San Bernardino, CA
Project No.: LP23116
Date: 6/30/2023
Lab. No.: N/A

Soil Description: Olive-Brown Silty Sand w/ Gravel
Sample Location: B-1 @ 0-3 ft.
Test Method: ASTM D-1557 A
Maximum Dry Density (pcf): **130.2**
Optimum Moisture Content (%): **8.6**



LANDMARK
Geo-Engineers and Geologists

Project No.: LP23116

Moisture Density Relationship

Plate C-3

APPENDIX D

LANDMARK CONSULTANTS, INC

Project:	Shandin Hills MHRC	Project No:	LP23116	Date:	7/10/2023
Test Hole No:	I-1	Tested By:	Maddy E		
Depth of Test Hole, D_T:	60"	USCS Soil Classification:	SM		
Test Hole Dimensions (inches)			Length	Width	
Diameter (if round)=	6"	Sides (if rectangular)=			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1	8:02	8:15	13.00	16.00	48.00	32.00	Yes
2	8:25	8:40	15.00	23.00	36.00	13.00	Yes

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Percolation Rate (min./in.)
1	8:41	8:51	10.00	27.00	34.00	7.00	1.43
2	8:51	9:01	10.00	25.00	32.00	7.00	1.43
3	9:01	9:11	10.00	24.00	32.00	8.00	1.25
4	9:11	9:21	10.00	23.00	31.00	8.00	1.25
5	9:21	9:31	10.00	23.00	31.00	8.00	1.25
6	9:31	9:41	10.00	21.00	29.00	8.00	1.25
7							
8							
9							
10							
11							
12							

COMMENTS:

PERCOLATION RATE CONVERSION

CLIENT: New Gen HC
PROJECT: Shandin Hills MHRC
PROJECT NO.: LP23116
DATE: 7/14/2023

TEST HOLE NO: I-1

Time interval, **Δt** = 10 inches
Initial Depth to Water, D_0 = 21 inches
Final Depth to Water, D_f = 29 inches
Total Depth of Test Hole, D_T = 60 inches
[2]Test Hole Radius, **r** = 4 inches

The conversion equation is used:

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

"H_o" is the initial height of water at the selected time interval

$H_o = D_T - D_0$ = 60 - 21 = 39 inches

"H_f" is the final height of water at the selected time interval

$H_f = D_T - D_0$ = 60 - 21 = 31 inches

"ΔH" is the change in height over the time interval

$\Delta H = \Delta D = H_o - H_f$ = 39 - 31 = 8 inches

"H_{avg}" is the average head height over the time interval

$H_{avg} = (H_o - H_f)/2$ = (39 + 31)/2 = 35 inches

"I_t" is the tested infiltration rate

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t\ (r+2H_{avg})} = \frac{(8\text{ in})(60\text{min/hr})(4\text{in})}{(10\text{ min})((4\text{ in}) + 2\ (35\text{ in}))} = 2.59\text{ in/hr}$$

LANDMARK Geo-Engineers and Geologists **Project No.: LP23116**	**Percolation Rate Conversion**	**Plate D-2**

LANDMARK CONSULTANTS, INC

Project:	Shandin Hills MHRC	Project No:	LP23116	Date:	7/10/2023
Test Hole No:	I-2	Tested By:	Maddy E		
Depth of Test Hole, D_T:	60"	USCS Soil Classification:	SM		
Test Hole Dimensions (inches)			Length	Width	
Diameter (if round)=	6"	Sides (if rectangular)=			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1	8:15	8:30	15.00	0.00	23.00	23.00	Yes
2	8:32	8:47	15.00	9.00	22.00	13.00	Yes

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Percolation Rate (min./in.)
1	8:48	8:58	10.00	8.00	18.00	10.00	1.00
2	8:58	9:08	10.00	9.00	17.00	8.00	1.25
3	9:08	9:18	10.00	10.00	17.00	7.00	1.43
4	9:18	9:28	10.00	11.00	16.00	5.00	2.00
5	9:28	9:38	10.00	12.00	17.00	5.00	2.00
6	9:38	9:48	10.00	9.00	14.00	5.00	2.00
7							
8							
9							
10							
11							
12							

COMMENTS:

PERCOLATION RATE CONVERSION

CLIENT: New Gen HC
PROJECT: Shandin Hills MHRC
PROJECT NO.: LP23116
DATE: 7/14/2023

TEST HOLE NO: I-2

Time interval, **Δt** = 10 inches
Initial Depth to Water, D_0 = 9 inches
Final Depth to Water, D_f = 14 inches
Total Depth of Test Hole, D_T = 60 inches
²Test Hole Radius, **r** = 4 inches

The conversion equation is used:

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

"H_o" is the initial height of water at the selected time interval

$H_o = D_T - D_0$ = 60 - 9 = 51 inches

"H_f" is the final height of water at the selected time interval

$H_f = D_T - D_0$ = 60 - 14 = 46 inches

"ΔH" is the change in height over the time interval

$\Delta H = \Delta D = H_o - H_f$ = 51 - 46 = 5 inches

"H_{avg}" is the average head height over the time interval

$H_{avg} = (H_o - H_f)/2$ = (51 + 46)/2 = 48.5 inches

"I_t" is the tested infiltration rate

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t\ (r+2H_{avg})} = \frac{(5\text{ in})(60\text{min/hr})(4\text{in})}{(10\text{ min})((4\text{ in}) + 2\ (48.5\text{ in}))} = 2.18\text{ in/hr}$$

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