

# Centurion Transport

APN 0463-396-09

Waalew Road  
Adelanto, CA 92307

## Preliminary Drainage Report



**Prepared for:**  
Centurion Consulting Services  
19258 Estancia Way  
Apple Valley, CA 92308

**Prepared By:**  
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Original: March 12, 2023  
Updated: July 3, 2024

**Prepared under the supervision of:**

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Shelly Jones

Date

# Table of Contents

Discussion

Reference Material

Rational Methods

Existing Condition

Proposed Condition

Hydrographs

Existing Condition

Proposed Condition

Routed Condition

Hydraulic Calculations

Hydrology Exhibits

Existing Condition

Proposed Condition

## Discussion

### OVERVIEW

APN 0463-396-09 is located in Apple Valley, California, on the northeast corner of the intersection between Comanche Road and Waalew Road. The project encompasses 2.9 acres of vacant desert property but development will occur on the southerly 1.0 acre.

The site drains to the south to Waalew Road. The sites drainage is governed by existing topography which slopes at 1-2 % toward Waalew Road. Hydrologic Soil Class A can be found throughout the immediate area. The site is bordered to the north by vacant land. 3.9 acres of vacant land is tributary to the site. The existing land coverage consists of desert brush vegetation. Onsite drainage is characterized by sheet and shallow concentrated flow.

This project proposes to construct one shop building, one proposed pad for a modular building and associated parking lot. Drainage improvements will include v swales along the northerly and easterly project boundary that will intercept offsite flow and drain the runoff around the site. Onsite drainage improvements will include v gutters, stormtech infiltration chambers and one infiltration basin. Total new imperviousness is anticipated to be 2.3 acres. Impervious surfaces include proposed roof top, pavement and parking lot. In order to mitigate for increases in flow that will result from increased imperviousness, one infiltration basins and one stormtech chamber system is proposed to retain and infiltrate stormwater runoff. The proposed storage shall be sized based on the 100 year storm event as to reduce developed condition flows to less than existing.

### PURPOSE

The purpose of this report is to discuss the hydrologic characteristics of the site and quantify the sites existing and proposed runoff quantities. Sizing of the proposed infiltration basin and stormtech chamber system will also be included.

### CRITERIA

The criteria utilized in this report are set forth by the San Bernardino County Hydrology Manual. AES software was used to perform computations.

### METHODOLOGY

Rational methods were applied to estimate peak flow rates for the existing and proposed condition. Hydrographs were then developed and routed through the infiltration basin and stormtech chamber system to quantify the proposed outflow.

## **RESULTS**

Onsite rational method analysis indicates the site produces an existing 100 year peak flow rate of 4.46 cfs that discharges south to Waalew Road. In order to reduce proposed flows to less than existing flow that discharges south to Waalew Road, an infiltration basin with 6,100 ft<sup>3</sup> of storage and stormtech chamber with 13,696 ft<sup>3</sup> will be constructed to mitigate for increases in stormwater runoff. The stormtech chamber will treat runoff from node 30 to 31 and decrease peak flow from 4.73 cfs to 2.65 cfs and the infiltration basin will reduce the peak flow from node 40 to 41 from 4.72 cfs to 1.47 cfs, thereby reducing the peak discharged to Waalew Road. The volume of runoff will be reduced also. In the existing condition the site discharges 8,655 ft<sup>3</sup> of runoff. In the proposed condition the volume of runoff increases to 27,116 ft<sup>3</sup> of runoff. The stormtech chamber will store and infiltrate 13,696 ft<sup>3</sup> of runoff and the infiltration basin will store and infiltrate 6,100 ft<sup>3</sup> of runoff, discharging the remaining 7320 ft<sup>3</sup> of runoff to Waalew Road. Two v swales will be cut along the northerly and easterly project boundary. The northerly v swale (Node 21 to 22) is proposed to be a 6 ft v swale. The easterly v swale (Node 11 to 12) is proposed to be a 4 ft v swale.

**Q100 Flow Summary Table**

<b>Condition</b>	<b>Volume (ft<sup>3</sup>)</b>	<b>Peak Runoff (cfs)</b>
<b>Existing</b>	8655	4.46
<b>Proposed</b>	27116	9.32
<b>Mitigated</b>	7320	4.12

This report is a preliminary assessment to illustrate how onsite and offsite flow will be managed. An updated drainage report will be provided with final design. Calculations and exhibits accompany this discussion to further illustrate these findings.

## Reference Material



General Information

- Homepage
- Progress Reports
- FAQ
- Glossary

Precipitation Frequency

- Data Server
- GIS Grids
- Maps
- Time Series
- Temporals
- Documents

Probable Maximum Precipitation

- Documents

Miscellaneous

- Publications
- Storm Analysis
- Record Precipitation

Contact Us

- Inquiries



NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description

Data type:  Units:  Time series type:

Select location

1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude:  Longitude:

b) By station (list of CA stations):

c) By address

2) Use map:

a) Select location  
Move crosshair or double click

b) Click on station icon  
 Show stations on map

**Location information:**  
Name: Apple Valley, California, USA\*  
Latitude: 34.5574°  
Longitude: -117.2020°  
Elevation: \*\*

\* Source: ESRI Maps  
\*\* Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES  
WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION  
NOAA Atlas 14, Volume 6, Version 2

[PF tabular](#)

[PF graphical](#)

[Supplementary information](#)

[Print page](#)

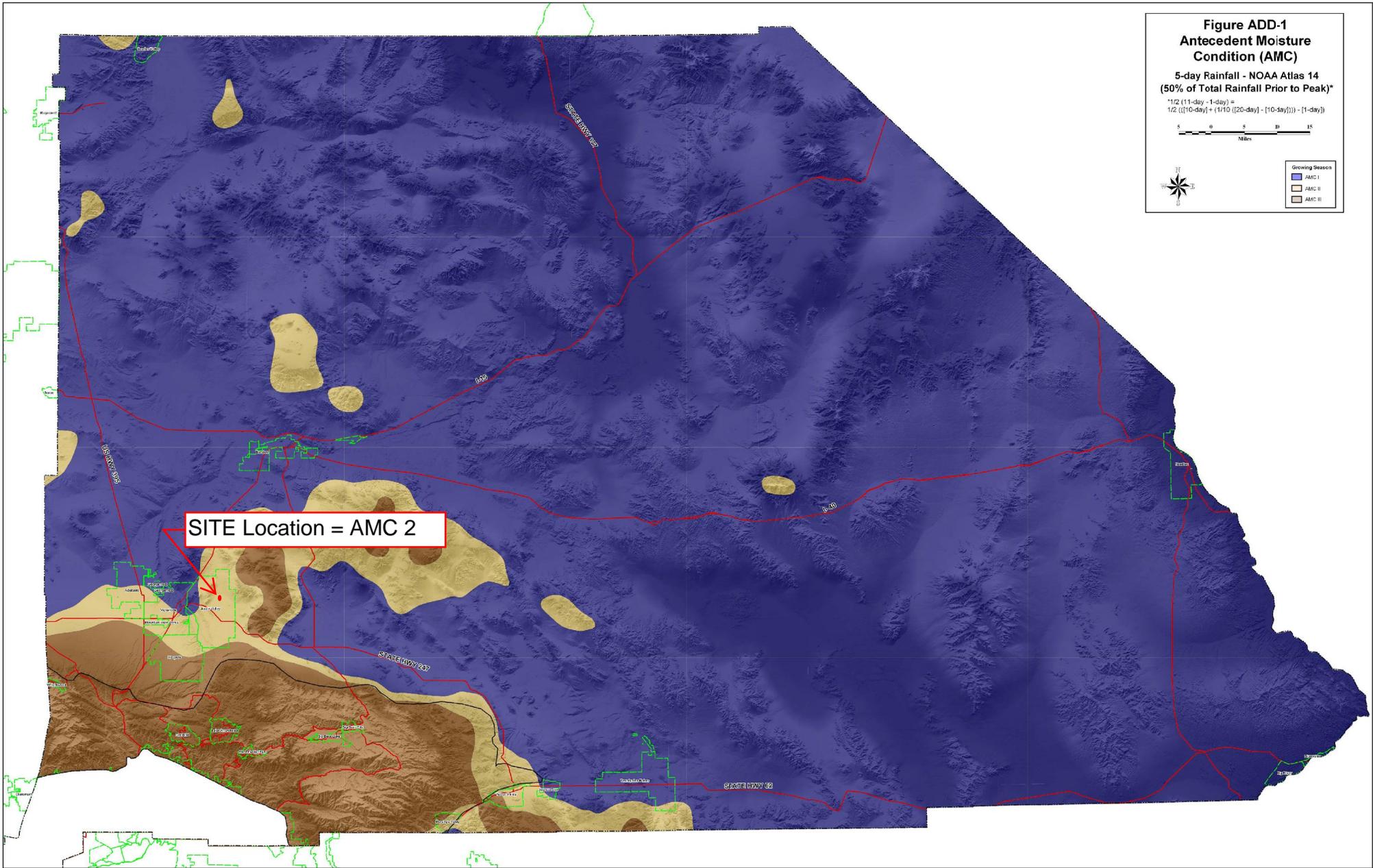
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.077 (0.064-0.095)	0.111 (0.091-0.136)	0.157 (0.128-0.194)	0.198 (0.161-0.245)	0.257 (0.202-0.329)	0.305 (0.238-0.399)	0.357 (0.289-0.478)	0.414 (0.303-0.570)	0.496 (0.348-0.711)	0.583 (0.383-0.836)
10-min	0.111 (0.091-0.136)	0.159 (0.131-0.195)	0.226 (0.185-0.278)	0.284 (0.231-0.352)	0.368 (0.290-0.472)	0.437 (0.335-0.572)	0.512 (0.396-0.686)	0.593 (0.435-0.817)	0.710 (0.500-1.02)	0.807 (0.549-1.20)
15-min	0.134 (0.110-0.164)	0.192 (0.158-0.235)	0.273 (0.224-0.338)	0.343 (0.289-0.425)	0.445 (0.351-0.570)	0.529 (0.403-0.692)	0.619 (0.467-0.823)	0.717 (0.525-0.987)	0.859 (0.605-1.23)	0.976 (0.654-1.45)
30-min	0.181 (0.148-0.222)	0.259 (0.214-0.318)	0.369 (0.303-0.454)	0.464 (0.378-0.576)	0.602 (0.475-0.772)	0.716 (0.553-0.936)	0.838 (0.632-1.12)	0.970 (0.712-1.34)	1.16 (0.818-1.67)	1.32 (0.898-1.95)
60-min	0.223 (0.184-0.274)	0.320 (0.283-0.392)	0.455 (0.374-0.560)	0.572 (0.466-0.709)	0.742 (0.585-0.951)	0.882 (0.681-1.15)	1.03 (0.778-1.39)	1.20 (0.877-1.85)	1.43 (1.01-2.09)	1.63 (1.11-2.42)
2-hr	0.321 (0.265-0.383)	0.438 (0.391-0.537)	0.600 (0.493-0.738)	0.739 (0.602-0.816)	0.939 (0.740-1.20)	1.10 (0.850-1.44)	1.27 (0.960-1.71)	1.46 (1.07-2.01)	1.72 (1.21-2.47)	1.94 (1.32-2.86)
3-hr	0.392 (0.323-0.481)	0.526 (0.433-0.645)	0.710 (0.583-0.873)	0.867 (0.705-1.08)	1.09 (0.860-1.40)	1.27 (0.982-1.66)	1.46 (1.10-1.96)	1.67 (1.22-2.30)	1.96 (1.38-2.81)	2.19 (1.49-3.26)
6-hr	0.541 (0.446-0.663)	0.714 (0.588-0.876)	0.949 (0.780-1.17)	1.15 (0.935-1.42)	1.43 (1.13-1.83)	1.65 (1.27-2.16)	1.89 (1.42-2.53)	2.13 (1.57-2.94)	2.48 (1.75-3.65)	2.76 (1.88-4.10)
12-hr	0.707 (0.583-0.866)	0.930 (0.766-1.14)	1.23 (1.01-1.51)	1.48 (1.21-1.84)	1.83 (1.44-2.35)	2.11 (1.63-2.76)	2.39 (1.81-3.21)	2.70 (1.98-3.71)	3.11 (2.19-4.47)	3.45 (2.35-5.12)
24-hr	0.936 (0.830-1.08)	1.24 (1.10-1.43)	1.64 (1.45-1.90)	1.98 (1.73-2.30)	2.44 (2.07-2.94)	2.80 (2.32-3.44)	3.17 (2.57-3.99)	3.56 (2.80-4.61)	4.09 (3.09-5.52)	4.51 (3.28-6.30)
2-day	1.14 (1.01-1.31)	1.53 (1.36-1.77)	2.06 (1.82-2.37)	2.48 (2.17-2.89)	3.06 (2.59-3.69)	3.51 (2.91-4.31)	3.96 (3.21-4.99)	4.43 (3.49-5.73)	5.02 (3.83-6.83)	5.55 (4.06-7.76)
3-day	1.24 (1.10-1.43)	1.70 (1.50-1.96)	2.30 (2.03-2.65)	2.78 (2.43-3.24)	3.43 (2.91-4.13)	3.93 (3.29-4.83)	4.43 (3.59-5.58)	4.95 (3.90-6.41)	5.65 (4.27-7.62)	6.19 (4.52-8.84)
4-day	1.31 (1.17-1.51)	1.81 (1.60-2.08)	2.45 (2.16-2.83)	2.97 (2.59-3.45)	3.66 (3.11-4.41)	4.20 (3.46-5.16)	4.74 (3.94-5.96)	5.29 (4.17-6.85)	6.03 (4.56-8.14)	6.60 (4.82-9.22)
7-day	1.43 (1.28-1.64)	1.94 (1.73-2.24)	2.63 (2.32-3.04)	3.19 (2.79-3.71)	3.95 (3.35-4.76)	4.54 (3.71-5.58)	5.13 (4.18-6.47)	5.75 (4.53-7.45)	6.58 (4.88-8.89)	7.23 (5.29-10.1)
10-day	1.50 (1.33-1.73)	2.04 (1.81-2.35)	2.76 (2.44-3.18)	3.35 (2.93-3.90)	4.16 (3.53-5.01)	4.79 (3.95-5.89)	5.43 (4.40-6.84)	6.10 (4.81-7.90)	7.02 (5.31-9.47)	7.74 (5.65-10.6)
20-day	1.70 (1.63-2.20)	2.31 (2.05-2.87)	3.14 (2.77-3.63)	3.83 (3.36-4.48)	4.79 (4.06-5.76)	5.54 (4.69-6.81)	6.32 (5.12-7.96)	7.13 (5.62-9.24)	8.26 (6.24-11.1)	9.14 (6.89-12.8)
30-day	1.91 (1.82-2.63)	2.60 (2.31-3.09)	3.55 (3.13-4.10)	4.34 (3.80-5.05)	5.45 (4.62-6.56)	6.32 (5.25-7.77)	7.23 (5.89-9.11)	8.18 (6.45-10.6)	9.50 (7.18-12.8)	10.5 (7.70-14.7)
45-day	2.28 (2.02-2.63)	3.11 (2.76-3.58)	4.24 (3.74-4.89)	5.19 (4.55-6.05)	6.54 (5.54-7.87)	7.61 (6.32-9.36)	8.73 (7.08-11.0)	9.91 (7.81-12.8)	11.6 (8.74-15.8)	12.9 (9.39-18.0)
60-day	2.47 (2.19-2.85)	3.36 (2.97-3.87)	4.58 (4.04-5.29)	5.61 (4.91-6.53)	7.08 (6.00-8.52)	8.26 (6.85-10.1)	9.49 (7.89-12.0)	10.8 (8.51-14.0)	12.6 (9.54-17.0)	14.1 (10.3-19.7)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).  
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.  
Please refer to NOAA Atlas 14 document for more information.

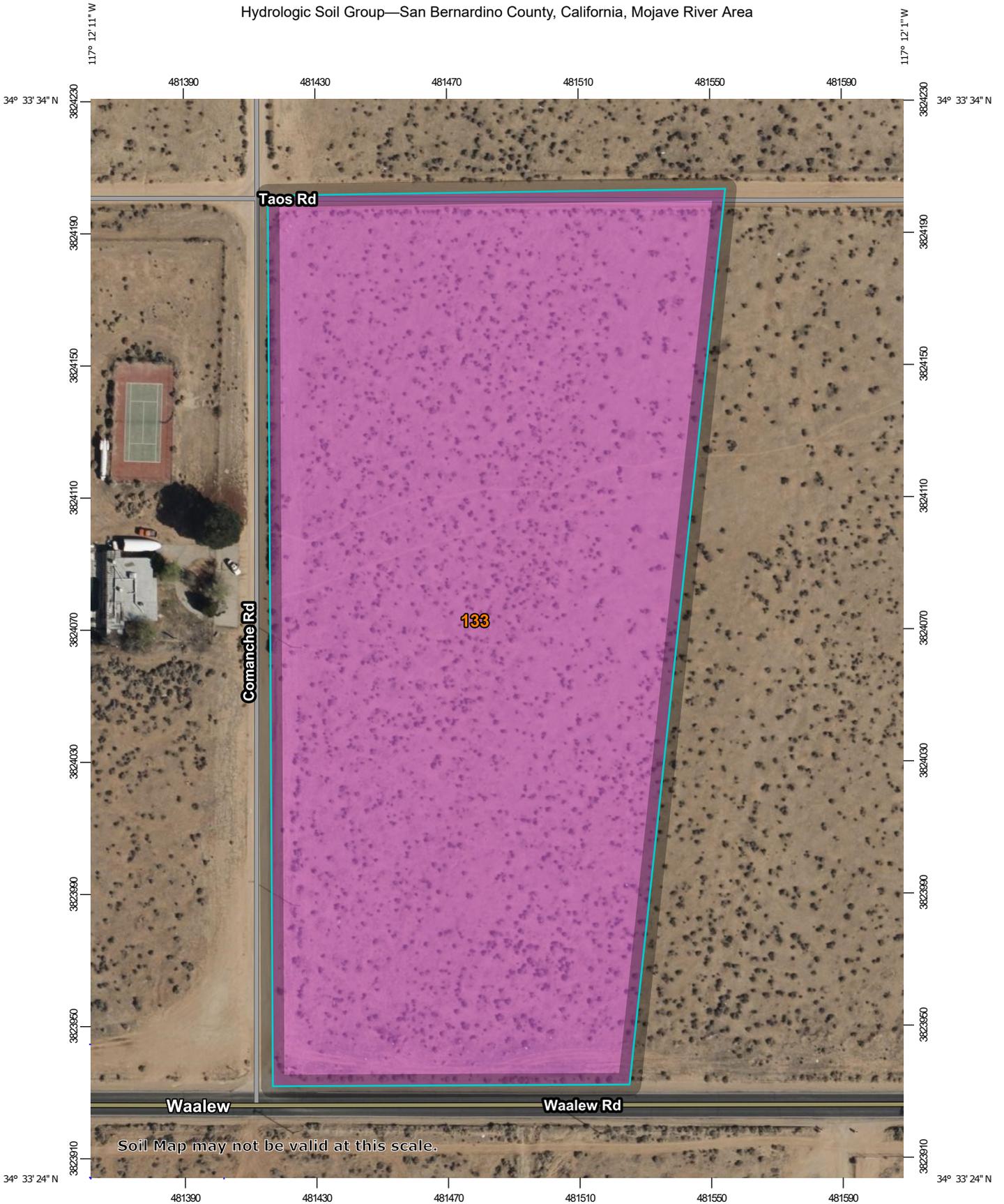
Estimates from the table in CSV format: [Precipitation frequency estimates](#)

Main Link Categories:  
[Home](#) | [OWP](#)

**Figure ADD-1**  
**Antecedent Moisture Condition (AMC)**  
**5-day Rainfall - NOAA Atlas 14**  
**(50% of Total Rainfall Prior to Peak)\***  
 $1/2 ((1\text{-day} - 1\text{-day}) + 1/10 ((20\text{-day} - [10\text{-day}])) - [1\text{-day}])$   
 Miles  
 Growing Season  
 AMC I  
 AMC II  
 AMC III



Hydrologic Soil Group—San Bernardino County, California, Mojave River Area



Soil Map may not be valid at this scale.

Map Scale: 1:1,590 if printed on A portrait (8.5" x 11") sheet.



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



## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons

 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Lines

 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Points

 A  
 A/D  
 B  
 B/D

 C  
 C/D  
 D  
 Not rated or not available

### Water Features

 Streams and Canals

### Transportation

 Rails  
 Interstate Highways  
 US Routes  
 Major Roads  
 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Bernardino County, California, Mojave River Area  
 Survey Area Data: Version 14, Sep 1, 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.

## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
133	HELENDALE-BRYMAN LOAMY SANDS, 2 TO 5 PERCENT SLOPES*	A	8.3	100.0%
<b>Totals for Area of Interest</b>			<b>8.3</b>	<b>100.0%</b>

### Description

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

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

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

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

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

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

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

### Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule: Higher*

## Rational Methods

\*\*\*\*\*  
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
(c) Copyright 1983-2011 Advanced Engineering Software (aes)  
Ver. 18.0 Release Date: 07/01/2011 License ID 1501

Analysis prepared by:

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
\* APN 0463-396-09 \*  
\* Onsite Existing Condition \*  
\* 100 Year Storm Event \*  
\*\*\*\*\*

FILE NAME: 0463EX.DAT  
TIME/DATE OF STUDY: 22:47 05/08/2023

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE(LOG(I; IN/HR) vs. LOG(Tc; MIN)) = 0.7000  
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0300

\*ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD\*

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

\*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

\*\*\*\*\*  
FLOW PROCESS FROM NODE 0.00 TO NODE 1.00 IS CODE = 21  
-----



\*\*\*\*\*

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
(Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)  
(c) Copyright 1983-2011 Advanced Engineering Software (aes)  
Ver. 18.0 Release Date: 07/01/2011 License ID 1501

Analysis prepared by:

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

- \* APN 0463-396-09 \*
  - \* Onsite and Offsite Proposed Condition \*
  - \* 100 Year Storm Event \*
- \*\*\*\*\*

FILE NAME: 0463P.DAT  
TIME/DATE OF STUDY: 12:49 06/18/2024

=====

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

=====

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

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 6.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90  
\*USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL\*

SLOPE OF INTENSITY DURATION CURVE(LOG(I; IN/HR) vs. LOG(Tc; MIN)) = 0.7000  
USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.0300

\*ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD\*

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

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

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

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

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

\*USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 11.00 IS CODE = 21

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

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 455.00  
ELEVATION DATA: UPSTREAM(FEET) = 2933.00 DOWNSTREAM(FEET) = 2922.00

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

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.785

\* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.040

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
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NATURAL POOR COVER

"OPEN BRUSH" A 1.20 0.67 1.000 62 12.78

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.67

SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000

SUBAREA RUNOFF(CFS) = 2.56

TOTAL AREA(ACRES) = 1.20 PEAK FLOW RATE(CFS) = 2.56

\*\*\*\*\*  
FLOW PROCESS FROM NODE 11.00 TO NODE 12.00 IS CODE = 52

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

=====

ELEVATION DATA: UPSTREAM(FEET) = 2922.00 DOWNSTREAM(FEET) = 2919.38  
CHANNEL LENGTH THRU SUBAREA(FEET) = 425.00 CHANNEL SLOPE = 0.0062  
CHANNEL FLOW THRU SUBAREA(CFS) = 2.56  
FLOW VELOCITY(FEET/SEC) = 1.42 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
TRAVEL TIME(MIN.) = 4.97 Tc(MIN.) = 17.76  
LONGEST FLOWPATH FROM NODE 10.00 TO NODE 12.00 = 880.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 21

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

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 435.00  
ELEVATION DATA: UPSTREAM(FEET) = 2933.00 DOWNSTREAM(FEET) = 2922.00

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

SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 12.444

\* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.098

SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
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NATURAL POOR COVER  
 "OPEN BRUSH"                    A            2.70            0.67            1.000        62    12.44  
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.67  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 1.000  
 SUBAREA RUNOFF(CFS) =            5.89  
 TOTAL AREA(ACRES) =            2.70    PEAK FLOW RATE(CFS) =            5.89

\*\*\*\*\*  
 FLOW PROCESS FROM NODE        21.00 TO NODE        22.00 IS CODE = 52  
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>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<<  
 >>>>TRAVELTIME THRU SUBAREA<<<<<<

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ELEVATION DATA: UPSTREAM(FEET) = 2922.00    DOWNSTREAM(FEET) = 2921.50  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 195.00    CHANNEL SLOPE = 0.0026  
 CHANNEL FLOW THRU SUBAREA(CFS) =            5.89  
 FLOW VELOCITY(FEET/SEC) = 1.11 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)  
 TRAVEL TIME(MIN.) = 2.93    Tc(MIN.) = 15.37  
 LONGEST FLOWPATH FROM NODE        20.00 TO NODE        22.00 =        630.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE        30.00 TO NODE        31.00 IS CODE = 21  
 -----

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

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INITIAL SUBAREA FLOW-LENGTH(FEET) = 360.00  
 ELEVATION DATA: UPSTREAM(FEET) = 2921.90    DOWNSTREAM(FEET) = 2920.10

Tc = K\*[(LENGTH\*\* 3.00)/(ELEVATION CHANGE)]\*\*0.20  
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 9.239  
 \* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.816  
 SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	A	1.65	0.98	0.100	32	9.24
NATURAL POOR COVER "GRASS"	A	0.10	0.60	1.000	67	15.95

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.83  
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.151  
 SUBAREA RUNOFF(CFS) =            5.81  
 TOTAL AREA(ACRES) =            1.75    PEAK FLOW RATE(CFS) =            5.81

\*\*\*\*\*  
 FLOW PROCESS FROM NODE        40.00 TO NODE        41.00 IS CODE = 21  
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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<<  
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<

=====

INITIAL SUBAREA FLOW-LENGTH(FEET) = 370.00  
 ELEVATION DATA: UPSTREAM(FEET) = 2920.60    DOWNSTREAM(FEET) = 2919.00

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

SUBAREA ANALYSIS USED MINIMUM  $T_c$ (MIN.) = 9.615

\* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 3.711

SUBAREA  $T_c$  AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	$F_p$ (INCH/HR)	$A_p$ (DECIMAL)	SCS CN	$T_c$ (MIN.)
COMMERCIAL	A	0.65	0.98	0.100	32	9.62
NATURAL POOR COVER "GRASS"	A	0.50	0.60	1.000	67	16.61

SUBAREA AVERAGE PERVIOUS LOSS RATE,  $F_p$ (INCH/HR) = 0.64

SUBAREA AVERAGE PERVIOUS AREA FRACTION,  $A_p$  = 0.491

SUBAREA RUNOFF(CFS) = 3.51

TOTAL AREA(ACRES) = 1.15 PEAK FLOW RATE(CFS) = 3.51

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.15  $T_c$ (MIN.) = 9.62

EFFECTIVE AREA(ACRES) = 1.15 AREA-AVERAGED  $F_m$ (INCH/HR) = 0.32

AREA-AVERAGED  $F_p$ (INCH/HR) = 0.64 AREA-AVERAGED  $A_p$  = 0.491

PEAK FLOW RATE(CFS) = 3.51

=====

END OF RATIONAL METHOD ANALYSIS



# Hydrographs

Existing Condition 100 Year Storm Event

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 3.17 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	2.90	100.00	62.	0.672	0.148

TOTAL AREA (Acres) = 2.90

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.672

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.852

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RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00  
 TOTAL CATCHMENT AREA(ACRES) = 2.90  
 SOIL-LOSS RATE, Fm,(INCH/HR) = 0.672  
 LOW LOSS FRACTION = 0.852  
 TIME OF CONCENTRATION(MIN.) = 18.12  
 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) = 0.36  
 30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.84  
 1-HOUR POINT RAINFALL VALUE(INCHES) = 1.03  
 3-HOUR POINT RAINFALL VALUE(INCHES) = 1.46  
 6-HOUR POINT RAINFALL VALUE(INCHES) = 1.89  
 24-HOUR POINT RAINFALL VALUE(INCHES) = 3.17

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TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.20  
 TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.57

\*\*\*\*\*

TIME (HOURS)	VOLUME (AF)	Q (CFS)	0.	2.5	5.0	7.5	10.0
--------------	-------------	---------	----	-----	-----	-----	------

0.30	0.0003	0.02 Q	.	.	.	.	.
0.60	0.0008	0.02 Q	.	.	.	.	.
0.90	0.0013	0.02 Q	.	.	.	.	.
1.20	0.0019	0.02 Q	.	.	.	.	.
1.50	0.0024	0.02 Q	.	.	.	.	.
1.81	0.0030	0.02 Q	.	.	.	.	.

2.11	0.0036	0.02 Q	.	.	.	.
2.41	0.0041	0.02 Q	.	.	.	.
2.71	0.0047	0.02 Q	.	.	.	.
3.01	0.0053	0.02 Q	.	.	.	.
3.32	0.0059	0.02 Q	.	.	.	.
3.62	0.0065	0.02 Q	.	.	.	.
3.92	0.0071	0.02 Q	.	.	.	.
4.22	0.0078	0.03 Q	.	.	.	.
4.52	0.0084	0.03 Q	.	.	.	.
4.83	0.0090	0.03 Q	.	.	.	.
5.13	0.0097	0.03 Q	.	.	.	.
5.43	0.0104	0.03 Q	.	.	.	.
5.73	0.0110	0.03 Q	.	.	.	.
6.03	0.0117	0.03 Q	.	.	.	.
6.34	0.0124	0.03 Q	.	.	.	.
6.64	0.0132	0.03 Q	.	.	.	.
6.94	0.0139	0.03 Q	.	.	.	.
7.24	0.0146	0.03 Q	.	.	.	.
7.54	0.0154	0.03 Q	.	.	.	.
7.85	0.0162	0.03 Q	.	.	.	.
8.15	0.0170	0.03 Q	.	.	.	.
8.45	0.0178	0.03 Q	.	.	.	.
8.75	0.0186	0.03 Q	.	.	.	.
9.05	0.0195	0.04 Q	.	.	.	.
9.36	0.0204	0.04 Q	.	.	.	.
9.66	0.0213	0.04 Q	.	.	.	.
9.96	0.0222	0.04 Q	.	.	.	.
10.26	0.0232	0.04 Q	.	.	.	.
10.56	0.0242	0.04 Q	.	.	.	.
10.87	0.0252	0.04 Q	.	.	.	.
11.17	0.0263	0.04 Q	.	.	.	.
11.47	0.0274	0.05 Q	.	.	.	.
11.77	0.0285	0.05 Q	.	.	.	.
12.07	0.0297	0.05 Q	.	.	.	.
12.38	0.0310	0.05 Q	.	.	.	.
12.68	0.0323	0.05 Q	.	.	.	.
12.98	0.0337	0.06 Q	.	.	.	.
13.28	0.0352	0.06 Q	.	.	.	.
13.58	0.0367	0.06 Q	.	.	.	.
13.89	0.0384	0.07 Q	.	.	.	.
14.19	0.0402	0.08 Q	.	.	.	.
14.49	0.0421	0.07 Q	.	.	.	.
14.79	0.0440	0.08 Q	.	.	.	.
15.09	0.0463	0.10 Q	.	.	.	.
15.40	0.0489	0.11 Q	.	.	.	.
15.70	0.0524	0.16 Q	.	.	.	.
16.00	0.0584	0.32 .Q	.	.	.	.
16.30	0.1171	4.46 .	Q	.	.	.
16.60	0.1734	0.13 Q	.	.	.	.
16.91	0.1762	0.09 Q	.	.	.	.

17.21	0.1782	0.07	Q	.	.	.	.	
17.51	0.1799	0.07	Q	.	.	.	.	
17.81	0.1815	0.06	Q	.	.	.	.	
18.11	0.1829	0.05	Q	.	.	.	.	
18.42	0.1841	0.05	Q	.	.	.	.	
18.72	0.1853	0.04	Q	.	.	.	.	
19.02	0.1863	0.04	Q	.	.	.	.	
19.32	0.1873	0.04	Q	.	.	.	.	
19.62	0.1883	0.04	Q	.	.	.	.	
19.93	0.1891	0.03	Q	.	.	.	.	
20.23	0.1900	0.03	Q	.	.	.	.	
20.53	0.1908	0.03	Q	.	.	.	.	
20.83	0.1915	0.03	Q	.	.	.	.	
21.13	0.1923	0.03	Q	.	.	.	.	
21.44	0.1930	0.03	Q	.	.	.	.	
21.74	0.1937	0.03	Q	.	.	.	.	
22.04	0.1943	0.03	Q	.	.	.	.	
22.34	0.1950	0.03	Q	.	.	.	.	
22.64	0.1956	0.02	Q	.	.	.	.	
22.95	0.1962	0.02	Q	.	.	.	.	
23.25	0.1968	0.02	Q	.	.	.	.	
23.55	0.1973	0.02	Q	.	.	.	.	
23.85	0.1979	0.02	Q	.	.	.	.	
24.15	0.1984	0.02	Q	.	.	.	.	
24.46	0.1987	0.00	Q	.	.	.	.	8655.372

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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%	1449.6
10%	18.1
20%	18.1
30%	18.1
40%	18.1
50%	18.1
60%	18.1
70%	18.1
80%	18.1
90%	18.1

Node 30 to 31 Developed Condition 100 Year Storm Event

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 3.17 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	0.10	100.00	67.	0.598	0.212
2	1.65	0.00	98.	0.000	0.927

TOTAL AREA (Acres) = 1.75

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.034

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.114

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RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00

TOTAL CATCHMENT AREA(ACRES) = 1.75

SOIL-LOSS RATE, Fm,(INCH/HR) = 0.034

LOW LOSS FRACTION = 0.114

TIME OF CONCENTRATION(MIN.) = 8.08

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) = 0.36

30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.84

1-HOUR POINT RAINFALL VALUE(INCHES) = 1.03

3-HOUR POINT RAINFALL VALUE(INCHES) = 1.46

6-HOUR POINT RAINFALL VALUE(INCHES) = 1.89

24-HOUR POINT RAINFALL VALUE(INCHES) = 3.17

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TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.42

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

\*\*\*\*\*

TIME (HOURS)	VOLUME (AF)	Q (CFS)
0.		
2.5		
5.0		
7.5		
10.0		

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0.11	0.0004	0.08 Q	.	.	.	.
0.24	0.0013	0.08 Q	.	.	.	.
0.38	0.0021	0.08 Q	.	.	.	.
0.51	0.0030	0.08 Q	.	.	.	.
0.65	0.0039	0.08 Q	.	.	.	.
0.78	0.0047	0.08 Q	.	.	.	.
0.92	0.0056	0.08 Q	.	.	.	.
1.05	0.0065	0.08 Q	.	.	.	.
1.19	0.0074	0.08 Q	.	.	.	.
1.32	0.0083	0.08 Q	.	.	.	.
1.46	0.0092	0.08 Q	.	.	.	.
1.59	0.0101	0.08 Q	.	.	.	.
1.73	0.0110	0.08 Q	.	.	.	.
1.86	0.0119	0.08 Q	.	.	.	.
1.99	0.0128	0.08 Q	.	.	.	.
2.13	0.0137	0.08 Q	.	.	.	.
2.26	0.0146	0.08 Q	.	.	.	.
2.40	0.0156	0.08 Q	.	.	.	.
2.53	0.0165	0.08 Q	.	.	.	.
2.67	0.0175	0.09 Q	.	.	.	.
2.80	0.0184	0.09 Q	.	.	.	.
2.94	0.0194	0.09 Q	.	.	.	.
3.07	0.0203	0.09 Q	.	.	.	.
3.21	0.0213	0.09 Q	.	.	.	.
3.34	0.0223	0.09 Q	.	.	.	.
3.48	0.0233	0.09 Q	.	.	.	.
3.61	0.0243	0.09 Q	.	.	.	.
3.75	0.0253	0.09 Q	.	.	.	.
3.88	0.0263	0.09 Q	.	.	.	.
4.01	0.0273	0.09 Q	.	.	.	.
4.15	0.0283	0.09 Q	.	.	.	.
4.28	0.0293	0.09 Q	.	.	.	.
4.42	0.0303	0.09 Q	.	.	.	.
4.55	0.0314	0.09 Q	.	.	.	.
4.69	0.0324	0.09 Q	.	.	.	.
4.82	0.0335	0.10 Q	.	.	.	.
4.96	0.0345	0.10 Q	.	.	.	.
5.09	0.0356	0.10 Q	.	.	.	.
5.23	0.0367	0.10 Q	.	.	.	.
5.36	0.0378	0.10 Q	.	.	.	.
5.50	0.0389	0.10 Q	.	.	.	.
5.63	0.0400	0.10 Q	.	.	.	.
5.77	0.0411	0.10 Q	.	.	.	.
5.90	0.0422	0.10 Q	.	.	.	.
6.03	0.0433	0.10 Q	.	.	.	.

6.17	0.0445	0.10 Q	.	.	.	.
6.30	0.0456	0.10 Q	.	.	.	.
6.44	0.0468	0.10 Q	.	.	.	.
6.57	0.0480	0.11 Q	.	.	.	.
6.71	0.0491	0.11 Q	.	.	.	.
6.84	0.0503	0.11 Q	.	.	.	.
6.98	0.0515	0.11 Q	.	.	.	.
7.11	0.0528	0.11 Q	.	.	.	.
7.25	0.0540	0.11 Q	.	.	.	.
7.38	0.0552	0.11 Q	.	.	.	.
7.52	0.0565	0.11 Q	.	.	.	.
7.65	0.0577	0.11 Q	.	.	.	.
7.79	0.0590	0.12 Q	.	.	.	.
7.92	0.0603	0.12 Q	.	.	.	.
8.05	0.0616	0.12 Q	.	.	.	.
8.19	0.0629	0.12 Q	.	.	.	.
8.32	0.0642	0.12 Q	.	.	.	.
8.46	0.0656	0.12 Q	.	.	.	.
8.59	0.0669	0.12 Q	.	.	.	.
8.73	0.0683	0.12 Q	.	.	.	.
8.86	0.0697	0.13 Q	.	.	.	.
9.00	0.0711	0.13 Q	.	.	.	.
9.13	0.0725	0.13 Q	.	.	.	.
9.27	0.0740	0.13 Q	.	.	.	.
9.40	0.0754	0.13 Q	.	.	.	.
9.54	0.0769	0.13 Q	.	.	.	.
9.67	0.0784	0.14 Q	.	.	.	.
9.81	0.0799	0.14 Q	.	.	.	.
9.94	0.0814	0.14 Q	.	.	.	.
10.07	0.0830	0.14 Q	.	.	.	.
10.21	0.0846	0.14 Q	.	.	.	.
10.34	0.0862	0.14 Q	.	.	.	.
10.48	0.0878	0.15 Q	.	.	.	.
10.61	0.0894	0.15 Q	.	.	.	.
10.75	0.0911	0.15 Q	.	.	.	.
10.88	0.0928	0.15 Q	.	.	.	.
11.02	0.0945	0.16 Q	.	.	.	.
11.15	0.0963	0.16 Q	.	.	.	.
11.29	0.0981	0.16 Q	.	.	.	.
11.42	0.0999	0.16 Q	.	.	.	.
11.56	0.1018	0.17 Q	.	.	.	.
11.69	0.1036	0.17 Q	.	.	.	.
11.83	0.1056	0.18 Q	.	.	.	.
11.96	0.1075	0.18 Q	.	.	.	.
12.09	0.1095	0.18 Q	.	.	.	.

12.23	0.1116	0.18	Q	.	.	.	.
12.36	0.1137	0.19	Q	.	.	.	.
12.50	0.1158	0.19	Q	.	.	.	.
12.63	0.1180	0.20	Q	.	.	.	.
12.77	0.1202	0.20	Q	.	.	.	.
12.90	0.1225	0.21	Q	.	.	.	.
13.04	0.1249	0.21	Q	.	.	.	.
13.17	0.1273	0.22	Q	.	.	.	.
13.31	0.1298	0.23	Q	.	.	.	.
13.44	0.1323	0.24	Q	.	.	.	.
13.58	0.1350	0.24	Q	.	.	.	.
13.71	0.1377	0.25	.Q	.	.	.	.
13.85	0.1406	0.26	.Q	.	.	.	.
13.98	0.1435	0.27	.Q	.	.	.	.
14.11	0.1465	0.27	.Q	.	.	.	.
14.25	0.1494	0.25	.Q	.	.	.	.
14.38	0.1523	0.26	.Q	.	.	.	.
14.52	0.1553	0.28	.Q	.	.	.	.
14.65	0.1585	0.29	.Q	.	.	.	.
14.79	0.1620	0.32	.Q	.	.	.	.
14.92	0.1656	0.34	.Q	.	.	.	.
15.06	0.1696	0.38	.Q	.	.	.	.
15.19	0.1739	0.40	.Q	.	.	.	.
15.33	0.1787	0.46	.Q	.	.	.	.
15.46	0.1840	0.49	.Q	.	.	.	.
15.60	0.1901	0.60	.Q	.	.	.	.
15.73	0.1973	0.70	.Q	.	.	.	.
15.87	0.2104	1.66	. Q	.	.	.	.
16.00	0.2320	2.22	. Q	.	.	.	.
16.13	0.2767	5.81	. . Q	.	.	.	.
16.27	0.3159	1.23	. Q	.	.	.	.
16.40	0.3256	0.52	.Q	.	.	.	.
16.54	0.3309	0.43	.Q	.	.	.	.
16.67	0.3353	0.36	.Q	.	.	.	.
16.81	0.3390	0.31	.Q	.	.	.	.
16.94	0.3422	0.27	.Q	.	.	.	.
17.08	0.3451	0.25	Q	.	.	.	.
17.21	0.3479	0.26	.Q	.	.	.	.
17.35	0.3508	0.25	Q	.	.	.	.
17.48	0.3534	0.23	Q	.	.	.	.
17.62	0.3559	0.22	Q	.	.	.	.
17.75	0.3583	0.21	Q	.	.	.	.
17.89	0.3605	0.20	Q	.	.	.	.
18.02	0.3627	0.19	Q	.	.	.	.
18.15	0.3647	0.18	Q	.	.	.	.

18.29	0.3667	0.17 Q	.	.	.	.
18.42	0.3685	0.17 Q	.	.	.	.
18.56	0.3704	0.16 Q	.	.	.	.
18.69	0.3721	0.16 Q	.	.	.	.
18.83	0.3738	0.15 Q	.	.	.	.
18.96	0.3755	0.15 Q	.	.	.	.
19.10	0.3771	0.14 Q	.	.	.	.
19.23	0.3786	0.14 Q	.	.	.	.
19.37	0.3801	0.13 Q	.	.	.	.
19.50	0.3816	0.13 Q	.	.	.	.
19.64	0.3831	0.13 Q	.	.	.	.
19.77	0.3845	0.12 Q	.	.	.	.
19.91	0.3858	0.12 Q	.	.	.	.
20.04	0.3872	0.12 Q	.	.	.	.
20.17	0.3885	0.12 Q	.	.	.	.
20.31	0.3898	0.11 Q	.	.	.	.
20.44	0.3910	0.11 Q	.	.	.	.
20.58	0.3923	0.11 Q	.	.	.	.
20.71	0.3935	0.11 Q	.	.	.	.
20.85	0.3947	0.11 Q	.	.	.	.
20.98	0.3959	0.10 Q	.	.	.	.
21.12	0.3970	0.10 Q	.	.	.	.
21.25	0.3981	0.10 Q	.	.	.	.
21.39	0.3993	0.10 Q	.	.	.	.
21.52	0.4003	0.10 Q	.	.	.	.
21.66	0.4014	0.10 Q	.	.	.	.
21.79	0.4025	0.09 Q	.	.	.	.
21.93	0.4035	0.09 Q	.	.	.	.
22.06	0.4046	0.09 Q	.	.	.	.
22.19	0.4056	0.09 Q	.	.	.	.
22.33	0.4066	0.09 Q	.	.	.	.
22.46	0.4076	0.09 Q	.	.	.	.
22.60	0.4085	0.09 Q	.	.	.	.
22.73	0.4095	0.09 Q	.	.	.	.
22.87	0.4105	0.08 Q	.	.	.	.
23.00	0.4114	0.08 Q	.	.	.	.
23.14	0.4123	0.08 Q	.	.	.	.
23.27	0.4132	0.08 Q	.	.	.	.
23.41	0.4142	0.08 Q	.	.	.	.
23.54	0.4151	0.08 Q	.	.	.	.
23.68	0.4159	0.08 Q	.	.	.	.
23.81	0.4168	0.08 Q	.	.	.	.
23.95	0.4177	0.08 Q	.	.	.	.
24.08	0.4185	0.08 Q	.	.	.	.
24.21	0.4190	0.00 Q	.	.	.	.

18251.64 13226.6

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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%	1446.3
10%	48.5
20%	32.3
30%	16.2
40%	8.1
50%	8.1
60%	8.1
70%	8.1
80%	8.1
90%	8.1

Node 40 to 41 Developed Condition 100 Year Storm Event

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

TOTAL 24-HOUR DURATION RAINFALL DEPTH = 3.17 (inches)

SOIL-COVER TYPE	AREA (Acres)	PERCENT OF PERVIOUS AREA	SCS CURVE NUMBER	LOSS RATE Fp(in./hr.)	YIELD
1	0.50	100.00	67.	0.598	0.212
2	0.65	0.00	98.	0.000	0.927

TOTAL AREA (Acres) = 1.15

AREA-AVERAGED LOSS RATE, Fm (in./hr.) = 0.260

AREA-AVERAGED LOW LOSS FRACTION, Y = 0.384

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RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00

TOTAL CATCHMENT AREA(ACRES) = 1.15

SOIL-LOSS RATE, Fm,(INCH/HR) = 0.260

LOW LOSS FRACTION = 0.384

TIME OF CONCENTRATION(MIN.) = 8.28

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) = 0.36

30-MINUTE POINT RAINFALL VALUE(INCHES) = 0.84

1-HOUR POINT RAINFALL VALUE(INCHES) = 1.03

3-HOUR POINT RAINFALL VALUE(INCHES) = 1.46

6-HOUR POINT RAINFALL VALUE(INCHES) = 1.89

24-HOUR POINT RAINFALL VALUE(INCHES) = 3.17

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TOTAL CATCHMENT RUNOFF VOLUME(ACRE-FEET) = 0.20

TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) = 0.10

\*\*\*\*\*

TIME (HOURS)	VOLUME (AF)	Q (CFS)
0.		
2.5		
5.0		
7.5		
10.0		

-----

0.13	0.0002	0.03 Q	.	.	.	.
0.27	0.0006	0.04 Q	.	.	.	.
0.41	0.0010	0.04 Q	.	.	.	.
0.54	0.0014	0.04 Q	.	.	.	.
0.68	0.0018	0.04 Q	.	.	.	.
0.82	0.0022	0.04 Q	.	.	.	.
0.96	0.0026	0.04 Q	.	.	.	.
1.10	0.0030	0.04 Q	.	.	.	.
1.23	0.0034	0.04 Q	.	.	.	.
1.37	0.0039	0.04 Q	.	.	.	.
1.51	0.0043	0.04 Q	.	.	.	.
1.65	0.0047	0.04 Q	.	.	.	.
1.79	0.0051	0.04 Q	.	.	.	.
1.92	0.0056	0.04 Q	.	.	.	.
2.06	0.0060	0.04 Q	.	.	.	.
2.20	0.0064	0.04 Q	.	.	.	.
2.34	0.0069	0.04 Q	.	.	.	.
2.48	0.0073	0.04 Q	.	.	.	.
2.61	0.0077	0.04 Q	.	.	.	.
2.75	0.0082	0.04 Q	.	.	.	.
2.89	0.0086	0.04 Q	.	.	.	.
3.03	0.0091	0.04 Q	.	.	.	.
3.17	0.0095	0.04 Q	.	.	.	.
3.30	0.0100	0.04 Q	.	.	.	.
3.44	0.0104	0.04 Q	.	.	.	.
3.58	0.0109	0.04 Q	.	.	.	.
3.72	0.0114	0.04 Q	.	.	.	.
3.86	0.0118	0.04 Q	.	.	.	.
3.99	0.0123	0.04 Q	.	.	.	.
4.13	0.0128	0.04 Q	.	.	.	.
4.27	0.0133	0.04 Q	.	.	.	.
4.41	0.0138	0.04 Q	.	.	.	.
4.55	0.0142	0.04 Q	.	.	.	.
4.68	0.0147	0.04 Q	.	.	.	.
4.82	0.0152	0.04 Q	.	.	.	.
4.96	0.0157	0.04 Q	.	.	.	.
5.10	0.0162	0.04 Q	.	.	.	.
5.24	0.0167	0.04 Q	.	.	.	.
5.37	0.0172	0.04 Q	.	.	.	.
5.51	0.0178	0.05 Q	.	.	.	.
5.65	0.0183	0.05 Q	.	.	.	.
5.79	0.0188	0.05 Q	.	.	.	.
5.93	0.0193	0.05 Q	.	.	.	.
6.06	0.0198	0.05 Q	.	.	.	.
6.20	0.0204	0.05 Q	.	.	.	.

6.34	0.0209	0.05 Q	.	.	.	.
6.48	0.0215	0.05 Q	.	.	.	.
6.62	0.0220	0.05 Q	.	.	.	.
6.75	0.0226	0.05 Q	.	.	.	.
6.89	0.0231	0.05 Q	.	.	.	.
7.03	0.0237	0.05 Q	.	.	.	.
7.17	0.0243	0.05 Q	.	.	.	.
7.31	0.0248	0.05 Q	.	.	.	.
7.44	0.0254	0.05 Q	.	.	.	.
7.58	0.0260	0.05 Q	.	.	.	.
7.72	0.0266	0.05 Q	.	.	.	.
7.86	0.0272	0.05 Q	.	.	.	.
8.00	0.0278	0.05 Q	.	.	.	.
8.13	0.0284	0.05 Q	.	.	.	.
8.27	0.0290	0.05 Q	.	.	.	.
8.41	0.0297	0.06 Q	.	.	.	.
8.55	0.0303	0.06 Q	.	.	.	.
8.69	0.0309	0.06 Q	.	.	.	.
8.82	0.0316	0.06 Q	.	.	.	.
8.96	0.0322	0.06 Q	.	.	.	.
9.10	0.0329	0.06 Q	.	.	.	.
9.24	0.0336	0.06 Q	.	.	.	.
9.38	0.0343	0.06 Q	.	.	.	.
9.51	0.0349	0.06 Q	.	.	.	.
9.65	0.0356	0.06 Q	.	.	.	.
9.79	0.0364	0.06 Q	.	.	.	.
9.93	0.0371	0.06 Q	.	.	.	.
10.07	0.0378	0.06 Q	.	.	.	.
10.20	0.0385	0.07 Q	.	.	.	.
10.34	0.0393	0.07 Q	.	.	.	.
10.48	0.0400	0.07 Q	.	.	.	.
10.62	0.0408	0.07 Q	.	.	.	.
10.76	0.0416	0.07 Q	.	.	.	.
10.89	0.0424	0.07 Q	.	.	.	.
11.03	0.0432	0.07 Q	.	.	.	.
11.17	0.0440	0.07 Q	.	.	.	.
11.31	0.0449	0.07 Q	.	.	.	.
11.45	0.0457	0.08 Q	.	.	.	.
11.58	0.0466	0.08 Q	.	.	.	.
11.72	0.0475	0.08 Q	.	.	.	.
11.86	0.0484	0.08 Q	.	.	.	.
12.00	0.0493	0.08 Q	.	.	.	.
12.14	0.0502	0.08 Q	.	.	.	.
12.27	0.0512	0.09 Q	.	.	.	.
12.41	0.0522	0.09 Q	.	.	.	.

12.55	0.0532	0.09 Q	.	.	.	.
12.69	0.0542	0.09 Q	.	.	.	.
12.83	0.0553	0.09 Q	.	.	.	.
12.96	0.0564	0.10 Q	.	.	.	.
13.10	0.0575	0.10 Q	.	.	.	.
13.24	0.0586	0.10 Q	.	.	.	.
13.38	0.0598	0.11 Q	.	.	.	.
13.52	0.0611	0.11 Q	.	.	.	.
13.65	0.0623	0.11 Q	.	.	.	.
13.79	0.0636	0.12 Q	.	.	.	.
13.93	0.0650	0.12 Q	.	.	.	.
14.07	0.0664	0.13 Q	.	.	.	.
14.21	0.0678	0.11 Q	.	.	.	.
14.34	0.0691	0.12 Q	.	.	.	.
14.48	0.0705	0.13 Q	.	.	.	.
14.62	0.0720	0.13 Q	.	.	.	.
14.76	0.0735	0.14 Q	.	.	.	.
14.90	0.0752	0.15 Q	.	.	.	.
15.03	0.0771	0.17 Q	.	.	.	.
15.17	0.0790	0.18 Q	.	.	.	.
15.31	0.0813	0.21 Q	.	.	.	.
15.45	0.0837	0.22 Q	.	.	.	.
15.59	0.0865	0.26 .Q	.	.	.	.
15.72	0.0897	0.30 .Q	.	.	.	.
15.86	0.0961	0.82 . Q	.	.	.	.
16.00	0.1074	1.18 . Q	.	.	.	.
16.14	0.1342	3.51 . . Q	.	.	.	.
16.28	0.1571	0.51 .Q	.	.	.	.
16.41	0.1613	0.23 Q	.	.	.	.
16.55	0.1637	0.19 Q	.	.	.	.
16.69	0.1657	0.16 Q	.	.	.	.
16.83	0.1674	0.14 Q	.	.	.	.
16.97	0.1689	0.12 Q	.	.	.	.
17.10	0.1702	0.12 Q	.	.	.	.
17.24	0.1716	0.12 Q	.	.	.	.
17.38	0.1729	0.11 Q	.	.	.	.
17.52	0.1741	0.10 Q	.	.	.	.
17.66	0.1753	0.10 Q	.	.	.	.
17.79	0.1763	0.09 Q	.	.	.	.
17.93	0.1774	0.09 Q	.	.	.	.
18.07	0.1784	0.08 Q	.	.	.	.
18.21	0.1793	0.08 Q	.	.	.	.
18.35	0.1802	0.08 Q	.	.	.	.
18.48	0.1811	0.07 Q	.	.	.	.
18.62	0.1819	0.07 Q	.	.	.	.

18.76	0.1827	0.07 Q	.	.	.	.
18.90	0.1835	0.07 Q	.	.	.	.
19.04	0.1843	0.07 Q	.	.	.	.
19.17	0.1850	0.06 Q	.	.	.	.
19.31	0.1857	0.06 Q	.	.	.	.
19.45	0.1864	0.06 Q	.	.	.	.
19.59	0.1871	0.06 Q	.	.	.	.
19.73	0.1878	0.06 Q	.	.	.	.
19.86	0.1884	0.06 Q	.	.	.	.
20.00	0.1891	0.05 Q	.	.	.	.
20.14	0.1897	0.05 Q	.	.	.	.
20.28	0.1903	0.05 Q	.	.	.	.
20.42	0.1909	0.05 Q	.	.	.	.
20.55	0.1915	0.05 Q	.	.	.	.
20.69	0.1920	0.05 Q	.	.	.	.
20.83	0.1926	0.05 Q	.	.	.	.
20.97	0.1931	0.05 Q	.	.	.	.
21.11	0.1937	0.05 Q	.	.	.	.
21.24	0.1942	0.05 Q	.	.	.	.
21.38	0.1947	0.05 Q	.	.	.	.
21.52	0.1952	0.04 Q	.	.	.	.
21.66	0.1957	0.04 Q	.	.	.	.
21.80	0.1962	0.04 Q	.	.	.	.
21.93	0.1967	0.04 Q	.	.	.	.
22.07	0.1972	0.04 Q	.	.	.	.
22.21	0.1977	0.04 Q	.	.	.	.
22.35	0.1982	0.04 Q	.	.	.	.
22.49	0.1986	0.04 Q	.	.	.	.
22.62	0.1991	0.04 Q	.	.	.	.
22.76	0.1995	0.04 Q	.	.	.	.
22.90	0.2000	0.04 Q	.	.	.	.
23.04	0.2004	0.04 Q	.	.	.	.
23.18	0.2008	0.04 Q	.	.	.	.
23.31	0.2013	0.04 Q	.	.	.	.
23.45	0.2017	0.04 Q	.	.	.	.
23.59	0.2021	0.04 Q	.	.	.	.
23.73	0.2025	0.04 Q	.	.	.	.
23.87	0.2029	0.04 Q	.	.	.	.
24.00	0.2033	0.04 Q	.	.	.	.
24.14	0.2035	0.00 Q	.	.	.	.
					w basin	
					8864.46	2764.46

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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%	1440.7
10%	33.1
20%	24.8
30%	16.6
40%	8.3
50%	8.3
60%	8.3
70%	8.3
80%	8.3
90%	8.3

Node 30 to 31 Developed Condition 100 Year Storm Event Routed Thru Stormtech

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FLOW-THROUGH DETENTION BASIN MODEL

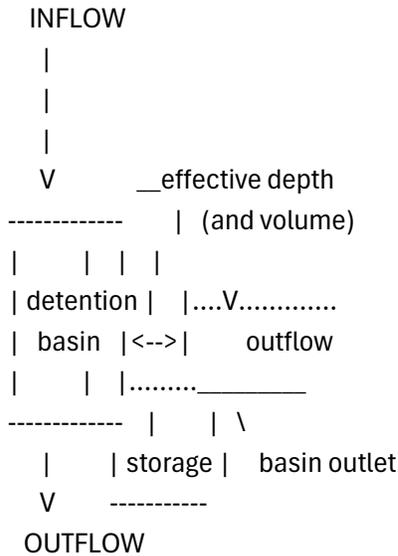
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:

CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 8.080

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 = 3

\*BASIN-DEPTH STORAGE OUTFLOW \*\*BASIN-DEPTH STORAGE OUTFLOW \*

\* (FEET) (ACRE-FEET) (CFS) \*\* (FEET) (ACRE-FEET) (CFS) \*

\* 0.000 0.000 0.000\*\* 3.000 0.150 0.000\*

\* 6.000 0.310 5.810\*\*

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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 3.00 0.10000 0.10000

3 6.00 0.18767 0.25233

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

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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)

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0.109	0.000	0.08	0.03	0.00	0.001
0.244	0.000	0.08	0.05	0.00	0.002
0.379	0.000	0.08	0.08	0.00	0.003
0.513	0.000	0.08	0.10	0.00	0.003
0.648	0.000	0.08	0.13	0.00	0.004
0.783	0.000	0.08	0.16	0.00	0.005
0.917	0.000	0.08	0.18	0.00	0.006
1.052	0.000	0.08	0.21	0.00	0.007
1.187	0.000	0.08	0.23	0.00	0.008
1.321	0.000	0.08	0.26	0.00	0.009
1.456	0.000	0.08	0.29	0.00	0.010
1.591	0.000	0.08	0.32	0.00	0.011
1.725	0.000	0.08	0.34	0.00	0.011
1.860	0.000	0.08	0.37	0.00	0.012
1.995	0.000	0.08	0.40	0.00	0.013
2.129	0.000	0.08	0.43	0.00	0.014
2.264	0.000	0.08	0.45	0.00	0.015
2.399	0.000	0.08	0.48	0.00	0.016
2.533	0.000	0.08	0.51	0.00	0.017
2.668	0.000	0.09	0.54	0.00	0.018
2.803	0.000	0.09	0.57	0.00	0.019
2.937	0.000	0.09	0.60	0.00	0.020
3.072	0.000	0.09	0.62	0.00	0.021
3.207	0.000	0.09	0.65	0.00	0.022
3.341	0.000	0.09	0.68	0.00	0.023
3.476	0.000	0.09	0.71	0.00	0.024
3.611	0.000	0.09	0.74	0.00	0.025
3.745	0.000	0.09	0.77	0.00	0.026
3.880	0.000	0.09	0.80	0.00	0.027
4.015	0.000	0.09	0.83	0.00	0.028
4.149	0.000	0.09	0.86	0.00	0.029
4.284	0.000	0.09	0.89	0.00	0.030
4.419	0.000	0.09	0.93	0.00	0.031
4.553	0.000	0.09	0.96	0.00	0.032
4.688	0.000	0.09	0.99	0.00	0.033
4.823	0.000	0.10	1.02	0.00	0.034
4.957	0.000	0.10	1.05	0.00	0.035
5.092	0.000	0.10	1.08	0.00	0.036

5.227	0.000	0.10	1.12	0.00	0.037
5.361	0.000	0.10	1.15	0.00	0.038
5.496	0.000	0.10	1.18	0.00	0.039
5.631	0.000	0.10	1.22	0.00	0.041
5.765	0.000	0.10	1.25	0.00	0.042
5.900	0.000	0.10	1.28	0.00	0.043
6.035	0.000	0.10	1.32	0.00	0.044
6.169	0.000	0.10	1.35	0.00	0.045
6.304	0.000	0.10	1.39	0.00	0.046
6.439	0.000	0.10	1.42	0.00	0.047
6.573	0.000	0.11	1.46	0.00	0.049
6.708	0.000	0.11	1.49	0.00	0.050
6.843	0.000	0.11	1.53	0.00	0.051
6.977	0.000	0.11	1.56	0.00	0.052
7.112	0.000	0.11	1.60	0.00	0.053
7.247	0.000	0.11	1.64	0.00	0.055
7.381	0.000	0.11	1.68	0.00	0.056
7.516	0.000	0.11	1.71	0.00	0.057
7.651	0.000	0.11	1.75	0.00	0.058
7.785	0.000	0.12	1.79	0.00	0.060
7.920	0.000	0.12	1.83	0.00	0.061
8.055	0.000	0.12	1.87	0.00	0.062
8.189	0.000	0.12	1.91	0.00	0.064
8.324	0.000	0.12	1.95	0.00	0.065
8.459	0.000	0.12	1.99	0.00	0.066
8.593	0.000	0.12	2.03	0.00	0.068
8.728	0.000	0.12	2.07	0.00	0.069
8.863	0.000	0.13	2.11	0.00	0.070
8.997	0.000	0.13	2.15	0.00	0.072
9.132	0.000	0.13	2.20	0.00	0.073
9.267	0.000	0.13	2.24	0.00	0.075
9.401	0.000	0.13	2.28	0.00	0.076
9.536	0.000	0.13	2.33	0.00	0.078
9.671	0.000	0.14	2.37	0.00	0.079
9.805	0.000	0.14	2.42	0.00	0.081
9.940	0.000	0.14	2.47	0.00	0.082
10.075	0.000	0.14	2.51	0.00	0.084
10.209	0.000	0.14	2.56	0.00	0.085
10.344	0.000	0.14	2.61	0.00	0.087
10.479	0.000	0.15	2.66	0.00	0.089
10.613	0.000	0.15	2.71	0.00	0.090
10.748	0.000	0.15	2.76	0.00	0.092
10.883	0.000	0.15	2.81	0.00	0.094
11.017	0.000	0.16	2.86	0.00	0.095

11.152	0.000	0.16	2.92	0.00	0.097
11.287	0.000	0.16	2.97	0.00	0.099
11.421	0.000	0.16	3.02	0.02	0.101
11.556	0.000	0.17	3.05	0.06	0.102
11.691	0.000	0.17	3.06	0.11	0.103
11.825	0.000	0.18	3.08	0.13	0.103
11.960	0.000	0.18	3.08	0.15	0.103
12.095	0.000	0.18	3.09	0.16	0.103
12.229	0.000	0.18	3.09	0.17	0.104
12.364	0.000	0.19	3.09	0.18	0.104
12.499	0.000	0.19	3.10	0.18	0.104
12.633	0.000	0.20	3.10	0.19	0.104
12.768	0.000	0.20	3.10	0.19	0.104
12.903	0.000	0.21	3.10	0.20	0.104
13.037	0.000	0.21	3.11	0.20	0.104
13.172	0.000	0.22	3.11	0.21	0.104
13.307	0.000	0.23	3.11	0.22	0.105
13.441	0.000	0.24	3.12	0.22	0.105
13.576	0.000	0.24	3.12	0.23	0.105
13.711	0.000	0.25	3.12	0.24	0.105
13.845	0.000	0.26	3.13	0.24	0.105
13.980	0.000	0.27	3.13	0.25	0.105
14.115	0.000	0.27	3.14	0.26	0.105
14.249	0.000	0.25	3.13	0.26	0.105
14.384	0.000	0.26	3.13	0.26	0.105
14.519	0.000	0.28	3.14	0.26	0.106
14.653	0.000	0.29	3.14	0.27	0.106
14.788	0.000	0.32	3.15	0.29	0.106
14.923	0.000	0.34	3.16	0.31	0.106
15.057	0.000	0.38	3.18	0.33	0.107
15.192	0.000	0.40	3.19	0.35	0.108
15.327	0.000	0.46	3.21	0.39	0.108
15.461	0.000	0.49	3.23	0.43	0.109
15.596	0.000	0.60	3.26	0.48	0.110
15.731	0.000	0.70	3.30	0.55	0.112
15.865	0.000	1.66	3.54	0.82	0.122
16.000	0.000	2.22	3.80	1.29	0.132
16.135	0.000	5.81	4.73	2.45	0.169
16.269	0.000	1.23	4.27	2.65	0.151
16.404	0.000	0.52	3.84	2.04	0.134
16.539	0.000	0.43	3.58	1.38	0.123
16.673	0.000	0.36	3.41	0.96	0.116
16.808	0.000	0.31	3.30	0.69	0.112
16.943	0.000	0.27	3.23	0.52	0.109

17.077	0.000	0.25	3.19	0.41	0.108
17.212	0.000	0.26	3.17	0.34	0.107
17.347	0.000	0.25	3.15	0.31	0.106
17.481	0.000	0.23	3.14	0.28	0.105
17.616	0.000	0.22	3.13	0.25	0.105
17.751	0.000	0.21	3.12	0.24	0.105
17.885	0.000	0.20	3.11	0.22	0.104
18.020	0.000	0.19	3.10	0.21	0.104
18.155	0.000	0.18	3.10	0.20	0.104
18.289	0.000	0.17	3.10	0.19	0.104
18.424	0.000	0.17	3.09	0.18	0.104
18.559	0.000	0.16	3.09	0.17	0.104
18.693	0.000	0.16	3.08	0.17	0.103
18.828	0.000	0.15	3.08	0.16	0.103
18.963	0.000	0.15	3.08	0.16	0.103
19.097	0.000	0.14	3.08	0.15	0.103
19.232	0.000	0.14	3.07	0.15	0.103
19.367	0.000	0.13	3.07	0.14	0.103
19.501	0.000	0.13	3.07	0.14	0.103
19.636	0.000	0.13	3.07	0.13	0.103
19.771	0.000	0.12	3.07	0.13	0.103
19.905	0.000	0.12	3.07	0.13	0.103
20.040	0.000	0.12	3.06	0.12	0.103
20.175	0.000	0.12	3.06	0.12	0.102
20.309	0.000	0.11	3.06	0.12	0.102
20.444	0.000	0.11	3.06	0.12	0.102
20.579	0.000	0.11	3.06	0.11	0.102
20.713	0.000	0.11	3.06	0.11	0.102
20.848	0.000	0.11	3.06	0.11	0.102
20.983	0.000	0.10	3.06	0.11	0.102
21.117	0.000	0.10	3.05	0.11	0.102
21.252	0.000	0.10	3.05	0.10	0.102
21.387	0.000	0.10	3.05	0.10	0.102
21.521	0.000	0.10	3.05	0.10	0.102
21.656	0.000	0.10	3.05	0.10	0.102
21.791	0.000	0.09	3.05	0.10	0.102
21.925	0.000	0.09	3.05	0.10	0.102
22.060	0.000	0.09	3.05	0.09	0.102
22.195	0.000	0.09	3.05	0.09	0.102
22.329	0.000	0.09	3.05	0.09	0.102
22.464	0.000	0.09	3.05	0.09	0.102
22.599	0.000	0.09	3.05	0.09	0.102
22.733	0.000	0.09	3.05	0.09	0.102
22.868	0.000	0.08	3.04	0.09	0.102

23.003	0.000	0.08	3.04	0.09	0.102
23.137	0.000	0.08	3.04	0.08	0.102
23.272	0.000	0.08	3.04	0.08	0.102
23.407	0.000	0.08	3.04	0.08	0.102
23.541	0.000	0.08	3.04	0.08	0.102
23.676	0.000	0.08	3.04	0.08	0.102
23.811	0.000	0.08	3.04	0.08	0.102
23.945	0.000	0.08	3.04	0.08	0.102
24.080	0.000	0.08	3.04	0.08	0.102
24.215	0.000	0.00	3.02	0.06	0.101

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Node 40 to 41 Developed Condition 100 Year Storm Event Routed Thru Basin

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FLOW-THROUGH DETENTION BASIN MODEL

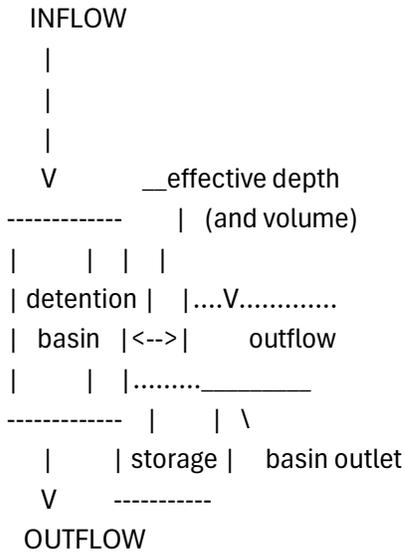
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:

CONSTANT HYDROGRAPH TIME UNIT(MINUTES) = 8.280

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 = 3

\*BASIN-DEPTH STORAGE    OUTFLOW \*\*BASIN-DEPTH STORAGE    OUTFLOW \*

\* (FEET) (ACRE-FEET) (CFS) \*\* (FEET) (ACRE-FEET) (CFS) \*

\* 0.000 0.000 0.000\*\* 3.000 0.070 0.000\*

\* 6.000 0.140 3.510\*\*

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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    3.00    0.07000    0.07000

3    6.00    0.11998    0.16002

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

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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)

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0.130	0.000	0.03	0.02	0.00	0.000
0.268	0.000	0.04	0.03	0.00	0.001
0.406	0.000	0.04	0.05	0.00	0.001
0.544	0.000	0.04	0.07	0.00	0.002
0.682	0.000	0.04	0.09	0.00	0.002
0.820	0.000	0.04	0.10	0.00	0.002
0.958	0.000	0.04	0.12	0.00	0.003
1.096	0.000	0.04	0.14	0.00	0.003
1.234	0.000	0.04	0.16	0.00	0.004
1.372	0.000	0.04	0.18	0.00	0.004
1.510	0.000	0.04	0.19	0.00	0.005
1.648	0.000	0.04	0.21	0.00	0.005
1.786	0.000	0.04	0.23	0.00	0.005
1.924	0.000	0.04	0.25	0.00	0.006
2.062	0.000	0.04	0.27	0.00	0.006
2.200	0.000	0.04	0.29	0.00	0.007
2.338	0.000	0.04	0.30	0.00	0.007
2.476	0.000	0.04	0.32	0.00	0.008
2.614	0.000	0.04	0.34	0.00	0.008
2.752	0.000	0.04	0.36	0.00	0.008
2.890	0.000	0.04	0.38	0.00	0.009
3.028	0.000	0.04	0.40	0.00	0.009
3.166	0.000	0.04	0.42	0.00	0.010
3.304	0.000	0.04	0.44	0.00	0.010
3.442	0.000	0.04	0.46	0.00	0.011
3.580	0.000	0.04	0.48	0.00	0.011
3.718	0.000	0.04	0.50	0.00	0.012
3.856	0.000	0.04	0.52	0.00	0.012
3.994	0.000	0.04	0.54	0.00	0.013
4.132	0.000	0.04	0.56	0.00	0.013
4.270	0.000	0.04	0.58	0.00	0.014
4.408	0.000	0.04	0.60	0.00	0.014
4.546	0.000	0.04	0.62	0.00	0.014
4.684	0.000	0.04	0.64	0.00	0.015
4.822	0.000	0.04	0.66	0.00	0.015
4.960	0.000	0.04	0.68	0.00	0.016
5.098	0.000	0.04	0.71	0.00	0.016
5.236	0.000	0.04	0.73	0.00	0.017
5.374	0.000	0.04	0.75	0.00	0.018
5.512	0.000	0.05	0.77	0.00	0.018

5.650	0.000	0.05	0.79	0.00	0.019
5.788	0.000	0.05	0.82	0.00	0.019
5.926	0.000	0.05	0.84	0.00	0.020
6.064	0.000	0.05	0.86	0.00	0.020
6.202	0.000	0.05	0.89	0.00	0.021
6.340	0.000	0.05	0.91	0.00	0.021
6.478	0.000	0.05	0.93	0.00	0.022
6.616	0.000	0.05	0.96	0.00	0.022
6.754	0.000	0.05	0.98	0.00	0.023
6.892	0.000	0.05	1.00	0.00	0.023
7.030	0.000	0.05	1.03	0.00	0.024
7.168	0.000	0.05	1.05	0.00	0.025
7.306	0.000	0.05	1.08	0.00	0.025
7.444	0.000	0.05	1.10	0.00	0.026
7.582	0.000	0.05	1.13	0.00	0.026
7.720	0.000	0.05	1.15	0.00	0.027
7.858	0.000	0.05	1.18	0.00	0.028
7.996	0.000	0.05	1.21	0.00	0.028
8.134	0.000	0.05	1.23	0.00	0.029
8.272	0.000	0.05	1.26	0.00	0.029
8.410	0.000	0.06	1.29	0.00	0.030
8.548	0.000	0.06	1.31	0.00	0.031
8.686	0.000	0.06	1.34	0.00	0.031
8.824	0.000	0.06	1.37	0.00	0.032
8.962	0.000	0.06	1.40	0.00	0.033
9.100	0.000	0.06	1.43	0.00	0.033
9.238	0.000	0.06	1.45	0.00	0.034
9.376	0.000	0.06	1.48	0.00	0.035
9.514	0.000	0.06	1.51	0.00	0.035
9.652	0.000	0.06	1.54	0.00	0.036
9.790	0.000	0.06	1.57	0.00	0.037
9.928	0.000	0.06	1.60	0.00	0.037
10.066	0.000	0.06	1.64	0.00	0.038
10.204	0.000	0.07	1.67	0.00	0.039
10.342	0.000	0.07	1.70	0.00	0.040
10.480	0.000	0.07	1.73	0.00	0.040
10.618	0.000	0.07	1.77	0.00	0.041
10.756	0.000	0.07	1.80	0.00	0.042
10.894	0.000	0.07	1.83	0.00	0.043
11.032	0.000	0.07	1.87	0.00	0.044
11.170	0.000	0.07	1.91	0.00	0.044
11.308	0.000	0.07	1.94	0.00	0.045
11.446	0.000	0.08	1.98	0.00	0.046
11.584	0.000	0.08	2.02	0.00	0.047
11.722	0.000	0.08	2.05	0.00	0.048

11.860	0.000	0.08	2.09	0.00	0.049
11.998	0.000	0.08	2.13	0.00	0.050
12.136	0.000	0.08	2.17	0.00	0.051
12.274	0.000	0.09	2.22	0.00	0.052
12.412	0.000	0.09	2.26	0.00	0.053
12.550	0.000	0.09	2.30	0.00	0.054
12.688	0.000	0.09	2.35	0.00	0.055
12.826	0.000	0.09	2.39	0.00	0.056
12.964	0.000	0.10	2.44	0.00	0.057
13.102	0.000	0.10	2.49	0.00	0.058
13.240	0.000	0.10	2.54	0.00	0.059
13.378	0.000	0.11	2.59	0.00	0.060
13.516	0.000	0.11	2.64	0.00	0.062
13.654	0.000	0.11	2.70	0.00	0.063
13.792	0.000	0.12	2.76	0.00	0.064
13.930	0.000	0.12	2.82	0.00	0.066
14.068	0.000	0.13	2.88	0.00	0.067
14.206	0.000	0.11	2.93	0.00	0.068
14.344	0.000	0.12	2.99	0.00	0.070
14.482	0.000	0.13	3.04	0.02	0.071
14.620	0.000	0.13	3.07	0.07	0.072
14.758	0.000	0.14	3.10	0.10	0.072
14.896	0.000	0.15	3.11	0.12	0.073
15.034	0.000	0.17	3.13	0.14	0.073
15.172	0.000	0.18	3.14	0.15	0.073
15.310	0.000	0.21	3.16	0.17	0.074
15.448	0.000	0.22	3.17	0.19	0.074
15.586	0.000	0.26	3.19	0.21	0.075
15.724	0.000	0.30	3.22	0.24	0.075
15.862	0.000	0.82	3.43	0.38	0.080
16.000	0.000	1.18	3.69	0.66	0.086
16.138	0.000	3.51	4.72	1.41	0.110
16.276	0.000	0.51	4.15	1.47	0.097
16.414	0.000	0.23	3.72	1.09	0.087
16.552	0.000	0.19	3.48	0.70	0.081
16.690	0.000	0.16	3.32	0.47	0.078
16.828	0.000	0.14	3.23	0.33	0.075
16.966	0.000	0.12	3.18	0.24	0.074
17.104	0.000	0.12	3.14	0.19	0.073
17.242	0.000	0.12	3.12	0.16	0.073
17.380	0.000	0.11	3.11	0.14	0.073
17.518	0.000	0.10	3.10	0.12	0.072
17.656	0.000	0.10	3.09	0.11	0.072
17.794	0.000	0.09	3.09	0.11	0.072
17.932	0.000	0.09	3.08	0.10	0.072

18.070	0.000	0.08	3.08	0.09	0.072
18.208	0.000	0.08	3.07	0.09	0.072
18.346	0.000	0.08	3.07	0.08	0.072
18.484	0.000	0.07	3.07	0.08	0.072
18.622	0.000	0.07	3.07	0.08	0.072
18.760	0.000	0.07	3.06	0.07	0.071
18.898	0.000	0.07	3.06	0.07	0.071
19.036	0.000	0.07	3.06	0.07	0.071
19.174	0.000	0.06	3.06	0.07	0.071
19.312	0.000	0.06	3.06	0.07	0.071
19.450	0.000	0.06	3.05	0.06	0.071
19.588	0.000	0.06	3.05	0.06	0.071
19.726	0.000	0.06	3.05	0.06	0.071
19.864	0.000	0.06	3.05	0.06	0.071
20.002	0.000	0.05	3.05	0.06	0.071
20.140	0.000	0.05	3.05	0.06	0.071
20.278	0.000	0.05	3.05	0.05	0.071
20.416	0.000	0.05	3.05	0.05	0.071
20.554	0.000	0.05	3.04	0.05	0.071
20.692	0.000	0.05	3.04	0.05	0.071
20.830	0.000	0.05	3.04	0.05	0.071
20.968	0.000	0.05	3.04	0.05	0.071
21.106	0.000	0.05	3.04	0.05	0.071
21.244	0.000	0.05	3.04	0.05	0.071
21.382	0.000	0.05	3.04	0.05	0.071
21.520	0.000	0.04	3.04	0.05	0.071
21.658	0.000	0.04	3.04	0.05	0.071
21.796	0.000	0.04	3.04	0.04	0.071
21.934	0.000	0.04	3.04	0.04	0.071
22.072	0.000	0.04	3.04	0.04	0.071
22.210	0.000	0.04	3.04	0.04	0.071
22.348	0.000	0.04	3.04	0.04	0.071
22.486	0.000	0.04	3.04	0.04	0.071
22.624	0.000	0.04	3.03	0.04	0.071
22.762	0.000	0.04	3.03	0.04	0.071
22.900	0.000	0.04	3.03	0.04	0.071
23.038	0.000	0.04	3.03	0.04	0.071
23.176	0.000	0.04	3.03	0.04	0.071
23.314	0.000	0.04	3.03	0.04	0.071
23.452	0.000	0.04	3.03	0.04	0.071
23.590	0.000	0.04	3.03	0.04	0.071
23.728	0.000	0.04	3.03	0.04	0.071
23.866	0.000	0.04	3.03	0.04	0.071
24.004	0.000	0.04	3.03	0.04	0.071
24.142	0.000	0.00	3.02	0.03	0.070

# Hydraulic Calculations

Proposed V Channel Node 11 to Node 12

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>>>>CHANNEL INPUT INFORMATION<<<<

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CHANNEL Z1(HORIZONTAL/VERTICAL) = 3.00  
Z2(HORIZONTAL/VERTICAL) = 3.00  
BASEWIDTH(FEET) = 0.00  
CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.006000  
UNIFORM FLOW(CFS) = 2.56  
MANNINGS FRICTION FACTOR = 0.0250

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NORMAL-DEPTH FLOW INFORMATION:

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>>>>> NORMAL DEPTH(FEET) = 0.64  
FLOW TOP-WIDTH(FEET) = 3.83  
FLOW AREA(SQUARE FEET) = 1.22  
HYDRAULIC DEPTH(FEET) = 0.32  
FLOW AVERAGE VELOCITY(FEET/SEC.) = 2.09  
UNIFORM FROUDE NUMBER = 0.652  
PRESSURE + MOMENTUM(POUNDS) = 26.65  
AVERAGED VELOCITY HEAD(FEET) = 0.068  
SPECIFIC ENERGY(FEET) = 0.707

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CRITICAL-DEPTH FLOW INFORMATION:

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CRITICAL FLOW TOP-WIDTH(FEET) = 3.23  
CRITICAL FLOW AREA(SQUARE FEET) = 0.87  
CRITICAL FLOW HYDRAULIC DEPTH(FEET) = 0.27  
CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) = 2.95  
CRITICAL DEPTH(FEET) = 0.54  
CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) = 24.34  
AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) = 0.135  
CRITICAL FLOW SPECIFIC ENERGY(FEET) = 0.673

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Proposed V Channel Node 21 to Node 22

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>>>>CHANNEL INPUT INFORMATION<<<<

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CHANNEL Z1(HORIZONTAL/VERTICAL) = 3.00  
Z2(HORIZONTAL/VERTICAL) = 3.00  
BASEWIDTH(FEET) = 0.00  
CONSTANT CHANNEL SLOPE(FEET/FEET) = 0.003000  
UNIFORM FLOW(CFS) = 5.89  
MANNINGS FRICTION FACTOR = 0.0250  
=====

NORMAL-DEPTH FLOW INFORMATION:

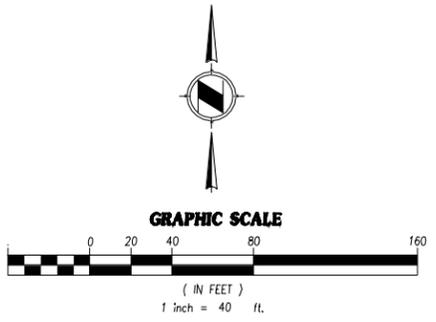
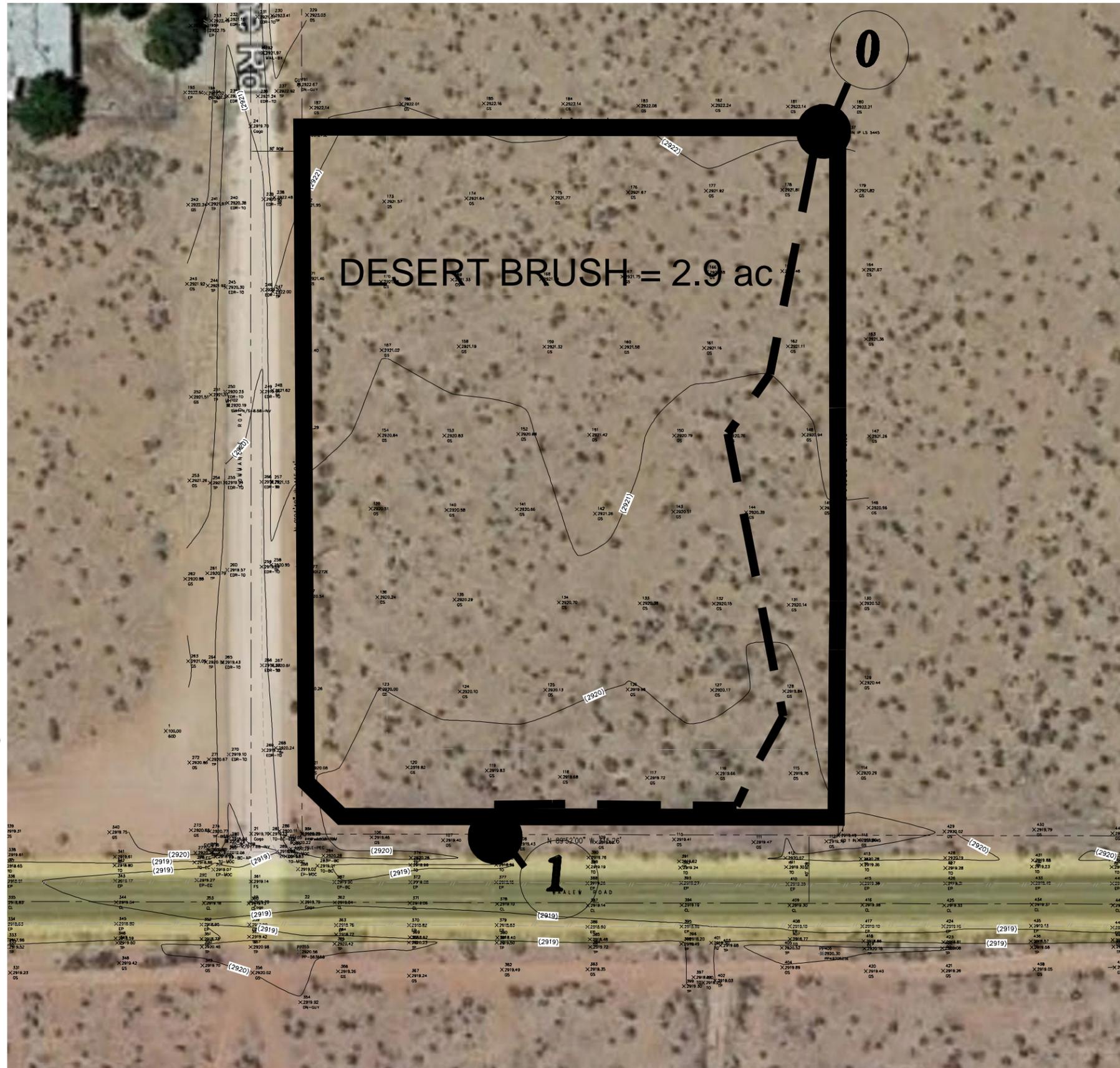
-----  
>>>>> NORMAL DEPTH(FEET) = 1.00  
FLOW TOP-WIDTH(FEET) = 5.99  
FLOW AREA(SQUARE FEET) = 2.99  
HYDRAULIC DEPTH(FEET) = 0.50  
FLOW AVERAGE VELOCITY(FEET/SEC.) = 1.97  
UNIFORM FROUDE NUMBER = 0.492  
PRESSURE + MOMENTUM(POUNDS) = 84.46  
AVERAGED VELOCITY HEAD(FEET) = 0.060  
SPECIFIC ENERGY(FEET) = 1.058  
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CRITICAL-DEPTH FLOW INFORMATION:

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CRITICAL FLOW TOP-WIDTH(FEET) = 4.51  
CRITICAL FLOW AREA(SQUARE FEET) = 1.70  
CRITICAL FLOW HYDRAULIC DEPTH(FEET) = 0.38  
CRITICAL FLOW AVERAGE VELOCITY(FEET/SEC.) = 3.47  
CRITICAL DEPTH(FEET) = 0.75  
CRITICAL FLOW PRESSURE + MOMENTUM(POUNDS) = 66.16  
AVERAGED CRITICAL FLOW VELOCITY HEAD(FEET) = 0.187  
CRITICAL FLOW SPECIFIC ENERGY(FEET) = 0.939  
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## Hydrology Exhibits

# EXISTING HYDROLOGY



PREPARED FOR  
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APN  
---

LEGAL DESCRIPTION  
---

DATE OF SURVEY  
---

### LEGEND

- AC INDICATES ASPHALT CONCRETE
- EP INDICATES EDGE OF PAVEMENT
- FF INDICATES FINISH FLOOR
- FH INDICATES FIRE HYDRANT
- FL INDICATES FLOWLINE
- MB INDICATES MAIL BOX
- MH INDICATES MANHOLE
- OU INDICATES OVERHEAD UTILITY
- PP INDICATES POWER POLE
- TC INDICATES TOP OF CURB
- WM INDICATES WATER METER
- WV INDICATES WATER VALVE

BENCHMARK  
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SURVEY NOTES  
( ) = ---

### BOUNDARY NOTE

BOUNDARY SHOWN HEREON IS A PAPER BOUNDARY. A PROPERTY LINE SURVEY WAS NOT PERFORMED OR REQUESTED AT THE TIME OF TOPOGRAPHIC SURVEY. OWNER OF SAID PROPERTY DID NOT PROVIDE A CURRENT TITLE REPORT, THEREFORE NO RECORDED EASEMENTS ARE PLOTTED ON THIS MAP.

PREPARED BY

PREPARED DATE: ---



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# PROPOSED HYDROLOGY EXHIBIT



Scale 1" = 100'

